

# **AURIGNACIAN RHAPSODY**

**With, through and about flutes from Swabian  
origins, in-between *a priori*, and *a posteriori***

## **Dissertation**

der Mathematisch-Naturwissenschaftlichen Fakultät  
der Eberhard Karls Universität Tübingen  
zur Erlangung des Grades eines  
Doktors der Naturwissenschaften  
(Dr. rer. nat.)

vorgelegt von  
Frances Gill  
aus Huddersfield/Großbritannien

Tübingen  
2023

Gedruckt mit Genehmigung der Mathematisch-Naturwissenschaftlichen Fakultät der  
Eberhard Karls Universität Tübingen.

Tag der mündlichen Qualifikation:	19.07.2023
Dekan:	Prof. Dr. Thilo Stehle
1. Berichterstatter:	Prof. Dr. Nicholas Conard
2. Berichterstatter:	apl. Prof. Dr. Michael Bolus
3. Berichterstatterin:	Professor Bodil Petersson

# AURIGNACIAN RHAPSODY

*With, through and about flutes from Swabian origins, in-between a priori, and a posteriori.*



ORIGINAL FRONT COVER - TUSK JIGSAW: PART OF A TUSK OF ANCIENT MAMMOTH IVORY INCORPORATING A FLUTE THAT WAS MADE FROM A SLIVER OF IT SPLIT IN TWO (LENGTHWAYS), HOLLOWED OUT AND THEN PUT BACK TOGETHER TO MAKE A TUBE, AND WHICH COPIES WHAT IS CONSIDERED TO BE A 40,000 YEAR OLD ENGINEERING TECHNIQUE.

ORIGINAL PHOTOGRAPH BY PATRIK GEIGER AND DIGITALLY MASTERED BY ANNIKA GRÜN WALDT SVENSSON.



*To Sam and Hannah*

*In memory of a dad – Michael Beatty [1935-2017] – who could find the broken notes on an old piano and find a key to avoid them, but couldn't remember how to spell the word rice.*

## TABLE OF CONTENTS

<b>Abstract</b> .....	<b>vi</b>
<b>Summary</b> .....	<b>vii</b>
<b>Summary in German</b> .....	<b>viii</b>
<b>Figures</b> .....	<b>x</b>
<b>Tables</b> .....	<b>xiv</b>
<b>Appendices</b> .....	<b>xv</b>
<b>Tracks from Album One: Sonic Debitage</b> .....	<b>xvi</b>
<b>Tracks from Album Two: LISTEN I am making a flute for you</b> .....	<b>xviii</b>
<b>Preface</b> .....	<b>xix</b>
<b>1. Ceci n'est pas une pipe</b> .....	<b>1</b>
1.1 <i>Introduction to 'Ceci n'est pas une pipe'</i> .....	1
1.1.1 <i>The Immutable-Flute Hypothesis</i> .....	7
1.1.2 <i>Structure of the Book and Notes</i> .....	8
<b>2. Music Origins?</b> .....	<b>12</b>
2.1 <i>Introduction to 'Music Origins?'</i> .....	12
2.2 <i>Nature Versus Nurture</i> .....	16
2.2.1 <i>A Working Definition of Music</i> .....	19
2.3 <i>Herbert Spencer</i> .....	22
2.4 <i>Musical Marvels</i> .....	24
2.4.1 <i>Nonsensical Vocables and the Absence of Symbolism</i> .....	26
2.5 <i>Charles Darwin</i> .....	28
2.5.1 <i>Spencer Versus Darwin</i> .....	29
2.6 <i>Terrible Emotions</i> .....	30
2.7 <i>Sonic Ritualisation</i> .....	33
2.7.1 <i>Ethological Perspectives</i> .....	33

2.7.2	<i>Musicking, Fluting (and Thinging)</i> .....	37
2.7.3	<i>Notes on Non-Representation</i> .....	38
2.7.4	<i>Salience</i> .....	39
2.7.5	<i>Response: Dynamic Icons Feel Real</i> .....	41
2.7.6	<i>Ambiguity and Meaning</i> .....	42
2.8	<i>Rousseau's Heritage</i> .....	44
2.9	<i>Sonic Icon</i> .....	47
2.9.1	<i>Heidelbergensis Iconic</i> .....	51
2.10	<i>Umbilical 'Chords'</i> .....	55
2.10.1	<i>An Important Calling for Archaeology</i> .....	56
2.10.2	<i>Umbilical Chords and Ritualisation</i> .....	57
2.10.3	<i>The Voice that Rocks the Cradle, and Oxytocin</i> .....	59
2.10.4	<i>Motherese and Melodic Behaviours</i> .....	63
2.10.5	<i>Crying, Laughing and Babbling, and the Invention of Instrumental Sound</i> .....	67
2.11	<i>Music, Feeling and the Icon</i> .....	72
2.12	<i>The Voice</i> .....	75
2.12.1	<i>Vocal Anatomy</i> .....	75
2.12.2	<i>Breath control</i> .....	77
2.12.3	<i>A Lowered Larynx</i> .....	77
2.12.4	<i>Neurology</i> .....	79
2.12.5	<i>Hearing</i> .....	81
2.12.6	<i>Walking</i> .....	82
<b>3.</b>	<b>Footsteps To Flutescapes .....</b>	<b>84</b>
3.1	<i>Introduction to 'Footsteps to Flutescapes'</i> .....	84
3.2	<i>Africa, Human Evolution, and the Earlier Stone Age (ESA)</i> .....	86
3.3	<i>The Middle Stone Age (MSA), the 'Mousterian', and the Middle Palaeolithic (MP)</i> .....	96
3.3.1	<i>A Crash Course in Cajsá S. Lund's Probability Groups</i> .....	105
3.3.2	<i>A TIDLIDIBAB and a Mirliton</i> .....	109

3.4	<i>Sound Tool Inventories for the Stone Age</i> .....	111
3.5	<i>Shifting to the Upper Palaeolithic (UP)</i> .....	117
3.6	<i>Considering Baldwinian Evolution</i> .....	123
3.7	<i>Intermission: Dream of a Waterbird</i> .....	125
<b>4.</b>	<b>The Valley</b> .....	<b>132</b>
4.1	<i>Introduction to The Valley</i> .....	132
4.2	<i>Hohle Fels Cave</i> .....	135
4.3	<i>Geissenklösterle Cave</i> .....	150
4.4	<i>The Palaeoenvironment of the Aurignacian Achtal</i> .....	153
4.5	<i>The Swabian Aurignacian</i> .....	157
<b>5.</b>	<b>Swabian Aurignacian: Tools of Sound</b> .....	<b>163</b>
5.1	<i>Introduction to Tools of Sound</i> .....	163
5.2	<i>Hidden Sounds in Hahn's Monograph, and Organological Morphology</i> .....	165
5.3	<i>The Ach Flutes</i> .....	168
5.4	<i>The Swan</i> .....	169
5.5	<i>The Mammoth: an Ivory-flute-blank Stave</i> .....	175
5.6	<i>The Mammoth: An Ivory Flute</i> .....	208
5.7	<i>The Vulture</i> .....	218
5.8	<i>Methodological Troubleshooting; the Round Peg and the Square Hole</i> .....	223
5.9	<i>The Conversation</i> .....	227
5.9.1	<i>To whistle or not to whistle, that is the question</i> .....	228
<b>6.</b>	<b>The Experimental Dimension</b> .....	<b>235</b>
<b>7.</b>	<b>Sonic Debitage</b> .....	<b>247</b>
7.1	<i>Seeberger's flute</i> .....	247
7.2	<i>Playing inside Hohle Fels</i> .....	249
7.3	<i>Playing at Geissenklösterle</i> .....	251
7.4	<i>Like blowing through a straw, (GK1)</i> .....	253
7.5	<i>The infant</i> .....	256

7.6	<i>Shak or ney?</i> .....	257
7.7	<i>14 cm and Green Källa</i> .....	259
7.8	<i>Bone tubes</i> .....	261
7.9	<i>Copying Seeberger</i> .....	264
7.10	<i>Duet for Anna</i> .....	266
7.11	<i>Copper for bone</i> .....	268
7.12	<i>Wolves and isophony</i> .....	271
7.13	<i>Reed play</i> .....	273
7.14	<i>Monica's house</i> .....	275
7.15	<i>The children</i> .....	277
7.16	<i>Aluminium for ivory</i> .....	278
7.17	<i>Across the valley from Sirgenstein</i> .....	285
7.18	<i>Vulture-radius flute</i> .....	288
7.19	<i>The bullroarers</i> .....	293
<b>8.</b>	<b>Immutable Flute .....</b>	<b>295</b>
8.1	<i>Introduction: The Paradox of the Icon</i> .....	295
8.2	<i>Life Situations</i> .....	296
8.3	<i>Acoustic Spaces</i> .....	297
8.4	<i>Melodic and Harmonic Musicality</i> .....	300
8.5	<i>The New Kids on the Block Flute</i> .....	309
	<b>Appendices .....</b>	<b>318</b>
	<b>An Index for Icons.....</b>	<b>329</b>
	<i>Discography</i> .....	329
	<i>Videography</i> .....	331
	<b>An Index for Symbols.....</b>	<b>333</b>
	<i>Bibliography</i> .....	333



## ABSTRACT

Life situations, acoustic spaces, melodic-harmonic musicality, and children, are contexts from which a number of experiential observations are amplified as related to material engagement *with*, *through* and *about* three particular archaeological artefacts from the Swabian Aurignacian referred to as the *Ach flutes*. In themselves these observations are enmeshed across a series of archaeo-organological experiments which are interrelated in respect of *immutable fluting*, hypothesised as a tangible aspect of the human compulsion to play with sound. The *Ach flutes* appearing so early on in the archaeological record provide an indication that fluting was a niche that modern *H. sapiens* harnessed in order to thrive and that these behaviours may be raised in reflection to the demise of the Neanderthals. Music and the origins of music are deconstructed from postcolonial and gender perspectives, which includes perspectives on ritualisation and fetishisation. Human evolution and the evolution of human music are also outlined. Music is argued as being functional, and results from quantitative and qualitative data lead to the logical abduction that the *Ach flutes* directly enhanced the survival of the Aurignacian Achtalians. Music making – as in the generating of sound patterns via processes of sound patterning – starts in infancy through provisioning, ontogenically first enhanced in the universal cradle of the mother-infant dyad. This is supported by perspectives which draw on numerous aspects of development psychology concerning sound and music, touching on the subject of children and young adults in archaeology, termed *umbilical chords*. An unwritten but assumed hypothesis that the hall at Hohle Fels was a place for fluting in the Aurignacian *Achtal* is overturned in favour of an appreciation that not only concerns dealing with the particular caves in which flutes and flute fragments were found, but also the environment in which the caves are embedded, in this case, the Ach Valley. Researching and understanding the musical cognition of modern humans using the archaeological record as a proxy is theorised and practised via an appreciation of critical Peircian semiotics in which a rationale for the dynamic icon is developed for *fluting* behaviours.

## SUMMARY

“Aurignacian Rhapsody: With, through and about flutes from Swabian origins, in-between a priori, and a posteriori” concerns three Aurignacian flutes from the Swabian Jura termed in this doctoral thesis as the *Ach Flutes*. The research also addresses the Ach Valley where the *Ach flutes* were discovered as a place where they were played and heard in pre/deep historical times. The study falls within the field of Music Archaeology, a discipline at the intersection of Art and Science. The author questions how these flutes define music and considers what this can reveal about the metacognition of modern humans. The study’s methodology draws on the Material Engagement Theory (MET) which provides a theoretical framework for experiment-based research that involves the reconstruction of the *Ach flutes*, their voicing methods, and music. The approach has evolved through the author's research during the past decade situated in the theory and practice of Contextual Experimental Archaeology, Experimental Heritage, and Experimental Music. Philosophical perspectives include the subjects of Phenomenology and Ritualisation. The *Immutable Flute* hypothesis asserts that flutes belonged to all members of the Aurignacian hunter-gatherer community but mainly to children and young adults who they were made for, and who also made them. Experiments concerning the acoustics of the Ach Valley itself indicate that the *Ach flutes* lay claim to the valley. Flutes developed the minds, musicality, and identity of human children in the Swabian Aurignacian as serious musical instruments offering endless possibilities for creating sonic form through generations. Small Aurignacian flutes such as the swan-radius flute are found exclusively in the Swabian Jura.

Research suggests that flute playing afforded the Aurignacian Achtalians a competitive advantage creating a distinct and powerful niche, both for individuals and collectively. Music arose among hominins in many critical contexts, and the engagement with flutes and music at different stages of ontogeny is discussed in relation to findings from experimental work to include the subject of adolescents and young adults at the cutting edge of change. The tonal ranges from reconstructions of the *Ach flutes* are compared to human voices, and a distinction is made between unmodified and modified flutes, and flutes that have mouthpiece attachments like reeds. Based on her experiments, the author argues that the flutes were not played exclusively in the caves where archaeologists have found flutes and flute fragments since the 1970s, but were played all over the valley where they can be heard clearly. A signaling system, making use particularly of the high frequencies of the unmodified instruments played as flutes, can be regarded in context of subsistence as the ethnomusicological and anthropological records suggest is the case for some hunter-gatherer societies. Finally, the research presents new perspectives on how the study of the *Ach flutes* and Upper Paleolithic wind instruments in general can be continued in the coming years and decades. As a result of the research, a new bullroarer, and mouth bows were also identified in Geissenklösterle based on a system developed by Cajsa Lund known as Probability Groups. The sonic results of the author's experiments can be heard on two music albums, released digitally and freely available to download. The albums are called "LISTEN I am making a flute for you" and "Sonic Debitage" and can be found on Bandcamp under the author's stage name, Frances Flute the Bellows Mender.

## SUMMARY IN GERMAN

”Aurignacische Rhapsodie: Mit, durch und über Flöten schwäbischer Herkunft, zwischen a priori und a posteriori“, Frances Gill, 30. April 2023.

Diese Arbeit handelt von drei aurignacischen Flöten aus der Schwäbischen Alb. Sie handelt ebenfalls auch vom Achtal, wo sie entdeckt wurden, als ein Ort, an dem sie in der Urzeit gespielt und gehört wurden. Die Studie gehört in den Bereich der Musik- Archäologie, welche ein Fach am Schnittpunkt von Kunst und Wissenschaft ist. Die Autorin stellt die Frage, wie diese Flöten Musik definieren und überlegt, was dies über die Kognition moderner Menschen aussagen kann. Die Methodik der Studie nimmt Bezug auf die von Lambros Malafouris entwickelte archäologische Theorie, Material Engagement Theory (MET). Diese liefert einen theoretischen Rahmen für die Experiment-basierte Forschung, welche die Rekonstruktion von und das Spielen rekonstruierter Flöten umfasst. Der Ansatz hat sich entwickelt durch die Arbeit der Autorin im letzten Jahrzehnt mit kontextueller experimenteller Archäologie sowie den Erkundungen im Bereich des experimentellen Kulturerbes in Skandinavien; dies in einem breiten Bogen, der beides miteinander verbindet. Die philosophischen Perspektiven schließen Phänomenologie und experimentelle Musik ein. Die Hypothese der Unstillbaren Flöte (Flöte, die nicht zum Schweigen gebracht werden kann) in der Dissertation behauptet, dass die Flöten allen Mitgliedern der aurignacischen Jäger-Sammler-Gemeinschaft gehörte. In den Experimenten mit der Akustik des Achtals wird argumentiert, dass die Flöte Anspruch auf das Tal erhebt. Die Flöten entwickelten den Geist der Kinder beim Spiel, indem sie zu ernsthaften Werkzeugen wurden, die endlose Möglichkeiten für Variation, Struktur, Form und Textur im Klang boten. Kleine aurignacische Flöten wie die Schwanenradiusflöte sind ausschließlich in der Schwäbischen Alb zu finden. Die Forschungen deuten darauf hin, dass das Flötenspiel den Verstand der Homininen im Achtal des Aurignacien entwickelte und den Menschen einen Wettbewerbsvorteil verschaffte, indem es eine besondere und mächtige Nische schuf, sowohl individuell als auch kollektiv. Musik entstand bei Homininen in vielen kritischen Kontexten, und die Beschäftigung mit Flöten und Musik in verschiedenen Phasen der Ontogenese wird in direktem Zusammenhang mit Ergebnissen aus experimentellen Arbeiten diskutiert, z. B. dem innovativen Geist von Jugendlichen und jungen Erwachsenen an der Spitze dessen, was als kulturelle Evolution bezeichnet wird. Flöten werden mit der menschlichen Stimme verglichen, und es wird unterschieden zwischen unmodifizierten Flöten und Flöten, die mit Rohrblättern gespielt werden, wie auch unterschieden wird zwischen weiblichen und kindlichen beziehungsweise männlichen Stimmen des Homo sapiens. Die Autorin plädiert ausgehend von ihren Experimenten, dass die Flöten nicht ausschließlich in den Höhlen gespielt wurden, wo Archäologen ihre Überreste seit den 1970er Jahren gefunden haben, sondern dass sie im ganzen Tal gespielt wurden, weil sie überall im Tal gehört werden können. Das einzigartige Signalsystem, insbesondere die hohen Töne der unmodifizierte Instrumente, kann als lebenswichtiges Mittel für Subsistenzstrategien angesehen werden, wie es in ethnomusikologischen und anthropologischen Aufzeichnungen belegt ist. Schließlich werden mit der Dissertation neue Türen und Fenster geöffnet mit Denkanstößen, wie die Erforschung der Flöten des Ach- (und Lone-)tals und der jungpaläolithischen Blasinstrumente im Allgemeinen in den kommenden Jahren und Jahrzehnten fortgesetzt werden kann. Als Ergebnis der

Untersuchung werden in Geissenklösterle auch ein neues Schwirrholz und Mundbögen nach einem von Cajsá Lund in der Musikarchäologie entwickelten System identifiziert. Die klanglichen Ergebnisse der Experimente der Autorin sind auf zwei Musikalben zu hören, die in digitaler Form veröffentlicht wurden und als Ergänzung zur Dissertation frei erhältlich sind. Die Alben heißen: „LISTEN I am making a flute for you“ und „Sonic Debitage“ und sind auf Bandcamp unter dem Künstlernamen der Autorin, Frances Flute the Bellows Mender, zu finden.

Translated Henrike, and Bernhard Mollenhauer.

FIGURES

FIGURE 1.1. Reconstructions (those from osseous material are labelled) ..... 11

FIGURE 2.1. Music as sound-pattern storage ..... 21

FIGURE 2.2. The humming bird ..... 48

FIGURE 3.1. The diving waterbird ..... 131

FIGURE 4.1. Water screening at Hohle Fels ..... 141

FIGURE 4.2. Field walking near Hohle Fels ..... 141

FIGURE 4.3. Stratigraphic profile from Hohle Fels ..... 142

FIGURE 4.4. Entrance to Hohle Fels Cave ..... 142

FIGURE 4.5. Caves of the Ach Valley ..... 143

FIGURE 4.6. Uncalibrated radiocarbon dates at Hohle Fels ..... 144

FIGURE 4.7. Dance for the new mammoth-ivory flute ..... 145

FIGURE 4.8. Bernadette Käfer - transverse flute ..... 146

FIGURE 4.9. Frances Gill - transverse flute ..... 146

FIGURE 4.10. Stratigraphic profile from Geissenklösterle ..... 147

FIGURE 4.11. Bayesian model for dates at Geissenklösterle ..... 148

FIGURE 4.12. UNESCO caves of the Swabian Aurignacian ..... 149

FIGURE 5.1. Key archaeologists from Tübingen (past and present) involved with flute finds and research ... 176

FIGURE 5.2. Caves that have yielded Aurignacian finds of flutes and flute fragments ..... 176

FIGURE 5.3. Aurignacian flute fragments from the Achtal and Lonetal, compiled Ewa Dutkiewicz (2021) ... 177

FIGURE 5.4. Sound tools from Geissenklösterle in Aurignacian layers ..... 178

FIGURE 5.5. Seeberger playing a mouthbow (video footage, Kölbl 2006) ..... 178

FIGURE 5.6. GK1; GK3, and HF1 from anterior, posterior, and lateral angles ..... 179

FIGURE 5.7. Characteristics of the Ach flutes from the first publication in English dedicated to them ..... 180

FIGURE 5.8. GK1, GK2, and HF1 reconstructions voiced by Potengowski: tonametrical results ..... 180

FIGURE 5.9. Plot showing distribution of fragments for GK1, GK2 & GK3 at Geissenklösterle ..... 181

FIGURE 5.10. A compilation of currently available measurements for GK1 ..... 182

FIGURE 5.11. *Drawing of the radius and ulna bones in a bird wing (drawn Riitta Rainio)* ..... 182

FIGURE 5.12. *GK1: anterior profile*..... 183

FIGURE 5.13. *The swan-wing experiment* ..... 183

FIGURE 5.14. *Smoothing the ends and surface of the bone tube* ..... 184

FIGURE 5.15. *Making fingerholes on a radius bone from a swan wing* ..... 184

FIGURE 5.16. *GK1 tonametrical series for actual fundamentals: comparing data from 3 sources* ..... 185

FIGURE 5.17. *Wedging and splitting an ivory stave* ..... 185

FIGURE 5.18. *The ivory-flute-blank stave (drawings from Hahn 1988/fig. 43, 1. 2. & 7)*..... 186

FIGURE 5.19. *Evidence of ivory fracturing in the Aurignacian* ..... 186

FIGURE 5.20. *Distribution of worked ivory for the flute-blank stave complex*. ..... 187

FIGURE 5.21. *Getting an ivory sliver from a tusk* ..... 188

FIGURE 5.22. *Notebook sketch of GK3 with measurements*..... 188

FIGURE 5.23. *Wax stabilising the GK3 complex* ..... 190

FIGURE 5.24. *Wax morphologies on GK3*..... 190

FIGURE 5.25. *Microscopic imagery for traces of working on GK3* ..... 191

FIGURE 5.26. *Hypothetical chain of operation for constructing an ivory flute*. ..... 192

FIGURE 5.27. *Constructing a mammoth-ivory flute (links I)*..... 193

FIGURE 5.28. *Constructing a mammoth-ivory flute (links II)*..... 193

FIGURE 5.29. *Constructing a mammoth-ivory flute (links III)* ..... 194

FIGURE 5.30. *Constructing a mammoth-ivory flute (links IV)* ..... 194

FIGURE 5.31. *Constructing a mammoth-ivory flute (links V)*..... 195

FIGURE 5.32. *Finished and semi-finished flutes* ..... 195

FIGURE 5.33. *GK3 flute players*..... 196

FIGURE 5.34. *HF1 stratigraphic position* ..... 197

FIGURE 5.35. *HF1 found in situ in the clay, in AH Vb* ..... 197

FIGURE 5.36. *HF1 Players I* ..... 198

FIGURE 5.37. *HF1 Players II* ..... 198

FIGURE 5.38. *Contemplating anterior notch on HF1, and impeccable reconstruction* ..... 199

FIGURE 5.39. <i>Contemplating the double notch on HF1</i> .....	199
FIGURE 5.40. <i>The fingerholes of HF1</i> .....	200
FIGURE 5.41. <i>Models of HF1 from several practitioners</i> .....	200
FIGURE 5.42. <i>The fingerhole symmetry of HF1</i> .....	201
FIGURE 5.43. <i>Notch or not</i> .....	201
FIGURE 5.44. <i>HF1 Players III</i> .....	202
FIGURE 5.45. <i>Sample of tonometrical series for GK1, GK3 and HF1 (previous research)</i> .....	203
FIGURE 5.46. <i>Experimental Morphology</i> .....	204
FIGURE 6.1. <i>An icon of 'the experimental dimension' (ED)</i> .....	238
FIGURE 6.2. <i>Cajsa S. Lund's 'research wheel'</i> .....	239
FIGURE 7.1. <i>Sound patterns from a GK1 reconstruction, voiced like blowing through a straw</i> .....	255
FIGURE 7.2. <i>Photo documentation from the experiment called 'shak or ney?'</i> .....	257
FIGURE 7.3. <i>Compositions related to GK1: '14 cm' and 'Green Källa'</i> .....	259
FIGURE 7.4. <i>An extract of a piece for solo swan-wing bones</i> .....	263
FIGURE 7.5. <i>Some theoretical pitch approximations for GK1</i> .....	270
FIGURE 7.6. <i>Fingerhole spacing for GK3 measured from a photograph</i> .....	281
FIGURE 7.7. <i>Pitch plasticity comparison between two embouchures across 5 reconstructions of GK3</i> .....	282
FIGURE 7.8. <i>Best playing areas for 5 reconstructions of GK3 across two embouchures ('ney' and 'shak')</i> .....	283
FIGURE 7.9. <i>Transcription of the sonic sketch called "GK3 22 cm Ney"</i> .....	284
FIGURE 7.10. <i>A Hein GK3 flute reconstruction, and Mandy Bertram's trek across the valley</i> .....	287
FIGURE 7.11. <i>Step by step reconstruction of HF1</i> .....	291
FIGURE 7.12. <i>Strip lighting and a silver copy of HF1 made by Jennie Gill</i> .....	292
FIGURE 7.13. <i>Sessions layout for HF1 reconstruction experiment</i> .....	292
FIGURE 8.1. <i>Reconstructions of the Ach flutes belonging to the author</i> .....	313
FIGURE 8.2. <i>The temporal icon</i> .....	313
FIGURE 8.3. <i>This is not a pipe. Graphic drawing Hannah Gill</i> .....	314
FIGURE 8.4. <i>HOLLOW RUMBLE OF WINGS by Simon Wyatt</i> .....	314
FIGURE 8.5. <i>A vulture, a flute and a flute player</i> .....	315

*FIGURE 8.6. Swans* ..... 315

*FIGURE 8.7. Swan ulna blockflute following GK1* ..... 316

*FIGURE 8.8. Animal icons of the earth* ..... 316

*FIGURE 8.9. Dating the Ach flutes* ..... 317

*FIGURE 8.10 The attitude of the flute* ..... 317

## TABLES

TABLE 5.1. <i>Archaeological data for GK3</i> .....	181
TABLE 5.2. <i>Excavation data for the ivory-flute-blank stave complex</i> .....	187
TABLE 5.3. <i>Dimensions of GK3 from previous research compiled Frances Gill</i> .....	189
TABLE 7.1. <i>Identifying a pierced baton at Geissenklösterle as a bullroarer</i> .....	294

## APPENDICES

<i>APPENDIX 1. Birds in GHs 12-14 (Geissenklösterle) .....</i>	318
<i>APPENDIX 2. Sound tools from Aurignacian layers in the Ach Valley .....</i>	319
<i>APPENDIX 3. Ivory and bone flutes, flute and bone-tube fragments, from Ach and Lone Valleys .....</i>	320
<i>APPENDIX 4. Swabian Aurignacian flute fragments: a report, and notes on Appendix 3 .....</i>	322

## TRACKS FROM ALBUM ONE: SONIC DEBITAGE

ALBUM ONE 7.1. <i>Seeberger's flute (02:36)</i> .....	247
ALBUM ONE 7.2. <i>In Hohle Fels that night (00:52)</i> .....	249
ALBUM ONE 7.3. <i>What the goat heard (00:45)</i> .....	251
ALBUM ONE 7.4 <i>Gravid (01:46)</i> .....	253
ALBUM ONE 7.5. <i>Trills (00:15)</i> .....	256
ALBUM ONE 7.6. <i>Tongue and pitch (00:55)</i> .....	256
ALBUM ONE 7.7. <i>The pitch of mummy (00:38)</i> .....	256
ALBUM ONE 7.8. <i>Bone tubes (01:51)</i> .....	261
ALBUM ONE 7.9. <i>Schlaflied (00:35)</i> .....	264
ALBUM ONE 7.10. <i>Duet for Anna (01:20)</i> .....	266
ALBUM ONE 7.11. <i>Length for a swan-radius flute (03:39)</i> .....	268
ALBUM ONE 7.12. <i>Finding wolves (01:45)</i> .....	271
ALBUM ONE 7.13. <i>Reed play (00:58)</i> .....	273
ALBUM ONE 7.14. <i>Monica's house (01:00)</i> .....	275
ALBUM ONE 7.15. <i>He has it (00:27)</i> .....	277
ALBUM ONE 7.16. <i>GK3 18 cm Ney (00:47)</i> .....	278
ALBUM ONE 7.17. <i>GK3 20 cm Ney (00:39)</i> .....	278
ALBUM ONE 7.18. <i>GK3 22 cm Ney (00:33)</i> .....	278
ALBUM ONE 7.19. <i>GK3 24 cm Ney (00:49)</i> .....	278
ALBUM ONE 7.20. <i>GK3 26 cm Ney (00:38)</i> .....	278
ALBUM ONE 7.21. <i>GK3 18 cm Shak (00:38)</i> .....	278
ALBUM ONE 7.22. <i>GK3 20 cm Shak (00:48)</i> .....	278
ALBUM ONE 7.23. <i>GK3 22 cm Shak (00:30)</i> .....	278
ALBUM ONE 7.24. <i>GK3 24 cm Shak (00:49)</i> .....	278
ALBUM ONE 7.25. <i>GK3 26 cm (00:26)</i> .....	278
ALBUM ONE 7.26. <i>Still hear you (12:18)</i> .....	285

Tracks from Album One: Sonic Debitage

<i>ALBUM ONE 7.27. Bullroarer one, no holes (00:52)</i> .....	293
<i>ALBUM ONE 7.28. Bullroarer two, 4 holes (01:03)</i> .....	293

TRACKS FROM ALBUM TWO: LISTEN I AM MAKING A FLUTE FOR YOU

<i>ALBUM TWO 7.1. Psychopomp I (12:39)</i> .....	288
<i>ALBUM TWO 7.2. Ring notching (08:17)</i> .....	288
<i>ALBUM TWO 7.3. Swilling (04:01)</i> .....	288
<i>ALBUM TWO 7.4. Smoothing and sanding (05:13)</i> .....	288
<i>ALBUM TWO 7.5. Psychopomp II (04:09)</i> .....	288
<i>ALBUM TWO 7.6. Fingerhole making (08:04)</i> .....	288
<i>ALBUM TWO 7.7. More fingerhole scraping (09:49)</i> .....	288
<i>ALBUM TWO 7.8. Last hole finding (06:44)</i> .....	288
<i>ALBUM TWO 7.9. Psychopomp III (06:48)</i> .....	288

## PREFACE

I first met Nicholas Conard in 2010 who had invited me to the University of Tübingen in Germany to discuss the possibility of collaboration on the subject of the Aurignacian vulture-radius flute from Hohle Fels Cave. I had been previously working on an audio-visual project about it in Sweden with artist Fredrik Tonnessen, referencing musical pitches taken from a recording of a performance by Wulf Hein playing his reconstruction of the find. In Tübingen, I was introduced to Susanne Münzel who told me about more Aurignacian flutes from the Ach Valley, one of which she had refitted from swan-radius fragments excavated at Geissenklösterle. I also met Maria Malina who had been managing the dig at Hohle Fels when her team had excavated the vulture-radius flute, and who had previously refitted another flute from mammoth-ivory fragments, recovered from Geissenklösterle. The following summer, 2011, I took part in the dig at Hohle Fels that she ran. These are the three artefacts that form the material focus in this thesis. During the 2010 visit Susanne Münzel introduced me to Petra Krönneck in Tübingen who was researching the archaeological remains of birds from Geissenklösterle. Petra died in 2018. I am grateful and glad to have had the privilege of meeting her, and to hear her talk about birdsong in the Ach valley.

As a graduate of music, and working as a flute teacher, performer and composer, I accepted, at Professor Conard's invitation, an opportunity to study Archaeology as a mature student in order to qualify as a PhD archaeology student at the University of Tübingen. This coincided with the launch of a new course in Music Archaeology in Sweden at Linnaeus University founded by Cajsa S. Lund and Cornelius Holtorf. Here I studied Archaeology, and Music Archaeology. After writing my bachelor's essay in Experimental and Music Archaeologies with a focus on Stone Age flutes, I also spent a term at Linnaeus reading Musicology, and researching the process of learning to play a swan-radius flute. Instead of approaching the instrumental process in retrospection, or in terms of expectation, the research instead focuses purely on what is happening in the moments of each moment. The interdisciplinary (towards transdisciplinary) challenges I encountered are partly why the Magister's dissertation in Musicology was completed but not submitted; instead it now forms part of this doctoral thesis (Experiment 7.4 with accompanying track called *Gravid*). The other reason was that I went into labour with my daughter, during the last seminar with my supervisor Karen Hallgren.

Throughout the early part of my research particularly, I could not play the flute reconstructions instantly. I have been fluting since age seven (age six if one counts the recorder), and was always making up music (composing). The beauty of not immediately being able to play bone flutes meant that my theoretical approach encountered process by design. It was no longer a dilemma to be non-virtuoso because my work was going to concern metacognitive (fluting) processes via engagements with the material through every stage of production, i.e., from making a flute, to making it sound, to the way in which processes can guide musical outcome, and so on. Besides this, the time spent at Linnaeus for a while took on a life of its own, with extra study for an additional Master's course in Archaeology which I began with a new baby – my daughter Hannah Rose – who accompanied me to lectures only days' old. The course I was not able to complete in full but I had already been accepted as a doctoral student in the Department of Early Prehistory and Quaternary Ecology, Eberhard Karls University of Tübingen. Many times I believed the

burden of research was too much and I shouldn't continue, and many times I questioned my entitlement, but I remember a conversation with Nicholas Conard who had said "just do it". In order to support my research, I accepted a funded project in Experimental Heritage, a new research area which forms a theoretical arch with Experimental Archaeology. Bodil Petersson, who had been my Archaeology supervisor at Linnaeus, supported me, offering me a primary role in this research project. This led me to conferences of the European Association of Archaeologists (EAA) and later, the Theoretical Archaeology Group in the UK (UK TAG). Here I gave presentations in Maastricht, and in Chester respectively, resulting in one published article which I co-authored.

Meanwhile I had found a mutual area of interest with music archaeologists in Sweden, Germany, and the world, via two groups and the same community: - the study group in Music Archaeology for the International Council for Traditional Music (ICTM); and the International Study Group on Music Archaeology (ISGMA). For symposiums in Germany and Slovenia respectively, I participated in various sessions, workshops and performances, including organising a session for the symposium on the theme of Stone Age Music, in Ljubljana. The German symposium in Berlin resulted in two publications, one which I co-authored. In Sweden, music archaeologists honoured the pioneer of Music Archaeology, Cajsa S. Lund, at a symposium held at Linnaeus University, which I helped to coordinate. A result of this was a published article in her *Festschrift*. The keynote speaker was Iain Morley. His thesis, the *Prehistory of Music*, permanently sits on my desk. I broadly agree with his teaching but differ on some points, and so in my thesis – especially in Chapter Two – it has, in part, become almost like a discussion with him. He died in 2021. Amongst the many scholars who have benefited, and continue to benefit from his outstanding contribution in the field, I am just one of many who feel aggrieved not to be able to continue the conversation with him on the subject he was so passionate about. I am glad I met him again visiting him in Oxford in 2017 where we talked about springs, and children.

During a period of experiments and reading for my PhD, I was back and forth from Sweden to Germany for concerts, workshops, and excavations which included a first meeting with Wulf Hein in 2011. Here I made a flute from a radius of a swan wing which I had extracted from a dead swan found in Blekinge (Sweden) by Gertrud Olsson who also supervised the experiment. I began collaborating with German archaeologists, flute players, and experimental archaeologists also interested in the Aurignacian Swabian flutes. These specialists have supervised my reconstruction attempts in bone and ivory, and in music. In Blaubeuren a team of us has been particularly dedicated to working as a group on the topic of the Swabian finds for several years, meeting periodically at the Museum of Prehistory. Amongst them are the flautists Anna Friederike Potengowski, Susanne Schietzel, and Gabriele Dalferth. In addition to the invaluable supervision and friendship from Wulf Hein, I must mention Frank Trommer and his team in Blaubeuren. Svenja Schray emerged at the end of this doctoral process shepherding me home via extensive help with checking the archaeology, databases, and performing all manner of administrative procedures for this thesis. I should also mention Maria Malina for her conversations, constant supply of information, and laughter. There are a great many great people and great groups of people whom I would like to thank. From first meeting Simon Wyatt in Berlin in 2014, he has been supportive, kind, and knowledgeable. Also, thanks to Susanne Münzel, and for all her delicious dinners!

Firstly I must say thank you for the grant awarded by *Gesellschaft für Urgeschichte* (GFU/the society of Pre-history/Germany) in 2013 for support with expenses towards making a mammoth-ivory flute. Secondly, I would like to thank (in Sweden) the artists, archaeologists and academics of Experimental Heritage who from spring 2015 welcomed me to their work at the intersection of Art and Archaeology (Art and Science). Through this valuable exploration supporting the theoretical aspects of my work in Germany, I was awarded a project funded by the Kamprad family charity (part-time between 2016 and 2018). Thirdly, I must say thank you for a grant awarded in 2019 to support the write-up/completion of this thesis within the UNESCO-project "Caves of the Swabian Jura" at the Department of Early Prehistory and Quaternary Ecology, Eberhard Karls University of Tübingen (Germany) on the topic of Aurignacian flutes from the caves of the Swabian Jura. Finally I would like to thank Visby International Centre for Composers (VICC) for a week's residency in Gotland (Sweden) in December 2022 to record the process of making a flute, and again in April 2023 to produce two albums in support of this thesis from recordings made over the last decade that are integral to this research concerning Upper Palaeolithic flutes of the Swabian Aurignacian.

The colleagues and friends especially that I would like to thank in Germany are: - Nicholas Conard; Susanne Münzel; Michael Bolus; Maria Malina; Harald Floss; Alexander Janas; Mohsen Zeidi; Sibylle Wolf; Panagiotis Kritikakis; Miriam Hiltermann; Ewa Dutkiewicz; Heike Würscham; Mandy Bertram; and Benjamin Schürch. Also, Wulf Hein; Stefani Kölbl; Marziyeh Zarekhalili; Barbara Spreer; Frank Trommer; Patrick Geiger; Hannes Wiedmann; Pierre Stoll; Nik Tarasov; Gabriele Dalferth; Anna Friederike Potengowski; Susanne Schietzel; Dorothea Federle; and Giulia Toniato. I am particularly indebted to Mohsen Zeidi for the maps created especially for 'Aurignacian Rhapsody'.

In Sweden, the list extends to: - Cajsa S. Lund; Karin Hallgren; Bodil Petersson; Anna-Karin Karlsson; Anders Högberg; Cornelius Holtorf; Ludvig Pappmehl-Dufay; and Emelie Bernhard. Also, Annika Grünwaldt Svensson; Helle Kvamme; Walle Dickson; Ylva Magnusson; Birgitta Ridderstedt; Fredrik Tonnessen; Gertrud Olsson; Åsa Gunnarsson (with class 4 from 2021 in Väckelsång); Jörgen Ludvigsson; Henrike and Bernhard Mollenhauer; Karin Bojs; John Swartling and his team; and Jan Bengtson.

From the spheres of Music Archaeology, I extend additional thanks to: - Bostjan Odar; Jean-Loup Ringot (and Raquel Jimenez Pasadolo); Rütta Rainio; Gjermund Kolltveit; Annemies Tamboer; Arnd Adje Both; and Barnaby Brown.

Towards help and support with music, music technology and music composition, the list includes: - Gary Carpenter; Linda Persson; John Schofield; Liam Maloney; Hans Gurstad-Nilsson; Rickard Scheffer; Sten Melin; and Joseph Lake.

I would additionally like to thank Ellen Dissanayake, Eric Spitzer-Marlyn; and to Erik (the flute maker) Sampson. Also, Andrew Lamb (Bate Collection). I would like to say thank you to Michael Praxmarer who invited me to read his doctoral thesis (forthcoming) whose work I have fortuitously had the opportunity to refer to in this doctoral thesis.

I thank my close personal friends and relatives who have given me emotional support and encouragement, to include Jennie Gill who also cast a copy of the vulture flute in silver during this process. I thank my mum, Susan Beatty, who has meticulously proofread my work also, and my brother Jonathan Beatty for his constant support and musical guidance. During this process, my dad died. He accompanied my flute playing on piano on many occasions, and he wrote out all my scales by hand – both tongued and legato. I would have dearly loved to have thanked him too.

I thank with all my heart my husband Adrian, and our two children, Sam and Hannah. I do remember a time sitting writing at my desk in my upstairs office one summer when a toy drone appeared at the window with a sticky note on it. A message on the note read something like: *We're hungry; are you making tea or are we getting our own?* So in gratitude to my family, I agree, it is time now to stop and have tea.

Finally, I have an elephant to thank whose tusk had been stored for decades for the now-illegal making of piano keys from ivory. So I thank the elephant for this flute which is one that Wulf Hein made for me. I thank the mammoth whose ivory I have for a flute I made with Frank Trommer and his team. I thank the vulture, supplied by Jean-Loup Ringot (and Raquel Jimenez Pasadolo), for a radius. I also thank two swans for their wing bones.



Graphic drawing by Hannah Gill

## 1. CECI N'EST PAS UNE PIPE

Flame:

Latin (flamma)

Ancient Greek ( φλοξ = phlox)

Modern Greek ( φλόγα = floga)

Flute:

Modern Greek ( φλογέρα = flogera)

### 1.1 INTRODUCTION TO 'CECI N'EST PAS UNE PIPE'

The progression from the simplest sound producers of the Palaeolithic to the most sophisticated electronic instruments of the 20<sup>th</sup> century is one of the most logical and natural; the evolution of the impulse which led to [hu]man[kind]'s inherent musicality is less well understood and all the more significant (Paula Marie Theresa, Scothern 1984a; 1984b).

Nicholas Conard once told me that he regularly experiences individuals being moved to tears as soon as he plays in his lectures an extract of Friedrich Seeberger playing a flute reconstruction of an archaeological find from the Ach Valley (*Achtal*) in the Swabian Jura, South West Germany. It is important to ask why this is, and I firmly believe that it must have something to do with existential emotion at the interface which is engaging materials in relation to time, redeeming identity and exciting memory. It reminds us who we are and where we have come from more than any other fragment of the past. Our past lives from millions of years ago where we lived in nurturing societies, as bonobos do – because what is truly savage about humans is only our current state of the art (Griffith 2016) – is unlocked. This is why I call this book a rhapsody, which is essentially a tragedy. This research has evolved organically at the interface *with, through and about* materials which comprise archaeological musical instruments, a valley, and an important material that emerges when they all come together, also known as 'music'. In this sense, flutes are tools, or 'soundtools' which is a term coined by Cajsja Lund and now widely used by music archaeologists (e.g., Kolltveit and Rainio 2020). *With, through and about* alludes to Lambros Malafouris work on metacognition in relation to stone knapping (2013).

The methodology in this research is situated in the "domain of human phenomenology (that is, the relationship or interface between cognition and material culture)", (Malafouris 2013: 15). Maurice Merleau-Ponty expresses this space from the perspective of a material pipe;

I have an absolute knowledge of where my pipe is, and from this I know where my hand is and where my body is, just as the primitive person in the desert is always immediately oriented without having to recall or calculate the distances traveled and the deviations since his departure (Merleau-Ponty: 2012:102).<sup>1</sup>

This methodology in this research is designed for experimental archaeo-musicological exploration. This attitude challenges the hegemony of *a priori* and *a posteriori* thinking and acting, towards what things do rather than what things mean. The three most complete 'flute' finds originating from the Ach Valley (to include the one which Seeberger had reconstructed), are types of material. The valley is material. Music is material. This includes across distances and across times. The archaeological-melodic wind instruments (the flute finds) constitute the material associated with modern humans living in hunter-gatherer societies during the Aurignacian which is a conceptual space that archaeologists use to mark the beginning of the Upper Palaeolithic (UP). The three finds will be referred collectively throughout this thesis, as the *Ach flutes*. This is simply a pragmatic label to differentiate the trio of artefacts from a larger inventory of related 'aerophone' finds in various contexts (e.g., Morley 2013: 327-368), and to avoid any possible confusion with the names of reconstructions associated with these.

The title of this first section *Ceci n'est pas une pipe* owes its reference to René Magritte [1898-1967] whose 1928-1929 painting known (in English) as *This is not a pipe*, is not a pipe because it is an icon of a pipe; the pipe can't be stuffed with tobacco and smoked because it is a representation, a fake, and not real. In this thesis I hone in on the semiotic icon as a methodological and epistemological tool. A critical point to clarify is that the icon which I am dealing with is not static, like rows of cutmarks in ivory unless the patterns are moving which they surely are if the patterns are on an ivory flute moving in the playing, like zebra stripes. If Magritte's pipe was a film-loop of a smoking pipe, then it would cease to be static. The term *dynamic* is used therefore to describe moving (and not static) icons following the work of Lawrence Zbikowski (2017). I form a direct comparison between his ideas and the research by Ellen Dissanayake (2006) following her ideas about music and ritualisation. The idea is ultimately to move the bias for understanding 'modernity' in the hominin evolutionary sense from seeing the world through symbols to feeling the world through icons which simultaneously allow the quality of the icon to refocus the rationale for approaching the subject of cognition in archaeology. Would Conard's audience be so moved to tears if they heard the bronze lurs? Surely the character of sound is intrinsic, and the type of iconic representation in a small flute may be considered in relation to the dynamic processes that reveal themselves cognitively in behaviours like crying.

*This is not a pipe* also has another connotation. For many years the earliest melodic-wind instruments in the archaeological record were referred to as flutes (e.g., Buisson 1990). The Aurignacian finds from Germany also follow this custom. Since these early French and German discoveries, the instruments have also been referred to as pipes (e.g., Lawson and d'Errico 2002). Jean-Loup Ringot (2011) pointed out that the term 'flute' is strictly speaking incorrect because if a reed (single reed) were inserted into the mouth end of such an instrument, or indeed a pair of reeds (double reed), or even played by using the lips as a reed – as in the way that brass

---

<sup>1</sup> The term 'primitive' may be better served with a non-pejorative connotation, e.g., 'non-Western' in relation to humans.

instruments are typically played – (a lip-reed technique), then a tube with finger holes would morph from a flute into a clarinet, an oboe, or a trumpet respectively. Ringot suggests using the term *aerophone* as a taxonomic label. In the database of instrument families found in Musical Instrument Museums Online/MIMO (2011) the current version adhering to the Hornbostel-Sachs scheme adopts a development by Jeremy Montagu (2009), and this replaces the term aerophone with the term 'wind instrument', a term that a group of us adopted in an article (Münzel *et al.* 2016), but since when I now prefer the term melodic-wind instruments.

Although the term aerophone is still in use, e.g., in The Grove Dictionary of Musical Instruments (Libin 2014), I am still not clear whether the term 'pipe' is an umbrella term for 'aerophones' or an alternate name for a 'flute'. Paula Scothern summarising categories for a Palaeo-organological survey includes: - Vertical flute: including notched and V-notched; Vertical flute; block and duct; Transverse flute; Syrinx/Pan; Perforated tubes: multi-hole flute / single-hole whistle; Whistle: phalange and perforated tube; Intermediate forms, and Unclassified (1984b: 73-74). She goes on to add that the phalangeal whistle is the most common type of The Whistle, and adds: - Free Aerophones: The Bull Roarer; Idiophones; Scraped and Percussion, to the full complement of general instruments. She doesn't mention chordophones since these are not typical Palaeolithic sound tools, although there may be a number of Aurignacian mouth bows in the Ach Valley (see Chapter 5).

I have noted an interest from many colleagues who are concerned with classifying instruments, nomenclature, and musical pitches (frequencies) that are possible through playing reconstructed finds. I wish to make it clear this is not my main interest but in context is often difficult to avoid, probably and mainly in relation to expectation, obligation and tradition. I take an approach for flutes of the type I am working with which recognises that the length of a tube determines the acoustic frequency which may be separated into two organological forms for theoretical frequency: - those musical instruments that are open at both ends, where the frequency  $f$  of the open tube equals  $c/2L$ ; and those that are closed at one end, where the frequency  $f$  of the tube closed at one end equals  $c/4L$ .<sup>2</sup> If one blocks or closes one end of a tube being blown in whatever way, (e.g., lip reed) the frequency is doubled producing a lower octave pitch. This is child's play, where such engagement with sound material is a good place for interrogating cognitive process in terms of sonic manipulation as material engagement. Similarly if one overblows and gets the octave harmonic on a flute, then the frequency is doubled. If one blocks the end of a tube, like a panpipe, the frequency is halved. This is sonic jumping up and down, *for joy*. As Malafouris writes; "the focus is on understanding the material world as a constitutive and efficacious part of the human cognitive system both from an ontogenetic and a phylogenetic perspective" (2013: 38). Any child playing with octaves in this way knows about this, like a first surprise.

---

2

$f$  = frequency in Hertz

$c$  = speed of sound in m/s (metres per second) at temperature i.e., 20 degrees = 343 m/s

$L$  = length of tube

There is another consideration in relation to the diameter of a tube called 'end correction' which I discuss in the experiment called 'Copper for bone'.

The *Acb flutes* are synonymous with music which is why an investigation of the *Acb flutes* is simultaneously an investigation of music and musicality. Dated to around forty-thousand years the *Acb flutes* represent a certain milestone in the pre/deep-history of music and humankind which is why they frequently appear in literature regarding monolithic questions about the origins of music, and human evolution. These are the questions that historically have been asked about music and musicality in relation to their origins. In this sense the monolithic questions are necessary and relevant for a fruitful and critical discussion about the phenomenon of the *Acb flutes*. The underlying aim of gaining an understanding of, and contributing to the archaeo-musicological knowledge about the *Acb flutes*, is intended in its own way to offer fresh perspective. The *Acb flutes* are put at the heart of the narrative for music and music origins, instead of appearing as the entertainment.

Research about music and musicality and the origins of melodic wind-instrument phenomenon in the context of human evolution, is complex. Luckily the academic world has been gifted a book already written by Iain Morley which Ellen Dissanayake refers to as an Encyclopedia. I refer to this extensively but challenge some points where they differ from mine. At the outset my investigation may be defined as a trans-disciplinary effort from an interdisciplinary endeavour academically schooled in Music and Musicology, and Archaeology. Research traditions from the subject disciplines of Archaeology and Musicology are holistically treated, belonging properly to the established subfield of Archaeology called Music Archaeology, which historically has been synonymous with Organology (see Organology and Palaeo-organology [Lund 1998: 18](#), and an overview of the term “Music Archaeology” in [Lund 2020: 333-335](#) referring to “palaeo-organology” in [Megaw 1968](#); [Lund 2010: 193](#) referencing the term “Archaeomusicology”). Organology, a discipline of Musicology, is the scientific study of musical instruments. Gunnar Ternhag points out that Organology had been originally concerned with classifying musical instruments into types. Morphological and cultural aspects of the musical instrument – for example, the study of the people who play ([Trørup 1981: 45](#) discussed in [Ternhag 2007b: 43](#)), the playing methods ([Kvifte 1989: 53](#) discussed in [Ternhag 2007b: 28](#)), and the performing space ([Jansson 1978: 103](#) discussed in [Ternhag 2007b: 39](#)) – are equally part of the current organology theory and practice.

Historically, Music Archaeology as a subject has been developing in the last fifty years as a subfield of Archaeology and been subject to the paradigm shifts in Archaeology. Cajsa S. Lund, a musician schooled in both Archaeology and Musicology, is one of a small group of pioneers who in the 1970s established Music Archaeology as a subject that she has described rather humorously as the child of Musicology and Archaeology having problems with one of its parents ([Lund 1998: 17](#); [2020: 339](#)) guess which one. She experienced theoretical debates supervised by Sweden’s Mats P. Malmer, and Carl-Axel Moberg, often caught in the intellectual cross-fire between inductive versus deductive logics of the (then) two theoretical schools of archaeological thought. She challenged particularly Moberg’s criticisms towards her perspectives ([Lund 2020: 337](#)).

The dialectic between Experimental Archaeology and Music Archaeology can be illuminated in the work of another music-archaeology pioneer, Graeme Lawson who was a student of John Coles known for his contribution to the formal establishing of the subfield Experimental Archaeology (see [Coles 1979](#)). Lawson’s methods include advocating performing practice and

composition, which he discusses in “Epistemology and Imagination Reconciling Music-Archaeological Scholarship and Ancient Music Performance Today” but he is cautious about how this can play out in terms of scientific integrity (Lawson 2010: 265 discussed in Gill 2020 61-62). Lund had already thought about this. Her methodology encompasses a system of probability against the freedom of possibility in an experimental rationale for Music Archaeology which is progressive (Gill 2020). ‘Archaeoacoustics’ has emerged formally in the last two decades (e.g. Scarre & Lawson 2006) and may represent a change of approach and interest focus rather than a separate disciplinary area generally (Gill 2020: 66-67). A more recent perception still is that Music Archaeology is recognised as a subject pivotally situated within the realm of sound studies that also includes Acoustic Archaeology, Auditory Archaeology and Archaeoorganology (Till 2020: 35 after Kollrveit 2012: 77/fig. 3).

An aim of the research is to find new ways to conceptualise music away from Western conventions (*cf.* Scothern 1993). Anthony Brandt, Molly Gebrian and L. Robert Slevc recommend that a “comprehensive scientific definition of music must take into account” the following:

- music varies across cultures
- musical practice varies overtime, even within the same tradition
- any sound can be treated musically
- music is often very ambiguous, even on an emotional level

(Brandt *et al.* 2012: 1-3)

Inferring that perhaps all sounds needn't be thought of as being treated musically (Morley 2013: 8 discussing hammering a nail in reference to Brandt *et al.* 2012) the aim in this thesis is to redeem music in terms of just this ‘acceptance’. Choosing to experience the ambience of water dripping in a cave may be conceived as an act of music, or hammering a nail, or making an ovate hand axe. Non-intentional sound – after the teachings of composer John Cage – should be accommodated in definitions of music (e.g., Cage 1963 from his 1952 Juilliard Lecture); if not then music surely ceases to be relevant. It isn't just the philosophical question about music and the babbling brook but what this material does in reception, especially if a human is the one doing the babbling. Ian Cross and Iain Morley argue for a “fundamental delimitation” of music's functions on the basis of “what can be legitimately construed as ‘musical’ across cultures and times”. They claim that “music appears to be a solely human phenomenon” because:

No other species appears to engage in behaviours that display all the qualities of music as delineated above [...] *'music embodies, entrains and transposably intentionalises time in sound and action'* (Cross and Morley 2008: section 2.1 and 2.2 their emphasis citing Cross 2003b: 24).

Ethological perspectives of ritualisation counter this position with a different approach for assessing function and evidence in relation to music (Ellen Dissanayake 2006). Ethnomusicologist Bruno Nettl writes that: "the primary contribution involves the musicologist's desire to understand all music, i.e., all human music and even (if there is such a thing) musical phenomena in the animal world" (Nettl 1964: 6). Bio-musicologist W. Tecumseh Fitch writes that "we should not limit our biological investigations to close relatives of humans (e.g. non-human primates) but should rather investigate any species exhibiting traits relevant to human musicality" (Fitch 2015: 3).

The phenomenon of music therefore continues to be a debatable point for researchers concerning what it is, what it does and how to define these two. It should be no surprise that "though we all feel we know what music is, it has proven remarkably hard to define" (Brandt *et al.* 2012: 1), and "Accepting that something like music—even if not discretely identified as such by its practitioners—is in all human cultures, the definitions in our dictionaries seem clearly unsatisfactory" (Cross and Morley 2009: 67). Morley explains that "musical knowledge is somewhat intuitive that few authors consider it necessary to define the term" (Morley 2013: 5). This is actually quite absurd as in science it is reasonable to expect defining of terms as a precedent, as Brandt *et al.* insist it should (2012: 1-3). However this is true; very few bother to define music. Morley pointed this out in his keynote speech in 2016 for Cajsja Lund. If by the end of reading this thesis the reader does not know my definition of music, then I will have failed in my duty.

Another problem about music in relation to pre/deep-historical past is to do with its intangibility in the archaeological record. Traces of music material beyond the instruments are intangible; there are no fragments of audio recordings of music or musical notation from Aurignacian times as far as it is known. In this respect, musical instruments are actually not unlike any other archaeological artefact in terms of how they might represent behavioural evidence. Since music is considered the explicit object of the behaviour for musical instruments, it can be put forward that musical instruments have a special advantage over other archaeological phenomena because they were made to be played which makes them as relevant now as when first made and played; "Far from mere tools used in the making of music, musical instruments stand at the intersection of a range of processes that together, make up the cultural phenomenon that we recognize as 'music'" (Waksman 2003: 252 cited in Ternhag 2007a: 12). Musical instruments therefore offer their own dynamic window onto the dynamic processes of music and human behaviour. The following two examples in relation to the *Ach flutes* can be considered: -

The presence of music in the lives of early Upper Palaeolithic peoples did not directly produce a more effective subsistence economy and greater reproductive fitness. Viewed, however, in a broader behavioural context, early Upper Palaeolithic music could have contributed to the maintenance of larger social networks, and thereby perhaps have helped facilitate the demographic and territorial expansion of modern humans relative to culturally more conservative and demographically more isolated Neanderthal populations (Conard *et al.* 2009: 740);

What these artefacts do frequently show, however, even from the earliest examples, is an already well-developed and sophisticated mode of production, superior to many mediaeval examples. What they are most valuable for, in contrast to identifying the earliest incidence of musical behaviour, is to confirm to us that recognizable musical behaviours were well developed and played an important role in the lives of anatomically modern humans by the time of the early Upper Palaeolithic (Morley 2013: 98).

What I note in both cases is that the (flute-playing) behaviours that are referenced are not described or explained, and this throws up a series of questions: -

- What are the recognisable behaviours that the *Ach flutes* stand for?
- How did the presence of music in the lives of early Upper Palaeolithic peoples *indirectly* produce greater reproductive fitness?
- How did the presence of music in the lives of early Upper Palaeolithic peoples *indirectly* produce a more effective subsistence economy?
- How did music contribute to the maintenance of larger social networks of *H. sapiens*?
- Did music do anything in any *direct* way, or are we to understand music as an explicit *indirect* force in terms of its agency?
- What else might have music done, *directly* and *indirectly*?

The above questions provide food for thought whilst I have formulated two broad questions which are.

- How do the *Ach flutes* define music?
- What does this tell us about the cognition of modern humans?

Morley suggests that the raw materials available to the flute makers and players of the flutes in the Aurignacian *Achtal* would account for the phenomenon emerging in this region at this time in deep history. He does not venture another explanation for why musical behaviour would change;

...likely is that the record we have is representative of a change in the production in instruments, either in the form of the raw materials chosen for—or available for—the purpose, the capability to work bone materials or to catch certain fauna whose bone could then be used, or by a change in musical behaviour that resulted in an increased dominance of melodic instruments (Morley 2013: 98).

Morley's use of the word dominance is significant because the dominance of any behaviour would serve as an important enquiry for understanding change which he explains in terms of raw material. There may be more to this than meets the eye, or to be more specific, the ear.

---

### 1.1.1 THE IMMUTABLE-FLUTE HYPOTHESIS

My central hypothesis is that the *Ach flutes* are a material phenomenon which is like the modern, mobile-phone phenomenon; the material objects whilst typologically ranging are nevertheless similar; everyone has one and each is personalised through time and place. Not all Aurignacian Achtealians may have physically carried a flute, but I bet they all owned one at one time or another in their lives, and carry that memory with them. I call this the 'immutable-flute' hypothesis.

Hearing the flutes reminds us of this human identity, which extends back to the heritage of a natural, nurturing, loving and playful state of being, a state which biologist Jeremy Griffith describes (2016).

The 'immutable-flute' hypothesis argues that the Aurignacian-melodic-wind-instruments of the *Ach flutes* type were not somehow the property of a shaman, or any one special individual through who all others subscribed. The *Ach flutes* were a vital way that the Aurignacian Achtalians lived and experienced their lives on the earth. It is through these engagements – and not to symbolic meaning – that the question of cognition is addressed in this thesis. Were these flutes the essential gift for the infant, the older child and the adolescent, offering them a chance to realise play as serious invention? Did these icons furnish the mind that in turn modified the instruments, and the music, in the ritualisations that redeemed and continue to redeem our authentic human selves? The people – the *Aurignacian Achtalians* – some of whom left their flutes behind in the vibrant-musical valley, leave an immutable memory of not only who they were but the heritage of who we are. This can be abducted on the basis that the tears that flow from the humans hearing Seeberger represent a collective memory of human life on earth that is as deep as time itself, from an untapped recognition that will determine our survival.

---

#### 1.1.2 STRUCTURE OF THE BOOK AND NOTES

*Chapter One* introduces the philosophical persuasion, and theoretical background of this research identifying disciplinary fields and research traditions. It presents questions, the hypothesis, and outlines the structure of the book.

*Chapter Two* is an essay about the origins of music, and is the longest chapter out of all chapters. It leans towards a post-colonial and post-humanist perspective which I argue resonates with a Western view of the theory and practice of Experimental Music. It deconstructs what music is and does, and follows some novel lines of thinking incorporating historical texts about the subject. It theorises semiotics and ritualisation, and raises the importance of the emotions for understanding music and cognition. The subject of the mother-infant dyad and female coalition is brought into focus. The chapter finishes with an appraisal of the evolution of the human voice.

*Chapter Three* follows the path of the human career as trodden by Richard G. Klein with occasional comment as related to music and musicality. It includes current and recent research. If Chapter Two is the musicological perspective on music origins and evolution, this chapter is the archaeological perspective on human origins focusing on the Stone Age. Throughout the chapter, references to artefactual musical instruments (sound tools) are presented and discussed. There is a supplement about birds to open an ontological relation of 'things' in current anthropological context, and to make the point that the new hominin arrivals to the valley in question did not arrive in a vacuum. I present an inventory of birds for the valley within the time frame of the *Ach flutes*, and this table is found in Appendix 1.

*Chapter Four* brings the physical and social geography of the Ach Valley into focus, presenting its Palaeoenvironment, and the Swabian Aurignacian. From the river that runs through it, to the

cave sites where the *Ach flutes* were recovered, the *Aurignacian Achtalians* and their artisan lifestyles in context are introduced in the locus of this (acoustic) ecology.

*Chapter Five* presents the *Ach flutes* as the three material pieces in focus, detailing previous and ongoing current research relevant to the topic. The chapter also references Appendix 3 which is an inventory of approximately fifty finds from the Swabian Aurignacian indexing additional melodic wind instruments. A report on Appendix 3 is also provided in Appendix 4. Other types of soundtools – some newly identified in this thesis – also feature in an inventory in Appendix 2.

*Chapter Six* is an overview of the methodology for experiments, consolidating philosophical, theoretical and epistemological perspectives, drawing on abduction logic, material engagement, phenomenology, ritualisation, and the semiotic icon. Mainly it is a recapitulation of the second chapter about music building on the ideas that are presented there to build a functioning methodical framework.

*Chapter Seven* documents a series of experiments, with data and results. Some experiments directly reference musical data. All musical data are documented in two music albums: - one called *Sonic Debitage*, and the other is *LISTEN I am making a flute for you*. They are both available via the platform called 'Bandcamp' (bandcamp.com) under the artist's name 'Frances Flute the Bellows Mender'.

*Chapter Eight* is the discussion and conclusion.

It can be noted here how the reconstructions for this research have been labelled, firstly with the name of the archaeological artefact, followed by the initials of the person(s) responsible for the reconstruction of this, and the number of the reconstruction, starting with 1. Finally the year the reconstruction was made is added to this. For example, the first reconstruction I made of GK1 supervised by Wulf Hein is labelled as follows: GK1-FG/WH-1(2011). These reconstructions [**Figure 1.1**] are now listed.

GK1-FG/WH-1(2011) a radius from the Blekinge Swan  
GK1-FG/PG-1(2012) an ulna from the Blekinge Swan  
GK3-FG/FT/PG/PS-1(2012) from mammoth ivory procured by Frank Trommer  
GK1-FG-1(2016) a swan radius procured by Frank Trommer  
GK3-FG/WH-1(2021) from elephant ivory procured by Wulf Hein  
HF1-FG-1(2022) a vulture radius procured by Jean-Loup Ringot

Two further points need to be made. Firstly, these labels only relate to those reconstructions from osseous material. This is to clarify that reconstructions made for this research but from metal tubes (as a type of material acting as a substitute for bone or ivory) are not labelled but they are described in full. Secondly, reconstructions that have been used directly or indirectly but which have not been produced for this thesis particularly are not labelled, i.e., in contexts where

instruments have been part of the experimental work, either having been lent for the purposes of this research, or played in ensemble contexts for the purpose of this research. In these latter contexts, the instruments are described.

A final remark is that besides the conventional *bibliography* for written references from book chapters and journals etc., there are two further categories of references. One of these is a *discography* for audio references like tracks on recordings that can be LPs, CDs etc. This system adheres to the information freely available on *Discogs - Music Database* to include master release ('m' numbers), release ('r' numbers) and sometimes artist reference ('a' numbers). The second is a *videography* for video references. These groups I organise either as symbols, or icons. The *Symbols* list is the heading for the standard bibliography and this includes sheet music. The *Icons* list is the heading for recordings of music, and for videos. If I refer to a piece of sheet music by a composer it will be found in the section under *Symbols*, but if I refer to a performance of that music that is recorded material, it will be listed in the *Icons* section. This research is conducted in the discipline of archaeology. We are about to enter the realm of music.

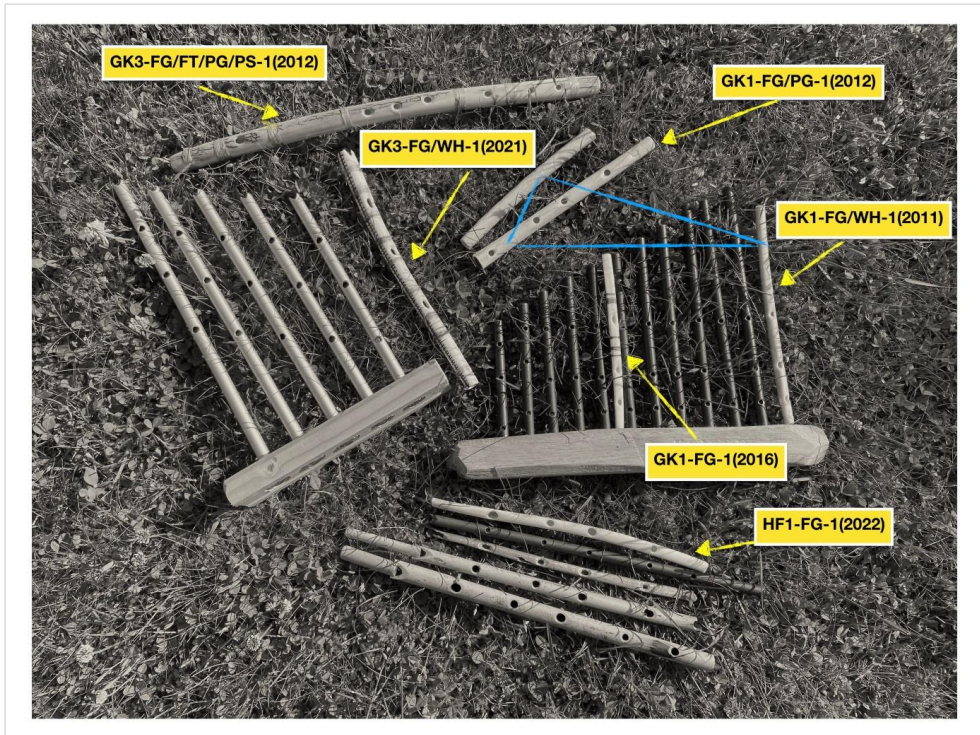


FIGURE 1.1. Reconstructions (those from osseous material are labelled)

Archaeo-organological reconstructions of the Ach flutes made and played for Aurignacian Rhapsody. The two ulnae bones and one radius bone (joined by a blue triangle) belong to the same swan.

## 2. MUSIC ORIGINS?

Professor Einstein looks more like a musician than like a mathematician. “If,” he confessed to me, with a smile that was half wistful, half apologetic, “I were not a physicist, I would probably be a musician. I often think in music. I live my daydreams in music. I see my life in terms of music. I cannot tell if I would have done any creative work of importance in music.”

“Perhaps,” I remarked, “if you had chosen to become a musician you would outshine Richard Strauss and Schönberg. Perhaps you would have given us the music of the spheres or a fourth-dimensional music.” Einstein gazed dreamily—was it into the far corners of the room, or was it into space—that space which his investigations have robbed of infinity? “I cannot tell,” he replied, “if I would have done any creative work of importance in music, but I do know that I get most joy in life out of my violin.”

(George Sylvester Viereck 1929: 113 interviewing Albert Einstein)

### 2.1 INTRODUCTION TO ‘MUSIC ORIGINS?’

To begin by looking at the way that some prolific writers on the subject of ‘music origins’ have introduced it reveals a recurrent theme which is a surprise - scholars believe that music through time and place is numinous, and it is mysterious (e.g., Storr 1993; Mithen 2005; Lowenthal 2006; Wyatt 2016a; etc.). Historically, “philosophers, intellectuals and musicians” revered music’s “special powers” (Fubini 1990: xi-xii, cited in Dissanayake 2006: 31-32) bestowing music with supremacy and particularly mystery (e.g., Lévi-Strauss 1970: 18; Darwin 1871b: 369-570; cited in Morley 2013: 1). Ellen Dissanayake suggests there should be a good reason for adding to this “abstruse discourse” (Dissanayake 2006: 32). Such is the hub of intellectual territory on the subject it is almost impossible to find an example for citation that has not already been quoted. There is one which appears to be not as popular as those that belong to the mystery theme, and this concerns an abduction that women (and not men) were the first to acquire musical powers (Darwin 1871b: 337).

Whatever music’s mystery, it is known to change its expression through time and place. Eckart Altenmüller notes the omnipresence of music in present-day Western department stores and restaurants (Altenmüller 2018: 1). Echoing what had once been Orphic and divine, David Lowenthal likewise refers to elevator music as a “tranquilliser” far removed from “the amplified world” of concert works like *The Planets* (Holst 1914-17), and the theme music for *Star Wars* (Williams 1977). Lowenthal too veers off into the conceptual world of music’s outer space alluding to *The Dream of Scipio* (Cicero 54-51 BC), reflecting on “Pythagorean formulae” and “orbital sounds” (Lowenthal 2006: 4). Tracing Western classical music via a theme of “conflicting expressive urges” he juxtaposes “universal, mystical, transcendental” with “local, particular, tribal, parochial” types of expressions, actualised in sound as Western heritage (Lowenthal 2006: 11). In the orchestral suite called *The Planets* (written 1914-1917), Gustav Holst [1874-1934] scored the final movement to include a wordless chorus for altos and sopranos. Why is a female wordless-chorus singing ‘ah’ so significant at the climax and nearing the end of such a sonic journey into outer space? An alternative starting point for music origins is one which begins with a

considerably earlier hominin than Pythagoras. *Lucy in the Sky with Diamonds*, a song written by John Lennon and Paul McCartney (The Beatles 1967), was broadcast on the radio when an early female hominin was discovered by archaeologists (Johanson *et al.* 1978). Listening to the ‘pop hit’ during their excavation, they named her Lucy. Lucy may signal an approach to exposing the origins of music from a more down-to-earth perspective. This being the case, the title of the original song with the acronym LSD referencing *altered state of consciousness* – the theme of ASC is a well-travelled topic in the research area of Archaeoacoustics, e.g., Scarre and Lawson (2006) – continues to imbue ‘music’ with a never-ending sense of a cosmological trip.

Tracing ‘music’ back to the dawn of the hominins is one approach that Iain Morley has demonstrated in his work on the ‘pre-history of music’ which includes an in-depth appraisal of the fossil evidence to identify physiological and neurological capacity for hominin music in terms of ‘musicality’ (Morley 2013: 2014). In the final sentence of his thesis he concludes that human music is simply the hallmark of human identity, referring to the Swedish song writers, Andersson and Ulvaeus (Morley 2013: 325). I give an overview of his synthesis of the evolution of the human voice at the end of the chapter. This evolution stems back in time to the australopiths<sup>3</sup> to include Australopithecus Afarensis (Lucy). He writes that the “shift to bi-pedal locomotion may have been an important factor in the development of rhythmic control and entrainment in humans” (Morley 2013: 248-249 referring to Trevarthen 1999). A concept of keeping to the beat through running and walking – the classical-music direction *andante* means ‘at a walking pace’ – transforms the context of the origins of music and musicality into a completely different spatio-temporal domain, making forty thousand year-old flutes, and subsequent times of the divine and infernal music which Lowenthal discusses, very recent. John Blacking’s writing claims that “The Australopithecine gait was more a run than a walk” (Blacking 1976: 9) so for Lucy her bi-pedal pace may have been more of an *allegro* tempo. Steven Mithen discussing “The musical implications of bipedalism” (2006: 150-154) points out that endurance running may have been more significant than previously considered (*ibid.* 153-154 referring to Bramble & Lieberman 2004). He underscores the connection to fluctuations in tempo to be found in pieces of music that mirror this potential in hominin-bipedal movement with the focus on slowing down (*ibid.* 152-153 referring to Friberg & Sundberg 1999, and see also the subject of ‘gaits as sound’ Sundberg *et al.* 1992), adding that music can be understood as “the embodiment of the physical world in motion” (*ibid.* 152 referring from page 24, to Sloboda 1998: 28).

Perceptions about the way that human bodies move through time (e.g., Merleau-Ponty 2012; Ingold 2007; Schuback 2012 discussing Klee) – which I have previously discussed in “On Cajsa Lund’s Legacy and Moving Movements” (Gill 2020) – inspire perspectives that will be raised about the difference between sound and music, and *who* draws this line of differentiation, *where* this line is, and *why* and *how* and *when* it is drawn. Sound-patterns as product and sound-patterning as process – including random/chance patterns and paterning – are put forward as a premise for defining music, as a working model (see section 2.2.1). When I move on two feet I can vary the pace, controlling both the steps (beats) and pace (tempo) of my body much more strictly than I can do my heart beat, or breathing in an out. In this space I can make other sounds and synchronise them with my time path. This is therefore a significant musical space for

---

<sup>3</sup> This is an abbreviated form of the word Australopithecines (see Klein 2009: 131)

experimenting with sound, and a viable premise for arguing the beginnings of so-called music on a basis of experimental practice coupled with chance experience. Whatever a body's speed or tempo, moving around on two legs must have been an important space for evolving musical capacity through developing musicality, where the relation of a regular beat is the division of time as the original pendulum. It is the mathematics of two-time in this symmetry of movement that does not rely on knowing words for 'one' and 'two' for walking to happen. I argue that symbols are irrelevant for the act of walking. They are not a prerequisite for patterns of environmental-life, which surely has just as much to do with cognition as symbolic thinking. If the ultimate test for hominin status, according to Richard Klein is bipedalism (2009: 271), then this must have consolidated a new identity, and therefore a new cognitive identity, which was a musical one.

Keeping in time to a beat (entrainment) is a major component of musicality, and in the West a way to point this out is to encourage children to clap in time to the music as a musical test of their developmental musical ability, but music pedagogues might just as effectively encourage students to 'step' in time to the music, which is presumably why this can be found on the syllabus for sports in many schools. When many people keep the same beat it engenders trust and facilitates social bonding understood to be significant in human evolutionary terms (Freeman 2000). It is not difficult to accept the premise that by doing so with complex rhythms successfully would only increase a sense of alliance, kudos and euphoria. Synchronising many bodies in the same repetitive movement *together* raises important questions about power, and survival.

Throughout this research I consider the origins of music from three implicit perspectives: - the long-term evolutionary or phylogenetic perspective; the ontogenic or lifetime perspective, and the genesis, organic, or coming into being in the moment, of music, in terms of composition. I explore what music is and what music does, and whilst outlining the basic arguments regarding the emergence of music in relation to human evolution, I aim to lay the foundations for an appropriation of music from the perspective of material agency. This in turn supports a methodology for the purpose of exploring the archaeological/artefactual pieces from Aurignacian Swabian Jura central to this study, but I also consider the spaces in which they authentically functioned, and consider those who made and played them and why they made and played them (not just how). I present various diverse and novel perspectives to address human music origins. Following a brief discussion about nature versus culture in relation to music, and to include a working definition of music, I present two historic accounts of music origins from 19<sup>th</sup> century texts. An aim is to create an appreciation of what music is and does by raising the importance of music as a process, and the significance of musicality for discussing human-musical origins. Arguments inevitably concern the emergence of linguistic speech; sound is a common denominator for both speech and music (*cf.* Saussure 1916; Ingold 2007), and a rationale for 'musilanguage' (Brown 2000) is presented in a section called *Rousseau's Heritage* emanating from an even earlier text written in the 18<sup>th</sup> century.

Writing about the origins of music demands an exercise in the deconstruction of the history of the subject of music origins, and of thought about music in relation to the heritage of evolutionary archaeology. The impact of John Lubbock [1834-1913], who became Lord Avebury and was a neighbour of Darwin, is taken up by Bruce Trigger addressing the subject of Native American hunter-gatherers. He writes, "Lubbock provided Americans with a Darwinian

explanation for the biological inferiority that they had attributed to American Indians since the late eighteenth century” (Trigger 2006: 177). He goes on to add that “the existing social order came to be thought of as biologically grounded and immutable” (*ibid.* 207; see also Tostevin 2013: 24). Perspectives from post-colonial, feminist and respective gender theories in archaeology (e.g., Arwill-Nordbladh 2001; Källén 2004; Gill 2020: 66-7) encourage the call to challenge bias. This is critical to keep in mind in musicology; judgments about indigenous modern-hunter-gatherer musics may serve indirectly to preserve prejudice through perceptions of quality and/or superiority. A section on the music of modern hunter-gatherer musics of the Native Americans is incorporated in this essay which introduces a recurrent theme of nonsensical vocables (wordless music), whilst providing invaluable-ethnomusicological perspective.

The subject of emotions in relation to music is well documented; “throughout history, music has frequently been described as the most ‘emotional’ of the arts” (Huron and Margulis 2010: 575; and see also Spencer 1857; Deryck Cooke 1989; Juslin and Sloboda 2010; etc.). Albert Einstein’s<sup>4</sup> sentiment for music referenced in the introduction of the chapter illuminates the significance of feelings; ‘Music’, is about personal “joy” experienced through playing a musical instrument. The fact that Einstein points to a material musical-instrument illuminates the importance of the organological material in an equation with music, humans and emotions. Why might we get most joy out of playing musical instruments? This subject of human emotion adds substance to understanding human music as a dynamic process, that like human feelings, are moving, rather than fixed and static, even when feelings are the type that Damasio calls “background feelings” (1994: 150). Theorising Peircian semiotics in relation to sound and music after the work of Lawrence Zbikowski (2017) I critique the case for the theoretical significance of the *sonic icon*. With this I incorporate a subsection outlining a theory about music origins by Chris Knight and Jerome Lewis, called “Wild Voices: Mimicry, Reversal, Metaphor, and the Emergence of Language (2017). *Wild Voices* presents an important perspective for music origins concerning the *H. Sapiens*, Neanderthal and Denisovan ancestor, *H. heidelbergensis* (or ancestor X). The subject of the emotions is covered in two sections dedicated to it. One is called *Terrible Emotions* in which I broach what I consider the taboo subject of music in relation to violence (e.g., Grant 2014). This subject challenges sensibilities, and there are good reasons why difficult and dissonant phenomena *should* be discussed in relation to power and agency in archaeology (e.g., Gill *et al.* 2021). The second section dedicated to the subject of emotions is called *Music, Feeling and the Icon* and it concerns the subject of cognition, drawing on the work of Antonio R. Damasio (1994). The subject of emotions is also the key aspect of the subject of ritualisation. It features the work of Ellen Dissanayake’s ethological perspectives on ritualisation and music (2006); music shapes emotions in animals including human ones. With this in mind I consider non-representational theory (Thrift 2008). A concept of non-representation is a bit of a contradiction in terms in relation to Peircian semiotics since all signs are types of representations (Peirce 1955: 99). The point is that music can be rationalised as a sonic icon (Zbikowski 2017) implicitly challenging the hegemony of the symbol in exclusive association with cognition which is what non-representational theory does.

---

<sup>4</sup> Einstein did not know about the *Ach flutes* in his lifetime. The *Achtal* is approximately 20 km from Ulm where Einstein was born.

Towards the end of the essay I present a section about the sound and music of mothers and babies, and of children in societies, (e.g., [Dissanayake 1999: 2000a](#); [Derricourt 2018](#)). The title of this section is “Umbilical Chords” which I hope is self-explanatory. At a colloquium at the Schloss in Tübingen in 2021 where I gave a presentation, a fellow student said my presentation had made him think differently about music. Although there is the word ‘musicking’ introduced by Christopher Small in 1998, it is surprising that there is no verb in English for ‘music’ where there is one to be found, for example, in Sweden (*att musicera*). A critical discussion about Music Origins would need to shake off a romantic view, and/or any narrow view of music, ideally accommodating novel, exceptional and diverse perspectives. This essay is therefore entitled ‘Music Origins?’ with the title including a question mark as a symbol of the perpetuity of this mysterious thing.

## 2.2 NATURE VERSUS NURTURE

There is no way to absolutely verify that the nature–culture opposition exists as an essential feature of universal unconscious structure... ([MacCormack 1980: 10](#)).

Dividing an organism’s characteristics into those explained by intrinsic nature and those explained by external influence is a standard move, part of folk-philosophical wisdom. And it is common place for especially talented musicians to be described colloquially as “born that way” ([Killin 2018: 5](#)).

In this section, I will problematise the nature-versus-nurture conundrum which reaches into some of the disciplinary worlds that a subject like music origins presupposes. Negotiating semantics is one aspect of the task; terms like nature and biology are conventionally bundled together, with terms like nurture and culture opposed to them on a conceptual spectrum, or even separated. Whilst acknowledging the dichotomy I reject ontological ‘naturalism’<sup>5</sup> as a way to understand phenomena in general, like the *Ach flutes*, and music in particular; “Music [...] is a bio-cultural phenomenon; theorists who blackbox one in attempting to explain the other do so at their peril ([Killin 2018: 14](#)). ‘Nature’ and ‘culture’ are constructs ([MacCormack 1980](#)), and the dichotomy between them is implicitly inherent in the task of defining music:

Much of the problem stems from the difficulty of identifying universality in different cultures’ conceptions of music, for example, some cultures contain no single word that relates to what we recognize as music... ([Morley 2013: 6](#)).

Terms such as ‘cultural’ and ‘biological’ are found across the literature in archaeology for the subject of human evolution, especially in the discourse about the point at which *Homo sapiens* in Africa is understood to have become fully modern. Whilst an aim of this section is to unpick the *nature versus nurture* narrative for music, and therefore music origins and music evolution, perspectives about ‘modernity’ in human evolution may also be called into question.

<sup>5</sup> ‘Naturalism’ ([Goldbahn 2019: 30-37](#) after “Beyond Nature and Culture” by [Descola 2013: 172-200](#)) is presented in Chapter Three in a section about birds.

Anton Killin (2018) suggests that a way to think about music in evolution is to compare it with fire, echoing the etymological relation between ‘flutes’ and ‘flames’ mentioned in the introduction to this thesis. This is an apt analogy when it is considered that “Humans did not invent fire, but instead harnessed it, giving purpose to an otherwise most unwieldy and destructive force” (Sorensen 2019: 13). This leads to a perspective that humans did not invent *music*, either, but instead harnessed wild sound. Andrew C. Sorensen’s article called “The Uncertain Origins of Fire-Making by Humans” (2019) refers to fire as a ‘range expander’ which music almost certainly is for hominins too, as it is for the birds who sing to mark the expanses of their territories. The human trait of controlling fire (like sound) therefore epitomises the problem of the *nature versus nurture* conundrum:

...it is unhelpful to conceive of fire control as a purely cultural “technology,” artificially splitting biological and cultural evolution, because doing so undermines the dynamic, intertwined evolutionary forces here (Killin 2018).

Music is an *exaptation* when it is considered to have played a role in the evolution of hominins, like cooked food in relation to encephalisation (Killin 2018: 15 referring to Wrangham 2009). The dichotomy between biology and culture is rationalised by Steven Mithen (and Morley) in what would seem to be a standard approach that reasons the existence of “a ‘natural biologically based musicality’ and music as a culturally constructed phenomenon which builds upon that biological basis” (Mithen 2006: 109, cited by Morley 2013: 5). Morley adds that:

This is indeed an important distinction to draw, and we are interested in both, in trying to understand how the latter has emerged from the former, the biological foundations. Indeed, one of our main objectives in seeking to understand the prehistoric origins of biologically based musicality is to better understand what music really *is* and how it can achieve the effects that it does in the many contexts in which it is used—our conception of music must itself be informed by our investigation into the phenomenon and, in the end, the investigation should allow us to better formulate a definition (Morley 2013: 5).

Musicality, from the Mithen/Morley perspective is thereby conveyed as a biological thing, and music, as a cultural thing, yet this potentially creates opposition which in turn contradicts a state of affairs for music which Morley acknowledges that for some ‘cultures’ is alien. This is emphasised by Tim Ingold inferring that non-Western intentional worlds do not recognise constructions of culture and nature (Ingold 2000: 42 referring to Strathern 1980). The net result can be seen as perpetuating a cyclic debate, which is endlessly redeeming what music is and does, from how it continues to be defined through Western perspective which, ontologically speaking, splits nature and culture, splits music and dance, and splits seeing and hearing too.

In “The Singing Neanderthals” Mithen suggests that Neanderthals were very much in touch with their musical instincts whereas modern humans have become alienated from these; “all modern humans are relatively limited in their musical abilities when compared with the Neanderthals” (2005: 245). The inference is that ‘nature’ and ‘culture’ having been split into the categories of the *natural biological* and the *culturally constructed* (in the ontological present for ‘us’) are reunited in *holistic, manipulative, multimodal, musical* and *mimetic* behaviours (in the ontological past for ‘them’). Doesn’t separating the musical existences of modern humans from the Neanderthals like this create an unnecessary divide between species on the basis of music, when music might be one of the main things that we must have had in common?

Laurel Trainor writes “there is currently no agreement as to whether music was an evolutionary adaptation or a cultural creation” and that “the origins of music are complex and probably involved exaptation, cultural creation and evolutionary adaptation” (2015: 1). Henkjan Honing *et al.*, support a “*multicomponent perspective on musicality* that emphasizes its constituent capacities” (2015: 1 – their emphasis), continuing that “It is virtually impossible to underpin the evolutionary role of musicality as a whole”. ‘Bio-musicology’ is a field of research defined by W. Tecumseh, Fitch (2015: 1) as the biological study of musicality in all its forms; “While music, the product of human musicality, is extremely diverse, musicality itself is a stable aspect of our biology and thus can be productively studied from comparative, neural, developmental and cognitive perspectives” (Fitch 2015: 1). In this sense, the product is an artifact, or a thing. From the perspective of archaeology – a subject which has been called the “discipline of things par excellence” (Olsen 2003) – it may be argued that archaeology can offer its own unique insights into human musicality.

Fitch proposes four foundational principles of Bio-musicology:-

- The ‘multicomponent’ principle: musicality encompasses multiple components;
- The principle of explanatory pluralism: consider all of Tinbergen’s explanatory levels;
- The comparative principle: adopt a comparative approach, embracing both homology and analogy;
- The ecological principle: seek broad ecological validity including popular styles, eschewing elitism.

Taken from Fitch (2015: 2-5)

Fitch’s approach towards these principles explicitly encourages the call to flatten bias: -

- ...musicality is built upon a suite of interconnected capacities, *of which none is primary*;
- ...pluralistic Tinbergen perspective that addresses and *places equal weight on questions* of mechanism, ontogeny, phylogeny and function;
- ...a comparative approach, which seeks and investigates animal homologues or analogues of specific components of musicality, *wherever they can be found*; [and]
- ...an ecologically motivated perspective, which recognizes *the need to study widespread musical behaviours across a range of human cultures (and not focus solely on Western art music or skilled musicians)*.

Taken from Fitch (2015:1)  
Gill’s emphasis

Fitch concludes that “there is no conflict between these endeavours, and indeed there is great potential for synergy among them since each can feed the other with data, hypotheses and potential generalizations” (Fitch 2015: 2).

There is no way of escaping the traditions of biology in arguments about musical phenomena that universally affect human bodies in different ways, an obvious one being how music can make hairs stand up on the back of one’s neck, which is a phenomenon called *frisson* (Huron and Margulis 2010). Another perspective concerns how “early and intensive exposure to music during ontogeny causes measurable changes in neural mechanisms later in life” (Fitch 2015: 3 referring to Elbert *et al.* 1995; Schlaug 2001; Gaser & Schlaug 2003). Music therefore is known to affect our bodies *in the moment* and *through lifetimes* (both momentarily, and ontogenically). From the longer-term-evolutionary perspective of phylogeny there is the classic example of the (permanent) lowering of the larynx and the development of the human voice as a standard hallmark for the origins of music. This is what Morley’s work (2013; 2014) illuminates. The phylogenetic lowering of the larynx certainly suggests that sound must have played an important role in human evolution, especially if *talking* is the ultimate thing that only humans do, for which sound is generally the prerequisite. These indices of organic, ontogenic and phylogenic change concern musical phenomena through micro and macro horizons of life on earth with a focus on hominins. Through the ears of theoretical archaeology a working definition for ‘music’ was constructed (Gill *et al.* 2021) within a theoretical space concerning place making and sonic identity (see Maloney and Schofield 2021).

---

### 2.2.1 A WORKING DEFINITION OF MUSIC

Humanly organised sound (Blacking 1973: 3-31) is widely accepted as the default position for many scholars’ definition of music but I would prefer to include non-human sounds, and non-intentional sounds in my working definition of music, the reason for which I base on the premise provided by the optical illusion known as Rubin’s Vase. Rubin’s Vase allows the observation of a vase, or two identical silhouette profiles face to face, with the idea being that it is impossible to see both at the same time. My position is to follow Catherine Bell (2009) and work to understand what difference is and how difference works. Analogically speaking if we decide music is only one thing, we run the risk of missing everything else that it might be, and is. As was outlined in the Chapter One some scholars do not even bother to define music, whilst it will be noted that others have explicitly decided to exclude non-human and non-intentional musics in definitions of music (e.g., Brown 2000). I cannot agree with the exclusions of non-intention and non-human; I strongly believe that the sounds and the sound patterns themselves should be the starting point. I heard a nightingale sing and this song was obviously made by the bird. It gave me an instant-ecstatic sensation; the sound pattern felt as though the song had flown into me, and through me, reaching parts of the body other sounds had never before reached. To this I add the experience in 1989 of giving a recital on flute of *Le Merle Noir* by Olivier Messiaen (1952) in which I felt that I had been transported into the mind and voice of a blackbird. The point I wish to make is that they both felt real, and when I recall the experience, I re-encounter the feelings that I had experienced, which is how I remember.

In recent work for the book on *Music and Heritage: New Perspectives on Place-making and Sonic Identity* edited by composer Liam Maloney, and archaeologist John Schofield (2021), authors contributing articles related to the theme of remembrance were explicitly invited to consider *How do we remember?* In an article I co-authored with Bodil Petersson and Fadumo Weheliye (2021) for this book, the working definition of music as sound-pattern storage emerged. The rationale behind it concerns sound patterns (as music) leaving indices in different ways impressed on the body irrespective of intention. This we expressed as follows:

If one applies oneself to listening to non-intentional sound then it becomes intentional. If a sound world is not intentionally listened to as a soundtrack of life, then it potentially still filters in and may get stored in the body as sonic signage. A sense of time through phenology and ontogeny are inferred by this definition whether patterns are the repetitive, rhythmic and sonorous babblings of infants, the call of a cuckoo, a written musical score, or the sound of a 'drop hammer' (Gill et al. 2021: 205 - 'drop hammer' referring to Wright and Schofield 2021: 91).

With permission for publishing purposes, we used the anthropological model (mentioned earlier) by Tim Ingold (Ingold 2000: 42 referring to Marilyn Strathern 1980) in which the separation of nature and culture are modelled from perspectives of non-Western and Western ontologies alongside a conceptualisation of the really natural. Non-Western ontology does not separate, or more to the point, does not recognise nature and culture as two distinct phenomena in the model. Our working definition of *music as sound-pattern storage* (in **Figure 2.1** first published in Gill et al. 2021: 206) is an adaptation of Ingold's model in which we have changed the orientation and slightly modified it for our purposes. This includes an overlapping of intentional worlds to indicate a sense of contemporary hybridisation and musical fusion in the contemporary world. The word 'storage' is not strictly a space for storing information, like a computer stores data; the word 'storage' is geared instead towards the feeling of life. Morley explains that:

The potential of particular musical stimuli to become strongly associated with particular circumstances in our own prior experience is itself likely to be due to the ways in which we store memories of sensory experiences with high emotional salience (Morley 2013: 315).

In the sonic-heritage article (Gill et al. 2021) we also refer to sound patterns as those which have been designed purposely to carry messages to the future as an integral part of the solution for the global nuclear repository problem. The case in France known as 'The *Memoire* Programme' seeks to realise 'the informational and memory capacities of the world of sound to design a generative signage that will carry collective memory on a large scale' (Paul Boyer 2017: abstract). Boyer explains that the program for the Cigéo project was undertaken by the French National Agency for Radioactive Waste Management (Andra). In Boyer's research he discusses how sound can be used to mediate the memory of the site, referring to biases for communicating memory both large scale and long-term. The term 'bias' is important for theorising the idea of Ruben's Vase because certain structures clearly invite focus, leaving other things out.

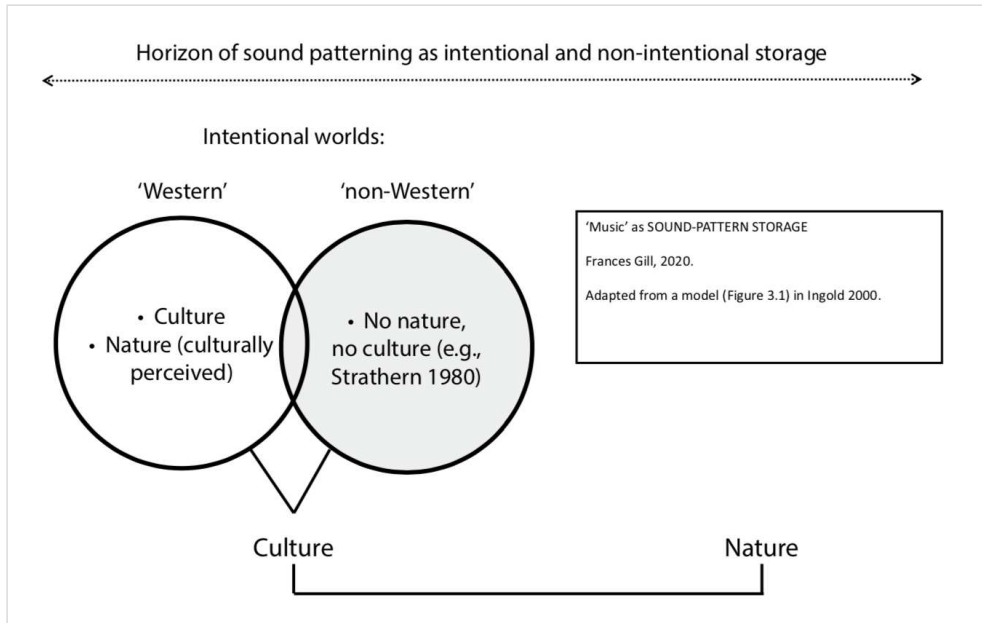


FIGURE 2.1. Music as sound-pattern storage

Gill's working definition of music as sound-pattern storage, after Tim Ingold (2000: 42/fig. 3.1) referencing Dame Marilyn Strathern (1980). Originally published in Gill et al. (2021: 206/fig. 19.3).

The notion that humans in the future will be able to understand the languages we currently use to warn them against dangers like waste remaining radioactive for up to 100,000 years buried 500 meters underground cannot be taken for granted; customs of language (written and verbalised) may change, or even disappear in future millennia. This led us to conclude that:

Sending sonic messages to a future humankind is rather like decoding sonic messages from the past, which resonates with the narrative that places are not actually frozen in time (Massey 1994: 155) but subject to change. (Gill et al. 2021: 207).

Discussing Enhanced Working Memory (EWM), Morley refers to a series of studies by archaeologist Frederick L. Coolidge, and psychologist Thomas Wynn. He refers to EWM as “the ability to hold information in mind, and to process and integrate additional information at the same time. This includes current sensory information and information and skills already a part of procedural and declarative (‘factual’) memory” (Morley 2013: 301-302). He continues that:

According to Wynn and Coolidge (2005)<sup>6</sup>, a conservative interpretation of the archaeological record for these behaviours allows the identification of tasks that clearly required EWM only in the late Upper Palaeolithic; less conservative interpretation encompasses the record of the last 100,000 years or so, but only that associated with anatomically modern *Homo sapiens*. It is important to note that the absence of

<sup>6</sup> This article is referenced in Cambridge Archaeological Journal as Coolidge and Wynn 2005.

evidence for such behaviours earlier does not necessarily mean that the capacities described were *definitely* not present, or that earlier versions of memory functioning were not highly sophisticated and successful (see for example, [Wynn and Coolidge, 2004](#) regarding Neanderthals' expert intelligence), but they do argue that the lack of evidence for these capabilities is *most likely* to indicate a lack of EWM before *Homo sapiens* ([Morley, 2013: 302](#), his emphasis).

With the emphasis on the word 'enhanced' it becomes possible to conceive of music as a form of remembering, where the cognitive experience of salient patterns are the feelings of those patterns.

### 2.3 HERBERT SPENCER

Herbert Spencer [1820-1903] wrote an article called "The origin and function of music" published in London for Fraser's Magazine for Town and Country in 1857 (396-408). Spencer's text represents a position that music evolved from speech. By deconstructing his text it may be possible to see music in a clearer way, taking a position inspired by feminist, gender and post-colonial archaeologies (e.g., [Conkey and Gero, 1991](#) and [Källén, 2004](#) respectively). Written 15 years after Charles Dickens had written about Scrooge, and about 15 years before Darwin had published *The Descent of Man* (1871), I cite many of the main points directly from his text to reduce ambiguity.

Spencer's argument for music origins is a linear path from 'speech' to 'chanting' (musical recitation), and to 'proper' music described as 'elaborative'. An overtly-racist description declares that "...from the evidence furnished by existing barbarous tribes [...] the vocal music of pre-historic times was emotional speech slightly exalted" ([Herbert Spencer, 1857: 402](#)). Spencer's argument discusses the significance of feelings, and the subject of the voice in relation to feelings is put forward as the focus:

All music is originally vocal. All vocal sounds are produced by the agency of certain muscles. These muscles, in common with those of the body at large, are excited to contraction by pleasurable and painful feelings ([ibid., 397](#)).

..the explanation of all kinds of vocal expression must be sought in this general relation between mental and muscular excitements ([ibid., 398](#)).

The word 'feelings' is used for both senses and emotions:

All feelings, then—pleasurable or painful, sensations or emotions—have this common characteristic, that they are muscular stimuli ([ibid., 397](#)).

Spencer's text discusses the "direct connexion between feeling and motion" ([ibid., 397](#)) writing that "feelings demonstrate themselves in sounds as well as in movements" ([ibid., 397](#)) noting that, "Children may often be seen to 'jump for joy' ([ibid., 396](#)), and from observing the dog as a pet. The text continues that "the chief peculiarities in the utterance of the feelings" can be grouped as "loudness, quality or timbre, pitch intervals, and rate of variation" ([ibid., 398](#) his emphasis; cf. Brown, who uses the terminology *graded spectra* referring to 'sentic' factors in this context [Brown, 2000: 287-](#)

288). Spencer's use of the words "extent" and "direction" as related to "vocal intervals" and "variability of pitch" are given in his analysis of human-vocal expression in relation to structural form:

During a scene of complaint and recrimination between two excitable little girls, the voices may be heard to run up and down the gamut several times in each sentence (Spencer 1857: 400).

He wrote that "*à priori*, loud sounds will be the habitual results of strong feelings" (*ibid.* 398) and that "emotion makes use of fifths, octaves, and even wider intervals" (*ibid.* 399), to which he added "For to make large [vocal] intervals requires more muscular action than to make small ones" (*ibid.* 399). Spencer's text refers to vocal timbres, writing that "The different *qualities* of the voice accompany different mental states", reporting that "Under rising ill temper the voice acquires a metallic ring" (*ibid.* 398 his emphasis). More examples typify prejudice to children and women: "In accordance with her constant mood, the ordinary speech of a virago has a piercing quality" (*ibid.* 398), and "the cry of the disappointed urchin grows more shrill as it grows louder" (*ibid.* 399).

Spencer's text identifies the relation between the sentic state and graded spectra (borrowing Brown's terminology 2000), as universal forms of sonic expression:

The expressiveness of these various modifications of voice is therefore innate. Each of us, from babyhood upwards, has been spontaneously making them, when under the various sensations and emotions by which they are produced (Spencer 1857: 400).

He claimed that "the dance-chants of savage tribes are very monotonous" equating this perception to (his imagined/speculated) "ancient chants of a like monotonous character" also likened to songs "extant among boatmen and others in the East" (*ibid.* 402). Spencer's perception and attitude to music was a blatant hierarchy involving a requirement "to distinguish the lower vocal music from emotional speech, and the higher vocal music from the lower" (*ibid.* 404). He remarked that, "for though savages have their dance-chants, these are a kind scarcely to be dignified by the title musical: at most, they supply but the vaguest rudiment of music, properly so called" (*ibid.* 405).

Spencer referred briefly to a concept of signs; "All speech is compounded of two elements, the words and the tones in which they are uttered—the signs of ideas and the signs of feelings" (Spencer 1857: 406). His view on music was that "song employs and exaggerates the natural language of the emotions" (*ibid.* 401), in which:

...dancing, poetry, and music are connate—are originally constituent parts of the same thing, it becomes clear that the measured movement common to them all implies a rhythmical action for the whole system (Spencer 1857: 402).

The text bestows composers with an unusually emotional nature writing that "Musical composers are men of extremely acute sensibilities" (*ibid.* 403). It is at this conceptual junction that Spencer's main idea is surmised:

If music, taking for its raw material the various modifications of voice which are the physiological results of excited feeling, intensifies, combines, and complicates them—if it exaggerates the loudness, the resonance,

the pitch, the intervals, and the variability, which, in virtue of an organic law, are the characteristics of passionate speech—if, by carrying out these further, more consistently, more unitedly, and more sustainedly, it produces an idealised language of emotion; then its power over us becomes comprehensible (Spencer 1857: 404).

Spencer's text actually conveys that music is functional. By reasoning that emotional desire takes effect in behaviours like marriage, parenthood, and in the accumulation of property, he made the following rhetorical point:

Has music any effect beyond the immediate pleasure it produces? Analogy suggests that it has. The enjoyments of a good dinner do not end with themselves, but minister to bodily well-being (Spencer 1857: 405).

Spencer ended that “the love of music seems to exist for its own sake” (*ibid.* 405). At the time of Spencer's writing something like Music Archaeology had not been established; “the facts are of a kind which it is difficult to measure, and of which we have no records” (*ibid.* 407). His remarks are indicative of a colonial attitude in which connotations of a word like ‘savage’ (cf. Lévi-Strauss 1966) perpetuate condescension towards the musics of indigenous peoples which I challenge.

## 2.4 MUSICAL MARVELS

In this section I work with material from ethnomusicologist Bruno Nettl using a recorded lecture about Native American music (Nettl 2010), complementing this with insights from Morley's presentation of the music of the Plains Indians (Morley 2013:15-19 e.g., also referring to Nettl 1992) in a comparative study of the musics of four hunter-gatherer peoples. My aim is to demonstrate the complexity of Native American music by referring to Nettl's lecture of the Arapaho Indians of Wyoming in order to counter the impression that “It may seem that the music is rather simplistic, but amongst the Plains Indians the value of music is not measured in terms of complexity” (Morley 2013: 17). I think the suggestion that the music may seem simplistic is an error, and argue that the content of the music that is presented, both in the capability to produce it, and its compositional structure, are on the contrary, anything but simplistic.

As Simon Wyatt and Carlos García Benito point out, it is not until music archaeologists meet in person and have the facility in workshops to explore musical engagement that the benefits are fully realised (Wyatt and García Benito 2016b: 197). Therefore, and with music research in general, a close affinity to the phenomenon investigated may not always be served best by written text; “whereas sound is of the essence of music, language is mute” (Ingold 2007: 6). In the recorded lecture about Native Americans the nature of the composition of songs and ‘transmission’ of music is in focus. Besides getting a more rounded impression of the context of the music than a written text about the musical culture alone can offer, the recorded video source also delivers a much closer affinity to the researcher's musical perspective. In this case, my attention is drawn not only to the music samples in the lecture but also the gestural directions Nettl gives whilst ‘we’ listen along. This involves him pointing in the air to show the contours of

the songs, and making sounds with his throat and mouth to indicate particular types of vocal sound production.

The first song Nettl transcribed in his career, he explains, is what he calls the ‘Wolf Dance Song’ performed by the Arapaho Indians of Wyoming. He explains that it honours the wolf, a figure in Native American cosmology. After fifty years from when he first started transcribing the music he still does not know for sure if he has it “really right”. Often words of the songs are vocables that are ‘meaningless words’ which he clarifies are not words from another tribe or older language. These are the nonsensical vocables. A well-documented characteristic of the melodies that Nettl describes is that they start high and move gradually lower in terms of musical pitch, but it is the rhythm that Nettl says causes transcription problems, and not just the type of polymetric structures found documented in historical transcription (e.g., Frances Theresa Densmore is referenced). There are also vocal pulsations which Nettl mimics by performing these “uh uh uh uh” pulses that he explains occur at regular intervals whilst singers are singing the melody at the same time. Of further significance is a “curious discrepancy” between a synchronised drum beating and the melodic singing so much so that Nettl is keen to admit to being rather baffled about it, commenting that it is “related in some complicated way or maybe unrelated”. From analysing the recorded examples that he plays I too experience that the sung melody and additional vocal pulses are not synchronised to the regular drum beat in an obvious (Western) way as he suggests; it reminds me of how a conductor of an orchestra is always beating in front of the beat/pulse being played (i.e., not just waving her arms about in gestural appreciation of the music). In addition to the diaphragmatic-vocal pulsations, and the singing melody combined with drumming, are two further distinctions that Nettl draws attention to. Firstly the singers are the ones doing the drumming and vice versa, in which performances of these seemingly incompatible lines of music are “handled without difficulty”. Secondly, this all happens in ensemble with performers singing and drumming in “excellent unison”. Nettl calls the musical collective a “marvel of consciousness” so much so that transcription continues to challenge his musical perception.

Nettl is interested in how the information for learning the songs is communicated, and how individuals actually think about music and make it happen. He discusses the profile of learning songs as one that does not fit a Western ontology, i.e., learning songs “line by line”, for example. Songs are given to individuals in dreams or visions (“transmitted”) by a type of guardian spirit that is an animal like ‘a bear’ or ‘a beaver’. Learning a song in one hearing like this is another marvel to Nettl who refers to this as “musical economic craftsmanship”. This type of music genesis – of music coming into existence in a type of instant – punctuates the significance of music originating in the moment of its conception, in its genesis as an organic process. Nettl hypothesises that there is a first motif from which one starts out and then music happens. I imagine this as the moving movements of the animal; the gifted song may emerge organically from a unique pattern that is only realised in the permission of its unfolding. I think it is worth cutting in here with Tim Ingold’s conceptualisation of skills. Ingold writes that “Skills are not transmitted from generation to generation but are regrown in each” and explains:

By skills I do not mean techniques of the body, but the capabilities of action and perception of the whole organic being (indissolubly mind and body) situated in a richly structured environment. As properties of human organisms, skills are thus as much biological as cultural (Ingold 2000: 5).

Interpreting the music that Nettl describes as the organic growing of a particular skill may suggest that the musical process is rather more akin to the genius of the human in the genesis or purpose of existence, and towards the idea of performer as composer which often is the case for Experimental Music. How the dynamic process of dreams fits this is not clear. The Western idea of a gift of an object would seem to be like a ready-made product but maybe the point of the song is that it actually isn't ready made, like musical *Lego*. Nettl also recalls that he was told by a Native American informant that a song had been given to him by his grandmother and that having songs equates to having power. The Native American musics described are highly sophisticated and creative in nature, most likely evading untrained and even trained Western-musical ears and minds. Morley discussing the Plains Indians writes that “little credit for agency in composition (in the contemporary Western sense) was given to individuals” (2013: 17 referring to Nettl 1956).

---

#### 2.4.1 NONSENSICAL VOCABLES AND THE ABSENCE OF SYMBOLISM

...the music itself is said to have no symbolic content. According to Nettl: ‘native informants are able to say almost nothing on the symbolic aspect of their [non-lexical] music’ (Nettl 1956, p. 24, cited in Morley 2013: 19 discussing the Native Americans of the Plains of central North America).

The music of the Plains Indians is said to have no symbolic content, which is echoed by Isadora Duncan’s oft-quoted remark that “If I could tell you what it meant, there would be no point in dancing it (e.g. Tostevin 2013: 37 referencing Lechtman 1977: 13 quoting Duncan). This is a critical pivot towards an appreciation of music and music origins from a perspective of what music is and does, rather than what it means. The lack of symbolic content in Native American music raises the significance of this phenomenon as a *vocal technique*, a term described by Morley referring to the Sioux ‘Grass Dance’ which “uses vocables (non-lexical meaningless syllables)” (Morley 2013: 17 referring to David McAllester 1996)<sup>7</sup>.

Lexical words are symbols, and I argue therefore, that a notion of ‘symbolic thinking’ is not the best way to understand archaeo-musicological phenomena. Dissanayake thinks it isn’t the best way to think about archaeological material in terms of “What Symbol-Fixation Leaves Out”. In her article entitled “Ancestral Minds and The Spectrum of Symbol” she explains that the agenda for discerning symbolism in artefactual phenomena, like ancient rock art, dominates debates about detecting cognitive and behavioural modernity in anatomically modern humans (Dissanayake 2018). Her observation is that the use of the word *symbol* is often applied casually or imprecisely, noting that archaeologists are fond of the word *symbol* in the same, often “naïve”,

---

<sup>7</sup> Pedantry is required to point out that lexical words are also vocables and that the term *nonsensical vocables* is considered a clearer term to describe utterances that are non-lexical. Morley referring to Marin and Perry (1992) clarifies for his own work that “*Verbal* necessarily implies linguistic content, whereas *vocal* does not, encompassing non-linguistic utterances [...] *language* will be used to refer specifically only to the lexical, syntactic elements of *speech*, while *speech* also encompasses tonal elements of communication” (Morley 2013: 184, his emphasis).

“loose” and “idiosyncratic” the word *art* is used (Dissanayake 2018). Mithen explains implicitly why the dichotomy between nature and culture is unhelpful here; “attempts to define ‘music’ can be rather obscure and that terminological debates regarding the definitions of such concepts as music, language and symbolism deal with culturally specific products, so are not productive regarding studies of evolutionary origins” (Morley 2013: 4-5 alluding to Mithen 2006).

Whilst it is clearly important to recognise that “The use of symbols is considered to be a critical step in the development of modern language, being essential for the development of modern-type language, in which the majority of words are symbols” (Morley 2013: 21 footnote 2), it is equally critical to recognise that if music does not rely on symbols, why should we use symbols to negotiate it? The problem, I perceive, concerns the dynamic nature of music, and not as a footnote. Morley lists the: - *symbol*; *icon*; and *index* (Morley 2013: 21 (Chap 2) footnote 2; 2013: 257 (Chap 10) footnote 2; 2013: 259-261), giving the example of a sculpture of a horse as an *icon*, a horse’s footprint as an *index* and the word ‘horse’ as a *symbol* in his second set of footnotes. I think it is important to perpetuate the idea of the dynamic nature, rather than static nature of signs in relation to sonic phenomena. For example:- two coconut shells ‘clip-clopping’; the flute piece “Circus-Pony” (Stephen Cuthbert Vivian Dodgson) in its performance; and the sound of wild horses galloping, and so on, are all types of dynamic signs; they are all moving!

The phenomenon of nonsensical syllables is not limited to Native American music. There are Western examples of nonsensical vocables in songs. “*Gilly Gilly Ossenfëffer Katzenellenbogen Bogen By The Sea*” (Hoffman and Manning 1954), and “*Supercalifragilisticexpialidocious*” (Sherman and Sherman, Year Unknown) are examples of nonsensical vocables that are a feature of these songs in Western popular-song contexts. Words in a nursery rhyme are not always words that make sense either, like “*Hickory Dickory Dock*” (Unknown c. 1744). They suggest a non-symbolic playful language, like a new game in sound, like babbling infants and the songs of children. The phenomenon is also documented as a lovers’ language between Hmong and Kmhmu males and females (Dissanayake 2006: 45 referring to e.g., Catlin 1982; 1985; Proschan 1992).

In the context of nonsensical vocables and contemporary hunter-gatherers<sup>8</sup> Morley refers to the musics of two equatorial forest tribes of African Pygmies (Aka and Mbuti), in addition to the Native Americans of the Plains (Blackfoot and Sioux):

The music of the Aka and Mbuti is, like most aspects of the culture, a communal activity, without specialist musicians. Like that of the Plains Indians, it is predominantly vocal with little instrumentation; this is one of several features which the Pygmy and Plains Indians share. [...] They believe the way to communicate with the divine is through sound alone; as a result song texts are minimal, often consisting of only one line such as ‘the forest is good’ among the Aka (Turino 1992) or ‘we are the children of the forest’ among the Mbuti (Turnbull 1962). The rest of the vocal element of the music consists, as with Plain Indians, of vocables (Locke 1996).

(Morley 2013: 20).

He describes molimo music waking up the forest during periods of unsuccessful hunting:

---

<sup>8</sup> Of the other two hunter-gatherer societies that feature in Morley’s thesis on the pre-history of music (*ibid.*: 22-29), nonsensical vocables also occur in the songs for the Eskimos (Yupik and Inuit) but are not mentioned as documented for Australian Aborigines of the Western Desert (Pintupi).

...the molimo trumpet, a single end-blown tube, which is considered to mimic the sounds of the forest and answer the men's singing (Turino 1992). As such, the molimo sound does not have an abstract symbolic meaning, in the sense of encoding information, but does have an iconic association with the forest (Morley 2013: 21).

From a semiotic perspective, his description of the molimo trumpet is a little confusing: “The case of the molimo trumpet sound may be argued not to be solely indexical, but to be more akin to an onomatopoeic word such as ‘miaow’– being a conventionalized – and thus symbolic – version of an index” (Morley 2013: 21-22 footnote 2). The notion of a symbolic version of an index is confusing; isn't what he describes actually a dynamic icon? He writes that the sounds are “considered” to wake up the forest but without considering that the sounds may actually really do so. Nonsensical vocables became a kind of hallmark of the British phenomenon of the Spice Girls when they announced to the world in a song that they want to “zigzag ah” (1996). It seems extraordinary that the use of nonsensical vocables appears to deliberately punctuate the lack of symbolic content, almost like poking fun at a concept of meaning whilst waking up new meaning, potentially creating a neologism.

## 2.5 CHARLES DARWIN

So little is known about the use of the voice by the Quadrumana during the season of love, that we have hardly any means of judging whether the habit of singing was first acquired by the male or female progenitors of [hu]mankind. Women are generally thought to possess sweeter voices than men, and as far as this serves as any guide we may infer that they first acquired musical powers in order to attract the other sex (Darwin 1871b: 337).

In his text “Voice and Musical powers” (Charles Darwin 1871b: 330-337) Charles Darwin [1809-1882] concluded that females were probably the first to use their voice in a musical way to attract a mate. From the Darwinian view, women's voices are “sweeter”. Darwin's text refers to the “tender” nurturing disposition of women in contrast to their rivalry-prone males (Darwin 1871b: 326-329). Darwin may have been referring to softness or mellowness of tone/timbre, a softer or quieter loudness/amplitude, in context of mothers with infants. Female voices are capable of many dynamic sounds. They do not go through a significant second lowering of the larynx in puberty (Morley 2013: 157-158).

Darwin, like Spencer, demonstrates characterise chauvinism towards non-Western musics:

The musical faculties, which are not wholly deficient in any race, are capable of prompt and high development, as we see with Hottentots and Negroes, who have readily become excellent musicians, although that they do not practise in their native countries anything that we should esteem as music. But there is nothing anomalous in this circumstance : some species of birds which never naturally sing, can without much difficulty be taught to perform ; thus the house-sparrow has learnt the song of the linnet (Darwin 1871b: 334).

Darwin's inventory of examples includes the musics of insects, fishes, amphibians, birds and mammals. Describing the music of insects and spiders, he wrote about the “beautifully

constructed stridulating organs which are often confined to the males alone” (Darwin 1871b: 330-331). Referring to Samuel Hubbard Scudder (Scudder 1868), he added that “the sounds thus produced consist, I believe in all cases, of the same note, repeated rhythmically ; and this is sometimes pleasing even to the ears of [hu]man[s]” (Darwin 1871b: 331). The comment about the aesthetic effect of the spider/insect ‘music’ on humans builds into a chief narrative about music, as from the experience of it, and as a phenomenon shared by all animals, including human ones. This builds on a shared legacy of sound ecology through the physical existence of sound as a material connection and belonging in the environment. Darwin wrote that:

The capacity and love for singing or music, though not a sexual character in [hu]man[s], must not here be passed over. Although the sounds emitted by all animals of all kinds serve many purposes, a strong case can be made out, that the vocal organs were primarily used and perfected in relation to the propagation of the species (Darwin 1871b: 330).

Darwin exclaimed that it was a fact known to everyone that birds use their vocal organs for courtship, and continuing his inventory he drew attention to the *Hylobates agilis*, a gibbon with “an extremely loud but musical voice” (Darwin 1871b: 332). Darwin did not leave out crustaceans and their “auditory hairs” on writing that:

The perception, if not the enjoyment, of musical cadences and of rhythms is probably common to all animals, and no doubt depends on the common physiological nature of their nervous systems (Darwin 1871b: 333).

Darwin writing about musical capacity claimed that humankind “possessed these faculties at a very remote period, for singing and music are extremely ancient arts” and he judged instrumental music, like poetry, to be “the offspring of song” (Darwin 1871b: 333-334).

---

### 2.5.1 SPENCER VERSUS DARWIN

Theories of music origin come in two basic varieties: structural models and functional models. Structural models look to the acoustic properties of music as outgrowths of homologous precursor functions, whereas functional models look to the adaptive roles of music as determinants of its structural design features (Brown 2000: 271).

Spencer had identified a relation between sound and feelings (feelings = sensations and emotions) but considered that so-called ‘proper’ (human-made) music had diverged from passionate speech, in a hierarchical model concluding that music is a survival advantage, like ‘nutritious’ food. Darwin’s text explains the difference between this model and his:

Mr Spencer comes to an exactly opposite conclusion to that at which I have arrived. He concludes that the cadences used in emotional speech afford the foundation from which music has been developed ; whilst I conclude that musical notes and rhythm were first acquired by the male or female progenitors of [hu]mankind for the sake charming the opposite sex (Darwin 1871b: footnotes 336).

Darwin, however believed that: “neither the enjoyment nor the capacity of producing musical notes are faculties of the least direct use to [hu]man[kind] in reference to [her]his ordinary habits

of life, they must be ranked among the most mysterious with which [s]he is endowed” ([Darwin 1871b: 333](#)) which also seems to skew the perspective usually attributed to him with the emphasis on the word ‘mysterious’ (cf. [Stephen Davies 2018: 359-371](#) referenced by [Killin 2018](#)). Because every day sounds of “daily life”, e.g., prosody, *are* proven to be musical, and a pre-requisite for speech, it is curious that Darwin makes this comment whilst writing that sounds in all animals “serve many purposes” ([Darwin 1871b: 330](#)). One purpose that his text raises directly in reference to humans refers explicitly to violence:

Music affects every emotion, but does not by itself excite in us the more terrible emotions of horror, rage, &c. It awakens the gentler feelings of tenderness and love, which readily pass into devotion. It likewise stirs up in us the sensation of triumph and the glorious ardour for war. These powerful and mingled feelings may well give rise to the sense of sublimity ([Darwin 1871b: 335](#)).

This has critical implications for individuals and societies in relation to how music manages to stir up powerful feelings, how it does what it does. Is it not surprising that music can make war feel sublime, and that this in itself is a violation? Absolutely, music can awaken feelings of horror and rage, which the next section leaves little room for doubting.

## 2.6 TERRIBLE EMOTIONS

...the idea that music might be complicit or culpable as an injurious practice runs counter to some of our most deeply held articles of faith regarding this object of study ([Chung 2019: 281](#)).

A hunting strategy common to the Blackfoot Native Americans involves a song that mimics the sound of a bleating calf which lures animal herds over a bluff where they plummet to their deaths ([Morley 2013: 16](#), referring to [Chase 1989](#); [Taylor 1991](#); and [Kehoe 1999](#)). It seems quite acceptable in this respect to discuss music in its role in practices of harming or killing other non-human animals. However, there seems to be a prevalent stigma with regard to the subject of music and harm in relation to humans.

Ian Cross ([Cross 1999](#)) references the violence in the Kaluli longhouse ceremonies from an account by Steven Feld (see [Feld 2012](#)) where punishments (burns) could be inflicted by listeners on performers if the music induced them to tears. This is the basis of Cross’s counter argument against a provocative position expressed by Steven Pinker who maintains that music is ‘useless’ ([Pinker 1997](#)). Darwin’s comment about terrible emotions is a comment worth exploring if music blurs a line between ardour and murder which makes it lethal material. The theory traditionally attributed to Darwin with respect to the voice being used to attract a mate is given a different complexion by Andrew Jay Chung who asks “What If Music is Sexual Violence?” ([Chung 2019: 310](#)) and in his study concludes that, “music participates in enacting forms of coercion in cases of strip club-based sex trafficking, thereby definitionally contributing to forms of violence recognized by the WHO ([Chung 2019: 313](#)). Darwin’s point is that music does not incite terrible emotions *by itself*, like whether guns or people kill. This last point is discussed by Malafouris who referring to Bruno Latour ([1999](#)) writes “Neither the isolated gun nor the isolated individual can bear the responsibility for the act of killing” Malafouris ([2013: 221](#)).

Martin J. Daughtry deals with “Listening to War: Sound, Music, Trauma, and Survival in Wartime Iraq” (Daughtry 2015). Although his research is considered “significant” and “timely” according to Morag Josephine Grant “The silence characteristic of our own distance from the warzone is not really addressed” (Grant 2016: 2) suggesting that silence shields us from war which presumably and conveniently allows us to ignore it. According to Latour who redeems Lev Vygotsky’s notion of *mediation* it is pointed out that agency “resides in the blind spot in which society and matter exchange properties” (Latour 1999: 190; cited by Malafouris 2013: 221). This Malafouris discusses in relation to the phenomenon of a gunman as a hybrid of two things being a human and a gun, yet he begins this discussion referring to playing with clay. In this sense, it is possible to think about society and music with agency in residence. Grant claims “Show me a world without music torture, and I will show you a world without torture (2014: 15).

Research by Grant on music and torture is critical in gaining a particularly unbiased insight into what music is and does. Her findings encompass both historical and contemporary examples with five pathways to torture. The “sensory deprivation” pathway, (Grant 2014: 4-7) or “no-touch torture” makes use of two channels in which physical sound-spaces (the acoustics) are manipulated in order to control sensory experience, such as “enclosing the subject in an anechoic chamber or alternatively using a constant noise of a frequency structure and amplitude designed to mask any other noises (Grant 2014: 5). The “military tradition” pathway (*ibid.* 7-9) extends to detention centres, prisons and concentration camps. Some examples she gives include prisoners being beaten for not singing songs they are told to sing in a certain way, and also drumming at executions. She writes that:

As most famously discussed by Foucault, the path of criminal justice in general since the eighteenth century has moved away from the spectacular and towards the custodial. Yet even where it is forced into the criminal underground, torture often retains many aspects of these earlier and most public practices (Grant 2014: 7 referring to Michel Foucault 1979).

She writes that there are “many plausible routes via which music could enter prison camps and other detention facilities as an extension of military traditions and practices”. A salient point she adds in relation to cruel, inhuman or degrading (CID) treatment is that, “any musical practice undergoes significant symbolic transformations which makes it amenable to use as a form of torture and CID punishment” (Grant 2014: 9). In the “political communication” pathway (*ibid.* 9-11) Grant introduces the themes of ‘re-education’, and the ‘perception of threat’, as *excuses* in contexts for where group songs (referring to Ernst Klusen 1967) are specific materials of choice. Songs may be political or ideological, to generate emotional response. Survivors often refer to music when later describing their experiences; “we find so many references to prisoners being forced to sing either their own songs or the songs of those who are maltreating them” (Grant 2014: 10 referring to Klip and Sluiter 2005).

In the “humiliation pathway” (*ibid.* 11-12) Grant describes “the flute of shame” which was a barbaric practice from the Middle Ages that involved both physical punishment and humiliation (*ibid.* 11). In this context she also draws a line between play songs of children and how these can become twisted as acts of torment and bullying in the school playground noting that “forms of teasing interaction amongst younger children points to the prevalence of emphasised and

repetitive speech and “singsong” intonations in marking such interactions” (Grant 2014: 12). The fifth pathway – the “power performance pathway” – also specifically references children (*ibid.* 12-14). Referring to the documentary *Songs of War*, (Chytroschek 2011), she writes,

The film follows the American songwriter Christopher Cerf, most well-known for his creations for the American children’s programme *Sesame Street*, as he attempts to understand how and why music – his own included – came to be used as an integral part of torture practices in US detention camps in the “War On Terror” (Grant 2014: 12).

In this performance pathway she includes an extract of a transcription of a performance of “enhanced interrogation” acted out by Cerf and a US interrogator, writing, “it is exactly the combination of tone of voice, pitch, rhythm, repetition, and gesture – categories which can equally be applied to the analysis of musical communication – which are so telling in this exchange” (Grant 2014: 12). Grant explains that:

Since structures of state-sanctioned power and dominance lie at the heart of the relationship between torturer and tortured, and since music often plays a key role in performing and constituting these structures both in the public eye and in personal experience, music and torture, it would seem, are not so far removed from each other after all (Grant 2014: 14).

Darwin claimed that “mingled feelings” from music “may well give rise to the sense of sublimity” (1871b: 335). Here the theme of sublimity is referenced specifically. *Sublimation* is a critical theme in a category with *fantasy* and *displacement* in connection with “relief from anxiety and psychological pain” in how emotions are shaped by musical means and “social functions are served by ritual music” (Dissanayake 2006: 43-48). Ellen Dissanayake explains that these types of social function promote fitness “even if this sense of control is illusory” (*ibid.* 48). Dissanayake uses the words “wellbeing” and “common cause” highlighting that it is precisely cohesion that can also “incite a group to hate” (*ibid.* 49). Bell writes:

The deployment of ritualization, consciously or unconsciously, is the deployment of a particular construction of power relationships, a particular relationship of domination, consent, and resistance (Bell 2009: 206).

An example demonstrated in context of musical instruments in archaeology is the case of the Bronze-Age Lurs which subsequently became an intrinsic part of WWII Nazi propaganda (Lund 1986; 2010; and see Gill 2020: 56). The Palaeolithic Societies of Europe were hunter-gatherers (e.g., Gamble 1999) and it can be ruled out that the *Ach flutes* and use of music in the Aurignacian were not explicit tools of warfare between groups of humans:

...warfare is not what egalitarian, immediate-return hunter-gatherers do. Without leaders, warfare is not possible. Far from being warlike, the ethnographic literature describes people who actively welcome, include, and even marry their neighbors; when conflicts do arise, the first choice is typically to retreat from hostility. The theory of primitive warfare does have its supporters (e.g., Alexander 1987; Pinker 2011; Shackelford and Weekes-Shackelford 2012), but unless the idea is ethnographically supported, we can legitimately dismiss it as an ethnocentric assumption. Immediate-return hunter-gatherers do not erect fences or defend borders and are systematically disengaged from property; hence, they are disengaged from its potential to create dependency (Woodburn 1982). (Knight and Lewis 2017: 439).

Grant's assertion that "any musical practice undergoes significant symbolic transformations" (2014: 9) is relevant. The symbolic aspect Grant refers to in this context, and understood here, is not necessarily the music but presumably the context of the meaning behind the practice of using it. The mother-infant dyad is where humans first encounter music (see 2.10.2). If music is anchored in space to this first origin, it may explain why humans appear to be so intimately attuned and form life-long attachments to music. It is not so difficult to understand why such types of music, especially associated with the mother-infant dyad like children's songs, nursery rhymes and lullabies, are targeted by humans in different contexts as weapons. Symbols can be found to be used physically in music in various ways: - in songs with words; in Morse code, in whistling languages, (e.g. Meyer 2004); and so on, and so forth. There are also short sonic patterns that convey symbolic meaning in more implicit ways, which Zbikowski (2017) discusses within the realm of the *sonic icon*, as *sound symbols* and *sound effects* (see 2.9). The human practice of an iconic wolf whistle, for example, is an intimidating signal addressing a type of predatory intention. A vital aspect of all these sonic signs is that they are moving signals.

## 2.7 SONIC RITUALISATION

It is apparent that sound and music are often used in 'ritual' contexts but I am interested in sound and music as ritualisation itself with the emphasis on music as process over product, in terms of sound and music's potential for capturing attention and for hypnotisation. Music is formed in the temporal context through salient action. Salience can be used to investigate the relation between sonic signs and sentic emotions, between the feeling body and sonic material form. I consider non-representational theory, and the Western tendency to separate music and dance. I am also keen to make the point that sound patterns (as icons) can send signals which are not arbitrary, whereas speech acts (as symbols) can otherwise misfire and go astray, and are therefore potentially ambiguous. I also reason why icons feel real, and argue that they are important for understanding cognition, especially in relation to sound and music.

### 2.7.1 ETHOLOGICAL PERSPECTIVES

...ritualized behaviors in animals, which have evolved because they contribute to individual survival and inclusive fitness, occur in biologically important contexts: they threaten, show dominance, and display resources, or indicate submission, appeasement, and willingness for interaction. Interestingly, human ritual ceremonies occur in similar if not always identical circumstances, and engaging in them may also affect survival and reproduction (Dissanayake 2006: 43).

Dissanayake refers to herself as "an ethologist or biological anthropologist, who approaches music as a behavior that evolved in ancestral humans because it contributed to their survival and reproductive success" (Dissanayake 2006: 31). She points out that, "Not only anatomy and physiology are affected by selective forces. Psychology and behavior too have evolved to "fit" or "adapt" individuals to a way of life in a particular environment" (Dissanayake 2006: 35).

She gives four types of emotional response to music:

- Appeal to inherent sensory and cognitive dispositions
- Association and connotation
- Intensification
- Expectation; disruption and repair; heightened affective moments

Taken from Dissanayake (2006: 41-43).

1. Appeal to inherent sensory and cognitive dispositions

- is concerned with the human disposition to aesthetic stimuli for qualities like precision, balance and harmony because they confer, for example, youthfulness, vitality and fertility.

2. Association and connotation

- is concerned with how music sets scene, creates mood or sends signal for events. In this context she mentions flute playing: “For the Sambia of Papua New Guinea, the sounds of flutes may evoke the combined fear and excitement of ritual participation” (Dissanayake 2006: 41-42 referring to Herdt 1982).

3. Intensification

- is concerned with how music can alter consciousness states. Dissanayake mentions tempo and amplitude as key factors that affect “physiological and psychological excitement, leading to emotional discharge” (Dissanayake 2006: 42). Mentioned earlier, the subject of archaeoacoustics is concerned with how acoustic environments contribute to ASC and trance states (see Scarre and Lawson 2006).

4. Expectation; disruption and repair; heightened affective moments

- is emotional response to music whereby if anticipation not fulfilled according to expectation, a new reality emerges in which outcomes may include feelings of euphoria. The “three principles of salience” paves a particular trajectory of emotion experienced in infancy in the dyadic relation with an adult, important for survival (Dissanayake 2006: 42 referring to Beebe and Lachmann 1994). Here she draws the parallel with high Western art music; composers find ways to trigger this emotional trajectory.

Across six functions (listed below) served by ritual music in animals, Dissanayake identifies their counterparts in human behaviours, explaining that functions four to six are rather broader in scope (Dissanayake 2006: 43-49):

- Display of resources
- Control and channeling of individual aggression
- Facilitation of courtship
- Establishment and maintenance of social identity through rites of passage
- Relief from anxiety and psychological pain
- Promotion of group cooperation and prosperity

Taken from Dissanayake (2006: 43-49)

1. Display of resources

- Resources of skill, strength and beauty are displayed in music by the “best singers” (Dissanayake 2006: 44) referring to East Asian Hmong in e.g., Catlin 1982; 1985; 1992);

2. Control and channeling of individual aggression

- Eskimos (Intuits) resolve conflict duelling with songs (Dissanayake 2006: 44 referring to e.g., Hoebel 1968; Balikci 1970).

3. Facilitation of courtship

- Dissanayake writes that “Hmong and Kmhmu males play love songs on a strummed mouth-played bamboo instrument that conveys all vowels and most consonants, and the young woman may reply on a flute-like instrument of her own” (2006: 45 referring to e.g., Catlin 1982; 1985; Proschan 1992). The couple may compose “a secret language of love, with metaphoric uses of these musical “words,” to confuse any elder who might be listening” in this context, relevant to the discussion about nonsensical vocables.

4. Establishment and maintenance of social identity through rites of passage

- Dissanayake (2006: 46 referring to Shapiro and Talamantez 1986) explains that whilst “nonhuman animals don’t mark rites of passage” ritualisations, such as the eight-day long puberty ceremony of Mescalero Apache girls, are considered functional as they contribute to bio-cultural identities, like of a child, or of a widow, and so on. Like animal ritualisations these are also

maturational. Her reference to how music as a dynamic process can represent signs that are visual and non-dynamic (still) is relevant:

The clear contour of melodies with octave leaps, triadic outlines, and sectional structure provides an analogic design that matches other parts of the ceremony, from the shapes of tipis against the sky to painted geometric designs (Dissanayake 2006: 46).

5. Relief from anxiety and psychological pain

- Dissanayake discusses emotional ‘release’, ‘relief’ and ‘refuge’ through *troubled times*. She highlights the musical form known as the *lament* claiming that its “functions resemble what in the modern Western psychotherapeutic tradition is called displacement, sublimation, or fantasy” (Dissanayake 2006: 47). She refers to Kaluli women’s improvised “melodic-sung-weeping” (citing Feld 1982: 16) and in cross context, draws a parallel by detailing the Finnish-Karelian lament called *itkuvirsi* which:

...uses a highly metaphoric language and powerful improvisational manner of performance, reminiscent of a shamanistic trance (Tolbert, 1990). Karelian laments, sung at both weddings and funerals, are performed only by older women in an ecstatic style that is a mixture of weeping, speech, and song. They are not simply or primarily a personal expression of grief but the sacred language of these two important rites of passage—where through marriage a girl leaves her home as well as her girlhood, and through death a person leaves his or her life and loved ones (Dissanayake 2006: 47).

On the most general level, the Karelian lament is iconic for a sigh, using a terraced, descending melodic contour (with fluid pitches and irregular rhythm), repeated and endlessly elaborated with microtonal and microrhythmic variations that express, with intensifying emotional involvement, that a successful contact with the other world has been made and that spiritual power is present. This ambiguity and instability of pitch, mode, range, and phrase structure is as necessary to the effectiveness of the lament as predictable pattern and control is to other types of ritual music (Dissanayake 2006: 47-48).

6. Promotion of group cooperation and prosperity

- Dissanayake gives various examples varieties of this function, like the transference of cultural information. Morley, referring to the work of Thomas F. Johnston (1989), presents the music of the Yupik Eskimo of South-West Alaska as “informative and educational”, a way of “learning physical and mental skills” and as a repository for environmental information, like berry-picking songs, which he likens to the Australian Aborigines’ use of songs as a mnemonic aid (Morley 2013: 24-30).

Dissanayake takes a functional view of music origins, writing about musical emotion:

...how music produces emotion, and what musical emotion *is* or *does*. In an ethological view, the biological purpose of emotions is to motivate behavior—to make us respond appropriately to the sorts of occurrences in the environment that could affect us, for good or ill. In this sense, then, musical experience was originally functional (Dissanayake 2006: 32).

Catherine Bell in *Ritual Theory, Ritual Practice* (2009) explains that there have been two schools in relation to the subject of ritualisation (*ibid.* 88-93); “Gluckman contrasted the “ritualization” of

social relationships with “ritualism” in order to extend the notion of ritual beyond a narrow and somewhat traditional connection with organized religious institutions and formal worship” (*ibid.* 88 referring to Gluckman 1962: 20). The other is “more or less linked to the ethological perspective pioneered by Huxley” (*ibid.* 88). Bell identifies several features common to ritualisation:

- strategies of differentiation through formalization and periodicity,
- the centrality of the body,
- the orchestration of schemes by which the body defines an environment and is defined in turn by it,
- ritual mastery, and
- the negotiation of power to define and appropriate the hegemonic order.

Taken from Bell (2009: 219-220)

Dissanayake also follows Huxley (1966) with other advocates “who explicitly acknowledge the relevancy of ethology for the study of human ritual, such as Rappaport...” (Bell 2009: 89).

---

### 2.7.2 MUSICKING, FLUTING (AND THINGING)

Bell notes the term *ritualisation* is mainly used to “emphasise ritual as activity” and “now frequently the preferred term particularly for studies focusing on ritual in technologically advanced societies” (Bell 2009: 89). In the case for *music as activity* which music clearly is concerned with, one can be reminded that there is no verb in the English dictionary for music<sup>9</sup>. From an archaeological perspective, Malafouris (2019) refers to ‘thinging’ in a similar way by theorising the perspectives of things (he focuses on a notion of fetishisation rather than ritualisation, which I will come to in Chapter Six). The sticking point of music being a noun and not a verb was picked up by Christopher Small (1998) who coined the term ‘musicking’, referenced more recently by Liam Maloney and John Schofield in “Sonic Identity and the Making of Heritage” (2021: 3). They write:

...music challenges any prevalence of the distinction between its tangible and intangible forms, highlighting through composition, recording and performance how one cannot exist without the other. [...] A parallel

---

<sup>9</sup> The English verbs *to compose*, *to jam*, and *to busk* and the verb *to sing* etc. are otherwise words that do denote action.

exists in the concept of an ecosystem in which everything relates to everything else (Maloney and Schofield 2021: 2).

The notion of ‘musicking’ may provide a valuable perspective for the archaeological pieces in this research, in terms of an ecosystem for the Aurignacian *Ach flutes*.

---

### 2.7.3 NOTES ON NON-REPRESENTATION

Bracketing cognition, language, and the human subject as the sole means to access the world, non-representation theory instead focuses on movements and flow, performance and play, practice and affect; in short the entanglements of human, nonhuman and inhuman that make up the increasingly complex world we inhabit (Rutherford 2011: 248).

Rutherford reviewing Nigel Thrift’s 2008 book which concerns the subject of Non-representational theory, explicitly alludes to the inclusiveness of *nonhuman* and *inhuman*, together with *human* (Rutherford 2011: 248). This resonates with the theoretical principles of ethological ritualisation and notions of music. Not all scholars are willing to regard music in this way. Steven Brown sees a dichotomy between what he terms an ‘acoustic mode’, and a ‘vehicle mode’ as a reason to create a demarcation for music that discounts non-human song as music (2000). After Derek Bickerton (1995), he argues why bird and animal song are not forms of music for the same reason that they are not forms of language, stressing the “rich representational abilities of human beings”. Brown then claims that “birdsong is not a form of music for exactly the same reason that linguists argue that it is not a form of language” (Brown 2000: 298/ endnotes 1). Thrift redresses the balance. He refers to his theory of non-representation as “avowedly experimental” (Thrift, 2008: 2) making reference to dance as *ambulant ‘theorizing’* (Thrift 2008: 141 referring to Stewart 1998) giving the example of ‘Contact Improvisation’ which “mixes together the casual, individualistic improvisatory ethos of ordinary social dancing with the kind of task-orientated movement favoured by early postmodern dance groups” (*ibid.* 141). He describes the “kinaesthetic sensations and physics of weight and momentum rather than the visual picture of bodily shape within the stage space” (Thrift 2008: 142 referring to Albright 1997: 86), and which therefore “cleaves to a non-representational credo” (*ibid.* 142).

A child jumping for joy, as noted by Spencer (see 2.3), is a salient act, and whereas this action is not a lexical one, it is clearly something that is changing the atmosphere; it has agency. Witnessing my daughter’s friend actually jumping for joy, like a stotting gazelle, when she surprised him in his garden when they were both five years old, would not seem to be conscious and pre-intended action of representation, yet the skilful act of the athletic beat of his legs, with knees approaching the chin, the up and down repetitive pace for several seconds is a powerful type of signal. Here, movements through time are emphasised: - the alternating up and down, the new height of the body in the air; repetition in feet sounding both at once pounding the ground; lack of any physical contact with the earth when the body is in the air; and so on, are all salient actions. I studied Contact Improvisation as an undergraduate music student taking subsidiary dance for two years, and to begin with it ended up being a lot like rolling about on the floor with one’s partner

taking cues from their movements in a natural flow of moving movements. To observe professionals in the act of this dance however is to realise it is a grown-up art form; it is a practice-based phenomenon like Klee's wisdom of the line that is also something of a child's sense of faith and discovery which he perceived (Klee 1962: 183-84 cited in Schuback 2012: 154). To an extent, this echoes John Blacking's writing about ritualisation that references "the somatic state";

...as language evolved and *Homo sapiens sapiens* became established in the world, there emerged culturally defined areas *dance* and *music*, which in many societies are inseparable, and whose main purpose is suggested to be the attainment of the somatic state of sensori-motor communication that generates biosocial dance (Blacking 1976: 11).<sup>10</sup>

Blacking comes to the conclusion that ritualisation can be thought of as 'dance', describing "a fusion of bodies that transcends the sexual and can be extended to any number of bodies at a time. I cannot think of any way in which this might have been achieved except through the evolution of some kind of ritual behaviour which, since it is a formal, communal movement of bodies, is best called dance" (Blacking 1976: 13). A more nuanced term may be something else like 'musidance' that resonates more accurately with the fact that "in many cultures no clear distinction is made (or is indeed possible) between music and dance as separate activities, both being viewed as facets of the same activity" (Morley 2013: 6 referring to Cross and Morley 2009). Somatic movement is used as a tool in present-day Experimental Heritage explorations as a means to research the tangible and intangible material remains of the past around us, at the intersection of art and archaeology, through embodied movement-based practice (Petersson/Burke 2020).

---

#### 2.7.4 SALIENCE

In this section I would like to consider that what creates salience is the creation of contrast and of causing difference, which is a focus in Bell's perspective of ritualisation:

Semiologically speaking, just as a sign or a text derives its significance by virtue of its relationship to other signs and texts, basic to ritualisation is the inherent significance it derives from its interplay and contrast with other practices (Bell 2009: 90, referring to Douglas 1973: 11; Tambiah 1968: 198; Lévi-Strauss 1981: 671; Bourdieu 1977: 5).

Since sound can be quantified physically, and is theoretically experienced phenomenologically, its salient qualities and effects are of interest to both science and as art, yet is important to note that "Salience—prominence or emphasis of any sort—is potentially *emotional*" (Dissanayake 2006: 39 *her emphasis*). Potentially salient happenings 'of any sort' are therefore understood as being equally part and parcel of everyday life in experiential terms. Bell writes that "so-called ritual activities be removed from their isolated position as special paradigmatic acts and restored to the context of social activity in general" (Bell 2009: 7). Here, the idea is to "abandon the focus on

---

<sup>10</sup> Blacking's term *Homo sapiens sapiens* is not the term I use in this thesis for modern humans. See Klein (2009).

ritual as a set of special practices in favour of a focus on some of the more common strategies of “ritualization,” initially defined as a way of acting that differentiates some acts from others” (Bell 2009: xv).

*Fortissimo* (an Italian performance direction which means to play extremely loudly) is opposite to *pianissimo* (a performance direction which means to play extremely quietly) in Western-classical-music notation. I use this example of loud sounds and quiet sounds, to demonstrate the concept of amplitude contrast, in the same way it is possible to find contrast between high-pitched and low-pitched frequencies (pitch contrast). What I am getting at is the notion of fundamental oppositions as discussed by Bell (2009: 36 referring to Bourdieu, and Lévi-Strauss, from Bourdieu 1977 114-124):

Oppositions are not basic or fundamental in the sense of being underlying or absolute social, metaphysical, or logical values; rather, they are particularly useful tools for invoking and manipulating the taxonomic schemes of a culture (Bell 2009: 36).

These oppositions are also conceptual tools for the composer. When Bell writes “Ritualizing schemes invoke a series of privileged oppositions that, when acted in space and time through a series of movements, gestures, and sounds, effectively structure and nuance an environment” (Bell 2009: 140), she would also seem to be giving a description of music and composing. She continues; “fundamental oppositions do not seem to mean much in themselves but are effective for the internal organization of taxonomic schemes that generate the sense of a coherent unity” (Bell 2009: 36). Dissanayake likewise explains that salience does not mean much in itself:

Salience, novelty, and change in themselves are neither positive nor negative—they may lead to anxiety, intense fear, relief, curiosity, or delight. But an unexpected or markedly salient event seems to trigger a readiness for emotion, if not a full-blown emotion (Dissanayake 2006: 39-40 referring to Ellsworth 1994: 151-152).

Dissanayake taking Ellsworth’s view about salience being neither positive nor negative together, with Bell’s view of fundamental oppositions not meaning much in themselves, echo Darwin’s claim that music does not excite *by itself* (Darwin 1871b: 335). Dissanayake explains how salience is explicitly created in terms of structural form:

Formalization, repetition, exaggeration, and elaboration are all ways of giving salience, hence emotional or potentially emotional significance, to stimuli. In ritualized behaviors in animals, the marked signals are organized in time, thereby not only capturing but manipulating the attention of the recipient (Dissanayake 2006: 40).

Bell points out that Michel Foucault wrote that “nothing is fundamental” and that there are only “reciprocal relations” (Bell 2009: 37 referring to Foucault 1984: 247). This resonates with critical role of emotional *response*, in terms of how music affects the attention of the recipient. Dissanayake refers to these behaviours that capture attention as “marked signals” which steers the discussion about the origins of music into the realm of semiotics. I will now begin to consider why dynamic icons feel real because of their marked signals arranged in time.

I have experience of the red squirrel that lives at the bottom of the lane. This squirrel alarmed me by frantically scrambling over the entire spectrum of branches of one of the forest trees at lightning speed, to make the whole tree resonate and shake, accompanied by a fury of loud squirrel-chattering. The explanation is surely that the red squirrel had been threatened by an electronic hedge trimmer in action close by to the tree. I was in no doubt about the seriousness intention; there was not a shred of ambiguity in the inference. From an animistic perspective I might quite have believed that it was the tree that had told the squirrel to do this, and the massive tree, and not the squirrel alone, was warning me to go away (Frances Gill).

I knew it was the squirrel in the tree as the squirrel's behaviour was simultaneously affecting and shaping my emotional state, yet however much I rationalised it was a small squirrel in a tree, I couldn't then dislodge the reoccurrence of the fate of Roald Dahl's character Veruca Salt ([Dahl 1964](#)) from my mind. I could feel the alarm. The squirrel was not joking. The squirrel created a *dynamic icon* and the experience of this temporal process qualifies the abduction that *icons feel real* even if it is true, as Zbikowski points out ([2017: 40](#)) that non-human animals (like squirrels) are not capable of conceptualising icons, and that icons, as Knight and Lewis explain, are fake ([2017: 442](#)), and who add that,

According to Maynard Smith and Harper ([2003](#)), the costs to an animal of producing a signal may be divided into two parts—the “efficacy cost” (the investment needed to clearly transmit the signal) and the “strategic cost” (the amount needed to convince an audience of its reliability), ([Knight and Lewis 2017: 435](#)).

Blacking makes a distinction between non-human-animal ritualisation and human ritualisation (see [Wyatt 2020: 228](#) discussing [Blacking 1976: 10-11](#)) writing that “It seems that in animals adaptive ritual behaviour is specialized and maturational, whereas in [hu]man[s] it is generalized and situational”, adding that “Experiences in time and space are therefore externalized in an *externally* given situation” ([1976: 10](#) his emphasis). Blacking concedes however, that “the terms ‘maturational’ and ‘situational’ are not strictly accurate as distinctions between non-human and human ritual behaviour” ([Blacking 1976: 10](#)).

Blacking's point, about “human-type situational ritual in which all available people participate together in time and space” is one that also reflects the idea that “the time of performance of a ritual may transcend the time of the maturational event that it celebrates” ([Blacking 1976: 10 alluding to Van Gennep 1960](#)). Whilst it follows that non-human animals do not seem to delay rituals – they do it when the time is just right – so do human animals, e.g., if the time to perform a given ritual is indeed less significant for humans, it begs the question why having rituals curbed, stopped, and/or postponed at a certain time became a thing of such tremendous outrage during COVID-19 lockdowns. Another aspect of time can be considered as the relation of the date and clock time of ritualisation, to a movement of bodies in synchrony and diachrony on a macro and micro spectrum. Ritualisations may be connected through time and place by being displaced through time, place, or time and place. During COVID-19 lockdowns, there were many people in isolated contexts jumping for joy – doing the same thing at the same time (like ritual ‘keep-fit’ workouts) – in different places across the world via the net. The inversion of the ‘same-time’

scenario is found in the liminal space between mothers and children in infinite situations but at different times and different places, or in birth or death.

Whether the number of participants is one, two, or more than two, would also seem to be irrelevant to ritualisation *per se*, in relation to Blacking's point about the *communal movement of bodies* (Blacking 1976: 13). When ritualisation does occur with large participating numbers it is important to recall that this is not exclusive to humans either, since non-human animals are known for this too (e.g., like the starlings' dance), and this last point inspires at least one theory for the origins of music on the basis of a larger quantity of participants. Morley, for example, discussing "rhythm, corporeal movement, and emotion" comments on Björn Merker's theory (1999). The title of Merker's text is "Synchronous chorusing and human origins" (Merker 1999) which states that,

Distance-calls amongst higher primates in the wild are almost invariably accompanied by simultaneous body movements such as branch-waving and beating of the ground (Morley 2013: 241 referring to Merker 1999).

Merker's theory is that synchronised song behaviours with roots in higher-primate distance calls would have been used to attract females from one group to another on the basis of exogamy. Morley, in response to Merker's synchronised chorusing, writes that "there is no known precedent for this type of *cooperative behaviour* amongst primates—it is principally known amongst insects" (Morley 2013: 241). Whilst Merker's idea may be ruled out by Morley, cooperative behaviour may have been triggered via chorusing in other ways (*cf.* Knight and Lewis 2017). By rationalising ritualisation in terms of dynamic icons that constitute salient signals arranged in time, the cognitive response to them in real time is that they are real; whether made by squirrels or wordless female choruses, response is about feeling over reason which if challenged as irrational, nonsensical, or illogical is practically futile. The signal itself, like the speed bump, is the salient power.

---

#### 2.7.6      AMBIGUITY AND MEANING

The capacity for "robust" analogy (Zbikowski 2017: 40), and "rich" representation (Brown 2000: 298 referring to Bickerton 1995; *cf.* Cross and Morley 2008a; section 2.2) as being exclusive to humans, is accepted. I am not negating this but question whether it may constitute an oversight with regard to the subject of cognition, to question the following view (in relation to sonic ritualisation, and music origins):

The theoretical paradigms used to study animal communication are incommensurable with those used by linguists to study language. Although speech consists of vocal signals, Darwinian theory faces the difficulty that it does not apply to language. Costs or handicaps (Zahavi and Zahavi 1997), while central to the theory of animal communication, have no place in linguistics (Knight and Lewis 2017: 435).

I counter this view by referring firstly to Lawrence Kramer (2006) who uses William Shakespeare's Hamlet (1603: 1.2.71-74) to show how words and sentences can have several meanings. A standard example of this can be found in the title of the book called "Eats Shoots

and Leaves” (Truss 2003). In musicological theory, Kramer distinguishes the claims/assertions of *locutionary meaning* from the pressure of *illocutionary force* in acts of speech; it is not just what one says but how one says it. Critical to this is *iterability* in which situation (place) and hence ‘context’ is forever changing, which I discussed in a previous text:

John Langshaw Austin (1962) refers to speech acts “misfiring”, but it is Jacques Derrida (1982) who maintains that acts of communication, that is to say all expressive acts, like a visual image, have a capacity to be performed again and again, having the potential for new meaning and interpretation with each reiteration. These ideas support a basis for Lawrence Kramer’s “musical hermeneutics” where “the availability of alternatives is the very condition that makes interpretation possible”, that “meaning is produced everywhere, and, like air or money, it circulates everywhere”. Kramer (2006 [1990]: 7–17) situates the interpreters as agents by writing “the works, practices and activities – for us, the music – that we address as interpreters are not only the products but also the agencies of culture, not only the members of the habitus but also makers of it”. (Gill 2020: 72–73).

Ambiguity in speech is a tangible and defining feature of the mother-infant dyadic relation:

It is the liminal spaces between mother and infant, between self and other, between meaning and not meaning, that the infant voice becomes layered and resonant developing a unique self that has a unique place in the cultural places it inhabits (Maya Gratier 2008: 149).

Ann Fernald writes that, “Speech first becomes meaningful to the infant through prosody rather than through words, and through association of sound and meaning that are not arbitrary” (Ann Fernald 1992a: 277). Brown echoes Fernald’s point that:

...lexical words can have, and often do have, a very broad range of meanings, where semantic interpretation is highly dependent on the context of not only the sentence but the entire discourse arrangement. Thus, words have great semantic elasticity (Swain 1997), and this is seen in abundance during the development of speech in children, where lexical words start off having extremely broad meanings... (Brown 2000; 284).

Fernald also writes about the “the meaning of meaning” (Fernald 1992a: 288), and in the context of *prosody* asserts that, “The sense of the term *meaning* suggested here, obviously different from the referential meaning of the linguists, is closer to the ethologists’ understanding of meaning in vocal communication among nonhuman primates” (Fernald 1992a: 278). She examines long-distant vocalisations of African monkeys in a forest situation looking at the frequency spectrum of their calls which she compares to the vocal calls of human mothers. In both scenarios the results are tuned to ecological context. She explains that primate calls are unlearned, directed by emotion, “central to meaning” and beyond external reference. She concludes that in these respects “the melodies of human mothers’ speech to infants are analogous” (1992a: 278–279). This is not to be the case, as some scholars suppose, for vervet monkeys signalling that an eagle, a leopard or a snake is too close for comfort (*cf. Queiroz and Ribeiro 2002*). Michael Tomasello discussing “primate intentional communication” counters the claim because vervet monkeys are not the target of the sounds; they are only informed by “eavesdropping” (Tomasello 2008: chapter 2/section 2.1 referring to, e.g., Cheney and Seyfarth 2003). He refers to Jane Goodall who writes that “The production of sound in the *absence* of the appropriate emotional state seems to be almost impossible task for a chimpanzee” (Goodall 1986: 125 cited in Tomasello 2008: 2.1).

A theoretical perspective for the origins of music by Vanechoutte and Skoyles along similar lines concerns the subject of couple bonding, as discussed by Morley:

Amongst other animals (specifically tropical songbirds, whales, porpoises, wolves, and gibbons), song has evolved as a means of establishing pair bonding. Vanechoutte and Skoyles (1998) assert that this is an older requirement than linguistic speech and hypothesize that the ability to sing evolved in humans for the same reason that it did in other animals (Morley 2013: 224).

However Morley chooses a different narrative theory for the evolution of the hominin voice:

...the vocal tract developed to the extent that it did, not to support song before language (as Vanechoutte and Skoyles (1998) suggest), but instead to support tonal prosodic affective utterances that were a precursor to both language and melodic music (as Brown, 2000, suggests), *and were useful as social-emotional communication*. In this case, it is only since complex lexicon and syntax developed that speech has been able to be used without recourse to the entire human vocal range (Morley 2013: 225 his emphasis).

If language has meant that we don't need to use the full extent of our vocal range, then I beg to differ. My young son is in a shop crammed with circular rails of padded clothing, like small trees, and is starting to run around in an excited fashion. Suddenly I can't see him or hear him. My embarrassment dissolves into finding the entire vocal range I have at my disposal to make sure I will see him again alive in the jungle of winter jackets and snow suits. I shout his name loudly and angrily. Samuel! Such a large city-centre shop in a cold climate outperforms a dry acoustic studio and there are automatic doors opening and closing with moving cars directly outside. I am pleased I have a voice and that I can use it. What would be the 'cost' of not using the full vocal range of the voice?

Morley and Brown delineate music from speech on the basis of sound. Brown writes, "Perhaps the point of greatest distinction from music is language's liberation from the acoustic modality altogether" (Brown 2000: 293). I question where Brown assigns the written musical score in this argument for language's liberation from sound in terms of the cognitive ability to internalise sound (*cf.* Ingold 2007: 6-38) e.g., of singing silently, like reading silently. I prefer to dwell alternatively in the spirit of "music's immediacy and independence from language" (Zbikowski 2017: 32). The idea is to move ultimately the bias for understanding humans from a world of symbols to the abduction of the world through dynamic icons.

## 2.8 ROUSSEAU'S HERITAGE

At their highest level of function, music and language differ more in emphasis than in kind... (Brown 2000: 275).

Jean-Jacques Rousseau [1712-1778] in his essay on the origin of languages “suggested that speech and song were not originally distinct from each other, and that early languages were melodic and poetic rather than practical and prosaic” (Morley 2013: 215). Steven Brown’s essay: *The “Musilanguage” Model of Music Evolution* (Brown 2000) emanates from Rousseau’s idea of musilanguage. Brown has formulated “three graded spectra” (Brown 2000: 287). These are effectively the same as the ‘peculiarities’ that Spencer formulated under the headings of *loudness, quality or timbre, pitch intervals, and rate of variation*” (Spencer 1857: 398). They are (*ibid.* 287):

- tempo modulation (slow-fast spectrum);
- amplitude modulation (soft-loud spectrum);
- register selection (low-pitched-high-pitched spectrum)

Taken from Brown (2000: 287)

Brown presents these from the perspective of a “general modulatory system involved in conveying and perceiving the *intensity* of emotive expression along a continuous scale” (*ibid.* 287, his emphasis) from a suite of “output modalities” like gesture, facial expression, a dance step, and so on, borrowed from Manfred Clynes’ (1977: 18) work on sentic modulation. Brown writes that:

In all cases, the level of sentic modulation reflects the intensity level of emotional expression, thus highlighting the gradient nature of the sentic system. Happy movements are fast, but ecstatic movements are ballistic; sad movements are slow, but depression is immobilizing. Again, much evidence suggests that sentic modulation is not merely cross-modal, but also cross-cultural and cross-species. Sentic factors are an excellent place to look for universal expressive features in music, speech, and gesture (Brown 2000: 288).

Brown’s Musilanguage is presented in stages with a precursor, before leading to the divergence for language and music. The precursor to musilanguage is what Brown calls *referential emotive vocalization* (REV) which is:

...a type of call (not song) that serves as an on-line, emotive response to some object in the environment, but that also has the property of semantic specificity for the class of object being responded to. Thus, each call-type signifies a given object (Brown 2000: 291).

Brown references the East African vervet monkey species which appear to communicate lexical sounds (Brown 2000 referring to Struhsaker 1967). By highlighting how lexical tone in modern speech changes meaning in words – not just in tone languages like Chinese, and intermediary pitch-accent languages like Swedish, but also in intonation languages like English – he argues that such referential sounds are not just metaphorical they can be mechanistic; sounds can be a “semantic device” (Brown 2000: 281). There is good deal of literature on this subject as related to vervet monkey calls which was alluded to in the last section (e.g., Tomasello 2008: chapter 2/section 2.1; Fernald 1992a: 278-279) but I am sceptical about the nature of denoting such behaviour as lexical on the basis that this behaviour could be argued as iconic representation of the object, rather than symbolic as the term lexical would infer.

Morley is surprised that Brown's first stage of musilanguage – before music and speech are seen to diverge – is lexical tone, reasoning that “it seems most likely that the use of lexical-tonal units would only have grown out of emotive tonal units” (Morley 2013: 216- 217). Morley continues that “a single discrete vocalisation can, through tonal contour, express a great diversity of information regarding emotive state and reaction, without being part of a larger sequence, and without having a specific referent other than being an expression of personal state” (Morley 2013: 217). Brown refers to “the conflict between absolutists, who view music as pure sound-emotion, and referentialists, who view it as pure sound-reference (discussed in Feld and Fox 1994)” (Brown 2000: 271-272). Isabelle Peretz puts this in context of historical “antagonism” between ‘cognitivists’ and ‘emotivists’ beginning from when Descartes separated emotion from reason (Peretz 2010: 99-100).

In Brown's model, the first stage of musilanguage proper is *lexical tone* which leads on to a second stage of *combinatorial phrase formation* and *expressive phrasing* (Brown 2000: 280) where a phrase is the smallest unit of music and of language (*ibid.* 273). The lexical function of music's vehicle mode, as Brown describes it, is the “off-line human linguistic capacity on music cognition” (*ibid.* 271), and he adds,

Seeing music in terms of the acoustic mode-vehicle mode duality permits reconciliation of the two viewpoints by suggesting that two different modes of perceiving, producing and responding to musical sound patterns exist, one involving emotive meaning and one referential meaning. These two modes act in parallel and are alternative interpretations of the same acoustic stimulus (Brown 2000: 272).

Because humans are the only animals to have developed “rich representational abilities”, Brown stands *against* non-human animal song and birdsong as music (*ibid.* 298/ endnotes 1).

Brown models *sound as referential meaning* (for “language”) on one end of a horizon, and *sound as emotive meaning* (for “music's acoustic mode”) on the other, where verbal song occupies a central position belonging to both language and music that are situated above a *phonological level* and a *meaning level* (*ibid.* 275). On the referential side of language on the extreme end of the spectrum moving towards verbal song, are placed: - heightened speech; recitativo; poetic discourse; (and verbal song). On the emotive side of music's acoustic mode on the other extreme end of the spectrum moving towards verbal song, are placed: - music narration; leitmotifs; ‘word painting’; (and verbal song).

Whilst the notion of sentic modulation is invaluable for discussions about universal sound patterns and patternings, Brown's musilanguage model does not take stock of non-Western music or experimental music, and I wonder where on his spectrum he would place the phenomenon of nonsensical vocables, for instance. Also the musilanguage model discounts animal song and birdsong, as previously mentioned. In the next section I look more intently at how musical icons are linked to cognitive processes, and then a theory for human evolution at the heart of which includes one vital spring of evidence;

Pygmy women's music, [...] may constitute the “world's oldest stock of sound” (Dissanayake 2006: 41 citing Lomax in Thompson 1995: 206).

## 2.9 SONIC ICON

The rapid repeated notes, beginning in a low register, evoke the surprisingly visceral sound the hummingbird makes in flight; the sudden shifts along the length of the string (which produce brief but memorable portamentos) summon the darting movements of the bird; the larger blocks of musical material [...] map out its path in search of flowers on which to feed; and the accented non-chord tones [...] capture the small motions it makes as it dips to drink. (Zbikowski 2017: 26-27)

Lawrence Zbikowski demonstrates how “*sounds* serve as analogs of processes that are, for the most part, *visual*” (2017: 27, his emphasis). He puts analogy “at the very core of human cognition” after the work of Douglas Hofstadter (Hofstadter 2001) as the way humans *effortlessly* create meaning (Zbikowski 2017: 29-30). Zbikowski’s focus is “music’s immediacy and independence from language, as well as the basis for sonic analogs for dynamic processes” (Zbikowski 2017: 32). Turning to Lawrence Barsalou’s theory of perceptual symbol systems (Barsalou 1999), Zbikowski argues for the significance of “the part embodied experience plays in human cognition and, in particular, how it shapes conceptual knowledge” (Zbikowski 2017: 37).

In turn, Barsalou’s theory adheres to Antonio Damasio’s ideas about perceptual information as fragments and convergence zones, which Damasio describes as:

...an amodal record of the combinatorial arrangements that bound the fragment records as they occurred in experience. There are convergence zones of different orders; for example, those that bind features into entities, and those that bind entities into events or sets of events, but all register combinations of components in terms of coincidence or sequence, in space and time... (Damasio 1989: 26, cited in Zbikowski 2017: 33).

In **Figure 2.2** Zbikowski’s illustration is presented. It models the storage and simulation of sensorimotor information to show the experience and respective simulation of a dynamic phenomenon (a humming bird). Zbikowski’s reference to the simulation of the humming bird concerns the scored piece called *El Colibri* for guitar solo by Julio Salvador Sagreras (1954) that he describes as a type of *icon*. Unlike a still visual icon, a sonic icon is moving and thus changing temporally as a dynamic process.

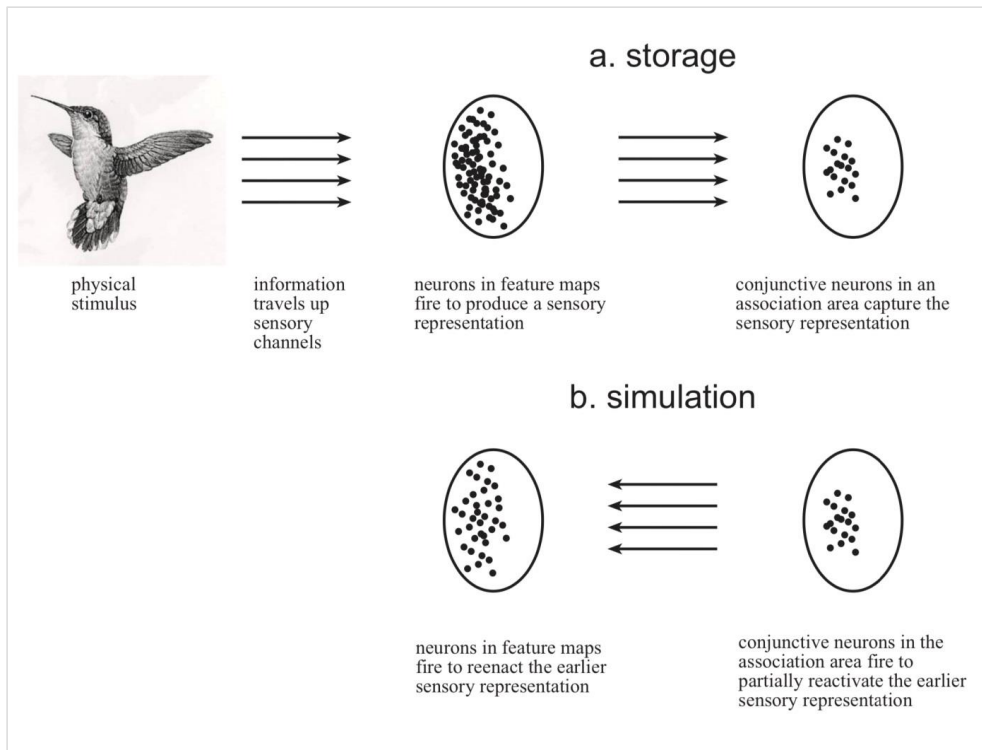


FIGURE 2.2. *The humming bird*

Copy of Zbikowski's illustration with permission from Lawrence Zbikowski (2017: 33/Ex. 2.2). Original caption: "Illustration of the storage (a) and simulation (b) of sensorimotor information (adapted from Barsalou 2005, Figure 15.1; image of ruby-throated hummingbird by James McClelland, from Johnsgard 1997, Plate 13)".

Zbikowski identifies the music as a simulation, and turning to Charles Peirce's theory of semiotics a sonic analogy. He writes that "One way to think of Peirce's study of signs is as an exploration of the origin and nature of the thoughts that are connected with some aspect of experience" (Zbikowski 2017: 38). Zbikowski gives an overview of Peirce's theory, as follows:

- an object (the relevant aspect of experience),
- a sign which stands for this object,
- and the thought-structure created in someone's mind by this sign

Taken from Zbikowski (2017: 38)

Zbikowski presents Peirce's explanation of this triadic structure:

A sign, or *representamen*, is something which stands to somebody for something in some respect or capacity. It addresses somebody, that is, creates in the mind of that person an equivalent sign, or perhaps a more developed sign. That sign which it creates I call the *interpretant* of the first sign. The sign stands for something, its *object*. It stands for that object, not in all respects, but in reference to a sort of idea, which I have sometimes called the *ground* of the representamen (Peirce 1955: 99 cited in Zbikowski 2017: 38).

There are three forms that signs can take:

- icon
- index
- symbol

Zbikowski calls on Terry Deacon's "The Symbolic Species: The Co- Evolution of Language and the Brain" (1997) who explains that Peirce's particular interest and focus was the relation between the type of sign token and the original object. Deacon explains the three types of sign as follows:

...icons are mediated by a similarity between sign and object, indices are mediated by some physical or temporal connection between sign and object, and symbols are mediated by some formal or merely agreed-upon link irrespective of any physical characteristics of either sign or object... (Deacon 1997: 70, cited in Zbikowski 2017: 39)

Peircian semiotics present two problems according to Zbikowski who cites Umberto Eco; that "it is rather difficult to find two separate passages on the same topic in which he [Peirce] does not contradict and re-propose what he has previously said" (Umberto Eco 1976: 1457, cited in Zbikowski 2017: 38). The second problem Zbikowski mentions is that Peirce was not focused on dynamic processes like music, rather objects and relations. Zbikowski asks:

...a sonic analog is akin to Peirce's notion of an icon and if, from Deacon's perspective, other species can make use of icons, why is it that other species have not developed music? (Zbikowski 2017: 39).

Zbikowski goes on to comment that:

...humans appear to be the only species with a robust capacity for analogy: while other species may be able to make use of the form of icon that Peirce called an image, they will not, independent of human intervention, be able to understand icons that are diagrams or metaphors (Zbikowski 2017: 40).

Zbikowski emphasises Peirce's conceptualisation of the *icon* as having "almost purely phenomenological status" (Zbikowski 2017: 39) referring to "Firstness", as Peirce had described:

An Icon is a Representamen whose Representative Quality is a Firstness of it as a First (Peirce 1960.1: 277, cited in Zbikowski 2017: 39).

Peirce's *Firstness* as noted by Zbikowski as phenomenological can be found in Maurice Merleau-Ponty's writing on "Temporality", of the:

...pre-objective present, where we find our corporeality, our sociality, and the preexistence of the world...  
(Merleau-Ponty 2012: 457)

In this sense an icon can feel real like the object it represents because it is concerned with similarity, which is the similarity of feeling in its perception. Zbikowski expands on this sense of *Firstness* in absolute relation to feelings:

...we can also find support for Rousseau's contention that sequences of musical sound did not directly represent the agitations of the sea or the flames of a blaze but instead awoke internal feelings of the same sort that had been experienced in seeing them. In Barsalou's terms, these feelings would be simulations: reenactments of the sensorimotor states active upon the sight of the sea or the blaze. And, according to the theory I have developed here, such simulations are a direct consequence of structural correlations between the attributes of those sound sequences and the salient features of turbulent waves or flickering flames  
(Zbikowski 2017: 54).

Zbikowski refers to Peirce's *icons* as delineated further into three forms:

- images,
- diagrams
- and metaphors

Zbikowski creates a spectrum for the *icon* to map out the *image*, the *diagram*, and the *metaphor*: - on the left noting "all essential aspects of objects preserved" is the *image*, on the right where "only some aspects of object preserved" is the *metaphor*, and the *diagram* is in the middle of the spectrum. His spectrum for the icon makes use of *sound effects*, and *sound symbols* both featuring somewhere between the *image* and the *diagram*, grouping *sonic analogs* on the side of the *metaphor* (*ibid.* 40).

The sonic icon subsumes *sound symbols* like "a rapidly descending whistling sound, used to represent a quick and typically precipitous— but soundless— descent of an object" (*ibid.* 40) and onomatopoeic words. However these are still grouped in Zbikowski's reckoning within the remit of the icon. Imitation/mimicry of birdsong that might fool a listener is an example of a type of *sound effect* on his spectrum towards *image*. The use of deceptive (as opposed to honest) call signs to fool animals in hunting is well documented (e.g. Lund 1983:17: 1988; Knight and Lewis 2017: 437) where sound can carry over long distances into places that the eyes cannot get. Knight and Lewis suggest a deceptive call may have been the first vocally expressed metaphor. Zbikowski's spectrum delineates a deceptive call as a *sound effect* erring more towards *image* than *metaphor* (as a type of *sonic icon*).

Zbikowski's note that Peirce referred to *icons* as *hypoicons*, helps to formulate an impression of the *sonic icon* as something that is going on beneath the surface, since the word *hypo* means under or

beneath. He also underlines the necessity of recognising “musical signs that stand for dynamic processes” (Zbikowski 2017: 41). By expanding the notion of the *icon* in dynamic terms, Zbikowski points out that not only signs can be dynamic processes but the objects – which signs represent – can be dynamic processes too (*ibid.* 41). Zbikowski’s perspective is now considered in relation to an anthropological theory for the origins of music which I loosely refer to as *Heidelbergensis Iconicus*, in the spirit of Dissanayake’s *Homo Aestheticus* (1992) which builds on the subject of ritualisation presented earlier (in 2.7).

---

### 2.9.1 HEIDELBERGENSIS<sup>11</sup> ICONICUS

Rappaport (1999) points out that the function of ritual is not to differentiate between lexical meanings but to establish, for everyone, an overarching meaning—a metaperformative or Word—from whose subsequent fragmentation a limitless multiplicity of subsidiary meanings can be derived. (Knight and Lewis 2017: 444).

Knight and Lewis theorise singing as a source from which language subsequently evolved, positing a world’s first metaphor from various lines of evidence to include female cosmetic coalitions, deep-time matrilocality bias, and Pygmy women’s music. They argue that a particular constellation of events that involved the principle of reversal led to chorusing that resulted in a “ratchet-effect” that changed the course of human evolution. They call their narrative “Wild Voices” (Knight and Lewis 2017).

With their primary case study being the BaYaka women in the northern Congo-Brazzaville, Knight and Lewis refer to the call of “One woman—one penis” (a girls menstruation/initiation song) in relation to gender egalitarianism and monogamy of immediate-return hunter-gatherers (Lewis *et al.* 1998). They advocate the female cosmetic coalitions (FCC) hypothesis (Power 2001: 2009; 2014) in which girl menstruants guarded by other females are coalesced in ritualisations that involve blood-red pigments. Males performing bride services for his wife-to-be’s mother and sisters, and sex strikes for men that do not bring home meat are examples of female-coalition practice:

If males invest preferentially in females who resist noninvestors—that is, in females who have accepted initiation into a gendered ritual coalition—we would expect an explosive increase in cosmetics in the archaeological record in conjunction with modern human speciation (Power 2009). This theoretical expectation is empirically confirmed. Traces of predominantly blood-red pigments suggestive of group rituals can be discerned from around 500–300 ka, associated with *H. heidelbergensis* (Watts *et al.* 2016). This sparse pigment record precedes the final phase of encephalization, which, in Africa, sees the speciation of *Homo sapiens*. This is exactly when pigment use—with a marked preference for brilliant blood reds—becomes ubiquitous, being evident in virtually all southern African rockshelter occupations from ~170 ka onward (Watts 2002, 2014; Watts *et al.* 2016). (Knight and Lewis 2017: 440)

---

<sup>11</sup> Please see the discussion about the terming, and new evidence for the dating of, *H. heidelbergensis*, in Chapter Three. I use *H. heidelbergensis* mainly to ring in this species (or Ancestor X), as the species link in our species ancestry at which point iconic behaviours evolved as a force of ‘mind’ which impacted the evolution of cognitive capacity in humans more than anything else. The ability to name these changes and talk (symbolic thinking) was a natural consequence of this.

Knight and Lewis advocate that the female coalition emerged to support childcare and to keep roving alpha males from dominating a group. Females became organised, using their attraction and solidarity to get the men to do the hunting. Vocal skills that had kept away predators were reversed inwards and utilised within the group as vocal mobbing akin to laughing such as the type of “waa-bark” calls observed in chimpanzees; alpha males became humiliated and controlled (Knight and Lewis 2017: 438 referring in their argument to Goodall 1986: 130; Eibl-Eibesfeldt 1989: 138; De Waal 1996: 91-92). Their argument follows that “human laughter can be traced back to the rhythmic cries of group-living primates mobbing a common enemy” (Knight and Lewis 2017: 437 referring to Eibl-Eibesfeldt 1989:138). They also reference the primate “fear grin” as a basis for the human smile (referring to Van Hoof and Preuschoft 2003). They write:

In conformity with the reversal principle, we can see laughter as aggressive vocal mobbing, except that, in our case, it culminates as the apparent threat dissolves, allowing the rhythmic chorusing to be enjoyed for its own sake (Knight and Lewis 2017: 437).

A feature of female coalition practice is alloparenting which give grandmothers and sisters power to look after babies and infants. Knight and Lewis write that alloparenting is “confirmed by population geneticists reporting a deep-time bias to matrilocality among African hunter gatherers (for Khoisan, see Schlebush 2010; for Central African Pygmies, see Verdu *et al.* 2013)” (Knight and Lewis 2017: 439). They argue that encephalisation would have eventually demanded cooperative breeding, as brain sizes doubled those of chimpanzees:

The costs associated with renewed encephalization among Middle Pleistocene *Homo heidelbergensis* (c. 700 ka) prompt child-burdened females to pressure males into becoming increasingly reliable helpers alongside grandmothers and sisters. With males bringing nutritious resources, such as honey and meat, children and their carers can reside longer at a camp before relocating, a development reflected in the establishment of structured hearths from around 350 ka (Shimelmitz *et al.* 2014). (cited Knight & Lewis 2017: 440).

It follows from this scenario that males with assigned hunting roles away from camp inadvertently will be leaving females without protection who become especially vulnerable in the dark. Knight and Lewis underline the observation that:

One of the universals unearthed by Lévi-Strauss in his *Mythologiques* is an association between darkness, the absence of cooking fire, and the production of loud noises (Knight and Lewis 2017: 441 referring to Lévi-Strauss 1970-1981).

They continue by explaining that BaYaka women refer to the moon as “their biggest husband” and in ritualised singing are *singing for their lives* (Knight and Lewis 2017: 442) as the women themselves interpret and account for their musical behaviour, according to Knight and Lewis, who add:

As the women sing, calling the forest spirits into being, they sit closely with limbs and bodies intertwined, forming a tangled, compact mass. As their melodies interlock in the complex vocal polyphony, their joy rises as their intermingled bodies and voices become one (Knight and Lewis 2017: 442).

What is poignant is the reference to the type of musical singing which adds substance to, and cross references, the data on nonsensical vocables, and I will come to wordless singing (Pink Floyd's *The Great Gig in the Sky*) and wordless choruses (Holst's *Neptune, the Mystic*). Moreover this form of 'singing' can be proposed as a *sonic analog* because it fits with Zbikowski's ideas that *icoms* are dynamic processes that awaken "internal feelings of the same sort that had been experienced" (Zbikowski 2017: 54); in this case, the experience of female unity for survival. Of significance is that the singing is explicitly taken up with the nature of modulating emotional states:

For BaYaka, the forest is conscious and will offer abundant resources when pleased by the sounds of human laughter and song. The unhappy sounds of shouting, fighting, or children crying provoke it to withhold its bounty. The sounds most likely to enchant the forest are those of the forest itself, mimicked by humans and echoed back. This is how the BaYaka understand their polyphonic singing, which consists not of lip or tongue modulations but exclusively of pitch changes expressed in vowels. They say that such sounds please the forest because "their melodies are the forest's words" (Lewis 2009: 252). (Knight and Lewis 2017: 442)

It is worth cutting in with Susanne Fürniss (2006 referring to Arom 1994) writing about the Aka pygmies<sup>12</sup> and how they conceive of their polyphonic singing. Their singing is in four parts with the top part sung by a female using a yodel technique that uses two different laryngeal mechanisms. She makes the point that because their language is a tone language, any linguistic meaning would need to follow the appropriate prosodic scheme to make sense. The three lower parts use meaningless syllables with only one principle voice that sings essential words.

Fürniss also explains that according to the Aka, more synchronised polyphony in performance better pleases the forest spirits. There is a master of the song who judges the quality of synchrony for the right quality of texture. Knight and Lewis call the BaYaka women's singing "defiant":

BaYaka women's exquisitely synchronized choral singing deters predators by broadcasting to the forest that they are a large and well organized group, much as synchronized roaring by coalitions of lionesses warns rivals of their numerical strength (McComb, Packer, and Pusey 1994). San all-night trance dancing is argued by Marshall Thomas (2006: 271-272) to serve a similar function. (Knight and Lewis 2017: 442)

Recordings, released on a CD of five Baka Pygmy women singers (comprising mothers and sisters) belonging to *The Baka Forest People Of Southeast Cameroon* (in the Congo basin), capture performances of *Yelli*. Reference to the night time is evident in the name given to the traditional songs which feature on the CD in four series (Baka Beyond 2009: *Twilight Yelli* tracks 1-4; *Firefly Yelli* tracks 7-10; *Moonrise Yelli* tracks 13-15; and *Midnight Yelli* tracks 7-10)<sup>13</sup>. It seems that this type of female-polyphonic yodelling performed by the Baka women is an annunciation of sounds made with an open mouth. Women singers who perform vocal-singing feats like the solo in the *Great Gig in the Sky*, (Pink Floyd 1973) – where mouths remain constantly open in extended-melismatic phrases – provide a Western example of wordless melodies in which tongue and lips are not engaged. In all these technical cases of women singing like this, it is power and control of

<sup>12</sup> Fürniss refers to Serge Bahuchet, (1993) to explain the concept behind the Western-invented term "Pygmy".

<sup>13</sup> The women singing belong to the Orchestra Baka Gbiné who together with other international musicians form the group 'Baka Beyond'.

the vocal apparatus and breathing control that is evident. These types of vocal techniques dial into ideas of motivation for innervation evolution in relation to perfecting breath control, that is, if this sort of women's singing, as Knight and Lewis suggest, emerged in pre/deep-history with *H. Heidelbergensis*. This may answer the question posed earlier about why Holst chose to use a female voiceless chorus.

Knight and Lewis go on to posit that from this pivotal point came perfect conditions that were conducive for “multiple subsidiary meanings” to emerge which evolved the hominin mind which facilitated language (Knight and Lewis 2017: 444). Their theory actually starts out as an investigation about why that out of 220 primate species, humans are the only primates who talk. They theorise this transformation as follows:

It is communal ritual that gives rise to what Searle (1996) terms “we-intentionality,” in turn the source of linguistic conventions and other institutional facts. The outcome of all this is a paradoxical insight. Rappaport explains how apparently irrational nonsense—perhaps the endless repetition of just a few meaningless sounds—may “provide the ground, deeper than logic and beyond logic's reach” upon which to establish sufficient collective authority and mutual trust to build up “the usages and rules of social life,” in turn enabling words to make sense. (Knight and Lewis 2017: 445, and citing Rappaport 1999)

Knight and Lewis defend their idea against “a Darwinian “selfish-gene” basis” (Knight and Lewis 2017: 441) that would account for alpha-males competing for the most fertile female arguing that this doesn't happen among African hunter-gatherers. They also argue “women and children versus predator”, over “sexual selection for male vocalizers” (Knight and Lewis 2017: 442) for the evolutionary lowering of the larynx. They continue that:

Among African hunter-gatherers, the woman's protective kin attribute supernatural potency to menstrual blood in ways that galvanize both sexes into gendered cooperation, successful hunting, childcare, sharing, conservation, and economic abundance (Knight 1991; Power 2001; Power and Aiello 1997; cf. Testart 1986). These effects—conceptualized by the BaYaka as so many manifestations of *ekila* (Lewis 2008)—are achieved by constructing women's blood as magically dangerous to men's blood-spilling activities, profoundly shaping belief, labor and conduct down to many details of everyday life. (Knight and Lewis 2017: 441)

Knight and Lewis tie up their theory criticising Western ‘assumptions’:

Although scientific conceptualization is itself fundamentally metaphorical (Lakoff and Núñez 2000), the core metaphors of hunter-gatherers appear so alien to Western assumptions that scientists from Western, educated, industrial, rich, and democratic (WEIRD) cultural backgrounds (Henrich et al. 2010) rarely feel able to grasp the logic or find common ground. (Knight and Lewis 2017: 441)

Alluding to metaphor (which Peirce's writing determines as a type of icon), they continue that “In addition to setting up the conditions for verbal metaphor to be deployed, this ritual was itself a metaphorical performance of a particularly potent kind” (Knight and Lewis 2017: 441). They add, “Metaphor is primarily a matter of thought and action, and only derivatively a matter of language,” (Lakoff & Johnson 1980:153 cited Knight and Lewis 2017: 441). Knight and Lewis refer to “the burden imposed on all signals to incorporate some costly component to demonstrate reliability” (*ibid.* 445). They highlight Sperber's ‘rule of thumb’ which is: *That's*

*symbolic*’ *Why? Because it is false* (Sperber 1975: 94 cited Knight and Lewis 2017: 436). They conclude with the reason why males yielded to the logic:

A winning ritually enacted falsehood, we have argued, was that hunter-gatherer women are game animals, their blood (fertility) inseparable from that of the hunt. This strange fiction succeeded because it was collective, essential to the survival of that collective— and aimed at an “enemy” who ultimately had good reason to collude. (Knight and Lewis 2017: 445)

The women’s singing in deep history based on the model describing the BaYaka women *singing for their lives* (Knight and Lewis 2017: 442) would seem to have come from an honest call. The hegemony of the female coalescence is ultimately redeemed in sonic ritualisation. In juxtaposition, the unique rhythms of the male hunting ritualisations of the BaYaka obey silently (*ibid.* 442). Knight and Lewis remark:

In our model, however, this “momentous occasion” was not the matching of a concept with a sound but the more profound revolutionary transition just presented—the use of symbolic ritual to establish a way of life based on moral norms. (Knight and Lewis 2017: 441).

The momentous occasion in terms of the music may still be regarded as a ritual that is symbolic because of what it stands for, but the actual ritualisations of the sort exemplified in this theory would seem rather more to represent the Firstness of the object being much closer to the feeling of the object. I think what Knight and Lewis actually mean here is the use of the iconic ritual which becomes a symbol semiotically, when it is named. The concept didn’t need to match the sound because the concept was the sound, evoking the coalition, the clambering together whilst singing loudly to create a perfect synchrony of sound like the partials driven by sounding a bell, or the murmurations of starlings. Here I believe is the hypnotic power manifest in sonic agency that uncovers the mystery of so-called music, ringing the changes, redeeming the hegemony.

## 2.10 UMBILICAL ‘CHORDS’

Without children, culture and knowledge die (Derricourt 2018: 2).

...culturally-created human music is drawn, at least in part, from biologically-evolved competencies and sensitivities that were originally developed in interactions between mothers and young infants (Dissanayake 2006: 38).

If evolution has shaped the human mind, it has probably selected at the level of infant predispositions... (Cross 2001: 98 cited in Morley 2013: 292).

The first citation is from “Unearthing Childhood” by Robin Derricourt (2018) implicitly infers that without children, our species dies too. In this section I use the metaphorical term *umbilical ‘chords’* as a collective term for the relational context of mother-infant dyad, children and adolescents in relation to (human) music. The word ‘chords’ is a pun on the word cord (umbilical

cord) to infer a sense of the many cords that in the deep past, now and in the future, connect baby to mother in the womb. The metaphorical cord-strings continue to resonate, after the umbilical is cut soon after entry into the world through birth. The soundtracks of these resonate, distributed through time. Being tied to *apron 'strings'* is a similar idea, 'pulled' and 'untied' as a child becomes independent of an archetypal pinafore-wearing mother, used also, incidentally, as metaphor in adult-couple pairs. These aspects of bonding rooted in the mother-infant dyad complement the theory about *wild voices* because they resonate with the motivation for female coalition and cooperative breeding (as opposed to patrilocal bands), as a turning point in pre/deep-history.

---

### 2.10.1 AN IMPORTANT CALLING FOR ARCHAEOLOGY

Clive Gamble writes that “children are an almost invisible category in archaeology” (Coward & Gamble: 2014: 465-467 cited in Derricourt 2018: 10) underlining the significance of children being “the ‘hidden half’ of past humanity” (Derricourt 2018: xvii). The category of children in Western counterculture has not in the same way been a source (as hunter-gatherers have) for New Age traditions of recent decades (Derricourt 2018: 19). Similarly, “the strong activist growth of a feminist archaeology paid proportionally little attention to this theme” (Derricourt 2018: 12). Morley discussing present-day hunter gatherers wonders why “with the exception of the Yupik [...] the literature does not mention the role and nature of music as related to children” (Morley 2013: 30). John Lubbock (noted earlier 2.1) believed that “Savages, like children, have no steadiness of purpose” (1913: 564 originally published in 1865; cited in Derricourt 2018: 18). Likewise, Lubbock’s contemporary, and ‘father’ of social/cultural anthropology, Edward Burnett Tylor [1832-1917], considered the “savage as a representative of the childhood of the human race” (1871: 257; cited in Derricourt 2018: 18). In stark contrast to the African proverb that *it takes a village to raise a child*, colonial bias in androcentric chauvinism in the anthropological literature is worth citing in full:

Le village entier partit le lendemain dans une trentaine de pirogues, nous laissant seuls ave les femmes et les enfants dans les maisons abandonnées (Lévi-Strauss 1936: 283).<sup>14</sup>

This is possibly why certain archaeologists are exploring – in theory and practice – the intersection between art and archaeology (e.g., Experimental Heritage) removing themselves from this heritage. Perspectives offered by artists can help to redress the balance, e.g., from the ideas of Paul Klee:

I have in mind the realm of the unborn and the already dead which one day might fulfill its promise, but which then again might not—an intermediate world, an interworld. To my eyes, at least, an interworld; I name it so because I detect its existence between those exterior worlds to which our senses are attuned, while at the same time I can introject it enough to be able to project it outside of myself as symbol. It is by

---

<sup>14</sup> Translated to *The entire village left the next day in about thirty canoes leaving us alone with the women and children in the abandoned houses.*

following this course that children, the mad, and the primitive peoples have remained faithful to—have discovered again—the power of seeing (Paul Klee, in [Felix Klee 1962: 183-84](#) cited in [Schuback 2012: 154](#)).

Derricourt references the conference on forager childhoods in relation to modern hunter-gatherers, which in 2002 exposed the lacuna about children in hunter-gatherer ethnographies, referring to Robert Jarvenpa and Hetty Jo Brumbach; “A compelling, comprehensive treatment of hunter-gatherer child-rearing and childhood has yet to be written” ([Jarvenpa and Brumbach 2014, 1257](#); cited in [Derricourt 2018: 17-18](#)). Derricourt adds, “Today’s Marxists are concerned only with adults.....They have forgotten their own childhoods” ([Sartre 1968: 62](#); cited in [Derricourt 2018: xviii](#)). Evident in Derricourt’s work is a bounty of possibility that potentially engages the subject of children to an endless list of subjects in archaeology, relevant and invaluable to music origins and the *Ach flutes*. A theme he discusses is the shift from childhood to adulthood, revealing that through time and place there is tremendous variation in how societies deal with this power. Derricourt writes about “a neurochemical basis for the level of risk-taking seen in adolescence, which might alternatively be considered innovative explorative behaviour” ([ibid.](#) 5 referring to [Susan Greenfield 2016: 135-138](#)). Risk taking in adolescents is also discussed by Felix Riede *et al.* (2018) to motivate an argument about these behaviours being at the cutting edge of evolution. This suggests that if the original *Ach flutes* were made and played by children the music of the time and place must have been highly experimental in nature.

---

## 2.10.2 UMBILICAL CHORDS AND RITUALISATION

Births of humans do not tend to happen in one place at the same time of the year. A perspective I argued (2.7.5) considers homogenous events staggered through time (as opposed to homogenous events happening at once), as ritualisation. Blacking refers to general and particular communion after Émile Durkheim referring to rituals that are not consciously organized ([Blacking 1976: 4](#)). He discusses conceptions of thinking in movement and movement in thinking in pre/deep-history, referring to a “somatic state of *generalized sensori-motor communion*” in which many bodies participating together, he regards as “the situation that Durkheim envisaged” ([ibid.](#) 7). The perspective I present here is that Blacking may have been seduced by the types of ritualisation he witnessed in Africa. For example his writing states that, “I have shared experiences in Africa that maybe more truly adaptive than their European counterparts”, and he compares these with examples like pop concerts, etc., that he refers to as “attempts to replicate the primordial” ([ibid.](#) 10)<sup>15</sup>. By dismissing Western rituals as less authentic than African ones, Blacking’s position would seem to present a rationale for ritualisation based on this bias. Bell’s criterion for ritualisation is simply on the grounds of differentiation;

---

<sup>15</sup> I have experience of Ghanaian drumming in Western concert situations in which I have witnessed audience members get on stage, during the interval, to try out the drums. I have never witnessed audience members get on the stage, during the interval, in an orchestral concert, and try out the organ, double bass, harp or piano, etc. I interpret this as an example of seduction and presumption.

At a basic level, ritualization is the production of this differentiation. At a more complex level, ritualization is a way of acting that specifically establishes a privileged contrast, differentiating itself as more important or powerful (Bell 2009: 90).

I want to argue here that mother-infant interaction is a form of ritualisation just as a communal festival is considered to be. Mother-infant interaction may be described as a social interaction that is intense, noting here the parallel with “Communal festivals” that according to Blacking (1976: 4) are designated “as times of intense social interaction”. In order to provide some perspective, I add the following from my diary:

Last night, I had a situation with my one year old daughter whom I continue to breast feed during the night. When my body decided that I had had enough, my hands pushed her body away offering her a dummy/pacifier as replacement. The result of this movement, when my body had turned my back on hers in bed, delivered to me a new-multisensory experience. From my perception, firstly her hand smacked my back three times, then six times and again six more times in a steady pulse. Then a series of softer smacks round my neck and near my head with a wet deposit which I felt on the top of my back; either spit or tears. During all of this, the bed was vibrating with her crying/screaming, and finally her head appeared in the shadows of dusk over my shoulders. All the senses were frantically working together, I rationalized, to send me a series of messages, and of course sound was an intrinsic and significant part of this ritualisation (Frances Gill 2014).

Maturational events of birth, like death, differentiate themselves from other daily human practices, as do other maturational events, like when an infant is cutting teeth, or learning to walk, feeding, or being lulled to sleep. The sound track of these maturational behaviours may readily be perceived as constituting differentiation in the quality of sound patterns and patterning. Dissanayake has written most extensively about ritualisation in relation to the mother-infant dyad and the origins of music (Dissanayake 1999; 2000a; 2000b; 2006; Miall & Dissanayake 2003) whilst Morley points out (Morley 2013: 281) that a discussion of “biological and cultural origins of early musicality” by Harmš Papoušek (1996), and Juan G. Roederer’s “search for a survival value of music” (1984), had raised these ideas earlier still.

Ability to plan and turn-taking in relation to mother-infant dueting – borrowing the term ‘duet’ from Dissanayake (2000b: 156) – raises questions about how an infant is not only being shaped by this sonic relationship but how the infant is simultaneously contributing to the shared emotional state using sound, like a kind of sonic Contact Improvisation. This resonates with evidence that Morley outlines (e.g., Morley 2013: 246-254; 269) for cooperative-symmetrical and subservient-asymmetrical musical entrainment, for action-observation networks and for physiological reactions to music and shared emotional states. This cognitive state of being may be somewhat like Blacking’s notion of thinking in movement and movement in thinking (1976: 4) and Thriff’s ambulant theorising (2008: 141).

To note, is that “The First Relationship: Infant and Mother” (Daniel N. Stern 1977) is, *a priori*, the first musical relationship. The two ‘participants’ together – in the case of mother and child – remain an exclusive dyad (see Derricourt 2018: 40) yet their exclusive dueting is potentially reaching the ears of others, if according to Morley, there is no listener as distinct from performer and vice versa (Morley 2013: 248). A loop is discussed as a two-way interactive process by Saint-

Georges *et al.* who model “motherese” as an “interactive loop” (2013). From a sonic perspective this loop is a duet not least because a loop concerns repetition which is intrinsic to the nature of sonic patterns and patterning as a feature of musical structure in general melody (Gabrielsson and Lindström 2010). Ellen Dissanayake situates both mother and child directly in the sonic centre of the debate about the origins of music (Dissanayake 1999; 2000a; 2000b; Miall & Dissanayake 2003) referring specifically to a concept of “the improvised duets of mother-infant mutuality” (Dissanayake 2000b: 156 cited in Barret 2006: 207). She explains exactly why mother-infant (sonic) behaviour is ritualisation:

...one can consider mother-infant interaction itself as a biologically ritualized behavior, where visual, vocal, and kinesic expressions drawn from adult affiliative contexts—e.g., smiles, nods, soft undulant sounds, touches, caresses -- are simplified, stereotyped, repeated, and exaggerated in order to temporally coordinate and emotionally unite the mother-infant pair. Infants are born ready to respond to and coordinate their own behavior with these very signals, and especially to their dynamic variation (Dissanayake 2006: 38).

Loops begin with the sound of infant crying. Linda LaGasse *et al.* specify that “Infant crying and parental response is the first language of the new dyadic relationship” with a second function of crying being “to elicit caretaking”. They state that “Infant crying signals distress to potential caretakers” (LaGasse *et al.* 2005). The volumes of specialist literature about maternal depression (which I won’t go in to here) would seem to indicate that the demands on both mother and infant fall into a special category as distinct from other types of interpersonal behaviours.

---

### 2.10.3 THE VOICE THAT ROCKS THE CRADLE, AND OXYTOCIN

Derricourt pinpoints the “exclusive roles played by mothers in the raising of children” (Derricourt 2018: 40) in chimpanzees. The iconic hunter-gatherer image of men leading families and children is distorted:

..if we consider our hominin ancestors emerging within the family of the great apes, then a more feminised, matrocentric model presents itself.. (Derricourt 2018: 40).

Knight and Lewis cite Robin Dunbar; “female bonding may have been a more powerful force in human evolution than is sometimes supposed” (Dunbar 1996:150 cited Knight and Lewis 2017: 439). Discussing “we intentionality” (Knight and Lewis 2018: 445 referring to Searle (1996), they write:

It is precisely when an evolving hominin mother lets others hold her baby that selection pressures for two-way mind reading and triadic structures of joint attention are set up (Burkart *et al.* 2014; Hrdy 2009). The mother must elicit support and accurately judge others’ intentions toward her offspring; likewise, her baby must interact with its new caregiver while monitoring “where’s mum gone?” (Knight and Lewis 2017: 438)

Like alloparenting, theories about music surrogacy in relation to ‘parking the infant’ (although otherwise Morley mentions baby-slings in this context - 2013: 20) become relevant:

For the infant that has been put down and separated from its mother, emitting prosodic emotional cries would be a good way of attracting the attention of the mother (Morley 2013: 209 referring to Falk 2004b).

This is a two way process as Falk notes describing surrogate vocalisations the “disembodied extensions of mothers’ cradling arms” (Falk 2004b: 501 cited in Morley 2013: 209). Morley also explains that “Musical activity [...] provides a vicarious social interaction when alone” (*ibid.* 250), and discussing Autism, Asperger and Williams syndromes, explains that “musical activities can provide a surrogate medium for social engagement” (Morley 2013: 267). Referring to Roger Watt and Roisin L. Ash, (1998) he explains that this concerns “human perceptual system processing properties of the musical signal in the same way as interpersonal interaction” (2013: 295). From the perspective of music origins, it has been considered that “early vocal utterances were initially used to facilitate and then replace social grooming” (Morley 2013: 225, referring to Aiello and Dunbar 1993; and Dunbar 1998). Music may ignite automatically the early musical memories that lie deep within, motivating feelings of vulnerability. Memories of songs from early experiences have been shown typically to be choice material in acts of violence, and music is often recalled in accounts given by victims see section 2.6).

Morley is dismissive of non-adaptive models of music origins (*ibid.* 277-279) for which music is regarded as a “cultural artefact” (Repp 1991: 260) and technology (Pinker 1997). These opinions typify positions that advocate a “purely cultural basis for musical behaviours” (Morley 2013: 278). He pinpoints “adaptive rationales for the use of music” listed below:

- Music and group cohesion
- Music and dance as a coalition signalling system
- Music and sexual selection
- Music and group selection
- Music’s multiple meanings and cognitive development

Taken from Morley (2013: 279-294)

Darwin advocated that extinct hominins would have sung to attract a mate, and he suggests that the singers may have been female owing to his feelings about timbre and the female voice (Darwin 1879b: 337). Curiously, this reference is not the standard one that tends to be used in relation to music origins, but it is true that Darwin thought that women were probably first to hone their voices for musical purposes. Whilst Morley has argued against the probability of early hominins wooing each other with singing to attract (rather than keep) a mate (Morley 2013: 285-286), this would presumably discount the music of mothers wooing their children as display that might just happen to woo others by default. Referring to Dean Falk (2004b), he writes:

In fact, the premise that human mother-infant interaction is unusual in that it is characterized by almost continual affective vocal interplay may be overstating the case of mother-infant interaction relative to that of other interpersonal interaction (Morley 2013: 210).

Laurel Trainor *et al.* (2000) however infer that the only other type of interpersonal interaction that may match the level of vocal interplay demonstrated in mother-infant interaction is in adult coupling: “It is interesting to speculate as to whether the vocal expression of emotion in the speech of new lovers differs substantially from that exhibited in ID speech” (*ibid.* 188). Falk suggests behaviours of early attentive hominin mothers would make them particularly desirable and selected for (Falk 2004b). Clearly musical interaction with an infant is a way that demonstrates this attentiveness; however, might the ritualisation constitute a display in its own right? Does it really matter if the display is sexually overt, or not, if the female is then selected, or if her musical behaviour arouses others? Anton Killin dismisses lullabies and nursery songs as non-sexual forms of display (Killin 2018). Mothers’ lullabic utterances might not seem a blatant aphrodisiac, but to dismiss such behavioural products as asexual may fail to recognise that a mother’s musical attentiveness to her infant may be seductive to others. For music *per se*, Geoffrey Miller reasons that, “If one can perceive the quality, creativity, virtuosity, emotional depth and spiritual vision of somebody’s music, sexual selection though mate choice can notice it too” (Miller 2000: 335 cited in Morley 2013: 287). Morley responds by commenting that;

This is true, but it relies on the existence of value judgements on creativity, virtuosity, and emotional depth to such a behaviour. To say that sexual selection is responsible for these value judgements begs the question—there has to be a reason why such values are held, and held as applicable to music, before selection can act upon their manifestation (Morley 2013: 287-8).

I think it is important to think about how we define wooing, and most importantly, what it does. Attraction may have little to do with judgement, and more to do with feeling. Whilst music for display is put forward as a good medium to indicate fitness (Morley 2013: 286 discussing Miller 2000) this does rather compromise music as the signifier, and critically, not the signified, so that music is assumed to be carrying the message of fitness rather than the perspective that music is the message – music is the sign – which is manipulating emotional response. For Morley, “emotional response to emotional cues is the foundation of empathy and successful interpersonal interaction, and musical stimuli act upon the mechanisms responsible” (Morley 2013: 313). However, a mother’s attentiveness to a child through inherent musical interaction may conceivably catch the attention of others becoming attracted by new seductive rhythms and melodies that are repetitive and enticing. The new participants to the ritual may begin experiencing changes in their own bodies in response to the salient-emotional-chemical charge of the mother-infant ritualisation that is an inherently musical one. Whilst this is speculation, Morley writes that “research into hormonal responses to music appears to be in its infancy (2013: 282). What can be noted is that, “Adult attractions are promoted by similar brain chemistries to those of mother-infant bonding, which include oxytocin systems as well as other opioids” (Morley 2013: 270 referring to Panksepp and Trevarthen 2009). Antonio R. Damasio writes about the agency of oxytocin:

In the case of mammals, humans included, it is manufactured both in the brain (in the supraoptic and paraventricular nuclei of the hypothalamus) and in the body (in the ovary or in the testes). It can be released

by the brain in order to participate, for instance, directly or by interposed hormones, in the regulation of metabolism; or it can be released by the body, during childbirth, sexual stimulation of genitals or nipples, or orgasm, when it acts not only on the body itself (by relaxing muscles during childbirth, for instance), but also in the brain. What it can do there is nothing short of the effect of legendary elixirs. In general, it influences a whole range of grooming, locomotion, sexual, and maternal behaviors. [...] it facilitates social interactions and induces bonding between mating partners (Damasio 1994: 121-122).

Morley explains that oxytocin is “released in females whilst lactating” (Morley 2013: 281-282 referring to Freeman 1995; 2000). Mother-infant interaction includes the critical dimension of breast feeding<sup>16</sup> in which the regular hormonal release of the ‘elixir’ oxytocin during the breast-feeding period can be considered analogically in a direct but implicit relation to vocal interplay between mother-infant. Like interplay between mothers and infants there is a constancy; breast feeding can last a long time on the basis that human females may have several children and breast feed each of them for a few years each<sup>17</sup>. In music, oxytocin is made and released during “peak musical experience”, and further, is involved in the “reduction of separation anxiety” (Morley 2013: 282-283 referring to Panksepp and Trevarthen 2009). Morley also adds that “Freeman (1995, 2000) reports that the hormone oxytocin aids in the formation of strong positive emotional memories, and in the supplanting of negative emotional memories” (Morley 2013: 281).

Separation anxiety is relevant to the argument about music being a physical surrogate for adults as well as children in terms of the manifestation of cradling of arms. The subject of “music clearly being able to regulate arousal in large group situations” (Morley 2013: 282 referring to Freeman 1995 and Huron 2001 respectively) is relevant here as reasoned from the perspective of a human’s first experiences of separation triumphed by the denouement of reunion through sound. Morley references music and dance as territorial coalition signalling pointing out that music and dance not only cause social cohesion, they also signal social cohesion (2013: 283 referring to Hagen and Bryant 2003). He refers to the New Zealand All Blacks *baka*, surely a prime example of the extrinsic and intrinsic properties of music in which the message is the medium, like the polyphony of singing Pygmy women. This resonates with the *wild voices* theory (Knight and Lewis 2017) about women’s singing in pre-deep history being a signal to warn away dangerous animals whilst simultaneously bonding together as they *sing for their lives* (*ibid.* 442). Morley refers to the mother-infant dyad as “equalising the emotional state of the whole group” (Morley 2013: 281 alluding to Roederer 1984), whilst Dissanayake asserts that:

Had our ancestors wished to devise a way to promote group cohesion and a sense of common purpose, and to relieve individual anxiety, they could hardly have done better than to co-opt the mechanisms for mutuality that were in place between mothers and 6- to 8-week infants in order to reliably and compellingly shape attention, coordinate emotional state, enculturate, and bond (Miall and Dissanayake 2003: 357).

<sup>16</sup> WEIRD perceptions (Henrich *et al.* 2010) may caution against particular views on breast feeding (*cf.* “Whose breasts are they: a male takeover?”; “The British breast industry”; and “The baby milk industry” McConville 1994).

<sup>17</sup> I have two children and breast fed both of them for up to three years each. As far as I have direct and personal experience of this phenomenon I consider this being of some relevance to the context, especially as I have felt tangible pressure, at times, to refrain from doing so in public, and when I have done so have experienced at times tangible and salient marked attention.

#### 2.10.4 *MOTHERESE AND MELODIC BEHAVIOURS*

Anne Fernald refers to the speech of mothers to infants as “meaningful melodies” (Fernald 1992a) and the consensus is that these melodies are innate and not culturally learnt (Morley 2013: 204). Of especial note for music origins is the fact that “parental speech is one of remarkable consistency across cultures in the use of exaggerated intonation in speech to infants” (Fernald 1992a: 264) where Infant-Directed speech (ID speech) – also referred to as mother-ease or parent-ease – “seems to be a universal trait of human personal behaviour” (Morley 2013: 205). Fernald writes:

By the time infants develop the prerequisite cognitive skills for interpreting speech sounds as symbols, they have had a long experience responding to the mother’s vocalisations as meaningful in other ways...[which]...builds on our primate legacy (Fernald 1992a: 279).

Fernald’s point of departure (1992a) is Darwin’s text: “A Biographical sketch of an infant” (1877) in which Darwin concluded that both sound and gestures of the body are understood by infants before linguistic meaning is established. Speech, as referenced earlier, is a critical theme in theories about the subject of music origins from the perspective of the infant. In relation to developmental psychology, Brandt *et al.*, make the emphatic point, that,

Arguments for innate language ability often appeal to the “poverty of stimulus” problem (Chomsky 1980): language is too complex for children to learn based on positive evidence alone. Along with social cues such as facial expressions and physical gestures, the musical features of language may help surmount the “poverty of stimulus” and provide a richer context for language induction. From a developmental perspective, the progression is clear: first we play with sounds; then we play with meanings and syntax. It is our innate musical intelligence that makes us capable of mastering speech. Music as an art-form may develop from this initial entanglement: it may enable us to continue to explore and exploit features of music cognition that language does not prioritize. (Brandt *et al.* 2012: 10).

What I argue here is that *infant-directed speech is music* from criteria that Morley gives below for music in relation to musical behaviours and musical activities. Here I expand the case, as Dissanayake does, for mother-infant interaction (to include motherese) as being a hotspot for the origins of music. In her experiments Fernald discusses prosodic-pattern categories that include ‘attention bid’, ‘approval’, ‘prohibition’ and ‘comfort’ (Fernald 1992a: 265). Fernald writes that, “Prior to the time when the mother’s speech sounds have impact through their symbolic power to refer beyond themselves, the prosody of her voice can influence the infant directly” (*ibid.* 278).

Trainor *et al.* point to a pool of research that indicates that language learning is a function of prosody in ID speech, and it is also about getting infants’ attention, and communicating information (Trainor *et al.* 2000: 188) which would be non-lexical attention and non-lexical information. On the basis of current research (and through personal experience of motherhood combined with music) I perceive that changes in sonic behaviour by adults towards infants in ID speech are often particularly noticeable musically; the new and salient sonic sounds set themselves apart dramatically from other sonic behaviours which can be determined as ritualisation on the basis of differentiation. This is because ritualisation differentiates itself

through “interplay and contrast with other practices” (Bell 2009: 90, referring to Douglas 1973: 11; Tambiah 1968: 198; Lévi-Strauss 1981: 671; Bourdieu 1977: 5).

On a more general point of alloparenting, Brenda Shute and Kevin Wheldall in their research ask “How Do Grandmothers Speak to their Grandchildren? They test the “Fundamental Frequency and Temporal Modifications in the Speech of British Grandmothers to the Their Grandchildren” with a result showing salient evidence of motherese amongst grandmas which they refer to as *Grandmotherese* (2010). ID speech is not exclusive to mothers but the mother-infant dyad is particularly poignant to the subject of ID speech. Morley referring to Laurel Trainor *et al.*, (2000) echoes this but continues to argue that ID speech doesn’t really differentiate itself fundamentally from adult-directed (AD) speech:

Observations such as ‘through the melodies of the mother’s voice, infants could gain early access to her feelings and intentions’ (Fernald 1992b, p. 423) are equally applicable to adult speech prosody, for adult listeners. The difference is that ID speech is tailored to the emotional and perceptual needs of infants. The fact that the prosodic features of vocalizations (in particular pitch, pitch contour, and tempo) are exaggerated in ID speech allows infants to attune to them better (see earlier), but they are not fulfilling a role fundamentally different from the role of prosody in AD speech (Morley 2013: 208-209).

I beg to differ, and again take issue with Morley because prosody is not *teaching* language as a function of AD speech. Basically Morley is inferring that ID speech is not that different from AD speech. Trainor *et al.*’s argument (from which Morley takes his point) critically does not include the nature of the structure of ID speech which includes repetition, if structure is also part of the nature of acoustic prosody. Prosodic repetition and (also) repetition with melodic variation are common features of ID speech which Morley points out but this is overlooked in context of this particular argument about prosody (Morley 2013: 213, referring to Stern 1977; Fernald and Simon 1984; and Fernald 1992b). I perceive that by separating prosody from the structure in which it is situated is to remove a basic characteristic of its form.

Trainor *et al.* (2000), focusing on the relation of emotions to speech, in their experimental work, use filters to access pitch, pitch contour, pitch range, tempo, and rhythmic contour. Repetition is overlooked in their experiment as a feature of prosody, and the question of whether it is even a factor of acoustic prosody is missing from their discussion. In their experiment, Trainor *et al.* used one phrase; ‘*Hey, honey, come over here*’ in which 23 mothers with infants performed this phrase four times acting it out differently each time from a remit in the experiment that required them to express a different emotional feeling for each rendition of the command from a stock of four types of emotions across two contexts; firstly, as addressed to their infant, and then undertaken a second time as addressed to the experimenter without the infant present. In total the phrase was uttered by each mother eight times. A discussion about the ecological validity of experimental processes using *acting* is not discussed in their article. I also question the aspect of calling the experimenter ‘honey’. I would imagine that in a real-life situation a mother is repeating such a phrase several times, with variations in phrase structure each time, until the child responds (see discussion 2.7.6 about Ambiguity and Meaning, and calling out to find a child who has run off in a in a city centre shop).

I refer to Alf Gabrielsson and Erik Lindström (2010) firstly, discussing “Experimental control vs. ecological validity” and secondly, in context of “The Role of Structure in the Musical Expression of Emotions”. Although Gabrielsson and Lindström are focused on factors of music in relation to emotional expression, whereas Trainor *et al.* are focused on emotional expression in speech, their respective perspectives of what constitute prosody versus melody provide a useful comparison. Gabrielsson and Lindström discuss the ecological validity of manipulating various factors to test expression of emotions, stating that, “manipulation may result in musically unnatural stimuli, thus jeopardizing the ecological validity” whereas Trainor *et al.* (2000) fail to acknowledge this. Gabrielsson and Lindström also write that “conclusions regarding the effects of separate structural factors can only be tentative since they are usually confounded in musical contexts” (Gabrielsson and Lindström 2010: 370). Trainor *et al.* are not tentative when they claim that “ID prosody itself is not special” but “What is special is the widespread expression of emotion to infants in comparison with the more inhibited expression of emotion in typical adult interactions” (Trainor *et al.* 2000: 188). This is the reason cited for Morley’s claim, that,

...infant-directed vocalizations are a specialized perpetuation of a sophisticated form of non-linguistic interpersonal interaction which was used earlier between all individuals (Morley 2013: 210).

What does seem to make sense however is “that the ability to comprehend non-linguistic emotional utterances was selectively important” (Morley 2013: 205). However it must be observed that:

As Lewis observed in *Infant Speech* (1936 / 1951), the mother’s voice “is not a neutral stimulus” for the newborn; “it possesses an affective character for the child – in other words it evokes a response” (Fernald 1992a: 272 citing Morris Michael Lewis 1936/1951: 52).

I tend to conceptualise prosody by imagining a built wall with a conversation going on the other side of it that masks the words from the sounds; the linearity of each voice moving up and down in different combinatorial patterns is what I experience as *prosody*. As the sound in this scenario exists without me hearing the context of the words it may just as easily be distinguished as *melody*. I can trace melodic patterns and imagine copying them on my flute and so on. The patterns are dependent on a structure through time. The perspective given for melody by Gabrielsson and Lindström (2010: 390) within their longer list of “effects of separate musical factors” pinpoint melodic range, melodic direction and melodic motion:

#### MELODY

Range	between highest and lowest frequencies
Direction	overall shape or pitch contour
Motion	how the shape is achieved (steps and rhythm)

From Gabrielsson and Lindström (2010: 390)

Gabrielsson and Lindström refer to melodic pitch-range in terms of narrow/wide. Melodic direction is explained in terms of ascending/descending, and pitch contour in terms of up/down. Motion is referred to in terms of stepwise leaps (these are melodic intervals). They refer to a much longer list of attributes in relation to factors for music, of which melody is only one of several other considerations like timbre, key, tonality, tempo, for example. This underlines the significance of structure in understanding prosody, *a fortiori*, melody, in relation to emotional expression.

Morley summarises “the core features the cultural phenomenon of music possesses” (2013: 6-7) identifying patterns and patterning bias for musical behaviours and musical activities. This he draws from a selection of papers<sup>18</sup>. Precepts of Experimental Music are *not* a direct fit with these summaries (below), for example, not all music is metered, and Morley does acknowledge this, referring to Brandt *et al.*, who simply define music as “creative play with sound” (Brandt *et al.* 2012: 3 cited in Morley 2013: 7). Morley writes about the “circulatory of us having too narrow a focus and investigating only what we already think we understand it to be” even though his core features are not tested explicitly in relation to hunter-gatherers or Palaeolithic musical-instruments; he does not go beyond circulating what he presents at the outset in conclusion (see Morley 2013: 5; 7; 8; 11; 308). These summaries are listed as follows for musical behaviours and then for musical activities:

Morley writes: “In summary, it would appear that musical behaviours amongst all humans involve

- the encoding of sounds into pitches (usually between three and seven)
- which are unequally separated across the scale, including the perfect fifth,
- favouring consonance over dissonance, and
- organizing sequences of sound so they have a deliberate temporal relationship to each other”

Taken from Morley (2013:7)

Morley writes: “Musical activities rely on the ability to

- voluntarily produce sequences of sounds moderated for intensity and/or pitch and/or contour,
- generated by metrically organized muscular movements (often coordinated (entrained) with an internally or externally perceived pulse),
- plus the ability to process and extract information from such sounds”

Taken from Morley (2013: 8)

<sup>18</sup> Trehub (2003); Burns (1992); Sloboda (1985); Butler (1989); Shepard (1982); Trehub *et al.* (1999); Schellenberg and Trehub (1994; 1996a; 1996b); Tramo *et al.* (2003); Gosselin *et al.* (2006).

Because mother-infant duet loops are a negotiation, the music is highly experimental, and it is possible to look at the melody of the mother as distinct from the infant's (and vice versa) in relation to the counterpoint that exists in their loops together appreciated as holistic behaviour which is universal. In the next section, I consider the sound patterns that babies, infants and children are making (as opposed to parents and caretakers), and the invention of instrumental sound as the origin of (hominin) music.

---

2.10.5      *CRYING, LAUGHING AND BABBLING, AND THE INVENTION OF INSTRUMENTAL SOUND*

...early vocalizations become a channel of communication only after young birds or babies come to realize the instrumental value of sounds ([Goldstein et al. 2003: 8034](#)).

Pre-linguistic (human) infants provide an excellent source for understanding how music and language develop. Darwin wrote that birds are born with the capacity to sing but learn their songs from parents or foster parents, whilst making the comparison to babbling in infants ([Darwin 1871a: 53-62](#)). Research on babbling shows that whilst babbling would seem to be a lot like spoken language (or spoken language seems to be a lot like it) it is also a way in which infants learn to use their bodies as musical instruments, as Goldstein *et al.* above, infer. Morley considers that “notwithstanding choral music we have a tendency to think of music as being an ‘instrumental’ activity” ([2013: 130](#)), and:

Our background in the Western music tradition can easily skew our expectations as to what should constitute the principle material evidence for musical activity—namely, the instrumentation—and we need to be prepared to identify other forms of sound-producing objects that may be less recognized by us than pipes ([Morley 2013: 99](#)).

Whilst I do not experience music personally in the way that he suggests is a Western tendency, one of his points is to the aspect of other instruments of sound that are not obvious musical instruments, and here he refers to pipes (these being wind instruments like the *Ach Flutes*). ‘Music’ can, of course, involve ‘other forms’ of sound producing instruments which Cajsa S. Lund has been pioneering since the 1970s in relation to the pre/deep-history of sound and music together with the *sound tool* as a focus for research in Music Archaeology ([Gill 2020](#)). Her Probability Groups discussed in this research are testament to the variety of ways musical humans experience their worlds through time and place. Morley’s other point implicitly references music from the perspective of the body with a prominent theme in his work being the evolution of the human voice (see 2.12).

Hartmut Rothgänger concludes that “Crying of a new-born and infant can be regarded in direct connection with cries of a grown-up person, particularly in situations of emotional agitation or cultic rituals”. He has found that the mean fundamental frequency of crying in babies who are between three and five days’ old increases significantly by the time they are one ([Rothgänger](#)

2003). This indicates to me that the infant is also exploring her capacity to make higher-pitched sounds with her voice as she experiences life in her first year. I do the same to test the capacity of a flute reconstruction by experimenting with the range of higher-pitched tones. In terms of response to frequency, Morley writes that “Changes in frequency have direct effects on arousal level, and consistent frequency can effectively moderate level of arousal too” (Morley 2013: 253). Jaak Panksepp and Colwyn Trevarthen (2009) suggest that physical responses to crying are agitated in a similar way in music. What they describe below would seem to be, in compositional terms, a sonic analog of human-infant crying:

Chills are effectively induced by sustained high-pitched crescendos (Panksepp and Trevarthen, 2009), and it has been suggested that this may be because of the close resemblance of this stimulus to the cry that infants make when separated from their parents—a primal signal that solicits attention and social care, and which also results in a sense of lowered body temperature and desire for warming contact (Panksepp and Trevarthen 2009). (Morley 2013: 270)

The use of high frequencies is furthermore a salient pattern in ID speech (Morley 2013: 205 referring to Fernald 1992b and Trainor *et al.* 2000). Morley writes that:

Infants are more sensitive to sounds at higher pitch ranges, and continuity in pitch contour is an important cue in attending to a single speech source; exaggerating these contours makes it easier for an infant (who cannot rely on linguistic content for this purpose) to attend selectively to the sound source (Morley 2013: 206 referring to Fernald 1992b).

Morley continues that high frequency is “associated with positive sentiment” (referring to Scherer 1986) and “across a diversity of animals high tonal vocal sounds were associated with appeasement, submission, friendliness, or fear” (Morley 207 referring to Morton 1977). This has promoted Trainor *et al.*, according to Morley, to consider that high pitch ID “vocalizations towards an infant naturally underplay aggression” (Morley 2013: 207 referring to Trainor *et al.* 2000). What is of particular note is that high frequencies are concerned with crying and chills whilst also concerned with positive sentiment. These two forms of primary emotion would seem to be diametrically opposed. However this shouldn’t be so surprising. The notion of underplaying aggression resonates with principles of reversal, which Camilla Power enlightens, as:

...a consistent logic according to which relaxed social conditions transform anxiety into relief, the primate fear grin into the human smile, vocal mobbing into human relaxed laughter, and aggressive warfare into play fighting and “let’s pretend” (Power 2017: 447).

Robert Provine also points out the link in humans between crying and laughing, in which extreme laughter may involve tears, revealing its close neurological links with crying (Provine 2000: 187 referenced in Knight and Lewis 2017: 437). Feelings that generate sounds such as laughter, and the sounds of people speaking when smiling are also characterised with higher frequencies. A reason for this is that “facial expression has a fundamental influence on vocal quality” (Morley 2013: 225; and 207 discussing mean frequency of vocalisations made by smiling, (Tartter 1980; Tartter and Braun 1994). Comparing speech versus singing, Marieve Corbeil, Sandra Trehub and Isabelle Peretz report that “happy voice quality rather than vocal mode (speech or singing) was

the principal contributor to infant attention, regardless of age” (Corbeil *et al.*, 2013). Fernald referring to Wolff writes that “a high-pitched voice was considerably more effective than a low-pitched voice in eliciting infant smiling” (Fernald 1992a: 272 referring to Peter Wolff 1987). Of direct interest to these perspectives are that the pitches of the Aurignacian flutes played in a particular way are also high in frequency, and perspectives that concern the usefulness of high pitches over lower ones to express and elicit responses, and over long distances, should therefore inform part of the investigation in this thesis.

Rothgänger also found in his experiment (with the same sample of infants) that the mean fundamental frequency of crying that “increased considerably from 441.8 to 502.9 Hz” contrasts significantly with babbling which “decreased remarkably from 389.3 to 336.9 Hz”, leading him to make some interesting conclusions. Babbling, he concludes, is more consistent with parallels to language remarking that for the nine-month old infant, “the melody contained features of the language of females in labour”. Crying and babbling he refers to as two systems and one channel (Rothgänger 2003). Morley relays the vocal characteristics of babbling behaviours in human infants from research by Margaret Elowson, Charles T. Snowdon and Cristina Lazaro-Perea (1998). Babbling is: - universal; rhythmic and repetitive; occurs in infants between six and ten months; is phonetic and uses vowels and consonants; has no apparent linguistic meaning; and is part of the bonding process between the caregiver and the child in the first year of the infant, (Morley 2013: 203 referring to Elowson *et al.* 1998: 33, box 2). It is pointed out by Elowson that the phonetic sounds used by babbling infants are a subset of the full set of phonetics that adults use. What seems to be the case for babbling, like crying, is that the voice is used like a musical instrument, and also a vehicle for musical invention. This also resonates with numerous contexts that the incidence of nonsensical vocables happens to appear in the literature about music origins. Here I am arguing for the inventive and creative play of using the voice as an instrument, emphasising the point Morley makes when he refers to the emotional limbic system being activated in learning (as in play and invention) where the effects of oxytocin are strong during such activations (Morley 2013: 282).

Michael Goldstein, Andrew King and Meredith West test the interactions of infants and carers in human babbling, with the interactions of juvenile and adult birds in refining birdsong (2003), and just as Darwin had thought, they find an analogue. An example they give is of white-crowned sparrows (*Zonotrichia leucophrys*). Adult males sing back only certain song patterns sung by the young males, as a kind of confirmation of which patterns are good enough. This process, as in the case for the young male sparrow, is known as contingency learning. Goldstein *et al.* (2003) conclude that it is the quality, not the quantity, of attention that is critical for both the young birds and the young humans. They conclude that “babbling both regulates and is regulated by social interaction” (2003: 8034). A poignant take on this is “The Australian songbird that’s ‘forgotten its song’<sup>19</sup>. Nairán Ramírez-Esparza, Adrián García-Sierra, and Patricia K. Kuhl likewise demonstrate that “the *quality* of social interactions – defined by both the social context and the style of speech – are strongly associated with concurrent and future infant speech

---

<sup>19</sup> See <https://www.bbc.com/news/av/science-environment-56424317> (BBC 2021). Last accessed June 2025.

development, regardless of the socioeconomic status of the family” and they conclude that “caregivers who provide quality speech input to their infants will likely observe who’s talking in the near future” (Ramírez-Esparza *et al.* 2014). Research showing that post-maternal depression on motherese results in increased risk of psychopathology for the infant, concludes that quality of ID vocalisation is critical (Bettes 1988).

In the case for brown-headed cowbirds (*Molothrus ater*) the young male birds learn from social gestures of adult females who *don’t* sing. Instead, the adult female responds to the immature songs through gesture, to “modulate the rate, quality, and retention of specific vocal patterns” (Goldstein *et al.* 2003: 8034, referring to West and King 1990) in order for the immature songs to crystalize:

When males sang certain themes, females responded with distinctive wing movements, The males responded in turn to such behavior by repeating the songs that elicited the females’ wing movements” (West and King 1990: 110).

The research by Goldstein *et al.* also happens to resonate with Zbikowski’s work about how visual processes can be simulated as sonically as analogues (2017). It is worth noting here Fernald’s observation who reports that “infants smiled consistently to the voice when presented alone, but not to the face alone, in the first month after birth” (Fernald 1992a: 272 referring to Peter Wolff 1987) showing the power of audio over visual stimuli as *the best* medium for eliciting a smile. Babbling also involves gesture:

The gestures made by babbling infants are not iconic, they are rhythmic and emotionally determined movements (Trevarthen 1999; Falk 2004b) that accompany the vocalizations, but do not add meaning or symbolism to them (Morley 2013: 231-232).

I would however argue that babbling gestures are entirely iconic in a dynamic sense, because an infant is experimenting with body movements together with vocal movements to find out what ‘something’ is like, because an icon is essentially the expression of likenesses. This ‘something’ is the child’s environment in tangible sound patterns, such as children later in their development inventing their own songs. Children’s songs that children make themselves are the focus of research by Esther Mang. Mang explains that children’s sound patternings are making sense of place using existing songs patterns that have been learned as a template for new creation. These particular musical behaviours begin to emerge by eighteen months. She writes that:

...using learned songs as referent, a child possesses a repertoire of learned musical features that allows her to create and improvise as a reaction to environmental stimuli. The resultant early songs, therefore, exhibit a distinctive sense of ownership endowed with rich creative instincts (Mang 2005).

The research of Margaret Barrett (2006) also concerns young children’s invention of songs, through stages she identifies as *mutuality and belonging*, *finding and making meaning*, *developing competence in handling and meaning*, and *elaboration*. She explains that adults may think children’s songs musically immature but it is actually these very processes which are about “using the practice to explore ideas and possibilities” (Barrett 2006: 218). I believe her point is critical to understanding that the invention of children’s songs (by children) is experimental and the essence of musical,

and should be considered in form, as music. This is because they demonstrate *the wisdom of the line* that Paul Klee described in relation to children *remaining faithful* and *discovering again* (Klee 1962: 183-84 cited in Schuback 2012: 154).

Besides birds, a source for researching vocal behaviours in infants comes from researching primates (Morley 2013: 203-214):

Primate infants display vocalization behaviours from an early age, and these may be valuable in informing us about which aspects of vocalization behaviours have an ancient foundation” Morley 2013: 202)

In pygmy marmosets there is evidence of babbling behaviour leading Morley to conclude that hominin infants would have babbled (Morley 2013: 202-204 referring to Elowson *et al.* 1998) and he considers this likely to have played a role in vocal evolutionary development, whether it emerged phylogenetically or by convergence.

Five species of primate form the subjects for research by Marina Ross, Michael Owren and Elke Zimmermann in experiments concerning *laugh acoustics* (2010). In an experiment, Bonobos, chimpanzees, gorillas, orangutans, and humans were all tickled. The ticklers (the ones doing the tickling) in the experiment were humans that were familiar to those being tickled, to include human babies tickled by their own mothers. Analysis from a series of criteria showed that humans are closest in laughter behaviours to the bonobos and chimpanzees. Data from laugh acoustics generated through the tickling experiments were recorded and the sounds compared in spectrograms. Ross *et al.* conclude that ‘laughter’ is a vocalisation type from the last common ancestor of great apes and humans, ten to sixteen million years ago, and not an anthropomorphic term. The researchers continue that laughter was originally a signal of play and afterwards underwent greater change in hominins after separating from their common ancestor with chimps and bonobos. Laughter is described as an “acoustically distinctive signalling tool occurring in almost every conceivable form of human social communication” (Ross *et al.*, 2010). Laughter is undeniably a sonic expression of emotion, and as a signal it is regarded as a turning point in our species evolutionary ancestry according to Knight and Lewis (2017).

“Laughter,” as Provine (2000:2) points out, “is a harlequin that shows two faces—one smiling and friendly, the other dark and ominous . . . Laughter can serve as a bond to bring people together or as a weapon to humiliate and ostracize its victims.” (Knight and Lewis 2017: 437-438)

A detour into the complex world of emotions is discussed in the next subsection. I leave Darwin with the last word in this section as a bridge into the next, to remind us that if music is the language of the emotions, then the mother-infant dyad as the nexus for locating the origins of music origins continues to vibrate:

The love of a mother for her infant is one of the strongest of which the mind is capable (Darwin 1872: 215 cited Derricourt 2018: 33).

## 2.11 MUSIC, FEELING AND THE ICON

**The strategies of human reason probably did not develop, in either evolution or any single individual, without the guiding force of the mechanisms of biological regulation, of which emotion and feeling are notable expressions (Damasio 1994: xii).**

Music is expressed in Deryck Cooke's oft-quoted reference to music as the *language of the emotions* by (1989). The all-important Handbook of Music and Emotion (edited Juslin and Sloboda 2010) references *Emotion* as a key term:

This term is used to refer to a quite brief but intense affective reaction that usually involves a number of sub-components—subjective feeling, physiological arousal, expression, action tendency, and regulation—that are more or less ‘synchronized’. Emotions focus on specific ‘objects’ and last minutes to a few hours (e.g., happiness, sadness).  
(Juslin and Sloboda 2010: 10)

Antonio R. Damasio in *Descartes' Error: Emotion, Reason and the Human Brain* (1994) uses the word *feelings* for “the perception of all the changes that constitute the emotional response” adding “I reserve the term *feeling* for the experience of those changes” (Damasio 1994: 139 his emphasis). He writes:

I see feelings as having a truly privileged status. They are represented at many neural levels, including the neocortical, where they are the neuroanatomical and neurophysiological equals of whatever is appreciated by other sensory channels. But because of their inextricable ties to the body, they come first in development and retain a primacy that subtly pervades our mental life. Because the brain is the body's captive audience, feelings are winners among equals. And since what comes first constitutes a frame of reference for what comes after, feelings have a say on how the rest of the brain and cognition go about their business. Their influence is immense (Damasio 1994: 159-160).

Damasio's description of feelings as coming first in development and retaining a primacy, resonate with the notion of *icons* which Zbikowski describes as having “almost purely phenomenological status” (Zbikowski 2017: 39). Peirce referred to the quality of icons in terms of “Firstness” and “First” (Peirce 1960 1: 277 cited in Zbikowski 2017: 39). In Morley's chapter on “Emotion and Communication in Music” he writes that:

...music may have *intrinsic* and *extrinsic* emotional content (Juslin and Sloboda, 2001), which may be *iconic*, *indexical* or *symbolic* (Dowling and Harwood, 1986; following Peircean semiotic categories), and may *represent* and/or *elicit* emotion (arousal theory vs. expression theory, Davies, 2001) (Morley 2013: 256-257).

Problematising the emotional content of music, Morley admits to information not being clear as to whether icons are extrinsic or intrinsic, referring to this as “confusing things somewhat”; in Sloboda and Juslin (2001) *icons* are ‘extrinsic’, but in Sloboda's 2001 classification respectively – about ‘affect’ in *The New Grove Dictionary of Music on Line* – icons are ‘intrinsic’ (Morley 2013: 258). I actually see this at the heart of the problem; isn't it the case that icons are both intrinsic and extrinsic, which is why icons can feel real? Morley comes to the conclusion that “physiological state and emotion are fundamentally interrelated, and at a deeper level than mere iconic

resemblance” (Morley 2013: 257). I perceive that there is nothing ‘mere’ about the icon! The point that I think that Morley misses is that the icon is not meant to be confused with a literary level of association. In this sense, the “real world encounter” in music, as Cross describes it (2003, cited Morley 2013: 260), is the agency of the dynamic icon, as Zbikowski (2017) describes the sonic analog. This would seem to be why dynamic icons may feel real because intrinsic and extrinsic content elicits and represents emotion *at the same time*. This I rationalise as the agency (or mystery) of music.

Morley gives the scenario of a film score as experienced in a film to consider the *index*, the *symbol* and the *icon* (*ibid.* 259). He concludes that:

...the listener need not actually cognize a resemblance between the music and an ecological stimulus in order for it to elicit the appropriate emotional response; i.e. the listener need not think ‘this sounds like a large sound-producing entity approaching me, how exciting’ in order for the music to elicit the appropriate thrill reaction. They may, in fact, make such a rationalization *after* their reaction to the stimulus (Morley 2013: 260).

Once again this reasoning in itself resonates with the way that the emotions come first, with reasoning and recollecting processes happening afterwards. In the preface to the 2006 edition of his work, Damasio writes:

A squirrel or a bird will respond to a threat without any thinking at all and the same can happen to a human. In effect, in some circumstances, too much thinking may be far less advantageous than no thinking at all. This is the beauty of how emotion has functioned throughout evolution; it allows the possibility of making living beings *act* smartly without having to *think* smartly (Damasio 2006: preface – his emphasis).

There are countless examples where humans in emergency situations have been told to stay put and not escape a sinking boat, or a burning building, for example, and have done as they are told because of some obligation to reason over emotion. Homologous to this is the dichotomy between thought and action, and the misrecognition that action is second to thought (Bell 2009). An adjective often used in conjunction with the subject, e.g., ‘irrational’ (emotions), is something that would seem to convey a sense that emotions are flimsy and wishy-washy. Bob Dylan counters this when he refers to those who “criticise all fears” (Dylan 1963) confirming, for example, that emotions are the reality. This is affirmed most explicitly in the introduction to *Descartes’ Error* (Damasio 1994) in which Damasio writes about his upbringing. He was “advised” to have a “cool head” and that “emotion should not be allowed to intrude”. He explains that this perpetrated the idea that *reason* has a separate neural system in the brain to *emotion* that he challenged in his research which became the basis of his ground-breaking work.

Damasio distinguishes between three *varieties of feelings* of which universal primary and secondary emotions are two, making the point that feelings are not always emotions but emotions are always feelings. Damasio relates primary and secondary emotions to a perceptual difference between child and adult emotions respectively. He separates these with the terms *Basic Universal Emotions*, like Happiness, Sadness, Anger, Fear, and Disgust (primary emotions), and *Subtle Universal Emotions* which are variations of basic emotions like “melancholy and wistfulness” (secondary emotions). *Background Feelings* (a third variety of feelings) he describes with a musical

metaphor, “It is not the Verdi of grand emotion, nor the Stravinsky of intellectualized emotion but rather a minimalist in tone and beat, the feeling of life itself, the sense of being” (Damasio 1994: 150). Damasio specifies this third variety of feelings with a bold understatement in referring to background feelings as being the very “*feeling of life*”. This seems to be like John Cage’s music piece 4 ‘33’’ where the very sonic canvass of the listener’s life is reflected (Gill 2020), so I add to the list of composers’ music, a suitable one for his third category, as follows:

- Verdi                      Primary feelings
  - Stravinsky                Secondary feelings
  - \*Cage                      Feeling of life
- Taken from Damasio (1994: 150)
- \*Cage added by Frances Gill*

Damasio goes on to describe *mood* as “When background feelings are persistently of the same type over hours and days, and do not change quietly as thought contents ebb and flow” (Damasio 1994: 151).

Knight and Lewis (2017) refer to symbols and icons as fakes (and only indices as real). This may be the key to understanding agency in music; music is potentially iconic and fake, but music still feels real. The line or mirror between real and fake may even cease to exist, as is described implicitly by Damasio:

I asked Regina Resnik, the most memorable operatic Carmen and Clytemnestra of our time, and the veteran of a thousand nights of musical anger and madness, how difficult it had been to remain separate from the exorbitant emotions of her characters. Not difficult at all, said she, once she learned the secrets of her technique. Nobody would have guessed, watching and hearing her, that she was just bodily “portraying” emotion rather than “feeling” it. But she does admit that once, playing in Tchaikovsky’s The Queen of Spades, alone on the dark stage for the death-by-fright scene of the Old Countess, she did become one with her character and was terrified (Damasio 1994: 149).

The power of music to elicit emotional response extends to emotions of fear and terror is patently clear, as pointed out by Damasio above, and Grant (2014). When “a young man singing a spiritually potent song in the mode of a bleating calf” causes alarm to a herd of bison which is lured “over a bluff or up a closed ravine” (Kehoe 1999: 38), the herd do not recognise that the bleating is not real. There is archaeological evidence of horse, large bovids and reindeer from the Middle Palaeolithic of cliff-fall locations at La Quina (Mellars 1996: 229). It opens the discussion about the human voice and its ability to mimic and trick other animals. It is to the physiological and neurological evolution of the human voice that the last section of this chapter now focuses.

## 2.12 THE VOICE

...the vocal organs were primarily used and perfected in relation to the propagation of the species (Charles Darwin 1871b: 330).

As Spencer (1857), and as Darwin (1871b) noted, the voice is central to the narrative of the origins of music. Morley presents a Palaeo-anthropological study of the evolution of the physiological and neurological anatomy of the voice in humans discussing “Vocal Anatomy” and “Brain and Hearing” (Morley 2013: 130-176). He explains that animals that are living today, primates and especially chimpanzees together with fossil evidence can provide data for modelling reconstructions of anatomies of extinct hominins. In relation to speech evolution Morley asserts that “physiological capabilities would not have been shaped by linguistic demands, but linguistic form would have been shaped by the physiological capabilities present” (Morley 2013: 150). In this section I paraphrase Morley’s account of the evolution of the human voice, with some comment.

---

### 2.12.1 VOCAL ANATOMY

Vocalizations are produced in two stages, in the supralaryngeal tract (the throat above the larynx) and the oral cavity (the mouth) [...]. The acoustic energy of vocal sound is generated when air exhaled from the lungs passes through the larynx, which modulates the airflow in the supralaryngeal tract. This sound is then adjusted by the action of the tongue, lips, teeth, and palette in the oral cavity (Morley 2013: 133, referring to Lieberman 1992).

Morley begins with attention to the position of the larynx in the throat (2013: 136 and 137). The production of lower formant frequencies necessary for the vocalisation of vowels is formed in the supralaryngeal vocal tract. This part of the anatomy that includes the pharynx, oral and nasal cavity, is permanently larger in humans due to the low position of the larynx in the throat. Until after a year the larynx in human babies is at the top of the throat to prevent choking whilst swallowing (Morley 2013: 135 referring to Magriples and Laitman 1987) in the same way that upper respiratory and digestive tracts are separated in the resting positions of larynges in most animals (Morley 2013: 135 referring to, e.g., Budil 1994). Some mammals, like dogs and red deer, lower the larynx during vocalisations thus increasing the size of the supralaryngeal tract temporarily when they bark. Only humans have a larynx in a permanently lowered resting position amongst higher primates (Morley 2013: 135-136 referring to e.g., Fitch 2009; Duchin 1990). Vocal physiology and the neurological control of this for the creation of lower formants for vowels are needed for singing;

This capacity to produce such a wide variety of sustained vowel sounds, and the control to be able to shift between them at will, do seem to be unique to humans, and are also fundamental to the ability to produce vocal melody (Morley 2013: 136).

An experience of the supralaryngeal vocal tract in action by humming different pitches is a way to appreciate the morphological process of the vocal anatomy where the movement in the oral/buccal cavity is relatively still.

Morley discusses the connection between the curvature under the base of the skull (basicranial flexion) and the position of the larynx (Morley 2013: 136-7 referring to Laitman *et al.* 1979; Laitman and Reidenberg 1988), and reports on the first evidence of arching in *H. ergaster*, from around 1.75 million years ago (Morley 2013: 138 referring to Laitman and Heimbuch 1982; Laitman 1984). Vowels in the words ‘boot,’ ‘father’ and ‘feet’ would have been possible for *H. ergaster* (like those vowels in *doo-bi-doo-nab*). Evidence from specimens of *H. heidelbergensis* between 400,000 and 250,000 years ago, demonstrate a “fully flexed” basicranium, and the ability to produce the full range of modern vowel sounds (Morley 2013: 138 referring to Laitman and Heimbuch 1982; Laitman 1984; Johanson and Edgar 2006), also thought to be the case for descendants of *H. erectus*.

Morley presents fossil evidence from the small hyoid bone as the bone “to which the tongue base attaches and which supports the larynx in the throat” (Morley 2013: 144) as an indication of the position of the larynx. Because they are so small only a few fossil hyoid bones have been found. Assimilating available fossils across species of *A. afarensis* (Morley 2013: 144 referring to Alemseged *et al.* 2006), *H. heidelbergensis* (Morley 2013: 145 referring to Martínez *et al.* 2008) and Neanderthals (Morley 2013: 145 referring to Arensburg *et al.* 1990), it is concluded that from at least 530,000 years ago the anatomy of the hyoid bone in *H. heidelbergensis*, was “modern-human-like” (Morley 2013: 145 referring to Martínez *et al.* 2008).

From research comparing non-human primates and non-primate mammals, superior tongue control on the basis of “stronger and more direct neurological connections in the brain from the motor-cortical tongue area to the hypoglossal nucleus” is suggested as an indication of a phylogenetic trend in humans (Morley 2013: 148 referring to Jürgens and Alipour 2002), although when this happened in evolutionary terms is unclear. There are studies on innervation of the hypo-glossal canal which compare hominin fossils where an increase in innervation would seem to indicate better motor control of the tongue, however results are so far inconclusive (see Morley’s discussion 2013: 146-148). A feature of the mandible known as the mylohyoid groove is considered to give an even better indication of the position of the larynx in the throat than basicranial flexion (Morley 2013: 146) as its angle denotes the position of the hyoid bone (Morley 2013: 145 referring to Arensburg *et al.* 1990). Evidence demonstrating the same position and orientation of the mylohyoid groove in specimens from the Middle Palaeolithic hominins, including early modern humans, and Neanderthals possessing a similar muscular “suite” (Morley 2013: 145-146 referring to Arensburg *et al.* 1990) does not justify attributing *Heidelbergensis* and the Neanderthals with “modern-like articulatory ability” according to Fitch (Fitch 2009 reported by Morley 2013: 146). Morley summarises that the vocal anatomy of the australopiths would have been ape-like. By the time of early modern humans and Neanderthals, the anatomy was already modern. Fitch’s argument that *H. heidelbergensis* and Neanderthals did not necessarily have speech ability comparable to modern humans would effectively not rule out singing, presumably.

---

 2.12.2 BREATH CONTROL

Morley writes about the importance of “vertebral innervation, intercostal musculature, and breathing control” (2013: 148-153). The thoracic muscles that are involved in movements like coughing and defecation, needed for fine breath control in supporting the subglottal pressure needed in speech, are more important than the vocal tract for volume and emphasis in vocalisation (Morley 2013: 150 referring to MacLarnon and Hewitt 1999). The role of thoracic muscles in relation to parturition – especially to babies with larger heads – should also be kept in mind.

The thoracic rib cage is barrel shaped in humans compared with funnel shaped in chimpanzees (Morley 2013: 149). Control of intercostal (rib) muscles is important for breath control. The australopiths’ thorax was funnel shaped whereas *H. ergaster* already possessed the barrel anatomy. Research from Ann MacLarnon and Gwen Hewitt (1999) maintain that the thoracic vertebral canal is not expanded in *H. ergaster* (and australopiths) whereas it is expanded in modern humans and Neanderthals. The degree of innervation is regarded as significant regarding intercostal and subcostal muscles. Morley debates polarized views from this perspective of evolutionary development referring to MacLarnon and Hewitt (1999) and to David Frayer and Chris Nicolay (2000) regarding thoracic and cervical innervation and thoracic canal arches, in relation to estimated overall body mass and cranial capacity (see Morley’s discussion 2013: 151-153). Morley consolidates their opposing positions writing that:

...there is no reason why we should not attribute to *Homo ergaster* the ability to voluntarily moderate its breathing sufficiently well to produce vocalizations controlled for pitch, intensity, and contour, in coordination with its laryngeal and orofacial anatomy (Morley 2013: 152).

Morley continues that “What the thoracic nerves seem to allow is control of especially prolonged vocalizations”, and continues:

It seems that this *is* an ability which has developed over the course of human evolution, as indicated by thoracic canal innervation, between *Homo ergaster* and the common ancestor of *Homo neanderthalensis* and *Homo sapiens*” (Morley 2013: 152).

This also would appear to concur with the theory about *wild-voices* emerging in *H. heidelbergensis* in that the potential to sing long melismatic lines of vocal melody with the support from breath capacity and control became roughly equivalent with that of modern humans during this period of ancestral pre/deep-history.

---

 2.12.3 A LOWERED LARYNX

...a lowered larynx essentially formed a pre-adaption (exaptation) to complex controlled vocalizations in a creature that was already very vocally active” (Morley 2013: 154)

Morley points out that a temporary lowering of the larynx “simply allows a *different, additional* vocal sound to be made” (2013: 154 his emphasis). However once permanently lowered in a more energy-efficient resting position the tongue can play a more effective role increasing flexibility for vocal morphology. Morley cites three stages in an evolutionary process set out by Fitch proposing that during the temporary lowering of the larynx the tongue came into play with new “formant patterns” evolving ultimately into the permanent low resting position of the larynx, with an in-between period Fitch describes as when the “tongue body was consolidated into the communication system” (Fitch 2000: 216 cited by Morley 2013: 155).

Morley considers why the anatomy changed. *Articulate speech* is discussed as a principle theme (e.g., Lieberman *et al.* 1969 etc.). Another hypothesis concerns *infant-directed speech*, and he refers to Dissanayake (2000a) and Fernald (1992b) although his emphasis here refers to speech directed to infants and not vocalisations per se, or as types of duets between infants and care givers. Morley explains that building on the work of Lieberman *et al.*, Fitch integrates into the first stage of his three-stage process a hypothesis that concerns size-exaggeration theory, a kind of *he who shouts loudest* for sexual selection. Knight and Lewis counter this as follows:

The descended larynx in the adult human male probably evolved initially not to enable language or song but as a size exaggerating device adaptive in sexually competitive male-on- male roaring contests (Fitch 2002). The theory that music may have evolved initially thanks to sexual selection of this kind—with females choosing males for their vocal skills (Miller 2000)—is unlikely. Among Pygmies, San and Hadza women take the lead in singing, with men playing a secondary role. The ethnography fits the “women and children versus predator” idea better than the “sexual selection for male vocalizers” one (Knight and Lewis 2017: 442).

Morley referring to Richard Klein (2009) points out that during the emergence of the permanently lowered larynx in *Homo ergaster*, this species’ environment was less arboreal but Morley cautions that “Fitch’s suggestion that size exaggeration might be especially effective at night or in dense foliage should perhaps read that it might *only* be effective at night in dense foliage (i.e., in situations of limited visibility, when the vocaliser cannot be clearly seen)” (Morley 2013: 156). Morley writes:

...the size exaggeration hypothesis provides an interesting model for vocal tract use in our ancestors which has received less attention than linguistic hypotheses, and describes a potential additional role of the vocal tract, but its likelihood needs to be judged in light of the ecological circumstances in which these hominins operated (Morley 2013: 157).

It is worth pointing out that the *wild-voices* theory regarding female coalition and singing does supports this if women’s singing at night around a fire kept away predators when their males were away on hunting trips from an (Knight and Lewis 2017).

Morley mentions the second lowering of the vocal tract at puberty for males suggesting that we might focus on why this *does not* happen in females rather than why it *does* happen in males. He points out that removing ambiguity about body size is the opposite of exaggerating body size (Morley 2013: 157). Morley notes Richard Klein’s observation about male Australopiths being 50% larger than female Australopiths; this would have made the voices of males distinct from

females, but as the degree of sexual dimorphism evolved so that by *H. ergaster*, the differences in body sizes between the sexes became equivalent to what they are in modern humans, the lower-sounding voices of males has remained (Klein 2009 discussed in Morley 2013: 157). This phenomenon is an index that differentiates the adult males from infants, children and adult females; effectively all humans that are not adult and male. This index is one that potentially identifies the age-old enemy the roving Alpha-male. This index serving a hominin's physical identity is presumably one that hominin females would have benefited from, and as a consideration, still do.

---

#### 2.12.4 NEUROLOGY

Morley problematizes the difficulty of investigating the brain and hearing in hominin evolution because unlike skeletal remains, brains do not fossilize. He explains that endocasts (casts of the insides of fossil skulls) whilst unable to show the internal brain (Morley 2013: 162 referring to Leakey 1994) “show the shape and features of the brain which occupied the cranium” (Morley 2013: 161 referring to Kochetkova 1978; Falk 2004a; Johanson and Edgar 2006). Endocasts are potentially useful in identifying areas of the surface of the brain related to changes through time that can supply information about neurological changes.

Broca's area in the left hemisphere of the human brain becomes a focus because it is “a part of the brain which in humans has important roles in language production” (Morley 2013: 162). Morley explains that Broca's area is also involved with controlling muscles involved in movements of the mouth and face, writing that this “seems to be an evolutionary very ancient function of this region, the analogous area in macaque monkeys is also involved in orofacial musculature control” (Michael Petrides *et al.* 2005 referenced in Morley 2013: 163). Morley underlines the “uncertainty” about the “precise function” of Broca's area, and he points out that language and vocalisations are not the same thing. He cautions that language abilities may have been attributed to hominins that had none. He writes:

Broca's area and the areas around it have important roles in fine vocal, orofacial, and manual control, and the identification of development in this area in endocasts gives important information regarding the development of these capabilities essential to complex vocalisation, rather than necessarily indicating *linguistic* function (Morley 2013: 163 his emphasis).

Morley continues by referring to the classic Broca's area of Brodmann's area 45 and 46 with research by Brown *et al.* (2006) concerning comparative speech sentences and melody improvisations. Brown *et al.* identify “phonological generativity” as “the major point of cognitive parallelism” between music and language (2006: 2801). Morley continues:

In humans Broca's area is also involved in executing sequences of movements for rhythmic production, and has been shown to be involved in playing music and when musicians were carrying out a rhythmic task (Sergent *et al.* 1992; Platel *et al.* 1997; Besson and Schön 2003). (Morley 2013: 163).

Morley reports that there is no obvious change in the endocasts of Broca's area from fossil evidence of brains before 2 million years ago in hominins, referring to Falk (2004a). Between *H. habilis* and *H. ergaster* – from a comparison between two skulls of these two species where cranial capacity increased from 674 cc to 909 cc (Johanson and Edgar 2006) – there is an 'especially intense' growth of the lateral tuba, corresponding to Broca's area" (Kochetkova 1978: 200 in Morley 2013: 164). Morley rules out stone-tool activity to account for the change, as evidence of hominin cut marks on bones from 3.4 million years ago (McPherron *et al.*, 2010) antedates the evidence for the changes in Broca's area.

Aside from the use of endocasts, Morley presents another means of investigation that involves comparisons between humans, non-human primates, and other mammals. He cites Uwe Jürgens' research with squirrel monkeys which Jürgens considers a "suitable model for the study in humans of the biological basis of non-verbal emotional vocal utterances, such as laughing, crying and groaning" (Jürgens 1998: 376 cited in Morley 2013: 166). Voluntary and involuntary vocalisations related to the emotional content of these are examined. Morley explains that the anterior cingulate (limbic) cortex and the periaqueductal grey matter (PAG) in the brain as significant to the investigation (Morley 2013: 165). He reports that "Instinctive vocalizations do not rely on any input from the forebrain, but voluntary vocalizations do" (2013: 164), from Uwe Jürgens' research (2002).

Firstly, the anterior cingulate (limbic) cortex is considered an ancient evolutionary area of the brain involved with "the production of voluntary emotional vocal expression in all primates" (Morley 2013:165 referring to Jürgens 1992). When damaged, involuntary vocalisations are not affected but voluntary vocalisations become lacking in emotional salience. Secondly, the periaqueductal grey matter is described as follows:

The PAG is responsible for mediating emotional processes in all mammals; it and tegmentum of the midbrain that borders it collect the various audio, visual and somatosensory stimuli that trigger vocalisation, as well as motivational controlling inputs and volitional impulses from the limbic structures, including the anterior cingulate cortex (Morley 2013:166 referring to Jürgens 1998).

Morley continues that opiate receptors in the PAG reinforce positive emotional experiences and this extends to social attachments, attachments to (conspecific) voices and attachments to music (Morley 2013: 166 referring, e.g., to Panksepp and Trevarthen 2009: 117). Morley cites Davis *et al.*:

...the PAG is a crucial brain site for mammalian voice production, not only in the production of emotional or involuntary sounds, but also as a generator of specific respiratory and laryngeal motor patterns essential for human speech and song (Davis *et al.*, 1996: 34 cited in Morley 2013: 167).

Morley concludes that "of the higher primates alive today, only humans possess a direct monosynaptic connection from the primary motor cortex to the nucleus ambiguus controlling the larynx" (Morley 2013: 167 referring to e.g., Jürgens 2002, Schulz *et al.*, 2005). He writes that "what separates us from other primates, however, is vocal behaviour which involves voluntary control of the larynx, and voluntary control and planning of the structure and complexity of vocal utterances" (Morley 2013: 168).

Together with the evidence for cervical and thoracic vertebral innervation, the neurological changes for the fine control of voluntary utterances are considered to have developed between *H. ergaster* and the last common ancestor with Neanderthals (the species *H. Heidelbergensis*). Morley also reports on further evidence of mutations on the Forkhead Box Protein (FoxP2) coding gene both in humans and Neanderthals. This is relevant because “the selective sweep that led to these mutations must have pre-dated our last common ancestor with the Neanderthals” (Morley 2013: 169). Morley concludes:

...the hypothesis that human vocal behaviour, whilst being unique today amongst higher primates in its degree of voluntary control, built upon the existing system for vocalisations communicating emotional state and arousal—a system which has become ‘exapted’ from that original purpose (Morley 2013: 168).

---

### 2.12.5 HEARING

Morley explains that both production and perception of sound are integral to the evolution of the voice, writing,

It would seem that sometimes the development of the auditory system has been spurred by changes in vocalization capabilities and at other points vice versa (Morley 2013: 170).

The frequency ranges of vocalisations in most mammals “coincide” with their auditory perception systems (Morley 2013: 170 referring to Wind 1989). Morley discusses audition and universal *articulatory invariants* that make up a range of sounds common to all spoken languages (Morley 2013: 170 referring to Liberman *et al.* 1967; and Wind 1989). The view that auditory perception evolved to detect these phonetic invariants (Wind 1989) is reversed in Patricia Kuhl’s view (1988) regarding *natural auditory categories* in relation to intraspecific communication; “the acoustical properties of speech were selected for as a consequence of the particular invariant properties that are detected by the auditory system” (Morley 2013: 170 referring to Kuhl 1988). Morley surmises that,

As hominins developed the ability to control their vocalizations in order to communicate, there would have been strong selective pressure to be able to vocalize using those sounds that were most easily perceived by others” (Morley 2013: 170).

Morley (*ibid.* 171) discusses “tonotopic organization of the human auditory cortex” referring to Catherine Liégeois-Chauvel *et al.*, (2003) with evidence to show which range of pitches gives the greatest electrophysical response referred to it as ‘Best Frequencies’ in the brain. The Best Frequencies happen to coincide with the range of the human voice, that is 400 Hz–4KHz, underlining that the human auditory system is *fine-tuned* to human vocalisations. Morley indicates that since studies on non-human primates do not demonstrate the same fine tuning (e.g., Aitkin *et al.* 1986), that the human auditory system has evolved to be sensitive to the sounds of the voices of its own kind as a “principle concern”.

Morley (*ibid.* 171-2) refers to more evidence linking the auditory system with vocalisations referring to Erik Borg and Allen Counter (1989). The evolutionary benefit to us of reducing the

sound of our own voice when we speak concerns the stapedius muscles that “involuntary contract before the onset of vocalisations” and he concludes that the auditory and vocal systems evolved in response to each other. Morley comments here on the relevance to music making. If the sound of one’s voice is reduced in production, being able to hear others at the same time would be of benefit to ensemble singing presumably. It is most critical to understand that being able to make sound whilst hearing sound at the same time is perhaps one of the most important things to get right in musical ensemble situations which often demand playing in time, in tune, and so on. It would be interesting to speculate if music instrumentalists’ stapedius muscles may involuntarily start to contract before starting to play their instrument, although the existence of ear plugs for Western musicians would seem to indicate otherwise.

---

#### 2.12.6 WALKING

Morley explains that the labyrinths of the inner ear in quadrupedal mammals are vertical whereas in bipedal *Homo sapiens*, it has rotated 90 degrees (2013: 172). Morley goes on to explain that differences between the fossil evidence from hominins of the bony labyrinth preserved in fossil skulls are pronounced compared with modern humans and great apes, although not radically like those compared with four-legged mammals. Referring to Spoor *et al.* (1994), Morley reports:

...the labyrinths of *Australopithecus* and *Paranthropus* closely resemble those of modern great apes, whereas fully modern morphology is first exhibited by *Homo ergaster* (SK 847, c.1.5 million years ago), and they take this to imply that the australopithecines and paranthropines were partially bipedal, whereas *Homo ergaster* had full bipedality (Morley 2013: 172).

Further comparison by Spoor and Zonneveld (1998) indicate that the morphology occurred during the genus *Homo*, and Morley, referring to Ignacio Martinez *et al.* (2004), adds that,

Analysis of the inner-ear structures of 500,000-year-old *Homo heidelbergensis* from Atapuerca Sima de los Huesos, Spain, also confirms the presence of a modern-human-like inner-ear anatomy as a well-established early trait of the *Homo* genus (Morley 2013: 173 referring to Martinez *et al.* 2004).

Morley underlines the importance of the semi-circular canals for functions, like gaze, and controlling the neck, as well as walking. The significance of walking and music making is not only a romantic vision of the past as *H. ergaster* walking on the earth humming, clicking, clapping and singing. Intentionally made or not, the nature of the sounds leave a sonic impression, either as a memory or a change. Morley writes:

People spontaneously seek temporal regularity in the occurrence of sequences of events over a wide range of stimuli, not just music (Drake and Bertrand 2003), and this relies on the same underlying neurology to extract the temporal regularity regardless of the nature of the auditory stimulus. People seem to be most sensitive to changes in regularity of stimuli with around 600ms (0.6 seconds) between them (inter-onset interval, or IOI)...]. Interestingly, the preferred IOI for metre processing corresponds closely with human gait duration, in which the duration of each stride for which the foot is on the ground in walking also clusters around 600ms (Drake and Bertrand 2003), which could betray a close relationship between the

'fine-tuning' of human rhythmic perception and control, and the development of bipedal locomotion (Morley 2013: 192-193).

What is relevant for music is the extent to which the connection between balance and hearing affect learning and language (Morley 2013: 174 referring to Hal Daniel 1990). Even if Lucy was not fully bipedal, the new types of physical relations between hominins that standing up afforded her, and the sonic sharing of salient beats, and tempo, and frequency changes of body and voice is a certain origin for music. This creates impressions of deep-historical soundscapes not simply as a source for the origins of music, but a space where human origins have been shaped by the experience of those soundscapes.

I began this essay by discussing how walking is a process of mapping out time in a duple beat. Musicians used to 'laying down tracks' in a recording studio often may create a first track that synchronises subsequent tracks of sound to a beat. In this sense, the track we leave with our feet has a direct parallel since sounds like singing, humming, clapping, clicking etc., become synchronised with our footsteps. Even when we are not intentionally laying down music tracks, the very act of walking is always putting down a track. The sounds filter in through this process, some created by chance others intended, and some synchronised to a beat and repeated, others random and periodic. The question about music origins, as far as I can tell, concerns whether we are prepared to recognise this as music, not proto-music or a precursor to music or something else, but actually music? John Cage's writing infers that we should learn to accept this as musical experience – and hence music – and musicianship informs me to follow his lead in this respect.

### 3. FOOTSTEPS TO FLUTESCAPES

#### 3.1 INTRODUCTION TO 'FOOTSTEPS TO FLUTESCAPES'

This chapter treads the *career* of hominin evolution from the first bipedal footsteps in Africa, to the arrival of the modern humans responsible for the first flutescapes of the Ach Valley. The previous chapter's bias towards *music origins and (music) evolution* hinges on what music is and does, towards a working definition of music through its deconstruction. By comparison, this chapter is weighted towards *human origins and (human) evolution* touching ultimately on the chronological setting, new archaeological data, and different models for the arrival of modern humans, and extinction of archaic humans. It reports from the fossil and archaeological records presenting artefactual sound-tools (musical instruments) from various inventories. A method designed by Cajsa S. Lund to account for the way in which music-archaeologists deal with archaeo-organological material is also presented. The penultimate section introduces a current perspective relating to gene-culture evolution in the form of Baldwinian evolution. An 'intermission' at the very end of the chapter considers the significance of birds of the Ach Valley in a relational context together with the mammoth-human intersection; two of the *Ach flutes* are made from bird-wing radii, and one from mammoth ivory.

In a lecture about the Stone Age in 2018, Nicholas Conard asked "how would you arrange it?" Archaeological tradition is embedded in the heritage of a tripartite system, even when "None of these temporal divisions was intended as an evolutionary scheme, but rather they were thought to reflect repeated invasions by outsiders with new ideas" (McBrearty and Brooks 2000: 454). A further question might well be, how would you arrange it with regard to music? My starting point for this arrangement traces Richard G. Klein's *The Human Career* in which Klein's "working phylogeny of the hominins" (Klein 2009: 244/fig. 4.49) is the one that Morley's template is consistent with (Morley 2013: 4/fig. 1.1). The Earlier Stone Age (ESA), Middle Stone Age (MSA), and Later Stone Age (LSA) – that traditionally as a 'scheme' is not interchangeable with the Lower Palaeolithic (LP), Middle Palaeolithic (MP) and Upper Palaeolithic (UP) – allude to the complexities of 'arranging' a Stone Age already carved in stone. Conventionally, MSA and LSA are terms used for African finds only, whereas MP and UP are terms used for contexts in Eurasia (to include, therefore, Swabia); in contexts for Europe, neither the MP is referred to as the MSA, nor UP as LSA. Confusions may arise, for instance, as to why in "both Europe and western Asia the term *Middle Paleolithic* is often used as a synonym for Mousterian" when "the term *Mousterian* also has been applied to some north African assemblages" (Klein 2009: 482).

Evolution can be "defined as change in gene frequencies through time" (Klein 2009: 5) of which natural selection, mutation, gene flow and random gene drift are principle forces (*ibid.* 4.7). The word phylogeny, Klein writes, is synonymous with the word evolution, pointing out that phylogeny is "to a species what genealogy or family tree is to an individual" (*ibid.* 10). Generally, members of a species look and act similarly, yet Klein highlights the fact that sharks and dolphins, whilst bearing similar resemblances to each other, are not the same species. This

illustrates a critical distinction between analogy and homology, the former which concerns environmental adaptation, and the latter, common descent, (*ibid.* 12).

Types of homologous characters in cladistics (Klein 2009: 13-17 and referring to Hennig 1966) can be used to help classify species. For example, primitive characters, like the five digits on hands of Primates and people, are distinguished from *derived* characters which are later-evolving characters in a species. Explaining derived characters, he writes “structural modification of the rear limb to permit habitual bipedal (two-legged) locomotion is a key derived feature of the hominins (people, broadly understood) that ultimately underlies their separation from other closely related taxa within the larger hominoid group (apes and people)” (Klein 2009: 14). The process of speciation is given by Klein across two differing models: - one in which change through time is steady and gradual (phyletic gradualism); and the other in which changes occur in branches or clades (punctuated equilibrium).

Klein sees punctuated equilibrium as the model that best reflects human evolution since the alternative “fails to explain the common mode of evolutionary change in the fossil record. The typical pattern there is for a species to appear relatively abruptly, to change very little during the course of its existence. And then to disappear relatively quickly” (*ibid.* 7). On this note he continues to argue for the “abrupt appearance of the African Later Stone Age 50–45 thousand years ago, its nearly simultaneous expansion to Eurasia in the form of the Upper Paleolithic, and the ability of fully modern Upper Paleolithic people to swamp or replace non-modern Eurasians” (Klein 2019: 179). Genetic mutation which altered the neurology of modern humans through enhanced-creative innovation, is one theory for the “earliest evidence for increased complexity in *Homo sapiens*” (Will *et al.* 2019).

Klein explains that authorities for many years had interpreted the evolution of the genus *Homo* to have followed a sequence in which *H. habilis* was succeeded by the species *Homo erectus*, then by *Homo sapiens* – in which the Neanderthals were considered a subspecies (termed *H. sapiens Neanderthalis*) – with ultimately the emergence of the fully modern-human species (termed *Homo sapiens sapiens*), (2009: 279). Klein proposes a different flow that is branch-like, with modified terminology (Klein 2009: 244 /fig. 4.49; Morley 2013: 2014). Chris Stringer however does not model *H. erectus* on a separate evolutionary track; he outlines three phylogenetic trees, each modelling *H. erectus* as the distal ancestor of the Neanderthals, Denisovans and *H. sapiens* (2016: 7/fig. 2, a, b, c). A species called *Homo antecessor* ATD6-69 is also represented as a descendent of *H. erectus* in all three models which branches off early on and goes extinct.

Geologically speaking, the time period for this chapter refers to the current Cenozoic era, with the timing of the evolutionary divergence of chimpanzees and the first hominins in the Miocene epoch, towards introducing the first hominin tool makers in the Pliocene epoch. The chapter moves temporally to the geological time frame of the Late Pleistocene epoch to which the industries and artistic innovations, e.g., the *Ach Flutes* – which are a signature of the Swabian Aurignacian – are to be found.

## 3.2 AFRICA, HUMAN EVOLUTION, AND THE EARLIER STONE AGE (ESA)

The evolutionary divergence of chimpanzees and living people occurred somewhere between 8 million years ago (Ma) and 5 Ma. The Australopiths pounded a different rhythm sometime before 4.4 Ma and after 1.2 Ma according to the evidence in the fossil record from southern and eastern Africa (Klein 2009: 131 & 183). Australopiths were bipedal apes who moved around on two legs retaining morphological and behavioural traits from their primate ancestry, such as arms adapted for living in trees, and as Morley points out, they must have had ape-like voices too since the changes towards a *permanently* lowered larynx is only first found later in *H. ergaster* (Morley 2013: 158; Klein 2009: 275). Following the discovery of the first ever fossil from Taung, in South Africa and published by Raymond Dart [1893-1988] as the young skull of an *Australopithecus africanus* (Dart 1925), more Australopith remains were excavated during the first half of the last century in southern Africa from cave fills. The caves filled with fossiliferous breccia – “rock-hard blocks of sandy sediment and fossils cemented together by limy glue” – are difficult to excavate without “dynamite, pneumatic drills, hammers and chisels”. The fossil record for Australopiths in South Africa includes over thirty skulls/partial skulls, about a hundred jaws/partial jaws, hundreds of teeth and over thirty postcranial bones (Klein 2009: 135-139).

Mainly in the second half of the last century, attention centred in East Africa where subsequent Australopith-fossil remains were recovered from open-air sites such as the site at the base of Olduvai Gorge, excavated by Mary and Louis Leakey. Fossil remains in these environments are more easily freed up from the edges of rivers and ancient streams, providing the possibility for absolute dating due to stratigraphic layers of volcanic ash. Dates from sites in South Africa rely on faunal content for relative (and not numeric) dates (Klein 2009: 132-141). Among the East African australopith-fossil specimens are the 40% remains of a complete *Australopithecus afarensis* female skeleton (AL-288-1), the specimen named ‘Lucy’ from Hadar in Ethiopia (Klein 2016: 6345) as mentioned previously. East African sites provide a further advantage over the South African sites; despite yielding half as many fossilised bones compared with the larger sample in South Africa, the East African fossils are more complete.

Specialists usually classify all of the great apes including people in the family of Hominidae, previously ‘reserved’ for people. Current practice prescribes that people, extant and extinct, are separated in this family into the tribe of Hominini, where species are referred to (or anglicised) as ‘hominins’ (Klein 2016: 6345). In this system of Linnaean taxonomy australopith hominids are currently recognised as the oldest ‘undoubted’ hominins, for which “bipedalism is the ultimate litmus test for hominin status” (Klein 2009: 131 & 271). Music inarguably lends itself to collaboration, and since the act of listening is a prerequisite in that musical exchange, this becomes significant for a theory that posits that acts of sharing and fairness are the critical marker for hominin status; Klein points out that finding particular evidence of these behaviours in the fossil and archaeological records is problematic but perhaps he is overlooking the musical evidence. Evan MacLean – the authour of the research – underscores the importance of finding analogues in non-human animals to this end (Klein 2016: 6345 referring to MacLean 2016), from which further parallels with biomusicological, and ethnomusicological, perspectives (Fitch 2015; and Nettl 1964: 6, respectively) may be reflected.

The ‘savanna(h) hypothesis’ predicts bipedal adaptations in response to a more terrestrial and less arboreal lifestyle (Klein 2009: 273), supported by faunal records, and stable isotope analysis; “bipedalism and other uniquely human specializations were adaptive responses to progressive savanna expansion and woodland shrinkage across eastern and southern Africa after 8 Ma” (Klein 2016: 6345). Klein writes that “the savanna hypothesis predicts only that natural selection would have favored anatomical and behavioral changes that enhanced survival in grassier, less wooded vegetational settings. It does not explain why bipedalism would have been more advantageous” (Klein 2009: 273). It is worth pausing to think about how this particular change was also an acoustic one, and that within this paleoenvironmental-acoustic context is the emergence of a bipedal hominin towards, eventually, having a permanently lowered larynx with increased vocal capacity and capability, combined with hearing attuned to the new sounds. Sonic productions from collaborations of all types of sound emission unequivocally generate complex sound structures that can be regarded as prompting response. How did the acoustics of vast open landscapes differ from dense forested ones? This may be considered from perspectives concerning the evolution of musical capacity in animals as related to the palaeoacoustic ecologies of their lives.

For the species *Ardipithecus ramidus* which between 4.5 and 4.3 Ma, Klein “probably mixed bipedalism with a significant amount of tree climbing” (Klein 2009: 729), evidence for bipedalism and social sharing presents a dissonance to the savanna narrative. A re-examination of *Ar. ramidus* by C. Owen Lovejoy posits mutual cooperation as a behavioural characteristic of this species, which reveals that “small canines occurred in hominids long before any of the dental modifications of *Australopithecus* or the use of stone tools” (2009: 74). A subsequent argument by Gary Clark and Maciek Henneberg (2017) for an earlier emergence of vocal capability in hominins – based on a model of organism morphogenesis – suggests in the neck of *Ar. Ramidus* a significantly deeper position of the larynx than for chimpanzees. Clark and Henneberg recall convergent evolution evident in human and avian species, alluding to the FOXP2 gene associated with longer periods for infants interacting vocally with older carers. They mention the case of convergence in humans and gibbons, in respect of the closure of the glottis. Additionally, they point to fallacies about brain size and vocal capability in animals. This is with regard to “a distinct lacuna regarding the links between craniofacial correlates of social and mating systems and vocal ability” in literature on language evolution (2017: 101). Accordingly, the authors mention that a similar lacuna exists in the Palaeoanthropology literature, echoing what was also noticed by Morley in his study of the evolution of the human voice (2013). However, Morley did not put *Ar. ramidus* on the evolutionary map for laryngeal descent as Clark and Henneberg have done.

On the basis of evidence Klein writes that “A link between bipedalism and tool use may seem unlikely” but suggests that tools were probably scattered in transit, some of which may have been perishable, plus the possibility that evidence simply may be missed by archaeologists (Klein 2009: 273-274). Sonia Harmand *et al.* write about the *conventional wisdom* which “has assumed that the origins of hominin sharp-edged stone tool production were linked to the emergence of the genus *Homo* in response to the climate change and the spread of savannah grassland” (2015: 310). The “3.3-million-year-old stone tools from Lomekwi 3, West Turkana, Kenya” currently provide the earliest demonstration of *substantial* hominin-manual dexterity, forward planning and material sourcing, indicating “reorganization and/or expansion of several regions of the cerebral cortex”

in the brain (*ibid.*: 314). *Kenyanthropus platyops* is the only hominin known about in the region of West Turkana during this period and is posited to be the species temporally associated with these 149 surface-and-*in situ* artefacts. The palaeo-environmental context for these *first tools* happens to be woodland.

Carsten Niemitz (2010) notes at least thirty hypotheses on the subject of bipedalism, and raises the importance of research highlighting australopiths as shore dwellers; wading in water causes walking. He concludes that aspects of hypotheses would enable synthesis if correct time periods were better assigned (Niemitz 2010: 259). There is not scope to reference all the research for the evolution of the upright gait but popular hypotheses include: - infant carrying; better visibility; waving arms about to scare off potential conflict; fruit picking; reduced skin surface to the midday sun; seeing far away; and so on (Klein 2009: 273 and Niemitz 2010). One of these thirty hypotheses is *The Freeing of the Hands Hypothesis* from Darwin's *Descent of Man* (1871) and this would seem to be at the heart of many hypotheses that concern behaviours like reaching, carrying, throwing, waving, etc. An image of a mother chimpanzee wading in water whilst cradling her infant who is simultaneously feeding from what I call the heart-beat breast (the breast on the left of her body)<sup>20</sup> illustrates infant-carrying hypotheses in relation to bipedal-hominin evolution (2010: 256/fig. 4, e. from a film by Mike Salisbury 2003). Close head-to-head (voice to voice) intimacy is clearly a dynamic of this mother-infant cradle-carrying and which, *a priori*, has important benefits for musical development, and in turn, behavioural and neurological development, both ontogenically and phylogenetically speaking. I argue that there are good reasons for continually returning to this perspective of mother and child for the origins of music, and the origins of so-called 'social' bonding.

William Etkin had written that early female hominins would not have been able to hunt effectively being required continuously to be carrying and nursing the young, and he discusses the idea of male cooperation (Etkin 1954: 136). If the interpretations from the relevant fossil remains are not incorrect (Klein 2009: 196-199: 197/tab. 4.10) it would seem however that early hominins only become considerably less dimorphic in *H. ergaster* with "an especially large increase in female size" (*ibid.*: 197). Klein substantiates this argument related to social organisation and dimorphism with further evidence demonstrating canine dimorphism in *A. afarensis*, analogous to chimpanzees and the great apes whose males are uncooperative economically (*ibid.*: 198). Lovejoy, advocating adaptive-suite models (and criticising chimp-centric-referential modelling) insists that *Ar. Ramidus* was "minimally dimorphic" and that this may have been the "primitive hominoid condition" (Lovejoy 2009: 74e3). He qualifies this turning to Gen Suwa *et al.* who write that:

The *Ar. ramidus* dental morphology and wear pattern are consistent with a partially terrestrial, omnivorous/frugivorous niche. Analyses show that the ARA VP- 6/500 skeleton is female and that *Ar. ramidus* was nearly monomorphic in canine size and shape. The canine/lower third premolar complex indicates a reduction of canine size and honing capacity early in hominid evolution, possibly driven by selection targeted on the male upper canine (Gen Suwa *et al.*, 2009: 94).

---

<sup>20</sup> I hypothesise that this may have contributed to why more humans are right-handed, than left-handed, in evolutionary terms.

If cooperative breeding is noted for *Ar. Ramidus* temporally foreshadowing the Australopiths and also *K. platyops*, then Etkin's idea should not be ruled out. It can be noted in Klein's table showing differences in body weight and stature in males and females across several species (Klein 2009: 197), that *Ar. Ramidus* and *K. platyops* are not part of these data. One argument for cooperation is the sex-for-food argument driven by reduced ovulation, and longer lactation periods (Lovejoy 2009). With reference to the latter, and discussed in the last chapter, the sound patterning and sound patterns (the music) of this universal duo (mother and infant), as ritualisation, are considered a dynamic icon signalling emotional cooperation and intelligent power; theorised as a dynamic icon, such ritual actuations are enactive. Universal-musical exchanges between mothers and infants – who demonstrate considerable differences in body weight and stature – hold the ultimate continuum on unconditionality, and cooperation, it can be said. If ritualisation redeems hegemony, what prompts change and creates reversals?

Whilst there is no doubt that the musical cradle is absolutely developing the musicality of the infant, the argument in itself is drowned out, figuratively speaking, by what may be called a 'he who shouts loudest' scenario. By this I mean that we are so deafened in the West by amplified sound, that a principle on the subject of sound perception should be raised; "the strength of emotional reaction to sound is affected by the individual's perception of the distance to the sound source" (Wyatt 2016a: 179 referring to Tajadura-Jiménez *et al.* 2008: 37). In other words, there is a surround-sound-phenomenology for the baby cradled in the arms, punctuated by the heartbeat, and voice of mother hominin in close-acoustical context. Secondly it should be emphasised that such experience will also be developing the musicality of the mother, who is, in a sense, leading the duet in sharp proximity to the ears and voice of the infant. The sources of sound are acoustically intimate for both of them in which physical distance is measure of intimacy. Is there a possibility that some scholars dismiss this origin for music too readily because it isn't Woodstock?

The above perspective, rationalised by my personal experience as a musician, and mother, and in the appreciation of *wild sound*, or *natural music* (the Cage perspective), is a common sense matter. It predicts that intense-musical exchange and emotional longevity in such cradle contexts stand to develop the musical skills of not only the infant but the mother of the infant too. Thirdly, distance to the sound source in relation to emotional response is also significant for others participating as active or subliminal listeners to any acoustic, and thereby psychoacoustic, event. Notably, this is a pertinent perspective for the interpretation of the *Ach flutes*. A body's response to sound patterning, such as in the ears of a flautist creating the sound patterns, do not have to be loud, or near in distance, to be sensed, yet an argument for high-pitched sounds carrying over longer distances is relevant to the dynamic of distance (and therefore intimacy) for participating listeners. I may also add here, *vis-à-vis* flute playing, that the vibrations are sensed in the fingers, and the body, and it is this sensory experience of sounds per se, such as issued by an infant in an adult's arms, and vice versa, which offer a powerful-phenomenological invitation. This is sophisticated 'musical' synchronisation indeed!

It follows that the lullabic utterances of the mother become even more relevant as a musical phenomenon, as relative to the distance of listening participants. The intimate-high pitches may attract the attention of other listeners who are distanced further away from the source of the

sound. Can her voice making these evocative-sound patterns be broached as creating sexual arousal in others? Bo Gräslund (2005) discusses the end of oestrus and oestrus signals in early-female hominins as a consideration for bipedalism, with one line of argument towards the fact that wading in water reduces strong-seductive aromas. As a replacement for the lack of this signal from the nether regions of the females, the males' susceptibility to other signals, hypothetically, become heightened; a tender voice, in the soft and sensual sense of act of what, is potentially, a type of experimental-sound acrobatics, may be an alluring seduction even when said recipient is not the conscious target. 'Experimental' can equal the chance event; one doesn't know precisely what is going to happen next as the mother's 'performance' is not scripted.

Gräslund points out that even though some modern women may be more sexually driven around their ovulation periods, female *H. sapiens* have evolved to be like men in sexual readiness, ovulating many times during a lifetime, and thus being permanently sexually available, biologically – not socially – speaking!! This is another reversal. Gräslund underscores the idea that longer child rearing in hominins with paused ovulation during lactation periods, is a situation found in wild female chimpanzees ovulating only once every four to five years, coinciding with the time needed to rear one child. Gräslund's theory posits that as hominin females evolved to become more upright, the clitoris – located at the far end of the genital region (quadrupedally speaking) – became rotated to top spot (bipedally speaking); as Gräslund puts it, the female's sexual organs are now upside down. Discussing perspectives such as: - the female orgasm; neotene selection; the penis; and bisexuality, Gräslund illuminates "A New Sexual Pattern" (2005: 89-105) as a credible reason for why bipedalism offered phenomenal advantages serving possibilities for face-to-face sexual intercourse.

I have argued that the way in which the mother vocalises to her infant; the way in which the infant vocalises to her mother; the way in which they exchange vocalisations etc., and combinations of these complexes, in terms of intensity and longevity, create salience and thereby *différence* in context. In the previous chapter I critiqued the research concerning prosody by Trainor *et al.* (2000) on ID speech, relative to AD speech; specifically the structural context of musical form of material used in their experiment, questioning its ecological validity with regard to repetition, and the context of emission (through acting). The Morlian position may be erroneously eroding the theoretical perception of the universal nature of motherese as a complex-enactive force. The mutual exchange between mother and child in terms of intensity and longevity ("continual affective vocal interplay"), is considered an overstatement (Morley 2013: 210), plus ID speech as an exaggerated form of AD speech is not a 'special' case (Morley 2013: 208-209 referring to Trainor *et al.* 2000). Coined *umbilical chords* in advocating the perspective championed by Dissanayake, my understanding is that this cradle scenario extends to Darwin's theory; the singing voice evolved in early hominins to attract a lover (1871 b: 330), and to excite sexual response. This is where I perceive that Killin (2018), overlooks a critical point of reversal in that despite his claim that the lullaby is not a sexually-blatant form of music, that its 'performance' may nonetheless *be experienced* as display. At least according to Darwin, a 'sweet' singing voice is the reason given for why adult-female-vocal acts would have made more than just the ears prick up. Singing probably evolved as a type of behaviour in *females first* before it did so in our male ancestors (Darwin 1871 b: 33). Curiously, I have not encountered this particular perspective of Darwin's overly referenced.

For habitually-bipedal hominins, periods of longer infant dependency are noted together with the evolved narrower pelvis indicating a constricted birth canal for the shorter-armed *Homo ergaster*, according to the fossil evidence (Klein 2009: 326). Long-infant dependency is seen in birds as 80% of them are born altricial and the more care they get in the nest, the bigger their brains and more intelligent they grow to be (Goldhahn 2019: 9 referring to Ackerman 2016: 49). This parallel resonates with the Darwinian perspective on music in humans in that it had evolved as behaviour to function originally during courtship as with birds and other animals, (Darwin 1871 b: 330-337). Moreover, for a bird to sing he must first have important singing lessons in the nest as his survival depends on this skill as a prerequisite. This is where there is another inversion in the analogy; a bipedal-hominin mother is not restricted to only ‘teaching’ her sons, since she has the power to nurture her daughter’s musicality too in the cradle of her arms. She even has a possibility to exert favouritism in this regard. Infants carried in close proximity to carers, and especially those who are breast-feeding carers<sup>21</sup> is a good way for infants get their first music lesson, if I may be permitted to labour the point. This gestural position and the longevity of the behaviour in evolving hominins with altricial offspring affords long periods of head to head intimacy due to necessary carrying, and an ideal ‘nest’ for the evolving-infant-hominin’s musical development and musical life. There are many ways to carry babies (without slings) but whilst wading in water with a baby, infant or child, a mother wouldn’t want to risk drowning her infant; a mother would feel that her infant was alive with the tugs on the nipple and the emptying of milk in the mammary ducts, or just sucking for security and comfort. The ‘music’ of bipedal locomotion is thereby accommodated as a musical event in hominin evolution to include the breast-feeding event in motion<sup>22</sup>.

By at least 4.4 Ma the australopiths species are on the move on two feet, a change which must have had its own new-distinctive rhythmic beat, coinciding with the shift over time in the progressive vegetation from woodlands to grasslands (Klein 2009: 272-273). The hominin-heart beats constantly pulsing as a continuum against the evolving precision-controlled-duple time of two moving feet – the latter constant, or changing, fast, or slow, or still, getting faster or slower, regularly or irregularly executed – present perspectives for thinking about how hominins have designed space through time and place, up to the present day and beyond. Trevarthen highlights the significance of human *feelings* within these physical structures:

...evolution of human bipedal locomotion and the pressure of social intelligence set free a new polyrhythmia of motive processes, and that these generate fugal complexes of the Intrinsic Motive Pulse (IMP), with radical consequences for human imagination, thinking, remembering and communicating. Gestural mimesis and rhythmic narrative expression of purposes and images of awareness, regulated by, and regulating, dynamic emotional processes, form the foundations of human intersubjectivity, and of musicality. Acquired musical skill and the conventions of musical culture are animated from this core process in the human mind (Trevarthen 1999).

---

<sup>21</sup> Western-centric models of modern parenthood are cautioned as a universal lens; in 2022 there was a shortage of formula milk in the US leaving infants in mortal danger. This can be seen as a type of reversal that puts markets over control of how babies survive. The 2022 phenomenon also has its own Wikipedia page (see also Martin *et al.* 2022 and Freeman 2019).

<sup>22</sup> I have breast fed my children cradled in my arms whilst walking round the supermarket.

Because we know that oxytocin is released from nipple stimulation, then the chemically-musical inventions of the sweet-voiced-singing mother (with child at the breast) – eventually more accustomed to standing on two feet than moving around on all fours – hypothetically, discovers in her new acoustic ecology, a new-found musical ability in a situation with her offspring. Her sweet songs are dialling new calls, whether these are cognitively inadvertent ones, or becoming less so as owning her own sexuality develops. In this sense, females discovered the power of their own sexuality in which singing – the invention of melody – was a potent sound tool in her tool box of seduction.

Darwin writes that in humans “song is generally admitted to be the basis or origin of instrumental music” [Darwin 1871 b: 333](#)). The presence of the first secure melodic-wind instruments in the archaeological record is critically and obviously related to the use of hominin tools both in the sense that tools are needed to make them, and that essentially, the instruments themselves are tools (hence Lundian *sound tools* after the work of Cajsa S. Lund). The analogy between a feeding infant sucking milk from the nipple (or plastic teat), can be made readily with wind-instrumental playing, i.e., on cylindrically-shaped objects that are placed in the mouth and in coordinated action with hands and fingers. If an Acheulian hand axe is rather like a hand, a small flute (or pipe, for those who like smoking) is rather like a nipple. From personal experience, an infant’s hands and fingers are very active during the breast-feeding process offering relief from mastitis as overloaded mammary ducts are cured by the infants’ sucking and massage. There is even the case of wind-instruments in the archaeological record that are sucked, and not blown, calling for a modifying of a Western classification system for aerophones, organologically speaking ([Rainio 2016](#)).

The earliest hominin-stone tools, as mentioned above, are found in West Turkana, from Lomekwi 3, dated to 3.3 Ma ([Sonia Harmand et al. 2015](#)). Among the 149 finds there are *cores, flakes, anvils, percussors, and worked cobbles* ([ibid. 312](#)). The use of stone tools by hominins had previously been documented by 2.6–2.5 Ma in eastern Africa, and 2 Ma in southern Africa to where the behaviour spread, and to which Klein points out does not surface with the emergence of australopiths, adding that the same is true also for bone artefacts which are only known from Olduvai from about 2 Ma. This does not mean necessarily that australopiths were not using tools; the hands of both *Australopithecus afarensis* and especially *A. africanus* are “derived in the human direction” towards the precision grip, making use of the thumb and first finger, for example, as opposed to basic power gripping with fingers to palm ([Klein 2009: 249-252](#)). Precision gripping is required for flute playing, of course. A player does not sit to her instrument like the gamelan, or a piano; a pincer grip – a technique where the top of the thumb clasps a material object with the top of another finger (like the forefinger) on the same hand – is usually required, and often both hands and several fingers are involved. In addition to the hands and fingers, the mouth is quite fundamental (with exceptions like nose-flutes, organs, and the advent of electronic sound, accepted).

As there is no evidence for a flute-playing Lucy however, can it be assumed 100% that bones or other materials were not sucked or blown, and that sounds were not ever made and manipulated? The notion of eating as an origin for music to include suckling babies, is demonstrated by Gorillas’ humming whilst eating food which was recorded for the first time only recently in the

wild (Downer 2020). This may offer a new analogue for evolutionary vocal control in early hominins. There is less chance of choking on food if the larynx is high in the throat as it is in most animals and in baby humans, but whilst gorillas hum, the larynx is presumably manipulated in a controlled way due to the relaxed-muscular glissandic movement of humming during the raptures of masticating. If a humming hominid in mid hum is doing so because of enjoying eating, other ‘participants’ are presumably tuning into the display of sound, and possibly becoming emotionally and sensually alert. Sonic expression of enjoyment in this way must be ranked as musical, and doing the two things at the same time, a cognitive feat worthy of admiration.

Eating and music making are readily analogous, such as for the functionality of music after a good meal in terms of “bodily well-being” (Spencer 1857: 405). Pinker’s reference to music (1997) as a type of food (cheesecake) is taxonomically imbalanced, musicologically lacking an appreciation of much broader and deeper complexes of sound patterning and patterns, i.e., wild-sound aesthetics, as Experimental Music. Certainly the ritualisations of pedestrian breast feeding – like all types of natural rhythms across primary-life contexts, i.e., birth, and coitus – present a discrete suite of sounds, each with its own repertoire. Eating in transit can be considered, likewise, for the bipedal movers because of free arms and hands facilitating munching on the move without breaking pulse. Whilst use of fire for cooking food can be raised here in its role bringing together people round a central hearth – enhancing sonic collaborations of sucking, chewing and munching, etc., (see also Killin 2018: 3-4) – did such early hominins in the Early Stone Age gather round fires? To speculate that the Australopiths may have made stone tools can be certainly extended to fire control, although Klein writes that evidence for the deliberate use of fire is ambiguous at this early juncture; “Unequivocal hearths are commonplace only in European Middle Paleolithic (Mousterian) and African Middle Stone Age sites postdating 200 ka (Klein 2009: 261-262).

What can be abducted for the Australopiths is that they did not live their lives in vacuums, and their new bipedal behaviours must have synchronised to, and reciprocally synchronised, the polyrhythmic soundscape (cf. Mithen 2006: 137-138). The major phylogenetic patterns for the australopiths who were “proficient bipeds and agile tree climbers” reveal two lineages, one progressively evolving smaller teeth and considerably bigger brains, understood to be the species making the first flaked stone tools 2 Ma (Klein 2013: 248). Prior to Lomekwi 3, dated to 3.3 Ma, the first known hominin tools in the archaeological record had been the Oldowan Industrial Complex of stone artefacts. Originally designated by Louis Leaky in 1936, these artefacts are divided generally into *manuports*, *hammerstones*, *core forms* and *flakes*. Flakes are thinish slices of sharp-edged stone splintered away from cores through hammer strikes on particular points of the core. Cores, in turn, can become forms (e.g., *discoids*, *spheroids*, *polyhedrons*). A core form (a pebble tool) is designated a ‘chopper’, for example, when flaking is centred towards a modified edge, either on one side of the form (*unifacial*) or on both sides of the edge (*bifacial*). If there is modification extending all the way round the entire peripheral edge of the form then the tool is a *protobiface*, and if this also extends across the surface, the tool is a true *biface*, also known as a hand ax (*ibid.* 253).

Whilst the probability for flute making and playing is extremely unlikely especially with no evidence of this during the ESA, the chiming of stones should always be kept in mind because stones can, and do, ring out when manipulated or ‘played’ in different ways. Elizabeth Blake and Ian Cross (2008) investigated flint tools as mobile-sound tools applied from an Upper Palaeolithic context in their experiments, a context which also implies that the aesthetic-sonic quality of ‘playing’ flint tools, *per se*, may have an older heritage still. Anton Killin also discusses “intentional listening that supports better knapping” (Killin 2018b referring to Killin 2016; 2017; cf. Gill 2012: 51-52). In his knapping experiments, James Dilly (2021b: 11:15 – 11:24) likewise instinctively refers to the crispiness and cracking of what I rationalise as *sonic debitage* (also the name of one of the two albums accompanying this research); sound patterns become discarded but are likely to leave an index from the experience as a memory of the pattern. In this regard, hominin evolution concerns *bearing lithics* too, a vital consideration for the cognitive development of substantial *ear-hand* coordination (cf. Tostevin 2013: 106/fig. 4.11; 108/fig. 4.15).

*Homo habilis* dated to be between around 2.5 Ma and 1.7 Ma, first discovered at Olduvai by the Leakeys, and synonymous with the Oldowan Industrial Complex, was initially acknowledged to be the earliest species of *Homo* whilst Klein cautions that the situation is likely to be more complex since records are sparse (Klein 2009: 140). Antedating *H. habilis* – from fossil evidence comprising teeth and a temporal fragment, and to include a mandible proposed to be as old as 2.4 Ma – is *Homo rudolphensis* (Klein 2009: 235; tab. 4.11). *H. rudolphensis* therefore represents the earliest *Homo* species in the phylogeny for the genus *Homo* (Klein 2009: 280/fig. 5.1). In his model for the existence of “all populations between 1.8 Ma and 130 ka” (*ibid.* 281) he outlines, and terms, “primitive *Homo*” which is marked by the appearance of the species *Homo ergaster*, dated from 1.8-1.7 Ma, from which all later species of *Homo* are descended. *H. ergaster* is distinguished as the first *Homo* species to colonise Eurasia having dispersed to the Far East having given rise to *H. erectus* by 1 Ma. *H. ergaster* continued to persist in Africa, Klein thinks, which subsequently gave rise to the species *Homo heidelbergensis* which spread to Europe 700-600 ka, recognised as the common ancestor of *H. sapiens* and the Neanderthals, with its fossil remains in Africa and Europe being those that “formerly composed “archaic” *H. sapiens*” (*ibid.* 280).

Klein refers to the emergence of *H. ergaster* as a ‘watershed’, being the first species to resemble historic hunter-gatherers in anatomy and behaviour, i.e., economic cooperation between males and females, and a tradition of stone-tool making that defined ‘primitive *Homo*’. *H. ergaster* had a bigger brain perhaps precisely because of the stone tools it made, coinciding with the appearance in the archaeological record of a change in the design of stone tools towards hand axes of the Acheulean tradition, a practice ‘widely established’ 1.6-1.4 Ma. This was a punctuated-evolutionary event, like the one in which Klein considers the Oldowan-stone tools appeared 800 ky prior to this, with *H. habilis*. *H. Ergaster* was able to disperse across different and varied terrestrial environments, with *H. erectus* being differentiated first in the Far East, whilst ‘early’ *H. sapiens* in Africa and the Neanderthals in Europe were differentiated only after 500-400 ka, according to this model. From the fossil evidence in Africa and Europe, *H. heidelbergensis* would also seem to have evolved in a rapid burst one million years after the emergence of *H. ergaster*, according to the punctuated mode of evolution evident in the fossil and archaeological record. There is a suggestion that the species *H. heidelbergensis* was responsible for a “conspicuous shift” towards behaviours manifest in the intentional refinement of symmetrically-styled bifacial hand

axes, and also sophisticated flakes, made by those after 700-600 ka referred to as “late Acheulian” people (Klein 2009).

Contemplating the origins of music Anton Killin rings in the “Late Acheulean” at between 800 and 250 ka. He refers to spear use – citing the spears from Schöningen, Germany, (Killon 2018b referring to Thieme 1997) in relation to the use of projectiles which he considers a measure of cognitive ability that can be related to music ability. The spears in question were found together with the remains of butchered horses, and there is new dating for them to circa 300 ka (Richter and Krbetschek 2015).. Arguments for scavenging versus hunting, spears for thrusting or penetrating, and other uses of wooden spears e.g., as ‘snow probes’ for carcasses are discussed by Mellars (1996: 221-229). There is also evidence in the archaeological record of “heavy-duty thrusting or penetrating spears”, e.g., at Clacton on sea (England), (Mellars 1996: 227 referencing e.g., Oakley *et al.* 1977). Killin highlights the subject of fire control to the socialisation of the brain and musicking (2018b 4-5) Structured hearths from around 350 ka were discussed by Knight and Lewis (2017: 440 referring to Shimelmitz *et al.* 2014) in relation to female coalition and vocal polyphony. This was from the perspective of renewed encephalisation among hominins living in Africa circa 700 ka. Throwing projectiles at moving targets, knapping aesthetic hand axes, and ‘fire culture’, is synergised by Killin who asserts that:

At least by 400 Kya (some) ancient hominins engaged in group activities worthy of the admittedly vague description, social “proto-music” (by which I mean not necessarily the direct progenitor of all current-day musics; rather, activities that exemplify some but not all of the distinctive features of music-making in ethnographically known forager societies) (Killin 2018b: 1).

The species *H. heidelbergensis*, or *H. rhodesiensis*, or Ancestor X, (or *H. iconicus* as a conceptual name I give for the hominin in this space) requires more clarification. In the literature it is referred to as ‘*H. heidelbergensis* or *H. rhodesiensis*’, e.g., Hublin *et al.* (2017). The name ‘*heidelbergensis*’ references the discovery of a jaw recovered in Heidelberg Germany (in 1907), that was matched with a subsequent discovery of a skull from Broken Hill in Zambia (in 1921) which was then in Rhodesia, hence, the name ‘*rhodesiensis*’. However the skull has been re-dated recently to about 300 ka (Grün *et al.*, 2020) which makes it too young to be the common ancestor of *H. sapiens* and the Neanderthals. Stringer explains that there must have been a common ancestor around 600 ka but what the species looked like, and where it lived, is still uncertain (Stringer 2022: 6’ - 8’ 37’). Stringer models *H. erectus* at the distal end of three phylogenetic trees (Stringer 2016: 7/fig. 2) with one tree calling into question *Homo heidelbergensis* as a species commonly regarded as the LCA of the Neanderthals, Denisovans and *H. sapiens*. This he models in the tree labelled fig. 2, c (Stringer 2016: 7) in which he posits an ‘Ancestor X’ as the LCA, thus incorporating *H. heidelbergensis* as an early-sister branch of the Neanderthal lineage prior to a later-sister branch for the Denisovans (therefore *H. heidelbergensis* being separate to the *H. sapiens* lineage). This model shows *H. heidelbergensis* as a species that had gone extinct before “Late Pleistocene inter-lineage gene flow” between Neanderthals, Denisovans and *H. sapiens* could occur. *H. ergaster*, is not acknowledged.

A sketch of *H. heidelbergensis* with: - a permanently lowered larynx; modern-like breath control for long phrases of vocal sound; neurological control for fine control of voluntary utterances; a

capacity to produce all modern vowels (if not articulate in an absolute ‘modern’ sense); and modern-like hearing capacity (Morley 2013). Silent hunting practices for groups of males is theorised for *Heidelbergensis* by Knight and Lewis (2017) juxtaposing a kind of pyrotechnic polyphony for groups of females. The people gained a “permanent foothold in Europe”, thus providing an explanation as to why their Neanderthal descendants between 500 and 300 ka were able to establish themselves so successfully in Europe with evidence of their tools ‘foreshadowing’ the Middle Stone Age (*ibid.* 432-435).

### 3.3 THE MIDDLE STONE AGE (MSA), THE ‘MOUSTERIAN’, AND THE MIDDLE PALAEOOLITHIC (MP)

Excavations from *Le Moustier* rockshelters in southwestern France since 1863 recovered typological stone tools attributed to the Neanderthals which define the Mousterian Industrial Complex. The term ‘Mousterian’ has been used for coeval assemblages found elsewhere in Europe, in Africa, and eastern Asia although evidence is not so well documented in Asia, according to Klein. He writes that “Scholarly tradition and geographic distance are the principle reasons for separating the MSA and Mousterian” after pointing out that “In both Europe and western Asia, the term *Middle Paleolithic* is often used as a synonym for Mousterian” (Klein 2009: 482). Terminologically speaking, it can be noted, that current practice may favour the more general term ‘Middle Palaeolithic’ than the term ‘Mousterian’. Klein refers to the “Mousterian/MSA reduction of raw stone nodules or blocks to sharp-edged blanks” (Klein 2009: 485) to typify stone-tool making traditions and technologies that hallmark this archaeological space. He continues that the Acheulean and MSA/Mousterian industries may possibly have coexisted for up to tens of thousands of years, e.g., in Kapthurin Formation, Lake Baringo Basin, Kenya, despite the rarity of large bifacial tools in Africa and Europe for the period (*ibid.* 481-485). Klein considers that the MSA/Mousterian replaced the Acheulean in different times and places across Europe, western Asia, and northern Africa, emerging by 250-200 ka “in most places” to include “probable MSA artifacts” in South Africa (Klein 2009: 483).

*Chaîne opératoire* is a term commonly used in conjunction with Mousterian/MSA knapping technology, as is *Levallois* reduction or technique, with terms in use, like *Levallois* core, and *Levallois* flake. The people of the MSA were expert at executing various series of discrete knapping actions which as a process enabled them to produce, or even ‘design’ precisely the kind of tool that they intended, beginning by selecting workable stone material like flint, chert, and (in Africa) volcanic rock, like obsidian. Klein writes that they “were more primitive than their Upper Paleolithic/Later Stone Age successors in many important behavioral respects, but their primitiveness clearly did not extend to the primary working of stone. In this respect they were as human as anyone, and they have never been surpassed” (Klein 2009: 490). The word ‘primitive’ – in context of ‘behavioral respects’ linked to artefacts – may be addressed. Ethically speaking, pejorative connotations of the word would seem to resonate with the series of works by artist John Graham Walker called *Oceania – my dilemma*, which in one vein, indicates a never-ending lack of resolution between indigenous and Western worlds. This is critical vis-à-vis interpretation and what Kramer refers to as the responsibility of response (2006). This is a valuable key for research,

simultaneously highly subjective that is potentially open to bias and personal preference, which Klein raises as a conundrum for archaeological interpretation from the perspective of it being the antithesis of an exact science (2019: 186). In these contexts the word ‘symbolic’ (see [Dissanayake 2018](#)) may more aptly be replaced in the strict semiotic sense by the word ‘iconic’, I am debating. In the following perspective an alternative view on hominin-cognitive evolution is asserted by Malafouris, who appropriates *symbolic technologies* as behaviours associated with a subtly different range of more ‘recent’ archaeological materials:

...innovations in early material culture are important not as evidence of human modernity but as evidence against it. Material innovations from the Oldowan chopper to the Acheulean handaxe to the Blombos engravings and shell beads to depictional cave art to the more recent symbolic or “exographic” ([Donald 1991](#)) technologies, such as calendars, writing, and numerals—are neither accomplishments of the hominin brain nor symbolic statements about the presence of a new human representational capacity and thus the origins of human modernity. Instead, they are opportunities for the hominin brain ([Malafouris 2013: 243](#)).

Archaeologists refer to a notion of reduction from a natural stone block called a *nodule* which is referred to as the *core* as soon as the first flakes are removed, until it is exhausted. Retouching allows flakes to become reshaped, such as sharpened, blunted (backed, i.e., for hafting). The makers of these stone tools were artisans skilled at pinpointing *striking platforms* on the core in order to hammer away a single flake using a *percussor* (like a *hammerstone*, or something made from wood, antler or bone), and repeat this. The weight of each blow on the striking platform leaves an impression on the core, and on the flake. The *ventral* and *dorsal* surfaces of flakes have distinct features, with a characteristic *bulb of percussion* – which is an index of the hammer blow – on the ventral surface close to the striking platform. The ventral surfaces of flakes are smooth having come clean away from the inside of the core from the invasive blow, whereas dorsal surfaces have scars and are faceted. The striking remnant from the original platform on the flake is referred to as the butt, and Klein explains that it is standard practice in archaeology to display flakes with these platforms pointing downwards<sup>23</sup> ([Klein 2009: 485-491](#)).

Tom Higham *et al.* report that the Mousterian in Europe ended during a period of only a couple of thousand years, dated to 41,030 - 39,260 calibrated years before present (at 95.4% probability), according to their recent study of Neanderthal and Mousterian sites (2014)<sup>24</sup>. This would seem to be a very abrupt time period signalling the extinction of a species which Klein explains endured “over several glacial cycles, from 500 ka or before” (2009: 455). Just why did Neanderthals go extinct? A way to approach this at the outset is to recognise that the Neanderthals were not the only species of hominins on the planet at the time. Conard writes, that “If rather than two, at least four hominins survived into the recent past, the questions connected to the evolution of cultural modernity become more complex” (2010: 7622). Besides the Neanderthals in Western Eurasia, Stéphane Peyrégne *et al.* refer to the “previously unknown hominin relative who lived in

<sup>23</sup> It is also music-archaeological practice to show flutes in a vertical alignment with the blowing end faced upwards but, I argue, that this permits bias of opinion if each end is missing or damaged.

<sup>24</sup> The sites in question in the study are: - Gorham’s Cave; Zafarraya; El Niño; Sima de las Palomas; El Salt; Quebrada; Jarama VI; La Viña; El Sidrón; La Güelga Esquilleu; Morín; Arrillor; Labeko Koba; Lezetxiki; Abric Romani; L’Arbreda; Pech de l’Azé; Le Moustier; La Ferrassie; La Chappelle; La Quina; Saint-Césaire; Les Cottés; Arcy-sur-Cure; Hyaena Den; Pin Hole; Spy; Grotte Walou; Néron; Mandrin; Bombrini/Mochi; Geissenklösterle; Fumane; Castelcivita; Oscuruscuito; Cavallo; Lakonis; Ksar Akil; and Mezmaiskaya.

southern Siberia and coexisted with multiple Late Pleistocene hominin groups in Eurasia” numbering in Island Southeast Asia, *Homo floresiensis* from Liang Bua cave island of Flores, (announced 2003/2004 Klein 2009: 722-724), *Homo luzonensis* and *Homo erectus* (Peyrégne *et al.* 2024: 84). It was only in 2010 that the news of the Denisovans came to light, a species now recognised as another descendent of *H. heidelbergensis* (Klein 2016: 6346). The Denisovans are currently known from ten fossil fragments, nine from the Denisova Cave in the Altai Mountains in south-central Siberia, and one from Baishiya Karst Cave on the Tibetan Plateau (2024: 90). The DNA preservation of a distal phalanx of a little finger (Denisova 3), dated to 63-55 ka, has revealed – via mitochondrial DNA (mtDNA) sequencing – a complete Denisovan nuclear genome sequence, from which the phylogenetic relationship to Neanderthals and modern humans has been clarified. Humans shared a last common ancestor (LCA) with Denisovans one million years ago, and with Neanderthals half a million years ago; the Denisovans were a sister group of Neanderthals, which diverged early from their LCA (Peyrégne *et al.* 2024: 84). Following the divergence the Denisovans expanded to the east, and the Neanderthals to the west, where for more than 300 thousand years they were isolated from each other in Eurasia. There is evidence of episodic interbreeding (admixture) in the Denisova Cave region midway in Eurasia (*ibid.* 85).

What the Denisovans looked like still remains a mystery; whereas the fossil record for the Denisovans is meagre (Slatkin & Racimo 2016; Peyrégne *et al.* 2024) the current sample of Neanderthals exceeds 350 individuals from over seventy sites (Klein 2009: 440 & 435). Anatomical comparisons between Neanderthals and modern humans are therefore easier to make. Klein theorises Neanderthals as behaviourally ‘conservative’ questioning whether they possessed, or lacked, the capacity for modern behaviour (Klein 2009: 434-5) writing that the species “engaged in strenuous physical activity and that compared with anatomically modern humans they relied more on bodily power and less on artefactual skill to accomplish essential tasks”. They were muscularly incredibly strong with powerful-gripping hands (*ibid.* 456), and likening their environmental conditions with those of the Inuit, Klein asserts that the Neanderthals “relied more on physiology and less on culture as a buffer to the cold” (*ibid.* 458). By 200 ka their brains sizes had “approximated the modern standard” (*ibid.* 434).

Klein thinks that whilst “the Neanderthals differed from anatomically-modern people only about as much as do two subspecies in some living mammal species” (*ibid.* 451) the brains of Neanderthals were “differently organised” to those of modern humans (*ibid.* 435). He suggests the ‘accretional model’ would best fit the Neanderthals who may have evolved more by drift and chance, and not selection, as populations became under pressure due to their ecological conditions. Neanderthals existed in harsh environments, over a long period, and are known for tools like: - *raclours* (*side scrapers*); *pointed forms*; *notched and denticulated tools*; *backed knives*; *rarer forms*, *like end scrapers and burins*; and *bifacial tools*, *like leaf points*, (Mellars 1996: 96-133). Neanderthal subsistence consisted of: - red deer; reindeer; horse; and bovinds. The full extent to what may have been hunted and what was actually scavenged isn’t properly settled (*ibid.* 196-227). At La Quina (France) there is evidence of horses, large bovinds and deer having been driven over a cliff and butchered on the kill site (Mellars 1996: 229 referencing e.g., Jelinek *et al.* 1988), which brings to mind the hunting strategy of the bleating-calf song in the ethnomusicological literature (Kehoe 1999: 38; Morley 2013: 16).

Compared to modern humans, the exploitation of raw materials by the Neanderthals was quite similar, although: - materials were not carried as far (in terms of distance); there was less variety in the types of form of these raw materials; also less variety in the particular materials for particular tools; and their quarry workshops are considered less specialised (*ibid.* 165-167). Neanderthals structured their sites in cave and rock-shelters, and in the open air. The all-important hearths are considered the focal point around which everything else in a site becomes structured, differentiated as: - “Open”; “Constructed”; “Paved”; and “Excavated” (Mellars 1996: 245-314). Categories for open air sites as designated by Alain Turq (1988, referenced in Mellars 1996: 264-268) further delineate: - “Extraction and exploitation” (quarry sites); “Extraction and production” (workshops); “Mixed strategy”; and “Episodic” (stop-over occupations). It is hypothesised that hut structures may have been erected, such as against a cave wall at Lazaret, and there is some evidence for post holes in open-air sites (e.g., Lumley *et al.* 1969; Lumley 1969, referenced Mellars 1996: 287; 308 respectively).

There has been a discussion about the pelvis which is larger in the Neanderthals than in modern humans suggesting a longer gestation period but there is no conclusive agreement that either the birth canal was in fact larger in Neanderthals, or if size has any real bearing on gestation. Longer gestation would suggest that population growth would have been slower than in modern humans (*ibid.* 458-459). Klein points to the evidence that the skull features (cranial and mandibular) developed quickly before the age of two in Neanderthal children. These characteristics represent most of the anatomical contrast in adult skulls between Neanderthals, as compared with modern humans. He thinks that during maturation Neanderthals and modern humans must have differed genetically, and he refers to the degree of basicranial flexion present in two-year old modern humans which in Neanderthals was never developed (*ibid.* 461-2). Klein notes that childhood and lifespan must have been “extended” both for Neanderthals, and for modern humans, positing *H. heidelbergensis* for this “shared life history” noting “the potential for older women to enhance their reproductive fitness more by provisioning their daughters’ or nieces’ offspring than by bearing additional young of their own”. Slow maturation, allowing for a longer period ‘in the nest’ for children, is what Klein suggests may have been the result of naturally selected factors (*ibid.* 583), and that “group concern for the old and sick may have permitted Neanderthals to live longer than any of their predecessors” (Klein 2009: 572-585). Such selection, as such, may have had the emotional intelligence of singing women at heart.

Evidence indicates that Neanderthals may not have lived beyond their forties. The probability that *H. sapien* groups had a bigger percentage of older people than the Neanderthals pushes the hypothesis that *Grandmas* increase the survival of a group (*ibid.* 626). On a model of “nutritional welfare” a central study by Kristen Hawkes, James F. O. O’Connell and Nicholas G. Blurton Jones (1997) suggest that traits of longer postmenopausal lives may have evolved through provisioning grandchildren (see also Hawkes 2004; Callaway 2010; Krasheninnikova 2019). Their study, which is focused among the Hadza of northern Tanzania, concerns nutrition and is not directly about helping children to learn and develop musical skills. However, the existence of Grandmotherese (Shute 2010) – discussed in Chapter 2 (section 10.4 *motherese and melodic behaviours*) – unravels a different aspect to this posited provisioning, especially when taken in relation to Spencer’s inference about music being as functional as a nutritious dinner, discussed in Chapter 2 (section 5.1). In the case for the Neanderthals, one is left thinking about a species

without postmenopausal women *en masse* to shake things up, and in doing so, steering their grandchildren through song and purpose.

Conard suggests that “the numerous burials of the Neanderthals and anatomically modern humans of the Middle Paleolithic reflect the deliberate burial of kin and are linked to personal and emotional ties between the living and the dead” (2015: 2480). There is evidence for Middle Palaeolithic burial practices known from about thirty five examples across West Asia, and Europe for the Neanderthals. Klein supposes that evidence for burial practices in East Asia and Africa may not have been found yet, or has disappeared. With the exception of a burial indicating that flowers might have accompanied an individual (at Shanidar Cave), and another example of the remains of an eight-to-nine-year-old boy found together with what may have been an intentional pattern (a circle) of ibex horns (at Teshik-Tash), Klein underscores that “there are no instances where Neanderthal skeletons are accompanied by special artefacts or other indisputable grave goods” (2009: 573). Klein continues that the pollen at Shanidar Cave may have been intrusive. This has been proven recently (Hunt *et al.* 2023). Recalling how funerary practices changed during COVID 19 one is left thinking why opportunities to pick colourful-aromatic flowers may not have been routine for Neanderthals in harsh environments, with the notion of ‘opportunity’, after Malafouris (2013: 243) being a new watchword.

The remains of what have been called ‘early modern humans’ at Mugharet-es-Skhul and Djebel Qafzeh sites in Israel dated to around 90-110 thousand years’ old has strongly supported, for some time, the theory that modern humans did not evolve from the Neanderthals (Mellars 1996: 401-404 referencing e.g., Mercier *et al.* 1991; and Bar-Yosef 1992, respectively). For Klein (2009) “The Neanderthals and their contemporaries” and ‘Anatomically Modern Humans’ (AMH), are delineated diachronically but it is critical to bear in mind that one of these contemporary species in the former category is an evolving clade of *H. sapiens* respectively; besides the Neanderthals living in Europe and Western Asia at a time when there were different species of *Homo* living in Eastern Asia, “it is to the African contemporaries of the Neanderthals that living humans must look for their ancestors” (Klein 2009: 445). The term ‘archaic humans’ used for Neanderthals and Denisovans by Stringer (2016: 6) he also applies to *H. sapiens*; “early members of the modern human lineage could be informally termed ‘archaic *H. sapiens*’ ...]. ... its use could be restricted to specimens with a predominance of archaic features but which nevertheless demonstrably belong to the phylogenetic clade of extant *H. sapiens*” (*ibid.* 7). For Jean-Jaques Hublin *et al.* who differentiate early anatomically modern humans (EMH) and recent modern humans (RMH) (2017: 289-290), the term “non-*sapiens* Middle Pleistocene hominins and Neanderthals” (*ibid.* 290) differentiates these species from hominins belonging to the *sapiens* clade.

Chris Stringer focuses strictly on the fossil evidence in his article entitled “The origin and evolution of *Homo sapiens*” (2016). He identifies ‘big questions in modern human origins’ which include whether evolution was gradual or abrupt, the nature of the last common ancestor (LCA), and the nature of the exchange of genes, to include modern lineages mixing with ancient, and even ancestral, lineages (2016: 1-2). He highlights the problem of how to determine which fossils are differentiated as *H. sapiens* from those that are non-*sapiens*. He writes:

“Extant *H. sapiens* share specific traits such as a high neurocranium, rounded in lateral profile, a small face retracted under the frontal bone, a true chin even in infants, small discontinuous supraorbital tori, a

lengthened post-natal growth period and life history, and a narrow trunk and pelvis with short superior pubic rami” (Stringer 2016:1).

Stringer summarises the anatomical characterisation of extant *H. sapiens* to which the features “cranial globularity, retrocessive face, basicranial flexion, development of a mental osseum, dental micro structure and pelvic shape” (2016: 1) can be assessed. He lines up a series of “early modern *Homo sapiens* crania”, referenced as: - Florisbad; Jebel Irhoud 1; Jebel Irhoud 2; Eliye Springs; Guomde; Omo 2; Omo 1; Herto; Ngaloba; Singa; Skhul 5; and Qafzeh 9 (2016: 3/fig. 1). These skulls together with fossil data in related contexts are represented across the geographical regions from their respective origins of discovery. These include: - North-west and North Africa; Southern Africa; East Africa; and (from the Levant African Middle Stone Age) Western Asia (Skhul and Qafzeh). Of the last category, Stringer writes that “Although not in Africa, the adjacent Levant has clearly been a conduit for ancient population movement between Africa and Eurasia” (*ibid.*:6). Conard writes that:

...if the people from Skuhl and Qafzeh in the Levant 100,000 years ago were fully modern with their burials, use of pigments, and personal ornaments, why did Neanderthals later reoccupy this region and continue to live there for tens of thousands of years? At a minimum, these two hominins must have been on fairly equal evolutionary footing (Conard 2010: 7622).

Jean-Jaques Hublin *et al.* (2017) presenting new data from new fossils at Jebel Irhoud (Morocco) have recently determined the origin of *H. sapiens* to be around 300 thousand years old. The evidence includes fragments of an adult skull (Irhoud 10) and adult mandible (Irhoud 11). The authors refer to an African origin for *H. sapiens* from *H. heidelbergensis*/*H. rhodesiensis* but state that is unclear whether ‘modern’ anatomical morphology emerged rapidly 200 ka or gradually over 400 ka (*ibid.*:289; referring to Stringer 2002; and Bräuer 2008, respectively). Their criteria which concern facial morphology distinguish early anatomically modern humans and recent modern humans, from “the large, robust and prognathic faces of the Neanderthals or older Middle Pleistocene forms”. They conclude that “all the possible reconstructions of the new facial remains of Irhoud 10 fall well within RMH variation”. They identify a ‘mosaic’ of features showing that “the evolutionary processes of *H. sapiens* involved the whole African continent”. Dated to  $315 \pm 34$  thousand years, the cave site provides the ‘oldest and richest evidence’ for the clade of *H. sapiens* “in which key features of modern morphology were established” (Hublin *et al.* 2017: 289-290). Their research concludes that facial morphology for *H. sapiens* “was established early on” (*ibid.*:291).

Hublin *et al.*’s pan-African origin for the species (2017), and the model that Stringer calls “African multiregionalism’, with many potentially interfertile subdivisions of the evolving sapiens species across Africa” (2016:7) is highlighted by Manuel Will, Nicholas Conard, and Christian Tryon (2019) who explain that attention to Africa and the MSA has become a scholarly focus in recent decades for behavioural evolution. They favour “more highly contextualized, temporally variable, and historically contingent trajectories in different regions” across the African continent with the focus on ‘cultural evolution’ (Will *et al.* 2019: 25). They partition an archaeological period from between 200 to 30 ka – “the archaeological background for the early evolution and global dispersal of *H. sapiens*” – structured by Marine Isotope Stages (MIS) through five regions (South,

East, Central, West and North - encompassing the whole of Africa). This focuses on a selection of forms across MIS 6, 5, 4 and 3, comprising: - *backed pieces; bifacial points; ochre, bone tools; engravings; bead shells; ostrich-egg-shell (OES) canteens and beads; hafting; fishing; and long distant transport*. In addition to the *Human Revolution/ Out of Africa (3)*<sup>25</sup> model – centred on punctuated emergence and the arrival of AMH to Europe (*ibid.* referencing Klein 1994; 2000; 2001; 2008) – Will *et al.* compare the results of their empirical evidence against expectations from three further selected models. These models are: - a gradual and cumulative model in the late Middle Pleistocene on an unidirectional and accretionary trajectory within Africa (*ibid.* 28 referencing McBrearty and Brooks 2000); two varieties for coastal complexity on the coasts of Africa – one in the Late Pleistocene on a gradual and cumulative trajectory, the other in late Middle Pleistocene on a Step-change trajectory – (*ibid.* 28 referencing e.g., Parkington 2001 / Marean 2015 resp.); and a ‘Synthetic Model’ in the Late Pleistocene on a discontinuous and abrupt trajectory within South Africa (*ibid.* 28 referencing Jacobs *et al.* 2008; Jacobs and Roberts 2008; Henshilwood and Bubreuil 2011). Their model drawing on Conard’s perspective (Conard 2005; 2008; 2010) indicates that each region in Africa has its own archaeological pattern, and therefore they rule out a pan-Africa trajectory, for “cultural evolution” (Will *et al.* 2019: 46). For this they used a theoretical model of a fitness landscape, from simple to rugged, reflecting patterns of time, demography and cultural complexity (*ibid.* 50-51).

Against the ‘Global model of Mosaic Polycentric Modernity, in the Middle Pleistocene to the Late Pleistocene on a decentralised, heterogenic and multidirectional trajectory’ (Will *et al.* 2019), Klein continues to support an “abrupt appearance of the African Later Stone Age 50-45 thousand years ago” in an article published in the same year (Klein 2019: 179). N.B., he reformulates his position with regard to mutation arising in one single population, as follows:

...dramatic fluctuations between more humid and especially more arid conditions periodically reshuffled African populations, redirecting gene flow and increasing the probability of novel gene combinations. A novel combination that additively or cumulatively enhanced cognition could explain how and why fully modern *H. sapiens* initiated the African Later Stone Age by 45 ka and dispersed to Europe by 44 ka. Genetic change is unlikely to have involved one or a few simple mutations, as I first postulated, because whole genome scans have failed to reveal any potentially relevant genes that swept to fixation in the millennia before these events. Thus, unlike the Neanderthals, who differed from living humans in specific genes related to brain function, particularly to connectivity, near-modern Africans probably differed from living humans only in gene combinations (Klein 2019: 179-180 with references).

What was this initiation that is the Later Stone Age that Klein refers to above as being abrupt, and that coincides in Europe with the end of the Middle Palaeolithic and demise of the Neanderthals? Mellars discusses ‘standardisation’, ‘symmetry’ and ‘imposed form’ in relation to MSA lithic-tool morphology, pointing out that this sort of thing “emerges on a greater, more complex and more rapidly changing scale in the ensuing tool inventories of Upper Palaeolithic groups” (1996: 383). However Thomas Wynn “can see nothing in the subsequent patterns of tool

---

<sup>25</sup> The *Out of Africa* model Klein considers should really be called ‘Mostly Out of Africa’ (Klein 2009: 636), counting it as the last of three major dispersals from Africa, with the makers of African hand axes to Europe as a second (around 600 ka), and the initial dispersal from Africa between 1 and 2 Ma now “widely accepted” (*ibid.* 627).

manufacture during either the Middle or Upper Palaeolithic to suggest that there were any further significant advances in basic cognitive ability beyond those reflected in the production of hand axes” (Mellars 1996: 385 referring to Wynn 1985: 41). Nevertheless, the observed changes in the archaeological record regarding the working of stone tools is only half the story since the simultaneous appearance of artefacts often referred to as ‘symbolic’ gives support to the idea that these changes reflect not only a radical-new hominin lifestyle, but a radical new hominin, i.e., the arrival of fully modern humans with a new style and identity.

Conard chooses the heading “Beyond Subsistence, Technology and Settlement” to analyse a range of categories across the late Middle to Late Pleistocene which he defines as: - *burials*; *pigments and ground ochre*; *decorated objects and nonfigurative representation*; *personal ornaments and jewelry*; *figurative representations*; and *music*, (*ibid.* 2480-2493) although the term *musical instruments* bears the actual evidence for ‘music’ in this context. Conard concludes that “most archaic humans appear not to have mastered the repertoire of new behaviors” (2015: 2495). Klein, likewise, highlights objects crafted from bone, ivory and antler, elaborate graves, and well-organised living spaces with hearths, whilst emphasising that “unequivocal art and decorative items are essentially unknown in a Mousterian context” (2000: 656-658). Assessing both fossil and archaeological evidence, Klein interjects that these are “only proxies” for genetic patterning (2019: 182) exasperated that “personal differences in perception may always impede consensus on modern human origins” (*ibid.* 186).

Klein (referring to Henshilwood *et al.* 2002; and Conard 2009 respectively) juxtaposes the oft-cited lump of red ochre (e.g., Malafouris 2013 187/8.2) with its triangular hatchings from Blombos cave, South Africa (dated to between 78-75 ka), with the infamous small figurine from the Swabian Aurignacian called the *Venus of Hohle Fels* (2019: 185/fig.5: 185-186). The inference is that the Upper Palaeolithic Venus – which coincidentally was found in the same basal Aurignacian horizon at Hohle Fels within a small distance from one of the *Ach flutes* (the vulture-radius ‘flute’ called Hohle Fels 1, Conard, Malina and Münzel 2009) – demonstrates enhanced-human capability. This is inferred because the detailed, ornate and possibly representational engravings on the Venus figurine (see also Dutkiewicz 2021) would seem to indicate that its maker’s cognitive disposition is somehow more sophisticated than the one required to incise triangular shapes into the body of red ochre. Moreover the figurine itself has been sculptured transforming hard mammoth ivory into an icon of soft-bodily voluptuousness. However the aesthetic simplicity in the triangular hatchings iconise a geometric form that might represent three dimensions, and for other reasons too the ochre is also impressive especially from a *less is more* perspective, it may be argued.

Mellars refers to the ‘quantum change’ – alluding to the density and perceived quality changes in the archaeological record at the onset of the LSA and UP – in relation to Neanderthal intelligence; “this major shift could indicate the emergence not of increased intelligence but simply of new cognitive structures, marked specifically by the appearance of more highly structured forms of language” (Mellars 1996: 387 referring to Binford 1987: 692). Without taking another detour into the subject of language per se, is it worth recalling the presentations concerning music origins in relation to language discussed in the last chapter, whilst questioning just why the new cognitive structures are considered here to have been marked specifically by

language, and not any other form? Leaving this bias to one side, Mellars continues that a starting hypothesis should be that there is “no significant contrast between the mental capacities of Neanderthal and modern human populations” (Mellars 1996: 366) and “it would be irrational to assume that there could have been no significant changes in the structure, complexity, or intelligence of the brain over 200–300,000 years since the emergence of the earliest taxonomically and anatomically Neanderthal populations” (Mellars 1996: 367 referring to Gibson 1988; Parker and Milbrath 1993). Mellars’ lines of enquiry concern: - “symbolic expression or behaviour”; “intelligence or cognitive capacity”; and “presence or absence of language” (Mellars 1996: 368).

Mellars devotes less than one page to answer the question, “what exactly do we mean by symbolism?” explaining the symbol as anything that refers to something beyond itself, (Mellars 1996: 369 referencing Hodder 1982; and Chase 1991). Whilst it is useful to bag up non-utilitarian finds in the primary context of a dig and label them as ‘symbolic’, I perceive it is too convenient for archaeologists to label some phenomenon as symbolic and then argue that any meaning of it is now lost to the group that used it (see Dissanayake 2018). The Crimean fragment Zaskalnaya VI (ZSK VI), published by Anna Majkić, Sarah Evans, Stepanchuk Vadim, Alexander Tsvelykh together with Francesco d’Errico (2017) is also considered to be have some type of meaning. This is a fragment of a raven radius under 2 cm in length, with seven notches along its posterior (see Praxmarer 2022: 113; 115/fig.4.3\_5). Whilst the authors consider that to “obtain regularity when required” such as is indexed in the notch sequence indicates that the notch-maker had neuromotor control comparable to modern humans, the find appropriated as some kind of code item is not critically discussed. Lara Carol Neal imagines certain engraved patterns on Upper Palaeolithic flutes may have functioned like Australian *message sticks* which she contextualises for a Magdalenian flute from Isturitz, (2013: 102/fig. 4. 2 referring to Howitt 1889: 314). However the pursuit of looking for meanings in patterns may have something to do with general perceptions of what archaeologists do (cf. Holtorf 2007: D).

Mellars discusses use of red pigments, and imported sea shells indicating that Neanderthals, liked to collect things, manuporting organic objects as possessions. Perforations and patterns are also to be found on various artefacts, like on animal bones and teeth (1996: 369-375). In South Africa, there is also the phenomenon of engraved Ostrich Eggshell (OES) canteens allocated to MIS 4 (e.g., Will *et al.* 2019: 35/fig. 2) which also contains in this context another type of artefact from Blombos Cave in addition to the patterned ochre described above (e.g., Klein: 2009: 534/6.46). These are the *shell beads* (for bracelets or necklaces) interpreted from evidence of post-mortem perforations on tick/gastropod shells (*Nassarius*) found in MSA layers. In the same vein as before, Klein (2019: 183/fig. 4) presents juxtaposition between these MSA beads and the *shaped ostrich eggshell beads* from the LSA, e.g., at Enkapune Ya Muto Rockshelter in Kenya, inferring that the spherical discs are more specialised because they would appear to require more careful craftsmanship to produce. He uses the comparison as part of his argument for the LSA suddenly emerging in Africa 50-45 ka “and its nearly simultaneous expansion to Eurasia in the form of the Upper Palaeolithic” again drawing a line between the two types in terms of human capability (*ibid.* 185).

Other possible material evidence from both artefactual and fossilised remains can be those related to sound production, starting with the voice. For example, it is to the people at Skuhl and

Qafzeh caves “whose uparched basicraniums imply a fully modern laryngeal position” that Klein refers to in order to discuss the possibility of a higher position for the larynx in Neanderthals, because the cranial base is flat for Neanderthals<sup>26</sup>. He suggests that it might have been the case that the Neanderthals “could not have benefited from a neural change that enhanced spoken language” (Klein 2009: 651). This also infers that the voices of the Neanderthals may have sounded strange or different if heard by other hominin species, but Francesco d’Errico refers to the irrelevance of basicranial shape in vocal tract reconstruction as argued by Fitch (d’Errico *et al.* 2003: 28 referring to Fitch 2000b). Spencer also had inferred that timbral gestures of the human voice change according to emotional disposition and circumstance (1857: 398-399).

The differences in appearance between the Neanderthals and modern humans are well documented but was there contrast in the way they produced and used sound, starting with the signature of the voice? In this study I am pinpointing the Peircean semiotic icon with regard to ‘music’ after Zbikowski (2017) as a way to negotiate archaeological material. Asked with the same question of music, it is perhaps necessary to ask not what an artefact means (or its patterns mean) but what it does in the moment. The iconic use of sound patterning / production of sound patterns is brought forward in the case for voices because of its power and agency in the moment over semantic meaning. This, of course, extends to other parts of a body’s anatomy that can be motivated to generate sound patterns, such as clicking fingers, clapping hands, stamping feet, swishing hair, clicking teeth, licking lips, blowing kisses, and so on. The use of body appendages as part of a body’s physical scheme of sound – understood well by music instrumentalists sensing instruments as extensions of the body – is another variant of possible sonic production. Enter Cajsa S. Lund’s Probability Groups!

---

### 3.3.1 A CRASH COURSE IN CAJSA S. LUND’S PROBABILITY GROUPS

Probability Groups is a system invented by Cajsa S. Lund for a type of classification of musical instruments in the archaeological record which stretches the traditional (Western) concept of a musical instrument into the world of sound tools, thus anything can be a musical instrument. In this sense, Lund’s system is highly experimental balancing probability against possibility. It means that archaeological experiments concerning *sound-tool finds* can be limitless in their practical scope whilst grounded in theory. To give an example, the Balkakra drum from the Bronze Age in Sweden – which makes a gong-like clang when hammered (such as when Lars Hammarteg plays it, Hammarteg 1984) – has only become called a drum because of Lund’s research, yet archaeologists who dispute this may not be aware that her research places the find in ‘group five’ (Lund 2012: 71) together with items like combs, saws, spoons, and bottles. As a former music-archaeology student of Lund’s, I have written about her methodology, and work in the “slipstream of her legacy” (Gill 2020: 56-66). In a symposium in her honour in Växjö in 2016, *Probability Groups* was the subject of a panel discussion, and a notable article from this exists in the

---

<sup>26</sup> I would like to thank Helena Victor for our memorable work in a session during my undergraduate-archaeology study at Linnaeus University in which we undertook a practical experiment which involved me trying to use my voice to emulate the voice of a Neanderthal. Our results were not conclusive.

work of Annemies Tamboer (2020), who cites Lund in a description of ‘group five’ which I call *Lund Probability Group 5* (LPG 5), as follows:

Any object can be used for sound production. Indisputable bone ‘beads’, bone ‘needlecases’, bones with ‘marrow holes’ and so on, may also have been used – secondarily – as flutes in prehistoric times. Even today we blow on cartridge-cases, keys, reeds, bottles, and other objects for the sake of their sound (Lund 1987 cited in Tamboer 2020: 104)

Part of the logic for LPG 5 is expressed by Tamboer who writes that “as long as a provisional interpretation is keeping objects in Probability Group 5 these will not be forgotten and they will eventually incite new research” (Tamboer 2020: 104 referring to Lund 2012).

My appreciation of Lund’s system is that it is not simply a system for researching the past; it is a way of thinking about sound and music. We are part of this system, now, and in the future (so that there is no line between a past, present and future, just the potential existence of sound in a universal sense). All things that are resonant belong here, and this does not stop at artifice; it potentially includes the body (as mentioned above), plus it can accommodate scale, in which large structures may be identified, i.e., natural-world spaces such as caves as ecofacts. For example, the identification of some aspect of a cave’s features like a stalagmite played as a lithophone, or the whole cave behaving like a giant-lithic ocarina (Gill 2020: 62), can be counted in humankind’s sound-tool box. The image of an organological instrument rather than a megamonument on the front of a volume of studies in ‘archaeoacoustics’ (Scarre and Lawson 2006) implicitly makes the point that sound tools can be any size.

A system for archaeoacoustics (i.e., d’Errico and Lawson 2006) has been developed from Lund’s work but because scale is not the focus of her Probability Groups; large structures (both built and of the natural world), can be accommodated reasonably into her system. It is useful to pause and think about perishable items like a wooden flute (i.e., Wyatt and García Benito 2016) because whatever may have perished organically could also be considered for Lund’s system. Simon Wyatt points to the “the classic idiom from archaeology, absence of evidence is not evidence of absence” (2016b: 201), yet Morley adds that “neither can absence of evidence be reliably asserted to represent evidence of loss” (2013: 129). The context of ecofacts is not an unreasonable methodological consideration being that flutes can be made from many different materials. There is immediacy to wood; one of the first reconstructions of the mammoth-ivory flute from Geissenklösterle was reconstructed by Friedrich Seeberger from elder (Conard *et al.* 2004).

There are five Probability Groups and their divisions are very fluid, which extends to temporality; Hohle Fels now in 2025 may be allocated an entirely different probability category to Hohle Fels dated to 40 ka. Hohle Fels in the Ach Valley will be described in some detail in the next chapter. Lund has published the criteria for her probability groups in both Swedish and English (Lund 1979; 1980; 1981; Lund *et al.* 2015). ‘Group one’ which I call *Lund Probability Group 1* (LPG 1) categorises “Artefacts which clearly are sound-producing devices (such as bronze lurs and bells)” (Lund 1979: 53-54; 1980: 7). An old water tower in Växjö (Sweden) happens to have a spectacular acoustic, so much so that since ceasing to be a water tower, the structure now has an

official car park for visitors to experience the acoustic phenomena there<sup>27</sup>. The water tower's function has changed so that its original function is now history. This is relevant because as a large sound tool to be played, the tower may be placed in the LPG 1 category. However, the tower as it will come to exist in the future may not necessarily be considered a deliberate sound tool without some prior knowledge of it having been one during the dawning of the second millennium AD. In this case the Våxjö water tower emerges in 'group two' (Lund Probability Group 2 / LPG 2) from, e.g., the perspective of a music archaeologist from the long-distant future looking back to the present, considering it as an ancient water tower. LPG 2 is described by Lund for "Artefacts with a strong potential for having been used as sound-producing devices" (Lund 1981: 247).

Mousterian shell beads may be assigned a probability grouping because they may function like a musical instrument, e.g., shell beads may become a musical shaker in movement with the body when worn as a bracelet, necklace or attached to clothing, for example, (Lund 1979; 1980; 1981; Lund *et al.* 2015; cf. Coumont 2002: 87-88, 94). If the design of such jewelry had a pre-conceived double purpose in which one purpose was to consciously make deliberate sound, such as a type of rattle costume, then this would be considered as belonging to Lund Probability Group 3 (LPG 3). If such a musical effect was purely incidental (unconsciously intended or consciously non-intentional), then the jewelry would fit in Lund Probability Group 4 (LPG 4). There is a fine line between groups 3 and 4.

It is at this point that Lund's probability group comes in its own because experimental work with sound phenomena may begin. Which necklace is more resonant when worn on the body, one made from *Nassarius* shells with post-mortem perforations, or one made from carefully shaped ostrich eggshell beads? I would predict that a more salient resonance may be achieved from the hollow-spherical shells than the flattish discs which may be less effective as sound producers in this context. The argument challenges the inference that the capability to make a necklace one way or another is an indication of cognitive superiority (cf. Klein 2019: 183-186). What about what it does when wearing it, as in the sonic performance of a gender, for instance? This is a theoretical argument until someone carries out this experiment with a hypothesis that MSA shell wearers had a particularly resonant thing going on with their jewelry in their respective sound worlds. This must have some bearing on cognition, both for the bodily displays of people wearing the jewelry, and the way that this may have affected others, individually and communally, sociologically speaking. Klein lists "Mousterian/MSA sites with proposed art or personal ornaments" which by his own admission could be expanded further with additional finds as recognised by Robert G. Bednarik, although Klein considers these 'crude' (Klein: 2009: 530-531/table 6.8, and referring to Bednarik 1992). There is one incidence of a MSA OES-shaped bead in the list from Boomplaas Cave A in South Africa which would pre-empt Klein's point about OES-beads signifying cognitive sophistication as a phenomenon of the LSA (cf. Klein 2019: 184).

---

<sup>27</sup> I organised a trip for music archaeologists to the water tower at the symposium called 'The Archaeology of Sound, Acoustics and Music' in honour of Cajsa S. Lund, Linnaeus University (Våxjö campus), Sweden, 2016.

If we hold to the principle of LPG 5 that *any object can be used for sound production* it becomes clear that proposed art or personal ornaments could expand even further still for the MSA and MP where such denominations of artefacts are not as forthcoming as they are particularly in the UP. For sound tools, the inventories are rather short; actual MSA and MP sound tools – to include the organological categories *bullroarer*, and *scraper* – feature in a recent inventory by Michael Praxmarer. These include: - a possible bullroarer from Tata (Hungary); and possible scrapers from Schulen (Belgium) and, from Grotte Vaufrey, Cénac-et-Saint-Julien (France), ([Praxmarer 2019: 89-90/table 1](#), referring to [Zagiba1976/fig. 1/2](#); [Morley 2003: 37; Fig. 3.4](#) respectively). Praxmarer adds two finds from sites in Border Cave (South Africa), and Kolosovskaya Neanderthal site (Crimea), as additional scrapers ([Praxmarer 2022: 113; 115/fig.4.3, 5, 6](#) referring to [d’Errico et al. 2017](#); [Majkić et al. 2017](#)) from the MSA and MP respectively. The last item here is the raven radius with seven notches, mentioned above, and I believe that to run a fingernail down such an item would make a nice pleasing sound pattern. It would be insightful to get Praxmarer’s ideas on Lund Probability in his inventory for these. From other inventories that I will come to, the only other type of musical instrument listed for this early on in time, is the Mousterian phalangeal whistle, of which there are numerous from La Quina in France, and from Prolom II in Crimea ([Morley 2013](#)). Other categories from Praxmarer include struck percussion (*schlagzeug*), and music bows (*musikbogen*) but these only exist in UP contexts. One of the music bows is from the Swabian Aurignacian found at Geissenklösterle in the same context with two of the *Ach flutes*.

Finally, There is another sound tool which features in both Klein’s and Praxmarer’s inventories which requires attention here, as related to the Neanderthals who we can assume were highly musical (*cf.* [Mithen 2006](#)). Klein asserts, however, that “the archaeology of the Neanderthals does not suggest they were especially intelligent” ([Klein 2009: 637](#)). Klein’s view finds itself in conflict with an opinion that “generally recognised flutes, as an invention of modern man, have lower capacity as musical instruments than the disputed find from Divje babe” ([Turk et al. 2014: 257](#) referring to [Horusitzky 2006: 339](#); and [Dimkaroski 2014](#)). The musical instrument in question is the Mousterian Divje babe I artefact, described as “A juvenile bear femur shaft with four evenly spaced perforations suggesting a flute-like musical instrument” ([Klein: 2009: 530/table 6.8](#)). This will be presented in the next section.

Many music archaeologists – according to a consensus at the panel discussion at the 2017 symposium in Cajsja S. Lund’s honour – secretly desire with all their hearts that every sound-tool discovery will make it into the Lund Probability Group 1 (LPG 1), even though Lund’s favourite category happens to be LPG 5 (discussed in [Gill 2020: 57](#)). Schooled music archaeologists appreciate the problems concerned with the nature of interpreting finds from the archaeological record as sound tools. Even when a find is considered unequivocally LPG 1, there will always be doubt because reconstruction is always open to new possibility (i.e., [Austin 1962](#) and [Derrida 1982](#) referenced in [Kramer 2006: 7-17](#)). [Turk et al. \(2018: 18\)](#) infer that they are not of this opinion, writing that “According to some authors, the key criteria for a supposed Palaeolithic find to be declared a musical instrument is its playability” (referring to [Dauvois 2005, 232](#); [Conard and Malina 2008, 15](#)). This is clearly a problem because “Within positivist approaches [...] more emphasis on testability than there is on whether the theories being used are interesting or valuable” ([Hodder 1982: 2](#); *cf.* [Trigger 2006: 2: 17; 29-30: 387; 400: 452; 530: 578](#)) goes against

the grain of the artistic/musical credo which music-archaeological exploration actually demands in practice. Lund helpfully resolves this error because music of the past, including deep past, has not till fairly recently been recorded so that we can play it back to hear it again (but see Kristiansen who holds out hope [2014: 27-28](#)). So for the sake of Music Archaeology, and in all clarity:

It would indeed be a significant advance for music archaeology if we could, in some way, at some time or other, verify that a possible bullroarer really is a bullroarer (or that a possible buzz-bone really is such, or that a potential rattle is a rattle, a potential phalange flute a phalange flute [...]) However, that an artefact can produce sounds [...] does not prove that this artefact was actually used as a sound tool ([Lund 1998: 19](#)).

### 3.3.2 A TIDLDIBAB AND A MIRLITON

Accepting that Neanderthals were musically intelligent is not a difficult proposition, but was there ever a time that Mousterian people were making and playing flutes? From Divje babe, a young-bear femur labelled Divje babe I was unearthed in the Upper Pleistocene Paleolithic cave site in Slovenia. Designated an artefact and not an ecofact, it was first reported in 1995 by Ivan Turk, Janez Dirjec, and B. Kavur, and a quarter of a century later continues to be defended by Matija Turk, Ivan Turk and Marcel Otte in “The Neanderthal Musical Instrument from Divje Babe I Cave (Slovenia): A Critical Review of the Discussion” ([Matija Turk et al. 2020](#)). This is one of the most recent of numerous articles relating to the find, to include a colossal collection of articles in two volumes<sup>28</sup> about the Divje babe I phenomenon. A CD called “Sonorities of the Tiddibab” ([Dimkaroski 2013](#)) accompanies the volume “Divje babe I. Upper Pleistocene Palaeolithic site in Slovenia. Part II: Archaeology” ([Horvat et al. 2014](#)). TIDLDIBAB is code for: - *TI* for Ivan Turk (the archaeologist who discovered the Divje babe I artefact); *DL* for Ljuben Dimkaroski (the musician who managed to reconstruct and play it impressively as a flute-like instrument); and *DI BAB* for Divje babe ([Dimkaroski 2014](#)).

Dated from charcoal, cave bear bones and teeth, the find is between 50 and 60 ka, ([Turk et al. 2018: 1](#)) and was excavated from the same Mousterian horizon (D-1) as a side-scraper that has a thinned back, and denticulate edge ([Turk et al. 2018: 9/fig. 6](#)). The hearth evidence places the find in relation to fire making. There is an absence of obvious working traces on the Slovenian find in association with the symmetrically-aligned perforations (not including the existence of the holes themselves). It has never been suggested that the holes had been scraped into the bone, as is evident in the case for the *Ach flutes*. To the eye, the perforations on the Divje babe I look like two-to-possibly-four (or two and two-half) fingerholes along the anterior longitude of a sort of short flute, with what looks like a corresponding thumb hole on the posterior longitude. Results of more recent research under the microscope identify an anthropogenic index in relation to a “Depression near hole no. 3 on the posterior side of the diaphysis and location of two parallel micro-scores on the abraded surface of cortical bone” ([Turk et al. 2020: fig. 5](#)).

<sup>28</sup> The second volume I was gifted together with a beautiful brooch in the image of the find, at GLASBA V KAMENI DOBI *Music in the Stone Age* – International Council for Traditional Music (ICTM) Study Group on Music Archaeology XV Symposium, and Workshop of the European Music Archaeology Project (EMAP), Ljubljana (Slovenia), 24<sup>th</sup> - 26<sup>th</sup> August 2017.

It is possible to make perforations on such a bone just like the ones on the find but without leaving any anthropogenic index. This I witnessed with fellow music archaeologists in a demonstration by Giuliano Bastiani at the ICTM Study Group on Music Archaeology XV Symposium and Workshop of the European Music Archaeology Project (EMAP) – Music in the Stone Age – Ljubljana, Slovenia, 24th - 26th August 2017. At the same symposium we were treated to memorable flute performances by Katinka Dimkaroski on a reconstruction of the find following in the ‘flute steps’ of her father, Ljuben Dimkaroski who had made the TIDLIDIBAB ([Dimkaroski 2014](#)).

I have interviewed an artisan in Sweden who regularly makes reconstructions of Divje babe I, as part of my bachelors-archaeology essay ([Gill 2012](#)); attended a round table discussion at the 2016 Stone Age Music symposium in Ljubljana (which I recorded in situ, with permission); have had correspondence on the subject with Jelle Atema in relation to his article “Musical Origins and the Stone Age Evolution of Flutes” ([2014](#)); have had insightful correspondence with Bostjan Odar; plus have made a presentation about the find<sup>29</sup> incorporating some microscopic imagery from Divje babe I showing possible anthropogenic markings, shared by Odar. I am urged to believe that the presence of spongiosa in a cave bear femur is of no obstruction to sound production either with spongiosa intact, or through the apparently relatively easy removal of it, which was an objection that we had raised in a co-authored paper ([Münzel \*et al.\* 2016: 225](#)). This was raised again by Susanne Münzel at the symposium but critically not actually demonstrated in the table discussion when she requested it; time ran out and I am still not sure if the effective playing of a flute with spongiosa was ever demonstrated to her satisfaction or not.

Ivan Turk, Janez Dirjec and Matja Turk published a critique of the taphonomic interpretation of the find addressing every (published) argument for a non-anthropogenic origin of the perforations that had been made since the discovery (of which there are numerous). If the information in their article is accurate then claims for a non-anthropogenic origin of the finger holes may need revision in several important respects. However trusting that the possibility for a non-anthropogenic origin of the perforations is truly exhausted (and it may well be), does this automatically prove that a Neanderthal *did* make the holes? Turk *et al.* have already concluded that “doubt is no longer justified” ([2014: 268](#)).

Praxmarer has reconstructed Divje babe as a mirliton/voice disguiser ([2022: 136/fig. 4.12. 1](#)) which is a very different instrument to the TIDLIDIBAB. This at least proves the fact that interpretations can vary. A flautist playing a reconstruction of a find, and the physical reconstruction of that find which she is playing on, are both forms of interpretation, and often musicians are asked to play on reconstructions someone else has made. Interpretations can vary at pivotal points during processes which can render different outcomes during the chaîne opératoire of instrumental music making, with the TIDLIDIBAB and the mirliton as a prime example. This is problematized by Tellef Kvifte ([1989: 53](#) cited in [Ternhag 2007b: 28](#)) who asks “How can one know whether an instrument should be classified as an idiophone, membranophone, chordophone, or aerophone if the playing method is unknown?” Results may

---

<sup>29</sup> This was called: *There's no place like home: Divje babe*, at the “Seminar in honour of Mats Larsson” at Linnaeus University, Kalmar, Sweden, September 26th - 27th 2017.

continue to vary for the acoustic vocabulary of the same instrument according to anatomy and capability of the instrumentalist (Potengowski's monograph in Münzel *et al.* 2016: 231). To the sum of all these possibilities can be added the direction (or even agenda) of the player, as many players go on to make successful careers from playing archaeological finds in certain ways. There is not so much written about the agency of external demands on the courteousness of research-practitioners in relation to how expectations may influence results.

The well-travelled debates on *music authenticity* problematise a range of issues such as the performance of historical works being a “most modern style” of the present, vis-à-vis “The pastness of the present and the presence of the past” (Taruskin 1988: 152). In the case for pre/deep-historical music, it may be argued that performing-practice agendas are even more super plastic (Lawson 2010), because practitioners usually are the ones making up (composing) their own material, e.g., without a Stone-Age-musical score to play from, practitioners are forced to create something of their own invention. They may perform a work on a reconstruction of an archaeological find by a 20<sup>th</sup> century composer, like a musical performance of John Cage's piece “Ryoanji”, for example! (listen to Potengowski and Wieland 2017; track 4).

There are no other finds quite like Divje babe I, and therefore no other instances to reinforce a typology. The spaces between each ‘fingerhole’ on the diaphysis suggest a coherent acoustic pattern to the ‘eye’ which gives an impression that a ‘flute’ was indeed intended. Against continued contention, the ‘certitude’ of at least one music archaeologist has since been ‘broken’, as expressed by Jean-Loup Ringot at the round table in Ljubljana in 2017 (from an unpublished recording by Gill 2017). My impression is that there seems to be currently a resistance from the scientific academic community in general to re-engage with the debate surrounding Divje babe I. The artistic Music Archaeology community is super accommodating and flexible; The European Music Archaeology Project (EMAP) team exhibited a replica of Divje babe I and a reconstruction of it together in a cabinet alongside reconstructions and find replicas of other melodic-wind instruments from the Stone Age. These included two out of the three *Acb* flutes (GK3 and HF1), and the exhibition travelled around Europe<sup>30</sup>. Divje babe I represents an iconic case study for debating music-archaeology theory. I am often pressed to affirm one way or another if Divje babe I is a flute. The only response that I am prepared to concede is to assert that I have been wrong before.

### 3.4 SOUND TOOL INVENTORIES FOR THE STONE AGE

Different researchers have grouped various sound-tool artefacts in different ways according to different criteria for sound-tool finds belonging to the MSA and LSA in Africa, and MP in UP in Europe, respectively (with the term ‘Mousterian’ being used periodically to describe the MP). It must be noted that the general category *wind instruments* appears as having the most entries of all extant sound-tool finds in the archaeological record for the archaeological periods given above.

---

<sup>30</sup> Two of these I visited (Ystad in summer 2016, and Ljubljana in summer 2017, respectively).

This is the basis for my hypothesis *Immutable Flute* in the sense that a flute is simply a type of *flue* or *vessel* in its most basic sense, and that humans have been blowing such flues and vessels in different ways for a long time. The ontological compulsion to play with such tubes and containers, through time and place, can in the sense be rationalised as unstoppable, and a condition of being human. These most basic instrumental (melodic) forms, appreciated in the simple cylindrical and spherical forms which are tubular bones, can be blown to instantly produce sonic-sinusoidal perfection. The classic inventory of photographs of flutes from the Middle Ages by Christine Brade (1975) is a reminder that the basic flute form, clearly reminiscent of the Palaeolithic material, would seem to be an everlasting phenomenon.

In chapter one I referred to the *Ach flutes* as ‘melodic-wind instruments’ which some researchers refer to as ‘flutes’ and others as ‘pipes’. ‘Melodic-wind instruments’ isn’t an official organological classification it is just a term which I use to delineate wind instruments that are designed to be fingered, from wind instruments like bullroarers that are known as ‘free’ aerophones. It recognizes that melodies and melodic patterns are equally possible on wind instruments without fingerholes, e.g., panpipes, and whistles of all types. Melodic patterns are indeed possible on *all* sound producing objects, e.g., bull roarers can produce melismatic (plastic) melody; this rather depends on how one defines melody. *Fingered-wind* might otherwise be another term but since the frequency manipulation of the *Ach flutes* has been found not to be reliant on finger manipulation in absolute terms, and there are possibilities to achieve harmonic intervals (see APPENDIX 5), this term is not entirely accurate. In the vulture-radius flute experiment in this research (Chapter 7, section 18), my results also demonstrate the possibility to build harmonic textures in particularly resonant places so that a flute isn’t exclusively a melody instrument either. Melodic-wind instruments like the *Ach flutes* are types of wind instruments that I would place in Lund Probability Group 1 (LPG 1).

I refer to three current sources of inventorial research (Morley 2013; García-Benito *et al.* 2016; Praxmarer 2019) which between them refer to a handful of other sources. Of these, the earliest inventory is by Gilbert Fages and Cécile Mourer-Chauviré (1983) who listed thirty Palaeolithic flutes (Morley 2005: 215 referring to Dams 1985; Lawson *et al.* 1998). The next inventory is by Dominique Buisson (1990) which focuses on fragmented Palaeolithic flutes from the site of Isturitz in the Pyrenees. These artefacts are often compared with the *Ach flutes*. Thirdly, there is the inventory (not available in published form) which is the doctoral thesis by Paula Marie Theresa Scothern<sup>31</sup> held by Cambridge University Library, to which Iain Morley added 15 more entries to the 122 “sections or fragments of bone” that she lists, in addition to 90 or so phalangeal whistles (Morley 2005: 214-215). There is also another inventory that I will come to later and this is the list of flutes that Ewa Dutkiewicz itemises in her 2021 monograph about signs, marks, patterns, and symbols in the Swabian Aurignacian. This is refigured in my own inventory APPENDIX 3, with a report on this in APPENDIX 4.

Morley has compiled three inventories that I will come to which are published in three tables in his appendix for ‘The Prehistory of Music’ (2013), plus three additional tables, the first of which

---

<sup>31</sup> The book is referenced as from 1993 in the Cambridge University records but in all the music-archaeology literature it is referenced as from 1992. I will keep the 1992 reference following Morley (2013).

is called “Pipe finds from the Ach Valley<sup>32</sup>, Germany” (2013: 43-45/table 3.1), the second being “Inventory of Isturitz pipes discussed by Buisson (1990) in chronological order” (2013: 43-45/table 3.3 55-75) and the table called “Isturitz pipes listed as ‘lost’ by Scothern (1992)” (2013: 43-45/table 3.4 77-83). He gets round the ‘pipe’ versus ‘flute’ pedantry by listing all reputed Palaeolithic finds of this type as both “flutes and pipes” in one category (Morley 2013: Appendix table 1). Whilst this is a comprehensive inventory of all Palaeolithic wind instruments excluding bullroarers, and phalangeal whistles, it is only so by default because there are no listed items from Africa (although see next paragraph). There are only two entries which are possibly of MP origin for which stratigraphic certainty is either non-existent or dubious. Otherwise the periods of all other entries belong exclusively to the UP, to include: - Aurignacien; Gravettian; Solutrean; and Magdalenian. It is quite conclusive that the evidence for melodic-wind playing explodes on to the archaeological scene not before the UP. The full list of descriptions that Morley documents in this table includes: - Flute; Flute fragment; 3 bone tubes; Bone tube; Pipe fragment; Bone fragment; Whistle; Bone pipe/whistle?; Whistle?; 2 pipes/whistles?; Notched whistle-flute; Whistle-flute; 4 bone pipes; Bone pipe; Signal pipe?; 4 bone fragments; Flute/whistle fragment? N.B. these are not Morley’s classifications; these are how other researchers have described the finds which he documents.

In a second table Morley places all recorded finds of this same category differentiated on a basis of finds being “originally reputed to be pipes and flutes but since deemed unlikely” (Morley 2013: Appendix table 2), and here he places Divje babe I, a MSA whistle from Haua Fteah in Libya, and a Mousterian hare bone from Kent’s Cavern in Britain. All other entries are from UP contexts. In conclusion therefore – at least according to this, and the aforementioned inventory – evidence for flute playing of this type across MSA, MP, and also LSA contexts, is remote.

In a third table (Morley 2013: Appendix table 3), Morley adds reputed phalangeal whistles (e.g., from reindeer bone). Here it is a nice surprise that there is considerable quantity of whistles from two independent Mousterian contexts; “numerous” whistles are recorded at La Quina in France (where perforation are pressure punctured), and 74 whistles are recorded at Prolom II in Crimea. Even if the Mousterians weren’t flute playing en masse (apparently), they were certainly using whistles and this is certainly significant. Klein’s separation of the Venus, and engraved ochre above, plus the separation of shaped OES beads, and tick shells, automatically engages another comparison here between Phalangeal whistles, and types of melodic wind such as the *Ach flutes*. It would not be difficult to make an argument that one type of sound tool appears more sophisticated than the other, and because anyway, *music is in the ear of the beholder*<sup>33</sup>. Phalangeal whistles are “small whistles made not using a bone tube but a pierced toe bone” (Morley 2013: 34) which Morley describes referring to R. A. Harrison (1978);

These objects consist of a phalanx bone pierced, in most cases, with a single hole at the proximal end of the posterior surface [...] The product of this is a small hollow vessel-flute; by placing the proximal end of the phalanx against the lower lip, one can blow over the top of the hole to produce a clear tone (Morley 2013: 100).

<sup>32</sup> Morley lists Vogelherd as being in the Ach Valley. NB Vogelherd is in the Lone Valley (see [Figure 5.2].

<sup>33</sup> I introduced this notion of the *ear of the beholder* to Jelle Atema in our telephone conversations and correspondence about ancient flutes, and who published this perspective in his article (2014).

I think that phalangeal whistles belong in Lund Probability Group 2 (LPG 2). Due to their abundance across the UP Harrison thinks that they must have been a “basic item” (Harrison 1978: 20). The type of embouchure needed to make a signal on such whistles is similar to blowing over the top of a bottle, i.e., a normative flute embouchure. The whistles remind me a little bit, in appearance, of small, pierced, pig-metapodials (the buzz bones known in German as *Schnurrer*) that were attached to string and buzz when played (Lund 1979: 53-54; 1980: 7). This happens by winding the string on either side of the bone so as to make the yarn completely twisted, then releasing and stretching the yarn – in and out, and in an out, and so on – which produces a whirring sound. However buzz bones have two perforations on either side of the bone to thread twine through. Lund uses the buzz bones as a typical example of LPG 2 (Lund 1981: 247).

García-Benito *et al.* take stock of all the entries in Morley’s table 1 and 3, noting that together the items add up to around 300 artefacts. These are “flutes and pipes (105), notched whistle-flutes, whistles and phalangeal whistles (185)” (2018: 124 referring to Morley 2013: appendices 1 and 3). García-Benito *et al.* have narrowed down an inventory for “Aerophones with holes for musical fingering” (García Benito *et al.* 2016: 240-241/table 1), which lists the type of LPG 1 melodic-wind instrument finds, and associated fragments which may be said to epitomise the *Ach flutes*. To be included here are the flutes from Isturitz, of which one specimen is the focus of the experimental study in their article which houses their selection of sound tools of this type. This inventory therefore excludes plain-bone tubes and general whistle finds. There are no examples in this inventory listed as dated earlier than the Aurignacian, and all items listed – apart from a find called Peyrat 2 from the Magdalenian – are found in Morley’s inventory (table 1). All listed items are therefore also from the UP.

Michael Praxmarer (2019: 90-91/table 2) also follows the trend as García-Benito *et al.* do (2016), to hone in on what he refers to as intentionally manufactured wind instruments of the Upper Palaeolithic, with his first selection comprising ‘20’ entries (compared with García-Benito *et al.*’s ‘38’ entries above). Taking Morley’s lead, ‘11’ more entries under the heading of supposed aerophones of the UP (with ‘2’ entries actually listed in MP contexts, one being Divje babe I, and another from Austria) are presented in a separate table (2019: 92/table 3). Praxmarer illustrates ‘15’ of what he considers to be the “Best preserved intentionally produced aerophones in Upper Palaeolithic Europe” (Praxmarer 2019: 83/fig. 4; 2022: 148/fig. 4.18). These include the ‘3’ principle *Ach flutes*, which represent the earliest finds of this type in an Aurignacian context. Then there are ‘3’ more significant finds listed here all coming from Isturitz Cave (Saint Martin d’Arberoue) in the Arberoue Valley on Mount Gaztelu, in the French Pyrenees (Buisson 1990). The Isturitz finds – that also feature in the inventorial work of Morley (2013) and García-Benito *et al.* (2016) – require a special mention not least because one of them comes from an Aurignacian horizon. They belong to a collection of Upper Palaeolithic vulture ulnae exhibiting intentionally-perforated *fingerholes*. Graeme Lawson and Francesco d’Errico describe the Aurignacian specimen, writing that “the surviving portion includes one end and bears no fewer than three finger-holes” (2002: 119). Discovered in 1921, the find as referenced by Lawson and

d’Errico (2002) as 77142(a) [DB 4.1] is the only example out of originally twenty-plus<sup>34</sup> fragments that is this old. Of the remaining fragments, Dominique Buisson, in 1990, had refitted two separate flutes from fragments in the collection finds, as accounted by Lawson and d’Errico;

..amongst the pieces of worked bird-bone tube from E. Passemard’s 1914 season in the northern chamber (Salle Nord) there was one, 75252-A3, which not only matched but actually fitted, perfectly, the already substantial remains of what had hitherto appeared to be quite another pipe, from R. and S. Saint-Périer’s later (1939) excavations in the Salle Isturitz, 83888(a) [DB 2] [...] Amongst the remaining finds he was able to obtain a second important refitting which yielded another specimen, almost as complete, 86757(a) [DB 5.1] (Lawson and d’Errico 2002: 219).

The piece 75252-A3 (top) / 83888(a) [DB 2] is described as a “complete four-hole pipe”, and the piece 86757(a) [DB 5.1], a “near-complete four-hole specimen” (Lawson and d’Errico 2002: 119; 138/Plate 1). It is usually the most complete one that is frequently reconstructed and played (e.g., Lawson and d’Errico 2002: 121; Wyatt 2016b; Münzel *et al.* 2016; García Benito *et al.* 2016a; 2016b; Jean-Loup Ringot and Barnaby Brown (EMAP); and Praxmarer 2022). This Isturitz find is also commonly associated with the *Ach flutes*. For example, in a joint paper it was reconstructed by Wulf Hein, and tested by Anna Friederike Potengowski, because it “provides a useful reference for the incomplete finds from the Swabian Jura” (Münzel *et al.* 2016: 227) but it should be remembered that this most complete flute from Isturitz is not technically an Aurignacian artefact, since it is allocated to the Gravettian period (Lawson and d’Errico 2002: 121, etc.). The *Ach flutes* plus two refitted Isturitz flutes (melodic wind instruments / pipes), and the incomplete Aurignacian specimen all feature in Praxmarer’s list and illustrations of the best preserved collection UP aerophones of Europe. The remaining nine in his selection of fifteen consist of the following. N.B., the tube lengths given are those from Praxmarer (2019: 90-91/table 2);

Under the heading ‘Périgordien’<sup>35</sup>, Praxmarer lists: –

- a “bird bone, three fingerholes preserved” from Pair-non-Pair, France<sup>36</sup> with a length of 121 mm;
- a “bird bone, three fingerholes preserved” from Abri Lespoux, France<sup>37</sup> with a length of 58 mm;
- and a “mammal bone, two fingerholes preserved” from Les Roches, France<sup>38</sup> with a length of 123 mm.

<sup>34</sup> See Morley 2013: 76 for an impressive attempt to untangle all the entanglements.

<sup>35</sup> The term Périgordien is not so frequently used. Depending on precise classification, the Périgordien is currently ‘translated’ into the Aurignacien, the Gravettian, the Solutrean, or the Magdalenian.

<sup>36</sup> (Praxmarer 2022: 148/fig. 4.18. 4. from, Fages and Mourer-Chauviré 1983: 100);

<sup>37</sup> (Praxmarer 2022: 148/fig. 4.18. 5. from, Fages and Mourer-Chauviré 1983: 100);

<sup>38</sup> (Praxmarer 2022: 148/fig. 4.18. 11. from, Atema 2014/fig. 4.A).

Under the heading ‘Magdalénien’, Praxmarer lists: -

- a “mammal bone, four fingerholes preserved” from Peyrat, France<sup>39</sup> with a length of 60 mm;
- a “mammal bone, four fingerholes preserved” from Pas du Miroir, France<sup>40</sup> with a length of 166 mm;
- a “hollow antler, four fingerholes preserved” from Moldova V, Ukraine<sup>41</sup> with a length of 196 or 210 mm;
- a “hollow antler unfinished because broken, five fingerholes preserved” Moldova V, Ukraine<sup>42</sup> with a length of 195 mm;
- and a “mammal bone, three fingerholes preserved” Grubgraben, Austria<sup>43</sup> with a length of 156 mm.

From the ‘end of the Upper Palaeolithic’, Praxmarer lists,

- a “hollow antler, four fingerholes preserved” from Moldova V, Ukraine<sup>44</sup>.

Praxmarer presents a table for European UP sound tools which include: - bullroarers, that strictly speaking are also wind instruments as ‘free’ aerophones (*schwirrholz*); scrapers (*scraper*), struck percussion (*schlagzeug*), and music bows (*musikbogen*). Out of an initial list of 11 bullroarers there is one in a MP context carrying the description ‘possible’, as noted earlier, to which he has added two more (one from the MP and the other from the MSA). Another is the German Swabian Aurignacian example made from ivory at Vogelherd in the Lone Valley ([Praxmarer 2019: 89 referring to Holdermann 2001: 92](#)). The rest are dated to later UP periods that follow on chronologically from the Aurignacian ([Praxmarer 2019: 89-90/table 1](#)). He has subsequently re-identified two more finds as bullroarers, one of which is from Isturitz (France), and another from Tischofer Cave in Austria ([Praxmarer 2022: 127-128](#)). From his list of 13 scrapers, there are two from MP contexts, as noted earlier, and two from the Aurignacian: - one from Cro-Magnon, in France (referring to [Holdermann 2001: 90](#)); and the other from Geissenklösterle which I will come to in the next chapter along with the Aurignacian music bows, also from Geissenklösterle.

---

<sup>39</sup> ([Praxmarer 2022: 148/fig. 4.18, 9](#), from, [Fages and Mourer-Chauviré 1983: 100](#));

<sup>40</sup> ([Praxmarer 2022: 148/fig. 4.18, 12](#), from, [Fages and Mourer-Chauviré 1983: 100](#));

<sup>41</sup> ([Praxmarer 2022: 148/fig. 4.18, 13](#), from, [Fages and Mourer-Chauviré 1983: 100](#)).

<sup>42</sup> ([Praxmarer 2022: 148/fig. 4.18, 15](#), from, [Lucius 1969/pl. XLII/6](#));

<sup>43</sup> ([Praxmarer 2022: 148./fig. 4.18, 10](#), from, [Einwögerer et al. 1998: 23](#)).

<sup>44</sup> ([Praxmarer 2022: 148/fig. 4.18, 14](#), from, [Fages and Mourer-Chauviré 1983: 100](#)).

### 3.5 SHIFTING TO THE UPPER PALAEOLITHIC (UP)

Skeletal remains discovered in the mid nineteenth-century from the cave sites of: - Goat's Hole (Paviland, South Wales); a hillside cave near Aurignac (in the lower Pyrenees, southwestern France); and the Cro-Magnon rock shelter in Les Eyzies (Dordogne, southwestern France), initially documented, what was thought to be evidence for the earliest modern humans in Europe (Klein 2009: 616-617). The Aurignac cave is from where the 'Aurignacian' takes its name. The Natural History Review published an article in 1862 which describes how a man called J. B. Bonnemaïson in 1852 had been repairing the road from Aurignac to Boulogne. This led to his discovery of a cavern containing human bones, large animal teeth, and eighteen small pierced discs, as from a necklace or bracelet. Dr. Amiel, the Mayor of Aurignac, subsequently collected the human remains (to curb mounting gossip) and re-interred what turned out to be a group of seventeen individuals in the parish burial ground. Édouard Lartet [1801-1871] who had written the article became involved in investigating the finds, and following his own 1860 excavation there, concluded,

Palæontologically, the human race of Aurignac belongs to the remotest antiquity, to which, up to the present time, the existence of man or the vestiges of his industry have been traced. This race, in fact, was evidently contemporary with the Aurochs, Reindeer, Gigantic Elk, Rhinoceros, Hyæna, &c. ; and what is more, with the Great Cave Bear (*U. spelæus*), which would appear to have been the earliest to disappear in the group of great mammals, generally regarded as characteristic of the last geological period (Lartet 1862: 62).

Klein explains that the Aurignac skeletons are probably Neolithic (Klein 2009: 617) yet the Aurignacian is still used by archaeologists and is associated with the beginning of the Upper Palaeolithic. Some of the oldest modern human fossils in Europe dated in Aurignacian contexts to between 40 and 30 ka are noted by Klein from the sites of La Crouzade, La Grotte des Rois, and Brassempouy in France (*ibid.* 586). In the last two decades there have been new discoveries, both of new fossils, and new research from fossils previously excavated or found. When fossils and artefacts are not found together, diagnosing the makers of the materials becomes problematic. Here follows a short review culminating in the latest data available and current theories.

Josef Szombathy's 1881 excavations at the Mladeč Cave in the Czech Republic revealed modern-human fossils together with archaeological material. Martin Oliva's retrospective describes how the sorting of materials was problematic with decades-long periods between collecting and publishing material, sparse documentation, and confusion in the literature (Oliva 2006: 41). The most coherently documented archaeological context comes from the 1882 excavation, in upper sediments in the part of the cave known as *The Dome of the Dead*, with "22 perforated animal teeth, a long bone point, several fragments of points or awls, a used lower jaw of *Ursus spelæus*, and two flint artefacts (Szombathy 1925: 8): These finds were mixed with bones of reindeer and *Bos* or *Bison*, and with human skeletal fragments" (Oliva 2006: 41). The full collection of hominin finds from Mladeč includes a female skull with derived modern features (Mladeč 1) and an upper jaw of a male (Mladeč 8) with modern and archaic features (Wild *et al.* 2005: 332/fig. 1). Eva M. Wild *et al.* took sample material from teeth and an ulna for <sup>14</sup>C dating. Dates for the teeth gave

uncalibrated ages of  $\sim 31,000$   $^{14}\text{C}$  Before Present (BP), with the dating of the bone, more recent and less-certain. Writing at the time they assert that “These data are sufficient to confirm that the Mladeč human assemblage is the oldest cranial, dental and postcranial assemblage of early modern humans in Europe” (Wild *et al.* 2005: 332), adding that other examples in the fossil record do not have “a secure and diagnostic archaeological association”. Here they mention evidence from Peștera cu Oase, (Romania) at  $\sim 35,000$   $^{14}\text{C}$  BP, plus:- the Kent’s Cavern (UK) maxilla at  $\sim 31,000$   $^{14}\text{C}$  BP; the Peștera Muierii (Romania) remains at  $\sim 30,000$   $^{14}\text{C}$  BP; and the Peștera Cioclovina (Romania) cranium at  $\sim 29,000$   $^{14}\text{C}$  BP. They also note time overlaps with “late Neanderthals” from Vindija (Croatia) at  $\sim 29,000$   $^{14}\text{C}$  BP; and Arcy-sur-Cure (France) at  $\sim 34,000$   $^{14}\text{C}$  BP in the article (Wild *et al.* 2005: 332, with references).

From 2003 to 2005, a modern human cranium of an adolescent (“Oase 2”) was found on the surface of the Peștera cu Oase, situated in the southwestern Carpathian Mountains (Romania), revealing “a suite of derived modern human and/or non-Neanderthal features”. Although it was found without archaeological association it is firmly dated to 40.5 before the present (35 ka  $^{14}\text{C}$  B.P.) (Rougier *et al.* 2007) placing the cranium as the earliest modern-human in Europe at the time of publication. The analysed DNA from a human mandible found in 2002 from the same site (“Oase 1”) – dated 34,950, +990, – 890 years BP (Trinkaus *et al.* 2003) – reveals that 6-9% of this individual’s genome is derived from Neanderthals.. The individual had had a great-great-grandparent (or maybe plus two more generations) who was Neanderthal (Fu *et al.* 2015). Current dates for this specimen places it as being older still (Hajdinjak *et al.* 2021).

Writing in 2016, Cosimo Posth *et al.* report that the genetic identity of the hunter-gatherers arriving about 45 ka in Europe is unknown (see Sümer *et al.* 2025 below). Their research recovered mitochondrial DNA (mtDNA) from a sample of 35 ancient modern humans from Italy, Germany, Belgium, France, Czech Republic, and Romania, dating in range from 35 to 7ka, (but not including ‘Oase 1’). They compare their results with the genetic makeup of non-African people living today, differentiating Asians, Australasians, and Native Americans – belonging to two clades M and N – from non-Africans with European ancestry but who lack the M lineage. Out of 18 from their sample of ancient modern humans dated to before the Last glacial maximum, three of them carry the basal mtDNA lineage M, consistent with the model for a rapid dispersal at least 45 ka of one source population into Europe carrying both the M and N basal mtDNA haplogroups (hgs).

Hublin refers to “so-called modern humans” as the species that arrived in Western Eurasia from Africa to a place inhabited by Neanderthals. Questions arise concerning “local Neanderthals and the late members of our species at the limit between the Middle and Upper Palaeolithic” and Hublin considers a time frame between 50 and 35 ka cal Before Present (BP) for its assessment (Hublin 2015: 194). According to Hublin these issues concern both interbreeding, and exchanges of ideas, practices, and habits. It is worth noting the following:

Although it is heuristically useful to equate the Neanderthals and the Mousterian, it is important to stress that, strictly speaking, this is incorrect. The people who made Mousterian/MSA artifacts in Africa were clearly not Neanderthals, and at Saint-Césaire and especially Arcy-sur-Cure (Grotte de Renne) in France, Neanderthal fossils are associated with Châtelperronian artifacts, which some specialists assign to the early Upper Paleolithic” (Klein 2009: 484).

Current research into the biological identity of the people during the shift to the UP (commonly referred to as a ‘transition’) concerns the makers of the Châtelperronian, under the group title of ‘transitional assemblages’ (TA), represented mainly in western Europe extending into central Europe, and even the Balkans and Greece (Hublin 2015; Gicqueau *et al.* 2023). Arthur Gicqueau *et al.* describe the Châtelperronian as a new techno-cultural complex appearing in the archaeological record around 42 ka for Western Europe coinciding with the expansion of AMH (2023). Other groups of TA as presented by Hublin consist of: - the *Szeletian* (Czech Republic and Hungary); the “*Lincombian-Ranisian-Jerzmanowician*” (LRJ) – comprising the Lincombian (southern UK and Belgium), the Ranisian/Altmühlian (Germany), and Jerzmanowician (Poland) – and the *Uluçian* (southern Italy and Greece). Whether the Neanderthals authored the changes themselves, or were influenced by the ways of the newcomers, is an ongoing issue (Hublin 2015: 198-202).

Hublin refers to the Châtelperronian dated to about 44 to 40 ka cal BP as “the most iconic of the transitional assemblages” with over 40-listed sites, writing that “it generally displays little evidence of MP components in its lithic production”. However there are arguments for the Châtelperronian being transitional vis-à-vis being ‘rooted’ in the local *Mousterian of Acheulean Tradition* i.e., from observations arguing the presence of similarities in the production of artefacts, e.g., various emphases concerning backed pieces. He pinpoints the *Grotte de Renne* (GDR) at Arcy-sur-Cure with “multiple Châtelperronian layers” as the jewel in the crown for this particular TA group (Hublin 2015: 200-201). A fossil from an early anatomically modern human together with 11 Neanderthal fossils retrieved from the base of the Châtelperronian sequence (layer Xb2) has been identified recently. Prior to this there had been no modern-human fossils in these layers, just Neanderthal ones, clearly significant to arguments in recent decades concerning which hominin species had made the ‘transitional’ products recovered from the site. The fossil is a neonate ilium (AR-63) which differs from those of Neanderthals geometric-morphometrically, although it is slightly outside the variability of living humans, dated (but without absolute dating) to between 45 and 41 ka cal BP (Gicqueau *et al.* 2023).

Pivotal to the debates corresponding to the MP / UP transition is the subsequent demise of indigenous Neanderthal people who were supplanted by modern-human people. This wave of modern humans may not have been the first into Eurasia either, with an earlier (partly unsuccessful) wave between 60 and 50 ka BP in southwest Asia, eastern and central Europe, and central Asia but which apparently never got so far as western Europe (Hublin 2015). Evidence for modern human ‘incursion’ as early as this in France at Grotte Mandrin from between 56,800 and 51,700 years’ ago, currently provides the earliest evidence to suggest the ‘presence’ of modern humans in Europe (Slimak *et al.* 2022), however Dorothea Mylopotamitaki *et al.* (2024: 345) point out that the deciduous tooth in question has not been directly dated and genetically identified. Nevertheless, in the same archaeological layer is a direct association with evidence of industry. The stratigraphic sequences at Mandrin – with twelve archaeological layers encompassing the limit between the MP and the UP – yield the presence of at least seven individuals as represented from nine dental specimens. Whilst Neanderthals are identified from four levels (C, D, F and G), the authors reveal that the “Man12 E 1300 specimen from layer E is unequivocally classified as an Upper Pleistocene modern human”. In the same layer E, ‘Neronian’ nanopoints and micropoints have been recovered which have been attributed to the ‘Neronian’, a

term used in relation to four other Rhône River Valley sites (including Néron). Neronian industries are described as demonstrating “remarkable technical precision in their execution”, with the nearest source of rocks for manuporting to Mandrin – which were taken to the site for the full production of tools – as calculated coming from either between 15 to 35 km away from the site, or 60 to 90 km (Slimak *et al.* 2022, with references).

Slimak *et al.* assert that “The technologies used to produce the points from both the Ksar Akil IUP and the Neronian are the same”. They conclude that “the replacement of indigenous Neanderthal groups was not a straightforward single event but a complex historical process during which both populations replaced each other rapidly or even abruptly, at least twice, in the same territory” (2022). IUP is the abbreviation for the archaeological period called Initial Upper Palaeolithic. Hublin models a chronology for the IUP theorising a first expansion of people predating a subsequent expansion as represented by the Protoaurignacian and/or Early Aurignacian, with the chronological data for the various groups of TA also charted (Hublin 2015: 206/fig. 7). Hublin begins with the modern human remains at Qafzeh and Skhul (Israel) dated to around a hundred thousand years’ old expressing surprise that “Levantine MP assemblages are quite distinctive from those produced in Africa in the same time period” (Hublin 2015: 195). He highlights Emirian assemblages in the Levant, for the sites of: - Boker Tachtit; Ksar Akil; Umm el Tlel; Emireh Cave; Wadi Antelias and Wadi Aghar. North of Ksar Akil is the Üçağizli 1 Cave in Hatay (Turkey) with its UP-like shell beads and bone artefacts, a site central to the theoretic argument broadening the IUP delineation (referring to Kuhn 2003). I notice that these shell beads from Üçağizli (Kuhn *et al.* 2009: 104/fig. 18) are typical of those found elsewhere in Africa from the MSA, i.e., punctured gastropods which Klein infers are inferior to OES beads found in LSA contexts (Klein 2019) as discussed above. Hublin maps the IUP as extending from Ksar Akil towards Bacho Kiro (Layer 11) in Bulgaria, to sites in Maravia, (Bohunician), based on the reasoning that their assemblages demonstrate similarities in relation to knapping techniques, with a trend towards elongated Levallois-like points (Hublin 2015).

Mateja Hajdinjak *et al.* point out that whilst ‘Oase 1’ (living *roughly* 42-37 ka), and another individual from ‘Ust’-Ishim’ in Siberia (living *roughly*. 45 ka) fail to demonstrate “specific genetic relationships to subsequent Eurasian populations”, that a third individual – ‘Tianyuan’ from China (living *roughly* 40 ka) – has contributed to populations in East Asia today (Hajdinjak *et al.* 2021: 253). From recent excavations at Bacho Kiro Cave (Bulgaria), their research presents results from five human specimens, consisting of morphological analysis of a lower molar and mitochondrial DNA results from four fragments of bone. At the time of publication it was suggested that these represented the earliest early modern humans in Europe, living between 45,930 and 42,580 years ago (cal. BP) (Hajdinjak *et al.* 2021). Helen Fewlass *et al.* (2020) provide a <sup>14</sup>C chronology for the MP-UP limit at Bacho Kiro. The presence of an IUP assemblage directly associated with the fossils in the stratigraphy forms a period between 45-820-43,650 cal BP (95.4% probability) for the IUP at the site. The MP occupation dates are from at least 51ka, with a three thousand year gap before *H. sapiens* occupied the site till 34,000 cal BP. The beginning of IUP there has been dated to around 46, 940 cal BP (95.4% probability) (Fewlass *et al.* 2020). Mateja Hajdinjak *et al.* also present new data for ‘Oase 1’ including an earlier date for this specimen. They write that three IUP Bacho Kiro individuals dated to around 45 thousand years’ old are more similar to each other, than to any other ancient specimen, sharing more alleles with

‘Tianyuan’. From their results Hajdinjak *et al.* write that “several distinct modern human populations existed during the early Upper Palaeolithic in Eurasia”, concluding that:

IUP Bacho Kiro Cave individuals contributed to later populations with Asian ancestry as well as some western Eurasian humans such as the GoyetQ116-1 individual in Belgium. This is consistent with the fact that IUP archaeological assemblages are found from central and eastern Europe to present-day Mongolia...[...].and a putative IUP dispersal that reached from eastern Europe to East Asia. Eventually populations related to the IUP Bacho Kiro Cave individuals disappeared in western Eurasia without leaving a detectable genetic contribution to later populations, as indicated by the fact that later individuals, including BK1653 at Bacho Kiro Cave, were closer to present-day European populations than to present-day Asian populations ([Hajdinjak \*et al.\* 2021: 257](#) with references).

They write that “all IUP Bacho Kiro Cave individuals had recent Neanderthal ancestors in their immediate family histories” distinguishing the three IUP individuals with a proportion of 3.8%, 3.0%, and 3.4% Neanderthal DNA in their genomes, respectively. They comment that whilst this is less than ‘Oase 1’ it is more than the 1.9% found in other ancient or present-day humans ([Hajdinjak \*et al.\* 2021: 256](#)). Bacho Kiro is situated within the Balkan mountain range, south of the Danube by about 70 km. Pendants from teeth, an awl and an ivory bead are some of the artefacts found in layers I and J corresponding to the IUP. Hublin *et al.* conclude that:

The presence of IUP assemblages documents a wave of peopling that precedes the spread of the first Upper Palaeolithic bladelet techno-complexes...[...].Together, the behavioural and biological evidence strongly suggest a relatively rapid dispersal of IUP assemblages from southwest Asia into mid-latitude Eurasia by groups that—contrary to Aurignacian populations—seem unrelated to present-day European populations. Direct contact with Neanderthals must have occurred much earlier in eastern Europe than in western Europe, where the latest Neanderthals and their associated assemblages persisted until at least about 40,000 cal. BP ([Hublin \*et al.\* 2020: 301](#), with references).

This leans towards the theory that the Neanderthals did not orchestrate the changes in the material styles themselves but were influenced by the behaviours of the incomers. In Czechia, the hill above the Koněprusy cave system is called Zlatý kůň (Golden Horse), which is the name given to an almost complete skull of a female individual recovered there from the 1950s. Kay Prüfer *et al.* study the genome sequences of Zlatý kůň which they report is estimated to carry 3.2% Neanderthal ancestry, and like Ust'-Ishim and ‘Oase 1’ “appears to fall basal to the split of Europeans and Asians” ([2021: 822](#)). They consider that Zlatý kůň is about the same age as Ust'-Ishim, or a little older, concluding that,

...she was part of a population that formed before the populations that gave rise to present-day Europeans and Asians split from one another. Our estimated age of ~45,000 years or even older could make Zlatý kůň the oldest European individual with a largely preserved skull. As for Ust'-Ishim and Oase 1, Zlatý kůň shows no genetic continuity with modern humans who lived after ~40 ka ([Kay Prüfer \*et al.\* 2021](#)).

Geoff M. Smith *et al.* ([2024](#)) refer to the individuals from Zlatý kůň, Bacho Kiro, and Mandrin to assert that *H. sapiens* were in Europe between 50 and 45 ka. They present new research from the 2016–2022 excavations at Ilsenhöhle Cave in Ranis, (Thuringia, central Germany) which includes the Lincombian–Ranisian–Jerzmanowician layer 9 dated to between 47,500 and 45,770 cal BP, and LRJ layer 8 dated to between 46,820 and 43,260 cal BP at the cave. They indicate that the

people at Ranis were living during a much colder period that had previously been first associated with the arrival of the first AMH into Europe. They conclude that,

Bulk collagen carbon and nitrogen stable isotope data from 52 animal and 10 human remains confirm a cold steppe/tundra setting and indicate a homogenous human diet based on large terrestrial mammals. This lower-density archaeological signature matches other Lincombian–Ranisian–Jerzmanowician sites and is best explained by expedient visits of short duration by small, mobile groups of pioneer *H. sapiens* (Smith *et al.* 2024: 564).

Dorothea Myopotamitaki *et al.* (2024) underline the significance of being able directly to link LRJ materials with human (and not Neanderthal) fossils, something which had not been possible for the LRJ before. They also show that Neanderthals and modern humans co-existed in “the higher latitudes of Europe” before the onset of the Aurignacian. Finally, they link the LRJ at Ranis with Bohunician in Moravia where there are no human fossils, but point to the overlapping dates with Zlatý kůň, and conclude that the LRJ is part of the IUP if their technocomplexes are related.

Arev P. Sümer *et al.* (2025) bring the situation regarding modern-human hunter-gatherers, older than 40 thousand years, into closer focus in a recent article entitled “Earliest modern human genomes constrain timing of Neanderthal admixture” with new data concerning: - *Kinship and uniparental markers* (from the Ranis specimens); *Linking Zlatý kun and Ranis*; *Population continuity*; *Population size*; *Dating Zlatý kůň*; and *Neanderthal ancestry and dating*. Their results indicate that “Zlatý kůň and some Ranis individuals shared ancestors in their recent family history”, and they continue that “It is therefore conceivable that all of these individuals originate from the same population” (Sümer *et al.* 2025: 713). Of the nine Ranis specimens, five of them are different individuals: - the mother and daughter, Ranis4 and Ranis6, and the three biologically-unrelated males, Ranis10, Ranis87, and Ranis13. The remaining four specimens belong to the female individual, Ranis12. Their research is able to confirm that:

This common branch of Ranis13 and Zlatý kůň separates earlier from the ancestral Out-of-Africa lineage than the lineage leading to the Bacho Kiro individuals... [...]. The population corresponding to this common branch also splits earlier from the Out-of-Africa lineage than the population represented by the Ust'-Ishim genome... [...]. Ranis and Zlatý kun are thus members of the same population, which we refer to as the Zlatý kůň /Ranis population (Sümer *et al.* 2025: 713).

With regard to continuity, the Zlatý kun/Ranis population do not contribute ancestry to the “later Out-of Africans” as is also similar to the situation for Ust'-Ishim and Oase 1. In terms of size, the Zlatý kůň /Ranis population is “rather small”, which the authors think is around 300 individuals. With regard to dating, Ranis 13 is radiocarbon dated to about 45 ka, whereas reliable dates cannot be given for Zlatý kůň. However Zlatý kůň can also be placed in this same time frame of 45 ka which the authors estimate from evidence indicating that the two individuals lived at the most fifteen generations apart from each other, and possibly as few as three (*ibid.* 714). The situation with Neanderthal ancestry – of which all non-Africans alive today share up to 2-3% – is brought into focus for the Zlatý kun/Ranis population. The authors consider a “single-generation pulse of Neanderthal ancestry”. However, admixture over several generations is considered more realistic for the Zlatý kun/Ranis population. Neanderthal introgression is recalculated to be ~45.4–49.4 kyr, which represents a revision for the dating of “the common Neanderthal admixture of 45–49 ka” (*ibid.* 716/fig. 4).

### 3.6 CONSIDERING BALDWINIAN EVOLUTION

A deep-time perspective was introduced at the beginning of this chapter aimed towards presenting a chronological sketch of hominins through time and place. It culminates in this narrative with the first secure evidence for melodic-wind-instrument playing which emerges during the dawning of the Upper Palaeolithic. Piotr Podlipniak (2024) discussing “The evolution of musicality and cross-domain co-evolutionary interactions” considers Baldwinian evolution an important model for the evolution of hominin musicality. He refers to music and ‘natural’ language as inseparable, and whilst common structures appear universal, their forms of expression seem infinite. He draws on the importance of inventiveness in relation to rationales for gene–culture co-evolution, in which cognition is raised in relation to skills in general (although he uses the term ‘abilities’). Musical skills are raised particularly because of the way that ‘music’ works on the mind. He gives an example of a model which concerns non-music-specific adaption resulting in increased hominin musicality. For this, the notion of social bonding is offered as an adaption that was exapted later for musical purposes. On this basis, Podlipniak suggests that certain adaptations are not unidirectional and restricted to one domain in the brain. He writes that “Baldwinian co-evolution of a language-like propositional domain and a music-like emotional domain of communication interacted in such a way that the abilities for one were exapted by the other and vice versa”. He refers to Bateson’s model of double description to reference the interplay between them describing it as a form of logical abduction (Podlipniak 2024: 6 referring to Bateson 1979). Baldwinian evolution in this context is described as:

...a culturally invented behavioral trait, which is adaptive and in which the learning is time-consuming and effortful, comes under genetic control. Although this process may look like Lamarckian inheritance of acquired traits, the actual reason for the inheritance of such a behavioral trait is the accidental appearance of a mutation enabling a predisposition to learn this behavior faster and with less effort (Hall, 2001), which is then favored by natural selection (Podlipniak 2024: 7).

For Baldwinian evolution, cultural inheritance precedes genetic inheritance and concerns invention which is subject to the plasticity of the creative-cognitive process during ecological adaptation. Podlipniak draws on research that considers two types of plasticity; *experience-expectant*, and *experience-dependent*, where the latter “opens more space for learning” and “is a source of behavioral innovations that go beyond the canalized behavior and enable open-ended cultural evolution”. If adaptation is required for survival that exceeds quick-learning in stable environments, this type of plasticity would be advantageous. Podlipniak refers to the ‘iterated Baldwin effect’ as a process “in which culturally invented musical behavioral innovation creates a niche enabling the selection of genetically controlled elements of musicality, allowing subsequent innovation and so on, resulting in ‘a virtuous spiral’ ”. (Podlipniak 2024: 6 referring to Savage *et al.* 2021: 3). Felix Riede *et al.* (2018) consider young adults at the cutting edge of innovative change in ‘cultural’ evolution. Broadly speaking, they are not bearing responsibility for parenthood, yet simultaneously are grown up and highly capable, taking risks and showing off, still ‘young enough’ to indulge in authentic child-play, at the heart of art.

It is not unreasonable to think that the first wave of modern humans into Europe may have carried with them mobile whistles and small flutes, the Stone Age equivalent of mobile phones.

Certainly phalange whistles have been found in MP contexts, and Lund even calls these potential phalange flutes, phalange flutes. These may have been used to send signals to each other, and to create patterns (melodies) reflecting their respective journeys, tying music and people to places they were going and places they had been. People of a new age migrating into Europe following the IUP are theorised as the ones making large straight bladelets likely used for projectiles over long distances. The dawning of the Aurignacian is discussed by Hublin as a complex formed of three phases: - Protoaurignacian; Early Aurignacian, and Later Aurignacian. He writes that “In the Danubian region, where the Protoaurignacian is virtually unknown, early Aurignacian assemblages have been associated with  $^{14}\text{C}$  dates as old as the first occurrence of the ‘Protoaurignacian’ in the Mediterranean area” (Hublin 2015: 202).

Geissenklösterle happens to be one of only two sites in central Europe – the other being Willendorf (Austria) – that marks, in general, the arrival of the Early Aurignacian (Hublin 2015: 203) which is a chrono-cultural term. The evidence comes from the (Archaeological Horizon) AH III at the cave which is home to two of the *Ach flutes* (GK1 and GK3), plus fragments of a possible additional flute (GK2) recovered in the overlying layer AH II. Appearing without any underlying Protoaurignacian layer, it can be noted initially that amongst the early arrivals of modern humans into the *Achtal* of the Swabian Jura in Southwest Germany, some visitors were the makers of flutes if not hypothetically players of flutes and creators of ‘music’. This is considered on the basis of an ivory fragment that is flute-related found in AH III at Geissenklösterle, although the stratigraphic situation for the particular *flute-blank stave* complex to which the fragment belongs is tricky according to an article by Svenja Schray (*in press*) who has recently assembled all the information on the attribution for these layers. Nevertheless there is evidence in the form of the ‘Hohle Fels 1’ (HF1) flute in the layer Vb – basal to the Aurignacian at the nearby cave site, Hohle Fels – dated to a window in time that is similar to the AH III at Geissenklösterle. Another site yielding similarly old dates, to be counted amongst the oldest dates of the Early Aurignacian, is found in the neighbouring Lone Valley at the cave of Vogelherd. These aspects are discussed more fully in the next two chapters where the foci are the Swabian Aurignacian and the *Achtal* (the Ach Valley) respectively. There are currently no human fossils directly associated with the Early Aurignacian. Conard writes that “While the caves of Swabia preserve a wide range of archaeological materials, they rarely contain human bones. Given the excellent organic preservation of faunal remains from the caves, we can be certain that neither the local Neanderthals nor modern humans regularly buried or otherwise disposed of their dead in these caves” (Conard 2011: 223).

Klein argues that the Upper Paleolithic represents an ‘abrupt departure’ with ‘cultural variability’ from the “painfully slow” artefactual changes observed prior to 40 ka (2009: 656-665), concluding that “The sum suggests a common mindset that differed qualitatively from the mindset of earlier peoples” (Klein 2009: 660). In terms of UP stone-tool technology, Klein lists: - “*endscrapers* (elongated flakes or blades with smooth, continuous retouch on the edge opposite the striking platform)”; “*burins* (flakes or blades from which a second smaller flake or blade (a burin spall) was struck along one edge, leaving a scar at an abrupt angle to the ventral surface of the

parent)”; “carefully made *leaf-shaped points* with flat invasive bifacial retouch”<sup>45</sup>; “*backed or truncated pieces* on which a lateral edge or end has been methodologically dulled or blunted”<sup>46</sup>; and “*carinated (keel-shaped) and nose-ended scrapers* on which the presumed working edge has been formed by removing numerous small thin blades (“bladelets”)”, cited directly from Klein (2009: 656-657). Morley also marks the change in cultural variability for the UP noting the appearance of melodic-wind instruments, besides commenting that the UP is also quite distinct from what followed afterwards, writing that:

...the evidence for The Upper Palaeolithic in Europe sees the first incontrovertible archaeological evidence for musical behaviour in humans, in the form of bone items which have been variously interpreted as flutes, pipes or whistles. In addition, there are items which may be interpreted as rasps and bullroarers, as well as evidence for the use of the natural acoustic environment.....The Mesolithic appears to be a complete contrast” (Morley 2005: 212).

Scothern accounts for this apparent shift for music in the much later Mesolithic period as an issue of preservation; the climate was warmer, and people moved to aquatic and open-air sites, rather than inhabiting caves and valleys (Mithen 1994), and where the type of bones used for flutes indicates a new trend towards the domestication of animals, like pigs and sheep (Morley 2013: 219-222, and referring to Scothern 1992).

Lana Carol Neal situates her doctoral thesis discussing “The Earliest Instrument: Ritual Power and Fertility Magic of the Flute in Upper Paleolithic Culture” (2013). In his doctoral dissertation called “Music(s) in the European Upper Palaeolithic: The Melting Pot Theory” (2022), Praxmarer likewise focuses on a similar period writing that “multifaceted societies in Late Pleistocene Europe – at the interface from the Middle to the Upper Late Stone Age (45,000 - 25,000 y. a.) – contribute to the emergence of deliberate and elaborate arts (Praxmarer 2022: viii). The choice of words ‘deliberate’ and ‘elaborate’ concerns a concept of *the flowering of the arts* to incorporate (in addition to the organological evidence) the visual arts in relation to the subject of cognitive archaeology (Praxmarer 2022: 24-34), e.g., the paintings at the Chauvet-Pont-d’Arc Cave in southeastern France. Whilst both Neal and Praxmarer situate their dissertations respectively within a similar time-place ratio encompassing the entire UP, my lens concerns one tight horizon belonging to the absolute beginning of the UP bound to one place which is the Ach Valley.

### 3.7 INTERMISSION: DREAM OF A WATERBIRD

The theme of birds in the Aurignacian *Achtal* is significant from a number of perspectives and some of these are specifically musical ones. The pitch range produced in the upper registers on some of the *Ach-flute* reconstructions are very similar to the type and range of pitches produced by some song birds. This is especially the case for the smallest-flute artefact made from a swan-wing radius which has been reconstructed and tested by numerous practitioners. A resemblance to birdsong is expressed in the sonority of Friedrich Seeberger’s recordings on a swan-radius

<sup>45</sup> *Leaf-shaped points* are only typical for the Solutrean.

<sup>46</sup> These are typical for the Aurignacian.

flute, especially in his piece called *Vogelstimmen* (Seeberger 2003: track 5) which means literally 'bird voices' (birdsong).

An intrinsic portrayal of birds found in the first chapter of Joakim Goldhahn's archaeology thesis (2019: 3-52) is an invitation; "this diminutive synopsis about the human wonderment of birds, their behavior, and being evidently illustrates the vibrant potential to be explored within an archaeological setting" (*ibid.*: 18). Goldhahn, an archaeologist who conducted research in archaeoacoustics (Goldhahn 2002) before the subject came into its own realm, discusses a concept of "worldings" after Philippe Descola's work *Beyond Nature and Culture* (2013), who discerns *animism*, *totemism*, *naturalism* and *analogism* as ontological categories of being. Shumon Hussain and Harald Floss refer to this as the 'belief world' (*Glaubenswelt*) (2015: 45).

Goldhahn introduces the theme of how humans use, and have used, birds, and how alike it appears that birds and humans are, and relationships between birds and humans. For instance, birds are found to be kept as pets, guards, attributed with healing powers, and spiritual powers. They are known to be "fellow travellers" in relation to the past, present and future and can cooperate with humans in the procurement of food. Goldhahn suggests people generally keep birds as pets for entertainment but some birds are used as guards, such as the Maori practice in new Zealand of keeping seagulls with clipped wings in their vegetable patches to keep away pests, and to signal the arrival of visitors (Goldhahn 2019: 4-5 referencing Riley 2001: 90-91).

Being around birds can make humans feel better (Goldhahn 2019: 5 referencing Cox *et al.* 2017) with some species attributed with special powers. In European bird lore, the white feather found under the right wing of a raven is significant; "This precious feather and its spiritual power would be bestowed upon individuals trusted by the raven" (*ibid.*: 5 referencing Svanberg 2013: 74) and "can enable invisibility" (*ibid.*: 5 referencing Grundtvig 1883: 84). Goldhahn makes the point that "We best know the use of birds in the unfolding present" (2019: 5), alluding to migrating birds which provide direction to places for future hunting. This is considered one of the ways humans discovered new continents (*ibid.*: 6 referencing Mulvaney and Kamminga 1999; Pauketat 2013). He adds that "Both hunters and fishers used to watch birds to locate and catch their prey" (2019: 7 referring to Michell 1959; Cocker 2013), like cormorants used by fishers in China (*ibid.*: 4 referencing Rose 1987). To the above list we can also add that humans use the bones of birds as tubes for making flutes, in fact my musician friend and colleague, the flute maker, player, and researcher, Gabriele Dalferth, has an ongoing joke about this; on encountering a swan or a goose in flight, she will look to the sky and say, 'there goes another flute'. Joking apart, humans exploit birds, and sometimes violently, to procure different parts of their bodies and their habitats as material for our own desires, however poetically this is appropriated:

We sleep on their down. Their bones, beaks, feather quills, wings, and talons are used as tools, ornaments and instruments. Oil from birds can provide warmth, smooth leather and skin, and light up even the darkest night or cave (Goldhahn: 2019: 4).

Birds are like humans (and vice versa) in numerous ways; some birds build elaborate nests (homes), collect things; and use tools. Like humans, the majority of birds are born helpless, and birds mate in all sorts of different ways, and they like to play and sing (*ibid.*: 7-10). An analogy to the birds is mentioned by Edmund Gurney [1847- 1888] referring to Darwin who thought that

birds must also sing simply to emulate, (Gurney 1880: 188, referring to Darwin's *The Descent of Man*).

Writing that “The entrapping nests of sociable weavers, golden-headed cisticolas, long-tailed tits, or blue wrens are skilful and impressive creations” (Goldhahn 2019: 8, referring to Burke 2012; Ackerman 2016: 68), Goldhahn adds that some birds collect ‘shiny’ things to adorn their homes for the purpose of attracting a mate. Ironically, birds’ collecting-behaviours become a complex situation for human archaeologists dealing with birds acting as “casual archaeologists” like the bowerbird (Goldhahn 2019: 9, referring to Solomon *et al.* 1986). Birds that use tools are numerous (Goldhahn 2019: 8-9, referring to Kaplan 2004: 49-61; Ackerman 2016: 67-71 with references) and he writes that “Male black palm cockatoos use a stick or a twig to drum on a carefully selected hollow tree to attract a partner to nest” (Goldhahn 2019: 9). The biomusicological situation of these cockatoo percussionists and connoisseurs of drums – if the tree along with the drumstick is also a tool (a drum) – can be mentioned here. Robert Heinsohn *et al.* write that “drumming by palm cockatoos (*Probosciger aterrimus*) shares the key rudiments of human instrumental music, including manufacture of a sound tool, performance in a consistent context, regular beat production, repeated components, and individual styles” (2017).

Most birds are altricial; 80% of them are born helpless, and Goldhahn conveys that it is generally understood that the longer chicks stay in the nest the greater the increase in brain size and intelligence (*ibid.* referring to Ackerman 2016: 49 and Kaplan: 2004). I referred to the research in Chapter 2 about contingency learning by Goldstein *et al.* (2003, with references) who make the comparison between the inventive nature of human-infant-babbling behaviours moulded by interaction with carers, and the interactive behaviours of young brown-headed cowbirds and white-crowned sparrows who take singing lessons from both female and male adult birds of their own species respectively.

Goldhahn continues that “there is great variety in how birds mate” mentioning common swifts, who are “known to have coitus while they are aloft”, surmising that birds are generally social beings, living and gathering together, and playing (Goldhahn 2019: 7-10). It is surely not a coincidence that Goldhahn goes straight from the aspect of birds ‘playing’, to present the subject of bird vocalisations, alluding to the nature of tonality, writing that “Highly esteemed composers and artists have a strong affection for birds, owing to the pitch in most birdsongs” (*ibid.*: 10). He refers to a dozen or so composers from the Western music canon in relation specifically to nightingale devotion and its expression in ‘music’ to highlight the profundity of being able to “stop time” (*ibid.*: 10). Humans certainly seem to revere the musicality of birdsong, and this presents a path for understanding ways in which humankind has been influenced and inspired by the sonic forms and patterns which birds universally demonstrate through time and place. To this is the knowledge of why the trait exists in birds, exemplified in the statement that “Everyone knows how largely birds use their vocal organs as a means of courtship” (Darwin 1871b: 331).

Goldhahn goes on to write about ‘clever’ birds that appear to communicate messages, share histories with humans, demonstrate capacity for remembering, develop reciprocal relationships with humans, and appear to mourn the dead of their species (Goldhahn 2019: 12-18). He refers to the *Descent of Man*; bird vocalisations are “the best analogy to human language” (*ibid.*: 11, referring to Ackerman 2016: 12). What Darwin actually writes is that there are several aspects that

are analogous. For example, he remarks that birds are born with the capacity to sing but learn their songs from parents or foster parents, whilst making a comparison to language babbling in infants. Darwin also makes the point that crows and nightingales have similar vocal chords but use them differently, drawing the comparison between the vocal chords of higher primates, and human vocal chords (Darwin 1871a: see section on language 53-62). Goldhahn notes,

As Claude Lévi-Strauss and other behaviorists and anthropologists have shown, interpreting birds and their actions not only make it possible for us to express ourselves; it also triggers our imagination and curiosity about the world. This seems to work in a dialectic way. Animals in general and birds in particular are enough like our own species to be used to categorize our world (Goldhahn 2019: referring to Lévi-Strauss 1964:1966).

Goldhahn explains how the subject of archaeology has had a hand historically in redeeming the ontological worldings that are perceived and discerned in the West. Visitors to the *wunderkammer* of the Renaissance experienced a sense of analogical similarity and resemblance amongst the bizarre cache of ecofacts and artefacts which the display provoked. Goldhahn describes how fossils and hand axes seem similar, and how stars, flowers and starfishes appear to resemble each other, inspiring a sense of heterogeneity. This category of ontology is known as *analogism*. Experiencing this type of kaleidoscope of discrete marvels – and Goldhahn notes being tickled by a peacock feather and listening to ‘God’ in a seashell, amongst other wonders – would seem to constitute the means in which God’s creation is constructed at the gates of heaven. By this I imagine the doors of the curiosity cabinet opening like angel wings. By contrast, *naturalism* – affiliated with the Scientific Revolution – took a different archaeological style, in museum displays exhibiting regimented-artefacts that mediated the theory of evolution in linear perspective (Goldhahn 2019: 31-37).

According to Descola’s different modes of identification, for the worldings of *analogism* and *naturalism*, all beings are dissimilar in terms of interiorities (2013: 233 referenced by Goldhahn 2019: 23). In terms of physicalities, for *naturalism* there is only “continuity of matter” and not internal continuity. The perception for *analogism* is that whilst physicalities may appear similar there is further discontinuity, through which analogical resemblances relate to the appearance (and not reality) of continuity and completeness. Descola writes that “The exclusion from personhood of nonhuman organisms that are biologically very close to us is a sign of the privilege granted in our own mode of identification” (Goldhahn 2019: 30-31 referring to Descola 2013: 277). Goldhahn asserts that birds and non-human animals “challenge a world based in naturalism” (Goldhahn 2019: 31), and refers to Eduardo Viveiros de Castro (2015) to underline that Descola has not gone far enough in challenging *naturalism*.

*Animism* is discussed as a category of ontology or way of being that regards things including birds, non-human animals, plants, places and things like rocks, as part of a coherent body or soul that we are all a part of, and share. It is our clothes that distinguish us, and by clothes, these are things like fur, skin, nails, claws, and so on, that simply differentiate our physicalities. This worlding also extends to how many legs, flippers and flukes, or wings we have for getting about, and how these attributes – as behaviours, I take it to mean, like walking and singing – are also clothing signatures, from this ontological perspective. *Totemism* (taken from an Australian model in the Descolan overview), on the other hand is a little more specific and connects certain things

together with each other emphasising physical as well as internal continuity, like between a group of people and a species of animal (*ibid.*: 22-29).

A comparison between *animism* and *totemism* that Goldhahn notes is in Ingold's findings that "the making of portable art could be attributed to animism, while the making of rock art and bark paintings could be attributed to totemism" (Goldhahn 2019: 27 referring to Ingold 2000: 111-131). Goldhahn also picks up on Ingold's reference to animal depictions "in an X-ray style" in which interiors, or areas within the animal figure, are patterned with markings, (Goldhahn 2019: 27 referring to Ingold 2000: 113 and 120), developed elsewhere by Ingrid Fuglestedt (2010a; 2010b; 2018, cited by Goldhahn 2019: 27). Fuglestedt writes that "animic rock art expresses a focus on the guise of the animal, while totemic rock art expresses a focus on its inner essence" (2018: 268-169, cited by Goldhahn 2019: 28). It is Ingold who writes about animic ontology "as free-flowing like the wind" whereas, with totemic ontology, "the forms life takes are already given" (Ingold 2000: 113 cited by Goldhahn 2019: 26). In the Swabian Jura, all of the Aurignacian art is portable, and (excluding flutes as 'art') is exclusively figurative, apart from in the case for the lion. Hussain and Floss report that:

Three figurines from the Swabian Aurignacian incorporate a 'mixture' of lion and human traits: the iconic 'lion man' from Hohlenstein-Stadel in the Lone valley, the 'small lion man' from Hohle Fels, and the 'adorant' from Geißenklösterle, the latter two sites being located in the Ach valley (Hahn 1986; Floss 2007; Kind *et al.* 2014; Conard *et al.* 2015 [...]) All three representations have been described as anthropomorphic in stature and posture with a 'felid-morphic' head as well as less defined, 'transitional' features (Kind *et al.* 2014; Wolf 2015: 252-53) (Hussain and Floss 2015: 45).

Hussain and Floss consider the "deeply animistic" Aurignacian groups in the Swabian Jura in relation to two of the most frequently represented animals from the mobile-art inventory. These two animals are the mammoth and the lion. The iconic 'lion man' had been originally considered a lion or a bear and is refitted from many pieces (Kind *et al.* 2014: 132). Some researchers even feel that the lion man, rather than a hybrid of lion and human, is a cave bear standing up, and that the smaller lion figurine, and the adorant relief are too vague to determine that these are examples of therianthropoc representation (Clifford and Bahn 2020). I do not wish to argue that the lion man is a bear but suggest instead that there is some degree of logic to suppose that the lion man might be a cave bear. This would therefore place the cave bear (of which there already is one example), and the lion, together on a similar footing for the most frequently occurring animals represented in the mobile art found in Swabia. However, Hussain and Floss argue that therianthropoc representation for the lion may be a good fit with a relational ontology that is based in some degree of fear of the lion, in contrast to a more blended relation between mammoths and humans; "the mammoth human intersection in the Late Pleistocene mammoth steppe is characterised by at least partial intersection of human and mammoth 'taskscape', inseparability between landscape knowledge and experience and mammoth behaviour and close phenomenological proximity between human and mammoth sociality" (Hussain and Floss 2015: 48, their emphasis)

Hussain and Floss, also note that bison, horse, hedgehog and fish are included in the animals represented (2015: 45) as well as a waterbird. The waterbird is object number 78-2385 *Wasservogel*, found in Archaeological Horizon (AH) IV. It is made from ivory, and is 47.52 mm long, has two

types of pattern marks on it that consist of a total of 20 lines (Dutkiewicz 2021: 231). Conard describes the history of archaeology of the find:

The body of the Figurine [...] was recovered in 2001 from AH IV near the bottom of the Aurignacian sequence. In 2002 the head and neck of the figurine were recovered from AH IV and confirm that the sculpture depicts a water bird with morphology similar to that of a diver, cormorant or duck. This figurine has dimensions of 47 x 13 x 9 mm. The extended neck of the bird is strongly suggestive of a waterfowl in flight or diving. The wings are depicted close to the body. As compared with many finely carved figurines of the Swabian Aurignacian, the front of the bird has been left in a seemingly unfinished state. The other parts of the bird are presented in greater detail. Both eyes are easily recognizable, and the beak has a conical, pointy form that one would not expect on many of the common ducks. The legs of the bird are short with no indications of feet. The tail of the figurine extends below the legs and is depicted as a finely carved flat splint. The back of the bird shows a series of distinct lines that apparently represents feathers, (Conard 2003: 830).

In **Figure 3.1** there is an image of this figurine which I have placed in a diving orientation, so as to dive into the next chapter where we surface in the Swabian Aurignacian.



*FIGURE 3.1. The diving waterbird*

*Photographic image by Juraj Lipták of the ivory waterbird figurine from Hohle Fels.*

## 4. THE VALLEY

**The bird had given the flute to her. He kept singing when she played the flute. The bird was now a part of her.**

**(Martin Porr 2018: 147).**

## 4.1 INTRODUCTION TO THE VALLEY

In this chapter I introduce the Ach Valley, and the principle cave sites involved in this study, putting the landscape in archaeological context for the things that the Aurignacian Achtalians made and left there. The attempt to move towards an approach reflecting proximity and intimacy to the subject, exploring landscape and things (as an epistemological-relational archaeology), is one that is situated theoretically within the scaffolds of artistic (experimental) practice and material engagement. At this trans-disciplinary intersection I take a perspective from the UNESCO professor, Cornelius Holtorf, who writes about the importance of “the many great stories that archaeologists can tell about the past and its remains on the one hand and about their own work on the other” (2010: 391). With this baton, the style of delivery in this chapter aims, in places, towards the aspect of a journal.

Geoarchaeologist Christopher E. Miller tells us that:

The Ach Valley is a deeply incised river valley, in some places more than 150 m below the surrounding plateau surface. The valley was incised by the Danube before it left its course, just prior to the Riss Glaciation (Miller 2015: 13 referring to Villinger 1986).

If one picks the right time, it is possible to find a spot 20 km west of Ulm in southwestern Germany, which feels like the world is standing still, until a train or a car shuttles past. Standing in the valley floor roughly equidistant from the slopes on either side of the main valley, there is an area that is presided over on the north-western side of the valley by the white face of Sirgenstein Cave that is roughly in-between Hohle Fels Cave and Geissenklösterle Cave on the south-eastern side of the valley. There must be many more such acoustic spaces in the landscape of the Swabian Jura (*Schwäbische Alb*) which is a dry upland plateau that extends over a range of 220 km running northeast to southwest, in which the eastern Swabian Jura corresponds with the eastern part of the State of Baden-Württemberg. Dry valleys, sink holes and caves are a feature of the Swabian Jura’s karstic environment which is composed of Jurassic-age limestone and marls. The plateau dips to the southeast rising from the Danube Valley to the Neckar Valley where the plateau scarp rises 1000 metres above sea level (Miller 2015: 13 referring to Geyer and Gwinner 1979; 1991).

Miller explains that the Swabian Jura’s Jurassic-age rocks are divided into three units. The lowest is Black Jura (*Schwarzer*) which “consists of dark-colored clayey marls and sandstone complexes”.

Over this is Brown Jura (*Brauner*) consisting of “sandy clays and marls, interfingered with calcite sandstone banks and lenses”. White Jura (*Weißer*) “forms the surface of Swabian upland plateau, and consists of massive limestone and bedded marl complexes” (2015 13-14 referring to Geyer and Gwinner 1979). These three units are further subdivided taking letters of the Greek Alphabet. Miller describes the subunit *Weise Jura ε*:

The caves of the Ach Valley formed within the *Weise Jura ε* (or *Obere Felsenkalke*) subunit of the White Jura, which consists of massive limestones of the *Schwammfazies* (reef-facies) that in some locations has been heavily diagenetically altered. Differences in resistance to erosion within the *Weise Jura ε* have allowed *Felsen*, or tors, to form along the valley walls. It is in association with these rock formations that caves that contain archaeological material are found (Miller 2015: 14).

The Ach River which meanders through the Ach Valley rather quietly and inconspicuously flows closely along one side of the valley in some areas, crossing to the other, for example, by Hohle Fels Cave, as though the Ach River doesn't know which side of the valley she wants to be with the most. She flows into the Blau River which flows into the Danube. Without the sound of traffic (if you find the right time) a particular sense of timelessness pervades as the pre-industrial acoustic reclaims its ancient seat. One reason that the nexus between the caves of Sirgenstein, Hohle Fels and Geissenklösterle may inspire a certain kind of centre-of-the-universe feeling is the overwhelming presence of the natural landscape. The main roads, and the railway track between Blaubeuren and Schelklingen, in this vicinity, are tucked up tight towards the north-western side of the valley almost obscured from visibility when standing in the floor of the valley. They become hidden under Sirgenstein located about 35 metres above the valley floor. One way to reach Sirgenstein Cave is by scrambling up a steep unmarked path through the trees from a nearby roadside layby. The first time I went up there, I fell. It also takes about 10 minutes to walk briskly from this layby to the other side of the valley, firstly via a level crossing over the railway, and a small bridge crossing over the Ach River.

Being in the Ach valley also inspires timelessness. The Danube corridor was a waterway for some of the first modern humans into Europe, who followed the river coming from the east. According to Klein, “There may have been two separate early Aurignacian entry routes – one through the Danube valley marked by classic early Aurignacian antler and bone split-base points, and the other along the Mediterranean coast marked mainly by small, abruptly retouched blades (bladelets)” (Klein 2009: 587-588). Mellars also regards the Danube as one of the two early routes, noting that the climate in the middle of the last glaciation, between 50 and 30 ka, may have been warmer in certain places, by up to 5 or 6 degrees Celsius (Mellars 1996: 419). Was this the case for the regions of the Swabian Jura, and more particular, in the locality of the Ach valley, e.g., that the periglacial tundra/steppe started to be replaced by woods? What was the climate and weather like for flute playing in the seasons of those Aurignacian millennia? And when modern humans arrived in the Ach valley did they meet the Neanderthals there?

The history of early archaeological research in the Swabian Jura is documented by late nineteenth and early twentieth centuries' researchers who are today known in association with their excavations at particular caves in three valleys of the Swabian Jura (Conard and Bolus 2006: 211-212):

- |                                       |                           |                   |
|---------------------------------------|---------------------------|-------------------|
| • Ludwig Bürger<br>e.g., 1883/84      | <i>Bocksteinhöhle</i>     | (Lone Valley)     |
| • Robert Rudolf Schmidt<br>e.g., 1906 | <i>Sirgenstein</i>        | (Ach Valley)      |
| • Gustav Riek<br>1930s                | <i>Vogelherd</i>          | (Lone Valley)     |
| • Robert Wetzel<br>1930s              | <i>Hohlenstein-Stadel</i> | (Lone Valley)     |
| • Eduard Peters<br>1930s              | <i>Göpfelsteinhöhle</i>   | (Lauchert Valley) |

*Taken from Conard and Bolus (2006: 211-212)*

The early excavations along with the modern and current ones have “played a prominent role in establishing the Swabian caves and the Upper Danube region as a whole as an area of central importance for the study of the Aurignacian” (Conard and Bolus 2006: 215-216). Robert Rudolf Schmidt, who founded the Research Institute for Prehistory in Tübingen, was the first to note a discontinuity between the MP and the Aurignacian at Sirgenstein (Schmidt 1912: 30-31 referenced in Conard and Bolus 2006: 212-213), as did Gustav Riek at Vogelherd (Lone Valley), and Joachim Hahn at Geißenklösterle. These researchers from Tübingen all contributed to discussions about the stratigraphic ‘cultural’ relation in this respect (Conard 2011: 227 referring to Riek 1934 and Hahn 1988). Hahn, who in 1969 discovered *Löwenmensch* (the lion-man) sorting through collections from Hohlenstein-Stadel (Lone Valley), embarked on long-term excavation at Geißenklösterle, following up the work of Eberhard Wagner in 1973, during which time he also excavated at Hohle Fels, following the work of Oscar Fraas and Gustav Riek (Conard and Bolus 2006: 216). After Hahn died, excavations have continued at Geißenklösterle, Hohle Fels (Ach Valley) and Vogelherd (Lone Valley) as directed locally by Nicholas J. Conard via numerous teams which have included Michael Bolus, Susanne Münzel, Hans-Peter Uerpmann, K. Langguth, Maria Malina, and Alexander Janas. In summer 2011, I joined the team of students digging at Vogelherd and Hohle Fels being managed that year by Maria Malina, where I was involved in screening the sediment from the Hohle Fels Cave on the bank of the Ach River [Figure 4.1].

## 4.2 HOHLE FELS CAVE

Blaubeuren is nestled in a chink of the Ach Valley (*Achtal*) home to a karstic spring, the deepest of its kind in Germany (which has its own mythology). Archaeology researchers and students who have been excavating in the region stay during the summer's digging in an annexed part of the Urgeschichtliches Museum (URMU/the museum of prehistory) in Blaubeuren. During the summer of 2011, I was on a two week excavation here. At this time in my archaeology career I was only permitted to water screen the sediment from the excavation where I was stationed, which because of my interest in Upper Palaeolithic flutes, was at Hohle Fels Cave. The cave is located between Blaubeuren and closer to the small town of Schelklingen. Hohle Fels in German simply means 'hollow fell'. Working in pairs we collected hessian bags of sediment that had been stacked up and waiting in a huge pile inside the entrance to the cave. Archaeologists digging in the antechamber of the cave which is at the end of a 20 m-long phreatic tube that separates the entrance of the cave from the hall (Miller 2015: 14), were excavating in units of square-metre units divided into quadrants called spits (*Abträge*), digging down 3 cm, vertically. Each researcher was focused on her or his own spit, correlated to respective geological and archaeological horizons, and with collected deposits in situ digitally recorded and mapped via protocol's geographical information system (GIS). The sediment for a spit fills a 10 litre bucket. This was a system that Joachim Hahn had instigated in the 1970s, which implements the plotting of finds in 3D (Velliky 2019: 61 referring to Hahn 1977).

The stratigraphy at Hohle Fels is divided into 12 separate geological horizons (GH), grouped in 5 larger units that correspond to distinct technocomplexes. As of 2015, Group E (GHs 12-8) is MP; Group D (GHs 7-3d) is “encompassing most of the Aurignacian layers and also the early Gravettian” (Miller 2015: 33). Groups C, B, and A encompass the upper layers to include the Magdalenian. Geological horizons are allocated to archaeological horizons (AH), and Miller explains that “sometimes two separate AHs can be identified within a single GH, based on two distinct high-concentration horizons of artifacts” (Miller 2015: 15), or there may be no AH designation if there aren't any finds in the layer. Miller also explains that some ‘features’ are also stratigraphic units. The Aurignacian deposits at Hohle Fels are about a metre thick, in which GHs 6 and 7 correspond to five AHs: - IIIa; IIIb; IV; Va; and Vaa. The discreet geological and archaeological horizon correlations at Hohle Fels for the Aurignacian are noted by Sarah E. Rhodes: - GH 6a/AH IIIa; GH 6b/AH IIIb; GH 7/AH IV; GH 7a/AH Va; GH 7aa/AH Vaa; GH 8/AH Vb (2019: 58/fig. 2). She also clarifies that AH Vab/GH 7ab “are not continuous across the whole site and therefore not present in all stratigraphic and sedimentological profiles” (2019: 57). It is also worth pointing out here that stratigraphic interpretations can change. For example, in the 2019 illustration that Rhodes refers to there is a unit of transition between the Aurignacian and Gravettian. In recent e-mail correspondence with Alexander Janas (February 2023), the current perspective is that there may no longer be a unit of transition between the Aurignacian and Gravettian at Hohle Fels. A number of vertical cross sections (around 10 profiles) have been taken of the stratigraphy in the antechamber at Hohle Fels. Figure 4.3 shows profile 2.

The earliest Aurignacian deposits (allocated to AH Vb) are found in the sterile top of GH8 that separates Neanderthal from modern-human occupations at Hohle Fels. For the ages of the GHs

at Hohle Fels, AMS radiocarbon dates have been obtained in relation to stratigraphic position [Figure 4.6]:

The earliest Aurignacian dates at Hohle Fels come from AH Vb (GH8), and fall mostly between 32 and 35 ka <sup>14</sup>C BP (Conard and Bolus 2008), apart from a single date obtained from an ibex tibia which returned an age of 40,000 + 500. Material from AH Va (GH7a) returned dates mostly around 32 ka <sup>14</sup>C BP, although a single date from AH Va Bef. 10 returned an age of 34,720 + 280 <sup>14</sup>C BP. Stratigraphically, higher archaeological horizons associated with Aurignacian materials (AH III and IV) date slightly younger, with 18 samples returning ages between 30 and 32 ka <sup>14</sup>C BP, (Miller 2015: 17).

These radiocarbon dates are uncalibrated and Conard points out “Although there is no generally accepted calibration for radiocarbon dates over 30 kyr BP, preliminary calibrations suggest that dates of 32 kyr BP correspond to roughly 36 kyr BP in calendar years” (Conard 2009: referring to Weninger and Jöris 2008). He suggests that the lowest and oldest archaeological horizon for the Aurignacian at Hohle Fels (Vb) falls within a calibrated range of 40 ky (BP), whilst abducting that the architectural presence of Hohle Fels Cave in the landscape along with its accessibility would have been the first port of call for the new arrivals to the valley (Conard 2009). Nevertheless there is always a degree of interpretation in calibrating the dates, and in determining aspects of post depositional mixing between stratigraphic layers.

During the dig in 2011, we brought several bags of sediment at a time to the edge of the river which is where we did the screening, recycling the water which was directly pumping from the river as we were sieving the dirt. Bearing the bags was not difficult with a wheel barrow because the cave which is about 564 m above sea level is only about 7m above the floor of the valley (Miller 2015: 14); the path to and from the cave entrance to the river is slightly inclined. Working by the river every day gave me a very different experience to the one that I imagined I would have had if I had been digging inside the cave, and it helped me to form a hypothesis. I was outside rather than inside the cave, yet the valley made me feel as though I was inside her. The water-screening station by the river has its own special acoustic and phenomenal character. Whilst scrutinizing the swilled delights from the cave and hoping I would find part of a flute I had plenty time to wonder where the flutes of the valley would have been played in Aurignacian times, between screening the dirt through firstly meshes of 1 cm for the rough sieving, and then meshes of 2 mm for the fine sieving, which occupied most of the time. I also realised in this place in time that I had become rather obsessed with Hohle Fels; it had caught the attention of the global media following the announcement that “New flutes document the earliest musical tradition in southwestern Germany” (Conard *et al.* 2009). I hadn’t really thought about, nor had the chance to experience, the special quality and dynamic of the Ach Valley, nor realise that Hohle Fels happens to be just one of five caves in the *Achtal*. Hohle Fels, Sirgenstein and Geissenklösterle, also Brillenhöhle, are all caves located between Schelklingen and Blaubeuren on the Ach River. Große Grotte located on the other side of Blaubeuren – a cave associated with MP (Eberhard Wagner 1983) – is on the Blau River which the Ach River flows into, so strictly speaking, Große Grotte is in the Blau Valley (*Blautal*) but all five caves are fairly close by each other [Figure 4.5]; walking briskly it is possible to visit them all on foot in one day.

At first I was drawn to the concept of the cave acoustic as a place for playing with sound and music, because of the natural-acoustic resonances associated with caves. This is an obvious

assumption, and testament to this is the fact Hohle Fels Cave is currently the venue for many concerts. She has been beautifully and evocatively lit with electric lights, and is therefore often a chosen place for media productions too. Practitioners working with Aurignacian flutes giving musical performances on their reconstructions also typically stage productions as if within a cave context, such as with dripping water in the background (e.g., [Seeberger 2003](#)). It is always difficult to know whether an artist has physically recorded in the dry acoustic of the studio then added 'FX' effects, or has recorded 'live' in the cave. This happened to me working for Sveriges Radio where I was recorded by a producer in a small-carpeted room playing my reconstruction of one of the *Acb flutes* which was then broadcasted nationally as though I was in Hohle Fels Cave (experiment 7.14). An idea was presented by Rupert Till at Linnaeus University's symposium for Cajsja Lund in 2016, that cave acoustics may be measured and programmed to simulate the effect of a particular place, but it wasn't so clear how this is theorised archaeologically for caves. There are some archaeoacousticians, for example, who think that, "The acoustical properties of the cave depend on its shape, which has generally not been altered since the Paleolithic period, except sometimes on the ground level after excavations like, unfortunately, those in Lascaux, or from a natural landslide like that in the cave of Fontanet (Ariège), where after a landslide the acoustics have changed from that of an open-pipe to one of a closed-pipe"<sup>47</sup> ([Reznikoff 2002: 41](#)). This type of general rationale for the acoustic of caves isn't really the case for Hohle Fels at all, whilst it may be argued that Hohle Fels is at the same time, rather a special case in relation to music. At Hohle Fels, the ceiling has been dropping pieces of itself (known as *éboulis*) over millennia so that what was the ceiling is now on the floor of the cave whilst things have blown inside from the outside of the cave ([Miller 2015b: 61](#)). The remodelling of acoustics from the past therefore would seem to fall into a similar category of performing music from the past in relation to the notions and debates about authenticity, and the discipline of performing practice vis-à-vis what is 'sold' as being authentic. Embracing such geological anachronisms, in this sense, may be considered a useful means of exploring the conundrum (*cf.* [Pettersson and Narmo 2011: 34](#)) unless one is of the opinion that *if you have heard one echo, you've heard them all*.

Stepping out of my comfort zone and coming into the world of archaeology as a mature student, affords a particular perspective. Non specialists, or as they used to be called 'laymen' (laywomen too, presumably) have a relation to archaeology in terms of Public or Community Archaeology, and this relation has been studied (e.g., [Holtorf 2007](#)). My own perceptions about archaeology I recognised in Holtorf's study; reading archaeology at Linnaeus and Tübingen universities has been a full-scale exercise in deconstructing and questioning assumptions. For example, I always thought that the *Acb flutes* having been found in caves would have been played in the caves in Aurignacian times, but assumptions can be misleading. During the summer 2011 excavation Maria Malina gave me the keys to Hohle Fels for a whole weekend; there were no events scheduled in the cave, and the other students on the dig, apart from Marziyeh Zarekhalili (and me), had gone off on a trip. I asked Marziyeh if she wanted to join me in Hohle Fels. She replied that she had had a dream about it. That evening we set off to the Hohle Fels with the keys for the gate of the cave, a gate which inhibits unwelcome access, plus instructions about what to do if the alarm goes off. There was dripping water in the hall and in many places the floor was wet. I had

---

<sup>47</sup> This is probably where the idea for the cave as a big musical instrument caught my attention.

acquired a bamboo flute on the basis that it followed the patterns of one of the Aurignacian flutes. The hands-on bamboo flute gave me the first experience of actually playing inside the acoustic space, and we set about digitally recording our ‘sound sketches’ (Experiment 4 in Chapter 7). This epistemological approach that methodologically chooses phenomenological response seemed an intuitive and logical response to the opportunity. This leans more towards early research styles in archaeoacoustics, especially rock-art acoustics from the 1980s (Gill 2020: 80 referring to Reznikoff 2002: 2006). Iégor Reznikoff perceives, for example, that “It should be noted that human sound perception, aural or physical (when the body perceives vibrations), is of unequalled precision and, with a trained ear, permits a flexibility of approach that is invaluable for this sort of work” (Reznikoff 2002: 41). What is significant is that this would seem more consistent as a type of method for a relational archaeology, which moves towards perceiving the past through sound by via phenomenal perception and human skill at an interface with cave and flute. As mentioned above, the geological architecture of Hohle Fels has *not* remained unchanged; nevertheless it is still a cave complete with typical cave resonances yielding significant echoes. The paradigm of quantification in archaeoacoustics has only become more common in the subject relatively recently, (e.g., somewhere between, and to include, Goldhahn 2002 and Mattioli and Díaz-Andreu 2017), with the emphasis towards measuring the acoustics with equipment rather than the body. I think that a reliance on equipment is a Cartesian fetishisation which goes against the grain of relational archaeologies, especially when geological architectures change through time, such as at Hohle Fels Cave.

A response to the water screening experience at Hohle Fels was a hypothesis that the *Ach flutes* were played by the Aurignacian Achtalians outside the caves in the valley, or rather, not exclusively in one big hall, as popular traditions may have them stereotyped. Chris Miller provides some geoarchaeological perspective for this. Starting with the hall of Hohle Fels, was this a place for flute playing (fluting and musicking) as it is today in modern times? The hall is quite large (one of the largest of the caves in the region) but not so massive, feeling immense yet intimate at the same time; it has been referred to as an Ice Cathedral in numerous contexts. The cave hall is 12 m high and extends over an area of about 500 m<sup>2</sup> (Miller 2015: 14) with a total volume of 6000 m<sup>3</sup> (Rhodes 2019: 56-57 referring to Bolus 2015b). It makes it the perfect place for an evocative modern-day concert. Miller looks carefully at the use of fire in the cave, and it is through this perspective of fire that the hypothesis takes form, and it directly concerns the Aurignacian Achtalians’ relation to dumping ash and remains of a fire inside Hohle Fels Cave, away from the outside entrance and pushed into the backside of the cave in the antechamber before the hall. Miller writes that “Apart from GH 7, bef. 6, all of the combustion-related features studied here exhibited clear evidence that they were not within their original combustion context, but were removed from that location and redeposited anthropogenically as part of dumping activity” (Miller 2015: 164 referring to Schiegl *et al.* 2003). The features for this investigation include GH 8, bef. 1; GH7, bef. 1; GH 7, bef. 6; GH 6a, bef. 1; and GH 3cf. These are those GHs that encompass Aurignacian occupations. He goes on to conclude that:

Therefore, removal and dumping of burnt material away from the locus of occupation was apparently an important part of occupation and site maintenance, regardless of the type of fuel being used by the Paleolithic inhabitants of Hohle Fels. The pattern of dumping, as seen for both fires dominated by charcoal and by bone, suggests that this activity was not just carried out as a simple desire to remove foul-smelling burnt bone waste, as suggested by Schiegl *et al.* (2003). Rather, the practice of removal of burnt waste was

part of a larger cultural and behavioral system regulating hygiene and site maintenance that appeared with the earliest Aurignacian and continued throughout the Gravettian occupations at Hohle Fels (Miller 2015: 165).

Miller goes on to argue that this type of behaviour is indicative of people living at Hohle Fels for longer durations than before, arguing that this intensity of occupation for the Aurignacian Achtalians meant that the Neanderthals never re-emerged in the Ach valley because it had become the new territory of the new, more ‘sedentary’ modern-human people. However, and critically for the argument about flute playing, is that the place for the dumping in Hohle Fels Cave, known as the ‘dump zone’, is in the antechamber where the modern excavations take place, (Miller 2015: 166) and this is significant for the pre/deep-history of music performance in relation to Hohle Fels. The 20 m-long phreatic tube creates a feeling of a passage or corridor to the main hall that is sometimes referred to as a tunnel, in total, an aisle about 30 m long (Rhodes 2019: 57 referring to Bolus 2015b). The perspective that I am arguing here is that it would not make logical sense to create a dump zone in the antechamber if it were a thoroughfare for the hall. My suggestion therefore is that the hall may not have been used to make music. This is not to argue that the hall was never accessed but to deconstruct the idea that the grand hall of Hohle Fels was the exclusive place for sound ritualisations in the Aurignacian.

There had been excavations in the north side of the antechamber (the niche), by Gustav Riek and Gertraud Matschak in 1958 and 1960 which is close to the hall entrance. The unpublished results of this were analysed decades later by C. Saier in her 1994 Magister dissertation, also unpublished (Miller 2015; Velliky 2019). Prior to this, Robert Rudolf Schmidt had published his 1912 monograph from excavations at Hohle Fels in 1906, following on three decades after the first ever excavations there between 1870 and 1871, conducted by Oscar Fraas and Theodor Hartmann (Hahn 1978 referenced in Miller 2015: 15). According to Sara E. Rhodes, the mid-nineteenth century excavations had focused on the cave hall (2019: 57 referring to Schmidt 1912), and Riek’s excavations had also excavated the hall along with the tunnel “proving that undisturbed Paleolithic deposits remained outside of the cave hall” (Rhodes 20019: 57).

The modern excavations at Hohle Fels – to include Hahn’s excavation work there between 1977 and 1979, and then again between 1988 till 1997 (Hahn 1978; 1979; 1989; 1992; 1995; referenced in Miller 2015: 15), plus recent and continued excavations at Hohle Fels directed by Nicholas Conard (Conard, Langguth and Uerpmann 2001; 2002; 2003; 2004; // Conard and Malina 2005; 2006; 2007; 2008; 2009; 2010; 2011; 2012<sup>48</sup>; 2013; 2015; 2019; 2020; // Conard, Janas and Malina 2014; 2016; // Conard, Janas and Rudolf 2017; // Conard and Janas 2018; 2021) – have mainly been focused in the antechamber. In 2018, a small mound in the cave hall from one of these previous excavations in the 1970s or earlier (undetermined) was excavated, running parallel with the seasonal dig in the antechamber. The latter focused on squares: - 11; 12; 25; 26; 31; 32; 111; and 112, and yielded a number of finds to include a small piece of curved bone from AH Vab with nine lateral marks (Conard and Malina 2019: 58/plate 32, 17) which is suggestive of a decorated bird bone of the type associated with small flutes. With regard to the excavation of the mound in the cave hall, there was nothing to report coming from there at all (Conard and Malina

---

<sup>48</sup> This is the report for the dig at Hohle Fels that I was involved with water screening.

2019: 56). There would seem to be little evidence for sound ritualisations (music) in Hohle Fels Cave Hall which finds itself in juxtaposition with present-day ritualisations of live concerts, recordings and film-production for which there is evidence in abundance.

There are significant perspectives about ‘dirt’ in the anthropology of religion; Mary Douglas writes that “the difference between pollution behaviour in one part of the world and another is only a matter of detail” (Douglas 1976: 34 cited by Bowie 2008: 42). Fiona Bowie also refers to Judith Okely (1983) discussing English Travellers in the late 1970s in Hertfordshire, regarding the inner circle of their camps as being pure, whereas the outer circle was felt to have been compromised, and polluted. (Bowie 2008: 65-66). Bowie alludes to the structural perspectives on purity and pollution which Douglas had considered crosses over into all aspects of life, and isn’t at all neatly aligned and delineated in terms of, for example, the sacred and the profane that Émile Durkheim (2001) had constructed. The idea that caves are wombs of sound (Purser 2002) is certainly poetic, and evocative resonances typical of cave-hall acoustics, especially from high-pitched flutes, are certainly impressive. There is also a further certain point to the cave hall at Hohle Fels that both Marziyeh and I experienced. The sizzling summer’s Saturday night had enchanted a group of young adults who were meeting and mingling by the river, chatting and laughing. What was especially surprising was that some sounds were detected well inside the hall of the cave and this felt strange since the dark cave feels so isolated and detached from outside. Listening to the recordings we had made later, one such sound file I labelled as *flute with motorbikes*.

All the other caves in the Ach valley are much smaller (and cosier) than the actual hall at Hohle Fels Cave. Would the cave hall at Hohle Fels been too large for comfort as a place for living in? The hypothesis that the hall at Hohle Fels cave was a kind of no-go area in Aurignacian horizons because it is situated beyond the dumping zone which would mean passing through, or having to walk round, polluted rubbish, to get to the hall, may be raised as a hypothesis<sup>49</sup>. If music is the mysterious, cosmic phenomenon that philosophers have described, why place something like rubbish directly in its path? As a working hypothesis, the idea is therefore to abstract the flute playing activity away from modern-day bias of the hall, and out through the length of the corridor towards the entrance and mouth of the cave into the open air of the valley. If my hypothesis is correct – on the premise that foul (processed) smells from burned bone were deliberately organised deeper inside this part of the cave (Miller 2015) away from the entrance to the cave – then the dump zone may have created a physical barrier of material and smell (an ontological boundary) to the large cave hall. The mouth of the cave with its close proximity to the fresh water of the river and fresh air may have been considered more conducive for living. I don’t think it is a surprise that this was a perfect meeting point for morning coffee breaks during excavations at Hohle Fels [Figure 4.4].

---

<sup>49</sup> The practice of using the cleansing properties of ash to cover and process lavatorial waste, in terms of hygiene behaviour, can be speculated.



FIGURE 4.1. Water screening at Hohle Fels

*Photograph of water screening at Hohle Fels, by F. Gill Summer 2011. Hohle Fels Cave is out of sight to the left-hand side of the image.*



FIGURE 4.2. Field walking near Hohle Fels

*Photograph by F. Gill November 2021. Hohle Fels Cave is located beyond the carpark on the right-hand side of the image.*

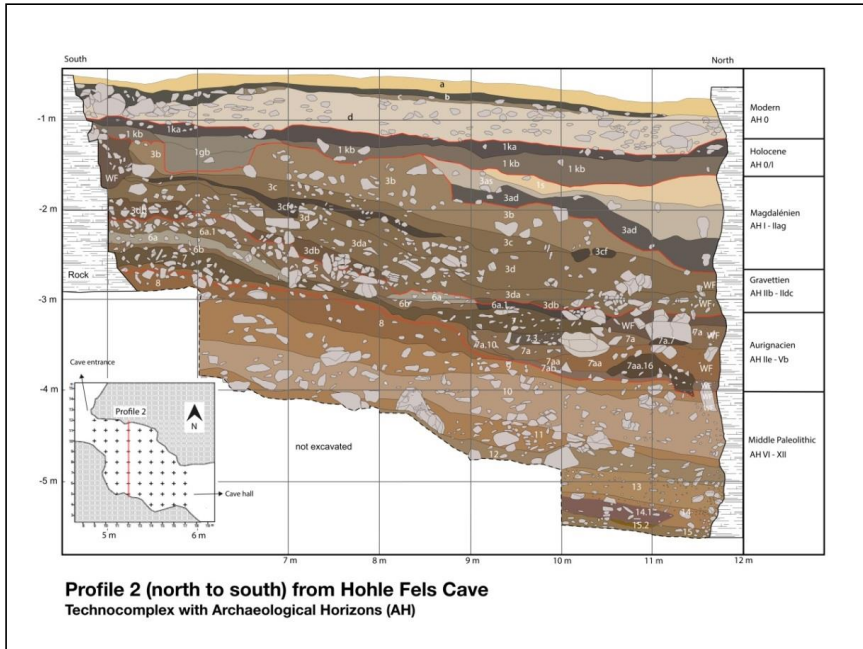


FIGURE 4.3. Stratigraphic profile from Hohle Fels



FIGURE 4.4. Entrance to Hohle Fels Cave

Photograph by F. Gill Summer 2011 on a coffee break from excavation work at Hohle Fels

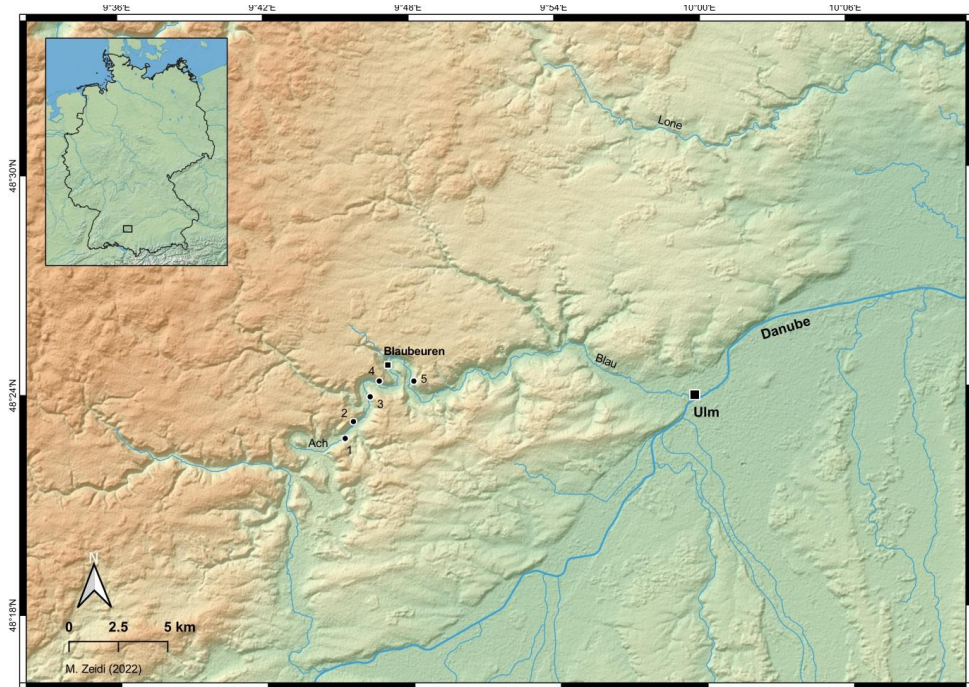


FIGURE 4.5. Caves of the Ach Valley

Map created by Mohsen Zeidi especially for 'Aurignacian Rhapsody'. Elevation data are from SRTM V3, hydrological raw data are from LUBW, and the country map is from Natural Earth. The caves in the Ach valley (Achtal) shown on the map are: - 1. Hohle Fels; 2. Sirgenstein; 3. Geissenklösterle; 4. Brillenhöhle; and 5. Große Grotte (which strictly speaking is in the Blautal).

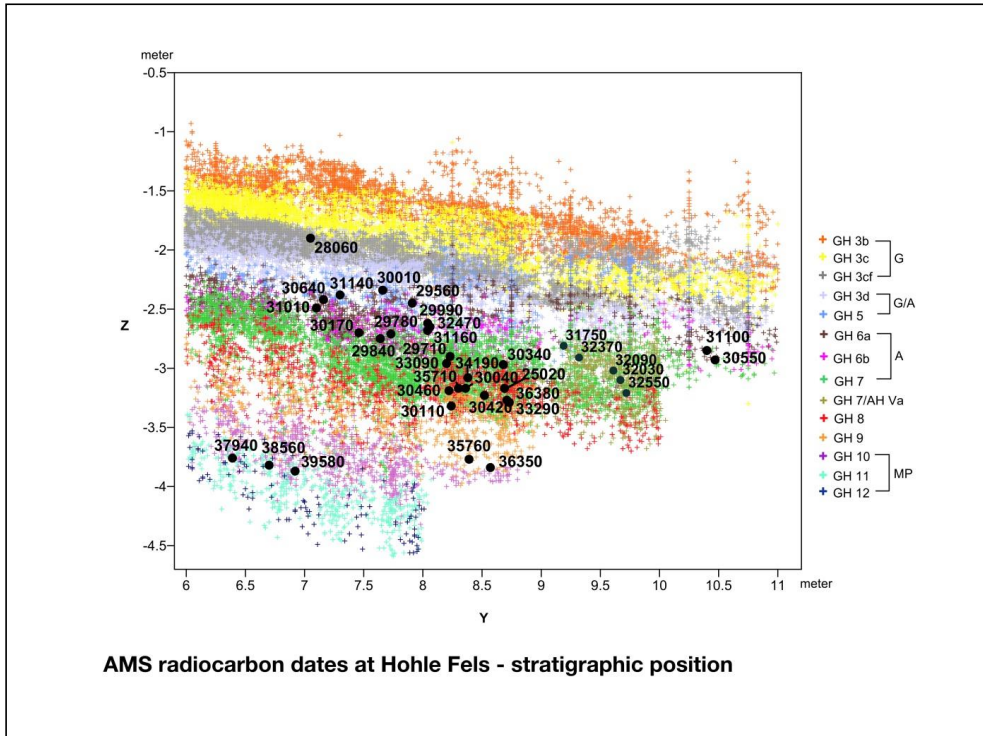


FIGURE 4.6. Uncalibrated radiocarbon dates at Hohle Fels

Illustration is from Miller (2015: 17/fig. 3 after Bolus and Conard 2008), who writes that "the apparent overlap between layers is a result of projecting sloping strata onto a two-dimensional image", and that "the dates are projected onto a north-south profile".



FIGURE 4.7. *Dance for the new mammoth-ivory flute*

*F. Gill (author) dancing for the joy of her new mammoth-ivory flute in Frank Trommer's workshop, Friday 20th April 2012. Photograph by Patrik Geiger, Blaubeuren.*



FIGURE 4.8. Bernadette Käfer - transverse flute

*At Kassel (Germany) on a reconstruction of HF1 by Wulf Hein, February 2012. Photograph by Wulf Hein (published with permissions).*



FIGURE 4.9. Frances Gill - transverse flute

*At Geissenklösterle (Germany) on a free reconstruction of GK3 made from mammoth ivory, Friday 20th April 2012, by Frances Gill and Frank Trommer's team. Photograph by Patrik Geiger, Blaubeuren.*

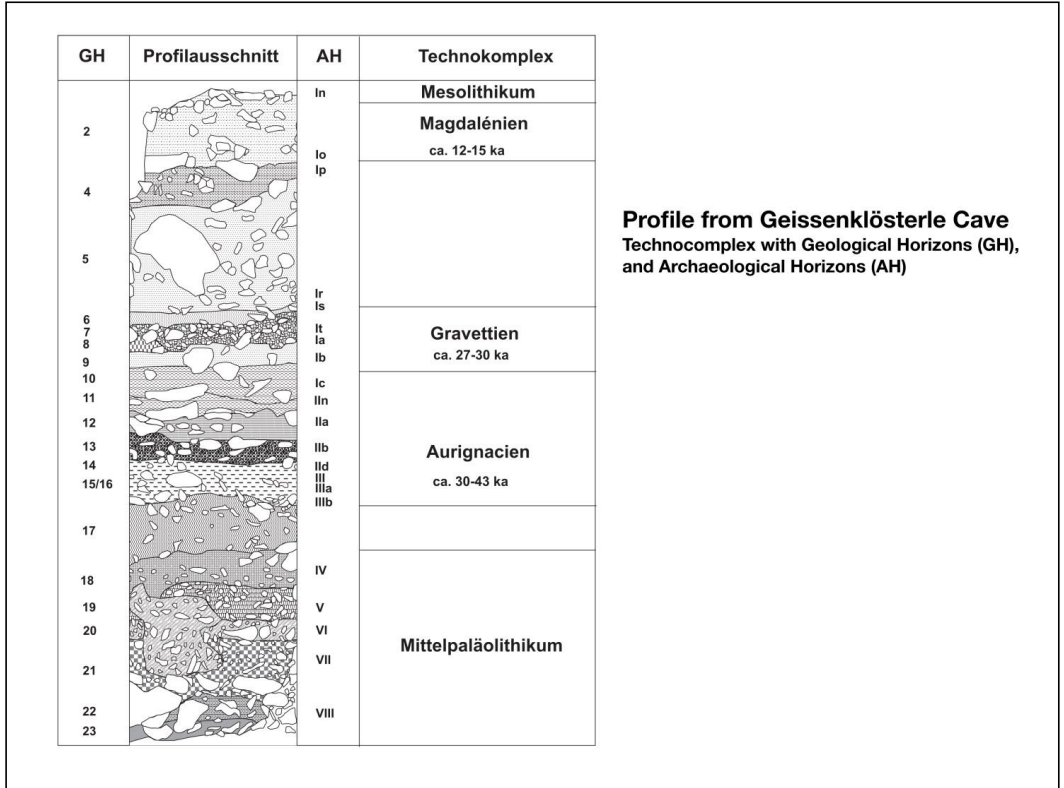


FIGURE 4.10. Stratigraphic profile from Geissenklösterle

The schematic profile from Geissenklösterle was supplied by Alexander Janas from the University of Tübingen.

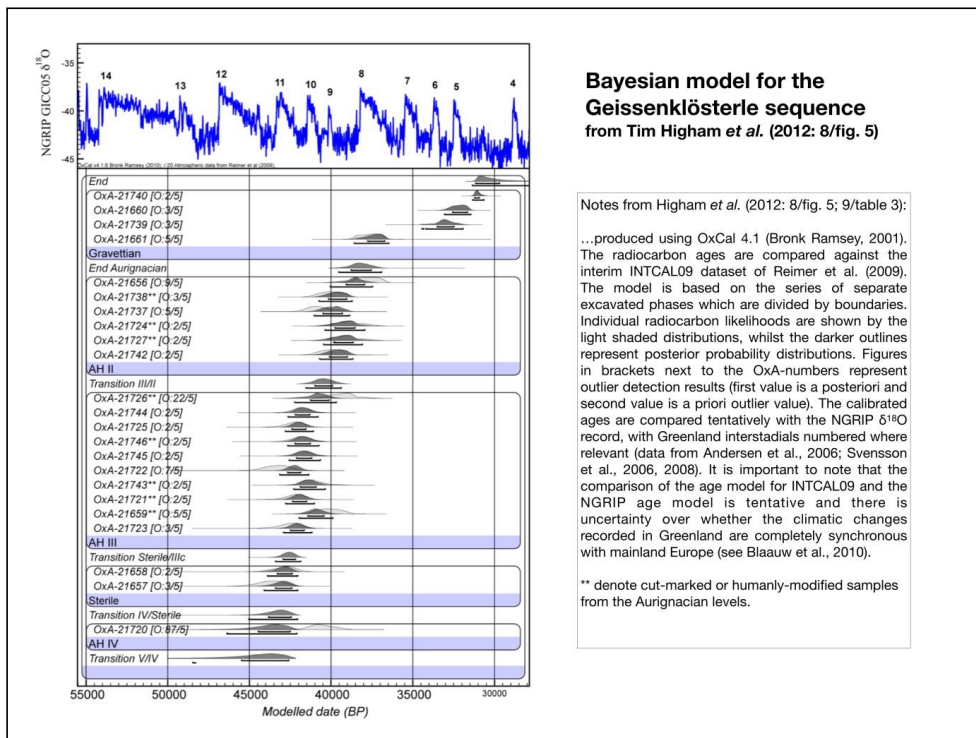


FIGURE 4.11. Bayesian model for dates at Geissenklösterle

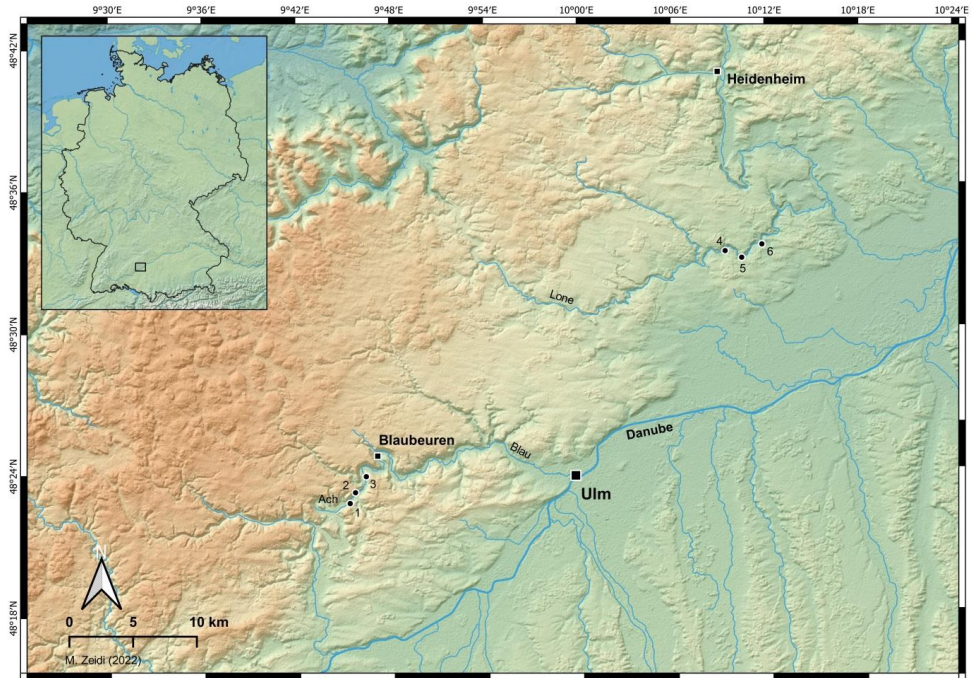


FIGURE 4.12. UNESCO caves of the Swabian Aurignacian

Map created by Mohsen Zeidi especially for 'Aurignacian Rhapsody'. Elevation data are from SRTM V3, hydrological raw data are from LUBW, and the country map is from Natural Earth. The UNESCO caves of the Swabian Aurignacian shown on the map are: - 1. Hohle Fels; 2. Sirgenstein; 3. Geissenklösterle; 4. Bockstein; 5. Hohlenstein; and, 6. Vogelherd.

### 4.3 GEISSENKLÖSTERLE CAVE

Unlike Hohle Fels which it seems had been used by local artisans for sources of clay from as early as 1830 (like Karl Friedrich Rixinger who was also selling bear teeth and reindeer bones that he found), and from 1844 onwards was mined for bat guano ([Miller 2015: 14-15](#) referring to [Blumentritt and Mall 1979](#)), Geissenklösterle was not discovered before Reiner Blumentritt had conducted a survey of the Ach Valley. This took place during a period between 1955 and 1963 when Gustav Riek was excavating at Brillenhöle ([Miller 2015: 15](#) referring to [Riek 1973](#)). During this time, Riek dug a small trench (*sondage*) in front of the entrance to the cave which was subsequently carried through into the cave as far as the back wall by Wagner. Wagner's excavation was the year before Hahn embarked on his long-term excavation at Geissenklösterle in 1974 that continued till 1991 ([Miller 2015: 14-15](#) referring to [Hahn 1988](#)). Miller notes that between 1977 and 1979, Hahn's excavation work at Hohle Fels had been undertaken with the primary aim to correlate stratigraphic profiles between the two caves. This is a critical aspect to Miller's own investigation in "A Tale of Two Swabian Caves" ([2015](#)), and is highly significant for the subject of the *Ach flutes* since two of them are from Geissenklösterle and the other is from Hohle Fels. Excavations at Geissenklösterle in 2000 forward till 2002 have been directed subsequently, and more recently, by Conard ([Conard and Malina 2002; 2003](#)).

The name Geissenklösterle, refers to two subjects, one being a goat, perhaps a female goat, as *Geissen* is an old diminutive German word meaning female goat in some regions of Germany. The other part of the name of the cave refers to a cloister (or small abbey). So as near to English as possible, Geissenklösterle means, 'the cloister of the (female) goat', according to a German speaker with whom I correspond. It is not hard to get a feeling for this idea having clambered up to the valley side like a female goat (although perhaps more like a bear where it is very steep and I needed to use both hands) to what is now left of the cave in the upper fells; it does rather feel like a place that goats might like. This first excursion to the cave (for me) had been instigated by Frank Trommer and his team in the spring of 2012 after a week together making a flute from mammoth ivory in Blaubeuren (the image of this flute and the tusk to which it belonged is in the photograph on the cover of this thesis). Geissenklösterle Cave is really more of a rock shelter now with only an enclosed part of it locked behind a gate located about 60 metres above the valley floor in the wooded area surrounding it, significantly higher in the fells than Hohle Fels' close proximity to the river. Miller describes Geissenklösterle as "located within a cul-de-sac-shaped limestone massif that faces southwest. The cave was larger during the Pleistocene, with the walls of the present day cul-de-sac forming the former walls of the cave" ([Miller 2015: 14](#)). The area inside the gates at the site is the only part of the cave currently which has a roof. Its area is not so large and its entrance is directly open to the elements. This entrance is about 8 metres wide, and extends back in length 10 metres getting narrower towards the back wall which is about 4 metres wide ([Miller 2015: 15](#)). It is therefore considerably smaller in present times than Hohle Fels with her entrance, formidable tunnel, and antechamber, forming a walkway up to the grand cave hall.

From the rocky ledges of Geissenklösterle one gets a feeling of elevation, being out in the fresh air where the position offers a really good view over this part of the Ach valley. The mammoth-ivory flute, finished on Friday 20th April 2012, copied the form of the mammoth-ivory flute

from Geissenklösterle (one of the three *Acb flutes*) in that it was made by using a sliver of ivory that was half dentin and half cement tusk. As soon as the flute was finished, I was offered a Stone Age inspired garment to wear by Trommer and his team, with a suggestion that Geissenklösterle Cave would be the perfect place to try the flute out for the first time. The immediate response after putting on the garment in Trommer's workshop was a spontaneous 'dance for the new flute' which one of the team (Patrik Geiger) captured [Figure 4.7].

It is important to make a comment about this mammoth-ivory flute reconstruction in order to pre-empt any prejudice about it replicating the original artefact. The experimental-work making the ivory flute in Trommer's workshop was guided by the material, in which the resultant tube became considerably wider in diameter than the original artefact by the time we had finished. It started to feel like that it would be going against the integrity of the material to impose the form of the original artefact (in the strict sense of absolute replication) onto the new flute because a peculiar trajectory emerged mid-experiment which engaged us in thinking about the maximum diameter of a tube made in this way. The flute consequently turned into something a little different which in the direct engagement with the material led to the natural placing of my own fingers on the tube to make the finger holes, and a transverse orientation for playing [Figure 4.9]. Theoretically, the ivory flute includes anachronistic aspects, in which anachronisms are valued and recognised as an intrinsic part of investigation in Contextual Experimental Archaeology within a progressive paradigm that recognises the horizon of the researcher (e.g. Beck 2011), and because "Anachronisms in experiments are a useful complement enabling experience" (Petersson and Narmo 2011: 34). Hence this is the contextual aspect of the interface between researcher/artist/artisan and archaeo-related material. The experimental experience affords self-observation of practical-technical skill, simultaneously offering insight into tacit-knowledge that an immediacy of awareness affords, and it disciplines the genesis process. This performance art is harnessed for the purpose of devising a window onto human metacognition, i.e., finding out what something is like (the unfolding process is as a dynamic icon) from which methods of documentation are generated.

Another flautist and researcher of Palaeolithic flutes, Bernadette Käfer (See [Käfer 1998](#); [Einwögerer, Käfer and Fladerer 1998](#); [Käfer and Einwögerer 2002](#)) only a few weeks earlier had also (unbeknown to me at the time) been exploring transverse orientations on a reconstruction of one of the *Acb flutes*, namely the find from Hohle Fels mentioned above (Figure 4.8). She was playing an instrument reconstructed by Wulf Hein from a Griffon Vulture's wing bone (the radius), that copies the original find diligently so that it looks like the original (as is Hein's hallmark). Using ivory to make a tube for a flute rather than a ready-made bone makes replication problematic and as far as I know, my ivory flute is the only flute where longitudinally, half of the tube is made from the layer of cement that is found under the outer surface of the tusk, and the other from the modified dentin which is the solid mass of the tusk (experiment 7.5). There are other ivory-flute reconstructions of the Geissenklösterle mammoth-ivory flute but they have been worked completely from dentin, and not all of them from mammoth ivory. With a solid mass of dentin it is possible to isolate and determine a certain size to work with although no one has ever done this without a machine in association with making a flute. Machines are used more than is perhaps realised in archaeological-experimental reconstruction of ivory flutes where such

anachronisms become intrinsic to process, mainly because the entire *chaîne opératoire* from tusk to flute – from mammoth to music! – is particularly extensive.

In e-mail correspondence with Wulf Hein (22<sup>nd</sup> April 2025) who has made more GK3 reconstructions from ivory flutes than anyone else in the world, he commented that the reason he has always used pure dentin (so far) is because the cement was far too thin on the ivory that he had got to work with, in each experiment or commission, respectively. Maria Malina and Ralf Ehmann (2009) had split a tusk successfully on the border between the cement and dentin but didn't finish their work into a flute. They used what is thought to be an Aurignacian technique to split the ivory on this borderline but then used a machine to hollow out the interior. On my flute with Trommer, we used a machine to do the splitting but hollowed out the inside by hand but I used a metal tool to do the hollowing, and not flint, because of time. Another reason for the metal tool was due to the fact that we had such a great chunk of mammoth tusk to work with which we didn't want to compromise by inadvertently damaging it; as a novice I just happened to be working with an ivory sliver with a fat layer of cementum (see front cover of this thesis). It was important to get it right and I could feel the tension and pressure in the workshop because of this! I had never worked with ivory before and the hollowing out, including to each end of the half I was working on, was challenging, mainly a pressure to get an even finish so that the entire length of 35 cm – copying the length of a *flute-blank stave* complex – could be sustained. It seems that every part of the *chaîne opératoire* from tusk to flute has been conducted across a series of isolated experiments by different researchers. All of us have used modern tools for different parts of the process, here and there, and often cost would seem to be a factor in dictating what has happened. Even though I got a grant for half the cost of the ivory the rest came out of my own pocket. Nevertheless my finished flute seemed to create surprise because it doesn't resemble GK3.

Miller writes that Hahn (1988), and Conard and Malina (2002) identified 23 geological horizons at Geissenklösterle, in which two are grouped together (GHs 15 & 16), and one split into two (GH 20a & 20b). It is the earliest UP (Aurignacian) layers that are found are in GHs 15 & 16, with GH 17 being a sterile layer above the lower GHs where MP Archaeological Horizons are located (Miller 2015: 113). **Figure 4.10** provides a profile of the stratigraphy at Geissenklösterle correlating GHs with AHs together with the technological complex ('technocomplex') groupings for: - the UP; the Aurignacian; Gravettian; Magdalenien; and above these layers, the Mesolithic. With regard to the Aurignacian at Geissenklösterle which corresponds to GH's 11, 12, 13, 14 and 15/16, the lower archaeological layers that include AH III, AH IIIa, and IIIb, correlate to the lower 'portion' of GH 15. AH IIc, AH IIa, and AH IIb represent the higher layers of the Upper Aurignacian (Miller 2015: 18). Rhodes comments how the original situation for AHs at Geissenklösterle had arisen due to Hahn (1988) attributing the Aurignacian into two units. Unit II includes: - AH IIc; IIa; and IIb. Unit III includes: - AH IIId; III, IIIa; and IIIb. These had been designated as 'pre-Aurignacian' or 'proto-Aurignacian' (Hahn 1993) (Rhodes 2019: 59).

Miller explains that the research into dating has a much longer heritage at Geissenklösterle than at Hohle Fels. Miller (2015: 18), and Ewa Dutkiewicz (2021: 55-56) chart the research for dating Geissenklösterle, from Hahn (1983), continued by Conard and Bolus (2003; 2008), Richter *et al.* (2000), and most recently, Tim Higham *et al.* (2012). Higham *et al.* (2012) argue that

Geissenklösterle is critical to understanding the ‘transition’ from the MP to the UP, and the ‘origins’ of the Aurignacian. They consider the ‘Kulturpumpe’ model (Conard and Bolus 2003) in which the Aurignacian is hypothesised as originating in the Swabian Jura and spreading from there to other places in Europe. Radiocarbon dating from past research is problematised, and the chronology is re-evaluated with new radiocarbon determinations from Mousterian, Aurignacian and Gravettian horizons at Geissenklösterle. Their Bayesian model [Figure 4.11] indicates earlier dates for Geissenklösterle than previously documented which they compare with other early dates for the Aurignacian in France, and in Italy. The new dates for Geissenklösterle fail to refute the hypothesis. The site of Isturitz – where one flute is reported from Aurignacian layers (Buisson 1990; Lawson and d’Errico 2002), as previously noted – is left out of their comparison; Referring to Barshay-Szmidt *et al.* (2010) they write that dates at Isturitz “were not ultrafiltered and they have extremely large standard errors” (Higham *et al.* 2012: 10). The beginning of the Aurignacian in the Swabian Jura from the new dates at Geissenklösterle is dated to 42,500 cal BP, occurring prior to the Heinrich 4 cold phase (*ibid.* 12).

#### 4.4 THE PALAEOENVIRONMENT OF THE AURIGNACIAN ACHTAL

The caves of Hohle Fels and Geissenklösterle are very different from each other in many acoustic respects. I have sketched out briefly in accounts of the present landscape, respective flutescape experiences in these locations, a feeling for the Ach Valley as a preliminary relational (archaeo-musical) response. Results from these and other experiments are theorised and documented in full towards the end of the thesis. Sterile layers, stratigraphically speaking, that separate the MP from the UP deposits in both sites, present a marker for the start of the Aurignacian in the Ach Valley (Miller 2015: 158-159). From this it is clear that Neanderthals and Modern Humans did not meet, or in any context co-inhabit, the Ach Valley. This becomes important for new questions as to why Neanderthals who hadn’t gone extinct and were still living in Europe at the time didn’t return to the *Achtal* during the Aurignacian. It becomes possible to consider the Palaeoecological-acoustic context of the Ach Valley to model/sketch a musical-playing ground for the flute-minded Aurignacians living there. Here Miller’s questions regarding the MP / UP transition become most significant. Miller compares the micromorphology across the GHs at both Hohle Fels and Geissenklösterle in relation to the “larger archeological framework”. For this, and already mentioned, is his perspective that the dumping of ash indicates that the modern-human visitors to the *Achtal* were lingering longer in the valley per stay and organising their sites accordingly (Miller 2015: 11). This illustrates the importance of the geoarchaeological aspect to studying sediments as it facilitates more ‘holistic’ archaeological interpretation between anthropogenic versus non-anthropogenic changes observed in geological strata (echoing the ‘nature versus culture’ dichotomy).

I draw on Miller’s study to support archaeo-musicological (or archaeo-organological) interpretation regarding whether the Ach Valley was at times conducive for ‘fluting’: - firstly by limiting the idea that the hall at Hohle Fels was the exclusive domain for flute performance; and by considering the open-air climate for musical-behavioural activities that develop cognitive ability (assuming neurological capacity). The relation between fire and music has already been

discussed in this study. I now locate the subject between fire and music / flutes and flames, in the situated-regional locality of the Ach Valley with data from geoarchaeology at Hohle Fels. Quite obviously air and ventilation are needed for fire, and making fire in an enclosed space is problematic and dangerous. For this reason, it can be abducted that fires were located closer to the entrance of caves, with the added benefit of keeping unwelcome visitors out of the cave. I think of it like a shop that has a warm air generator on its threshold to separate the air outside from the warmer air inside during the colder seasons where I live in the north. As was also noted, *Phlox* (φλοξ) in ancient Greek means ‘flame.’ The Modern Greek is *floga* (φλόγα) and *flogera* (φλογέρα) is Greek for flute. The etymology for *floga* and *flogera* is *fisco*. *Fisco* means ‘blow’ and this aspect of blowing offers a new complexion, not least in organological classification if the etymology for ‘flute’ is related to wind (as in ‘wind instruments’).

My suggestion is that tubes may have been used like straws to blow jets of air to aid fire control, and through blowing down tubes that certain sounds would have automatically been made. I can’t help but think that Shakespeare had this sort of thing in mind with his character, *Francis Flute the Bellows Mender*. This happened to be diminutive name that my mother called me as a child. Nowadays, my artist’s name is Frances Flute the Bellows Mender. Nicholas Conard also remarked that he had played the role of Francis Flute in a high school production. Why is this relevant? I think more than an anecdotal coincidence, it draws attention to the connection between music and fire/flutes and flames, and the assistance of etymology and philology to, at times, provide a useful signpost for the generation of ideas, not least because a sonic analog of dancing flames is an (ongoing) invitation for any human with a flute and a will to release the musical imagination. As fingers dance on the flute, the air in the tube blown from the mouth potentially blasts new flickering cycles of sonic flames; will the fire keep burning and the music keep playing? As a flute teacher, I do not regard fluting as the domain of any one special person but an invitation for everyone. It has been often suggested that musical events in pre/deep-history evolved around a hearth, and especially at night (see Chaps 2 and 3). If flute playing flourished in relation to fire control in the Aurignacian, did the material engagement with flutes stop when the fires died out? With a flute in a pocket, or worn as a hair accessory, where would one venture to practice, or to redeem a previous atmosphere from the night before; into the inner chambers of a pitch-black cave negotiating a dump zone and guano carpet, or outside to greet the smell of fresh air and the warmth of sunshine recalling a tune?

From the long-term perspective, Miller describes the volatile and unstable nature of Paleoenvironments “that underwent numerous and rapid fluctuations, from periods of warmth (interstadials), to periods of glacial extremes (stadials) only surpassed in intensity by the Last Glacial Maximum (LGM), roughly about 20 ka” (2015: 143). He considers, like other Palaeoarchaeologists, how climate impacted change, highlighting the significance of Geissenklösterle and Hohle Fels for answers to questions about Neanderthal extinction. The lowest GHs at Geissenklösterle and Hohle Fels, it is safely assumed, were deposited in Swabia during the Würm glacial (the Weichselian glacial for northern Europe). The period 60–27 ka associated with Oxygen Isotope Stage (OIS) 3 is the time frame in which MP and UP deposits were forming in the GHs at the cave sites. Miller writes that “some of these climatic events would have been short enough that a single generation of humans would have noticed a significant change in their environment” (*ibid.* 144, referring to Alley 2000). These cycles he

describes as rapid warming followed by slower cooling in relation to “discharges of icebergs from ice sheets in the North Atlantic” called ‘Heinrich events’ (referring to [Bond \*et al.\* 1992](#)).

Miller points out that the start of the Aurignacian dated by Higham *et al.* ([2012](#)) to 42.5 ky BP that has “refined aspects”, helps to support a regional model of change in Swabia in which Miller’s study “despite its admittedly low resolution, has a distinct advantage over previous studies: it uses paleoenvironmental data found in direct association with archaeological data” ([Miller 2015: 153](#)). To this Miller adds, that:

Although Paleolithic archaeologists often view the replacement of Neanderthals by modern humans on continental scale, we should remember that the individuals and groups that brought about this replacement would not and could not have seen it from this perspective. Their view of the world would have been rooted in a detailed knowledge of regional environments and landscapes ([Miller 2015: 153](#)).

Miller conveys that from the earliest evidence of the Aurignacian at Geissenklösterle in GH 15 (AH III), the Neanderthals had left during a warm phase, and the modern humans arrived during a cold period, but that this is from seeing Geissenklösterle in isolation ([ibid.](#) 157). For the Aurignacian, the layers across both sites indicate that the paleoenvironmental change was recorded with higher resolution at Geissenklösterle than at Hohle Fels where records are more general ([ibid.](#) 161). At Hohle Fels the earliest evidence is in the upper portion of GH 8 which Miller considers contemporaneous with GH 15 at Geissenklösterle despite micromorphological differences in the contacts between the GHs as compared across both sites. The disparities he accounts for (and see his discussion about correlating records at Geissenklösterle and Hohle Fels in his synthesis [2015: 143-171](#)), are due to processes of deposition and post-deposition ([ibid.](#) 158). He states that “the earliest Aurignacian at Hohle Fels roughly correlates with the earliest appearance of the Aurignacian at Geissenklösterle” ([ibid.](#) 159), and concludes that:

Based on the interpretation of micromorphological data, it appears that modern humans arrived in the Ach valley during a warm period about 40 kyr BP and that this warm period was subsequently followed by a cold period, during which modern humans remained in the valley and left behind a much denser archaeological record than the previous, archaic inhabitants ([Miller 2015: 161](#)).

In summary: - the ‘initial appearance’ of the Aurignacian (Geissenklösterle’s lower portion of GH 15 correlated with Hohle Fels’ upper portion of GH 8) indicates a warm and wet climate; and subsequent ‘purely Aurignacian layers’ (Geissenklösterle’s GH 15 correlated with Hohle Fels’ GH 7) indicates a cold and dry climate. In conclusion, Miller writes that:

The sediments from the more-or-less culturally sterile layer separating the Middle from the Upper Paleolithic occupations at both Hohle Fels and Geissenklösterle exhibit evidence for a relatively warm and wet period. The cold event that would have supposedly driven Neanderthals out of the region occurred after modern humans had already settled in the Ach Valley ([Miller 2015: 168](#)).

In conclusion he refers to the *Kulturpumpemodell* formulation ([Conard and Bolus 2003](#)) – which he describes as “the florescence of cultural expression in the Aurignacian as either the result of direct competition with the Neanderthals, as the result of problem solving in response to climatic change, or as the result of independent socio-cultural and demographic change” ([Miller 2015:](#)

168). He goes on to note that in the later formulation of the model (Conard *et al.* 2006) climatic deterioration caused the Neanderthals to retreat from the area. He falsifies this as a hypothesis with an argument from the evidence for the recycling of rubbish, namely the movement of ash from hearths, reasoning longer and more intense occupations by modern humans in the *Achtal*, to support this position:

...the removal of waste implies that the occupants of Hohle Fels had defined a specific space within the cave for occupation and that they planned on using this occupational locus in the future... (Miller 2015: 167).

Sara E. Rhodes synthesises the Paleoecology of the Ach Valley (2019) bringing evidence from botanical, macrofaunal and microfaunal proxy records to compare with sedimentological records. Her research emphasises the small mammal record (rodent, insectivore and bat), and she concludes that “the earliest AMH populations in the Swabian Jura would have found the region empty of other human groups, and the landscape a mosaic of cold dry tundra and wooded steppes” (2019: 88). She notes that the climate may have “ameliorated” during the sterile period (2019: 88). She also considers that modern humans arrived in the Swabian Jura with skills already in place (after Conard and Bolus 2003; Conard 2011). The sedimentological records from Geissenklösterle and Hohle Fels together with the botanical, macrofaunal and microfaunal records do not all tally in perfect-proxy synchrony. To this Rhodes also refers to some herpetological records from Geissenklösterle, (Böhme 2019) which she writes “suggest a mesic and humid climate during deposition of GH 12, 9/10 and 6/7 which may mark interstadial periods” (2019: 66).

Rhodes discusses Miller’s research describing the contacts between GH 8 and GH 7 at Hohle Fels, and GH 17 and GH 15 at Geissenklösterle as indicative of a “substantial change in temperature and a decrease in the presence of water”, in which cold/dry and warm/moist oscillations continued throughout the Aurignacian (Rhodes 2019: 64). With regard to the botanical records at Hohle Fels, she notes species of wood charcoal found in the early Aurignacian for GH 8 and GH 7 include pine (*Pinus sylvestris/mugo*), and in the upper Aurignacian for GH 6 there is willow (*Salix arctica/reticulata*) indicating a “taiga or forest-steppe biome” for the area around Hohle Fels in the early Upper Palaeolithic, with “extending snow-covered tundra in later periods” (Rhodes 2019: 65 referring to Riehl *et al.* 2015). The small mammal record seems to contradict the botanical one because of evidence for “the dominance of cold-adapted taxa” suggesting that “snow-covered tundra was more prominent in the landscape” (Rhodes 2019: 65 referring to Hahn *et al.* 1977; Münzel *et al.* 1994; and Ziegler 2019). Reinhard Ziegler’s study (2019) of small fauna using a larger sample also corroborates this position indicating “a clear decrease in boreal species from the early to the upper Aurignacian suggesting a decrease in forest patches” (Rhodes 2019: 65). Bear and carnivore percentages decrease in the large faunal record as small game increase (Rhodes 2019: 65 referring to Starkovich *et al.* in press), to include at Sirgenstein Cave, the avian record (Rhodes 2019: 65 referring to Bertacchi 2017). In contrast there is an increase in “reindeer and other cervids” all of which can in part be accounted for by the agency of human hunting strategies in combination with climate cooling (Rhodes 2019: 65-66 referring to Conard 2011; Conard *et al.* 2013).

The Aurignacian in the Ach Valley spans approximately from the maximum-earliest dates at Hohle Fels documented to 42,460 cal BP, and at Geissenklösterle 42,472 cal BP; to the minimum most-recent dates of 32,602 cal BP at Hohle Fels, and 35,029 cal BP at Geissenklösterle (Dutkiewicz 2021: 57/table 2 referring to Conard and Bolus 2003; 2008; Conard 2009; Hahn 1983; Richter *et al.* 2000; Higham *et al.* 2012; see also Tallor and Conard 2019). During this time the climate oscillated so that whilst it was generally cold and dry there were warm and wet periods. Despite Rhodes noticing a variable climatic signal in the proxy records, she considers the new data for the small mammal record as generally matching the Paleoecology from previous research (Rhodes 2019: 82-83). The context of ‘climate’ and ‘flute playing’ may be raised here as for consideration in general. Did cold weather prohibit fluting activities in the open air of the Ach Valley? Sound does not simply stop if it’s very cold although I will admit to finding it difficult to produce a tone on my flute if I am outside and it is very windy. A Cartesian perspective, i.e., as described by Hussain and Floss (2015: 45-46) may foster, however, certain basic assumptions that are incorrect or biased. For example, Derricourt illustrates a case for cold-weather behaviours per se, which at least would seem to go against what in Sweden is the rhyme *kläder efter väder* (clothes according to the weather). He writes that “visitors (including Charles Darwin) encountering the indigenous nomadic foragers of Tierra del Fuego, on the frequently cold southern tip of the Americas, were struck by their nakedness in such an inhospitable climate and lack of more than flimsy shelters to rest in” (Derricourt 2018: 98):

But these Fuegians in the canoe were quite naked, and even one full-grow woman was absolutely so [...] In another harbour not far distant a woman, who was suckling a recently-born child, came one day alongside the vessel, and remained there out of mere curiosity, whilst the sleet fell and thawed on her naked bosom, and on the skin of her naked baby (Charles Darwin 1905: 202, cited in Derricourt 2018: 98).

#### 4.5 THE SWABIAN AURIGNACIAN

The term ‘Swabian Aurignacian’, introduced to denote “specific techno-typological characteristics of respective assemblages” from archaeological sites across the region (Bataille and Conard 2018: 42 referring to Bolus 2003; Bolus and Conard 2001) refers to sequences of lithic and organic archaeological material. Swabian Aurignacian material design is in this sense understood here, is indicative of mainly lithic tools e.g., *blades*, *bladelets* and *microblades*, overlapping a fluid category dedicated to special or ‘symbolic’ types of tools, e.g., *split-base points* and *pierced batons*, (after Dutkiewicz 2021: 83-84). Categories of material design, such as musical instruments e.g., *flutes*, *mouth bows*, *bull-roarers* and *scrapers*; personal adornments e.g., *buttons*, *broaches*, *hair accessories*, *bracelets*, *beads* and *pendants*; works of art, especially sculptured *figurines* e.g., small mobile-art icons of animals from the mammoth steppe biome (such as the water bird referenced at the end of last chapter), constitute the Swabian Aurignacian mantle. On the basis of the richly diverse Swabian-Aurignacian assemblages, a nomination for the United Nations Educational, Scientific and Cultural Organization’s status was deliberated on “The Path to UNESCO World Cultural Heritage Status for the Caves and Ice Age Art in the Swabian Jura” which became granted in 2017 (Conard 2017). Hohle Fels, Sirgenstein, and Geißenklösterle, (in the Ach Valley), together with Bockstein, Hohlenstein, and Vogelherd, and (in the Lone Valley) [Figure 4.13], were singled

out as representing UNESCO's 'Criterion iii'; "to bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared" (Conard 2017: 153).

Key types of Swabian Aurignacian lithic-artefacts, from a survey of materials by Conard and Bolus, are grouped as 'cores', 'carinated artefacts', and 'other tools'. Cores include the following types: - *Blade/bladelet core*, *flake core*, and *discoidal core*. Carinated artefacts include: - *carinated endscraper*, *nosed endscraper*, *carinated burin*; and *busked burin*. Other tools comprise: - *endscraper*, *burin on truncation*, *dibedral burin*, *burin on a break*, *Spißklinge (pointed blade)*; *truncated blade*, *borer/zinken*; *Dufour bladelet*, *splintered piece*, and *sidescraper* (2006: 217/table 1 listed from: - the Ach Valley (Sirgenstein; Hohle Fels; Geißenklösterle; and Brillenhöhle); the Lone Valley (Bocksteinhöhle and Bockstein-Törle<sup>50</sup>; Hohlenstein-Stadel and Hohlenstein-Bärenhöhle<sup>51</sup>; and Vogelherd); and the Lauchert Valley (Göpfelsteinhöhle). Bataille and Conard refer to "an internal regional development of the upper Aurignacian assemblages out of the lower ones" from Swabian Aurignacian assemblages comparing sequences at Geissenklösterle and Vogelherd from Hohle Fels, (2018: 42 referring to Bolus 2003; Conard and Bolus 2006). They refer to "a new techno-functional variant of the Swabian Aurignacian in AH IV" with reference to using burins as cores, and knapping lamellar blanks from these and other 'small reduction surfaces'. The extent to which the Swabian Aurignacian is an outlier has been raised in relation to Aurignacian projectiles where more tapered points from Vogelherd and Geissenklösterle may be indicators of 'reliable', 'safe' and 'effective' hunting practices (Dilley 2021: 84 referring to Niven 2007, and Wolf *et al.* 2016), and in relation to dating (Dilley 2021: 155 referencing Dinnis 2019; and see Bataille *et al.* 2018).

Ewa Dutkiewicz, in her 2021 monograph, called "Zeichen. Markierungen, Muster und Symbole im Schwäbischen Aurignacien" (Signs: Marks, Patterns, and Symbols in the Swabian Aurignacian) documents in relation to "the fascination with geometric patterns" her inspection of 575 artefacts, an analysis of 2,569 lines, 1,640 notches, and 571 dots (Dutkiewicz 2021: 14). Nick Conard refers to her work as "the most complete and compelling examination of Aurignacian markings ever published" (Conard 2021: 9). Archaeological interpretation of markings from the Swabian Aurignacian "as representations of real objects, such as nets, or as hunting marks" (Dutkiewicz 2021: 13 referring to Riek 1934) offer valuable perspective. Artefacts (with markings) from Geissenklösterle that before Dutkiewicz' study were never comprehensively published (although available), form the primary source of her core data, together with artefacts from Vogelherd where excavations are currently ended, and from ongoing excavations at Hohle Fels up to and including (which is to say, not after) 2016, (Dutkiewicz 2021: 13). To this core-material source she supplements "the Lion Man and a pendant from Hohlenstein-Stadel and a ring from Bockstein-Törle" (Dutkiewicz 2021: 14). There are possible additional artefacts that are not included in her survey, to include new finds at Hohle Fels, plus she notes that Sirgenstein (in the Ach Valley) is comparable to the other sites in its sequences of organic and lithic pieces (e.g., Schmidt 1912), and that the site of Brillenhöhle (also in the Ach Valley) includes finds from the

<sup>50</sup> Bocksteinhöhle is a cave, and Bockstein-Törle the entrance to this cave. These are both sometimes referred to as the Bockstein complex, or simply, Bockstein (e.g., Dutkiewicz 2021: 23; 46).

<sup>51</sup> Hohlenstein-Stadel and Hohlenstein-Bärenhöhle are two caves next to each other in the same rock massif. They are sometimes referred to as the Hohlenstein complex, or simply, Hohlenstein (e.g., Dutkiewicz 2021: 23; 46).

UP from which the earliest layers of the Aurignacian return two bone points from Riek's excavations between 1956 and 1963 ([Dutkiewicz 2021: 45](#)).

Broadly grouping artworks, flutes, (body/clothing) ornaments, and 'symbolic' tools, as four main categories of finds in the Swabian Aurignacian, her inventory includes: - portable-art figurines; flutes from ivory and bone, including tubes and possible fragments of flutes; perforated beads, and pendants, made from teeth, antler, bone, ivory and shell, sometimes stones, fossils, fish vertebrae and amber; bands (bracelets/anklets) that interpreted as mouth bows become sound tools; and some important fragments of debitage from personal adornments (raw forms). She adds that "Due to one example of a find exhibiting an eyelet, the so-called antler objects, made from antler burrs, represent another interesting artifact category of possible personal ornaments. The function of these objects is still unclear. They are often referred to as retouchers, smoothers or pendants ([Dutkiewicz 2021: 82-83](#)). In the last group she includes pierced/perforated batons; and smoothers/spatulas, points and awls (delineated on a basis of form and function, like differences between simple-base 'Lautscher' points, split-base points, projectiles, and needles, etc.). The former category, also referred to as *bâton percé* that can be found made from ivory, provides another tool that remains limited in our understanding of what it is which I will come to in the next chapter in relation to possible musical instruments. She also includes rods, as blanks for end products, such as those made from ivory, to include blanks for flutes, beads and points ([Dutkiewicz 2021: 83-84](#)).

Harald Floss, Simon Fröhle, Benjamin Schürch, and Stefan Wettengl ([2017](#)) maintain that open-air Palaeolithic sites in the Swabian Jura are eclipsed by cave sites, especially, Hohle Fels, Geissenklösterle and Vogelherd, which in my thesis aims at putting 'The Valley' as a generic name for the flutescape of the whole acoustic region in perspective. They illustrate 28 individual sites across the region peppering caves and open-air sites together in a constellation that dots the landscape of the Swabian Jura<sup>52</sup>. The authors refer to their work as a starting point (see also [Floss et al. 2012](#); [Brenner 2013](#); [Fröhle 2013](#); [Wettengl 2013](#)) to demonstrate the contribution of open-air sites to understand relations between cave sites and sites for raw materials. The list of sites above is by no means exhaustive showing the great capacity to understand the whole of the region as a place of occupancy, activity and life. Harald Floss and Benjamin Schürch, for example, have explored the Alpine region around Blaubeuren (*Blaubeurer Alb*) for surface finds identifying additional areas of interest ([2015](#)). The work that the authors describe reminds me of the archaeology I am familiar with in Sweden (where there is no Palaeolithic) in which more often than not, finds are on the surface or just below the surface of the ground, and where local collectors, amateur archaeologists, and local heritage centres, are often a good source for finds, and for information.

---

<sup>52</sup> The sites in this sample include: - Kleine Scheuer (cave); Heubach-Sand (open-air); Waldstetten-Schlatt (open-air); Braunfirst (open-air); Randecker Maar (open-air); Käppele (open-air); Burkhardtshöhle (cave); Wittlingen (open-air); Hohle Fels (cave); Geißenklösterle (cave); Große Grotte (cave); Wipplingen-Sonderbuch (open-air); Börslingen-Eisenberg (open-air); Bockstein (cave); Hohlenstein-Stadel and Bärenhöhle (cave); Vogelherd (cave); Spitzbubenhöhle (cave); Bruckersbergstationen (cave); Haldensteinhöhle (cave); Papierfels (cave); Brillenhöhle (cave); Sirgenstein (cave); Heidenschmiede (cave); Irpfelhöhle (cave); Fohlenhaus (cave); Schmiechenfels (cave); Hohle Fels-Hütten (cave); and Kogelstein (cave), ([ibid. 45/fig. 2](#)).

Floss *et al.* (2017) profile four open-air sites documenting evidence from: - the Middle Palaeolithic at Börslingen-Eisenberg, Waldstetten-Schlatt, and Wipplingen-Sonderbuch; the Early Upper Palaeolithic at Börslingen-Eisenberg, and Wipplingen-Sonderbuch; the Aurignacian and Magdalenian at Waldstetten-Schlatt; and the Magdalenian at Heubach-Sand (2017: 70). The site of Wipplingen-Sonderbuch is located close to the Ach Valley in the Blaubeuren Alps. Aurignacian tools coming from here are: - Lateral retouched pieces; Burins; Backed bladelets; Endscrapers; Borer; and Truncated pieces (Floss *et al.* 2017: 64). Local chert is noted, as is non-local chert, the latter coming from at least 60 km away (*ibid.* 66), and they conclude that:

In multiple cases, these sites are directly situated at or in immediate vicinity of raw material outcrops, especially in Börslingen. For Wipplingen-Sonderbuch, Heubach-Sand and Waldstetten-Schlatt the sources of water and the overview over the surrounding landscape are favourable and most probably one of the main reasons for the habitation of these areas by Palaeolithic groups. Therefore it is one of our major goals to link open-air sites or specific raw material outcrops respectively to cave sites, as was possible with Börslingen and caves in the Lone valley (Floss *et al.* 2017: 70).

Climatic oscillations in the Swabian Aurignacian must have impacted the flora and fauna (Conard 2011: 231 referring to Müller and Schönfelder 2005). Conard *et al.* write, however, that “our faunal data suggest that the environmental shifts of the Middle and Upper Paleolithic were generally not extreme enough to cause sudden faunal turnovers. This circumstance allowed the persistence of relatively consistent faunal community through the Middle and the early Upper Paleolithic” (2013: 176). Conard notes that the most common species from both MP and UP periods found in Swabian Aurignacian sites are horse and reindeer with a stronger index for mammoth in the Aurignacian, compared with woolly rhino in the MP (2011: 230 referring to Niven 2006). Münzel and Conard (2004a) consider that bones of foetal horse and infant mammoth from most cave sites in the Swabian Jura indicate that caves were occupied more in the winter and spring times by human visitors. A proliferation of mammoth bones and mammoth ivory also suggests that mammoths may have held additional significance for the Aurignacians (Conard 2011 230 referring to Münzel 2001). Shumon Hussain and Harald Floss (2015) write that,

A significantly reduced tree-cover, coupled with glacier- and loess-flattened surroundings, renders dwelling animals the main experience of Pleistocene landscape inhabitation. A small but potentially critical aspect of this ‘worldly architecture’ is that animals are clearly one of the most dynamic and ‘active’ landscape features in these rather generic settings (Hussain and Floss 2015: 46).

They argue that woolly mammoth (*mammuthus primigenius*) is a particular ‘keystone’ species. This is demonstrated in the extensive use of mammoth ivory as material for personal ornaments adorning the body like a landscape ‘stained in mammoth’ in harmony with ubiquitous iconography signified in hand-sized (portable) mammoth figurines. The authors perceive a ‘matrix’ that “structurally intersects the cognitive and behavioural space of mammoth and humans” and in this respect they conceptualise the notion of ‘thinking with mammoths’ (Hussain and Floss 2015: 48 and after Lévi-Strauss 2007 and referring to Wolf 2015). I opened this chapter with a reference to the bird bestowing the gift of a flute on the girl called Eya (Porr 2018). It may be brought to the attention again that whilst two of the *Ach flutes* are made from bird bones, the third flute is made from mammoth ivory. In this sense, if ivory ontologically adorns the body like

a landscape, then a mammoth-ivory-flute's music – generated with breath from the hominin body, flooding the valley as a flutescape – redeems a sense and feeling of mammoth, with, through and about the entire acoustic ecology of the valley place. There is also a strong parallel between Goldhahn's reference to birds being very much like humans (2019: Chapter One) in the identical sentiment expressed by Hussain and Floss (2015: 48) in respect of mammoths, e.g., referring to “When Elephants Weep” (Masson and McCarthy 1996: 91-110), and who comment,

Together with their environment shaping impact, they are therefore easily perceived as bearers of agency, intentionality and sentience – in particular when humans do not conceptualise worldly affairs along Cartesian dichotomies (Hussain and Floss 2015: 48).

From cave sites in the Ach and Lone valleys, ‘naturalistic’ figurative depictions of cave lions (after mammoths, and followed by bison, cave bear, horse, hedgehog, bird and fish) comprise the second largest percentage of species within ‘the visual art repertoire’. The cave lions are followed in direct succession by three finds in the category of lion-‘man’ which comprise the third largest percentage group (Hussain and Floss 2015: 47/fig. 2). Of this group that is typified in the infamous ‘Lion Man’ from Stadel Cave in Hohlenstein (Kind *et al.* 2014), Conard writes that “Geißenklösterle (Hahn 1988) and Hohle Fels (Conard 2003) have all produced clear examples of therianthropomorphic animals that include characteristics of lions and humans that are often referred to as *Löwenmenschen* (lionmen)” (2011: 235).

Hussain and Floss explain that cave lions (*Panthera spelaeo*) may have been singled out for a special type of special expression – and it is important to emphasise that felids *are* the only species in the Swabian Aurignacian to be treated in this way – considered because of the particular liminal-ontological relation between cave lions and people in the Swabian Aurignacian. This interpretation appropriates the cave lion as “probably the prime predator of the Eurasian mammoth steppe” whilst the species’ nocturnal and “*elusive*” character completes a juxtaposition at the lion-human interface (Hussain and Floss 2015: 51). An alternative interpretation for the large figurine has been suggested of a standing bear (Clifford and Bahn 2020). If *Löwenmenschen* are interpreted as cave bears (*Ursus spelaeus*), then the categories for bears and lions would level out in frequency from the sample of different species signified in the small figurines from the Ach and Lone valleys (Hussain and Floss 2015: 51/fig. 2). Conard writes that:

Over tens of millennia Neanderthals occupied caves in the Swabian Jura without exerting pressure on the cave bear populations. In contrast, during the Upper Paleolithic cave bears went extinct, probably due in part to human predation (Münzel and Conard 2004b). Neanderthals and cave bears seem to have coexisted in a dynamic equilibrium with both species able to survive in the same region over long periods of time. With the arrival of modern humans this dynamic equilibrium was disturbed. Cave bear hunting was intensified and more bones show anthropogenic modifications and even direct evidence of hunting (Münzel *et al.* 2001; Münzel and Conard 2004b). (Conard 2011: 230).

Whilst noting the Lévi-Straussian adage that animals are good to think about or eat but not at the same time, (pointed out by Hussain and Floss, 2015), the pressure that modern humans exerted on fauna is acknowledged. A shift in the increase of anthropogenic modifications in relation to natural weathering and carnivore gnawing of bones is detected across MP to UP layers which are

observed from a sample of reindeer and red deer, ibex and chamois (Conard *et al.* 2013: 177). In the comparison, cave bears and mammoths are excluded because they can “swamp the faunal signals with material that is not related to past human diets”; bears may have died in caves naturally, and mammoths used for their ivory rather than eaten. It is also unclear as to the extent in which bears and mammoths were hunted, although there is evidence that bears were sometimes butchered, but uncertainty remains as to whether mammoths were hunted more intensively in the UP than in the MP in the region (Conard *et al.* 2013: 173-175 referring to Münzel and Conard 2004b; Münzel 2001; 2005; and Niven 2006, respectively).

The shift in diet away from large game to “fish, fowl and small mammals in the Paleolithic diet of the Swabian Jura” (of hominins), is noted. Remains of certain bird species in the caves are considerably higher in the UP than the MP. Gastroliths or gizzard stones that have found their way into the stomachs of birds, along with evidence for ptarmigan (*Lagopus mutus/Lagopus lagopus*) indicate that ptarmigan was an important game bird for the Aurignacian Achthalians. The evidence of flutes made from swan radii also signals that birds of this size were actively hunted by humans. Similarly, songbirds such as the jackdaw (*Coloeus monedula*) that happen to be much smaller than ptarmigan are observed in the Upper Paleolithic deposits. It is considered that they may have been harvested out of their nests as easy pickings, so whilst they are smaller in size, they are easier to get (Conard *et al.* 2013: 84). In conversations with Petra Krönneck about this she told me that their calls from the nest may have alerted humans to their whereabouts.

If regional developments occurred as observed from lithic data in AH IV at Hohle Fels, then processes of music making may be interrogated in recognition of this. I wish to argue that a complexity of musical behaviours in the Aurignacian *Achtal* may have stimulated innovative behaviours motivated by ‘flute fetishisation’ (which I theorise as *fluting* after *musicking*) in relation to “place-making and sonic identity” (e.g., Malafouris, 2013; Maloney and Schofield 2021). In this sense, music may not have been pigeonholed, like some may regard a musical event as choice entertainment today, but was integral to the strategies of the new modern hominins arriving in Swabia who stayed for the duration. Valley resources modified human minds towards instrumental (organological) melodic music situated in the dynamic acoustic spaces of not only specific caves, but within the enigmatic vibrations of the mother valleys. These behaviours were highly experimental and impacted cognitive ability through various types of engagements with materials associated with musicking, helping to anchor personal and collective memories, establishing and serving traditions care of music’s immense power and agency in terms of emotional response. Music did not only stain the landscape in this sense, it claimed it.

## 5. SWABIAN AURIGNACIAN: TOOLS OF SOUND

## 5.1 INTRODUCTION TO TOOLS OF SOUND

The *Ach flutes* are interpreted without dispute as ‘secure’ evidence of melodic-wind instruments and therefore represent the most prominent earliest incidences in the archaeological record of this type of musical behaviour as first revealed in the Upper Palaeolithic context (Münzel *et al.* 2016: 225; Conard *et al.* 2009; d’Errico *et al.* 2003). Two people who had been relevant to the history of the research about the *Ach flutes* in different ways are: - archaeologist Joachim Hahn [12<sup>th</sup> August 1942 - 27<sup>th</sup> April 1997] [Figure 5.1]; and engineer Friedrich Seeberger<sup>53</sup> [1938 - 15<sup>th</sup> November 2007] [Figure 5.5] who made and played reconstructions of flutes from the Ach valley. Susanne Münzel, Maria Malina [Figure 5.1], and Wulf Hein [Figure 5.36, c] are also amongst the first researching the Music Archaeology of the finds who were joined later by Nicholas Conard. For my bachelor’s essay in archaeology (2013) I interviewed Hein. For this thesis I have conducted interviews with Münzel and Malina. Hahn, and Seeberger are sadly no longer available for interview or comment. Other key researchers who have become part of the story of the *Ach flutes* will be mentioned in due course.

The *Ach flutes* discussed in this thesis in chronological order of discovery are made from: - the wing bone – radius – of a whooper swan (*Cygnus cygnus*); ivory from the tusk of a woolly mammoth (*Mammuthus primigenius*); and the wing bone – radius – of a griffon vulture (*Gyps fulvus*). I refer to these almost complete finds of melodic wind instruments as the swan flute, the mammoth flute and the vulture flute, and sometimes ‘the swan’, ‘the mammoth’ and ‘the vulture’ although flute-playing colleagues usually refer to ‘the swan’, ‘the ivory’, and ‘the vulture’. The swan flute is from Geissenklösterle (GK) and carries the scientific label ‘GK1’. The mammoth flute is also from this cave carrying the label ‘GK3’. The vulture flute is from Hohle Fels (HF) and its label is ‘HF1’. GK1, GK3, and HF1 – as a trio of the most complete flute finds – are referred to as the *Ach flutes* in this thesis to separate them from other finds *per se*.

Hahn’s renowned 1988 monograph *Die Geissenklösterle-Höhle im Achtal bei Blaubeuren I* meaning ‘The Geissenklösterle Cave in the Ach Valley by Blaubeuren’ which includes drawings of finds from Geissenklösterle, is one that contains a number from the Aurignacian that after Hahn’s death in 1997 have been realised and discussed as sound tools, to include the category of the ivory flute. There are drawings of finds, for example, that are related both directly and indirectly to GK3 which are published in his monograph years before GK3 was refitted and recognised as a flute. The perspective in this thesis is that all sound tools of the Ach Valley are relevant to the soundscape of the valley for potentially understanding the musical minds, and music, of the Swabian Aurignacians, not just the *Ach flutes*. Whilst the *Ach flutes* retain the primary material focus it may be noted that the first publications for each of these almost complete flutes have been accompanied always by the simultaneous publication of fragmentary evidence of more flutes. With excavations at Vogelherd re-instigated in 2005 three years after the first publication

<sup>53</sup> See article by Georg Hiller about Seeberger (2007).

(in English) profiling the discovery of the swan flute (Münzel *et al.* 2002), fragments interpreted as flutes from the Lone Valley also emerge in the data for flutes in the Swabian Aurignacian, although only the relatively complete flutes (so far discovered) are from the *Achtal*. The three caves in Swabia from which Aurignacian flutes and flute fragments come from – to include bone-tube fragments – are Geissenklösterle and Hohle Fels in the Ach Valley, and Vogelherd in the Lone Valley [Figure 5.2].

Ewa Dutkiewicz has increased the number of flute-related fragments recently in her research published in 2021 investigating pattern markings on all finds from the Swabian Aurignacian. Her inventory takes account of all the bone and ivory fragments previously published as flutes (as these tend to have markings), plus she identifies some new fragments, whilst adding fragments of bone tubes with markings to the flute inventory. The result of this is around fifty flute-related finds [Figure 5.3]. There are more flute fragments and flute-related finds too. At least one find of ivory that was originally published in the first article about GK3 (Conard *et al.* 2004: 457/fig. 13. d)<sup>54</sup> is not to be found in her inventory. The reason for this must be that it does not have any markings on it, yet it is assumed to be part of the end of GK3 that is missing. The find in question, from two separate fragments, is a refit that looks like part of a perfect rim coming from the end of a cylindrical tube [Figure 5.3 a]<sup>55</sup>. With regard to its refitting in the GK3 complex, Maria Malina explained to me that it “was not possible to refit directly since the end with the splint is too incomplete”. She also answered a question I had regarding both fragments in the refit coming from the same sub-square C even if their labelling (48c and SFc) is noted differently (e-mail corr. Dec. 1<sup>st</sup> 2021).

As mentioned earlier, Dutkiewicz’s research incorporates finds up to 2016, and I have already noted one possible flute fragment at Hohle Fels from a subsequent summer (Conard and Malina 2019: 58/plate 32, 17) and there may be more to come. A refitted item of ivory originally published as two separate rod-like lengths illustrated in Hahn’s monograph [Figure 5.18, a, b] should also be mentioned. This *flute-blank stave* complex is quite possibly a preform for another flute and it deserves to have a place in the inventory for flutes and flute-related finds of the Swabian Aurignacian. The refitted ivory stave (or rod) is 35 cm long and had been found originally split down its entire length rendering two separate longitudinal halves. Its solid mass is rounded on its surface into a long cylindrical form. It probably originates from another part of the same ivory tusk that the mammoth flute GK3 is made from (see further).

Additionally, within the plate of artefacts of hidden sounds that are ‘flute related’, in Hahn’s monograph, is a decorated raven ulna (Hahn 1988: plate 45/17), [Figure 5.4, b.], which he had originally mooted as a scraper or type of guiro (Hahn 1988: 220-221) referring to research interpreting incised scapulae as soundtools<sup>56</sup>. Is it coincidental that Hahn was on the track for archaeological sound? The raven then emerges transformed as a possible bone-tube flute (Dutkiewicz 2021: 325: 296/plate 35, 1), [Figure 5.3, c.]. It is therefore important to outline in these coming sections, how music archaeologists go about deciding the classification of a musical

<sup>54</sup> This is a black and white image of the convex side of the find (original photograph by Hilde Jensen).

<sup>55</sup> This image is of both the convex side, and the concave side, of the find (original photograph by Hilde Jensen). The image was provided by Maria Malina.

<sup>56</sup> See research on three notched shoulder blades from Eastern Anatolia by von den Driesch and Boessneck (1981).

instrument and the critical importance of morphology. Appendix 2 lists a new inventory, *Sound tools from Aurignacian layers in the Ach Valley* that is not flute related which also includes a Lund Probability Group (LPG) allocation for each find. A new inventory for the *Ach flutes*, the flute fragments (those with markings and those without), and flute-related finds are presented in this thesis as Appendix 3. Whilst this builds heavily on Dutkiewicz's inventory, some information might differ from her report according to a recent cross-reference of the data by Svenja Schray which is presented in Appendix 4.

## 5.2 HIDDEN SOUNDS IN HAHN'S MONOGRAPH, AND ORGANOLOGICAL MORPHOLOGY

Presented together on one plate in Hahn's monograph is the notched/ribbed raven ulna (mentioned above), an antler band, and a pierced baton or perforated stick (ivory), and these are copied in this chapter, respectively [Figure 5.4, b, c, d]. What is coincidental is that these three illustrated finds are arranged together on the plate in a row (Hahn 1988: /plate 45, 17, 18, 19), and it is these three that I will discuss as musical instruments. On this same plate is also illustrated an ivory object which Hahn refers to as a decorated piece (1988: 221; plate 45, 12) copied in this chapter [Figure 5.4, a], which many years later refitted into the ivory flute GK3. It is worth mentioning at this point the system that Cajsja Lund follows for designating instruments into different classifications whatever their probability grouping. This is where the term *aerophone* for types of wind instrument fits along with *chordophone* for types of stringed instruments, *idiophones* for types of percussion instruments, and *membranophones* for types of drums or soundtools with skins/membranes. A short potted history of this is that Lund uses, (as do many other music archaeologists) the classification method developed in 1914 by Erich Moritz von Hornbostel [1877–1935] and Curt Sachs [1881–1959] which classifies musical instruments into systems (Lund 2012: 63), essentially from the four main musical-instrument families given above. The system was overhauled by Musical Instruments Museums Online (MIMO) in 2011 using the version of the Hornbostel–Sachs scheme developed by Jeremy Montagu in which the term *wind instrument* replaces *aerophone* (2009 and 2012) although it is retained elsewhere (Libin 2014). The 1914 German system was not however the first; there had been systems of organological classification much earlier in China and in India, and it was the Belgian Victor-Charles Mahillon [1841–1924] whose system for membranophone, chordophone and aerophone groupings – including groupings for rubbed, struck or plucked *autophones* – was the one adopted by Hornbostel and Sachs to develop their own system. Sweden's Tobias Norlind subsequently added *telephones* and *gramophones* to the list (Ternhag 2007b: 24–28). Then there are *lithophones* (stone-sound tools), *microphones*, *megaphones*, and many more examples, like *headphones*.

This systematic approach must also be flexible to accommodate the perspective that if I can play the grooved notches on a bracelet using a finger nail (e.g., LPG 5) and then use the same finger nail to strum the string of the same bracelet if I angle its band in my open mouth (e.g., LPG 4) – see Seeberger [Figure 5.5] as an example of the latter – the object is both an idiophone and a chordophone, depending on how it is played (or either a rubbed autophone or a plucked autophone). Gunnar Ternhag questions the nature of organology (a musicological discipline) and

its current purpose (2007b: 18). Morphology is the name of one of the three research areas of current organology, along with area of cultural analysis (Ternhag 2007b). Attention to morphology and cultural analysis may be perceived as a call to reframe the theoretics and ethics of organology, vis-à-vis classification as a hegemonic system, as I will go on to argue towards the end of this chapter. Here I comment on the morphological-reconstruction work of Simon Wyatt, i.e., his work with the notch of HF1; and *instrumental musique concrète* (acoustic not electronic in this context) in relation to the Stuttgart composer, Helmut Lachenmann. Aspects of morphology are echoed by Montagu who discusses the UP Swabian wind instruments in “How Music and Instruments Began: A Brief Overview of the Origin and Entire Development of Music, from Its Earliest Stages” (2017). However, I disagree with his opinion that “archaeologists (who are seldom trained musicians), who publish the scales and pitches of the pipes that they have found, can give us no more than conjecture and experience of their own musicality” (Montagu 2017: 6). As a trained musician and archaeologist, I can assert that this sentiment undermines the nature and complexity of the music-archaeology intersection, in which the same ‘concern’ can equally be applied to trained musicians with or without a ‘trained’ archaeological background. I go even further to theorise this interface as being advantageous to the art of archaeological reconstruction, as it is to the musicological discipline of performing practice, provided the methodology is relevant. Montagu fails to mention or even reference in his discussion of the Swabian wind instruments (*ibid.* 5-6) the work of Seeberger (1998; 1999; 2003) who was the first to discuss and test the ‘ney’ technique as method of playing them (referring to Meylan 1992) on reconstructions which he had made.

The first item to be considered as a sound tool at Geissenklösterle is a curved band (as alluded to above as a bracelet) made from antler [Figure 5.4 c]. The antler band’s length is 132 mm; breadth is 5 mm, and width is 4 mm. The band is ‘carrying’ 2 units of pattern (where a unit is one basic area of pattern) comprising a staggering total of 78 incised notches that have been carved using a back and forth sawing technique (Dutkiewicz 2021: 312). It looks like a delicate bracelet/wrist band, the type that people wear which consists of a hard-curved piece of material, pierced at both ends, and tied with a string. It is one of two curved bands that were both found in AH IIb at Geissenklösterle, profiled by Hahn discussing “*Gebogene Bänder*” (1988: 220). The antler band which follows the natural curvature of the material is illustrated in Hahn’s monograph (1988: plate 45.18). To make the perforation Hein notes that it had been gouged out from both sides rather than by twisting (Hahn 1988: 220). Ewa Dutkiewicz mentions that Hahn was the first to suggest that the band may have been a mouthbow (*mundbogen*) (2021: 83), but in subsequent correspondence (4th May 2022), we agree that the first mention of a mouthbow in print was not published for this find before 2004 where it is first mentioned by Tim Kerig from *Württembergisches Landesmuseum* (2004: 18). The antler band was found in square 47 at Geissenklösterle, and is numbered 59 (‘47-59’ is its reference). Dutkiewicz describes this find and others like it (typology) as,

...long, slender objects that are mostly made of ivory (in one case of antler). They have a flat oval to rectangular cross-section, following the natural curvature of the blank and having, in some cases, perforations at their ends. Different ways of using these objects are conceivable: as bracelets or anklets; as hair accessories; as pendants or decorations sewn onto clothing. They often bear markings in the form of deep, regular incisions (Dutkiewicz 2021: 83 referring to Hahn 1998; Wolf 2015: 55-59).

In 2006 (29th July), Stefanie Kölbl, the director of the Museum of Prehistory in Blaubeuren took video footage and photographs at a workshop with Friedrich Seeberger which she gave me when I started my research. From this source, I have found video footage of Seeberger playing a mouthbow [Figure 5.5] which is surely a reconstruction of the antler band, to which he fastened a piece of string, or some sort of hair that has been pulled taut. He holds the mouthbow in his left hand, and in his right hand he has a small plectrum made of something like bone or wood [Figure 5.5 a]. He plays the mouthbow by placing an end of it in his mouth where the mouth cavity (the buccal cavity) acts as a Helmholtz resonator from the soundwaves generated by the string or bow being plucked [Figure 5.5 b]. Different frequencies from the string's harmonics can be shaped melodically by manipulating the shape of the buccal cavity during performance which Seeberger demonstrates in the video.

Gjermund Kolltveit is known amongst other things for his music-archaeological expertise with Jew's harps (jaw harp) which I consider reminiscent of Seeberger's mouthbow described above. I invited him to be a part of a performance in which I was playing a GK1 reconstruction together in a concert for Cajsa S. Lund in 2016 in Växjö, Sweden, where he played a jaw harp. The jaw harp and bone flute complement each other; the bone flute and jaw harp are not powerful in volume but delicate, blending and not overwhelming each other when played together (see Experiment 7.8 in this thesis called 'Bone Tubes'). The Geissenklösterle (GK) mouthbow is one of the subjects he has been working with recently, and some of the results from this were presented at the 11<sup>th</sup> Symposium of the International Study Group on Music Archaeology<sup>57</sup> in a paper he read called "Palaeolithic strings? Experimental approaches". From experiments where results do not produce a strong sound, and from discussions at the symposium, Kolltveit's feeling is that the GK decorated band is likely not a mouth bow. However, the footage of Seeberger would seem to give a contrary impression, and it is precisely Seeberger's method that Kolltveit notes does give the best result which is by activating the friction of the string (suggesting horse hair for the string) with a type of plectrum, together with the mouth as a resonance cavity (personal correspondence 4<sup>th</sup> April 2023).

Praxmarer illustrates the GK mouthbow (2022: 126/fig.4.7.1 after Kerig 2009/fig. 404)<sup>58</sup>, which is included in his inventory (2019: 90/table 1 referring to Kerig 2009: 329; and fig. 404). Discussing "musical bows" he notes the relation between bows for hunting, and bows as types of string instruments, referring to the confusion between whether a bow is one thing and not the other, or whether it is more to do with one thing than the other, and so on (2022: 123-125). This is precisely the line between LPG 4 and LPG3 (the Lund Probability groups that I discussed in Chapter 3). LPG 4 is where I place the find from Geissenklösterle as an antler-wrist band [Appendix 2], and I call it a wrist band because I think it would have been a bracelet first and foremost, but that it may have been played occasionally and socially as a mouth bow. It is not large enough physically to be used to kill an animal, of course, but Praxmarer alludes to the metaphysical sense. Ornamental finds like small figurines and pendants from the Aurignacian

<sup>57</sup> The title of the symposium was "Sounds as Material Culture: Experimental Archaeology and Ethno-Archaeology" and was held at the Humboldt Forum in Berlin, 1–5 November 2021.

<sup>58</sup> In his illustration, Praxmarer's caption describes an "engraved perforated ivory band" but the band is probably antler, rather than ivory, according to Hahn (1988: 220).

Swabian Jura are deliberately small in size, designed to be worn or carried about the body, otherwise they could easily get lost; a mouthbow may be hypothesised as most conveniently carried around as a bracelet on the wrist, primarily as a jewelry item. It moves over into LPG 3 if the one wearing it is inclined to play it frequently, or perhaps think about it as a musical thing. I haven't reconstructed this find, yet I imagine running a finger nail over the grooves in this sense it would become a personal-miniature-musical scraper/guiro (LPG 5). There are four bands at Hohle Fels and one at Geissenklösterle all in Aurignacian contexts (Dutkiewicz 2021: 310-313). Together, therefore, there are five possible mouthbows all coming from the Ach Valley. One of these is not so curved but nevertheless, I think it belongs with the others [Appendix 2].

The raven ulna (*Corvus corax*) which is ribbed with 14 parallel notches has been most recently documented in the work by Dutkiewicz who classifies the find as a bone-flute tube (Dutkiewicz 2021: 296) therefore in the category of aerophones. It is described by Hahn as musical scraper (1988: 220) therefore in the category of idiophones. It comes from Geissenklösterle in AH IIb. Praxmarer (2022: 113; 115/fig. 4.3.5) also describes examples of raven bones as scrapers as discussed earlier, e.g., the Crimean raven radius fragment with seven notches (Majkić / Evans / Vadim / Tsvelykh / d'Errico 2017). Goldhahn also had highlighted the significance of the raven's white feather with other relevance for folklore (2019: 5). In a sense that this ribbed raven ulna from Geissenklösterle does not seem to have another obvious purpose it is reasonable to attribute the find as either a bone-flute tube (aerophone), or a scraper (lithophone)<sup>59</sup> or perhaps both at the same time (aero-lithophone). This is an experiment I did not have time to undertake but provisionally, I put the item in the category of both flute and scraper in LPG 2 [Appendix 2]. The ulna is 76.02 mm, with a breadth of 13.35 mm, and width of 9.35 mm. The fourteen notches in profile are wide and V shaped, and the technique identified by Dutkiewicz is sawing back and forth, and sawing and turning. The raven ulna was found in square 26 at Geissenklösterle, and is numbered 80 ('26-80' is its reference). Finally there is the leaf shaped pierced baton made from ivory at Geissenklösterle Hahn 1988: plate 45.19; Conard and Bolus 2006: 214/fig. 13.25; Dutkiewicz 2021: 325; 429/plate 47.1-4). Was this ever a bullroarer before the holes were made like the one at Vogelherd discussed as a whirling leaf (Riek (1934), or more to the point, do the holes actually prevent it from functioning as a bullroarer?

### 5.3 THE ACH FLUTES

As mentioned, the *Ach flutes* term is a collective noun that I use in the thesis to refer to the three main pieces to which this research is really dedicated. I will now describe each of them one by one, firstly, their history and archaeology, then their instrument and voicing reconstructions. In many ways the unfolding of their story over the last three decades has been a cumulative one, with each model offering means of comparison and offering perspectives about interpreting the others. This unique dialectic is presented here by firstly presenting four photographic images of the *Ach flutes* [Figure 5.6]. They were taken in a photoshoot from four different angles organised by Maria Malina and me. It is unusual that the three archaeological finds are all in one place at the

<sup>59</sup> The ridges on GK1 have also been discussed as a scraper (Münzel *et al.* 2002: 109-110)

same time; by sheer luck I was working on the dig at Hohle Fels in the summer of 2011 when they happened to be all together in the museum. Stefanie Kölbl took the three ancient flutes out of their cases and lined them up on a table where we took photos of them. Due to their antiquity, I was not allowed to handle them at the time but was left in the room alone with them for a little while. It felt like I had been left momentarily with the crown jewels.

The first time a dedicated article to all three *Ach* flutes was published in English was in 2016, by Susanne Münzel, Nicholas Conard, Wulf Hein, Frances Gill, and Anna Friederike Potengowski. Published in this article are: - a table for the characteristics of all three finds compiled by Susanne Münzel (Münzel *et al.* 2016: 239/table 1), copied in this chapter [Figure 5.7, a]; documentation about how ‘flutes’ in bone and ivory are reconstructed by Wulf Hein; results from experiments aimed at voicing these reconstructions, undertaken by Anna Friederike Potengowski, her results copied in this chapter [Figure 5.8]; and comments about the Seeberger/oral-glissando technique by the author (Frances Gill). N.B. Researchers referring across the decades to the top and bottom ends of the *Ach* flutes have done so in different ways because each flute has been played from both ends by a variety of different practitioners. What one researcher refers to as the proximal end is referred to as the distal end by another. The way that the flutes are each presented in diagrams (both in photographs and in drawings) in various articles across the decades, likewise changes from article to article. Finally, the reconstructions of the pieces also have entered this ambiguous system of referencing. Wherever possible I use descriptions to refer to parts of the respective flute finds to avoid confusion<sup>60</sup>.

#### 5.4 THE SWAN

**Originally they would not have belonged to my remains that I analyse but I just saw the boxes and checked them, and looked inside, and then I recognised these artificial traces on the bird-bone pieces...**

**(Interview conducted by the author, 15th January 2019, with Susanne Münzel)**

The swan flute is a little flute much thinner than an adult’s finger. Taking hold of a reconstruction of it feels like holding a pencil but unlike a pencil it is hollow inside. It feels almost weightless. The remarkable sounds that emerge in musical engagement with this small instrument

<sup>60</sup> For the data compiled in table 1 (Münzel *et al.* 2016: 239) there are a couple of points to raise: - firstly, the caption for the table is described as “Characteristics of the archaeological wind instruments and their reconstructions” but this is a conflation of measurements for the artefacts themselves used as a proxy for the sample of reconstructions, as far as I can tell. Strictly speaking, there should be two sets of measurements for each of the three pieces; one for the artefact, and one for its reconstruction; secondly, the reconstructions shown in the photograph (Münzel *et al.* 2016: 240/fig. 1) are not aligned in the same way as the archaeological artefacts in the drawings (Münzel *et al.* 2016: 240/fig. 2) for two of the three pieces, where only HF1 is in the same orientation on both images. This makes reading the data less straight forward, i.e., the data for each artefact’s fingerholes in the table explicitly refers to the photographic image of reconstructions “from top to bottom” which is the wrong way round for GK3 (as the larger of the two holes is closer to the notch end of this flute) .

is nothing short of a musical marvel, thanks to the innovation and insight of Friedrich Seeberger who first demonstrated how such a flute may have been played most sonorously (1998; 1999; 2003). GK1 is the first of the three most complete flutes to emerge accompanied in its initial discovery together with another flute, although this second flute (GK2) is too fragmentary for it to be refitted into anything like a complete instrument. Another way to think about a radius bone from a swan wing in terms of shape and size is as a drinking straw (e.g., for sucking, or blowing liquid). The Upper Palaeolithic hand stencils at Gargas in France are understood to have involved children and adults (Derricourt 2018: 58-60) in a technique for cave wall art engaging the spraying of paint by blowing it presumably through something like a straw. Blowing and sucking through a straw is surely sound play. I never believed in the idea that the missing fingers at Gargas are concerned with mutilation, or even that these are symbols (e.g., Etxepare & Irurtzun 2021); it seems to me simply to be a natural way to play with options. Such sucking and blowing action engages the tube, and sound is part of the engagement. Although there is mobile art (and not cave wall art) in the caves of the *Achtal* and *Lonetal*, the experimental and playful use of tubes potentially by sucking and blowing is put forward as an origin for sound and music, even before fingerholes are made (see the discussion about Shakespeare's character Francis Flute the Bellows Mender in Chapter 4). Geissenklösterle is also the original home of the ivory flute GK3. The distribution, respective stratigraphic location, of all flute fragments for the three complexes GK1, GK2 (swan radii) and GK3 (mammoth ivory) from where in the cave they were recovered in the last century have been plotted (Conard et al. 2004: 450/fig. 4), [Figure 5.9].

At Geissenklösterle in 1973, Wagner dug a four and half metre long ditch which started at the entrance and extended to the back wall. This work continued from 1974 under the direction of Hahn following signs that the site was offering good prospects for Middle and Upper Palaeolithic finds. The data and finds from Wagner's ditch were simulated into the new excavation system introduced by Hahn using square meters. Wagner's sondage covered the areas as designated by squares 45, 46, 47, 48 and 49 from the new system, running West to East from square 45 (at the opening of the cave), to square 49 being a half square because of the shape of the back wall of the cave (Miller 2015: 114). By the early nineties Susanne Münzel was working at Tübingen University analysing the faunal remains that had been measured in three dimensions in the field at Geissenklösterle from the long series of excavations stretching back to Wagner's work there in the early seventies. The smaller finds collected but not measured in the field, and those finds collected later during water screening down at the Ach River, were also waiting to be analysed in Tübingen, having being sorted in Blaubeuren. Two boxes of 'extra' finds that had been put to one side from the collection finds containing faunal remains caught her attention.

In interview with me (15<sup>th</sup> January 2019) Münzel explains that after spotting the finds she had undertaken some work trying to refit them, and had engaged Hahn who was similarly curious about these finds. Eventually he suggested that she bring them to his office in the castle. She describes finding new slightly larger (plexiglass) containers for the finds, putting some soft tissue and sesame seeds in the boxes to help preserve the fragments. It was evident that there were two flutes; refitting into one flute proved impossible; secondly the two complexes of fragments each displayed a different hue suggesting two specimens; and thirdly they had never come from the same place in the cave but from two separate squares a few metres apart. Altogether there were thirty fragments to deal with (Hahn and Münzel 1995). Münzel et al. (2002: 108) explain that it

was archaeologist Petra Krönneck [June 15<sup>th</sup> 1965 - October 30<sup>th</sup> 2018] who had identified the flute fragments as the faunal remains of swan radii. After her death, Krönneck's extensive inventory for birds at Geissenklösterle was published (2019) whose work gives insight into the faunal remains of birds in the Ach Valley that from a number of perspectives are relevant to the subject of the *Ach flutes*. I have translated this data into English for the geological horizons 12, 13 and 14, [Appendix 1], in search of songbirds. Since there are no other faunal remains of swans in the cave for these horizons, Münzel *et al.* suggest that “the flute was not manufactured in the cave but was brought in as a finished product” (2002: 108).

The total of 30 fragments in the two boxes of finds were first reported as including 7 coming from the 1973 dig that are likely to have originated in square 44 next to square 34, according to Hahn and Münzel (1995). For whatever reason, there are currently 14 fragments currently listed in the database for GK1 coming from square 34 (pers. corr. Malina, 27<sup>th</sup> April 2023). However, there are a total of 23 fragments recorded in the GK1 complex (Conard and Malina 2008: 14). It is 50 years from the first excavation and in those 5 decades there is at least one known fragment from GK1 that is understood to have been lost. This can be clearly observed in the article by Münzel *et al.* (2002); prior to the point at which Flute One (GK1) was refitted with wax, a small protruding splint can be observed at its broken end evident in an earlier photo image (Münzel *et al.* 2002: compare 115/fig. 5c with 114/fig. 5a). This earlier photo image is shown in this chapter [Figure 5.43].

Seven fragments for the complex Flute Two (GK2) all come from square 47, Archaeological Horizon IIa. The flute is too fragmentary to be recognised as a flute without the context of GK1, and impossible to reconstruct as a flute. For this reason, when I am referring to the *Ach flutes*, GK2 is not part of the trio of near-complete flutes. GK2 is listed by Dutkiewicz and shown as a single item labeled as 47-9000.1 (Dutkiewicz 2021: 292: 416/fig. 34, 6) but it should be noted that this item was previously shown by Münzel *et al.* in two parts, with one above the other but not in the order which they are refitted (2002: 115/fig. 5b), although the original publication of GK2 by Hahn and Münzel (1995) does show the two parts as a refit (Hahn and Münzel 1995: 10/fig. 6). Whilst this is not so puzzling, it must be raised that in both Hahn and Münzel (1995) and Münzel *et al.* (2002), the figures showing the parts of GK2 respectively both include two other parts but these are not counted as belonging to GK2 in Dutkiewicz' inventory for bone flutes, but reallocated in her category of possible bone flutes and tubes. These are the find labelled (also) 47-9000.1 (Dutkiewicz 2021: 296: 417/fig. 35, 4), and the find labelled 47-9000.2 which is rotated on the vertical in her image (Dutkiewicz 2021: 297: 417/fig. 35, 5). As these are each originally designated as belonging to GK2 in the previous research, I take this up in the report in Appendix 4 about whether we are counting flutes, or flute fragments, and how this can be misleading. It is not clear which of these parts in the different publications relate to the seven original fragments of GK2, and what happened to the missing fragment.

Flute One (GK1) [Figure 5.12] is a flute artefact made from the radius bone of a swan which in birds is part of the wing [Figure 5.11]. It has three fingerholes placed on the dorsal side or convex face of the bone, and is 126.5 mm long, with one end reasonably intact as a rim, and the other end broken. The most recently published organological measurements for GK1 are compiled by Münzel *et al.* (2016: 239/table 1 measurements taken with a calliper Hahn and

Münzel 1995), [Figure 5.7]. Here it is reported that the tube wall is 0.9 mm to 1.5 mm thick. The maximal diameter is around 10 mm to 11 mm, and the minimal diameter is 8 mm to 7.7 mm. The sizes of the fingerholes from the biggest one near the broken end to the smallest one near the end with the complete rim are given as 5.3 mm by 3.4 mm, 3.5 mm by 3.0 mm, and 2.8 mm by 2.4 mm. Measurements for spacing between fingerholes are missing in these data. Together with Adrian Gill, I have measured the spacing between fingerholes from a scaled photograph [Figure 5.10]. Between the two holes closest together that are nearest to the end with the rim (which is the one that is not broken), the distance is 27.5 mm. The distance between the middle hole and the hole nearest to the broken end is 41 mm. Measurements from the intact rim to the middle of each finger hole are 20.5 mm, 48 mm, and 89 mm respectively.

The most recently published measurements regarding the notch patterns on the anterior of the find have been measured and published by Dutkiewicz who conceptualises them into two units of patterns. There are eight notches in total in two units of patterns that have been finely-executed leaving trapezoidal profiles via a technique of sawing and turning. The four notches in the unit between the perforation closest to the broken end of the flute and this end itself have lengths of 1.64 mm to 2.18 mm, widths of 0.3 mm to 0.54 mm, and distances between of 2.04 mm to 4.18 mm. The four notches at the other side of this perforation and the next perforation (the middle finger hole), have lengths of 1.44 mm to 1.58 mm, widths of 0.28 mm to 0.36 mm, and distances between of 1.02 mm to 4.40 mm (2021: 291). These notches have been discussed as creating a type of guiro but Münzel *et al.* consider this unlikely although I suggest it should not be ruled out from a perspective of LP5. They suggest that it is not inconceivable that the notches are simply created for the sake of a decorative pattern, and they point out that this type of ornamental design does feature on many artefacts from the Swabian Aurignacian (Münzel *et al.* 2002: 109-110). Discussing similar markings on UP finds from Isturitz, Graeme Lawson suggests such markings are serving another purpose besides decoration because markings are not equidistant (d'Errico *et al.* 2003). Nevertheless there is a recognisable symmetry to the positioning of the notches and in relation to positing of fingerholes on GK1 (*cf.* Feliks 2011) which has led to discussions amongst researchers that there may have been a fourth fingerhole somewhere around where the top of the flute is broken. The system of marks may have predetermined where the finger holes should be placed on the bone during construction. Alternatively, the function of designated places on the surface of the flute for the purpose of 'resting' other fingers not involved in actual fingering – and that may benefit from the sensation of a grooved surface to touch, or position a pincer grip – is another possibility, given how sensitive the tips of *H. sapiens*' fingers are.

On Thursday 31<sup>st</sup> March 2011, I met Gertrud Ohlsson in Blekinge, Sweden who had invited me there because she had swan wings from a dead swan which she told me had died naturally on the archipelago. Together we dismantled the wing bones extracting the ulnae and radii [Figure 5.13a]. Not having any flint to hand or being experienced with flint tools at the time, I trimmed the epiphyses back with a hack saw, then prodded and wiggled a stick inside the tube [Figure 5.13b] after leaving the bones soaking for half an hour in tepid water with a little alcohol (according to Wulf Hein's recommendation). Between Monday and Wednesday 16<sup>th</sup> to 18<sup>th</sup> May 2011 I worked in Dorn-Assenheim in Germany supervised by Wulf Hein, transforming one of the radii into a flute copying the pattern of GK1. Firstly, a circumferential ring notch was

grooved around either end of the bone for the desired length [Figure 5.14 a. b] which at the time we discussed in terms of maximizing the length of the flute. The ends of the bone start to become undesirably flat (for a flute) where the bone shaft tapers into the epiphyses. Removal requires grooving all the way round to make a deep ring notch then snapping off the end [Figure 5.14 b. c]. Smoothing the surface of the bone with a flint blade and the ends of the tube on sandstone [Figure 5.14 d. e] prepares the bone for the next stage which is scraping in the fingerholes. This I did with a flint blade [Figure 5.15 b. c] engaging a backwards and forwards motion putting most pressure on chiselling away from the body with both thumbs and the flute in a palm grip. Once or twice, Hein warned me not to be tempted to drill the hole. The fingerholes had been marked out by Hein using a photograph of the original as a template [Figure 5.15 a]. The finished flute is an 18 cm model with three holes. I have named the flute GK1-FG/WH-1(2011). Hein said the thickness of this radius bone is very similar to the original GK3. At the time I found it rather difficult to play (Gill 2020: 76) even though I had managed some clear signals experimenting with one of Seeberger's flutes previously (as a vertical flute adopting a normative flute embouchure). Potengowski tried out this flute in Stuttgart (May 2013), and she was able to play it using the Seeberger technique but commented that it wasn't as easy to play as Seeberger's reconstructions made from thinner-walled radii. This led to her lending me one of her own flutes to practice on [Figure 7.1c right image]. Susanne Schietzel also tried my radius flute in Blaubeuren (May 2013) and I have video footage of her playing it.

Hein had embarked on reconstructions of GK1 with Hahn in the mid-nineties (Hahn and Hein 1995) which led to some voicing experiments (Hein and Hahn 1998) using a method of *blowing over the finger holes* (Münzel *et al.* 2002: 117/fig. 9). This is a ductless blockflute, organologically speaking. This involves putting the end of the flute in the mouth (thus sealing the end) and blowing down the bone using the series of fingerholes as a series of labiums (which I develop in Experiment 7.4 of this thesis called 'Like blowing through a straw' playing the aforementioned flute lent to me by Potengowski). Hein and Hahn noted a distinct inclination towards pentatony, documenting a sequence of musical pitches/frequencies (a tonametrical series) from blowing over the finger holes on their swan-radius reconstruction copying GK3, which is 161 mm long (Hein and Hahn 1998: 69-70; Münzel *et al.* 2002: 109)<sup>61</sup>. In a subsequent paper with new research from Potengowski (Münzel *et al.* 2016: 234-235) the pentatony idea was challenged. However Hein's reconstruction played in this way does deliver a feeling of diatony from fundamentals inclined towards the minor pentatonic scale. Friedrich Seeberger was also reconstructing the Aurignacian flutes from Geissenklösterle (1998; 1999) and recording musical performances playing his swan radii reconstructions with a 'ney' embouchure, with the flute held obliquely to the mouth (2003). Münzel *et al.* also report on Seeberger's work comparing his method of playing with Hein's, noting the tonametrical series he produced on his swan-radius reconstruction

---

<sup>61</sup> Note that the blowing end demonstrated (shown in the photograph in Münzel *et al.* 2002: 117/fig. 9), and from which data is presumably measured, is the one with the finger hole closest to the extant rim in the mouth. In Münzel *et al.* (2002: 109) the names of the musical pitches A3, B3, C4, E4, and F4 (as well as frequencies in Hz) are also given. I recalculate these to be *A6, B6, C7, E7 and F7 for the musical pitches gained from Hein's GK1 16.1 cm reconstruction played 'over the fingerholes'* adjusted to the standard Scientific Pitch Notation (SPN) system.

copying the pattern GK1, which is 15 cm in length<sup>62</sup>. They suggest that Hein's way should not be predicted for "all Palaeolithic bone flutes" (2002: 108) and by this implicitly support the idea of *la différence*. Nick Tarasov followed the work of Seeberger notating the tonametrical series produced from playing the aforementioned flute (2005).

In the spring of 2013 Susanne Schietzel and Anna Friederike Potengowski paired up in a concert in Stuttgart<sup>63</sup> playing reconstructions of GK1, both engaging the Seeberger ('ney') technique to voice their respective swan-radius flutes. A number of discrepancies occur when comparing the GK1 research of Seeberger (Münzel *et al.* 2002) with the GK1 research of Tarasov (2005: 9), and subsequent GK1 research of Potengowski playing a Seeberger reconstruction (Münzel *et al.* 2016). This is shown in this chapter [Figure 5.16] in which all examples in the comparison concern the 'ney' method of blowing. However, the tonometrics notated by Tarasov for apparently the same flute as shown in Münzel *et al.* (2002: 116/fig. 6) show the upper fundamental as being a B flat, and not a B natural (Tarasov 2005: 9). A second query is that it is not clear if the Seeberger flute that Potengowski plays on for her experimental work shown in Münzel *et al.* (2016: 240/fig. 1) is the same flute he played on for his experimental work because the length was omitted in the article (and Seeberger made more than one GK1 reconstruction). When I made contact to check where the flute was at the time, I was told that this flute was back in Blaubeuren at the museum. Stefanie Kölbl kindly measured it as being 14.4 cm. This surely explains the next query which is that Potengowski's measured frequencies are exactly a semitone higher than Seeberger's apart from the interval between the upper two fundamentals where there is disparity; this is a perfect 5<sup>th</sup> for Potengowski whereas it is a perfect 4<sup>th</sup> for Seeberger. The slightly shorter tube produces a slightly higher overall tonal frequency range. In Münzel *et al.* (2002) the B natural indicates an augmented 4<sup>th</sup> from the previous note in the tonametrical series. A transcription that I made of some video footage of Seeberger playing a reconstruction of GK1 at Federsee museum 2000 transcribed in this chapter [Figure 5.16 c] shows that the notes that he actually plays (from his melody in the key of B flat major) correspond with the tonametrical series documented in the Münzel (2002), and Tarasov (2005) articles for the bottom three fundamentals, but for the upper fundamental it only tallies with Tarasov, i.e., the upper fundamental from the audio footage is B flat (not B natural). This leads me to the abduction proposed by Potengowski (Münzel and Potengowski 2015; Münzel *et al.* 2015) that because of certain oral glissandic-possibilities of the flute played using the 'ney' technique which Seeberger engaged, that he automatically adapted or tuned his playing to fit the tonality of the music. This sinking and raising the pitch possibility is quite considerable, technically viable via buccal cavity morphology for the tiny radius flutes, i.e., not through fingering. It is still possible that Seeberger correctly noted a B natural in the case for the 2002 Münzel article – which is clearly not a mistake because he also documented the same in his 1999 article – and that Tarasov simply documented

---

<sup>62</sup> Frequencies in Hertz are not recorded for Seeberger's work (Seeberger 1998) but results of the tonametrical series in his experiment – recorded as C3, D3, F3, B3, and for the overblown octave C4, D4, F4 – is given in Münzel *et al.* (2002: 208). I recalculate this tonametrical series to be *C6, D6, F6, B6, and C7, D7, F7 for the musical pitches gained from Seeberger's GK1 15 cm reconstruction played as 'ney'* when adjusted to a standard Scientific Pitch Notation (SPN) system. My adjustment can be verified also by referring to Tarasov's transcription of Seeberger's musical pitches documented using Western musical notation (Tarasov 2005: 9).

<sup>63</sup> The concert was called FLÖTEN, VENUS, MAMMUT, held at Berger Kirche, Struttgart, on May 4th, 2013.

what he heard from Seeberger's playing in context. According to Tarasov's documentation, and my transcription of Seeberger's playing, this tonometrical series comprises C6, D6, F6, and B $\flat$  for fundamentals in its first register, and C7, D7, and F7 in its second register which produces a strong signal of pentatony.

My own playing on a copper GK1 reconstruction of the same length of Seeberger's (15 cm) accords with Potengowski's playing analysis; the interval between the upper two fundamentals is a perfect fifth [**Figure 5.16 b**] when pushed to the limit before jumping up to the nearest harmonic. However, my playing of this particular 15 cm copper reconstruction of GK1 fluctuates between two separate pitches on this top fundamental in 'Copper for bone' (Experiment 7.11) which can be heard in the album *Sonic Debitage* (on the track called *Length for a swan radius flute*, 1'42'' – 2'06''). Potengowski plays the GK1 reconstruction made by Seeberger using a 'ney' method of holding and blowing, and she unfolds a series of contemporary extended techniques for flute, like drumming the fingerholes with her finger ends, engaging further timbral and morphological options (Münzel and Potengowski 2015; Münzel *et al.* 2015; Münzel *et al.* 2016) which opens a window onto how sound is an experimental process of exploration.

## 5.5 THE MAMMOTH: AN IVORY-FLUTE-BLANK STAVE

The aforementioned ivory stave (*ivory-flute-blank stave*) was originally published by Hahn as a 35.1 cm ivory stave (*elfenbeinstäbe*) but as two separate pieces (Hahn 1988: /fig. 43. 1. 2) [**Figure 5.18 a. b**]. The two pieces were not refitted into one piece at the time despite Hahn's comment that the shorter stave fits on top of the longer stave (Hahn 1988: 204-205). As a composite of the two pieces the *ivory-flute-blank stave* is symmetrically fractured, lengthways. This *ivory-flute-blank stave* was only first published as one composite by Maria Malina and Ralf Ehmann (2009) twenty years later in context of their practical-experimental research that primarily concerns an ivory-fracturing technique as related to the ivory flute GK3. Hahn had suggested that another ivory piece (*Geschoßspitze mit einfacher Basis aus Elfenbein* - Hahn 1988: /fig. 43. 7) [**Figure 5.18 c**] is possibly also part of a much longer piece that may have originally included the two stave pieces, with all three pieces having come from one single ivory extraction from the outer part of a mammoth tusk in the Aurignacian (Hahn 1988: 205). The 'point' looks like a chisel or a type of bevelled tool tapered at both ends. If this had belonged to the same original extracted-ivory length then the whole length could have been about a metre long given that the tip is missing from the smaller of the two stave pieces (*ibid.* 205). Situated theoretically between the two artefact staves that fit together in the one complex at the distal end of the tusk, and the chunkier point located towards the proximal end, there is a potential gap of about 40 cm. This is certainly generous enough for the (18.7 cm) length of the ivory flute GK3, and even scope for another flute or something else besides. Maria Malina and Ralf Ehmann notice a similarity in the size of the diameters between the composite *ivory-flute-blank stave* (minimum 0.5 cm and maximum 1.07 cm) as compared with GK3 commenting that the stave and the flute could be related (Malina and Ehmann 2009: 104).

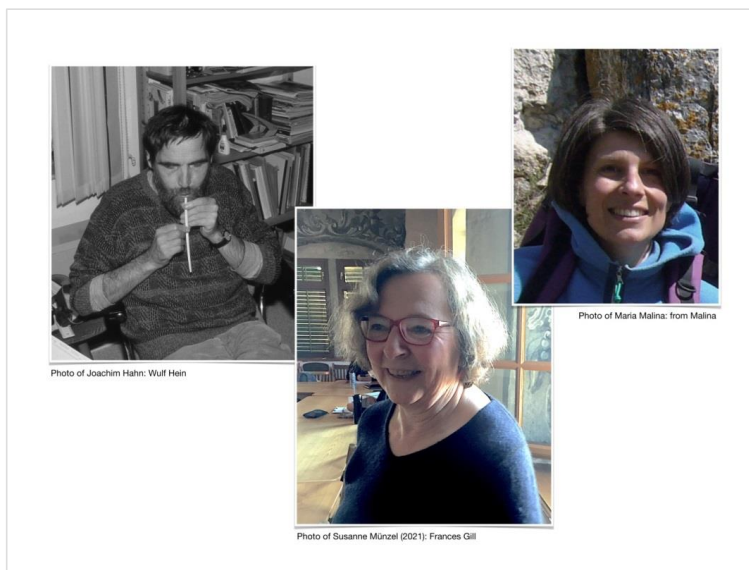


FIGURE 5.1. Key archaeologists from Tübingen (past and present) involved with flute finds and research

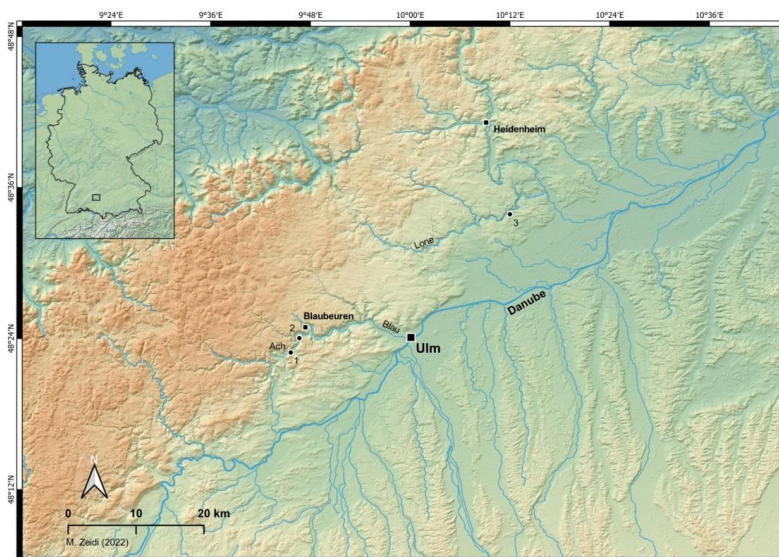


FIGURE 5.2. Caves that have yielded Aurignacian finds of flutes and flute fragments

Map created by Mohsen Zeidi especially for 'Aurignacian Rhapsody'. Elevation data are from SRTM V3, hydrological raw data are from LUBV, and the country map is from Natural Earth. The UNESCO caves of the Swabian Aurignacian shown on the map are: - 1. Hohle Fels; 2. Geissenklösterle; and, 3. Vogelherd.

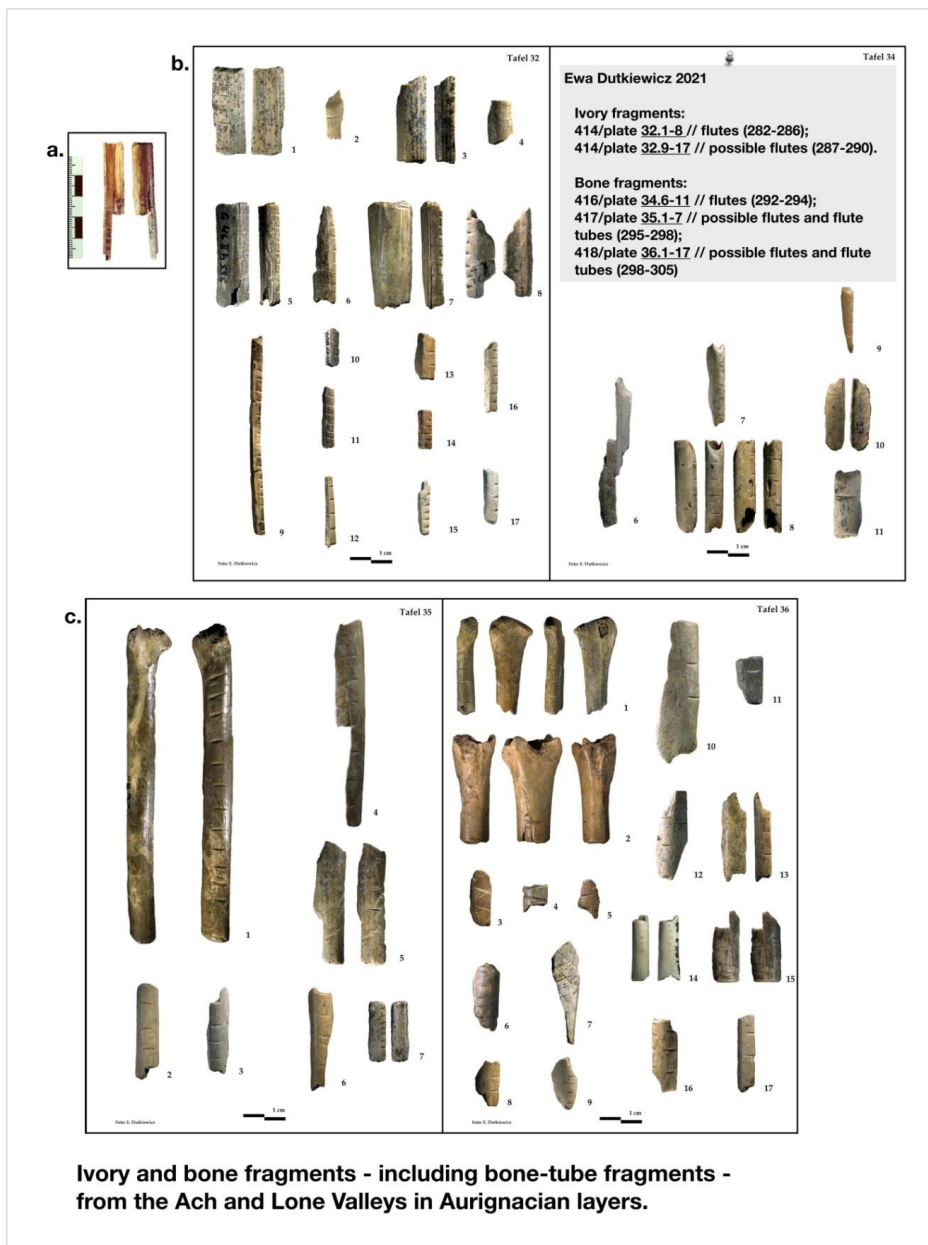


FIGURE 5.3. Aurignacian flute fragments from the Achtal and Lonetal, compiled Ewa Dutkiewicz (2021)

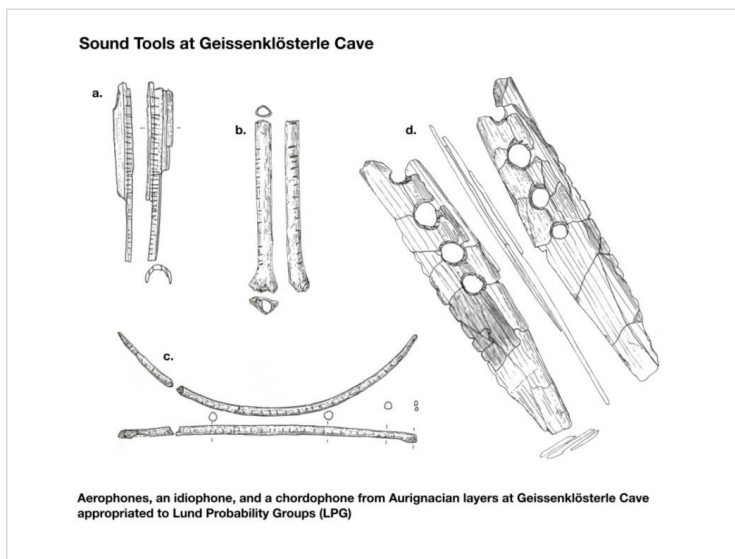


FIGURE 5.4. Sound tools from Geissenklösterle in Aurignacian layers

Drawings from Hahn's monograph, including - a. an "ivory rod with notches" (Conard and Malina 2008: 14 referring to Hahn 1988: fig. 45, 12).



FIGURE 5.5. Seeberger playing a mouthbow (video footage, Kölbl 2006)

- a. mouthbow and plectrum; - b. the act of playing; - c. the antler band from Geissenklösterle.



FIGURE 5.6. GK1; GK3, and HF1 from anterior, posterior, and lateral angles

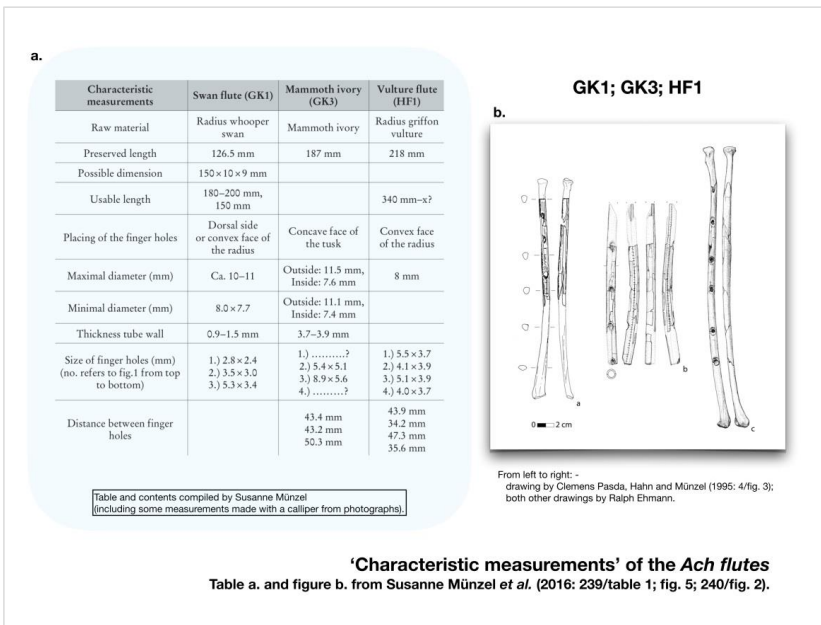


FIGURE 5.7. Characteristics of the Ach flutes from the first publication in English dedicated to them

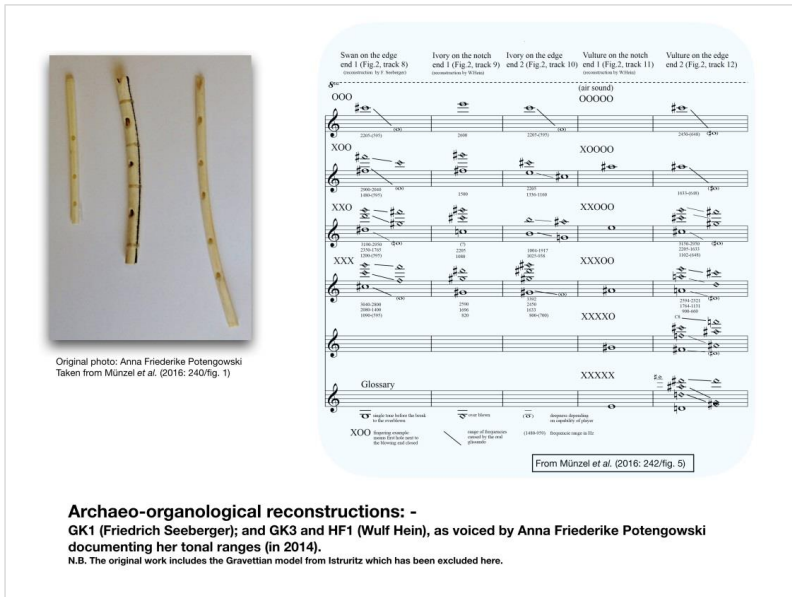


FIGURE 5.8. GK1, GK2, and HF1 reconstructions voiced by Potengowski: tonametrical results

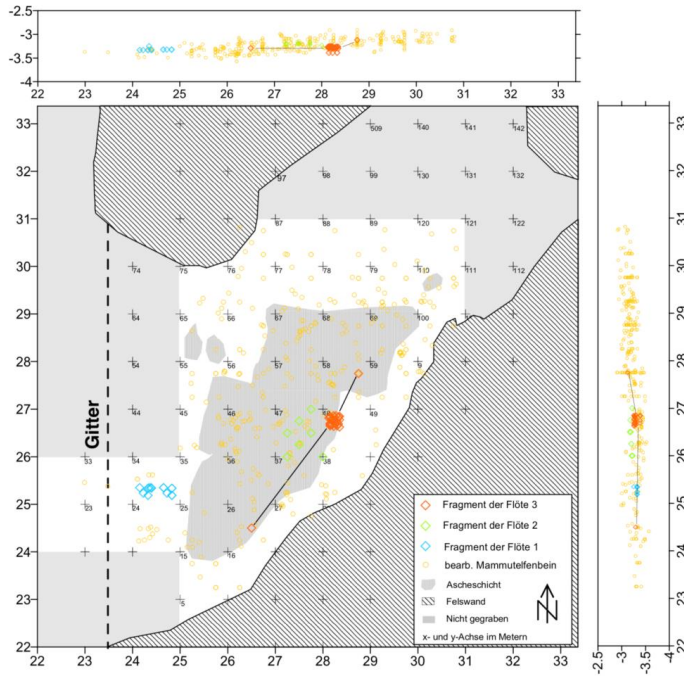


FIGURE 5.9. Plot showing distribution of fragments for GK1, GK2 & GK3 at Geissenklösterle

From Conard et al. 2004: 450/fig. 4). Translation into English of the Key: - Fragments of flute 3; Fragments of flute 2; Fragments of flute 1; Worked ivory; Ash layer; Rock face; Not excavated; x- and y- axis in meter. "Gitter" – grid. Original caption in English where this figure is reproduced: "Geissenklösterle. Distribution of worked ivory (yellow), flute 1 (blue), flute 2 (green) and flute 3 (red). All finds are from the archaeological horizon II" (Conard and Malina 2008: 22/fig. 9).

TABLE 5.1. Archaeological data for GK3

Square	Find number	Find category	Geo-horizon	Archaeo-horizon	Z-value	Number of pieces
48		sfc	12	IIa	-3.25 to -3.3	23
48		sfc	14	IIc	-3.3 to -3.39	4
58	227	sfd	13	IIb	3.12	2
26		sf	13	IIb	3.29	1
48	50	eb	13	IIb	3.3	1
<i>Number of pieces in GK3 complex</i>						31

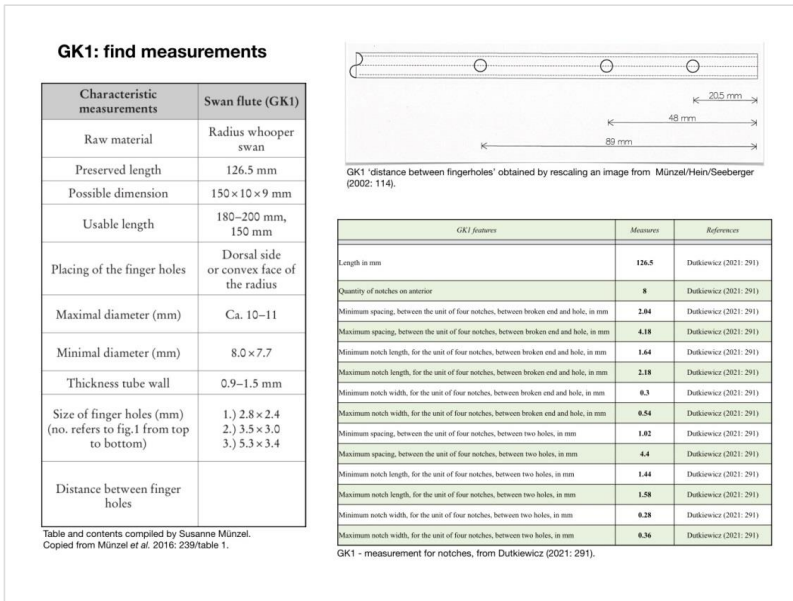


FIGURE 5.10. A compilation of currently available measurements for GK1

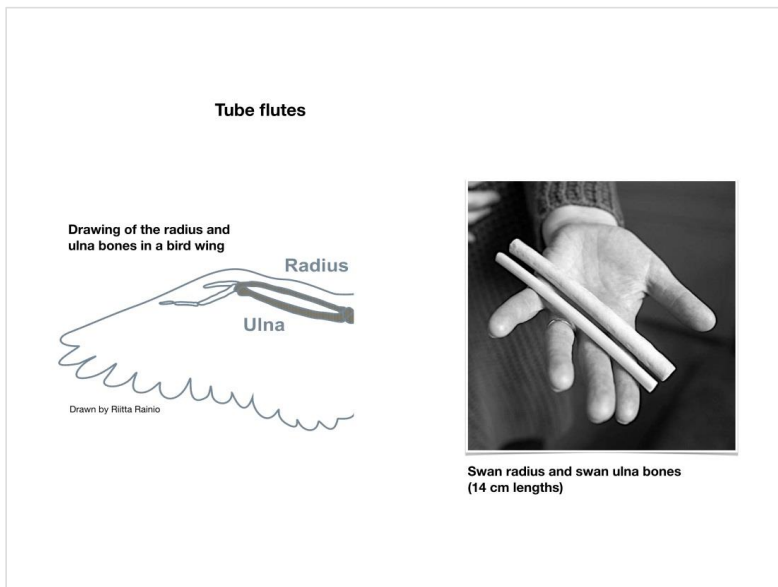


FIGURE 5.11. Drawing of the radius and ulna bones in a bird wing (drawn Riitta Rainio)



FIGURE 5.12. GK1: anterior profile

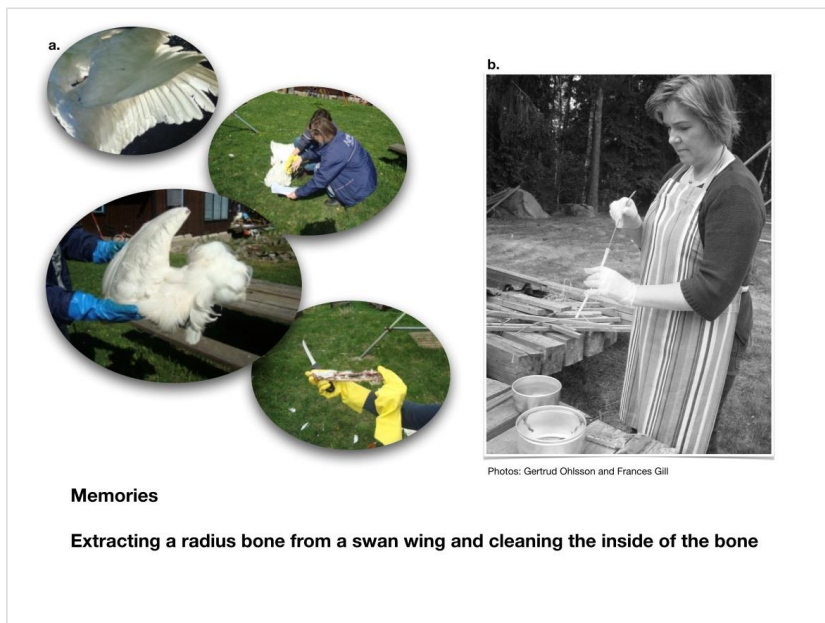


FIGURE 5.13. The swan-wing experiment

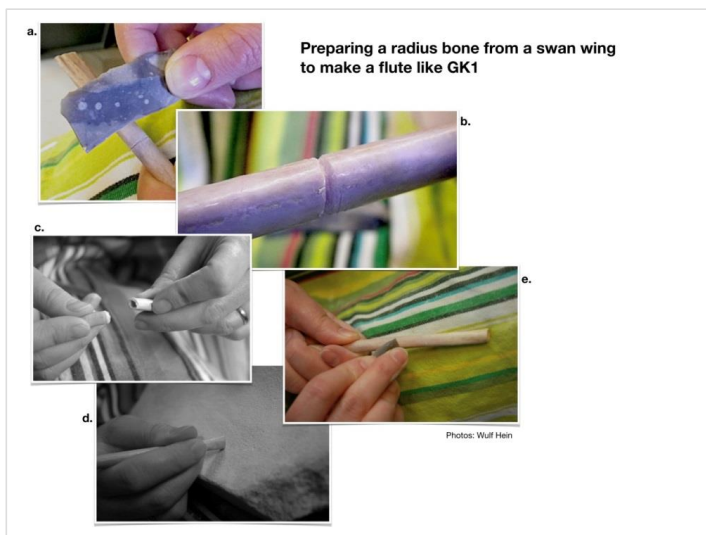


FIGURE 5.14. Smoothing the ends and surface of the bone tube

- a. & - b. sawing a ring notch with a flint blade; - c. snapping the end of the bone; - d. sanding the rough end to make it smooth on a sandstone; and, - e. smoothing the outer surface of the bone with a sharp blade.

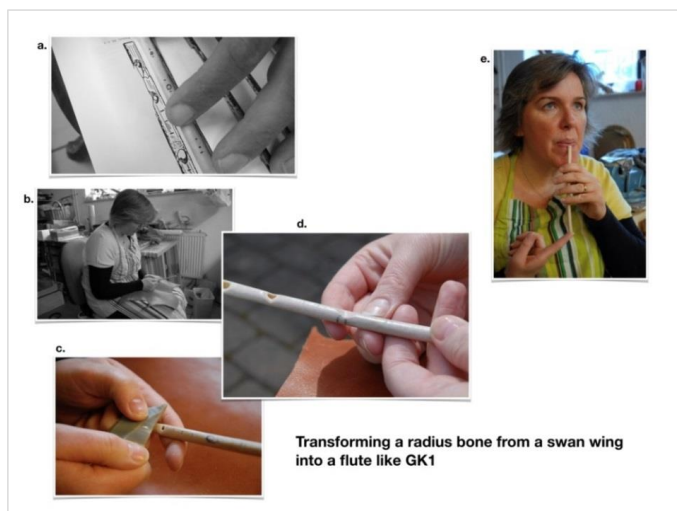


FIGURE 5.15. Making fingerholes on a radius bone from a swan wing

- a. marking fingerholes; - b & - c. scraping fingerholes; - d. contemplating a fourth fingerhole; and, - e. playing the bone as a tube flute with a normative flute embouchure ('shak'), blocking the bottom end with a finger.

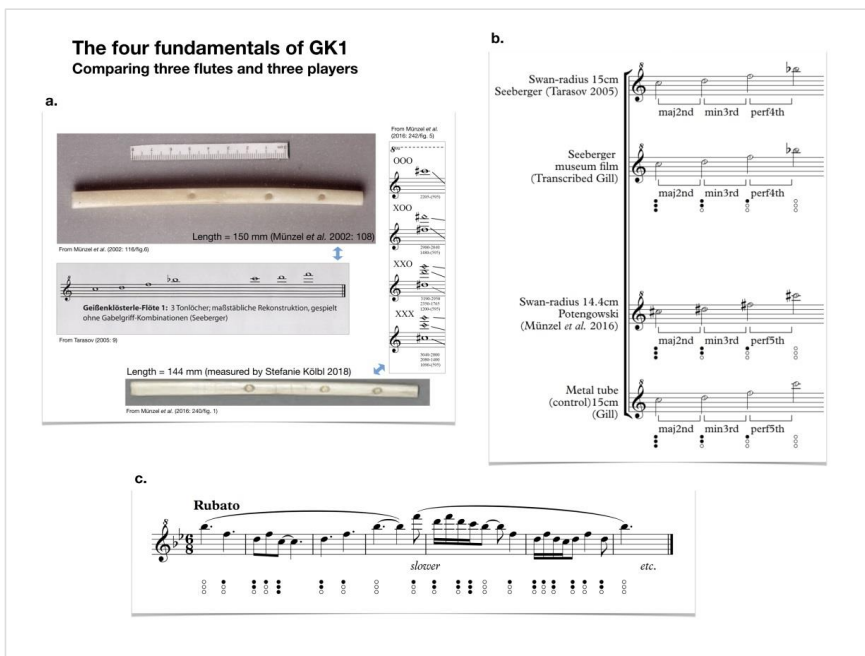


FIGURE 5.16. GK1 tonometrical series for actual fundamentals: comparing data from 3 sources



FIGURE 5.17. Wedging and splitting an ivory staff

Image from Malina and Ehmman (2009: 102/fig. 16).

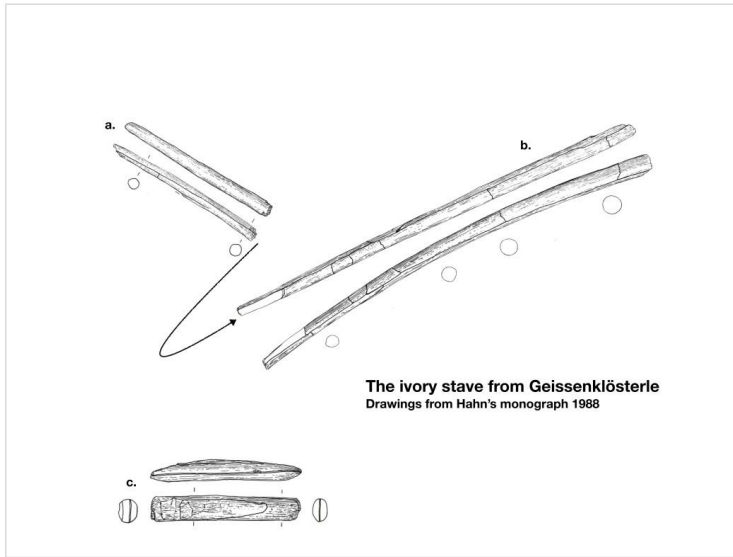


FIGURE 5.18. *The ivory-flute-blank stave (drawings from Hahn 1988/fig. 43, 1. 2. & 7)*



FIGURE 5.19. *Evidence of ivory fracturing in the Aurignacian*

*Photographic images showing evidence of ivory fracturing in the Aurignacian (wedging-and-splitting technique). The plate is inverted from Malina and Ehmann (2009\_104/fig. 20). – a. the longitudinally-fractured ivory-flute-blank stave from a lateral angle. – b. enlargement of part of image a. to show gaps in the seam caused by driving in wedges. – c. enlargement of part of the concave, inside-flat platform of the stave that corresponds to image b. showing the damage caused by cleaving. Photographs by Ralf Ehmann.*

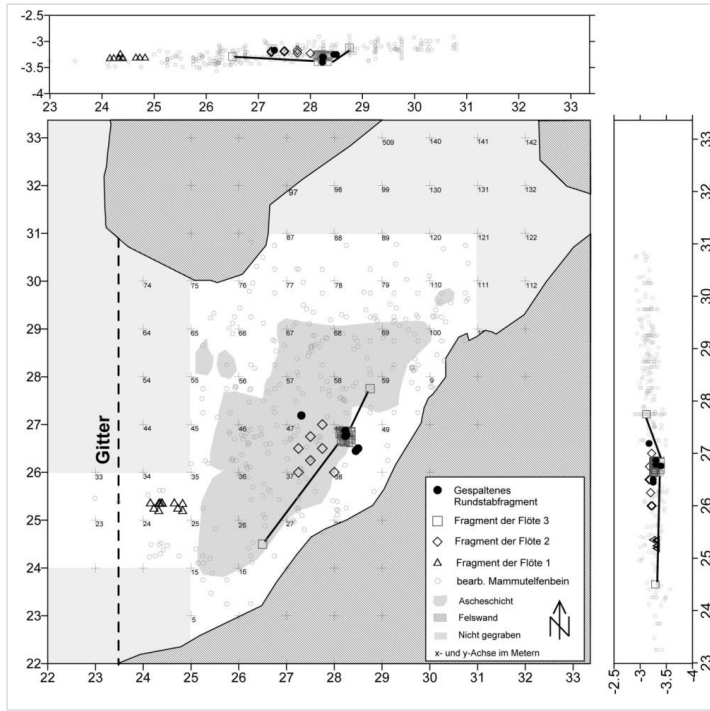


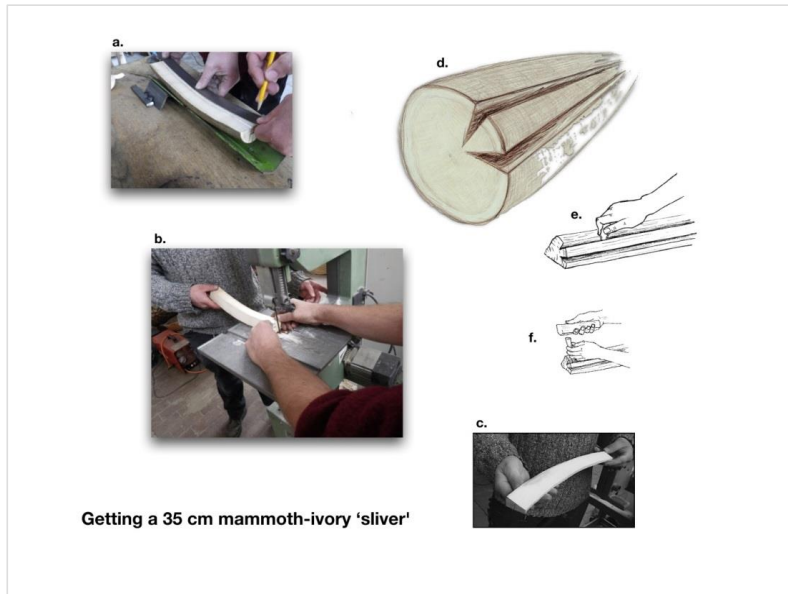
FIGURE 5.20. Distribution of worked ivory for the flute-blank stave complex.

Plot (including fragments of three flutes) published in Malina and Ehmann (2009: 105/fig. 21). Translation into English of the Key: - Fragments of the split stave; Fragments of flute 3; Fragments of flute 2; Fragments of flute 1; Worked ivory; Ash layer; Rock face; Not excavated; x- and y- axis in meter. “Gitter” means grid. –

TABLE 5.2. Excavation data for the ivory-flute-blank stave complex

Abbreviations: - ‘be’ refers to worked ivory; ‘sf’ collection find; ‘eb’ ivory

UNIT	ID	GH	AH	BEST	X	Y	Z
48	47	13	IIb	BE	28,25	26,79	-3,3
48	49	13	IIb	EB	28,23	26,87	-3,3
48	84	15	III	BE	28,23	26,76	-3,4
57	7	13	IIb	BE	27,31	27,19	-3,17
48		13	IIb	SF	28,45	26,45	-3,25
48		13	IIb	SF	28,5	26,5	-3,25



Getting a 35 cm mammoth-ivory 'sliver'

FIGURE 5.21. Getting an ivory sliver from a tusk

- a., - b. & - c. machine work; - d. drawing by author of hypothetical groove and splinter process; - e. & - f. drawing by Ehmann (Malina & Ehmann 2009) of hypothetical groove and splinter process (image f. inverted).

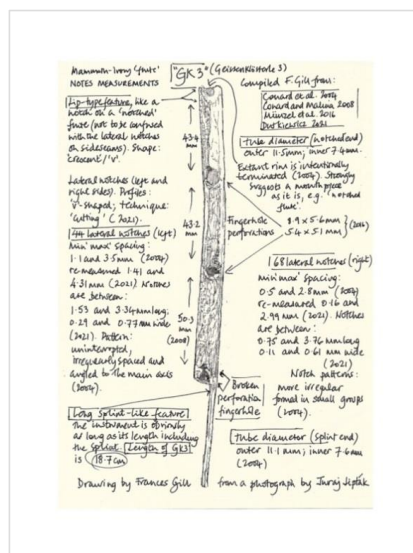


FIGURE 5.22. Notebook sketch of GK3 with measurements

TABLE 5.3. Dimensions of GK3 from previous research compiled Frances Gill

<i>GK3 features</i>	<i>Measures</i>	<i>References</i>
Length in cm	18.7	Conard, Malina, Münzel, and Seeberger (2004: 458)
Quantity of notches in pattern unit, on side-seam opposite side with extended splint-like feature	44	Conard, Malina, Münzel, and Seeberger (2004: 456)
Minimum spacing between the 44 notches, in mm	1.1	Conard, Malina, Münzel, and Seeberger (2004: 456)
Minimum spacing between the 44 notches, in mm, re-measured	1.41	Dutkiewicz (2021: 284)
Maximum spacing between the 44 notches, in mm	3.5	Conard, Malina, Münzel, and Seeberger (2004: 456)
Maximum spacing between the 44 notches, in mm, re-measured	4.31	Dutkiewicz (2021: 284)
Minimum notch length in the pattern unit of 44 notches, in mm	1.53	Dutkiewicz (2021: 284)
Maximum notch length in the pattern unit of 44 notches, in mm	3.34	Dutkiewicz (2021: 284)
Minimum notch width in the pattern unit of 44 notches, in mm	0.29	Dutkiewicz (2021: 284)
Maximum notch width in the pattern unit of 44 notches, in mm	0.77	Dutkiewicz (2021: 284)
Quantity of notches in pattern unit, on side-seam with extended splint-like feature	68	Conard, Malina, Münzel, and Seeberger (2004: 456)
Minimum spacing between the 68 notches, in mm	0.5	Conard, Malina, Münzel, and Seeberger (2004: 456)
Minimum spacing between the 68 notches, in mm, re-measured	0.16	Dutkiewicz (2021: 284)
Maximum spacing between the 68 notches, in mm	2.8	Conard, Malina, Münzel, and Seeberger (2004: 456)
Maximum spacing between the 68 notches, in mm, re-measured	2.99	Dutkiewicz (2021: 284)
Minimum notch length in the pattern unit of 68 notches, in mm	0.75	Dutkiewicz (2021: 284)
Maximum notch length in the pattern unit of 68 notches in mm	3.76	Dutkiewicz (2021: 284)
Minimum notch width in the pattern unit of 68 notches, in mm	0.11	Dutkiewicz (2021: 284)
Maximum notch width in the pattern unit of 68 notches, in mm	0.61	Dutkiewicz (2021: 284)
Outer diameter of tube at end with notch, in mm	11.5	Conard, Malina, Münzel, and Seeberger (2004: 458)
Inner diameter of tube at end with notch, in mm	7.4	Conard, Malina, Münzel, and Seeberger (2004: 458)
Outer diameter of tube at end with splint, in mm	11.1	Conard, Malina, Münzel, and Seeberger (2004: 458)
Inner diameter of tube at end with splint, in mm	7.6	Conard, Malina, Münzel, and Seeberger (2004: 458)
Dimensions of the larger finger-hole perforation, in mm	8.9 x 5.6	Münzel, Conard, Hein, Gill, Potengowski (2016: 239)
Dimensions of the smaller finger-hole perforation, in mm	5.4 x 5.1	Münzel, Conard, Hein, Gill, Potengowski (2016: 239)
Distances between finger-hole perforations in a direction from notch feature to splint feature, in mm	43.4 / 43.2 / 50.3	Conard and Malina (2008: 15)



FIGURE 5.23. Wax stabilising the GK3 complex

Left: drawing by Ralf Ehmann. Blue highlights the parts of the GK3 complex that is wax not ivory. Photos: Malina and Gill taken summer (2011).

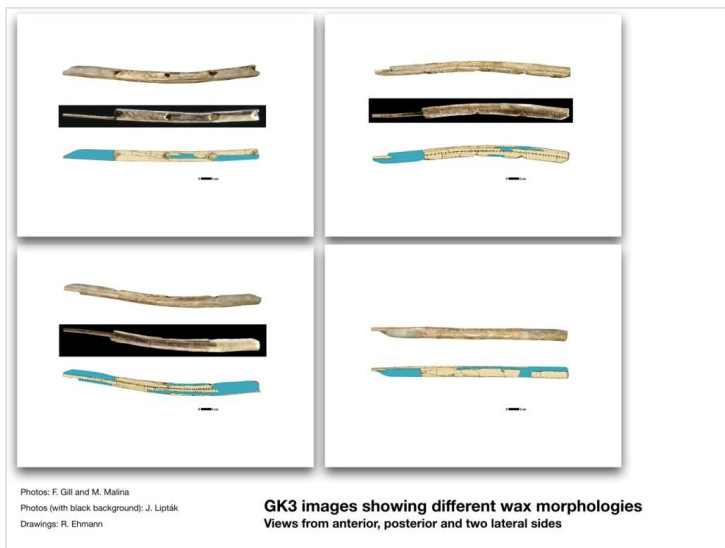


FIGURE 5.24. Wax morphologies on GK3

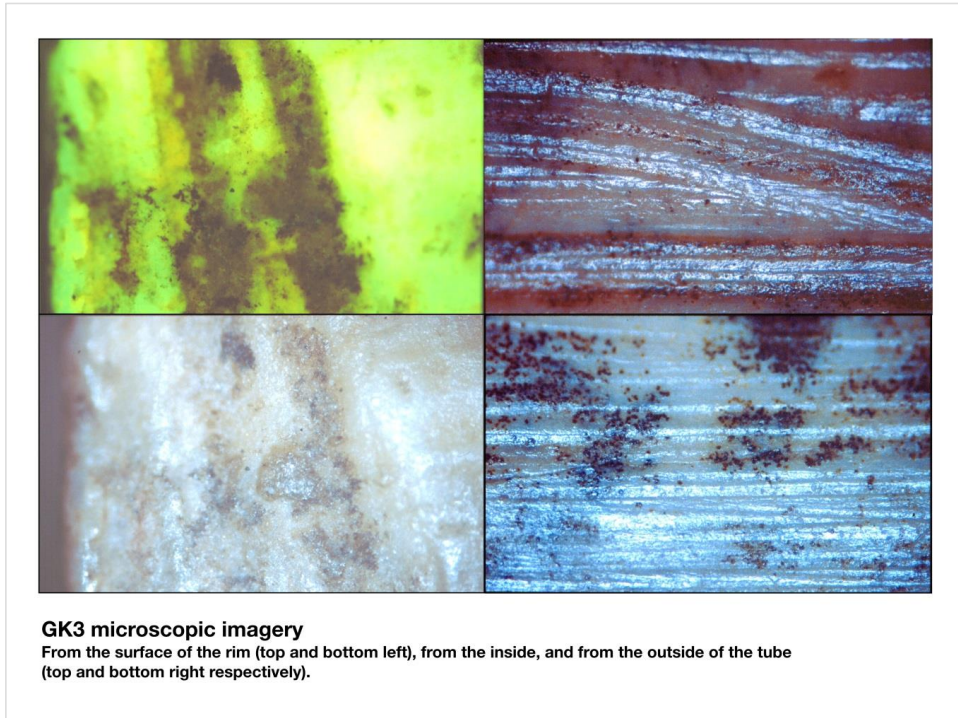


FIGURE 5.25. Microscopic imagery for traces of working on GK3

Top and bottom left: The rim of GK3 (dorsal side/'notch' end) by Bertrand Ligouis - technical details: Microscopic image with the DMRX-VSP Leica photometer microscope. Magnification: 12.5: 1 = total magnification on film: objective 5x (dry) with magnification setting 2.5x. field wide: 2.8 mm. Upper left image: RLD: reflected white light, dry mode. Lower left image: RVLd: reflected light, uv-light + violet-light excitation, dry mode (excitation filter: 355-425, beam-splitting mirror: RKP 455, barrier filter: LP 470). First published in Conard et al. (2004: 455/fig. 10, a, b).

Top right: microscopic images of striations on part of the external surface of GK3. Bottom right: microscopic images of striations on part of the internal surface of GK3. Photos by Bertrand Ligouis, found in Conard and Malina (2008: 21/fig. 5, a, b) and originally published in Conard et al. (2004: 454/figs. 7, a, 9, a). Technical details: Microscopic image with the DMRX-VSP Leica photometer microscope. Magnification: 12.5: 1 = total magnification on film: objective 5x (dry) with magnification setting 2.5x. field wide: 2.8 mm. RLD: reflected white light, dry mode.

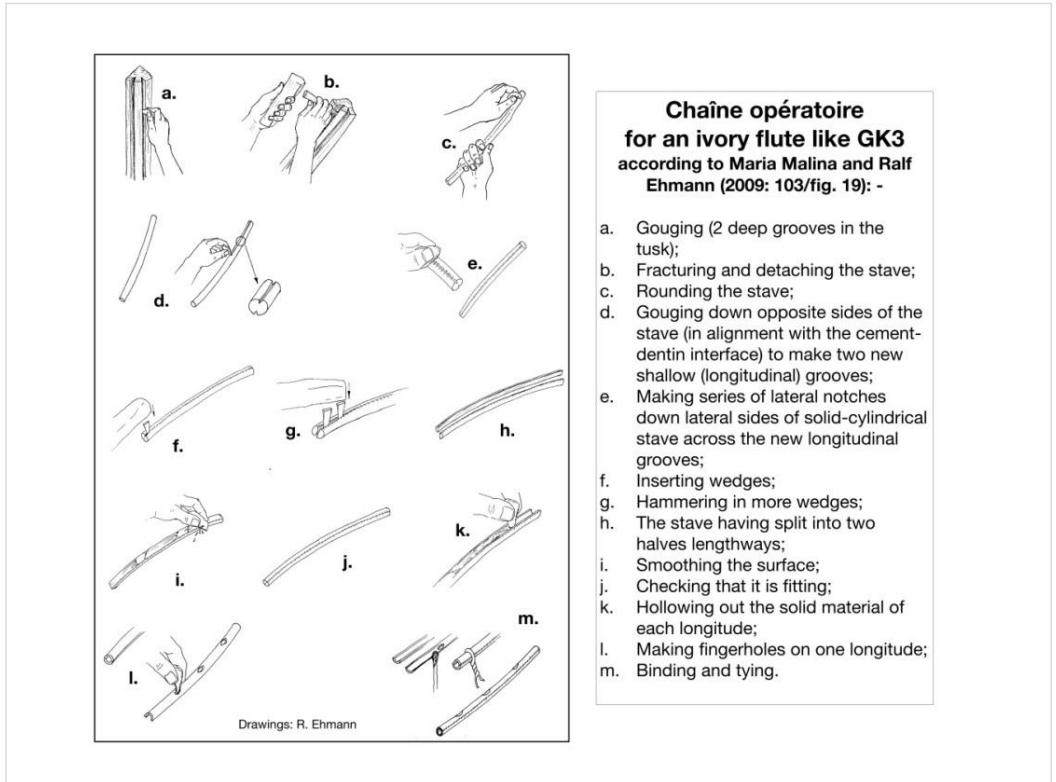


FIGURE 5.26. Hypothetical chain of operation for constructing an ivory flute.

Steps d., e., f., g., and h., were tested by Malina and Ehmann (2009) using authentic tools, with success.

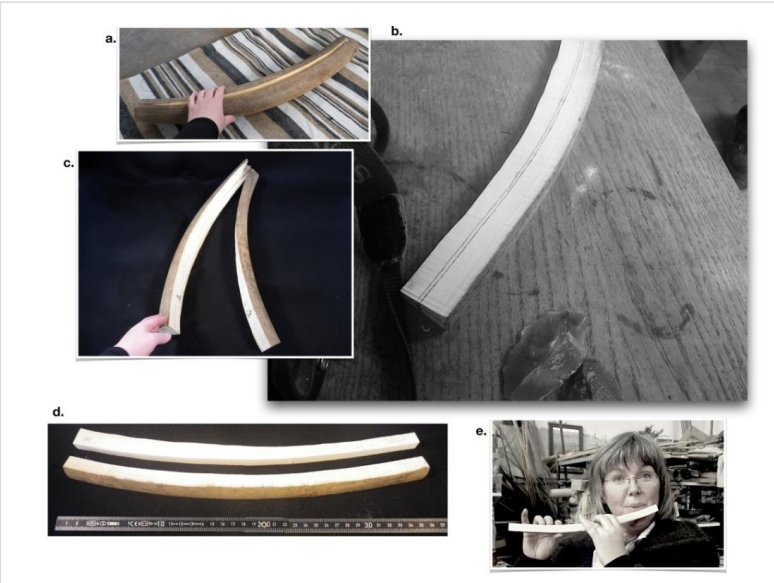


FIGURE 5.27. Constructing a mammoth-ivory flute (links I)

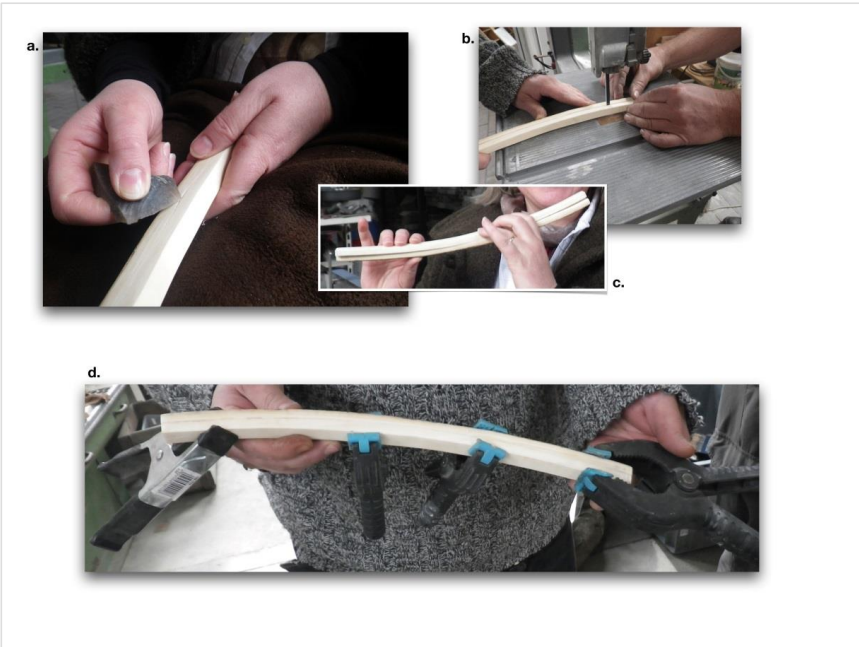


FIGURE 5.28. Constructing a mammoth-ivory flute (links II)

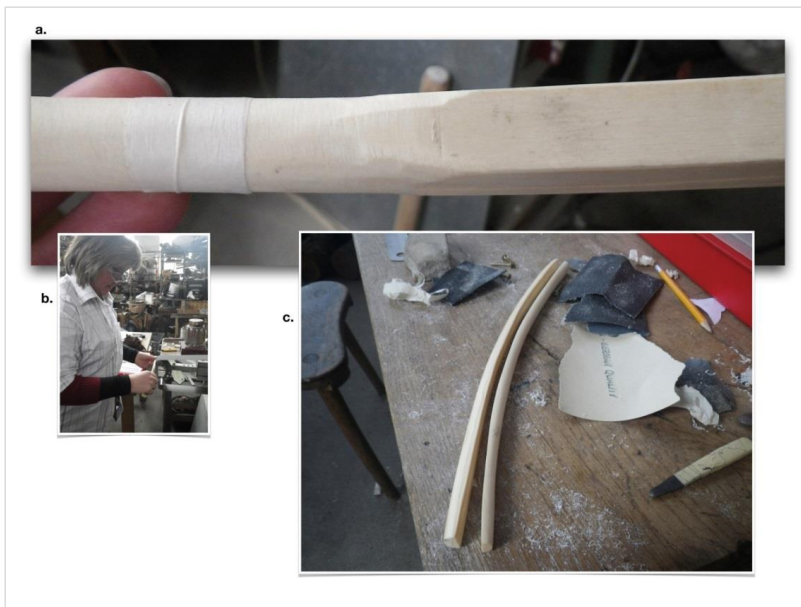


FIGURE 5.29. Constructing a mammoth-ivory flute (links III)



FIGURE 5.30. Constructing a mammoth-ivory flute (links IV)

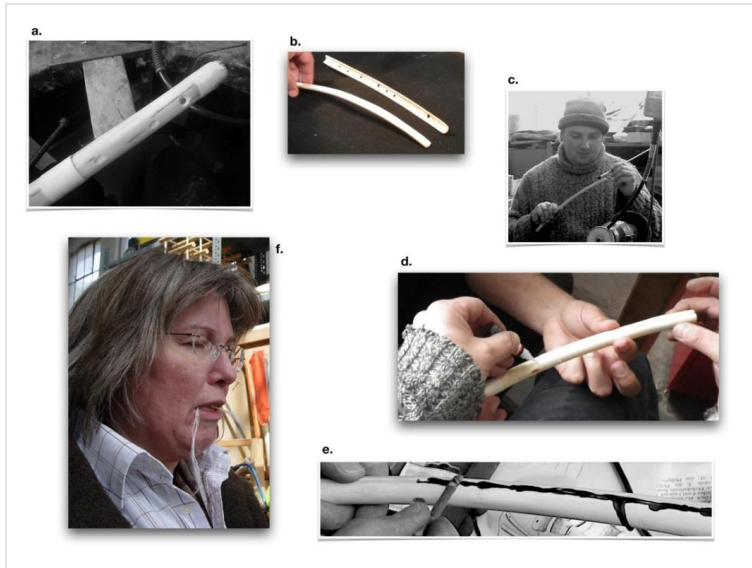


FIGURE 5.31. Constructing a mammoth-ivory flute (links V)

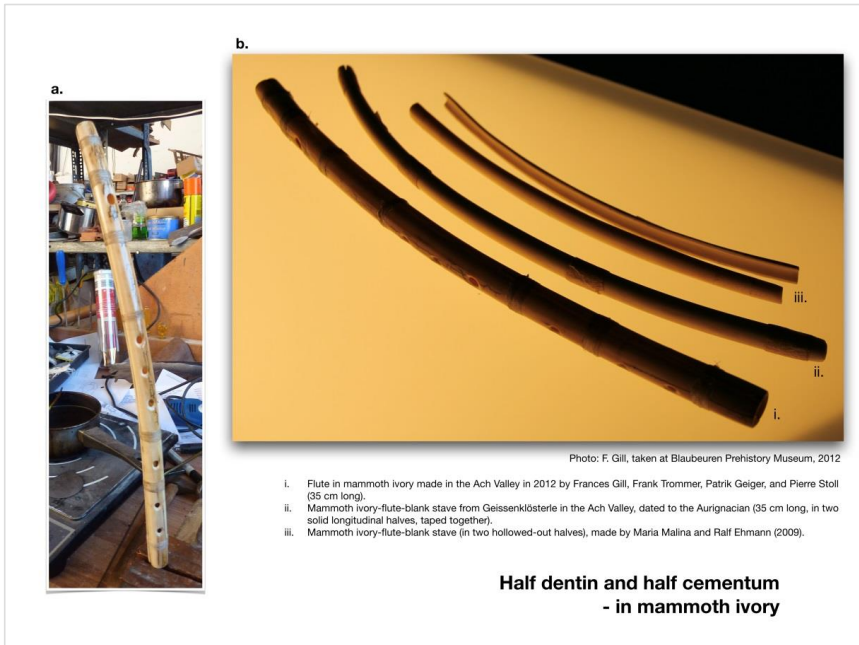


FIGURE 5.32. Finished and semi-finished flutes



Barbara Spreer, Gabriele Dalferth, and Anna Friederike Potengowski at a Swabian Aurignacian flute workshop 2021, in Blaubeuren. Photo: F. Gill.

**GK3 flute players playing reconstructions of GK3**



Photo of Seeberger's ivory flute from video footage (Kölbl 2006)



Photo of author playing her new GK3 reconstruction by Wulf Hein 2021. Photo by Mandy Bertram.

FIGURE 5.33. GK3 flute players

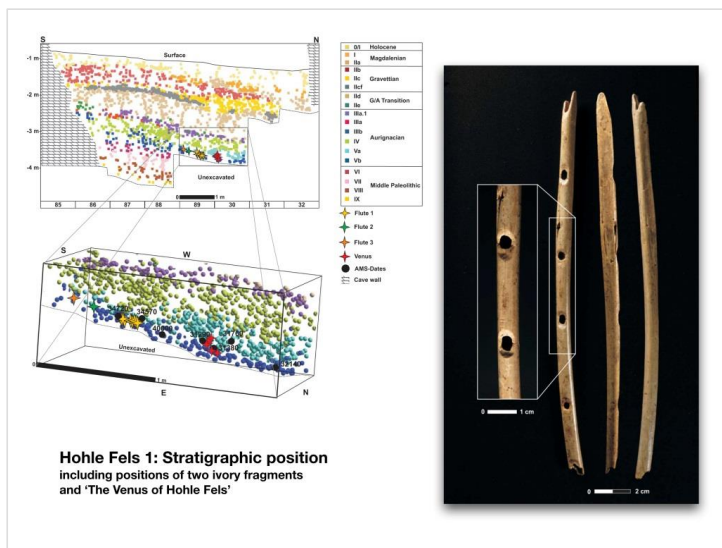


FIGURE 5.34. HF1 stratigraphic position



FIGURE 5.35. HF1 found in situ in the clay, in AH Vb



FIGURE 5.36. HF1 Players I



FIGURE 5.37. HF1 Players II

Barnaby Brown, 2017, Ljubljana. Photo ©Jean-Loup Ringot.

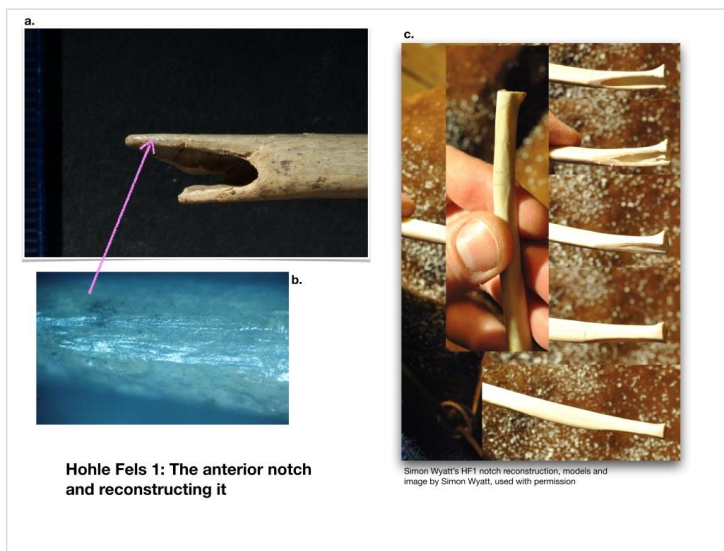


FIGURE 5.38. *Contemplating anterior notch on HF1, and impeccable reconstruction*

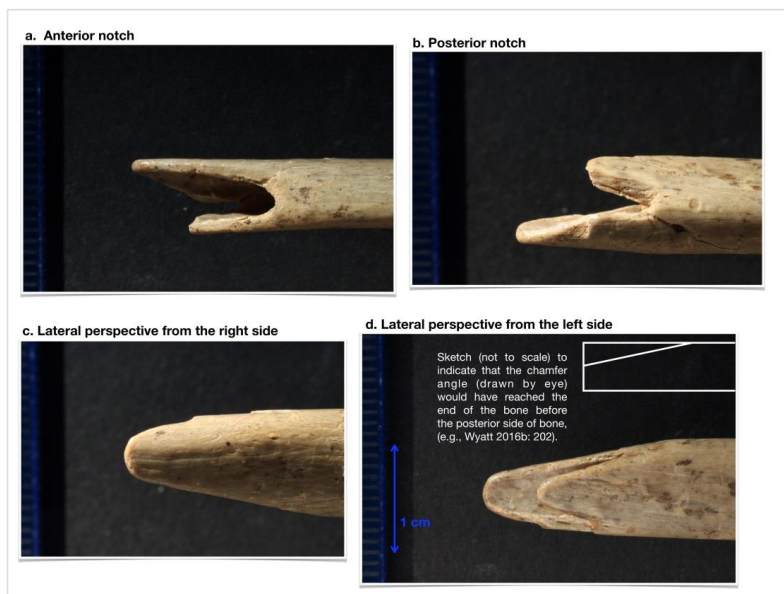


FIGURE 5.39. *Contemplating the double notch on HF1*

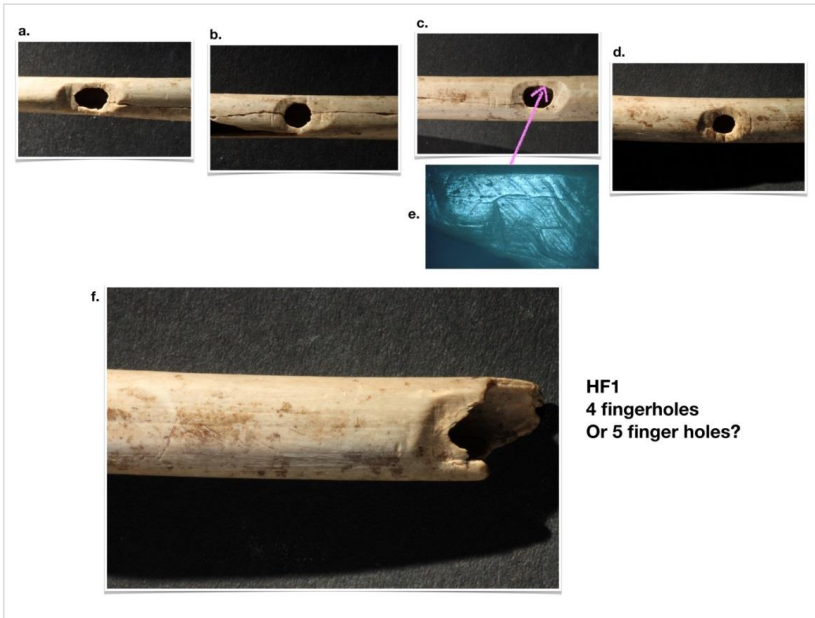


FIGURE 5.40. The fingerholes of HF1

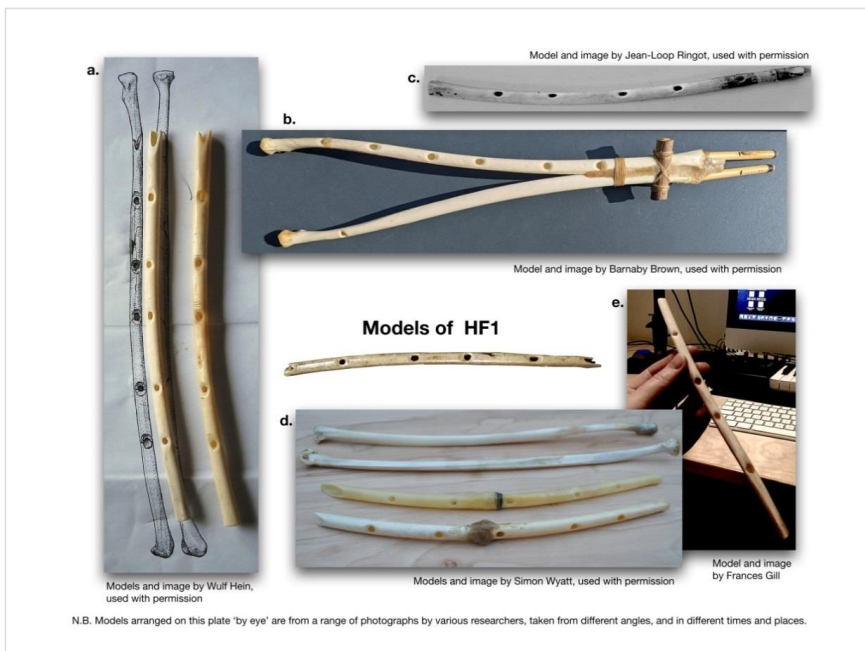


FIGURE 5.41. Models of HF1 from several practitioners

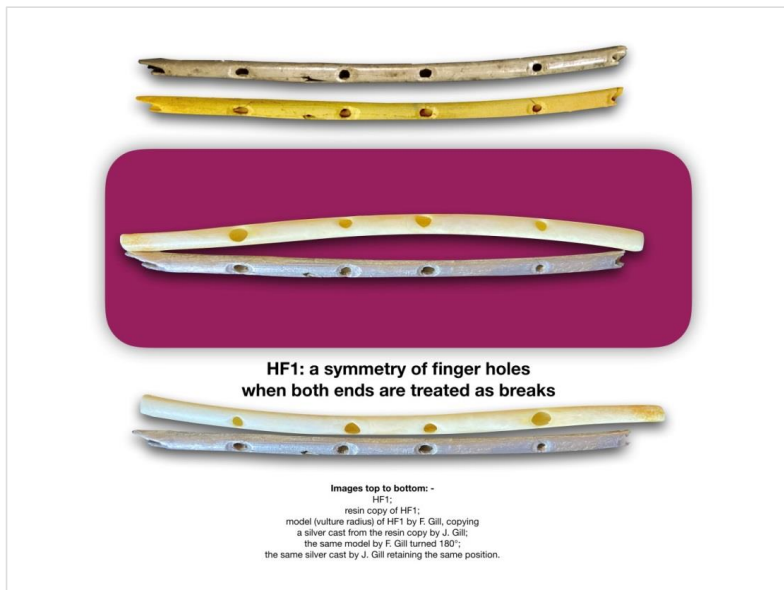


FIGURE 5.42. The fingerhole symmetry of HF1



FIGURE 5.43. Notch or not

Photographic imagery of post-depositional damage to the possible blowing ends of GK1, and HF1, respectively.



FIGURE 5.44. HF1 Players III

*Anna Friederike Potengowski playing with Orchestra l'arte del mondo on a reconstruction of HF1 from the non-notched end, using the Seeberger technique. Photograph by Peuserdesign (.de) with permission.*

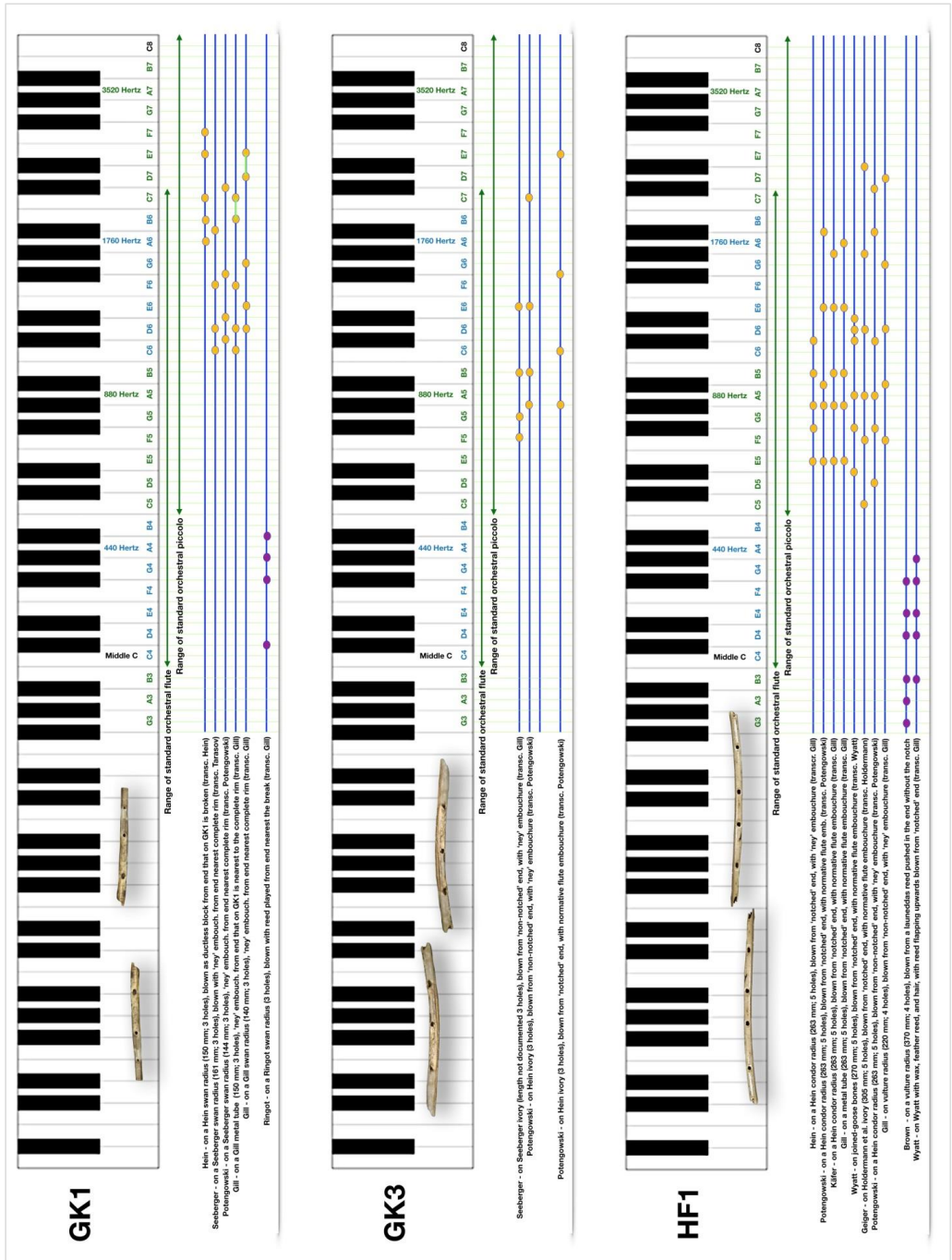


FIGURE 5.45. Sample of tonametrical series for GK1, GK3 and HF1 (previous research)

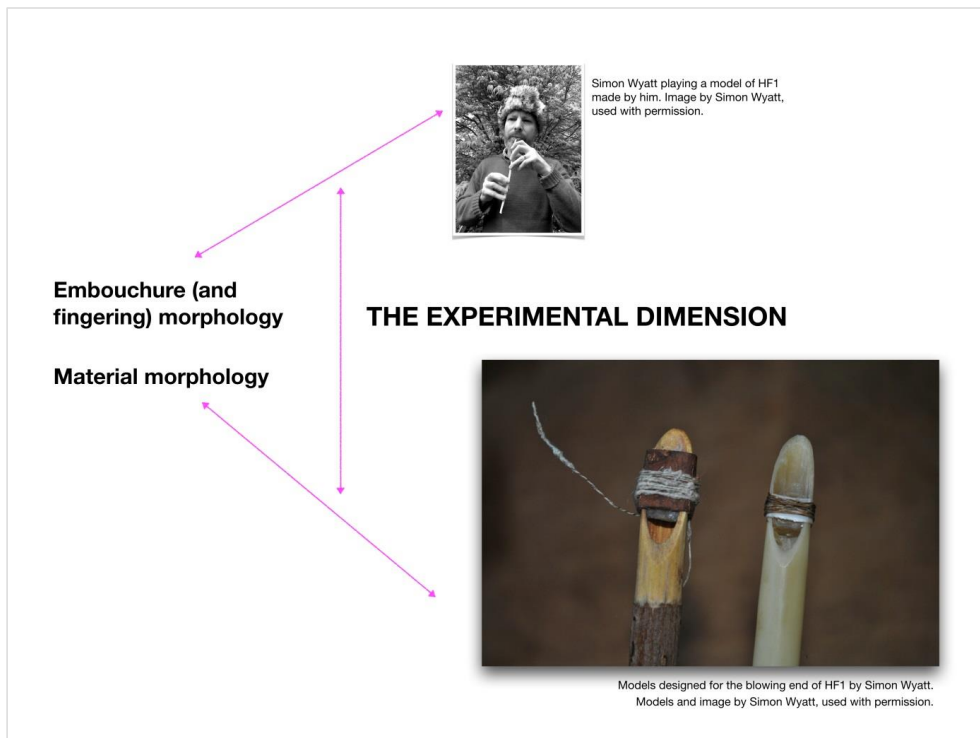


FIGURE 5.46. *Experimental Morphology*

Malina and Ehmann also point out that both the composite stave and GK3 are fractured on the same natural line between the dentin and the cement of a mammoth tusk because in both cases, one longitudinal half is entirely cement and the other is entirely dentin (2009: 105), although unlike the flute, the halves of the composite stave are solid pieces. Malina and Ehmann who first discovered evidence of cleavage practices on the composite stave concluded that the fracture on the seam between dentin and cement is intentional and artificial, and thus unlikely to be caused by natural weathering. They also noticed that on many other pieces of ivory material which they had looked at when sourcing ivory, that evidence for natural fracture on seams between dentin and cement was not anywhere to be found on the many ivory pieces that they selected from. They also refer to ivory-warping (*ibid.* 104 and 107), a factor which was encountered in my own experiment with mammoth ivory where industrial clamps were needed [Figure 5.28 d].

The *ivory-flute-blank stave* has a solid cylindrical mass whereas GK3, as a flute, is a hollow cylinder (tube) with finger holes (which I describe in the next section). If the stave is not from exactly the same tusk as the flute GK3, it has certainly been extracted and fractured in the same way, the authors point out. The spatial distribution of the ivory fragments and pieces for both the *ivory-flute-blank stave* and for GK3 are recovered originally from quite a small concentrated area in the cave (*ibid.* 104), [Figure 5.20], [Table 5.2]. All fragments but one come from AH IIB but there is one fragment coming from AH III. The current theory is that *ivory-flute-blank stave* represents a pre-product for an ivory-flute (*ibid.* 94) which is why I refer to this artefact in this way. Prior to this the reservation had been that “Since there are other kinds of elongated, cylindrical ivory artefacts from the Swabian Aurignacian, one cannot be certain if this object is the preform of an ivory flute” (Conard and Malina 2008: 16 referring to Conard and Bolus 2006). Malina and Ehmann went on to publish the results from their investigation in which they discovered evidence of debitage by fracture using a wedging-and-splitting technique. This was previously unknown for the Aurignacian (Malina and Ehmann 2009: 94), and their results simultaneously substantiate their theory that this was (and still is) a blank/preform for an ivory flute.

From the Aurignacian in the Lone Valley, Hahn points out that Gustav Riek had reported that mammoth tusks found at Vogelherd Cave had been segmented into pre-prepared sections about 30 cm long with a heavy sharp-edged stone (Hahn 1988: 204 referring to Riek 1934: 53). This addresses an important perspective that concerns the subject of procuring tusks. Harald Floss writing about the use of ivory as a material for portable art in the Swabian Jura highlights that, “The mammoth ivory originates partly from hunted animals but predominantly from tusks and fragments which had been collected by the Aurignacian hunter-gatherers” (Floss 2015 referring to Laura Niven 2006). Hahn explains that removing the longest lengths possible from the periphery of a tusk *optimises use* of this raw material, discussing approaches described for ivory extraction and for fracturing ivory lengths longitudinally (1988: 204-205). Malina and Ehmann also refer to the extraction phase as representing the *least effort* for the removal of such a piece from a tusk, for the purpose of obtaining a preform for an ivory flute (2008: 95). Hahn discussing a technique for splitting ivory that uses a chisel and wedges comments on a possible chisel object evident in the inventory made from ivory (1988). Malina and Ehmann also use two wedges which they made from ivory to be used as tools in their experimental work for splitting ivory (2009: 98/fig.7) [Figure 5.17].

The technique of fracturing a length of ivory using wedges leaves a trace or negative in the ivory material which Hahn refers to in one instance as a triangular-cleavage plane (1988: 204). These indices are evident on the *ivory-flute-blank stave* (Malina and Ehmann 2009: 104-107). Part of the examination which identified these characteristics on the *ivory-flute-blank stave* simultaneously demanded that Malina and Ehmann refit the two staves together into one piece which is why the refitting is only first documented in their 2009 article. Malina explained to me in an interview (21<sup>st</sup> March 2022) that the examination and subsequent refitting of the two staves into one piece was undertaken after, and not before, a series of practical experiments with Ehmann; the refitting happened as a consequence of their work. This would also explain why the first time that the *ivory-flute-blank stave* is mentioned in an ivory-flute flute context, only the longer of the two staves in the 35.1 cm composite stave is mentioned because before her experiments with Ehmann, the two staves had not been refitted<sup>64</sup>:

A slightly curved, ca. 25 cm long cylindrical piece of finely worked ivory with a ca. 10 mm diameter was recovered from the top of AH III and the base of AH II (Conard and Malina 2008: 16).

There may be a number of alternative words in English to use instead of ‘stave’ for such a form to describe an ivory-flute blank, or indeed a long-cylindrical mass for some apparent future purpose. Terms such as rod, chip, longitudinal segment, bar, stick, sliver, and so on, spring to mind. The important thing to recognise is that the refitted ivory stave discussed here is a solid cylinder, split longitudinally. Once a tusk has been sourced – in whatever context – it can be potentially portioned and treated, resulting in various forms which in themselves are representing various stages of process. It is worth touching upon traditions of debitage as applied to osseous material to understand more clearly just what is at stake in these technical processes. To do this is to appreciate the Swabian Aurignacian perspective on ivory treatment regarding preliminary phases of production. Using a concept of *debitage*, Claire E. Heckel and Sibylle Wolf (2014: 2) pinpoint a useful rationale. Here they refer to Marie-Louise Inizan *et al.* who describe debitage in context of stone knapping as “A term conventionally used to denote the intentional knapping of blocks of raw material, in order to obtain products that will either be subsequently shaped or retouched, or directly used without further modification” (1999: 138). This is insightful in itself because what it is being described, is action, although Inizan *et al.* do point out that it “also refers to the tangible products (debitage products) of this action” (*ibid.*). Heckel and Wolf explain the term *debitage* adapted for osseous materials<sup>65</sup> citing three primary approaches under the headings of: - *segmentation*; *extraction*; and *fracture* (Aline Averbouh and Jean-Marc Pétilion 2011: 41 referenced by Heckel and Wolf 2014: 2).

The segmentation approach (or debitage by segmentation) is about dissecting a whole chunk of the osseous material away, and the inference here is that the material remains similar in form but diminished in size. Heckel and Wolf refer to “transverse or circumferential grooving, sawing, or chopping” (*ibid.*) as a set of complementary technical actions. Analogically speaking, if I have a

---

<sup>64</sup> I originally considered that there may have been a typing error as the length of the stave was reported as being 10 cm shorter.

<sup>65</sup> I too have also adapted the term as a way to think about music; one of the albums that accompany this thesis is called Sonic Debitage.

swan radius bone and I wish to shorten it I can groove it circumferentially until there is a ring notched all the way round it. I can then simply snap off the end on the ring notch leaving a fairly clean break. The overall form of the bone is still cylindrical, and unchanged in that sense.

The extraction approach (or debitage by extraction) is also concerned with removal of a type of segment but the difference here seems to be that after extraction, the material (from which the extraction has been taken) is altered in form as well as diminished in size. Heckel and Wolf refer to *double rainurage* which is a common procedure otherwise known as the “groove-and-splinter” technique (*ibid.*). This is subtly different from segmentation in that extractions are mainly longitudinally rather than laterally orientated. Typical forms are first isolated by carving parallel grooves down either side of the intended part to be extracted. These grooves are then gouged further so that the part to be extracted sits proud, so to speak, before being detached. Such a procedure on a mammoth tusk is a preliminary phase that becomes executed in order to extract a long piece before further processing, such as segmenting it into shorter lengths, or fracturing lengthwise. This would seem to be the technique employed for the *ivory-flute-blank-stave* and the GK3 flute too. In my experiment making an ivory flute guided by Frank Trommer and his team in Blaubeuren, (Monday 16<sup>th</sup> April – Friday 20<sup>th</sup> April 2012), this part of the extraction of a sliver from a mammoth-ivory tusk was handled by a machine [Figure 5.21 a. b. c].

The fracture approach (or debitage by fracture) is also relevant to the discussion of the *ivory-flute-blank stave*. A common process for this approach is “splitting and wedging”. Splitting and wedging is the procedure as described above for splitting a long length of ivory on the seam between dentin and cement as is understood have been the case for the ivory flute GK3 reflected in the evidence provided by Malina and Ehmann (2009) for the *ivory-flute-blank stave* [Figure 5.26 d, f, g, h]. For my ivory flute experiment, this was also handled with a machine and since Malina and Ehmann had already provided data for this exercise it seemed more realistic to focus on a different stage of the ivory flute making process, namely hollowing out each length of ivory by hand. Another aspect of the fracture approach is knapping in order to produce flakes from a block of material (Heckel and Wolf 2014).

In my interview with Malina (dated 21<sup>st</sup> March 2022) I had asked her if the refitting of the two pieces into one composite stave was documented anywhere else as a separate article. She explained that it was simply a by-product of the experimental process. Malina and Ehmann point out in the article that without the experimental work guiding them, the evidence for this splitting technique so early on in the archaeological record would have remained undiscovered (Malina and Ehmann 2009: 94). From 1988 onwards, Malina recalls that the two rods were probably kept in two separate boxes on the same shelf (personal correspondence 10<sup>th</sup> May 2022). Hahn had glued the two longitudinal halves back together again so that the inside surfaces had become more or less permanently hidden from view. When they began their investigation she and Ehmann needed to dissolve the existing glue which was keeping all fragments of the two staves together. They report that the glue was already in quite a poor condition (2009: 104). This meant that in effect they were forced to start from scratch refitting all the pieces over again.

When Malina and Ehmann had succeeded in joining the two staves together for the finished refit they refrained from gluing the two longitudinal halves together, as Hahn had done, because they

considered that leaving the piece in two halves like this was closer to how the object must have been deposited in the Aurignacian. Felt rings are used to keep the two halves of the now longer 35 cm stave tightly in place presenting a fully refitted single object. Their examination had achieved the goal of locating indices of ivory splitting, signalling a fracturing technique that previously had not been observed before the Epigravettian (Malina and Ehmann 2009: 94 referring to Marianne Christensen 1999). They managed to identify with a high degree of certainty that the two ivory staves, first published by Hahn in 1988, are likely to have been for the purpose of making another ivory flute (Malina and Ehmann 2009: 94). They were also able to ascertain that wedging and splitting appears to be integral to the design for an Aurignacian ivory flute, in as far as that the instrument is dependent on a number of predetermined factors, like the requirement of a tube. Malina and Ehmann report that eight clearly-defined gaps on one of the seams could be observed on the newly refitted *ivory-flute-blank stave*, and that these gaps or apertures are between 2.3 and 15.5 mm wide appearing at fairly regular intervals along the fracture, just on one side (2009: 104). Traces duly examined on the surface of the flat platform running along the corresponding length of the seam inside reveal further indices of the splitting-and-wedging technique in which negative impressions corresponding to the apertures are interpreted as damage from the cleaving process. The publication of a plate of photographs showing this evidence for the wedge-and-split technology for ivory was first published in 2009 (ibid. 104/fig. 20), [**Figure 5.19**]. This is the first time that this technology, for ivory, is encountered anywhere so early on in the archaeological record.

After fracturing an ivory stave on its dentin-cement seam (that Malina and Ehmann had pre-rounded and marked with lateral grooves down each side of the seam), they proceeded to hollow out each interior with a machine leaving two matching lengths looking like a long thin tube sliced lengthways, reminiscent, so to speak, of two sticks of celery [**Figure 5.32 b, iii**]. They did not attempt to fix the two lengths into an airtight tube since producing a flute was not the remit of their experiment (Malina and Ehmann 2009). It must be pointed out there is a total absence of cutmarks (notches/grooves) on the lateral fracture of the *ivory-flute-blank stave* in comparison with the mammoth flute GK3 where a row of incisions traverse the seam which stylistically is a prominent feature of the design of the instrument. This flute (see Lawson 2020) I will now attempt to describe.

## 5.6 THE MAMMOTH: AN IVORY FLUTE

Three-dimensional carved ivory objects in relative abundance from the Swabian Aurignacian prior to the discovery of GK3 had always consisted of solid and not hollow objects (Conard and Malina 2008: 14). The very existence of a hollow ivory object as early as the Aurignacian had remained completely hidden until the discovery of the GK3 ivory flute. The first published report in a dedicated Music Archaeology volume for the mammoth ivory ‘flute’ (GK3) from Geissenklösterle cave in the Ach valley is a 2008 paper by Nicholas J. Conard and Maria Malina, from the 5th Symposium of the International Study Group on Music Archaeology in 2006. It presents much of what was originally presented in two earlier articles (these are Conard et al. 2004 with Seeberger Malina and Münzel; and Conard 2007) correlating the stratigraphy and

archaeological context for GK3 together with GK1 and GK2 plus presenting three additional ‘flute’ fragments from Vogelherd cave in the Lone valley (see Appendix 4 report for detail of these fragments). In the first publications for GK3, the task of sorting through the Geissenklösterle collection finds from Hahn’s numerous excavations between 1974 and 1991 (Hahn 1988) and processing the smaller non-measured fragment samples from waterscreening, is described. The ‘ivory flute’ known as Geissenklösterle 3 (GK3) was refitted during this process by Maria Malina in the project supported by *Landesamt für Denkmalpflege* and the *Alb-Donau-Kreis*. (Conard *et al.* 2004: 453). An impression of a 3D jigsaw with hundreds of similar-coloured loose pieces is given:

During this work we identified hundreds of worked pieces of ivory. Some of the preserved pieces display partial finger holes and cut and polished surfaces. Intense work was necessary to refit the many pieces of worked ivory (Conard and Malina 2008: 14).

Malina fitted 31 pieces in the complex to include matching a previously-published single find described as “an ivory rod with notches” (Conard and Malina 2008: 14 referring to Hahn 1988: plate 45.12) which was referenced earlier in this chapter as the ornate piece of ivory that features on Hahn’s plate from 1988 with the pierced baton (bullroarer), the raven ulna (scraper/bone-tube flute) and the ivory band (mouthbow) [Figure 5.4]. All 31 fragments of GK3 came from the second archaeological-horizon layer (AH II) of Geissenklösterle in an area of 3 square metres with a 30 cm maximum vertical spread between 3.12 and 3.39 metres above excavation zero [Figure 5.9 and Table 5.1]. 30 of the 31 fragments for GK3 – recovered during waterscreening, and together assigned to a measured sediment volume of 10 litres – had not been previously measured. Although the precise positions of water-screened fragments are unknown, 29 fragments were recovered in a single quarter metre of square number 48, except for one fragment two metres southwest, and another that was one metre northeast of the main concentration of fragments (Conard *et al.* 2004: 453).

Conard *et al.* (2004: 453) explain that high levels of ivory fragmentation are not unusual because ivory starts to disintegrate along its natural layering easily breaking into small pieces. Breakages can occur during excavation although it is considered that most pieces were broken in the Ice Age. They compare taphonomic events and the scattering of fragments for GK 3 to those of GK 1 and GK 2 as described by Hahn and Münzel (1995) in relation to anthropogenic, biogenic and geogenic rearrangement processes. Since other important finds of mobile art and jewellery have also been found at Geissenklösterle and Hohle Fels – some in good condition and others broken – they explain that there could be a number of scenarios for the flute depositions (Conard *et al.* 2004: 454). Whilst emphasising mobility and the likelihood that ‘flutes’ would have been carried around by their owners they point out they may have been just left behind now and again:

Each of the three flutes from Geissenklösterle was recovered in the midst of diverse cultural debris. The discard of the flutes seems to have taken place in the contexts of the routine use of this habitation site. While the flutes may have been cached for later use, they were not left in an area lacking other classes of finds (Conard and Malina 2008: 16).

The authors discuss spatial separation and stratigraphic relationship of all three Geissenklösterle flutes (GK1, GK2 and GK3) and dating for the Archaeological Horizon II at Geissenklösterle, analysing horizontal and vertical distribution to gain a micro-chronological overview (Conard *et al.* 2004: 453). They suggest initially that Flute 2 (GK2) occupies the highest position implying that it might be the youngest of the three (and see Conard 2007: 348). The relative ages of Flutes 1 (GK1) and 3 (GK3) are considered more problematic since the ivory Flute 3 is interpreted as possibly stratigraphically older whereas samples from the area of the fragments of Flute 1 that correspond stratigraphically give older radiocarbon dates. Radiocarbon dates of between 29,800 and 36,800 BP provided from samples coming from the areas with flute fragments (Conard *et al.* 2004: 452/fig. 5; see also Conard *et al.* 2004: 450/table 1; and Conard and Malina 2008: 14 referring to Conard and Bolus 2003) are acknowledged as underestimates compared with thermoluminescence ages in the range of 37,000 BP for AH II (referring to Richter *et al.* 2000). In 2008, Conard and Malina suggest that another sequence is equally plausible for the bone flutes 1 and 2:

Given the many problems in radiocarbon dating the period prior to 30 ka BP, we place more weight on the stratigraphic position of the flutes, which suggest that the ivory flute predates the two bone flutes, and that deposition of bone flute 2 probably predates the deposition of bone flute 1 (Conard and Malina 2008: 16).

To date, none of the three Geissenklösterle flutes have been sent away for testing. New data for dating at Geissenklösterle from Higham *et al.* (2012) was presented in the last chapter, and a summary of the dates of finds are assimilated and presented in the last chapter of this thesis. It is more than plausible from evidence of the remains of worked ivory in AH II that this flute was made on site. Given that so much worked ivory is also in evidence in the lower layers (Conard *et al.* 2004: 455-456 referring to Hahn 1988; Münzel 1999; Conard *et al.* 2003) is there a remote possibility that ivory tubes were crafted earlier than this? Besides the isolated fragment from the *ivory-flute-blank stave* mentioned earlier, there is one ivory fragment 56-975 considered to be part of a flute in AH IIIa (Dutkiewicz 2021: 287).

The very many features and 3-dimensional measurements for the GK3 artefact unfold and accumulate across the main articles for GK3 (Conard *et al.* 2004; Conard 2007; Conard and Malina 2008; Münzel *et al.* 2016; Dutkiewicz 2021). It is necessary to recognise and distinguish that there is a significant difference between one end of GK3 and the other which easily becomes conflated with which end is the blowing end (proximal end) and which isn't (distal end). These proximal and distal ends of the instruments can also get conflated further (in general) with distal and proximal ends of materials used for the instruments, such as bones, and even an ivory tusk has a proximal and distal end. On one end of GK3 there is a feature that I describe as being between a 'v'-shaped and crescent-shaped lip-type form on the forward facing rim of the instrument, like a broken finger hole/half of a finger hole or alternatively like a 'notch' on a *notched flute*. There is good reason to believe that this 'notch' feature isn't a finger hole because the backward facing rim that it corresponds with is smoothed deliberately flat leaving a very clear termination at this end of the flute [Figure 5.24, top right], leaning heavily towards the interpretation that GK3 *is* a type of notched flute. On the opposite (longitudinal) end of GK3 from the end with the notch-like feature, there is by contrast a splint-like feature extending from a broken perforation which also looks like a broken finger hole/half a finger hole. A traced photograph of GK3 taken by Juraj Lipták to make a drawing from with hand-written notes

highlighting information about features and previously published measurements was made as part of a process of compiling the data, to include the new data from Dutkiewicz which differs marginally here and there from previous measurements [Figure 5.22]. A table of these measurements for GK3 is also provided [Table 5.3].

At the end of GK3 that has the anterior notch feature<sup>66</sup> the inner and outer diameters of the tube are 7.4 and 11.5 mm; on the other end of GK3 with the long splint where there seems to be an actual broken finger hole, the inner and outer diameters are 7.6 and 11.1 mm; and the overall curved tube length of GK3 is 18.7 cm (Conard *et al.* 2004: 458; Conard 2007: 351; Conard and Malina 2008: 15<sup>67</sup>). These diameters provide an average width of the tube/size of the bore as around 7.5 mm which is largely uniform (Conard 2007: 351) as well as giving the potential thickness of the wall of the tube at each end of the flute. The distance between finger holes is given as 43.4 mm/43.2mm/50.3mm in a chronological direction that starts from the end of the instrument that has the ‘notch’ feature to the end with the splint (Conard and Malina 2008: 15). The two central perforations on the front of GK3 that are with little doubt fingerholes were not measured before Susanne Münzel measured them from a drawing with callipers (Münzel *et al.* 2016: 239/table 1). They have dimensions of 8.9 x 5.6 mm (the larger of the two nearest the notched end), and 5.4 x 5.1 mm (the smaller of the two holes nearest the splint end). Another matter of importance is that all 31 fragments refitted to make GK3 do not make a complete flute; wax was used to hold all the fragments in one piece. Malina provided a drawing for GK3 by Ralf Ehmann that clearly distinguishes the 31 ivory fragments of the GK3 complex from the wax parts of the instrument shown in blue-grey colour. Ehmann’s drawing represents the front, the rear, and each side of GK3 to which similar perspectives from subsequent photographic images are also provided for comparison [Figure 5.24]. Where the fragments stop and the wax starts, and vice versa, is critical for reading the form of GK3, furthermore, the actual parts of the artefact that are wax and not ivory can be subject to change. A further comparison between two different sets of photographic images of the original GK3 alongside the Ehmann drawing show that in the Liptak photos (published in 2007) the part of the instrument near the splint end had initially been left without wax. In more recent photograph images from a photoshoot with Malina in 2011, the splint end of the instrument is refitted with wax [Figure 5.23].

Down each side of GK3 – where the front longitudinal half of the tube with finger holes meets the back longitudinal half – are a series of interrupted ‘notches’ (cutmarks/grooves/incisions) traversing the seams laterally. There are 68 of them on the side of the instrument that extends to include the splint feature, so if the splint is pointing downwards and the surface of the instrument with finger holes is facing forwards this seam is on the right-hand side of the facing image. Across the other seam respectively (the seam without the splint feature) there are 44 of them. On both seams the rows of interrupted notches are unevenly spaced with a minimum to maximum spacing for the 44 notches of between 1.1 and 3.5 mm, and between 0.5 and 2.8 mm for the 68 notches where the notches are more irregular and seem to be formed into small groups (Conard

<sup>66</sup> Please see the detail in the Appendix 4 report about differentiating the *notches* that Dutkiewicz describes as surface patterns, and the *notch feature* at the apparent blowing end of the flute.

<sup>67</sup> The reference to the length of GK3 given as 18.4 cm (Conard and Malina 2008: 21/Fig. 4) must be a typing error. On page 15 of the same article it is given as 18.7 cm.

*et al.* 2004: 456). According to Dutkiewicz, the lateral grooves/notches are ‘V’-shaped, and are actually *cutmarks*, according to the technique in which they were created. She has re-counted the number of them on each side as two units of patterns, and re-measured the maximum and minimum spacing between them within in each unit. She provides new measurements for the maximum and minimum lengths and widths of cutmarks in each unit (2021: 283-285), [Table 5.3].

The extensive cutmarks on GK3 (which has a hollow interior) are not in evidence for the fractured *ivory-flute-blank stave* (which is solid dentin and solid cement). Can it be deduced that the cutmarks are likely to have been created on GK3, therefore, *after* the dentin-cementum splitting had been undertaken, and not before fracturing, given the absence of marks on the flute preform? It is initially curious as to why Malina and Ehmann factor this into their operational chain for the construction of an ivory flute *before* the step of debitage by fracture on the seam between dentin and cement (2009: 103/fig. 19, c), [Figure 5.26 c]. This is surely because they take their theoretical departure from the nature of the evidence on the flute itself, rather than from the absence of cutmarks on the longitudinally-fractured stave. The cutmarks – on GK3 traversing each lateral seam – strongly indicate forward thinking; anticipating the function of these incisions as a visual and even tactile guide for the eventual re-joining of the hollowed-out halves is more than a plausible prediction. The step of making these incisions could even viably occur *after* the hollowing-out (gouging) process is finished. There is, however, another theory for the pattern markings, and this concerns their effective function in the process of adhesion; such grooves may prove useful for fixing together hollowed-out ivory lengths by increasing the surface area on the seams, for better bonding (Malina and Ehmann 2009; Conard *et al.* 2004: 456-457). A final scenario which should not be overlooked is that the pattern markings are primarily for decorative purposes given that the evidence of decorative markings on objects in the Aurignacian is so prolific, e.g., Dutkiewicz (2021). My personal theory is that they were used, as Malina and Ehmann discuss (2009) – initially put forward by Conard *et al.* (2004: 456-457) – for lining up the halves, and to support adhesion. Yet the pattern aesthetics that are evolving simultaneously as a by-product are super relevant as an index of cognitive prowess. Such patterns on objects that for particular designs are integral to a given marvel of engineering, e.g., an ivory flute, become in themselves a stylistic sign of superior identity to any object that is also potentially marked in a similar way. These are icons of design. Whilst a flautist is playing, the patterns are moving with the sound patterns (the ‘music’) making them dynamic icons.

The subject of the complex operational-chain of crafting an ivory flute also raises the question of the fingerholes. Malina and Ehmann indicate that this part of the process for an ivory flute occurs in the chain before the fixing of the two halves (2009: 103/fig. 19, i), [Figure 5.26 i], whereas Hein demonstrates fingerholes being made at the very end of the process *after* gluing and binding (Münzel *et al.* 2016: 230). In my experiment making a 35 cm-long flute from mammoth ivory, the fingerholes were worked into the joined tube which was only temporarily bound with masking tape so it actually felt to be working with a finished tube. However, once the fingerholes were made, the tape was removed and the two halves separated again [Figure 5.31, a, b] before the steps of final and permanent binding (which followed treating the inside and outside of each half length with varnish). I suppose the advantage to carving finger holes before binding creates an opportunity to potentially affect change from inside the tube too. This isn’t possible with a

bone; one plus side of engineering an ivory flute is that the inside of the tube is completely accessible for a time during production. Was the process of making finger-holes attended to, however slightly, from the concave surface in the Stone Age? Although evidence for this has not been detected on GK3, it is an opportunity of the process.

The advantages of an ivory flute rather than one made from bone are previously discussed by Conard and Malina (2008), and attention is paid to the status of a flute as an ivory object. The fact that the tube has to be manually crafted means that the maker has more flexibility in choosing her length rather than being inhibited by the anatomical length of the tube, if the tube is animal bone, like a swan radius. In my experiment making the 35 cm-long flute from mammoth ivory the choice of bore size is not so easily determined either if the dentin-cement interface is an intentional part of the authentic process of ivory-flute making in the Swabian Aurignacian. This is because the thickness of the cement layer limits the bore-width of the tube. On the subject of length versus width, the aim in my experiment was to use the length of the *ivory-flute-blank stave* as a total length for a new flute, and also to test theoretically the potential maximum bore size possible from a mammoth-ivory tusk which we had at our disposal<sup>68</sup>. The material does present some possibility to have control over the diameter of the bore throughout the tube. One has control over how small the diameter is going to be but not how large because one is beholden to the width of the cement throughout.

On the original 35 cm *ivory-flute-blank stave* the end is narrow because it comes from the tip of the tusk which tapers to the end. It can be noted however that the *ivory-flute-blank stave* is from only part of the length of an original tusk from which other much longer peripheral pieces are considered to have been taken and fractured in the Aurignacian (Hahn 1988: 205). It is possible to deduce, therefore, that rather than 35 cm being an exaggeration for the maximum length of a flute tube made from a fractured rod of dentin and cement, an even longer flute tube is potentially possible. Given the generous diameter of the tube that resulted from my experiment making a 35 cm-long flute from mammoth ivory – composed of dentin and cement (demonstrated in the cross section of the tusk in the image on the front cover of this thesis) – a few more centimetres is not unthinkable. In my experiment, once the rod had firstly been extracted (by machine), and secondly cut down the dentin-cement seam (by machine), the two halves of the rectangular rod were bound with masking tape, and then smoothed into a rounded solid cylinder (also using a machine), [Figures 5.27; 5.28; and 5.29]. Lateral cutmarks were not made, following instead the path of the *ivory-flute-blank stave*. In the experiment I focused on testing the part of the chain involving hollowing out the ivory. Due to the expensive nature of the mammoth tusk procured by Frank Trommer, the team kindly made me a tool to work with. The tool made from metal fitted the size and shape of the channel I gouged out by hand, using elbow grease. It took three days, and running out of time on day three I was assisted in the task by Pierre Stoll with a second custom-made metal tool. One of the most difficult things was finishing the ends of each longitudinal half which requires persistence and patience [Figure 5.30]. In a subsequent experiment that Trommer undertook with Johannes Wiedmann and Angela

---

<sup>68</sup> The tusk was procured by Trommer at my request, the cost of which I contributed to by partly using a grant for the experiment that I received in 2012 from Gesellschaft für Urgeschichte (GFU/the society of Pre-history). The rest was self-funded.

Holdermann – using the same tusk as I had previously used, and following on with their own experiment after my flute was completed – they report that they got tired of this part of the job and decided just to cut off the end instead to get the job done (Holdermann *et al.* 2013a and Holdermann *et al.* 2013b). Trommer was therefore stricter on me in the supervision of my work [Figure 5.30] than he was on himself and his colleagues! One can only imagine the dedication and skill of a crafter using flint blades to do this job. The ivory is quite hard to chisel coming away in fine wispy layers, and a sharp blade is absolutely needed to do this. We persevered and both ends were chiselled as well as we could get them to be. There is currently no data on the wear and tear of tools for this process. Carving three dimensional solid forms in ivory wasn't unusual in the Aurignacian (Conard and Malina 2008 referring to Hahn 1986) but a three-dimensional hollow ivory form, like GK3, is unique for its time, and in the form as musical instrument is impressive by any standard. The joining of the two longitudinal halves of GK3 guided by the patterns of cutmarks that match up one half of the longitudinal length of ivory with the other half is also discussed relating to a minute amount of an organic substance detected on the original artefact GK3 during microscopic analysis by Bertrand Ligouis. The quantity was not sufficient to ascertain with organic petrology the type of substance yet the authors think it must be some type of mastic that was used for gluing the lengths together. Additional sinews or plant fibres may have also been used to hold the two halves in place (Conard and Malina 2008).

The way that we handled joining the two halves of my 35 cm-long flute of mammoth ivory together involved some modern solutions. After hollowing out the ivory lengths was accomplished, the two lengths were reconciled as a new tube and bandaged with masking tape in rings that allowed space for potential finger holes to be worked into the ivory. The next step was to bore into the ivory to make these finger holes which I modelled to follow the shape of my hand and my fingers. I also made a hole for playing on, which I modelled copying the hole of the lip plate on a modern-orchestral flute. These processes I accomplished using a modern machine. Then the masking tape was removed and the separate halves were each coated inside and out with Zapon varnish. After the varnish had dried, the two halves were rebound with new masking tape and superglue was squeezed into the seams, but not before a block of beeswax had been plugged into the proximal end of the flute. After the glue had hardened the tape was removed. A resin-wax mixture was applied to the seams. This was left to set hard, and the excess subsequently removed with a flat blade. Chewing sinew from reindeer provided a natural resource of sticky twine which was wound as binding around the tube of the new flute in between the various holes [Figure 5.31]. The resultant 35 cm-long flute of mammoth ivory (half dentine and half cement) takes as its point of departure GK3 and is a free reconstruction of the artefact (Atema 2014). It was made by Frank Trommer, Patrick Geiger, Pierre Stoll, and me. I name the flute GK3-FG/FT/PG/PS-1(2012). Johannes Wiedmann was also in the workshop documenting the process [Figure 5.30 d].

The chain of events that making a mammoth-ivory flute reveals is a complex process where modern machines and solvents may be used during different steps of the operational chain to keep the experimental work flowing. This type of working, as a kind of *bricoleur*, helps the realisation of new perspectives about authentic processes whilst engaging anachronisms that enable the experiment. Therefore, parallel to the process of working with authentic tools is a process that relies on modern equipment, solutions, and processes, and the dialectic between the

two promotes ideas. The most basic observation here is to note just how difficult the process of making an ivory flute actually is even with modern machines and chemical solutions at our disposal! Questions occur and reoccur, like at what stage in the original process were the actual lateral cutmarks and the fingerholes made on the original GK3, for example? Are lateral cutmarks indeed needed to support adhesion? Certainly, GK3-FG/FT/PG/PS-1(2012) is no longer playable because the seam is now not airtight but it did produce a glorious timbral sonority when it was new over a decade ago (Experiment 7.3). The longer and wider tube renders strong resonances from deeper sounds. In the first register the notes of my flute (none of which are overblown) are C4, E ♭ 4, F4, A ♭ 4, B ♭ 4, C5 and C♯5. However, forward thirteen years, and the varnish is flaking off, and it currently needs some attention. There is even scope to dissolve all the modern solvents on it and reassemble it strictly using Aurignacian methods and materials.

Trommer, with Holdermann and Wiedmann were the first to publish documentation describing an ivory flute-making process based on GK3 from an experiment ([Holdermann 2013a](#); [2013b](#)). They report that they used a stave made completely of dentin because there was no piece optimally suited (it turns out that I took the best piece). They question whether a longer length like 35 cm is viable as a notched flute. Using beaver teeth, it took Holdermann and Trommer about 5 hours each to finish hollowing out. Fixing the two lengths with hot birch pitch, and binding with sinew, they calculate it takes about 13.5 hours to make an ivory flute. The team also went off grid, so to speak, for the choice of pattern for fingerholes, and settled on a template from HF1 for their design, resulting in a hybrid flute made like GK3, but in its basic acoustic design, copying HF1. Musical pitches from their finished flute which was eventually reduced in length to 305 mm long – because they did not persevere with working the ends, and cut/trimmed them to finish the work – produce, C5, F5, A5, C ♯, and G in the second, and F ♯, played as a notched flute employing a normative flute embouchure. Perhaps the ambition of 35 cm from their original hypothesis can be realised if GK3-FG/FT/PG/PS-1(2012) is ever modified as a notched flute! In the Holdermann *et al.* experiment ([2013a](#); [2013b](#)), the edges of the two longitudinal halves were bevelled and then fixed in place before glue was applied. This was not the case previously for my 2012 experiment with Trommer's team; we did not bevel the edges before glue was applied ahead of the application of heated birch pitch, wax and resin. I presume that the application of the latter supports an airtight seal but because we didn't cut in any lateral notches/grooves in the earlier experiment, I wasn't able to tell if such cutmarks help with this, or with adhesion. Certainly an absence of them cannot be claimed to be a benefit given my flute's current unplayability, although the two halves have not budged, and remain very tightly bound together.

In a second series of experiments in 2019 using GK3 as a point of departure, I compiled a list of specifications commissioning Wulf Hein to craft a new ivory flute, GK3-FG/WH-1(2021) harnessing a skill which he has developed from years of experience and practice working with ivory, as well as reconstructing many of the finds the Swabian Aurignacian. In preparation, measurements for the morphology of the fingerholes of GK3 were undertaken as part of Experiment 7.16 called 'Aluminium for Ivory'. These measurements are taken from the image of GK3 before the more complete wax reconstruction [[Figure 7.6](#)]. I chose a series of 5 points for each finger hole which included: - to the start of the left bevel; to the left edge of the hole; to the

centre of the hole; to the right edge of the hole; and to the right end of the bevel [**Figure 7.6**]<sup>69</sup>. An experiment that followed this (Experiment 7.17 called ‘Across the Valley from Sirgenstein’) focuses on playing GK3-FG/WH-1(2021) in the open air of the Ach Valley.

With regard to the wind instrument itself, Hein has shared with me the details of his process making it, as follows. He refrains from using any additional modern mastic, instead using solely birch pitch which he has developed for optimum consistency using the double-pot method. The edges of each longitudinal half are lightly chamfered on the outside, before the birch pitch is applied to both edges of each half length. After application the birch pitch is reheated over a grease lamp to create evenness, and the halves meet, and are bonded. I also requested he cut in the patterns of lateral grooves along each seam, and it is at this point a contrast between the resulting finished flute GK3-FG/WH-1(2021), and the original GK3 flute, can be instantly spotted, as follows. On the reconstruction, the hardened tar has formed in each groove along these countless channels having been spread into and across the lineal seam, seeping along either side of the immediate join in a more-or-less perpendicular fashion. Any traces of dark-coloured mastic on the original GK3 artefact have gone whereas they are clearly visible on the ivory surface of the new flute, like the teeth of an ebony comb. Hein uses sinews from the leg tendons of reindeer for additional binding but doesn’t chew these (like I had done previously), but beats and wets them before separating and fixing them to the flute. This is done *before* making fingerholes, which I strictly requested should copy the pattern of GK3. I also requested a notch (for blowing on at one end of the reconstruction) which is usually the last part of his process (if notches are required). Modern machines were used for all steps of working with the ivory material itself for this flute. The main reason for this was the cost to my own pocket. It would have taken Hein considerably longer to scrape in the finger holes, and hollow out the interiors by hand using only flint tools. The ivory for this flute was also extracted by machine [**Figure 7.10 a**]<sup>70</sup> and was sourced responsibly from a stock of decades’ old elephant ivory supplied originally for making piano keys in the last century.

The first ever reconstruction of GK3 recorded is by Seeberger who made a flute from wood. Using suitable alternative material for organological reconstruction does not affect tonametric potential<sup>71</sup> provided that the shape/dimension of the acoustic instrument is the same although that the quality/colour of an instrument’s tonal sound or ‘timbre’ may differ as a result of the material (Conard *et al.* 2004: 458). The reconstruction made from elder wood was followed up with a reconstruction of GK3 in ivory (Conard and Malina 2008: 15). Seeberger glued the two longitudinal lengths of this ivory reconstruction of GK3 with birch mastic, and he also used binding made from sinews (Conard and Malina 2008: 15). Despite the description in this article there is no picture of Seeberger’s reconstruction in ivory, and whilst the results from his experimental work on GK 3 are reported the tonametrical series is not given. The authors report that the wider bored and longer ivory flute has a deeper/lower overall tonametrical range than his

<sup>69</sup> No research has yet focused on fingerholes as circular-pattern markings; discrete measurements, like the lengths of the radials from the centre of each fingerhole for the flutes, are currently not available.

<sup>70</sup> Hein gives a description of his ivory-flute making process in Münzel *et al.* (2016). In a recent article by Potengowski *et al.* (2023), a more detailed account is also given.

<sup>71</sup> This is precisely why anachronisms in experiments are useful, and why I use metal substitutes in my experiments, e.g., for GK1 and GK3. See also Lawson (in d’Errico 2003).

flutes made from swan radii which are shorter in length and narrower in bore (Conard and Malina 2008: 15). However, this cannot be entirely true with regard to the bore size. I have experimented with the bore size of a radius and an ulna bone respectively, both trimmed to 14 cm, precisely for the purpose of comparing their tonametrical potentials. Their pitch vocabularies are so very similar that it enabled a short polyphonic piece that I recorded on 4 separate tracks which were mixed together. The results of this piece expose the sonic similarity demonstrated by tubes of the same length but of different widths played as flutes in different ways (Experiment 7.8 called ‘Bone Tubes’).

Seeberger’s playing position for both his elder-wood flute and ivory flute is described:

Seeberger plays them in a transverse orientation. No reed is necessary since tones can be obtained by blowing obliquely across the proximal end of the flute. [...] Both the bone and ivory flutes reconstructed by Seeberger play multiple basic notes and produce additional notes by blowing more sharply into the instrument (Conard and Malina 2008: 15 referencing Seeberger 1998: 2003).

I have located Seeberger playing his ivory flute in video footage from 2006 given to me by Stefanie Kölbl and have taken an image of his flute from this [Figure 5.33]. The notes that I transcribe from his playing using the ‘ney’ technique are F5, G5, B5, and E6. Seeberger maintained that GK3 had its first finger hole far too near the notch feature for it to be played effectively from this perspective (Conard *et al.* 2004: 457; Conard 2007: 352; Conard and Malina 2008: 15). By taking this position Seeberger designated the notched end of GK3 as the distal end of the flute so that in all the first-wave papers for GK3 the notched end is referred to as the distal end of the instrument (the end furthest away from the mouth). An ivory fragment (mentioned at the beginning of this chapter) that is not refitted in the GK3 complex but was probably part of the original flute, adds some significant weight to Seeberger’s interpretation for GK3 as an end-blown or rim flute played as a ‘ney’. However, this in turn leans even more strongly to the notched end being the proximal end of the flute due to the deliberate shaping of the notch, over an otherwise unmodified end. The fragment appears on a plate in the first article for GK3 (Conard *et al.* 2004: 457/fig. 13) and is also shown in this chapter [Figure 5.3 a].

Seeberger evidently favoured playing both GK3 and GK1 models in the same way, holding them at an oblique angle to the mouth, as in playing a *rim flute* where the player’s airstream is directed over part of the rim of the flute whilst the rest of the rim is cushioned in-between the lips at one side of the mouth. The blowing/mouth ends for Seeberger’s reconstructions of GK1 and GK3 classify his reconstructions as *rim-flutes* because their proximal rims are terminated without notches or other types of morphological modification (e.g., Jeremy Monatgu 2017 and 2018). Seeberger was particularly accomplished in playing on the *rim* which he demonstrates, for example, exclusively in the recordings for *Klangwelten der Altsteinzeit* in which there are numerous short flute pieces composed by him for and on his own reconstruction/(s) of GK1 (Seeberger 2003: T.2 Shaman 2:24; T.4 Tonumfang 0:52; T.5 Vogelstimmen 3:21; T.7 Miko 1:00; T.8 Michaelstein 0:38; T.9 Falkenstein 0:37; T.11 Gafluna 0:36; T.12 Meersburg 0:55; T. 14 J. Hahn 0:32; T. 16 Shaman 1:44; T.17 Michaelstein 0:37). From my own experiment called ‘Shak or Ney?’ (Experiment 7.6), I can now play on the rim of a tube both with a ‘ney’ embouchure (the Seeberger technique), and with a normative flute-embouchure, respectively, following in the

flutesteps of Potengowski who has experimented extensively with both embouchure trajectories (Münzel *et al.* 2015; Potengowski and Münzel *et al.* 2015; Münzel *et al.* 2015). This however makes organological classification of the Aurignacian Swabian finds that are reconstructed and played in different ways problematic because of voicing morphology.

Potengowski experimented with an ivory flute modelled on GK3 with three finger holes reconstructed by Hein which became the instrumental source of two tonametrical series she produced using these two voicing methods, where she appropriates the ‘ney’ to the end on GK3 with the rim, and the normative flute embouchure to the end with the notch. Without reproducing the details of the harmonics and/or glissandi for these two series here in the text, I note the fundamentals for each of these from her experimental work. For the production with normative flute embouchure which she refers to as “on the notch”, the fundamentals are G#5, C6, F#6, and E7. From the other end played using the Seeberger technique, or as a ‘ney’ which she calls “on the edge”, the fundamentals are G#5, B5, E6, and C7. The full pitch vocabularies for these two methods from different ends of the same model are graphically documented in Münzel *et al.* (2016: 242/fig.5), [Figure 5.8]. In the image of this ivory model that figures in Münzel *et al.* (2016: 240/fig.1) – which is from a photograph by F. Korte originally published in an article by Potengowski and Münzel (2015: 177/fig. 2) – a scale is not given, and the length of the reconstruction is omitted in the texts, but it looks to be around 185 mm. Other players, respective researchers, of the GK3 flute to note are, Gabriele Dalferth and Barbara Spreer, who are photographed together with Potengowski playing as a trio in a workshop in Blaubeuren from January 2019 [Figure 5.33]. Potengowski has recently published a new article with these researchers, together with Malina, Wiedmann, Münzel, and Hein (2023) with which I was initially involved but needed to withdraw from to focus on my own experiments for my doctoral research.

## 5.7 THE VULTURE

The vulture flute, Hohle Fels 1 (HF1) [Figure 5.34] is the least complicated find in terms of its discovery. On the 17<sup>th</sup> September 2008 it was found by an excavator in the antechamber of Hohle Fels in the basal Aurignacian layer of archaeological horizon Vb. It comprises 12 pieces, all but one found in situ [Figure 5.35] with a remaining piece found through water screening. The flute is from the radius of a griffon vulture (*Gyps fulvus*), a bird with a wing span of between 230 and 265 cm. The artefact is 21.8 cm long with a bore of around 8 mm. It is reported as having a ‘double notch’ feature at one end [Figure 5.39], and five apparent fingerholes [Figure 5.40] (Conard, Malina and Münzel 2009). Wulf Hein was the first to reconstruct HF1 and play it on the ‘double notch’ engaging a ‘ney’ embouchure. An Andean condor radius was used for this first reconstruction. The sonic results of his work were released on the BBC website (source currently unavailable) which is how I first encountered his playing and why I became smitten with the ancient flutes. The musical pitches he produced (which he has since told me were recorded on 29<sup>th</sup> October 2009) I had listened to in February 2010, and had duly transcribed in my diary as E5, F#5, G#5, B and C#6. This pentatony echoes a similar inclination that he had noticed

together with Hahn for the tonametrical series which he had found playing his reconstruction of GK1 as a blockless duct flute (Hein and Hahn 1998).

In the years that have passed since then, new research has illuminated a number of perspectives about voicing techniques which greatly deepen and broaden our understanding about how these flutes may have been played in the Aurignacian. This forms a discussion point at the end of this chapter about the Seeberger technique and the ubiquitous glissando which for many sleepless nights I believed was whistling down the tube. My hypothesis about Hein's playing is that he naturally locks into the true fundamentals of the flute whilst at the same time demonstrates a skill that goes off grid, so to speak, for his tuneful playing. Seeberger perfected the art of tuning his playing to fit the tonality of his melody, as shown in the example I have given for this in which Seeberger's melody verges strongly towards pentatony [Figure 5.16, c]. Do Western ears do this, i.e., either fill in the gaps or adjust tuning to match a universal pentatony? Due to certain glissandic possibilities of the voicing technique for such small and narrow tubes it would seem that these are legitimate questions we can ask with regard to the subject of cognition, and musical cognition.

I have discussed in previous articles (Gill 2012: 34-37; 2020: 80) the phenomenological-acoustic of Hohle Fels in 2011 from my experience of playing in the hall of the cave on HF1-inspired flutes from bamboo, crafted by Erik Sampson, alias Erik the Flute Maker, (documented in Experiment 7.2 called 'Playing Inside Hohle Fels'). Sampson's reconstructions also demonstrate the idea of using a small tube as a mouth piece, fixed so that the channel is angled towards the anterior 'notch' whilst resting on the posterior 'notch'. HF1's apparent 'double notch' feature considered the blowing end of flute has by default designated this part of the instrument as the 'top' or proximal end, i.e., like the notch on GK3 that suggests GK3 was designed as a so-called *notched flute*. However Anna Friederike Potengowski and Barnaby Brown, respectively, who are two instrumental performers who play HF1 reconstructions, happen to use the other end in performance. So why are they ignoring the 'double notch'?

In 2011, Jean-Loup Ringot published research (Ringot 2011) which includes details of his model of HF1 [Figure 5.41, c] which he plays with a reed, calling into question the classification of HF1 (and similar organological artefacts) as flutes when they can be played as clarinets<sup>72</sup>. Ringot doesn't, however, document the tonametrical series for this reconstruction despite writing that it is easy to play and sounds great. He demonstrated playing it at the *Workshop on Bird-Bone Palaeolithic Aerophones* held in Berlin on 11<sup>th</sup> September 2014. Delegates were intrigued to see that the hole nearest to the 'double notch' feature is covered with a membrane instead of being left open to be used as a fingerhole [Figure 5.37, b]. Ringot sought to "change the atmosphere" in this way altering the timbral quality of the clarinet's tone (Wyatt and García Benito 2016: 198). One of the advantages of this method is that it makes the instrument easier to finger with only 4 and not 5 finger holes, it can be rationalised.

---

<sup>72</sup> Ringot has always insisted on referring to Palaeolithic aerophones as aerophones and not flutes. My point about continuing to use the word 'flute' for the *Acb flutes* is based on the argument about etymology of the word flute standing in itself as another term for aerophone. It alludes to perspectives about the subject of the statement 'this is not a pipe'.

In 2012, Simon Wyatt published his first paper about “Sound Production in Early Aerophones” (Wyatt 2012) on a path that led to the said *Workshop on Bird-Bone Palaeolithic Aerophones* which he organised with Carlos Benito García<sup>73</sup>. This memorable workshop led to the publication, in 2016, of numerous papers on the subject<sup>74</sup>. Wyatt had been the first to actually publish a tonometrical series for HF1 from results of a model that he had made by joining two goose bones together to make one 214 mm reconstruction of HF1 which he plays as a flute. This was one of four reconstructions he made of HF1 at the time; the other three are modelled in the article with reeds of cow horn, sheep horn, and antler, respectively. The tonometrical series he documents for the flute model in question is E ♭ 5, F#5, A5, C#6, D, and E ♭ (Wyatt 2012: 397/figs. 2 & 3). From numerous models, two flute reconstructions (i.e., without reeds) by Wyatt are shown in this chapter [Figure 5.41, d].

Hein reports that his first reconstruction of HF1 made from actual vulture radius was in 2012 which he photographed placed beside his Andean condor flute [Figure 5.41, a]. On the left (in the image) is the flute made from a condor radius, and on the right is the flute made from the radius of a vulture (e-mail corr. April 29<sup>th</sup> 2025). During the 2<sup>nd</sup> meeting of the Palaeolithic Music Group (28<sup>th</sup>-29<sup>th</sup> April 2013), Susanne Münzel began documenting in a database the emerging details of numerous reconstructions for various Palaeolithic flutes, mainly finds from the Ach Valley. Two Andean condor flutes and one vulture flute all made by Hein are noted in the database for HF1 (e-mail corr. February 18th 2021 from Susanne Münzel). The location of one of the condor flutes together with the vulture flute was registered at the time to Tübingen University. One of these was subsequently lent to Anna Friederike Potengowski for her experiments. She records the length as being 263 mm long (e-mail corr. February 18th 2021)<sup>75</sup>. A hallmark of Hein’s work is that his reconstructions are all practically identical. With three HF1 reconstructions in circulation, so to speak, made by Hein (although one of the condor reconstructions is now in South Korea, according to his mail), data from different players can be compared readily. For example Potengowski’s playing can be compared with further results which I have transcribed from recent video footage (sent to me by Hein) of Bernadette Käfer playing Hein’s condor radius<sup>76</sup>. The tonometrical series that I document for Käfer playing with a normative flute embouchure are located around the musical pitches of E5, G#5, B5, E6, and G#6. I have also made a reconstruction of HF1 as a metal flute the same length as Hein’s models and achieve with a normative flute embouchure a tonometrical series of the pitches E5, G#5, B5, E6, and A6. In this way I can check my flute playing against Hein’s, Potengowski’s, and Käfer’s for the 263 mm model played from the same end with a ‘notch’. Potengowski has experimented with the notched end and these results she has published (Münzel *et al.* 2016: 242) [Figure 5.8]. Her tonometrical series for HF1 played on the notch produce the notes E5, G#5, A#5, E6, and

<sup>73</sup> This was for the 9<sup>th</sup> Symposium of the International Study Group on Music Archaeology (ISGMA), held at the Ethnological Museum, State Museums Berlin, 9<sup>th</sup> -12<sup>th</sup> September 2014.

<sup>74</sup> These are published in the 2016 volume, *Studies in Music Archaeology X, Sound – Object – Culture – History*, edited by Ricardo Eichmann, Jianjun Fang and Lars-Christian Koch.

<sup>75</sup> In the image of this vulture model that figures in Münzel *et al.* (2016: 240/fig.1) – which is from a photograph by F. Korte originally published in an article by Potengowski and Münzel (2015: 177/fig. 2) – a scale is not given, and the length of this flute is not recorded elsewhere.

<sup>76</sup> From the movie take for *Raptor’s rapture*, a video installation by Jennifer Allora and Guillermo Calzadilla, for “documenta13” art festival in Kassel, Germany (taken in a studio in Kassel, 29<sup>th</sup> February 2012).

A#6. Hein somehow manages to produce the ‘ney’ embouchure on the notched end whereas Potengowski, Käfer and I all approach this end with a normative flute embouchure; I find it impossible to use the ‘ney’ embouchure on the notched end. I also believe that Hein had been exposed to Seeberger’s playing which he instinctively emulated. Comparisons of our flutings on models blown that are all 263 mm show a similar pattern overall, which would be expected because all flutes are open at both ends of the tube, even with Hein blowing with a different embouchure. These patterns also tally generally with the results from Wyatt’s flute model (about 270 mm) which being slightly longer in length would be expected to produce an overall slightly lower tonometrical series of fundamentals, and his results (noted above) do confirm this expectation.

Potengowski reports, however, that “blowing on the putative notch does not produce a sonorous sound” (Münzel *et al.* 2016: 231). By swapping the playing end around and using the Seeberger technique – as a ‘ney’ or as she calls it, ‘on the edge’ [Figure 5.44] – she reports that the sounds are very clear [Figure 5.8]. The pitch vocabulary increases considerably with a profusion of possibilities not only for the usual harmonics but also for playing glissando. This in principle is applicable to all three of the *Ach flutes*, championed especially by Potengowski on the trail of Seeberger who first re-introduced the possibility in context together with Susanne Schietzel. This starts to call into question the role of the ‘double notch’, to include whether it is actually the intended blowing end. Photomicrographs<sup>77</sup> show polish on the anterior notch [Figure 5.38, b], and on one of the fingerhole edges [Figure 5.40, e] respectively (first published in Conard *et al.* 2009: 1/fig. 1 a, d). The striations on the fingerhole are defined strongly, whereas the polish on the anterior notch is considerably less so. It looks as though the anterior notch may have been sanded rather than chiselled into this shape. Alternatively, may it be asked whether the index is from some other type of non-human abrasion? There has already been considerable discussion raising doubts about the posterior notch as being a human-made one (Münzel *et al.* 2016: 230). Close-up imagery of the back notch of this area from a photograph seems to indicate that the posterior notch is actually a break [Figure 5.39, b]. I notice from early photographs of GK1 that GK1’s broken end has a more than a striking resemblance to the ‘double notch’ of HF1 [Figure 5.43]. In this comparison, the small protruding fragment at the proximal end of the swan radius flute is currently reported as missing or lost; most current images of GK1 do not show this original feature.

Another option for the ‘double notch’ at the distal end of the instrument is as a decorative feature. Whatever the authentic scenario for this artefact, a question then emerges that if the orientation of the flute is swizzled round, what becomes of the apparent finger hole at the other end which is already broken? According to Dutkiewicz (2021: 291), there are faint cutmarks above each fingerhole except for this one. This is surprising. Is it possible that the partial fingerhole at the broken end may be simply just a broken end posing as a fifth fingerhole? In a close-up image of this apparent fifth fingerhole, the definition of the area around the fingerhole looks similar to the others but its appearance seems slightly warped [Figure 5.40, f]. As there is an absence of cutmarks here, whereas there are cutmarks for all the other fingerholes, the possibility that this end is not a fingerhole certainly may be mooted. Dutkiewicz records seven

<sup>77</sup> The long axis of the micrograph is 2.8 mm; incident-light fluorescence mode, ultraviolet and violet-light excitation.

markings all of which have been finely-executed leaving V-shaped profiles via a technique of cutting. Above the finger hole nearest the end of the flute with the so-called double notch feature there is a fine cutmark which is 1.64 mm long and 0.09 mm wide. Above the next fingerhole down the tube there is another cutmark which is 2.24 mm long and 0.11 mm wide. Above the next finger hole further down the tube (the third hole from the double-notch feature) are four short parallel cutmarks. These are between 1.63 mm and 2.21 mm long, and between 0.13 mm to 0.22 mm wide. The distances between them range from 1 mm to 1.7 mm. The fourth fingerhole in this line (the one nearest the broken end) has a single cutmark that is 3.22 mm long and 0.28 mm wide, but this has been cut in below, not above, the fingerhole. For the broken end where there is thought to be a possible fifth fingerhole there is no evidence of any markings (Dutkiewicz 2021: 290-291). Since the fourth fingerhole in the line described has its cutmark below it, there is always the chance that the possible fifth fingerhole (if it were a fingerhole) had previously had a cutmark below it too.

Barnaby Brown (2016) has published the results from an HF1 reconstruction of a vulture radius considering both ends of the instruments as breaks, writing that “playing it as a flute, the fingerhole placement doesn’t make any sense to me – the lower fingerholes seem redundant”. He inserts a launeddas reed into (what I calculate to be) the non-notched of the end of the instrument to play it, and records the following tonametrical series: - G3; A3; B3; D4; E4; and F#4. He explains that both ends of the instrument were tried and tested with both being musically interesting (corr. April 2025). The one he prefers listed here is due to the presence of three perfect 5ths (G-D; A-E; and B-F sharp). The length of the instrument is 370 mm. After making this instrument he used another vulture radius and attached the two side by side. The aesthetic effect of a right and left radii on one and the same instrument, each bone with its distinct shape, renders an instrument that looks like a large set of pliers [Figure 5.41b]. I have heard him play this instrument<sup>78</sup> and what is striking besides the matching vulture-wing radii is that two notes can be played at once; he blows both pipes at the same time, one acting as a drone [Figure 5.37]. Interesting too is use of the epiphysis at the distal end of each bone in his reconstruction in which each remains intact.

Wyatt considers the anterior notch a deliberate feature of the instrument. He points out that the angle of HF1’s anterior notch is not inclined sufficiently enough for it to reach all the way to the posterior of the bone (Wyatt 2016b: 202) [Figure 5.39, d]. Photographic illustrations he has kindly given show step-by-step images of the evolving end of one of his reconstructions with regard to this insight [Figure 5.38, c]. The result is looking something like a little boat at the end of the instrument with a small part of the epiphysis intact. He had spent several hours studying the shape of the angle and length of the notch at the Ice Age Exhibition which was held at the British Museum, returning on a second occasion to check his sketches. He has subsequently experimented with several options for this end of the instrument across numerous reconstructions, plus he gives explanations for engaging different kinds of embouchures and blowing techniques (Wyatt 2016b). In one model Wyatt put some wax at the top end of the tube to block it. There he placed a reed made from the quill of a feather covering the entire aperture

<sup>78</sup> ‘From Cave to Rave’ at Mednarodni Festival, Ljubljana (Slovenia), 25<sup>th</sup> August 2017

but not before tying some of his son's hair underneath it so that when the reed flaps shut it is not completely flush with the bone. The quill reed is tied around the bone facing downwards, not upwards (Wyatt 2016b: 211/fig.7 left). In a video call with Wyatt in the spring of 2023, he put the whole thing in his mouth (including wax, quill, and hair), sealed his lips around the instruments and blew, and out sang a melodious sequence of B3, D4, E4, F#4, and G#4 pitches.

My own encounter with a flute from vulture radius is documented in my Experiment 7.18 called 'Vulture-Radius Flute', where the experiment turned into one music album; I recorded the entire process and released the results as different tracks during a week's residence on Gotland at the Visby International Centre for Composers. The first impression that I got from handling a vulture radius is a sense that the bone is longer and wider than a swan radius. I too treat both ends of the original HF1 in this reconstruction as breaks, and use only the four middle perforations as a pattern for fingerholes. Copying the pattern directly from a silver cast taken from a mould of a resin copy of the artefact HF1 (commissioned from my sister-in-law, the artist and jewelry maker, Jennie Gill). I play my 220 mm long new flute with the 'Seeberger technique', or played as a 'ney' on the rim, holding the bone obliquely to my body. The tonometrical series I produce is: - F5; B ♭ 5; D6; G6; and D7. The middle three pitches are easily played and due to the Seeberger technique as my chosen method for voicing, there is furthermore the additional feature of considerable glissandi descending from fundamentals. There are also various overblown possibilities for the harmonics from these fundamentals.

#### 5.8 METHODOLOGICAL TROUBLESHOOTING; THE ROUND PEG AND THE SQUARE HOLE

The subtle detail of different organological designs, multifarious embouchures, and respective playing techniques, as demonstrated by practitioners such as Simon Wyatt, are seemingly infinite. His duct flute of elder wood with a sleeve from silver birch bark tied with nettle cordage binding and a beeswax block, and another similar model from goose bone with a sleeve from cow horn (**Figure 5.46**: left and right in image) show intricate detail. Gabriele Dalferth is another such practitioner who has her own collection of reconstructions taking as her point of departure the *Ach flutes*. I have experienced Dalferth's reconstructions, and like Wyatt she uses a number of innovative solutions to generate sounds from the blowing ends of instruments. Rather than regard these themes and variations of design as what wasn't actual or not in the Stone Age, I prefer to embrace them from the perspective of possibility in order to swab an impression of cognition that is harnessed by, and harnesses, these processes of making and playing. The perspective of morphological-reconstruction of instrument, and of playing, taken to a personal extreme, puts me in mind of *instrumental musique concrète* (acoustic not electronic in this context) in relation to the Stuttgart composer, Helmut Lachenmann. The whole enterprise for reconstructing the *Ach flutes* in terms of instrument and voicing design becomes exceptionally creative and I regard it like composition. In his piece 'Interieur for solo percussion' (1966) Lachenmann instructs an idiophone player to use her drumstick like a chordophone to sound like an aerophone; "the drumstick must not be clasped too firmly, but should slide loosely; the volume is determined by the speed of sliding (analogous to the "flautato" of stringly-instruments)". If

*Instrumental musique concrète* is something like a concrete exploration of the human condition via sound generation, this is Cajsa Lund's probability groups 1-5, and what lie within them, in a nutshell.

Whilst it is considered, that topics which lie outside the empirical realm of observation – and are nearer to the realm of experience, subjective impression and interpretation – are unusual or atypical for Palaeolithic Archaeology. This is always acceptable for Music. This however presents something of a dichotomy epitomised in researching the *Ach flutes* that are situated between art and science. Using Standard Pitch Notation (SPN) I have jotted down in this chapter numerous tonometrical series for various reconstructions of GK1, GK3 and HF1 from previous research mentioned in this chapter. SPN is a system for musical pitches from twelve chromatic notes across an octave (an octave representing a doubling of frequency) plus allocating a number according to which octave register a particular musical note being referenced is found, i.e., middle C on the piano is C4, and the octave above it is C5. I find a prospect of dealing with frequencies of instruments in Hertz counter intuitive because the nature of playing varies so much with each human personality, the environment, and the instrument itself anyway, and because context constitutes change. The context could simply include a change in temperature which affects the signal so a search for absolutes will always be impossible.

To consolidate previous research, I have created a visual aid [Figure 5.45]. The idea is to scatter the patterns from reconstruction work using yellow symbols indicating flute-blown notes, and purple ones indicating reed-blown notes, from a range of sample sources. It must be pointed out that patterns do not include additional series of overblown harmonics and/or glissandi possibilities. They are meant as a guide into the subject of the tonal possibilities in relation to the fundamentals of the three *Ach flutes* from a sample of data coming from different researchers, on different reconstructions, adhering to their physical forms. It has therefore been important for me to add data from: - Ringot's playing from a video; Hein's playing from a recording, Seeberger's playing from two videos, Käfer's from a video, and Wyatt's from a video call, all previously unrecorded in this way. I collect the information by ear and recognise that there are imperfections in resolution but feel it is *near enough* to record the series of pitches in this way. All the reconstructions follow the finger patterns of the *Ach flutes* which is why I do not include my 35 cm-long flute of mammoth ivory which follows the pattern of my own fingers in these data. However this instrument is relevant in another way, as follows.

In a recent article, Potengowski, together with Dalferth, Hein, Malina, Wiedmann, Spreer, and Münzel (2023) argue that the missing fragment [Figure 5.3 a] strongly suggests that GK3 is a notched-flute played vertically, an interpretation which has the convenience of limiting testing to the playing of just one end of a given flute reconstruction. Prescribing GK3 as a notched flute jettisons the notion of the flute as an obliquely-played rim flute using the 'ney' embouchure that Seeberger was fond of. The authors explain that this delivers a rather more straightforward set of pitch vocabularies for a given flute because glissando possibilities are not a feature of this voicing method and its results. They test 8 different models of GK3 by a range of different makers<sup>79</sup>, to

---

<sup>79</sup> My flute GK3-FG/WH-1(2021) was discussed as being part of this sample but it was not practically feasible at the time to lend it.

include some new and some old reconstructions. Relations between one model and the next are based on a general constant that they all adhere to the finger patterns of GK3 but with a number of exceptions. The Holdermann *et al.* ivory reconstruction (discussed earlier) is included, but this flute strictly copies the pattern of fingerholes of HF1, according to its authors (Holdermann *et al.* 2013a; 2013b) which is not at all emphasised in the text; “the spacing of the three fingerholes follows GK3 measurements. Holes 4 and 5 repeat these measurements” (Potengowski *et al.* 2023: 91). By this, I take it to mean that the similarities in the spacing between HF1 and GK3 detected are chance similarities, and this inadvertently reframes the perspective. Another new model with a longer length like the Holdermann *et al.* flute, also follows “the spacing and size of the first 5 fingerholes” of HF1 (*ibid.* 91) “running from the proximal end” (*ibid.* 86)<sup>80</sup>. In the new model, two extra finger holes are added; “the position of holes 6 and 7 was chosen to a comfortable position of the third and fourth fingers of A.F. Potengowski” (*ibid.* 91). The sample of instruments for testing also includes other models of GK3, two of which have four finger holes.

Potengowski *et al.* (2023) record a tonometrical series of C5, F5, A5, D6, G#6, and E b 7 for the 2013 Holdermann *et al.* flute. This differs from the original series published by Holdermann *et al.* (2013a; 2013b). The disparities in data are helpfully rationalised by it being pointed out that differences can occur in the results of recording musical pitches by ear in comparison with taking a reading from a device that measures frequencies in Hertz. Potengowski even explains that converting Hertz into musical pitches for the purpose of providing a supplementary set of results on a musical staff indeed creates new problems of accuracy! Differences almost certainly occur in actual sounds from performance contexts too, although Potengowski is the one testing all the flutes in the 2023 sample so it is assumed that each flute has been tested to the maximum of its limits. I would like to ask, which context is correct? Patrik Geiger, the one playing this reconstruction in 2013 originally generated a set of sounds (notated in the range of a piccolo by musician Dorothea Federle). Potengowski then created a set of sounds in 2023 which she recorded electronically taking measurements in Hertz. Both players played on the same reconstruction, using the same technique but the results are different. Which one is right and which one is wrong? The answer surely, is that we must accept both as being equally relevant.

It can be asserted that because context changes and is changing, we will never be able to get to a truth claim like a categorical frequency map for the Stone Age finds; the precise contexts that warrant such pedantry of frequency testing are immeasurable because authentic context is 100% unattainable. Therefore more than a general indication of what is possible will always be subject to the infinite variables of any potential context. In their testing, Potengowski *et al.* (2023) conclude that,

“Even if the original length of GK3 remains unknown, our study shows that several tonal materials can be excluded, and the possible range of the original tone material can be narrowed down. The analyses of the reconstructions of the mammoth ivory instrument GK3 indicates that increasing instrument-length without adapting the diameter causes problems in the voicing of the lower fundamental notes even though overblown tones still remain playable. Thus, elongating the mammoth ivory instrument in the attempt of

---

<sup>80</sup> The reference to the proximal end is a little confusing because both Potengowski and Barnaby Brown play HF1 from the non-notched end of HF1 using what some may call the distal end as the proximal one, as previously noted.

reaching the lower fundamental tones is not effective, whereas the aim of extending the tone range with new tones can be achieved by overblowing” (Potengowski *et al.* 2023: 97).

Returning to the subject of my 35 cm-long flute of mammoth ivory; I have shown that the bore width of a mammoth-ivory instrument is dependent upon the depth of cement in the periphery of a mammoth-ivory tusk. The bore size of this flute is 12 mm minimum. If this reconstruction were to be adapted as a notch flute and tested by Potengowski after the original hypothesis by Holdermann *et al.* (2013a; 2013b) – and given that the sample from Potengowski *et al.* 2023 includes flutes with fingerhole patterns that do not adhere to GK3 (apart from by chance) – would the above conclusion still apply to ivory flute making taking a lead from both the *ivory-flute-blank stave* and GK3? I also question why tonal materials should be ‘excluded’ if overblowing still produces fine sonority? I may even add that some overblown notes are particularly atmospheric in comparison with the same pitch produced without.

Praxmarer who defended his PhD thesis shortly before I defended mine (on a similar topic) has since published a subsequent article called “Different Blowing Techniques for Palaeolithic Aerophones: Animal Calls, Clarinets, and Flutes” where he presents a tonometrical series for his HF1 reconstruction played as a clarinet (Praxmarer 2023: 46/fig.4 and table 1). He also discusses bore size with reference to GK1, calling into question the accuracy of Potengowski’s work on GK1 *per se*, because he considers that her reconstructions are from specimens that have a much wider bore than the original artefact, and are therefore easier to play. He continues, that Seeberger’s flutes are easier to play like this because they are shorter than the potential length available from a swan radius (Praxmarer 2023: 40; 48). I would like to comment on Praxmarer’s remarks here. Firstly, my reconstruction of GK1 made from a swan-wing radius – which I call GK1-FG/WH-1(2011) – was supervised by Hein who remarked at the time how similar the specimen is to the original GK1, with regard to wall thickness of bone. The bore width of this reconstruction has a maximum diameter which is thinner at 6 mm than thinnest part of the original GK1. Hahn and Münzel (1995: 11) report that GK1 has a maximum diameter of 10.3 mm by 9.1 mm. They also measure 8.0 mm by 7.7 mm for the minimal diameter, which I assume refers to the intact rim.

My flute (18 cm long) was given to both Potengowski and Schietzel to test in 2013. Both flautists played it without problem, both using the Seeberger technique respectively, although it was noted at the time that it isn’t as easy as those made by Seeberger, perhaps because the wall is thicker. Comparing this with another swan-radius specimen that I play on with a much thinner wall, I can assert that the bore width of the latter at a maximum of 6 mm is not any wider than the narrowest tube width of GK1 either. I believe that the reconstructions Potengowski plays on made by Seeberger (one of which I have also played on) are not wider in diameter than the original GK1, as Praxmarer claims. Secondly I would like to remark that in my experiments testing models of GK1 across 11 lengths, sonorous results are gained from all of flutes, and that the choice of about 14 cm or 15 cm in length as an optimum model length for GK1 is simply one of preference because here the resonances are the greatest. Praxmarer’s point that swan radii can be as long as 30 cm (whereas Seeberger’s flutes are much shorter and therefore easier to play) does not seem to take into account the fact that the epiphyses have different cylindrical dimensions as they taper, squashing flat the tubular aspects at both extreme ends of the bone.

These ends, a flute maker would probably wish to remove and discard, as Seeberger obviously did. A choice to make a flute of 15 cm does not delegitimise it simply because a longer length is also possible.

With regard to the Seeberger technique itself, the final section in this chapter comes in form of a conversation. Due to the tremendous glissandi possibilities of the Seeberger technique, it is true to say that a range of frequencies that each of the *Ach flutes* is *unable* to produce becomes highly restricted unless one eliminates the technique, which is what Potengowski *et al.* (2023) have actually done for GK3 (see above), and what Praxmarer would seem to be implicitly indicating for GK1. However in my own experiments for GK3 (Experiments 7.16 and 7.17), and the other two finds GK1 and HF1, I do not rule anything out. Dalferth has subsequently written about this particular technique, in focus (Potengowski *et al.* 2023: 77-78).

## 5.9 THE CONVERSATION

This is a transcript of a recorded conversation between Gabriele Dalferth, Anna Friederike Potengowski, and Frances Gill, in the kitchen at the dig house on the 12<sup>th</sup> January 2019 (in an annex of the Museum of Prehistory in Blaubeuren (Germany)), as part of the 3<sup>rd</sup> meeting of the Blaubeuren Palaeolithic Music Group (11<sup>th</sup>-12<sup>th</sup> January 2019). Whilst Susanne Münzel was outside in the corridor producing data from measuring flute reconstructions, the conversation took place around the breakfast table. In the room listening were Barbara Spreer and Dorothea Federle. The aim of the conversation was twofold: - firstly to disentangle perceived differences about what the Seeberger technique actually is and does (also referred to as the ‘ney’ technique, or as playing “on the edge”); and secondly, what, and whether, we should name it. It is considered that this method of collecting the information – via a conversation in a qualitative sense, will give a deeper insight into the phenomenon.

Two of the speakers – Gabriele Dalferth and Anna Friederike Potengowski – are not native English speakers (neither is Dorothea Federle who briefly comments twice in the dialogue). As a native English speaker living in Sweden I understand very well how finding the right words to express myself in a second language requires extra effort and concentration. In the context of this conversation this is considered an advantage because what we are discussing is a phenomenon that doesn’t officially have an obvious, or readymade, classification. We are required to really dig deep into our understanding of what it is we are doing when we play to explain it to one another. We are talking about a playing technique on the rim of a type of flute that is small and thin, played as situated between the upper and lower lip, almost like a cigarette clamped casually at one side of the of the mouth at an oblique angle, and held in position with extra support from the pincers of the fingers and thumbs of both hands. Extra effort is needed, indeed from all of us (even the native speaker!), to find ways to describe this.

I have edited the text only to omit some content that I consider either rambling (‘waffle’), unnecessarily repetitive (but without taking away the flavour of the conversation), or otherwise is referring to passing each other our cups of tea. The methodological perspective of this data collection is to get to the truth via a stream of group consciousness.

## 5.9.1 TO WHISTLE OR NOT TO WHISTLE, THAT IS THE QUESTION

**Friederike:** ...the technique of playing like Seeberger, or the ‘ney’ technique, or whatever; as whistling, or not, is it flute playing, or is it a mixture?

**Frances:** ...because it came up, that Gabi said, “it really, it is like whistling”, and Friederike immediately said “no, it isn’t”, and then, there was this discussion between two that are doing the same thing, but saying it in a different way.

**Gabriele:** Yes.

**Frances:** I think that if we could articulate what we said last night, just to see what that difference was....

**Friederike:** We can just repeat the argument.

**Frances:** Yeah, so if that’s okay, if you were to say now what you said.

**Dorothea:** What means whistle?

**Gabriele:** I said, yes, what means whistle and this was the question. I think this is for the terminology. We have to find out what we call whistling, and I said, it is to some part, it is whistling, because of that technique. I define whistling; if you have an ‘edge’ where you, where the air breaks, like whistling...

[Gabi whistles a short phrase]

...and the edge is the lip. And the tone is defined and modified by the volume, nasal; the frequency is defined by the volume of air inside your body.

**Friederike:** And the inside of the instrument.

**Gabriele:** By the body, by whistling, with lips.

**Frances:** She’s talking about just whistling without any instrument.

**Gabriele:** Just whistling with lips, and so this...and you can manipulate the largeness of the volume inside your body, so to speak...by moving the muscles and everything making it smaller or bigger. And then I compared it with the flute, and I said, now you take instead of the edge of your lip, you take the edge of the flute...

**Frances:** ...correct, yeah...

**Gabriele:** ...and then, but you, it’s a big impact of your own volume inside your body as well, and as the flutes are so tiny and small, there is much more air volume inside your body so you can modulate the tones like with whistling because the relation of the air inside the flute, it does not matter so much compared to the lot of air inside, the volume. So, but, if you have a very big *Ney Flute* – long tube, big diameter – there is a lot of air volume in this flute so you can’t modulate the tone so much because then the air, the relation, as the air in the flute, is much more than in your body and so you can’t make this big glissando.

**Frances:** Perfect. I think that, because when you’d described it to me, it was like music to my ears, because I was thinking, this is describing it in a way that I also understand it. Now as you were saying this, what happened then was Friederike said, “but it isn’t whistling”, and so, Friederike, can you now say what your definition is?

**Gabriele:** I would like to say...

**Frances:** ...oh, so sorry...

**Gabriele:** ...and this is the reason why you have a wide range concerning the interval of the glissando on a very tiny flute compared to a very big flute. You can't have that strong variation.

**Friederike:** But you have also the possibility of a large glissando with the 'Hohle Fels 1' played on the edge.

**Gabriele:** Yes, but this is not such a big flute.

**Friederike:** No, no, not such a big flute, yeah.

**Gabriele:** Isturitz is a bit less, already, and...

**Fran:** ...so Anna, go on, you say?

**Friederike:** Yeah, but my point is when does flute playing start, and this is at that point when the air flow breaks at the edge of the instrument. This is the important difference; where does the air column, is being...

**Frances:** ...directed?

**Friederike:** Not directed, attracted.

**Frances:** Attracted?

**Gabriele:** Or split?

**Friederike:** Yeah, where does the air column start to move?

**Frances:** Yes, okay, so on, if it would be, a labium, for example?

**Friederike and Gabi:** Yeah, yeah.

**Frances:** So where is that physical position?

**Friederike:** Yeah.

**Frances:** Okay, and you're saying that it moves then away from the lips on normal whistling with just the body, and then as soon as you put the instrument in, you're then saying that then the...

**Friederike:** ...flute playing,

**Gabriele:** ...it moves outside,

**Frances:** ...from the lips, just from the lips, to the..., and because it is already in the lips it is moving maybe just hardly any millimeters at all. But then at that point, for you, you're saying that then it becomes a flute?

**Friederike:** A flute. Flute playing. But there are two techniques we are talking about, one is how...or two subjects. One is: - how is the air column brought into...

**Frances:** ...resonance?

**Friederike:** Resonance. And how are the frequencies affected, manipulated?

**Frances:** ...or determined.

**Friederike:** Yeah, two different subjects.

**Frances:** But we are not talking about how the frequencies are determined by finger holes now?

**Friederike:** No, no.

**Frances:** If we were just to imagine we have a tube without any fingers on? This is what we are discussing; we are discussing the oral glissando.

**Gabriele:** I think the determination is the same technique. It doesn't matter if it's, the labium is the lip, or the labium is on the flute, but the technique behind, is still the same.

**Frances:** I agree.

**Gabi:** It changes as soon as you use holes because, and then the highest note of the glissando, we call them fundamentals, and there are different... it makes a difference.

**Frances:** So what do you think Anna? How do you, can you comment on that?

**Friederike:** What was the content, of your last...?

**Frances:** Sorry, my question is, is that Gabi said that it is the same technique; if you're whistling without the instrument, it's whistling, but when you put the flute, it's the same technique, only what's going...the muscles... and everything that is going on in the mouth; the technique is the same.

**Friederike:** Yeah, I would say she is right: the technique is the same but it's, this is the technique to manipulate frequency.

**Gabriele:** Yes, I agree.

**Friederike:** Yeah, and the technique to produce sound is different because for whistling you use another edge than for flute playing.

**Frances:** Yes.

**Friederike:** So these are different points.

**Gabriele:** Yes.

**Frances:** But they, on the one hand, they are different points because as soon as you put the bone into the mouth then it is the bone that's resonating; it's the bone that is sounding, and at that point we say, now we call it a flute.

**Gabriele:** Yes and I think the volume of the bone has an impact on the frequency as well, because smaller bones, there's higher frequency, so it mixes.

**Frances:** Yeah, I know that, but that's not what I think we should be talking about; I think we should be focusing on just the oral glissandi from the perspective of what our mouths are doing. So if you go to a shorter tube, then you can still glissando and you also said you can glissando on a longer tube.

**Gabriele:** But I think it's a point that there is an influence of the flute.

**Frances:** Yes, yes.

**Gabi:** So you can't really say it is whistling because...

**Frances:** ...because the flute also has a part to play? It limits, the flute limits what you can do. Of course, yes, I'm sorry, yes.

**Gabriele:** Yes, because the volume changes with the flute, and so it depends which flute you take; you have different frequencies that you start with, sometimes higher, sometimes lower, or if you open a hole or not, so the holes have an impact, on the frequencies, on what happens. So I think this is really the difference between just whistling, or using a flute with this technique, a flute with holes.

**Friederike:** Yeah, so, maybe, it's, this is another argument for 'this is flute playing not whistling' but maybe we, this is one suggestion to come further with the terminology; you can, maybe you can say, this is flute playing because the air column is directed on an edge and the sound is produced that way, and we use, we are using whistling techniques to manipulate the frequencies.

**Frances:** ...()... I think that's just what Gabi has said, and that's what you just, and I agree. But then it starts to become complex when now you bring in this new part of the discussion, to do, yes but there are different fingerings, and there are different lengths of tubes. So the different holes, the different lengths of tubes, are also going to affect that, and that's when it gets very complex.

**Gabriele:** Yes, so then it starts being a combination of flute playing and whistling, I think. As a joke I used to say, we should say, *fistling* - flute playing and whistling, you know, because it's a combination.

**Frances:** That's also what Simon Wyatt had always said; it was a kind of half and half. For me, how I define it, is, as I said last night, is that the flute becomes an extension of the body. And so if we didn't separate the body from the flute, and the flute, somehow, we had some sort of genetic, what do you call it, something that changes in the body, and somehow I actually grew a flute out of the side of my mouth,

**Friederike:** (laughing)

**Frances:** Okay, but did the same thing on it, and it was hard like a nail (and she was the weird flute person with a flute that was always in her mouth). Then it would be part of my body, and I would be still using the same technique but it would be coming out this tube. So the point is because the tube is engineered technology because it has been made, because it's been got from an animal, cut, and cleaned. Soon as you put it in the mouth, at that contact point, it then becomes that you're playing with an instrument.

**Gabriele:** Yes

**Frances:** And so from my point of view I'd always thought about, and also mainly because as musicians we are taught that the flute is the extension of the ...(...)... it becomes part of your body's whole framework. And so from that perspective I always thought that the whistling, therefore, was just, instead of the...

[Frances whistles a short phrase]

...sound coming from my lips, the sound was then...

[Frances blows non-pitched air from her mouth]

..I was trying to do the same thing but getting it coming through the tube. And at that point the tube resonates, and that's what's producing the sound. So the sound is being produced in the tube. And you could say as soon as that happens it becomes a musical instrument.

**Dorothea:** But the flute is also a resonance room.

**Gabriele:** Sometimes Friederike plays these harmonies, and you can find them, these two tones.

**Frances:** Two tones together. Yes...

**Gabriele:** ...and I think this is something like proof, and it might be that there is the tone of like whistling, and the other is the tone of the flute. And so it mixes.

**Friederike:** But I think that this already proves that this is maybe to the terminology. We all know we aren't only whistling!

**Gabriele and Frances:** Yes.

**Friederike:** But the terminology as I know is in organology. The definition of the different types of instruments is made after how the air column is attracted, don't we say attracted? Or is brought into vibration?

**Frances:** Resonates.

**Gabriele:** Everything starts to resonate.

**Friederike:** Of course, every sound is moved air, in a way,

**Gabriele:** Of course.

**Friederike:** And the differences are in just, in terminology, how is this air column brought into vibration? And if we follow this, nobody was talking before about adding to the definition...the point of manipulating frequency, you know.

**Frances:** Say again.

**Friederike:** Never before, so organology is just defining after how the air column is brought into vibration.

**Gabriele:** I think the meaning might be what we said yesterday because...

**Frances:** Can we hang on a minute; can you just finish what you were saying...because I didn't understand?

**Friederike:** The official way today to define what kind of instrument you are playing is finding out how the air column is brought into vibration.

**Frances:** Okay, now I understand what you've just said, sorry, sorry...

**Gabriele:** And I think now we have this special feature of these very tiny flutes because there are not such flutes anywhere in the world it seems to me, I'm not sure but they are very rare, and so we have no expression.

**Frances:** Because they are made from radius; this was what Nicholas Conard was saying. There aren't any ulnae, and here is a special area just for radius.

**Gabriele:** It is so small and we have no other instruments to compare to. The terminology is missing; the expression is missing for what is happening, I think.

**Frances:** ...()... how organology is determined because, current organology ...()... Jeremy Montagu, an updating of the ...()... classification system ...()...the MIMO position was, we want to make terminology out, so that it's not just for specialists ...()... so when we did the paper for ISGMA we talked about changing this to *wind instrument* ...()... and that was important because most of the stuff that we talk about is stuff that is to do with folk traditions, and people have their own ways of talking ...()... in 2014, the Grove dictionary of music, they then published their latest volume and this is like the bible of organology, and they are still using the word *aerophone*.

**Friederike:** Yeah, but they, may I, just mention this because, what are the criteria, to classify?

**Frances:** ...()... organology used to be all about classification systems and nothing else. It is no longer just about classification systems; it is also about *morphology*, and it's also about *cultural* organology. So in that respect you can name a musical instrument from a cultural perspective. In my presentation this afternoon I have various quotes from different organologists to show that ...()... the criteria not only have changed but are continually changing.

Our process here is part of that change. There are no fast criteria ...(...)... getting away from a ...(...)... everything has to be concluded ...(...)... towards a more open narrative, ever-changing cyclic expression of what's going on. So, for example, even in this discussion now, what I find is that we are getting closer to the knowledge and understanding just by this document of a conversation. And that is another approach, another scientific approach, in order to handle this material. So that's why I am not worried about making any definitive conclusion ...(...)... if our discussion is actually written down, then every single person's point of view is expressed as they expressed it.

**Friederike:** Mmm.

**Frances:** ...(...)... As I said last night, this is a chair, this is a table, but if you sit on the table it becomes a chair ...(...)...

**Friederike:** But we have to be careful because how we name the instrument or how we describe it will work further in the world outside, you know what I mean?

**Frances:** It already has, it already has.

**Friederike:** ...(...)... if we are defining we are whistling, or if we are mentioning, this is a mixed technique of flute playing and whistling, and for some people this will...

**Frances:** ...be a problem?

**Friederike:** Be a problem, or less value.

**Gabriele:** They'll think it's like cheating.

**Frances:** ...()...we have no control over that because people will make their own ...(...)... opinions anyway ...(...)... you didn't tell anybody that you thought it was this sort of whistling technique ...(...)... but you said last night many people have said to you, "oh, it's whistling" ...(...)... people are not stupid ...(...)...what we do as music archaeologists, or as musicians, scientists, museum workers; we're on the edge, we have this, we sort of have this relationship to the public. And therefore how we present this to the public is also another question in archaeology, you know, how best to do it.

**Gabriele:** I think this is important because as soon as you start explaining the influence of the flute, then people understand it's not really whistling, because the flute has a very big influence, which frequencies, you can achieve.

**Friederike:** Mmm.

**Gabriele:** So the flute is very important. And so the more we understand of the physics in the background, and all the scientific things: - what happens to the air volume and everything; what happens inside the flute; and what happens inside your body. And you find out you can describe this clearly, and you can show the difference. It helps people to understand, otherwise if you have no other real explanation, they can say, "well, it's just whistling", and so we need some arguments to...

**Friederike:** ...we need arguments but most of the people don't read about the background, and don't listen to the explanations, they just listen to the names, and so from my perspective it is very important to call the technique flute-playing technique, and manipulating the frequencies by same technique you use for whistling.

**Gabriele:** Yes, I agree.

**Frances:** Say again ...(...)...

**Friederike:** I would prefer – because people don't read explanations and stuff like that – they listen to the names. That's why I would prefer to call the technique flute-playing technique, what did I say?

**Frances:** It's a flute-playing technique....

**Friederike:** ...and we use whistling techniques to alter the frequencies.

**Frances:** ...(...)... For me, what's very interesting is that a whistling technique, is what the body does, okay; it's completely separate to the tube. As soon as the tube comes into it, then we're using the same body technique but then that's then transferred on to the flute, or the bone.

**Friederike:** But we only use the body technique to manipulate the frequency; we use a different technique to bring the air column into vibration.

**Gabriele and Frances:** Yes, yes.

## 6. THE EXPERIMENTAL DIMENSION

...the body, as represented in the brain, may constitute the indispensable frame of reference for the neural processes that we experience as the mind; that our very organism rather than some absolute external reality is used as the ground reference for the constructions we make of the world around us and for the construction of the ever-present sense of subjectivity that is part and parcel of our experiences; that our most refined thoughts and best actions, our greatest joys and deepest sorrows, use the body as a yardstick...

(Antonio R. Damasio 2006: xvi)

Purpose is critical to research. Whilst it is necessary to document archaeological things in the archaeological record appropriately, the reason for doing this, and how this becomes undertaken in practice, should really be explained, but sometimes it seems that this is often taken for granted. Fiona Cram (2017) provides perspective by referring to McGregor and Murname who describe methodology as “the rationale and the philosophical assumptions that underlie any natural, social or human science study, whether articulated or not” (McGregor and Murname 2010: 2). This chapter articulates in brief a selection of archaeological and musicological perspectives from: - Music Archaeology, Contextual-Experimental Archaeology, Experimental Music, Performing Practice, and Experimental Heritage, in order to construct a trans-disciplinary or new interdisciplinary methodology for the purpose of this research dedicated to the *Ach flutes*, the Ach Valley, and ‘musics’ of the Aurignacian Swabian Jura in general, if we can talk about ‘musics’ of the Aurignacian Swabian Jura.

One of the first challenges of working with archaeo-organological material is that a researcher arrives at an intersection between science and art with many disciplines vesting interests in the subject. Disciplinarity may be rationalised to underscore the nature of collaboration when embarking on researching music in relation to the ‘archaeological’ past, or in any situation where art and science collide:

...intradisciplinary: working within a single discipline; crossdisciplinary: viewing one discipline from the perspective of another; multidisciplinary: people from different disciplines working together, each drawing on their disciplinary knowledge; interdisciplinary: integrating knowledge and methods from different disciplines, using a real synthesis of approaches; and transdisciplinary: creating a unity of intellectual frame works beyond the disciplinary perspectives (Alexander Jensenius 2012).

Jensenius points out that multidisciplinary work is often confused as being interdisciplinary, which indicates a lack of understanding in terms of what researchers think that they are doing when they collaborate or ‘reflect’ on how other disciplines go about doing things. Archaeologist Gavin Lucas writes that “much can be gained in reflecting on how other disciplines and practices also engage with things. This is one of the reasons why art has become such a common partner with archaeology over the last decade or so. Indeed, the whole concept of practice led research has largely developed out of traditional art disciplines like design and architecture. Thinking by

doing sums it up well” (2015: 18-19). As a musician, and archaeologist, I perceive that the subject of Music Archaeology exposes the problem of navigating a rationale between this [*thinking by doing sums it up well*] situation, and the one which Lucas nostalgically presents in his retrospective on a main debate always current in theoretical archaeology. It concerns the subject of the top-down versus bottom-up theoretical way of archaeological business. Bruce G. Trigger outlines this as the act of archaeologists producing generalisations “either by refining high-level theories so that they are applicable to specific data sets (such as archaeological data) or by seeking to provide an explanation for why certain low-level generalizations occur in multiple instances”. Trigger also questions “whether middle-level theory ought to be derived deductively as a coherent set of interrelated concepts from high-level theories or whether it also can be constructed inductively from evidence and low-level generalizations” (2006: 32-36).

My response (to the above) is that a type of horizontal, lateral, or rotational logic may be theorised using abduction for archaeological interpretation leaning towards post-processual endeavour. Formulating a theoretical framework that scaffolds these types of *thinking by doing* experimental processes through a notion of experimental play is precisely what I refer to as the Experimental Dimension (ED), where the body and materials are conceptualised on a fluid spectrum via playing, or experimenting, or *sketching*, or *wayfaring*. In 2019, I modelled this concept as an icon (first published Gill 2020: 58/fig. 2) in which the ‘body’ is in the centre of a circle, and ‘things’ are towards the circumference, with ‘play’ in-between [Figure 6.1]. This cog is docked on to Lund’s ‘research wheel’ which Lund first published as a hand-drawn model in English with the caption: “a model of music-archaeological investigative methods” and it is in the same article that she also refers to her model as “a research wheel” (1988: 297). I have digitally produced this research wheel [Figure 6.2] which was first published in her 2020 *festskrift* (Gill 2020: 58/fig. 1) where the hand-drawn wheel is republished (Lund 2020: 329/fig. 5), and the reasoning behind it re-explained by Lund herself, in relation to her Probability Groups (the latter I have referred to earlier as Lund Probability Groups, abbreviated to LPG);

When trying to verify or rectify the preliminary assignment of an artefact to one of the five Probability Groups I worked out a special combination of various theoretical and practical investigative methods (Lund 2020: 338).

In Lund’s wheel, the ‘sound tool’ takes the central position in the model and above this in a circle is listed ‘analogies, interpretations and theory.’ Below it she circles ‘archaeological data.’ This was done, she clarifies, to satisfy both of her archaeology supervisors who were working in different paradigms of archaeological research at the time, *vis-à-vis* “deduction (i.e. from theory to data) and induction (i.e. from data to theory)” (Lund 2020: 338). Sound is total acoustic ecology so a sound tool is potentially any physical material that is not in a vacuum. Lund’s music-archaeology model extends to include all material, past, present and future, from this perspective, and I think that this may have been her implicit intention. The wheel reflects an open appreciation of music making (musicking). On the left of her wheel she writes “Investigation: original objects” and on the right, “Experimentation: substitute models.” My adaptation of her model changes the left-hand side ‘Experimentation’ by docking my ‘Experimental Dimension’ model to it as a cog (as it is also a type of wheel). My intention is that the Experimental Dimension (ET) theoretically represents the third type of logical reasoning which is abduction and this concerns the present, or what is to be found in-between the past (*a priori*) and the future (*a posteriori*) as I allude to in the title of this

thesis. What happens in the present forcibly turns the wheel (theoretically speaking), as in a *moving movement*, like the soundwaves of music, in relation to the experimental processes during ‘experiment’. Perhaps Merleau-Ponty would have called this kind of motion the “adherence of two phenomena to the same temporal wave” (2012: 277). Malafouris (2013) may refer to this as the ‘*with, through and about*’, of metacognitive processes.

During the last ten years I have been fusing disciplinary theory and method from both Musicology and Archaeology into a trans-disciplinary frame of practical-based work, noting from Jensenius that when a disciplinarity is trans-disciplinary it starts to cease to be a trans-discipline since it has morphed into a new discipline (to Jensenius 2012 referring to Marilyn Stember 1991; Gill 2020: 68). In this sense archaeological interpretation is the very act of playing music like interpreting an artefact. Learning to play a reconstruction of a Stone Age flute as a means of composing (as a practitioner of pre/deep-historical music) must be likewise considered a kind of Experimental Music. In this very sense, the disciplinary-research area for the *Ach flutes* emerges as being experimental on a number of horizons. It becomes a nature of formulating and developing new disciplinary methods – in the sense of trans-disciplinarity – is in itself experimental and innovative. The creation/playing of music (composing) that constitutes portions of potential experiments in the domain of archaeo-organological research that takes form in this thesis may also be theorised as an exploration of Experimental Music in terms of innovating (formulating) methods. What sort of methods may be found or constructed? New experimental methods may emerge that form series of archaeological experiments in a devoted macro-type context of process that pays heed to the micro detail. Writing from the perspective of one thing leading to another, Lars Erik Narmo writes:

Experimental archaeology begins as a single event, but in my experience it tends to develop into long-term experiments. According to the scientific ideal of the controlled approach, an experiment is repeated to prove or falsify a hypothesis. A repeated experiment has no ultimate relevance to the contextual approach, as there is no objective to be proven. However, the contextual approach repeats experiments, improving them to increase understanding (Narmo 2011: 195).

Perhaps one of the most pragmatic ways of explaining the basic problem to do with advancing artistic perspectives into the scientific framework of Experimental Archaeology and Music Archaeology is properly and thoroughly to consider logical reasoning as triadic rather than dyadic. Deduction (*a priori*) and induction (*a posteriori*) are surely complemented with abduction as a set of three logics. Why is there no ‘common-usage’ Latin phrase for what happens in the present (if *a priori* is looking ahead, and *a posteriori* is looking back)? Much as I admire colleagues’ work in Music Archaeology, I find the binary logic inhibiting, frustrating, and inflexible. For example, Carlos García Benito, Marta Alcolea, and Carlos Mazo (2016a) discuss “Conscious construction” writing that,

When making an instrument, the artisan may have a preconceived idea of what is expected acoustically, or not. In the first case, the maker seeks an aesthetic-musical option a priori, while in the second, acoustic resources are explored a posteriori. Lack of knowledge on prehistoric acoustic preferences make it impossible to decide over one option (García Benito *et al.* 2016a: 249).

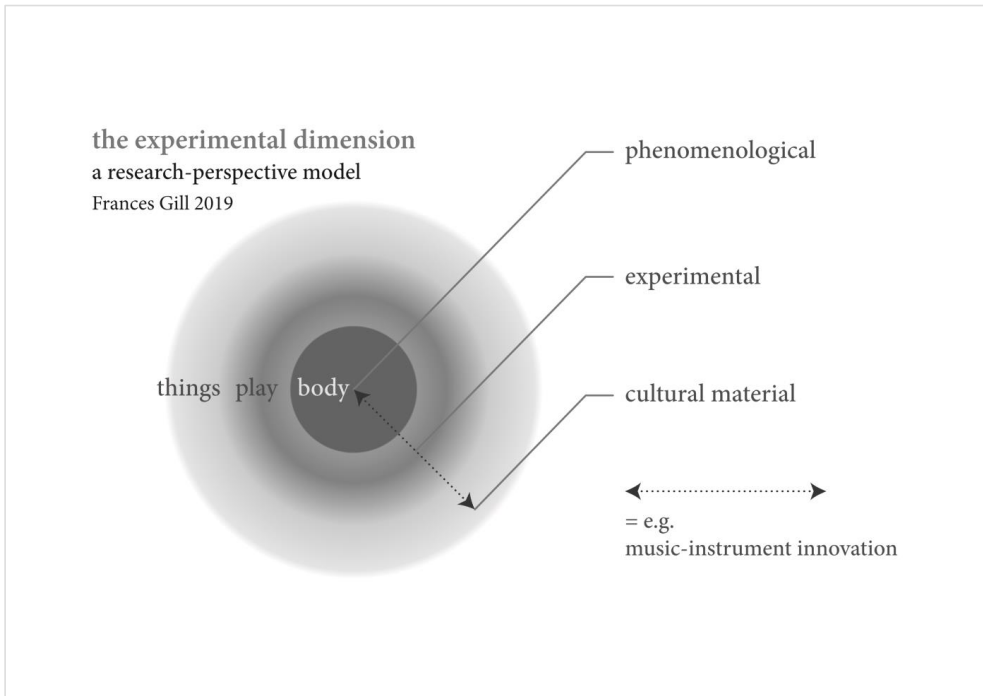


FIGURE 6.1. An icon of 'the experimental dimension' (ED)

Originally published with caption; "The Experimental dimension": a research-perspective model" (Gill 2020: 58/fig. 2 as redrawn by C. Zeissig).

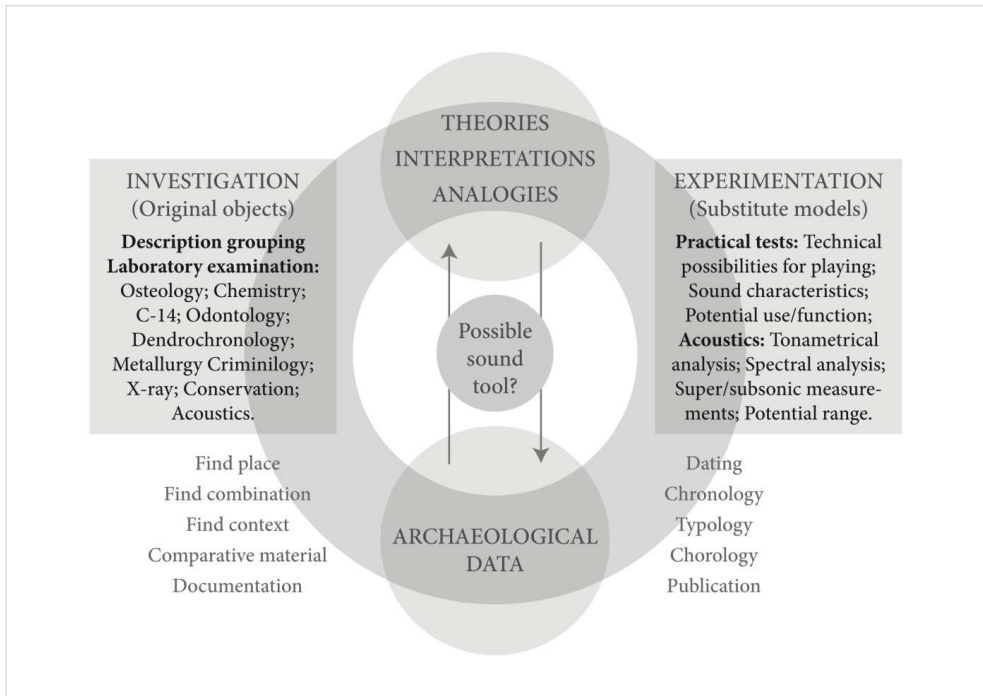


FIGURE 6.2. Cajsa S. Lund's 'research wheel'

*A digital copy of Lund's research wheel created by the author (Frances Gill) from Lund's original hand-drawn illustration (Lund 1988: 297), first published by Frances Gill (Gill 2020: 58/fig.1, redrawn C. Zeissig).*

*Errata: Metallurgy; Criminology*

One part of the problem then is that archaeological tradition obliges music archaeologists to stretch in multiple directions. The art of music composition is mentioned by Graeme Lawson as part of music-archaeological scholarship yet he still underlines a basic problem by asking how we may “walk that extra musical mile whilst still preserving our scientific and scholarly integrity?” (2010: 265). To give an example of this problem, I refer to a project that Wulf Hein was involved in with Bernadette Käfer playing a reconstruction of HF1 which he had made<sup>81</sup>. Käfer experimented in an experimental (playful) series of flute attitudes unfolding many musical ways of playing Hein’s reconstructions of HF1, documented via video and photographic media (e.g., Figure 4.8). In correspondence he told me that the work was ‘not scientific’ because they were simply playing around with ideas in an experimental fashion. My answer to this is that if there is apparently no scientific base for this type of experimental work in in Music Archaeology, let’s find one! The experimental playful mind is the human condition living life in the fullest human way possible, according to the writings of Johann Christoph Friedrich Schiller [1759–1805];

[wo]man only plays when [s]he is in the fullest sense of the word a human being, and [s]he is only fully a human being when [s]he plays (Friedrich Schiller 1795).

Hein describes experiential approaches to experimenting with the *Ach flutes* by telling me in interview that it gives him “a feel, sense, for the human being that made this object” (Gill 2012: 39) but theorising this is clearly another type of challenge, where dedication, a leap of faith and robust theoretical arguments are needed to argue that this sort of thing *is* also scientific. Hein also inferred in the interview that a concept of ‘the experimental’ vis-à-vis the German heritage from the post WW II era may act as a barrier to how willing experimental attitudes become accepted in current German Experimental Archaeology.

In Sweden, and after the work of Marcia Sá Cavalcante Schuback (2012) who discusses the poetics of sketching in relation to profiling the work of Paul Klee, a concept of *moving movements* is the basic methodological approach that I take from working in Experimental Heritage as explored with artists and archaeologists helping to build a platform for the new research area from 2015 onwards (Gill 2020; Gill *et al.* 2021). This is surely precisely the type of process that Hein and Käfer engaged in as described by Hein in relation to their artistic-collaborative process. There is a broad arch between Experimental Heritage and Experimental Archaeology according to Bodil Petersson (ongoing personal correspondence) who is an advocate of these respective *moving movements* that have culminated in these paradigmatic shifts for those willing to take the leap of faith, and the courage to dance those extra miles.

The *moving movements* of archaeo-organological reconstruction/interpretation is the thing practitioners may do to find out what phenomena are like, musical or otherwise. I regard this practice as the sign of the semiotic icon as a dynamic process, which as I argue throughout this thesis, is similar to ritualisation. This is what I believe that Seeberger did when he played his GK1 reconstructions. Even if he didn’t articulate that this is what he was doing theoretically, I perceive

---

<sup>81</sup> February 2012 Kassel (Germany) for *Raptor’s rapture*, a video installation by Jennifer Allora and Guillermo Calzadilla, for “documenta13” art festival in Kassel, Germany (taken in a studio in Kassel, 29<sup>th</sup> February 2012).

that he did an honest job (perhaps the most honest) job of showing the world what playing a reconstruction of GK1 is like! So what do our experiences actually offer archaeology (i.e., Petersson and Narmo 2011)? In 1903, Charles S. Peirce wrote,

...it is recognized that the phenomena are like, i.e. constitute an Icon of, a replica of a general conception, or Symbol. This is not accepted as shown to be true, nor even probable in the technical sense,—i.e., not probable in such a sense that underwriters could safely make it the basis of business, however multitudinous the cases might be;—but it is shown to be likely, in the sense of being some sort of approach to the truth, in an indefinite sense (Peirce 1998: 287).

There are those historians who take an anti-subjective stance in Music Archaeology. Catherine Homo-Lechner writes about historical correctness, and “deplores the fact that the increase in information of this nature does not reduce in similar proportion the role of subjectivity and invention, since it is evident that new information generates new ignorance by means of new questions.....Archaeological experimentation reaches out to specific musics but can never restore them to their past atmospheres and realities” (Homo-Lechner 1998: 46). Along with mentioning that “knowledge can be objective and subjective at the same time” (Lévi-Strauss 1966: 38), I must challenge this bias towards positivism;

This link between subjectivity and objectivity that already exists in mythical or infantile consciousness, and that always subsists in sleep or in madness, is found, a fortiori, in normal experience. I never live entirely within these anthropological spaces; I am always rooted to a natural and non-human space. [...] I can focus my eyes upon a stone in the wall of the Tuileries garden – the Concord disappears and all that remains is this stone without any history (Merleau-Ponty 2012: 306-307).

Homo-Lechner does allude to the value of experience:

...it would be desirable for musicians to learn once more how to work the wood before playing on their instruments, as was often the case up to the sixteenth century (Homo-Lechner 1998: 41).

Why exactly would be desirable? The ‘horizon of the experimenter’ (Beck 2011: 185) is considered the subjective presence in relation to an archaeological phenomenon via reconstructing music from the past, or musical instruments from the past, which concerns the experimental dimension at play in such working of the wood, (bone or ivory in the case of the *Aeb flutes*). These practices in themselves may be regarded as a special way of contributing to heritage and heritage research, since music archaeologists can be heard playing the archaeological data in which the advantage of music’s accessibility may be considered a simultaneous tool of mediation. For this purpose it is not accidental that the sonic data in this thesis is presented in the form of music albums. As Conard writes on “The Path to UNESCO World Cultural Heritage Status for the Caves and Ice Age Art in the Swabian Jura” (2017):

...it hit home that WCH sites are for every person over the entire globe, and not just for a few archaeologists, or the residents of Baden-Württemberg (Conard 2017: 154).

What I am aiming to do in the methodology for this research is to first and foremost find out what the *Aeb flutes* are like, as I believe that Seeberger had done playing his reconstructions, and as Hein does making his flute reconstructions too. To note, both practitioners (with regard to GK1) have worked with all aspects of the *chaîne opératoire*, from swan to flute, so to speak. The idea of the experimental in music archaeology is about all aspects of process including the music

itself. The methodological aim in this thesis is to find out what various musicking and fluting phenomena are like using both the *Achtal* and the *Ach flutes* as materials to work with. This may involve finding or inventing methods that interrogate process which generate new data as musical form. Is it even possible to think about the archaeological interrogation process as a form of music genesis? An archaeological theory by Lambros Malafouris who writes about *How Things Shape the Mind: A Theory of Material Engagement* (2013) would seem to fit hand in glove with the aspects put forward above, in terms of methodological archaeo-organology. Due to the fact that a large chunk of the experimental work for the *Ach Flutes* (from previous research examples) finds itself ultimately over the threshold of how the flutes are played, this experimental process then becomes a window onto the nature of composing music. If this is flooding the flautist composer with adrenalin, this is to be an aspect of what experimental heritage practice is about because the emotions, according to Damasio, are part and parcel of the cognitive realm of being human (see 2.11), and surely this also must be a line of enquiry offering insight.

Malafouris considers what happens when humans engage with materials. He discusses “Knapping intentions and the Handmade Mind” in terms of what he calls “enactive cognitive prosthesis” (2013: 175/fig. 7.4). He writes that,

The knapper first thinks through, with and about the stone (as in the case of Oldowan tool making) before developing a meta-perspective that enables thinking about thinking (as evidenced in the case of elaborate Acheulean technologies and the manufacture of composite tools), (2013: 175).

A more or less direct parallel can be drawn here with archaeo-organological performing practice, and it is to be pointed out here that his use of “through, with and about” is the one that I have adopted to incorporate into the title of this thesis. Performing historical music known as performance or performing practice, is an established discipline of musicology that hypothetically can be applied to any music which humans have made in the past and which is taken up again in the present. David Fuller comments on this, writing:

...practitioners of [Baroque] music who do specialize, who do confine themselves to a narrow range of styles and who steep themselves, morning and night.....come closest to the music of the past by duplicating in a very real way, the experience of the old musicians (1989: 119-120).

Does it matter if a repertoire for Palaeolithic music is missing in terms of written manuscripts? Baroque music provides an answer in its platform for research concerning the *Ach flutes* since it demonstrates the role of ‘performer as composer’ at work. Original Baroque music manuscripts gave the flute player an obligation to realize in performance the outcome of the music, discussed from the perspective of genesis and analysis, by Greg Dikmans (2000-2012). This concept of performer as composer is a tenet of Experimental Music through a body’s or bodies’ (people) processes (Nyman 1999: 6). It is through these connections between Experimental Music and performing music (*like* it may have been played in the past) that a space for contextual-experimentation in relation to reconstructing/performing-composing music becomes real as a living process<sup>82</sup>.

---

<sup>82</sup> I presented this idea in *The Living Musikarkeologi: Anachronisms and the Body in Experiment* as a ‘Poster’ at the 9<sup>th</sup> symposium of the International Study Group on Music Archaeology, in Berlin in 2014.

Taking a step further into the realms of MET as an overture to the experimental work about to be presented in the next chapter, Malafouris refers to Roy Ellen to argue for “the universal character of fetish-like behavior” (2013: 133-134, referring to Ellen 1988) which provides a critical perspective in relation to the Experimental Dimension. He explains that this is a type of fetishism that is not customarily associated with two intellectual traditions: - one is in anthropology as related to animism and religion; and the other is from Marxist theory, e.g., commodity fetishism. Neither of these concern how Malafouris relates fetishism to “the underlying cognitive processes responsible for the generation of the objects or phenomena labeled as fetishes” (Malafouris 2013: 133). How he refers to fetishism, I paraphrase as follows. Firstly there is concretisation. This is concerned with the process of objectification. The process or realisation of making something concretely into an object is considered as an act of fetishisation. To give an example, practising playing tones on a flute to create a certain colour of sound, can be a fetish, like how flute players (professional and amateur) practice their daily tone exercises to find the most beautiful and sonorous timbral-disposition which they achieve. This aspect of a fetish that is the making concrete of the object of the practice, whatever it is, becomes an “intrinsic quality” of the fetish. Talk to an orchestral flautist or a classical flute teacher and they will most likely know all about a difference between yellow and purple tone colours from the teaching of Trevor Wye (2014: Book 2).

Secondly there is “animation or anthropomorphization” in which it is abstracted that fetishes are experienced by humans as if experiencing a real organic being even if the engagement is actually with a non-sentic thing, like a flute made of ivory. This has already been underlined by Stephen Davies to be the case for music since music is not a living being and yet humans experience it as though it is taking the place of a real being:

An obvious question asks how music could be expressive of emotion, which is how we seem to experience many pieces, when it is non-sentient (Davies 2010: 20).

Malafouris points out that a material thing does not have to resemble a real-physical being for it to be treated as such, and of course music does not look like anything visually because it is invisible (synaesthesia aside to make the point that music is not a visual medium). Malafouris refers here to a concept of the organic metaphor. What should be pointed out is that the materials for the *Ach flutes* do come from beings that once were really alive (a swan, a vulture and a woolly mammoth respectively). Thirdly there is conflation of signifier and signified. This is a difference between the actual physical manifestation of a material thing and then what the thing stands for. Malafouris writes that “Where fetishization” has occurred, the signified is treated as though it were embodied in the signifier. The process of concretization often results in material objects that operate as things signified. That is, it results in objects that operate as causative agents in their own right rather than for what they might stand for—as with signifiers” (2013: 133-134).

Fourthly, Malafouris underlines Ellen's “ambiguous conceptualisation of power” which concerns the lack of clarity between whether people are controlling the object or vice versa. This was pointed out several times earlier in relation to the potential power of music over individuals and over groups of people in the chapters on music origins, especially related to the subject of

ritualisation. This is where the notion of abduction logic resonates. In summary, Malafouris writes:

Concerning methodological fetishism, what I am proposing here is basically what in philosophy is referred to as abduction. Abduction, as we know from Peirce (1955, 1991; see also Gell 1998), is a process of hypothesis formation that draws on a metaphoric logic rather than on the usual inductive logic. Very simply, first you hypothesise some resemblance between a familiar phenomenon or domain of experience and something unfamiliar that you seek to explain, then you project the properties of the familiar onto the unfamiliar. If the abduction leads somewhere and affects your initial problem, it is worthy of being pursued further. I consider material agency to be the unknown domain of experience that we seek to explore, and I hypothesise the properties of fetishism as being the familiar domain to be abducted. In other words, the properties of fetishism are abducted and projected into the general domain of material culture and used as a comparative reference point for detecting the agency of things (Malafouris 2013: 134).

I have endeavoured to bring these perspectives into a methodological framework for archaeology and music. As mentioned, the musicological discipline of performing practice has a body of research and experience from its practitioners concerning how to go about performing music from historical music scores. The archaeological discipline of Contextual Experimental Archaeology also represents a paradigmatic cornerstone situated within experiential-phenomenological approaches along trajectories that explore tacit knowledge and skill. Experimental Heritage is quite a new research area which redeems the meeting between Art and Archaeology through 'sketching' as a means to find out what the past is like. Experimental Music offers its own perspective onto these types of processes since performance as composition is often required of performing-practice practitioners. Finally, Music Archaeology has its own methodological ways of going about the meeting between art and science, and since it has been thrashing these things out with the scientific doctrines and paradigms in archaeology for a long time, Music Archaeology is always a good place to continue advancing the theoretical discussion especially concerning relational archaeologies since what is music after all, if not relational?

It is helpful to think of the three things at the heart of Malafouris' material engagement (MET). The first is coming back to the idea of the blind-person's stick in that the mind does not end at the fingertips but floods into the stick. This is known as the extended mind. The second is material agency and it is helpful to think here of the pedagogic adage concerning clay; it is not what a child does to the clay but what the clay does the child. The third aspect to Malafouris' nexus is the enactive sign. This concerns the semiotic aspect of what I have taken up in relation to the dynamic icon, and in relation to music (the sonic analogue). A usual example of this given is that experiencing a road sign that warns of a speed bump is not as efficacious as experiencing the jolt of the speedbump itself. The enactive sign is therefore considered, and whilst one can choose how fast to drive over a speedbump it may be pointed out that *music is the speedbump* in the sense of a dynamic icon, however music leaves no room for choice in terms of reception; sound does not usually leave the option open to choose how fast to go (although experimental music actively and explicitly challenges this). Music can act without warning; there is not usually a sign in the temporal life that warns of 'sound' on the road ahead that has power to slow down pace, mood and send a human to sleep with a lullaby;

We should acknowledge that sound, of itself, calls forth rather a grasping movement, while visual perception calls forth a designating gesture (Merleau-Ponty 2012: 116).

In organising the write-ups for experiments presented in the next chapter (Chapter Seven) I have chosen to include audio tracks as part of the documentation for nearly all experiments since the emphasis in this thesis for experiments concerns material engagement as related to sound experience. Most experiments (or cluster of experiments if there happens to be a series of follow-on processes grouped under one heading) are presented in an ‘information form’ which provides notes on: - *Background*; *Context*; *Composition* (if composed music is relevant to the experiment); *Observations*; *Results*; and *Comments*. If there is an audio track (or perhaps several tracks to an experiment or series of experiments), then there a title page preceding the ‘information form’ inserted with the details listed for referencing the audio track(s), but perhaps more significantly, the summaries provide WHAT the track is. These tracks can be accessed directly from the {bandcamp.com} website under the artist’s name {Frances Flute the Bellows Mender} from two albums. Album One is called *Sonic Debitage*. Album Two is called *LISTEN I am making a flute for you*. The choice to present the sonic material (archaeological-research data) like this and not, for example, by using QR codes is deliberate; I wish readers to listen to the work as two albums of music representing what working with the *Ach flutes* is like. The digital platform is a pragmatic means of delivery although to release these albums on vinyl album would make the point in the footsteps of *Fornordiska Klanger* (1991). I recommend that readers listen to the albums, ideally through reading title pages then access the detail about the experiment afterwards, revisiting the album tracks if necessary. Alternatively, visitors can just listen to the data.

The title of the experiments chapter (Chapter Seven) which forms the main source of data for this research is the title of one of the albums, called “*Sonic Debitage*”. Debitage is the stuff that comes away from material. It may be the stuff that gets thrown away or discarded like the potato peelings of sound, but as noted previously, it also refers to action (Wolf and Heckel 2014). One reason is that recordings have often taken place in make-shift fashion, perhaps on a mobile phone, or quite often via a field recorder, and this brings a different dynamic to the action; I try to avoid things being manufactured and contrived. The album called “*Listen I am making a flute for you*” was recorded entirely in a professional studio, and in this sense it stands alone from the other album, whilst nearly all tracks for both albums were mastered in Logic Pro X which I use for production.

With regard to the experiment forms, The ***Background*** documents how the experimental work came about. As a player of bone flutes that are modelled on archaeo-organological examples that are amongst the earliest from antiquity I don’t think I am alone in claiming that this type of work sometimes leads to some rather unique experiences, and it is through many of these privileged opportunities that new lines of experimental work have evolved organically. Sometimes these are planned and at other times, completely spontaneously executed; hence I explain the background for the experimental activity. Many examples are not isolated experiments as if in a lab (controlled), but real-life situations (experiential/contextual) that provide significant data and insight from which real-life Eureka moments are always a possibility, or as Narmo explains, this is “the unexpected” (2011: 195-226). On this trajectory are types of experiment that *are* deliberately formulated in such a way to launch the experimental dimension in action in search of the unexpected as the modus operandi of an experiment, as formulating an artistic process. Goldhahn thinks this readiness for surprise is important enough to open his book about birds: “Art is solving problems that cannot be formulated before they have been solved. The shaping of

the question is part of the answer” (Goldhahn 2019: 3 citing Piet Hein). The line in the sand between science and art is washed away by the waves, as “art gives form to human feeling” (Ingold 2000: 23 referring to Janáček 1989: 232).

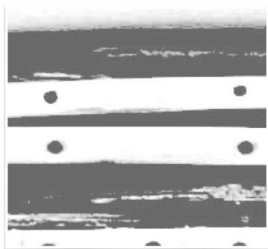
Seven *Lectures on Pragmatism* were delivered at Harvard in 1903 by Charles Sanders Peirce, who stated that “The surprising fact, C, is observed; But if A were true, C would be a matter of course; Hence, there is reason to suspect that A is true” (Peirce 1931: 189 - published posthumously). This aspect of logical reasoning forms the overarching perspective for archaeological interpretation in my research concerning with, through and about flutes from Swabian origins, in-between *a priori* and *a posteriori*. The following extract from my diary is my interpretation of this logic, and does not mention Socrates or bachelors.

At the start of the school term I waited with my daughter at the remote spot where the bus collecting pupils in the countryside usually collects her. However the bus didn't come and we experienced that emotional sensation of surprise! If the start of the school term was actually a day later, the fact that the bus hadn't come would be a matter of course, I abduct. This most likely of explanations had created the hypothesis, and a quick check on the mobile phone confirmed that I (the mum) had made a mistake with the schedule. Whilst I mused that this was probably the best example yet of abduction logic if I needed to explain it, (instead of using typical masculine themes for logical reasoning, like 'bachelors', etc.) my daughter ran back down the lane in tears shouting I was looking forward to seeing my friends, as I chuckled, it's better to be a day early than a day late! (Frances Gill, August 2023).

The **Context** documents what it is that is actually being explored in terms of lines of investigation, or the aim of the experiment, if there is a definite aim, which in some cases, there is. Context may include theoretical perspective, or some particular data that is relevant for the experimental work which may be quantitative or qualitative, or both. The **Composition** documents the approach to the actual creation of music (if music is a part of the experiment; not all experiments involve 'music' in the primary sense, as mentioned above, but most do). For example, if music is being made, how is it happening? The **Observations** documents what happens from the perspective of being in the moment in which why questions can be addressed. The **Results** document the outcome of the experiment noting salient aspects from both what has been tested if there were a specific aim, and anything considered relevant. The **Comment** documents these salient aspects of the contextual-experiential process that are considered relevant.

## 7. SONIC DEBITAGE

## 7.1 SEEBERGER'S FLUTE



Original photo: Susanne Münzel

**Album: Sonic Debitage**

**Track called**  
Seeberger's flute



**Summary**

This track is a compilation of excerpts documenting the first encounter of the author engaging a Friedrich Seeberger GK1 reconstruction by playing it as a vertical flute with a 'shak' embouchure. She is accompanied in the room by Eric Spitzer-Marlyn. The flute is made from a swan-radius bone.

ALBUM ONE 7.1. Seeberger's flute (02:36)

<i>Seeberger's flute</i>	
Background	This first experiment that the author conducted on Wednesday April 28th 2010 in the Blaubeuren Museum of Prehistory, Blaubeuren (Germany), was spontaneous, and it happened as a result of a trip to Blaubeuren Museum of Prehistory with Professor Nicholas Conard. It involved Gill trying out a tiny bone flute made from a swan radius by Friedrich Seeberger, loaned by Stefanie Kölbl (curator of the museum); firstly this was outside under a tree in a courtyard of the museum, then in a room inside the museum. The whole process took about half a day (in the afternoon). Werner Herzog and his film crew were in Blaubeuren filming Wulf Hein at Geissenklösterle that day (Herzog 2010). Herzog asked Gill if his team could record her playing, and Eric Spitzer-Marlyn responsible for sound recorded the bone flute later that day. The audio track called 'Seeberger's flute' (produced by Gill) is a sample of excerpts from some of Spitzer-Marlyn's recordings from the session.
Context	The experimental work involves exploring how to voice the flute played as a vertical flute using a normative flute (or 'shak') embouchure with no other reference point apart from the experience that the author's experience as a flautist brings to the work.
Composition	The composition of sound patterns is experimentally directed by the attention to playing each tone, moving slowly from one to another, and back again, sometimes prompted.
Observations	The flute feels tiny and the rim is so small that the lips feel too big and awkward to make the sound. Persevering with a new embouchure directed onto the edge of the rim as a labium requires keeping still and honing small movements so that a playing position can be found that is effective. The body starts to tire of the new attitude. The practice is executed whilst sitting down. Three different pitches are noted and the sounds feel intimate and quiet. The subsequent recording takes place inside whilst standing up.
Results	Three distinct pitches can be produced on the tiny flute. These are: - C, three octaves above middle C; the D, a tone higher; and the A, a minor third lower. The timbre is sinusoidal and whilst the amplitude is quiet, the frequencies are high so that the sound of the tiny instrument cuts into the atmosphere.
Comment	As a first contact with the phenomenon of Aurignacian flutes, no prior expectation was anticipated and no preparation had been made. Articles by Seeberger (1998; 1999) actually dismiss a method of playing this flute using such an embouchure-playing technique because of the narrowness of the tube. This experiment counters this claim, to an extent. The phenomenological experience is one of being almost motionless, because movements in the mouth and fingers are fractional whilst the tension in the body is still and strong, with a constant flexing and holding taut the diaphragm.

## 7.2 PLAYING INSIDE HOHLE FELS



Original photo: Marziyeh Zarekhalili

**Album: Sonic Debitage**

**Track called**

In Hohle Fels that night



**Summary**

This track comprises a compilation of two excerpts documenting the first encounter of the author engaging an Erik Sampson HF1 reconstruction, and the acoustics inside the hall of Hohle Fels Cave. She is accompanied in the cave by Marziyeh Zarekhalili who joins in one of the ritualisations by humming. The flute is made from bamboo with an attachment directing the airstream to a notch at the proximal end. The second excerpt picks up the sound of motorbikes.

ALBUM ONE 7.2. *In Hohle Fels that night* (00:52)

<i>Playing inside Hohle Fels</i>	
<b>Background</b>	The background for this experiment is described in section 4.2 which took place one Saturday evening in the summer of 2011. The audio track called 'In Hohle Fels that night' (produced by Gill) is a sample of excerpts from audio-visual documentation originating from Zarekhalili's camera recordings. Another document of this experiment is to be found on the Flute Origins YouTube channel called <i>Sound experiment Hohle Fels</i> (Gill 2014b). The flute made of bamboo by Erik Sampson copies the fingerhole patterns of HF1 but the overall bore diameter is larger.
<b>Context</b>	The experimental work involves exploring the relation of the engagement between the flute and the cave in terms of acoustic.
<b>Composition</b>	The composition of sound patterns is experimentally directed by the cave acoustic in relation to the sonic vocabulary of the new flute in the production of melodic motifs.
<b>Observations</b>	The cave acoustic gives a presence to the flute-playing sounds. It creates a sense of prominence taking charge of the space. The dark atmosphere forces the senses to focus much more on the sound which only increases the sense of the power of the sonic experience.
<b>Results</b>	The cave responds dramatically to the flute playing. Zarekhalili's humming and dripping water complement the soundscape inside the hall. The experience is very particular which feels a little like being in a kind of dream world.
<b>Comment</b>	The flute playing fills the whole cave taking full possession of the space and this gives a phenomenological feeling of strength and power emanating from the body through the flute as the mind extends into the sound. The hearing adjusts as the body becomes accustomed to the new sonic power. There is a considerably greater spectrum of amplitude to play with in the cave acoustic than in other spaces in which the flute was sampled previously. The decay of sound is slow so that the melodic gestures linger in time creating textural blankets of sound. This opens up possibilities to play with harmonic complexes. There is a temptation to find different motifs that create chords of sound.

7.3 PLAYING AT GEISSENKLÖSTERLE



Original photo: Frank Trommer

**Album: Sonic Debitage**

**Track called**  
What the goat heard



**Summary**

This track is an excerpt documenting the first encounter of the author engaging a 'free' reconstruction of GK3 made by her and a team led by Frank Trommer, and the acoustics of an area around Geissenklösterle Cave. The flute is made from a mammoth-ivory tusk and is fashioned as a transverse flute. The recording picks up the noisy sounds of the exposed space.

ALBUM ONE 7.3. *What the goat heard* (00:45)

<i>Playing at Geissenklösterle</i>	
Background	The background for this experiment which took place on Friday 20 <sup>th</sup> April 2012 is described in section 4.3. The experiment emerged as an unexpected excursion to Geissenklösterle to play the flute that had just been made. This flute and how it was made is detailed in Chapter 5. The audio track called ‘What the goat heard’ (produced by Gill) is a sample (with a small loop) of one excerpt from audio-visual documentation originating from Frank Trommer’s team’s camera recordings. Another audio-visual document of this experiment is to be found on the Flute Origins YouTube channel called <i>Sound Experiment Geissenklösterle</i> (Gill 2014a). It wasn’t possible to go inside what is left of the cave itself, so the playing took place close to the cave mouth sheltering under a small overhang.
Context	The playing takes place high up on the ledges by the entrance to the cave. The experimental work involves engaging with the brand new flute made from ivory material in the space around the ledges of the small cave.
Composition	The composition of sound patterns is experimentally directed by the sonic vocabulary of the new flute. Tones are more forcibly expressed in the open-air acoustic affecting the dynamics of the performance.
Observations	In the bright daylight and positioned so high up in the valley wall, the experience of playing is palpably affected in the mind of the player by the view of the valley. In a sense it is difficult to play whilst not being diverted by the visual stimulus. There is a sense that one is playing the view, or putting into sound what one sees, in the process of the casting of the eyes over this part of the Ach Valley. The timbre of the flute is pleasing to the ear; the tone of the pitches is clear and strong. The contemporary sounds of the valley disturb the isolation of the new flutescape. There is a feeling that the sound is not carrying very far and that the body has to work harder to make its sonic presence felt.
Results	The bore and length of the flute (larger than any of the original <i>Ach flutes</i> ) produce very clear pitches in the instrument’s bottom register comparable to the orchestral piccolo in range although a little lower. Overall the tonal range is considerably lower than the <i>Ach flutes</i> played as flutes, i.e., not reed instruments.
Comment	The flute does not seem to fit the environment, yet the flute generates a very tangible timbral sensation from the ivory material. The tone is mellow and warm in quality but this is lost a little bit on the high ledges. If the weather had been windy that day it is questionable as to whether any reasonable sound would have been possible from this instrument.

## 7.4 LIKE BLOWING THROUGH A STRAW, (GK1)



Original photo: Samuel Gill

**Album: Sonic Debitage**

**Track called**  
Gravid

**Summary**

This track is a compilation of melodic phrases from a recorded performance of a score composed by the author. Composing is a remit for the experiment in which the author engages a reconstruction of GK1, exploring it as a blockless duct flute, by blowing it like blowing through a straw. The flute is a reconstruction by Anna Friederike Potengowski and Johannes Wiedmann made from a swan-radius bone, and the design has four finger holes. The birdsong is part of the original recording. The sound of the buzzing bees (recorded on another day) is added to the mix to provide contrast.

ALBUM ONE 7.4 Gravid (01:46)

<i>Like blowing through a straw, (GK1)</i>	
Background	<p>This experiment initially constituted the content for a Magister's exam in Musicology at Linnaeus University, supervised by Karin Hallgren. It takes its point departure from Greg Dikman's research into "The performance practice of early 18th century French flute music" (1991) and "Early Music and Historically Informed Performance Practice" (2000-2012) in which music is realised or composed in the act of performance. Baroque flautists historically played from a basic score and were expected to embellish the music as they were performing it. This leans towards the notion of performer as composer, and the theory behind it is adopted by the author engaging a reconstruction of GK1, using the instrument's tonal possibilities, in practice, as a kind of musical score. The flute which is 17 cm long [Figure 7.1, c. (right)] was lent to the author for a period in the spring of 2013. The original intention was to work on the 'ney' method of blowing, but the author noted some rather interesting tonal possibilities emerging just by blowing down the flute like blowing down a drinking straw.</p>
Context	<p>The experiment takes place over a series of sessions in which observations are guided by Cato R. P Bjørndal's book (2005) on qualitative self-observation. Dikman's perspectives that focus on the continual cycle of genesis and analysis in general relation to performing practice complement this perspective. In each session, the author keeps a diary with three columns whilst notating musically on paper any interesting melodic gestures coming from engaging the flute in this way. The columns include the categories: - Emotions; Senses; and Technical.</p>
Composition	<p>The notes from each session form the basis of a solo flute piece [Figure 7.1, b.] in which technique, the feelings and musical gesture are recognised holistically. The result is a recording of the performance of the piece. The recording picks up natural birdsong. An excerpt from the recording is produced in the studio by the author with a second track that is a recording of bees buzzing. The reason for the bees is that the original recording was not produced in a studio and the quality of the recording was impaired by the equipment. The addition of the beesong therefore helps to mask some unwanted noise.</p>
Observations	<p>Various melodic motifs emerge during the practice of engaging the flute in fingering combinations across fundamentals and their harmonics. One observation made in one of the experimental sessions concerns how the outside environment plays a role in what is being played, e.g., "I hear a bird call. My fingers move to the notes before the brain has had time to think. I play the notes intuitively. I have articulated the rhythm with my tongue".</p>
Results	<p>The frequencies of the fundamentals and their harmonics are noted in terms of tones that are strong, and tones that are not so strong documented as a pitch map [Figure 7.1, a.]. By moving the fingers in different combinations the airstream can be directed to parts of fingerholes acting as the labium. Sometimes two pitches are heard producing a third subjective tone like a 'police' whistle, where the air is catching two labiums. The process of exploring tonal possibilities leads the way guiding temporal patterns of sound. This process prompts and inspires ideas for melodic motifs emerging together with responding to other factors like the agency of birdsong.</p>
Comment	<p>The type of flute as played in this way would seem to be the sort that Cajsa Lund refers to as a blockless duct flute (Lund 1988), and Münzel, Seeberger and Hein refer to as a playing technique which they call "blowing over the fingerholes" (Münzel <i>et al.</i>, 2002: 117). The process of engaging a flute in this way becomes a creative process of composing in action guided by the instrument as a score. The tones are so not difficult to achieve since one is simply blowing the flute like blowing through a straw whilst the fingers find different combinations forcing the airstream to be broken on a succession of different fingerhole edges creating new sonic patterns.</p>

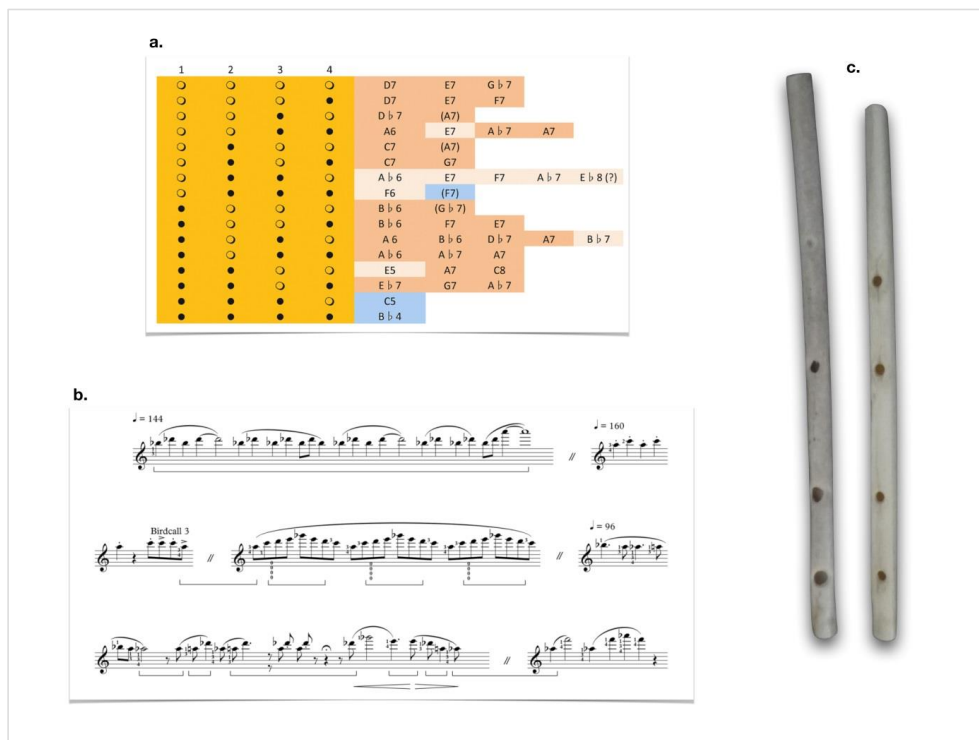


FIGURE 7.1. Sound patterns from a GK1 reconstruction, voiced like blowing through a straw

a. A diagram showing the frequencies from fingering combinations of a 17 cm GK1 reconstruction with four finger holes, voiced as a blockless duct flute. Filled circles represent closed fingerholes. Dark pink = strong tones. Light pink = weak tones. Light blue = very weak tones. b. Excerpt of the score from the experiment called "Like blowing through a straw, (GK1)". The score is written in the range of a piccolo (so pitches are sounded an octave higher than written). c. Swan radius flutes: - left flute is a GK1 reconstruction flute by Gill and Hein (for reference only); right flute: the 17 cm GK1 reconstruction by Potengowski and Wiedmann on which the experimental playing is tested.

## 7.5 THE INFANT



Original photo: Wulf Hein

**Album: Sonic Debitage****Tracks called**

Trills

Tongue and pitch

The pitch of mummy

**Summary**

The three tracks are spontaneous recordings of the author's daughter engaging the voice in innate-experimental ways. During the author's daughter's prelinguistic years, the author makes spontaneous recordings that are considered relevant to the subject of bone flutes, and more generally, musicality and musical development of the (her) infant. In the first two samples the voice is being used as a musical instrument, the second in which the tongue is used very similarly to the way that flautists articulate notes with their tongues together with large interval jumping, including discrete octave leaps. In the last of the three tracks the voice articulating the word 'mummy' aligns itself with the pitch of the author's bone-tube playing. It may also be observed from the image that when given the bone tube, the author's daughter puts it straight in the mouth.

ALBUM ONE 7.5. *Trills* (00:15)ALBUM ONE 7.6. *Tongue and pitch* (00:55)ALBUM ONE 7.7. *The pitch of mummy* (00:38)

7.6 SHAK OR NEY?



FIGURE 7.2. Photo documentation from the experiment called 'shak or ney?'

Photographs by Annika Grünwaldt Svansson.

<i>Shak or ney?</i>	
Background	The author was keen to know how Seeberger was playing his reconstructions which seem like whistling. It is no secret that she was stumped over how the sound was made (Gill 2016). After meeting Anna Friederike Potengowski and Susanne Schietzel in a concert that they performed in together in Stuttgart in 2013 using this Seeberger technique, the author was able to direct some questions. The biggest problem was the glissandi between notes which simply are not possible on orchestral flutes. How does this happen? Wulf Hein had also referred to how like whistling playing these flutes really is. At the time the author did not have an ivory flute replicating GK3 but made a general deduction that the bore diameters of swan ulnae are quite similar in size to the bore diameter of GK3. Armed with a swan-wing ulna and a swan-wing radius (as substitutions for GK3 and GK1 respectively), the practice regime became an experiment during the course of the summer 2014 and included additionally, various metal tubes replicating the dimensions of the osseous material. All models are 14 cm long.
Context	Using three notebooks, the author separated out three different avenues of simultaneous exploration: - firstly, engaging the Seeberger technique on the radius bone, secondly extending this technique to the ulna (held obliquely in both cases), and thirdly, using a normative flute embouchure on the ulna, held vertically. The sessions take place over a whole summer in a relaxed and natural way. From the inventory of bones and steel plumbing pipes, are two metal pipes which are modified with blowing notches. None of the bones or metal tubes has fingerholes so full attention may be given to the voicing experiments.
Composition	The composition in each session involves voicing the flutes and documenting any sounds and patterns that are considered pleasing by writing these down in a diary using music notation. The author also continues her attention to the sensations, feelings and technical experiences which she also makes a note of by writing any observations down in the appropriate diary. Finally, a long piece of wallpaper is put on the table towards the end of the summer, and the author revisits each session successively lifting all the experiences into a new score in chronological order. The experiments take place very early in the morning before most people have woken up in the Scandinavian bright light.
Observations	The process is an engagement with the forest. On more than one occasion, the first note breaking into the sound of the forest seems to attract the attention of all living things in the forest and there is a shock of silence for a minuscule but palpable moment. Playing the tubes in the ways described above is often an exercise of patience with control of notes wavering, sometimes the tone is strong, and at other times there is very little sound. But always there is an intimacy to the sound in close range in which the exhaling of breath, movements of fingers, and thin-wispy sounds are experienced at close range. The oblique end-blown playing feels naturally tuned into the forest whereas the vertical playing on the notch and rim using a normative embouchure produces a much more strident tone, not blending but disturbing. Also the cheek muscles start to ache. Playing the Seeberger way for both the ulna and radius feels more contemplative.
Results	At the end of the summer, the author can voice the tubes relatively successfully, yet the experience of learning has yielded tacit knowledge that feels more valuable than just being able to play or not in a certain way. Playing with the normative embouchure holding the flute vertically is possible both with and without a notch; the notches do not seem to help that much, but occasionally the airstream catches on a notch and the tonal quality is exceptionally clear and piercing.
Comment	Flitting between the different instruments and techniques adds its own dimension to the experience. The author starts to refer to the Seeberger method of playing as the 'ney' technique to include the embouchure and oblique-playing position. Likewise the normative flute embouchure with the tube held vertically she starts to refer to as the 'shak' technique, as it is similar to a shakuhachi. All of the frequencies are lower <i>en masse</i> by up to half a semitone or quarter note when played using the 'ney' technique. Pitches are therefore almost the same pitch but flatter.

## 7.7 14 CM AND GREEN KÄLLA

**Memory**

**a.** Musical score for the piece '14 cm', featuring a complex, circular notation with various symbols and text annotations.

**b.** A photograph capturing a performance of '14 cm' in a grassy field, showing several people standing and observing.

**c.**

### Green Källa

for Lotta and Walle

Frances Gill and Susan Beatty

1. sound the bone like playing a 'ney' unless stated otherwise, with or without vibrato unless stated

2. sections between dashed lines can be extended or curtailed at the player's discretion along with any instructions given

$\text{♩} = 60 - 112$  (this is a guide only)

*[Experiment with these five sounds in any order whatsoever. Alter the rhythm according to a natural feel. Vary dynamics and gradation of tone]*

Swan radius after GK1

S. rad

Flowing *accel.* *rit.* *mf* *pp* *mf*

*[breath from lips and blow down tube]* *[hoop fingers moving after breath has expired]* **[ney]** *[towards no vib]*

FIGURE 7.3. Compositions related to GK1: '14 cm' and 'Green Källa'

a. The full score for the piece called '14 cm'; b. Photo capturing a performance of '14 cm' in the spring 2015 at Sandby borg; and, c. Excerpt of the piece called 'Green Källa' which is scored for the GK1 radius flute as a piccolo (so pitches are sounded an octave higher than written).

<i>14 cm and Green Källa</i>	
Background	Two successive compositions form the basis of this experiment as related to the theme of memory. The author was commissioned to compose a sound installation for the Iron Age site of Sandby borg on Öland (Sweden) which she undertook to support her doctoral work and which also supported theoretical explorations in music as related to archaeological sites. This work is situated in the research field of Experimental Heritage, and is documented in an article (Gill <i>et al.</i> 2021). The first composition is a score for ensemble written in 2015 for 14 cm metal tubes replicating swan-ulna tubes [Figure 7.3, a.]. The second composition is a scored piece for swan-radius-bone flute written in 2017 for a 14 cm long reconstruction of GK1, using the 'ney' technique as a playing method [Figure 7.3, c.]. The piece is called "Green Källa" and it was ultimately recorded and edited by film maker Ylva Magnusson.
Context	Both experiments/compositions function on two horizons in terms of general aims. For the composition "14 cm" one horizon concerns ritualisation in relation to the place Sandby borg where the performance of it is physically intended, although it may be performed anywhere thus transporting the site to other venues as an abstracted way of thinking about place and sound. The other concerns the inventive ways that the players may engage with their 14 cm tubes. For "Green Källa" the piece (scored together with Susan Beatty) is a sonic icon of a spring, and movements of water from springs. The experiment seeks to advance the technical capabilities of the player. It is scored for a swan radius with three finger holes replicating the pattern of holes on GK1. The instrument reconstruction is described in the Experiment 7.9 called 'Copying Seeberger'.
Composition	The first composition "14 cm" involves any number of players positioned together in the shape of a spiral in the landscape [Figure 7.3, b.]. The players can bring their own instrument or they can receive a metal tube to play. One by one the sound is exchanged through the spiral as one player finishes another begins like passing the baton of music, till all players have played, and then the piece is finished. The second piece is written for the author, but as a scored piece is a document of the new flute's capacity as appropriated to that relation, and thus theoretically available for other players to perform. Movements of water trickling are simulated in quick repetitive finger movements hither and thither between close tonal intervals. Pulling the flute away from the mouth and blowing sharply on the edge whilst still moving the fingers in the same pattern demonstrates how the pitch sharpens by a semitone. When the breath stops but the fingers are moving the pitch still resonates at the new sharpened temperature. Playing using a ney technique flattens the frequency atmosphere [Figure 7.3, c.].
Observations	There were several innovative ways that the tubes become engaged in the "14 cm" performance [Figure 7.3, b.]. The author decided to call one technique 'palm pops' in which the end of the tube is hit in the palm of the hand and it produces a resonance in the tube. Another was by blocking the end of the tube with the finger such as the case for blocked ends of tubes found in panpipes. Playing a swan-ulna as a 'shak' is also considerably easier when blocked at the bottom like this. The players in the group, being mainly professional artists, offered an uninhibited engagement with the material tubes; there was no expectation or agenda for music to sound in a certain way. The performance of "Green Källa" for the film offered additional perspectives for the performance of the solo bone flute piece. One perspective from the experience highlights how the nerves of the author are affected in the performance. This is one consideration in a discussion concerning the question about ensemble versus solo playing in relation to the <i>Ach flutes</i> and participants in context.
Results	New ways of engaging with 14 cm tubes replicating swan ulnae were revealed in the experiment showing that the spirit of invention may be considered a vital part of the narrative for the <i>Ach flutes</i> . The "Green Källa" performance, recorded and mixed by Magnusson, indicates a stepping stone on the way for the author learning to play the radius bone flute using the 'ney' technique experimenting with the new dimension of fingerholes. The piece is available to watch on the Flute Origins YouTube channel (Gill and Magnusson 2017). The 'ney' technique takes time to learn and master, it is not instant even for flautists.
Comment	There was a definite sense in the performance of the ensemble piece that the musical experience seemed to belong to everyone who had had an equal share in making it. The author made the tubes into a gift for those who wished to keep the instrument that they were playing, and there were no returns. Learning a new skill like being able to play the radius like Seeberger involves a number of intermediate stages (documented in the following experiments). The reason for grouping these two compositions together is because they are both connected with the archaeological site of Sandby borg. The term 'memory' is used to link the two pieces as a reference to how experiences are intrinsic to remembering (Gill <i>et al.</i> 2021) and that this is necessary for skills to develop through time. This is also part and parcel of theoretical Contextual Experimental Archaeology in which experiments are connected through time like stepping stones or constellations as related to direction and horizon.

7.8 BONE TUBES



**Album: Sonic Debitage**

**Track called**  
Bone tubes



**Summary**

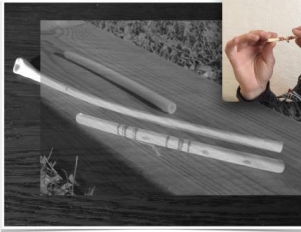
The track is a short polyphonic piece in four parts composed and performed by the author engaging a swan-wing's ulna and radius bones, 'with, through and about' basic voicing methods for unmodified tubes (simple flutes without fingerholes). The recording is produced by John Swartling who adds some wind and fire sounds to create a cave atmosphere.

ALBUM ONE 7.8. *Bone tubes* (01:51)

<i>Bone tubes</i>	
Background	<p>The audio track called <i>Bone tubes</i> is a polyphonic mix in four parts, composed and performed by Gill, and produced by John Swartling. In various contexts, a number of (Stone Age-inspired) bone-flute practitioners had started to discuss possibilities of playing music together on reconstructed flutes. At this time the emphasis had been on solo flute players and not flute ensemble. This prompted Gill throughout 2015 to continue experimenting with ideas for ensemble music following on from the experimental-heritage work with her piece called <i>14 cm</i>. During the autumn 2015, music producer John Swartling contacted Gill about creating a piece of Stone Age flute music for a radio show about the Swedish journalist Karin Bojs in relation to Bojs' award-winning book (2015), in which Bojs had written a chapter about Aurignacian flute players after hearing a recording of Seeberger in Hohle Fels. Gill agreed to collaborate providing that Swartling would help her mix some of her own recordings in his studio (because during this time Gill did not have access to a studio). In addition to this, a symposium in honour of Cajsa Lund at Linnaeus University in Sweden was being planned for the spring 2016, and Gill was given the possibility to compose a piece of music to be performed in the evening's concert. The projects converge.</p>
Context	<p>There are two main lines of experiment. The first is about revisiting various technical-instrumental possibilities that produced the concrete sounds which artists had created individually in the monophonic piece called <i>14 cm</i>. The second process is about experimenting with polyphonic ideas in which four independent lines of melody may be composed to be played in synchrony by instrumentalists playing <i>14 cm</i> tubes.</p>
Composition	<p>The first task initially involves the creation of symbols to document different concrete sounds as a memory of the sounds that were generated in the performance of <i>14 cm</i>. New sequences for these sounds are written down in a musical score [Figure 7.4]. The second (and separate) compositional process is to use the harmonic possibilities that a Swan's radius and ulna (each 14 cm long) produce when they are played together using embouchure methods from Gill's experimental work on the porch in the summer of 2014. A rhythmic gong pattern from Ghana is borrowed to base three independent melody lines for the ulna played in three different ways (described below), and a fourth line for the radius, with a view of recording a performance of each line as an audio track, and mixing the four tracks together in a studio.</p>
Observations	<p>The practice of remembering and replicating the different techniques for an ulna from the performance of <i>14 cm</i>, and extending some of these ideas to the radius, prompts memories of the experimental work from the sonic sketch called <i>Gravid</i> (from the experiment 'Like blowing through a straw'). It is a process (a fetishisation) of trying out the ideas from memory and developing them. The second task is stimulated by the natural harmonic series coming from the bones. By blocking the bottom of the ulna with a finger (like each single pipe is stopped or blocked in the organological case for panpipes) the lowest pitch blown with a 'shak' technique is a D an octave above middle C (the D in the bottom register of an orchestral piccolo). This note provides a ground base for the polyphony. Using this same technique and overblowing, notes from the harmonic series that can be achieved include an A (in the middle register of the piccolo), and a top F sharp (in the higher register of the piccolo). The A and F sharp provide a second line of melody. For a third melody line, the ulna adds a C natural fundamental (two octaves above middle C) which can be overblown to the A above it, from which a falling glissando is possible played using the 'ney' technique. The fourth part is played on the radius which provides a D fundamental (two octaves above middle C) which can be overblown up to the A above it (in the middle register of the piccolo) played with the 'ney' technique.</p>
Results	<p>The first part of the compositional process yields a musical score that is a solo piece for one player and two instruments; the radius and ulna bones, swapping them during the piece. This is a document of musical ideas generated from the musical sketch called <i>Gravid</i>, the piece called <i>14 cm</i>, and general engagement (with, through and about). The second part of the compositional process yields four separate music tracks which are given to John Swartling to mix. In doing this he adds some fire sounds and some wind sounds to create a sense of sheltering in a cave, like Hohle Fels on a cold windy night.</p>
Comment	<p>The first process involved executing instrumental techniques from memories of previous musical experiences creating new sequences of sonic patterns that become stored in a written document (a musical score). For the second process, the combined frequencies from both 14 cm bones played using different techniques (mastered by Gill on her porch the previous summer) provide a major-seventh harmonic complex, which creates a warm-jolly feeling when all are mixed in rhythmic polyphony. A live performance of the monophonic solo piece from the musical score, followed by a dance to the polyphonic-music mix – as an electroacoustic performance – was performed at the concert for Cajsa Lund in February 2016. Gill was joined on stage by Gjermund Kolltveit (on Jew's harp) and Birgitta Ridderstedt (voice and body). This was performed again at the 'From Cave to Rave' line-up at Festival Ljubljana on 25<sup>th</sup> August 2017 with some welcome support from Jean-Loup Ringot.</p>



7.9 *COPYING SEEBERGER*



Original Photos: Wulf Hein and Frances Gill



Jan Bengtson with author's GK1 reconstruction  
Photo: Frances Gill



**Album: Sonic Debitage**

**Track called**  
Schlaflied

**Summary**

This track documents the author engaging with her swan radius bone with newly-made finger holes that follow the pattern of GK1, by playing it with a 'ney' embouchure as an oblique flute. The melody is a response to this first encounter.

ALBUM ONE 7.9. *Schlaflied* (00:35)

<i>Copying Seeberger</i>	
Background	<p>The author was asked to send her flute to Stockholm for a special radio broadcast honouring Karin Bojs. The producer of the show, John Swartling, wanted the famous Swedish flautist Jan Bengtson to play it. The author had one reconstruction of GK1 she had made with Wulf Hein but wasn't playing this as it was difficult to voice, plus it had developed a crack. The crack had come from trying to sharpen one edge of the rim (against her better judgment), and she inadvertently forced the tube to crack during the process. Hein later told her there are ways of fixing cracks. The new instrument that she had been practising on which she could manage a good tone on using a 'ney' technique did not have any fingerholes. This radius bone she had acquired from Frank Trommer which she cut to 14 cm long. The decision to take the plunge and scrape in some holes following the pattern of GK1 on this swan radius was undertaken on the bone with flint she had been given from Hein. This she did by eye against the model (currently cracked) that she had made in Hein's workshop. On the new flute, she created some perpendicular grooves down the belly of the flute following the markings on GK1. She also took some red cotton thread and tied some small belts down the tube kept tightly in place due to the grooves. The spare thread left hanging was then tied together to make a small handle at the back of the flute, perfect for pinning or tying to clothing.</p>
Context	<p>The experiment involves finding a time when there is space without disruption to engage the new material which is a 14 cm long copy of GK1 with newly scraped fingerholes. Questions regarding which fingers to use for which fingerholes and how the flute will respond are secondary to the intention simply to engage sound. This is achieved for the author playing the flute quietly in a room adjacent to her daughter who is about to fall asleep late in the evening when it is dark outside. There is wood burning offering the only light.</p>
Composition	<p>The idea is to relax playing random sounds holding the flute obliquely using the 'ney' blowing technique, manipulating fingers, and by accepting (rather than judging) sound. There is no other aim than to feel a way forward through time engaging sound as the temporal-ontological focus. Manipulating the fingers is one way forward to hear the flute talk back by hearing the effect of the new fingerholes in the new acoustic ecology.</p>
Observations	<p>Approaching the radius bone with new fingerholes makes the flute feel different yet familiar. It is a little bit like living in a newly renovated familiar room. New tones are possible but control is not immediate. Using the phrase "Go away you scary monster" as a musical gateway into playing an instrumental lullaby, the sonic sketching develops affinity with descending glissandi copying the prosody of the phrase engaging repetitive-melodic gesture.</p>
Results	<p>Four fundamental tones emerge from the flute from: - all fingers closed; the bottom fingerhole open; the bottom two fingerholes open; and all fingerholes open. These fingerings correspond with the frequencies/pitches of D, E and G in the range of an orchestral piccolo's second register, and top E in the upper register. There is fluid pitch possibility especially with the top fundamental which can be manipulated to create more notes, such as an A and B that feel like an instinctive musical response (as a pentatonic scale) during engagement..</p>
Comment	<p>The setting playing the flute feels very natural, where ears are acutely tuned into the night-time atmosphere that correspondingly is very quiet everywhere. The lack of amplitude is no problem since the high pitches carry so well, and the music becomes a dominant part of the acoustic in situ of the experiment.</p> <p>The recording of the lullaby was given to John Swartling's team who cleaned up the recording. The flute was subsequently transported up to Stockholm by the author who didn't want to risk losing the instrument. As she anticipated, Bengtson could not manage to play it in the same way she herself had struggled to do so on first contact. The performance for Karin Bojs became therefore reassigned to her. This she had also anticipated. Currently the performance (which she and Bengtson worked on as a short piece) is owned by Sweden's Radio and she has to apply for a licence to have it and use it. It is available to listen to via the net on search engines using the keywords: - <i>Karin Bojs; Sommar i P1; Stenålders flöjt; 19<sup>th</sup> August 2016.</i></p>

## 7.10 DUET FOR ANNA



Original Photo: Susanne Münzel

**Album: Sonic Debitage**

**Track called**  
Duet for Anna



#### Summary

The track is an excerpt from a recording of a performance of two players engaging GK1 reconstructions blown as end-blown oblique flutes using the 'ney' voicing technique. One of the players is the author who wrote the duet, and the other player is Anna Friederike Potengowski who together with the author discussed what a duet such as this may seek to explore. The piece engages the players in a combination of unison, polyphonic and contrapuntal structures. The author plays on her own 14 cm GK1 reconstruction, and Potengowski plays on a reconstruction made by Friedrich Seeberger, comparable in length. Each flute is made from a swan-wing radius. The excerpt is from a performance given to an audience inside a conference room in a symposium context.

ALBUM ONE 7.10. *Duet for Anna* (01:20)

<i>Duet for Anna</i>	
Background	The initial source of the duet experiment is a scored piece by the author for a performance presentation made as part of a session on 26 <sup>th</sup> August 2017, (Music in the Stone Age – International Council for Traditional Music (ICTM) Study Group on Music Archaeology XV Symposium, and Workshop of the European Music Archaeology Project (EMAP), Ljubljana, Slovenia). The performance was also intended for the Mednarodni Festival in old Ljubljana town but the author decided that the performance was not suitable due to its context in the loud busy streets of the capital.
Context	The point of departure for the piece came from the author's experience of playing her GK1 reconstruction, and discussions with Potengowski as to what may be explored in such a meeting of two bone flutes and two bone flute players. Aspects of playing in unison and polyphony are considered a reasonable means of exploring textures of the instruments playing together.
Composition	Phrases playable to the author on her GK1 reconstruction engaging the duet are transported into the score with an underlying question as to whether, and if so, how two or more bone flutes may be engaged together. The composition is considered a sonic sketch of possibility. Small polyphonic phrases that start and stop together with even rhythms provide a simple pattern to synchronise.
Observations	From the performance perspective, the rehearsals yielded at first what seemed to be a problem which was that Potengowski's Seeberger reconstruction was slightly longer than the author's. This brought a new dimension to the music in terms of intonation or tuning. Since the capacity to tune down because of the glissandic nature of fundamentals is possible, there is some room for manoeuvre, but still the tuning is compromised in a different direction from the initial intention. This brings a new dimension to the experiment. The tuning differences in the polyphonic areas emphasise this. Potengowski adapted her playing to the new tuning, using embouchure morphology, and skills as an instrumentalist and musician.
Results	Both players seemed to accommodate and adjust their tunings to overcome the problem that the lengths of flutes are different, yet it is possible to hear the dissonance, e.g., in places where there is some repetition of phrases with each player repeating a similar phrase on their own becomes noticeable sequentially. This provides new timbral texture. Some dueting where both players engage very high pitches generates a third subjective tone.
Comment	A discussion after the performance yielded comments. Music Archaeologist, Arnd Adje Both, commented that the tuning dissonances were the most enjoyable part of the performance. Susanne Münzel commented that she envisaged the flutes as solo instruments and not dueting ones, in terms of interpretation for pre/deep-historical purposes. The duet brought a sense of unity to the players consolidating or finding a mutual reference, with different aspects of playing in practice, shared musically and instrumentally. The generation of a third pitch as a result of two high pitches is a discussion point. The performance felt a little bit like doing the same dance. The aspect of audience compromised the agenda of playing the duet in the street music festival at night. Even with microphones the music did not feel to fit the setting.

## 7.11 COPPER FOR BONE



Photo: Jörgen Ludvigsson

**Album: Sonic Debitage**

**Track called**  
Length for a swan radius flute



**Summary**

This track is a series of 11 excerpts from a performance by the author engaging 11 successive lengths of copper pipe, each reconstructed strictly following the form of GK1. The material engagement explores each instrument's fundamental frequencies, followed by a brief sonic sketch 'with, through and about' it. This forms the basis for an investigation into the harmonic complexes, and aesthetic tonal possibilities by comparing the various length possibilities, asking if there is an optimum length for the model GK1.

ALBUM ONE 7.11. *Length for a swan-radius flute* (03:39)

## Copper for bone

Background	<p>This experiment concerns different lengths of tube with a view to finding out whether 14 cm is the optimum length in relation to the best acoustic length for a swan-radius flute. GK1 has one end intact which is presumed not to be the blowing end; it is possible to experiment with different lengths whilst the pattern of fingerholes in relation to the end of the flute remains the same. Münzel <i>et al.</i> consider a usable length of up to and between 180 and 200 mm for a swan radius, and 150 mm is given to infer a reasonable length for playing (2016: 239/table 1). The experiment is inspired by the reconstructions of GK1 by Seeberger that are slightly different in length [Figure 7.5, f.]. The experiment also follows on from Gill's experiments in this thesis working with 14 cm lengths in different contexts (e.g., 'Shak or Ney'; '14 cm'; 'Bone tubes'; and 'Duet for Anna'), so that a question can be asked, is there a right length for GK1, and a flute made from the radius of a swan? Another point that is raised by Potengowski (Münzel and Potengowski 2015) concerns why her playing of Seeberger's flute yields a different upper fundamental to his in relation to the interval between the upper two fundamentals. The experiment is in three parts. Firstly, theoretical frequencies are approximated very generally for eleven different lengths. Secondly, the eleven different lengths are reconstructed physically using copper plumbing pipe (that has an inside diameter of 6 mm). Thirdly the fundamental tones from each copper flute are played using the 'ney' method of blowing, and recorded.</p>
Context	<p>A photograph of GK1 taken from Münzel <i>et al.</i> (2002: 114/fig. 5a) is scaled, and measurements are taken from theoretical lengths of 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, and 20 cm using the intact rim on GK1 as a basis for the distal end of the instrument [Figure 7.5, b.]. The frequencies calculated are converted to the closest corresponding musical pitch using standard tables. The theoretical frequencies (<math>f</math>) are calculated by dividing the speed of sound (<math>c</math>) by twice the length of the tube (<math>2L</math>), as is the formula for a tube that is open at both ends [Figure 7.5, d.]. This formula does not include what is known as 'end correction' which takes into account a proportion of the diameter of the tube (but what exact proportion this is does seem to vary, possibly due to the fact that some wind instruments are wider at the 'bell'). Overall for this rough approximation, and because the diameter of GK 1 is at the most around 1cm (Münzel <i>et al.</i> 2016: 239/table 1), the end correction is not considered significant although the shorter the tube, the more significant it will become (<i>cf.</i> Wolfe 1997). In addition to this is the point noted previously ('Shak or Ney') that the musical pitch of an end blown tube is sharper/higher in pitch if played as a 'shak'; played as a 'ney', the pitch of the same tube is flatter/lower in pitch.</p>
Composition	<p>The final part of the experiment is a composition in which the 10 flutes are laid out on a table from longest to shortest. The player picks each up in turn (starting with the longest) and plays the four fundamentals of each flute. The fingering sequence for this is always: - all fingerholes closed; the bottom fingerhole (fingerhole 3) open; the bottom and middle fingerholes (holes 3 and 2) open; and all fingerholes (holes 3, 2 and 1) open [Figure 7.5, b.]. At the end of each flute's turn, the fingers 'dance' to try out the 4 tones as a short melodic sequence. The performance is recorded in full and is then edited to isolate the fundamentals from each flute for the audio track.</p>
Observations	<p>As the tube gets shorter, the overall playing length of the instrument becomes higher in frequency which is to be expected but on average all fundamentals on all eleven models are lower than their rough approximations. What the ear is most attuned to during playing is the feeling that the different melodic intervals from each flute yield. Two flutes are particular diatonic and these are the 14 cm and the 15 cm models. The highest fundamental on the three shortest models are difficult (impossible) to obtain however the very smallest flute makes a pleasing sound playing just the bottom three fundamentals which are diatonic in nature. There is an unusual phenomenon on the 15 cm model where the top fundamental jumps alternately to give two upper fundamentals. This causes a response in experiment in which the short sonic sketch that follows on from the fundamental testing is extended. The pitches for this 15 cm flute are in the region of: - B5; C sharp 6; E6, and either A6 or B6. The 14 cm gives pitches in the region of: - C sharp 6; D sharp 6; F sharp 6; and C sharp 7. The 14 cm is the most pleasing to play on balance with the rest.</p>
Results	<p>There is a three octave range between the lowest and highest theoretical fundamental for the shortest 10 cm model. As noted above, the smallest flute is exciting to play when just the three lower fundamentals are used. This would be a delightful small flute with 3 fingerholes! The range indicated for theoretical fundamentals only falls below 2 octaves for the 13 cm model. From here till 18 cm, the range stays at 2 octaves. For 18 cm, 19 cm and 20 cm the range of theoretical fundamentals is under 1 octave in range. The graph shows how the intervals between the fundamentals expand exponentially as the tube becomes shorter. Somewhere between 13 and 17 cm there seems to be more of a theoretical balance in the relation of the intervals between fundamentals in terms of size. To play these tiny flutes with a 'shak' embouchure is not easy although possible (see the experiment called 'Seeberger's flute'). The preferred technique is the 'ney' embouchure. The actual pitches played and heard using a 'ney' technique on the copper pipes (heard on the track called "Length for a swan-radius flute") whilst echoing the same general pattern shown in the graph [Figure 7.5, a.] are overall lower, sometimes as much as about 2 tones. This may have something to do with measuring to the middle of fingerholes and not the edge of fingerholes, and/or the absence of the end correction in the formula. The additional factor that the 'ney' fundamentals sound slightly lower than the 'shak' fundamentals provides another reason. Finally the theoretical frequencies are only given as a rough approximation to get a sense of how the different lengths vary in relation to each other generally.</p>
Comment	<p>The fact that there are two alternative notes for the upper fundamental on the 15 cm model also offers another explanation as to why Seeberger's upper fundamental varied from Potengowski's and mine.</p>

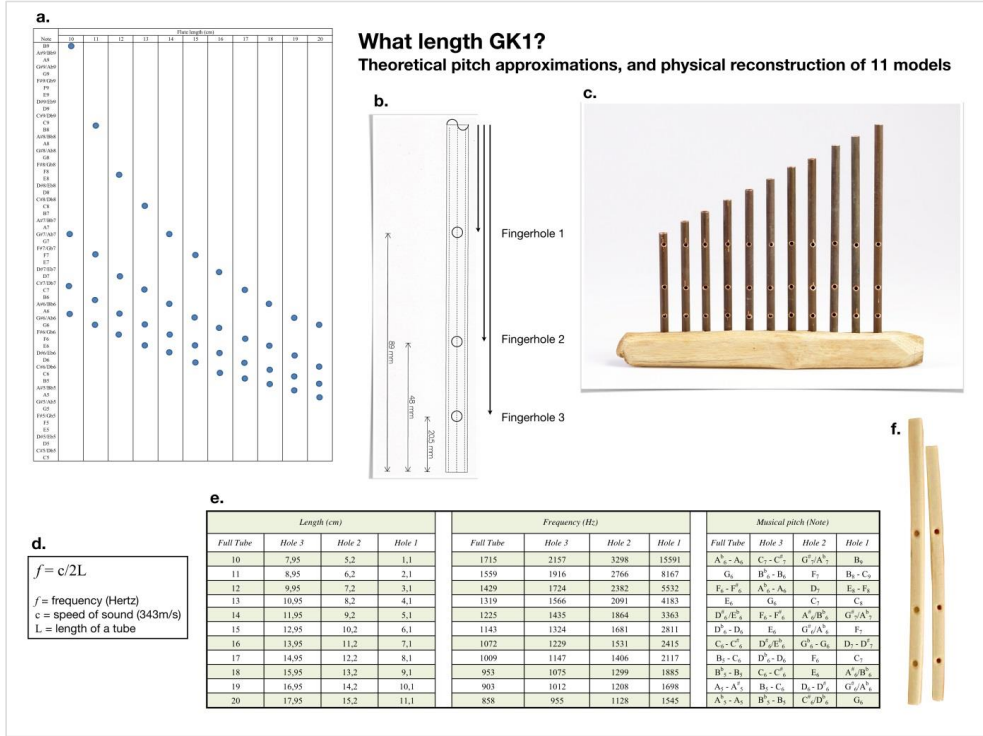


FIGURE 7.5. Some theoretical pitch approximations for GK1

a. Plot of theoretical pitches approximated for GK1 based on three fingerholes across 11 different lengths; b. Longitudinal measurements for GK1 from the intact-extant rim to the centre of fingerholes from a scaled photograph (Münzel et al. 2002: 114/fig. 5a); c. Photograph of eleven different GK1 flute lengths reconstructed physically using copper plumbing pipe with an inside diameter of 6 mm. The material weighs heavier than the radius bone. Photograph by Jörgen Ludwiggsson; d. The formula used for approximating the theoretical-pitches of GK1 as a flute open at both ends; e. frequencies in Hertz across all 4 fundamentals for each flute, and converted into musical pitches using standard tables; and f. A photograph (originally taken by Susanne Münzel) of two GK1 reconstructions made by Friedrich Seeburger modelled from different lengths.

## 7.12 WOLVES AND ISOPHONY



Original Photos: Frances Gill

**Album: Sonic Debitage**

**Track called**  
Finding wolves

**Summary**

This track is an excerpt documenting a few moments of a performance created by the author in a piece for five players engaging swan-radius flutes modelled on GK1, plus one swan ulna bone. The performers are Barbara Spreer, Anna Friederike Potengowski, Gabriele Dalferth, Dorothea Federle, and the author, Frances Gill. The players engage their instruments using either 'shak' and/or 'ney' blowing techniques to voice their instruments. The work engages structural, textural, and tonal possibilities in relation to isophony, like singing wolves.

ALBUM ONE 7.12. *Finding wolves* (01:45)

<i>Wolves and Isophony</i>	
Background	A group of bone-flute players met in January 2019, in Blaubeuren. These players are Barbara Spreer, Gabriele Dalferth, Anna Friederike Potengowski, Dorothea Federle and the author. Spending a weekend in rooms at the museum in Blaubeuren, the agenda included possibilities for members of the group to experiment with sound and musical ideas in different ways with support from each other, trying out different experimental methods.
Context	The context of the author's experiment continues the exploration into whether, and if so, how two or more swan-radius flute players may play together. Taking inspiration from Aleksey Nikolsky's 'commentary' on 'Musilanguage' (2018), the notion of isophony in relation to the theme of wolves is put forward as a means to engage ensemble playing.
Composition	Nikolsky writes about the function of isophony, that "All parts contain the same call that is repeated with substantial changes in frequency and duration. Each part is equal in status to other parts in producing an independent expression of the same idea by each performer—in the manner of reaffirming this idea" (2018). The idea the author devises is for players to engage with their flutes with, through and about a question of their choice, as a call.
Observations	Without following a musical score, the playing feels uninhibited, lucid and fluid in the mood in which players engage with the music, yet the whole piece of music feels to be united in sonic movement.
Results	The plasticity of the flute voices retain their distinct place in the music whilst as a chorus the material engages the group in a structural, textural and tonal dimension that feels holistic and secure in the space.
Comment	There is a feeling that the author experienced - the individual players remain isolated in their playing and yet there is a feeling of togetherness in the music, which in form changes in each moment, like a dance of starlings. There did feel to be certain shapes and patterns that seem to move the whole group in a direction together.

## 7.13 REED PLAY



Original photos: Frances Gill

**Album: Sonic Debitage**

**Track called**  
Reed play

**Summary**

This track is an excerpt documenting the first encounter of the author engaging a reconstruction of GK1 made by Jean-Loup Ringot which includes a reed, played therefore as a small clarinet. The context of the sound production includes birdsong and running water as the excerpt comes from a sound installation at Smålands Museum in Växjö set in a simulated forest with waterfall. The installation is called *Lekfullt* which translated from Swedish means 'playfully'. The author is not an accomplished reed player so the result of the material engagement is deliberately playful. The artistic idea in the installation is that the reed player is playing on one side of the valley. This is why the sound of the clarinet is panned to the extreme right in production and only heard therefore in one part of the sound field (or in the right ear if listening through headphones).

ALBUM ONE 7.13. *Reed play* (00:58)

<i>Reed play</i>	
Background	The initial source of the experiment emerged as a result of the group of bone-flute players meeting in January 2019, in Blaubeuren (discussed in the experiment called 'Wolves and isophony'). Anna Friederike Potengowski lent the author one of her GK1 reconstructions made from a swan radius made by Jean-Loup Ringot, which includes a single reed. During that weekend, the author tried it using a 'with, through and about' / 'sketching' / 'wayfaring' approach of experimental practice. From recorded documentation taken at the time, some parts of the sonic exploration were subsequently mixed in a one hour piece that runs on a loop as part of an exhibition in Växjö, Sweden (at Småland's museum). The reed play, heard every hour, is designed to annoy and amuse visitors for the foreseeable future.
Context	The context is simply to engage the instrument exploring the relation between player and instrument during a first encounter. The audio results are recorded by the author on a field recorder.
Composition	The engagement of the instrument through time as a composition is not formulated in terms of testing each note one by one. It is a holistic response to how the instrument feels in its engaging with the author. The author does not tend to play reed instruments so this experience is quite a new one, and this is disregarded as an advantage because there are no expectations, apart from that it might sound terrible. The patterns of sound are simply a direct response to the contact.
Observations	Like the GK1 swan radius models played using the 'ney' technique there is similarly considerable glissandic possibility because the tube is so short and small. The experience is very plastic in this sense whilst fixed pitches are possible but the feeling is one of instability. Playing the instrument as a clarinet gives a different feeling compared to playing GK1 with the 'ney' technique which produces a much softer tone quality, overall. The timbral amplitude of the clarinet is piercing, and with the top of the instrument blocked with the reed, the whole range of the instrument responds according to the physics of a tube blocked at one end. This means the overall sound from the range of available pitches is <i>en masse</i> an octave lower. The vibrations in the lips are felt quite strongly, and the pressure in the mouth to sustain the tone challenges the whole abdomen.
Results	The instrument, as Jean-Loup argues, is instantly playable (2020). However, it does not feel so stable. The level of pressure in the cheeks needed to produce the notes feels to require more effort than playing with Seeberger's method, but this may be due to the fact that the reed technique has not been developed proficiently as a skill by the author.
Comment	Whilst the instrument is playable instantly, the skill required to master tonal control is not that easy. This is the experience of the first encounter playing the reed flute from the author's perspective. As an accomplished flautist, the author also encountered problems playing GK1 reconstructions with a 'ney' technique at first, although she was not able to create any meaningful tone instantly whereas the reed flute does render some quality of sound straight away. Therefore, the subject of developing the necessary skills for producing pleasing tones on wind instruments, and the choice to play one way or another, may be discussed. The idea of the extended mind with regard to material engagement, along with the agency of the instrument, is considered a way of thinking about Swabian musicality in the Aurignacian, i.e., the choices that may have been made to play one way or another via experimentation, and/or guided by a preference for timbral character.

## 7.14 MONICA'S HOUSE

**Album: Sonic Debitage**

**Track called**  
Monica's house

**Summary**

The track is an excerpt from a practice session for solo bone flute in Kalmar Castle in preparation for the memorial of Monica Backström, from where the photograph (left) was subsequently taken in 2020. The flute is played obliquely, and engages a 'ney' method of voicing the instrument. The practice sessions explore the sense of liminality of the flute, and of the music. Processes of visual mental imagery for an organic score are also engaged in the experiment.

ALBUM ONE 7.14. *Monica's house* (01:00)

<i>Monica's house</i>	
Background	The audio track <i>Monica's House</i> is an extract from a series of recordings in Gröna salon at Kalmar Castle, March 4th 2020, in preparation for a remembrance service for Monica Backström [1939-2020]. The Swedish glass artist had made a miniature glass house for her own ashes. Backström's daughters had contacted the author with Backström's express wish when she had been alive that the author would play for this occasion. The liminal quality of the sound of the flute and the liminality of the flute's music is explored in these practice sessions, engaging a 14 cm reconstruction of GK1 voiced using a 'ney' embouchure.
Context	The idea concerns inaugurating the glass house with sound and life. Theoretical context was provided by Simon Wyatt's perspective on musical instruments and psychopomps (2009; 2010; 2016). Additional inspiration came from the Symposium of the International Study Group on Music Archaeology (ISGMA), at the Ethnologisches Museum in Berlin (9th - 12th September 2014) where Susanne Schietzel had talked about her work playing on her reconstruction of GK1 to patients with terminal cancer.
Composition	The fingers create short melodic patterns for trees and bushes. The flute describes a landscape around Backström's glass house as it paints this as a sonic plane onto the real-landscape plane creating a liminal space in-between. To begin with, each long note is the growing of a blade of grass.
Observations	As the flute warms up, and the muscles in the mouth are exercised, the tuning is pushed as far to the edge of each note becoming sharper without the note cracking. Then the tuning is steered wholesale into a lower playing range in which fingers still manipulate the pitches. The flute takes on a different material character when it is warm and moist inside. The honing of the embouchure, and attention to listening, converge in the quality of tone production.
Results	The quality of the flute's tone seems to fit with the acoustic and atmosphere in relation to its setting. The tuning is quite plastic and it is possible to adjust the overall tuning using the embouchure whilst still having control over the pitches with the fingers.
Comment	Skill in the coordination of breath, embouchure and fingering morphologies was developing through an attention to playing long notes representing growing blades of grass in a process evolving in real time. The experimental nature of the process is innovative because the score is evolving in real time. This situates practice and instrumental technique becomes improved.

## 7.15 THE CHILDREN



Original photo: Åsa Gunnarsson

### Album: Sonic Debitage

**Track called**  
He has it



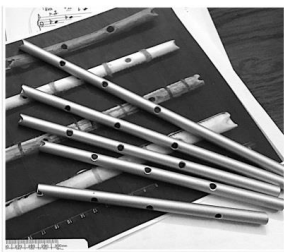
#### Summary

This track is an excerpt documenting the moments when a 10 year old school pupil plays two fundamental tones engaging a reconstruction of GK1 that is 14 cm long and made from aluminium. The student is playing the flute with a 'ney' embouchure.

ALBUM ONE 7.15. *He has it* (00:27)

<i>The children</i>	
Background	Musician and music teacher Åsa Gunnarsson invited the author into her school (Väckelsång, Sweden) to give a talk to class 4 (20 children between the ages of 9 and 10) on the subject of Stone Age sound tools. Prior to the talk in the summer term of 2021 the children had been out into the forest looking for organic sound tools, and playing with them with Gunnarsson. The author decided to give all the children an aluminium copy of GK1, and Adrian Gill duly made two dozen copies. The author returned to the school a month after her presentation to see what results, if any, leaving the flutes had had on the children.
Context	During the initial presentation to the children the author played her reconstruction of GK1 made from a swan radius. She left the children with some ideas about how to play their new flutes, including the illusive 'ney' technique that had evaded the Swedish flautist Jan Bengtson.
Observations	Gunnarsson, as part of her own research, had noted that the children were engaging with 'Stone Age' materials musically in innovative and inventive behaviours, and a large part of this seemed to be driven by having fun, and with laughter. On returning to the school the following month, the author noted that one child was engaging with the flute using a 'ney' technique, and this was recorded.
Results/ Comment	One child managed to produce a clear fundamental on GK1 and manipulating his fingers got a clear note on the second fundamental, playing the instrument with a 'ney' technique. Audio and video equipment at hand (Gunnarsson's mobile phone) was used to capture this. The technique provides no obstacle to all children.

## 7.16 ALUMINIUM FOR IVORY



Original Photos: Frances Gill

**Album: Sonic Debitage****Tracks called**

GK3 18 cm Ney  
 GK3 20 cm Ney  
 GK3 22 cm Ney  
 GK3 24 cm Ney  
 GK3 26 cm Ney  
 GK3 18 cm Shak  
 GK3 20 cm Shak  
 GK3 22 cm Shak  
 GK3 24 cm Shak  
 GK3 26 cm Shak

**Summary**

This track is a series of 10 excerpts from a performance by the author engaging five successive lengths of aluminium pipe, each reconstructed closely to copy the form of GK3. The author is engaging each instrument by playing it from both ends respectively. The notch end is being played as a vertical flute with a 'shak' embouchure, and the rimmed end is being played as an oblique flute using a 'ney' embouchure. The first track is of the author engaging with the shortest flute using the 'ney' method, progressing through all five lengths. This is then repeated in the same way playing the rimmed ends of all five flutes successively. The flute playing engaging the forest is documented in the extracts from the recording of the author's performance given outside in the open air. She is engaging the harmonic complexes, and aesthetic tonal possibilities of the five flutes blown from each end to find a best all-round length for GK3.

ALBUM ONE 7.16. GK3 18 cm Ney (00:47)

ALBUM ONE 7.17. GK3 20 cm Ney (00:39)

ALBUM ONE 7.18. GK3 22 cm Ney (00:33)

ALBUM ONE 7.19. GK3 24 cm Ney (00:49)

ALBUM ONE 7.20. GK3 26 cm Ney (00:38)

ALBUM ONE 7.21. GK3 18 cm Shak (00:38)

ALBUM ONE 7.22. GK3 20 cm Shak (00:48)

ALBUM ONE 7.23. GK3 22 cm Shak (00:30)

ALBUM ONE 7.24. GK3 24 cm Shak (00:49)

ALBUM ONE 7.25. GK3 26 cm (00:26)

<i>Aluminium for Ivory</i>	
Background	<p>The ten audio tracks (“GK3 18 cm Ney”, to “GK3 26 cm Shak”) come from recordings made in September 2021 from performances on five different flute lengths, all copying the pattern of fingerholes from GK3, and played using two different techniques. The experiment was formulated after asking Wulf Hein to make a reconstruction of GK3 from ivory to replicate the pattern of the original but to make it longer. To determine this length, the author bought some aluminium silver pipe which is similar in weight to a hollow-ivory tube, with a diameter of 8 mm and 1 mm wall thickness. The original GK3 is 187 mm long, and the lengths tested in this experiment are: - 18 cm; 20 cm; 22 cm; 24 cm; and 26 cm. During September 2021, Adrian Gill and F. Gill collaborated to cut these lengths from plumbing pipe, and drill holes into each length replicating the pattern of fingerholes from GK3. They calculated the centre of each fingerhole from various data including some new measurements from a photograph of GK3 [Figure 7.6].</p>
Context	<p>The context involves playing all five flute lengths outside in the open air to get some natural-world feedback, and from each end of each flute, with each particular end assigned to one of two particular blowing techniques. The aim is to determine a general sweet spot of length experienced as giving optimum-aesthetic sonority, technical accessibility, a particular or certain mood from the tonametric series (melodic chord/harmonic complex/pitch vocabulary) plus any other particular sonic sensations that make one of the flutes more desirable than the others. To test this, a series of sonic sketches on each pipe is executed through playing on the end with a notch using a normative flute embouchure – as though playing a <i>shakuhachi</i> (‘shak’) – and also on the end with the perfect rim – using an embouchure as though playing a <i>ney</i> (‘ney’) – in the knowledge that GK3 can be played from both ends in these ways respectively (e.g., Münzel and Potengowski 2015; Münzel et al. 2015; 2016).</p>
Composition	<p>The general idea for composition is to busk around experimenting with where the flutes lead into the melodic flutescape. This is a very free type of composition allowing the flute to limit the direction of the music. Because the fingerhole patterns for each model are the same, a sense of familiarity is expected to develop from the contact between the human fingers and the fingerholes, firstly through the series of sketches playing from one end, and then from the other. Familiarity with a type of melody is also anticipated to grow through the process in this sense. Each of the ten recordings begins after a short period of free experimentation, till all ten performances have been executed in succession.</p>
Observations	<p>Switching on the field recorder to record each of the ten episodes creates a feeling of the commitment to make music, where that music is unknown; it raises a sense of expectation and slight anxiety. The response from each flute feels to acknowledge this and they answer back in sonorous tones as though addressing the task and helping to lead the way. It starts to feel like a conversation between the body and the flute through which the net result is the music. For the <b>18 cm/Ney</b>: - the music feeling is wistful whilst hopeful, and super-bendy glissandi give a sensation as if the flute is talking, like a voice (and birds in the forest respond). <b>20 cm/Ney</b>: - also feels dreamy, and slides around, with a feeling of wanting to ascend, and with speed, also a feeling that the forest is listening. <b>22 cm/Ney</b>: - gives a similar dream-like feel with sense of harmonic balance inviting more glissandi. <b>24 cm/Ney</b>: - feels haunting and a little ‘jazzy’ with pitch-bending glissandi. <b>26 cm/Ney</b>: - the music gives a sense of trepidation and intrigue. <b>18 cm/Shak</b>: - Feels simpler with clean concise notes, a sense of brightness and strength in the tonal quality, with uppermost notes quite piercing. <b>20 cm/Shak</b>: - a similar feel of constricted directness with shrill uppermost tones. <b>22 cm/Shak</b>: - There is dissonant edge to this flute but with a sense of unity. <b>24 cm/Shak</b>: - feeling of balance but also the signal is like a warning to take care, but overall a feeling of positivity. <b>26 cm/Shak</b>: - flute feels warm and uplifting in mood.</p>

## Results

**18 cm/Ney:** - the tonametrical series (melodic chord) = F sharp minor melodic triad, first inversion. Technically, the falling slides (descending glissandi also referred to as the 'oral glissando' as coined by Potengowski in Münzel 2016) are possible from all available fundamentals, and the first octave of the lowest fundamental. Upper fundamental (all fingers open) is difficult to play. **20 cm/Ney:** - E minor triad first inversion (also suggests major triad with added 6th). Upper fundamental is also a kind of none-note. **22 cm/Ney:** - F sharp triad in root, with added major ninth. All four fundamentals are possible, and a similar pitch played using two fingerings gives change in timbre. Slides especially effective between larger melodic intervals of upper two fundamentals. **24 cm/Ney:** - E minor triad in root with added minor 9th. There is also a similar pitch over two fingerings. **26 cm/Ney:** - D sharp minor triad in root position, and everything is locked to this melodic chord. The highest fundamental is directly an octave higher than the lowest. **18 cm/Shak:** - the melodic chord suggests a B flat minor 7<sup>th</sup> or in another constellation, a D flat major 6th. There is a note than can be made with two different fingerings which reduces the overall harmonic palette. **20 cm/Shak:** - the cluster of notes creates a D flat major chord first inversion. There are three separate pitches that are achieved with different fingerings. **22 cm/Shak:** There is a relation between the bottom two fundamentals with the octave and a half harmonic on the first matching the octave harmonic on the second. The third and fourth fundamentals provide dissonance as the third fundamental is flattened (almost a G), and the fourth is a G natural. The melodic chord is comprised of F natural, F sharp, G and C sharp. **24 cm/Shak:** - fundamentals constitute a D flat triad in first inversion. There are discrepancies in the divergences from harmonics of the fundamentals, especially the higher fundamentals. **26 cm/Shak:** - The longer tube gives the lowest fundamental several overblown-harmonic possibilities. The upper fundamental gives two different signals; these are harmonically related or are catching two different parts of the tube, both very shrill in uppermost register. Lowest three fundamentals constitute a C sharp minor triad first inversion.

## Comment

Each of the two types of playing – differentiating the 'shak'-type playing on the notch, and the 'ney'-type playing on the rim – leads to a different sense of musical consciousness with some parallels experienced between both types of playing across all lengths. Very generally, the longer tubes are easier to blow up the octave with most fingers closed, whereas the fundamentals are more accessible on the shorter lengths although highest fundamentals on the shorter tubes are problematic. Whilst each flute has its own tonametric series, there are similar relations in terms of the physical acoustic spaces between the discreet pitches (melodic intervals), but where small deviations can change the character of the melodic chord, and therefore, the music. This gives each flute its own personality depending on its composite-pitch vocabulary. It may be possible to talk about a fetishisation of the plastic aspects to the shorter tubes played using the oral glissando technique because of the sensation whilst playing, and because of the effects that playing like this has on the birds audibly affected by the music. One main difference between the two blowing methods across all ten performances is the extent of plasticity playing with the 'ney' technique. This feels to become increasingly more flexible and plastic the shorter the tube using the 'ney' embouchure, but is almost non-existent playing with the 'shak' technique [Figure 7.7]. From a supplementary exercise that transcribed the tonametrical series of the five flutes played two ways each, the ney method, in addition, reveals a 'buzz' area where two notes are heard at once, one which is plastic and one which is fixed, (as previously discussed by Potengowski in Münzel and Potengowski 2015; Münzel et al. 2015; 2016). All the flutes have a certain charm, and I have located a best playing area (BPA) for each of them voiced in the two ways [Figure 7.8] but finally the complexion of the 22 cm length – from perspective of the feeling gained from playing both ends to include phenomenological-cognitive judgments about the character of the music along with technical accessibility of tone – renders the aluminium GK3 22 cm flute the chosen preferred length for a model made from real ivory, for the author [Figure 7.9].

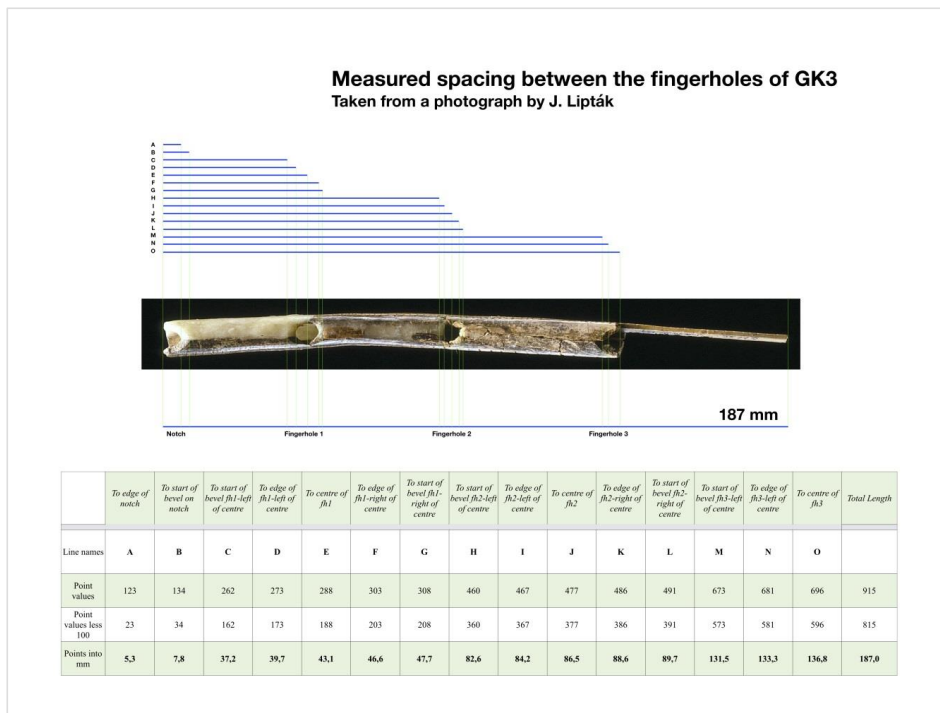


FIGURE 7.6. Fingerhole spacing for GK3 measured from a photograph

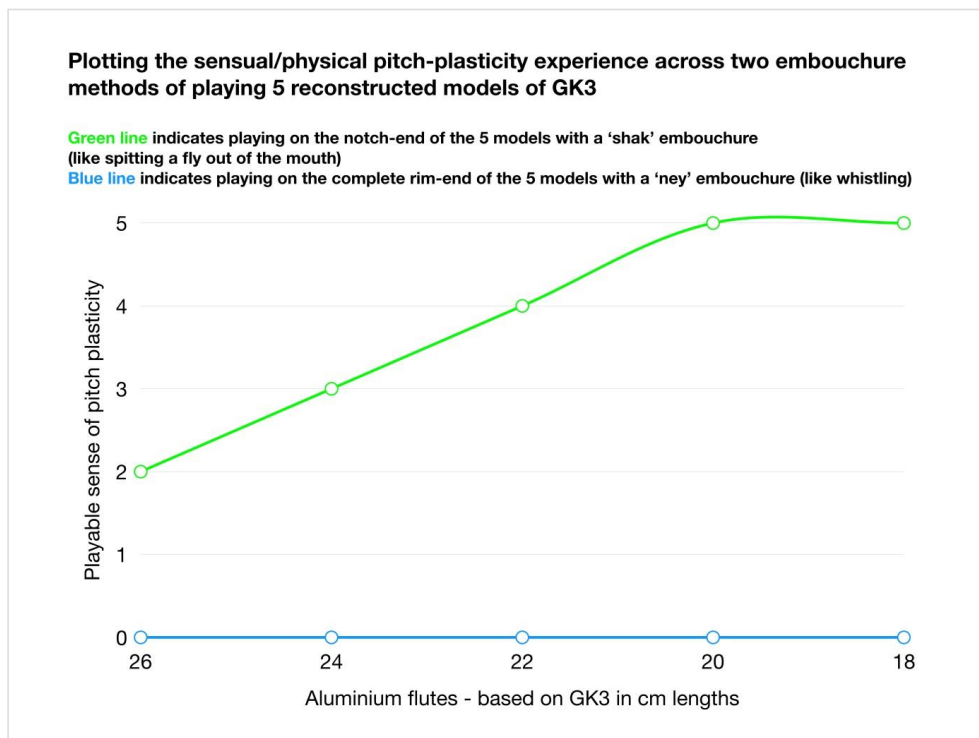


FIGURE 7.7. Pitch plasticity comparison between two embouchures across 5 reconstructions of GK3

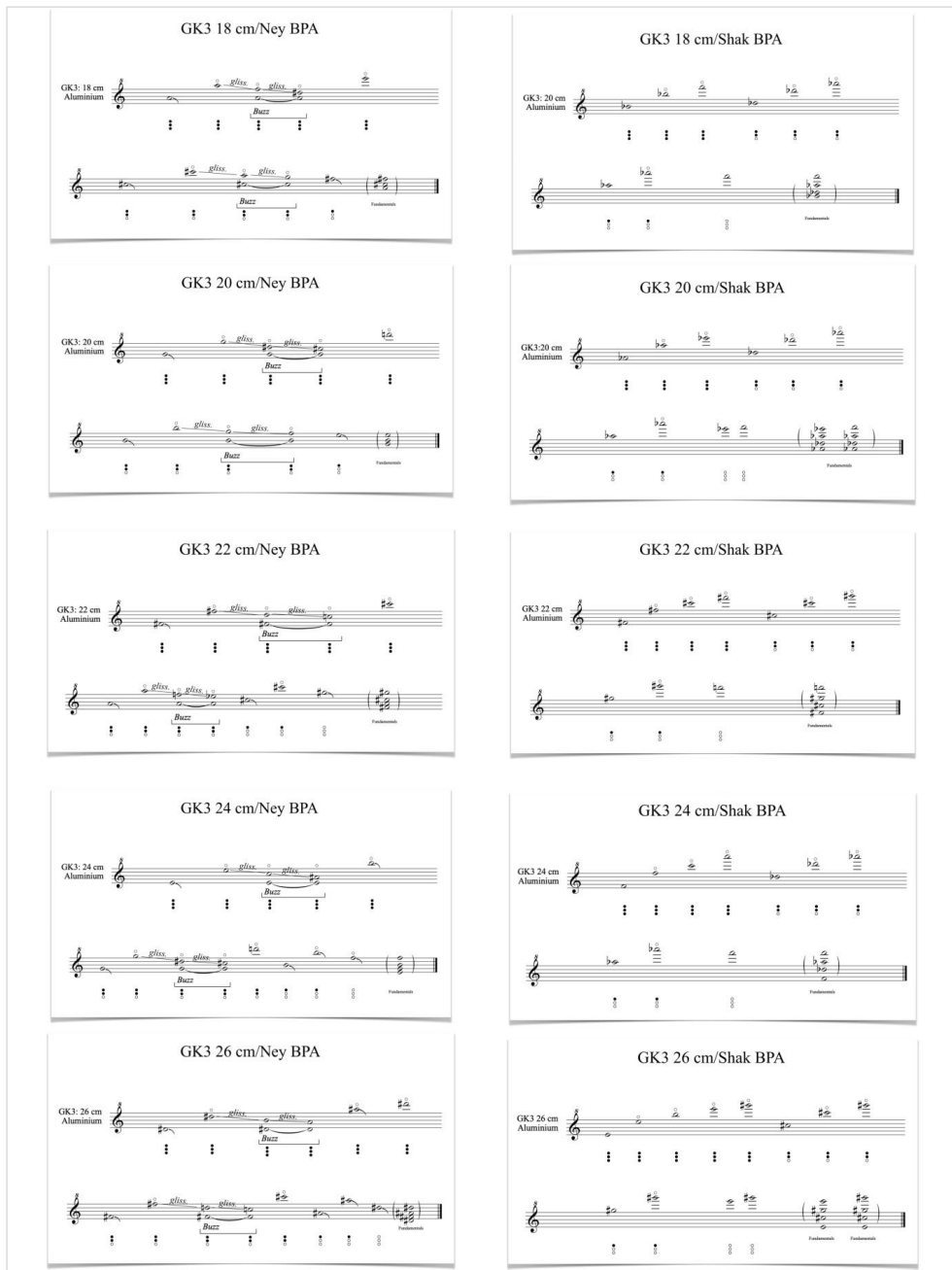


FIGURE 7.8. Best playing areas for 5 reconstructions of GK3 across two embouchures ('ney' and 'shak')

Musical score for "GK3 22 cm Ney" in G major (one sharp) and 8/8 time. The tempo is marked as quarter note = 96. The score consists of three staves of music.

**Staff 1:** Starts with a quarter note G4, followed by a triplet of eighth notes (A4, B4, C5), then a quarter note D5, a quarter note C5, and a quarter note B4. Dynamics: *accel.* over the first triplet, *rit.* over the second triplet, and *accel.* over the final triplet. Fingering diagrams below: three dots for the first triplet, three dots for the second triplet, and three dots for the final triplet.

**Staff 2:** Starts with a quarter note G4, followed by a triplet of eighth notes (A4, B4, C5), then a quarter note D5, a quarter note C5, and a quarter note B4. Dynamics: *rit.* over the first triplet, and *accel.* over the final triplet. Fingering diagrams below: a triplet of three dots, and three dots.

**Staff 3:** Starts with a quarter note G4, followed by a triplet of eighth notes (A4, B4, C5), then a quarter note D5, a quarter note C5, and a quarter note B4. Dynamics: *rit.* over the first triplet, *accel.* over the second triplet, and *rit.* over the final triplet. Fingering diagrams below: three dots, three dots, three dots, three dots, three dots, and three dots.

**Text below the score:**  
**What 22 cm can sound like on a model of GK3**  
 played as an oblique flute with a 'ney' embouchure  
 Track called *GK3 22 cm Ney* (on the album *Sonic Debitage*)

FIGURE 7.9. Transcription of the sonic sketch called "GK3 22 cm Ney"

## 7.17 ACROSS THE VALLEY FROM SIRGENSTEIN



Original photos: Mandy Bertram

**Album: Sonic Debitage**

**Track called**  
Still hear you



**Summary**

This 12 minute track is a series of extracts from an original recording lasting 25 minutes in which the author and archaeology colleague Mandy Bertram perform an experiment. Engaging her new 22 cm ivory GK3 reconstruction made by Wulf Hein, the author is stationed for the whole time of the experiment by the mouth of Sirgenstein Cave where she plays almost constantly (using the 'shak' method). In real time, Bertram takes a stroll down the side of the valley holding a field recorder which is recording the composition of her journey. She crosses the B492, the railway track, and the Ach River (between Blaubeuren and Schelklingen) making her way into the forest area at the other side of the valley between Hohle Fels and Geissenklösterle. Does Bertram still hear the flute?

ALBUM ONE 7.26. *Still hear you* (12:18)

<i>Across the valley from Sirgenstein</i>	
Background	Mandy Bertram's walk from Sirgenstein Cave to the other side of the Ach Valley [Figure 7.10, b. c.] is recorded as an audio file whilst the author stationed at Sirgenstein plays her new 22 cm ivory GK3 reconstruction made by Wulf Hein [7.5, a.]. The experiment took place on Sunday 14 <sup>th</sup> November 2021 early in the morning to reduce the possibility of sound pollution of traffic on the road.
Context	The hypothesis that the <i>Ach flutes</i> were played outside in the open air, and heard all over the valley, is tested.
Composition	Bertram's composition of the journey is recorded as digital wave file. It includes the sound of Bertram's walking, the cars, a train, birdsong, a dog, a passing cyclist and her voice, whilst the flute and voice of the author are a constant feature of the piece. The author uses a high-pitch call on the ivory flute and mimics this with her voice to call across the valley. It turns into a call using predominantly a falling perfect-fourth interval.
Observations	From the author's perspective, the view over the valley was obscured a little by trees but a sense of covering the entire valley at this point with the possibility of sound felt empowering. The sound was picked up the whole way by two sources; firstly the microphone on the field recorder, and secondly by Bertram's ears.
Results	The sound of the GK3 ivory flute is heard clearly over the valley, engaged as a vertical flute and played with a 'shak' embouchure.
Comment	Bertram's response in the experiment is vital to the data; even in a digital world of mobile telephones there is a point at which the two researchers cannot see each other, but the sound of the flute and voice calling from Sirgenstein is still heard clearly. This indicates that the marvel of the <i>Ach flute</i> phenomenon should be understood as extending from the cave into other parts of the valley. In extreme cold weather when many things are immobile, it is abducted that such sounds may have carried more status in the environment.

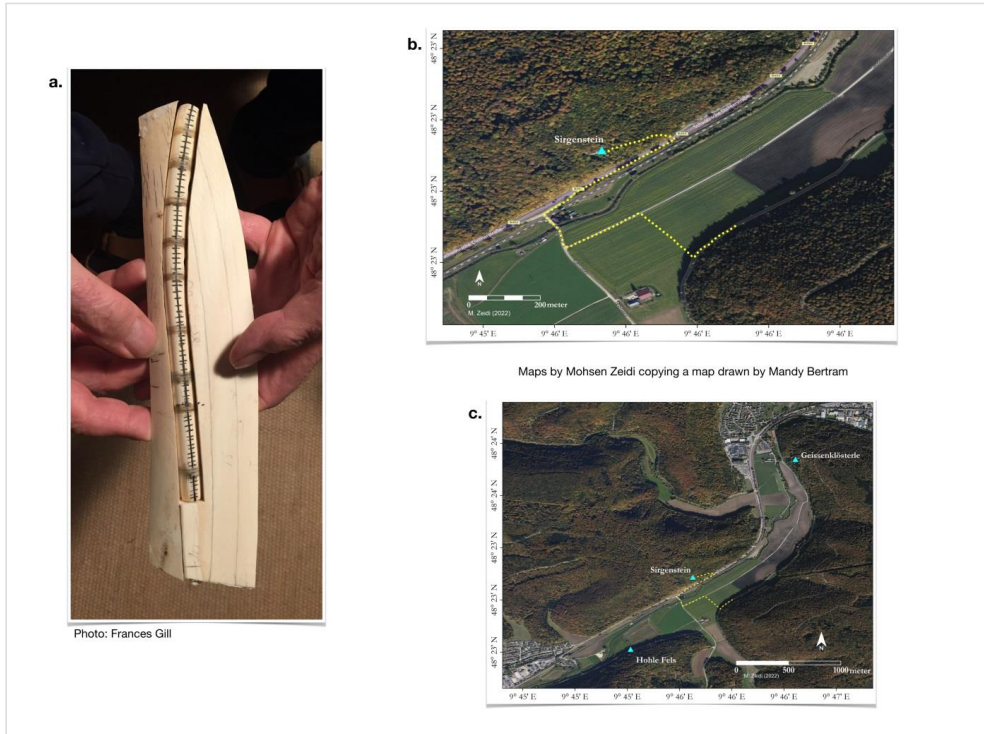


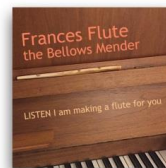
FIGURE 7.10. A Hein GK3 flute reconstruction, and Mandy Bertram's trek across the valley

a. Gills ivory GK3 reconstruction made by Wulf Hein according to her 22cm specification; and, b. & c. Mapping Mandy Bertram's trek from Sirgenstein to the other side of the Ach Valley. Maps created by Mohsen Zeidi especially for 'Aurignacian Rhapsody'. The caves shown on the map from left to right are: - Hohle Fels; Sirgenstein; and Geissenklösterle.

## 7.18 VULTURE-RADIUS FLUTE



Original Photo: Frances Gill



**Album: LISTEN**  
**I am making a flute for you**

**Tracks called**  
 Psychopomp I  
 Ring notching  
 Swilling  
 Smoothing and sanding  
 Psychopomp II  
 Fingerhole making  
 More fingerhole scraping  
 Last hole finding  
 Psychopomp III

**Summary**

The tracks: - Ring notching; Swilling; Smoothing and Sanding; Fingerhole making; More finger hole scraping; and Last hole finding; document the author engaging with a vulture radius bone as it transforms into a reconstruction of HF1. The three tracks as related to Psychopomps are from one complete performance which has been separated into three extracts. The author engages the flute in an exploration of its instrumental capacity using this as a musical score. It begins with the lower fundamentals and their harmonics before moving to the higher fundamentals. The emphasis of the engagement is sonority in terms of tonal quality and control; the piece in three movements is deliberately long, slow moving, towards intimacy and ethereality. The flute is played in an oblique position using a 'ney' embouchure.

ALBUM TWO 7.1. *Psychopomp I* (12:39)

ALBUM TWO 7.2. *Ring notching* (08:17)

ALBUM TWO 7.3. *Swilling* (04:01)

ALBUM TWO 7.4. *Smoothing and sanding* (05:13)

ALBUM TWO 7.5. *Psychopomp II* (04:09)

ALBUM TWO 7.6. *Fingerhole making* (08:04)

ALBUM TWO 7.7. *More fingerhole scraping* (09:49)

ALBUM TWO 7.8. *Last hole finding* (06:44)

ALBUM TWO 7.9. *Psychopomp III* (06:48)

## Vulture-radius flute

Background	<p>The nine audio tracks (<i>Psychopomp I; Ring notching; Swilling; Smoothing and sanding; Psychopomp II; Fingerhole making; More fingerhole scraping; Last hole finding; Psychopomp III</i>) are from recordings made between 14<sup>th</sup> and 18<sup>th</sup> December 2022. The recordings took place at Visby International Centre for Composers. The author had asked Jean-Loup Ringot for the possibility of him acquiring a vulture radius for her with both epiphyses intact. In 2017 he acquired one from the Sierra de Guara region of Aragon in Spain which had been transported to him care of Raquel Jimenez Pasadolo from the Centro de Recuperación de Fauna Silvestre de la Alfranca, Universidad di Valladolid. The bird had died naturally. Wild vulture is a species protected under the Convention on International Trade in Endangered Species of Wild Fauna and Flora, so may not be used for commercial purposes. This means performing music on vulture bones and releasing music made from vulture bones goes against the convention if there is commerce involved. This is why the music from this experiment (on the digital album called '<i>LISTEN I am making a flute for you</i>') is available without mandatory charge. Flint blades from Lascaux given to the author by Wulf Hein – who shared blades that he had left over after his work involved in Lascaux 4 – provided the tools for the author to work with. A combination of these gifts from both Ringot and Hein made this experiment feel super special for the author. The bone was given to the author before her father died; of personal relevance to her is Wyatt's work on "Musiquialia and Vultural Adaptation" who writes that "An animistic perspective may regard the vulture as able to free the soul of a deceased creature, since the transformation from corpse to bones reflects the journey of the soul from the land of the living to the land of the dead in many cultures" (2016a: 172 referring to Parker-Pearson 1999: 22).</p>
Context	<p>Gill decided to wait till the time was right to make the 'vulture flute' and a week's residence at the Composer's Hall (previously postponed due to COVID) seemed the right time to make a flute from a vulture bone. The context entails starting with the raw bone and working to reconstruct a finished flute engaging the human, flint blades and the vulture bone. In the context for this experiment this happens without supervision, external pressure, advice, distraction or interruption. The space for the experiment was set up with a cushion on the floor sitting with the flute beneath two cardioid microphones in the DBW room of Studio Beta with a view to making the flute whilst sitting on the floor. Rubber gloves, three different roughnesses of sand paper (a sandstone was not available at the time) and some old dust sheets were used to complete the experiment's implements. Finally the silver copy of HF1 was used for comparison purposes as a visual and haptic guide. The process as a series of sessions is recorded over a few days [Figure 7.11] inspired by experimental-archaeology perspectives from James Dilly's attitude to 'time and practice' e.g., tests of accuracy and knowledge of mechanics, and not speed (2021: 13:42 - 13:50).</p>
Composition	<p>The idea for composition is that the sounds of the process become part of the piece. Taking inspiration from James Dilly who refers to sound whilst knapping – Dilly says that "you can see that half-centimetre depth really crisp-crack noise" (Dilly, 2021b: 11:15 - 11: 24) – compositional interest is aroused theoretically from how the sounds from making a bone flute develop through processes, as a form of Experimental Music. During Dilly's knapping demonstrations there are periods where he develops a steady and repetitive rhythmic action which creates quaver-type energy with an emphasis on alternative quavers (e.g., Dilly 2021b: 44:45 - 45:51). Any melodic sequences that emerge from the bone-flute-making process therefore are not considered to be more important than the whole soundscape in action. The sessions are recorded for removing the epiphyses, cleaning and smoothing the inside and the outside of the bone tube. Each finger hole has two sessions dedicated to it; one to start a fingerhole, and one that follows to finish it. The three tracks <i>Psychopomp I, Psychopomp II and Psychopomp III</i> from a live session at the end of the flute-making process are enhanced later in production in which lingering echoes are left resonating as new notes create textures of more than one note, forming harmonic complexes. This piece is transcribed so as to create a notational device for subsequent performance.</p>
Observations	<p>Because vulture bone is not easy to acquire and vulture is a protected species, the process of working with a real vulture radius and flint blades from Hein feels 'holy'. A sense of excited trepidation is noted at the start of the process with no supervisor on hand to guide. Removing the bone epiphyses using a ring-notch technique involves opening up the bone and the smell of the inside of the bone tube is noted and releases a memory of working with two other bone flutes previously. After cleansing, and mainly using the left hand as a vice with the bone on the knee, fingerholes are made sawing back and forth with a flint blade using the right hand. However using the left hand with a palm grip and the left thumb as a chisel, this second technique tends to be used when fingerhole perforations are underway. Many of the techniques involve constant repetitive rhythmic episodes and these are alternated with episodes of trying out the tones from the flute as the radius progresses into a flute. The decision for the number and placement of finger holes emerged during the process of the experiment. The silver replica of HF1 was used to consider that the apparent double notch as a breakage (and not even therefore a single notch), and possibly the situation at the other end of the artefact is also a breakage [Figure 7.12]. This is not to ignore the evidence for a notch and a fifth fingerhole, but to consider the alternative. Tones tend to fall into a diatonic series, with the tonic, mediant, subdominant, dominant and submediant tones represented. The upper fingerhole produces different tones if caught in different ways but is essentially an octave above its (lower) adjacent fundamental. This gives the flute a sense of balance in terms of limiting its tonal spectrum and for intonation/tuning possibilities. The embouchure technique used is the 'ney' method. The length of the new flute which is slightly bowed is just under 22 cm (measured not across the string).</p>

## Results

The electric light in the studio highlighted the outer edges of fingerholes on the silver cast of HF1 from a resin replica. The two ends of the silver copy do not catch the light in the same way, especially the so-called double notch. In the process of the experiment (as a ritualisation) a decision was taken to make the radius bone into a flute with four fingerholes. The flute plays beautifully as a four-fingered flute using the pattern from HF1 with the so-called double-notch end being the distal end of this new flute reconstruction (listen to track 9 Psychopomp III on Album Two). Each episode was recorded and created later as an independent track in (studio) production. Time was also needed to start each recording and put on rubber gloves, and to ensure the studio was kept clean etc. The timings of each session are compared in [Figure 7.13] from the data in studio production. What is noticed for the fingerhole making process is a change in the timings for sessions as the fingerhole making process progresses through the time taken to make all four fingerholes. The time taken to finish each fingerhole is longer for the latter two holes, as compared to the first two in which more time is taken initiating the fingerhole-making process. This demonstrates increased proficiency of working towards the end of the fingerhole making series, and more attention to the end of the fingerhole-making craft. Overall, the time taken to perform each fingerhole decreases as the process ensues. The five fundamentals heard from a playing position with all fingers on to all fingers off (taking one off at a time from the bottom upwards) are F5, B ♭ 5, D6, G6 and G7, with some clear and easy-to-sound notes from the middle three tones. Like other flutes with fingerholes close to the blowing end, the note is unstable and different tones can be caught depending on the discreet embouchure and just where the jet of air is being directed whilst blowing down the tube. This along with glissandi possibilities provides a balanced palette of tonal colour in terms of timbre and pitch complexes with a few sonic spices here and there.

## Comment

Working with flint brought back memories of working guided by Wulf Hein, the smell of working with bone and the pain of working with sharp flint. Considering what this process is doing to the plastic brain and the body in terms of enactive signification (what the sign of the process is actually doing rather than meaning), material agency (what behaviours the materials are causing) and extended mind (like the mind going to the end of a blind-person's stick), the skills and knowledge can be regarded as an epistemological complex. Hand-eye coordination is quite intrinsic to the flint working, but hand-mouth-ear coordination is intrinsic to the sound production process. Morphological positions for the mouth in relation to the fine tuning of sounds causes fluid transitions in the experimental process of moving from one note to another in a series of melodic steps. In this sense the process limited by the material guides the composing of melodic form. The three flute tracks (1, 5 and 9) on Album Two actually come from one extended recording which started with playing around with moving just the bottom two finger holes. This was notated as a study for the bottom two finger holes. The composition then worked towards playing with the upper two fingerings, and eventually all fingerings. Accepting that sometimes just breathy air may emanate from the flute and not regarding these sounds as incorrect or 'duff' notes is like a deconstruction of Western expectation, as though the sounds that equal failure become sounds that equal strength, poise and control. Getting beyond the W.E.I.R.D mentality allows a closer intimacy with the personal sounds and releases the body from expectations. Like stalking prey, the movements are very small whilst the body remains very still, and in which breathing is kept in check in every nanosecond. Time is broken down into a new tempo that expands each moment into a longer and more lucid unfolding and sense of becoming like being transported into a different cosmological realm. The flute gives the plasticity of the mind a break from these expectations of being a court musician for archaeologists and introduces the notion of the hunter gatherer mind in this sense. Using a notion of mountain or cave echo brings the possibility to play new notes whilst resonances of previous notes are still audible facilitating harmonic textures. The release of these processes allows the material to play a part in guiding the new-temporal sonic object an iconic signification of weightlessness and transparency, and feeling of altitude like floating in the sky. The music then extends the mind into these spatial spheres beyond the immediate world and perhaps into the next.

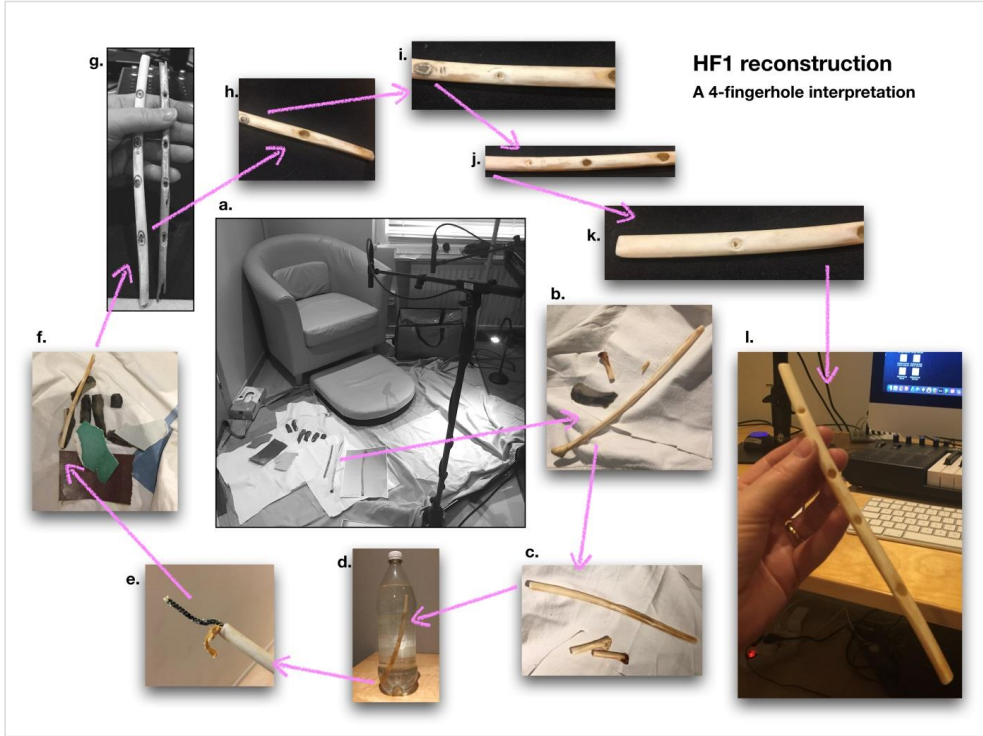


FIGURE 7.11. Step by step reconstruction of HF1

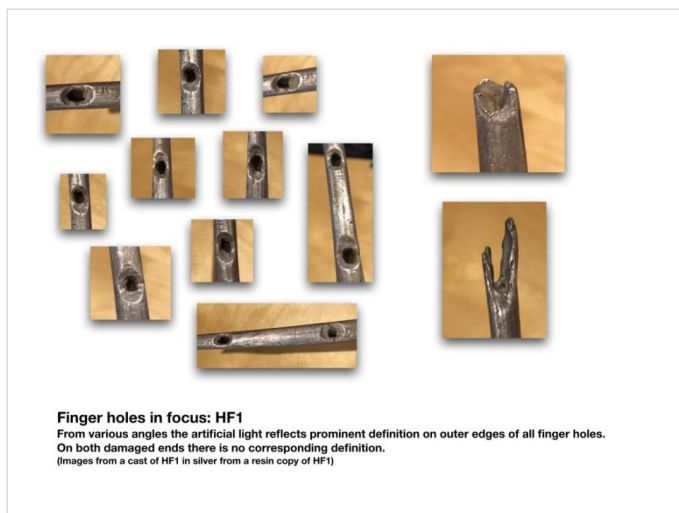


FIGURE 7.12. Strip lighting and a silver copy of HF1 made by Jennie Gill

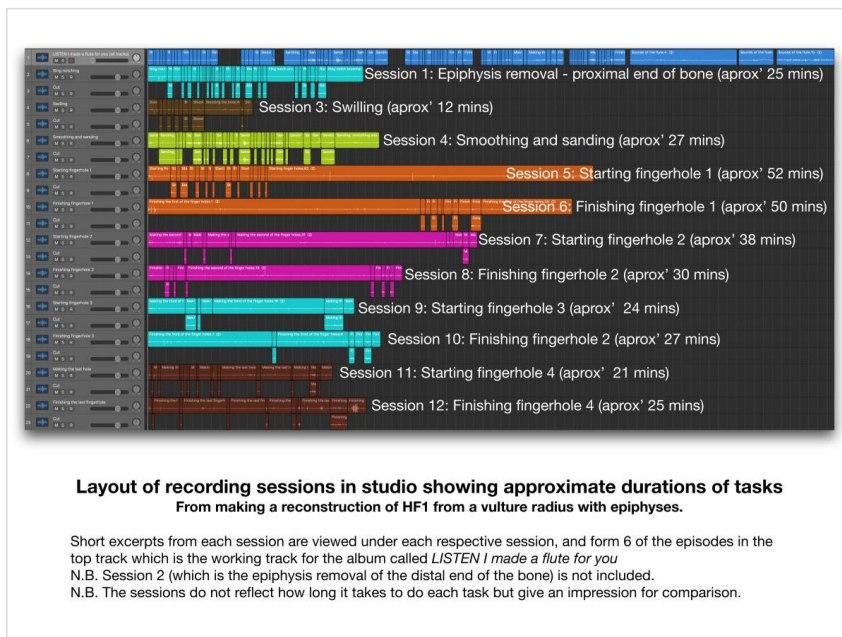


FIGURE 7.13. Sessions layout for HF1 reconstruction experiment

## 7.19 THE BULLROARERS



Original Photos: Frances Gill

**Album: Sonic Debitage****Track called**

Bullroarer one, no holes  
 Bullroarer two, 4 holes

**Summary**

These tracks are consecutive extracts from a session recorded outside in the open air in which Samuel Gill is engaging a baton firstly made without holes, and following this, another baton with holes. The second instrument copies the pattern of holes that is found on a pierced baton of ivory from Geissenklosterle found in Aurignacian layers. These reconstructed batons are each tied to a long piece of string and are whirled around the body. Do pierced batons perform as bullroarers, and does the experience differ from playing a conventional bull roarer without holes?

ALBUM ONE 7.27. *Bullroarer one, no holes* (00:52)

ALBUM ONE 7.28. *Bullroarer two, 4 holes* (01:03)

<i>Bullroarers</i>	
Background	There is a bullroarer in an Aurignacian Swabian context at Vogelherd (Holdermann 2001: 92) which Dutkiewicz reports that Riek (1934) had referred to as a <i>schwirrblatt</i> (whirling leaf). Dutkiewicz refers to this as a <i>lochstab</i> (perforated stick). Together with three other similar finds she also refers to these types of find as spatulas and smoothers. One of these four similar leaf-type objects in Aurignacian layers is found at Geissenklösterle with four holes (e.g., Hahn 1988: plate 45.19; Conard and Bolus 2006: 214/fig. 13.25; Dutkiewicz 2021: 325; 429/plate 47.1-4). Conard and Bolus refer to it as a <i>bâton percé</i> (pierced baton). The similarity in form suggests to the author that these may be bullroarers too but that they have not been considered so because of their perforations, presuming an assumption that the presence of holes would prevent a pierced baton from being played and successfully sounded as a bullroarer. The experiment took place on Saturday 1 <sup>st</sup> April 2023 playing firstly a baton reconstruction made without holes, and secondly a baton reconstructed to include the holes that are found on the original GK find.
Context	This collaboration is between Adrian and Samuel Gill, and the author. Firstly, copies of the pierced baton are reconstructed in wood copying the pattern of holes from the original, and then a duplicate copy is reconstructed but without holes. The second part of the experiment is to play both of these and compare them from a perspective of sonic output, and from how they feel to the instrumentalist playing them. The audio recordings also allow comparisons to be made. Wooden spatulas that nowadays are given free of charge to customers for mixing paint from hardware shops are used to make the reconstructions.
Composition	The form of the music is expected to evolve as a secondary consideration after the prime consideration of testing each instrument as a sound tool. The idea is to use traditional bullroarer playing techniques that are known, such as swinging one around on the end of a piece of string in a large circle above the head. Other possibilities that may emerge in context of the experiment are also to be considered.
Observations	The player had immediate success with the baton without holes which works like a standard bullroarer. Both swirling the soundtool above the head and also in front of the body in a figure-of-eight pattern produces a strong 'standard' bullroarer signal. The one with the holes feels a little more difficult to play and there is no response from a figure-of-eight pattern. However swirling the instrument above the head renders a comparably good and fine response in a similar way to the one without holes. The harder both soundtools are rotated, the stronger and more impressive the sound overall.
Results	Pierced batons can be played as bullroarers but take a little more strength to match the whizzing-patterns of sound from playing bullroarers without holes.
Comment	Whatever pierced batons may have been made, and used for – and this does remain unknown – pierced batons can clearly be played like bullroarers which may be considered a secondary function if they were used primarily for something else. This line of enquiry may have some bearing on understanding what they were originally intended for, and if they had a dual purpose in the Aurignacian, with one purpose being as a musical instrument. It is for this reason that I consider this find a musical instrument of the Aurignacian <i>Achtal</i> as a 'free' aerophone according to the rules of Cajså Lund's probability group system. See table below.

TABLE 7.1. Identifying a pierced baton at Geissenklösterle as a bullroarer

<i>Cave</i>	<i>Square and find number</i>	<i>Description</i>	<i>Material</i>	<i>Geo-horizon</i>	<i>Archaeo-horizon</i>	<i>References</i>	<i>LPG according to Frances Gill</i>
GK	67-1016	Pierced baton / Bullroarer	Ivory	13	IIa/IIb	Hahn 1988: plate 45/19; Conard and Bolus 2006: 214/fig.13.25; Dutkiewicz 2021: 325; 429/plate 47.1-4.	4

## 8. IMMUTABLE FLUTE

## 8.1 INTRODUCTION: THE PARADOX OF THE ICON

There are a number of threads running through the progression of experiments in this thesis. More often than not, one thing leads on to another. Is this relevant for archaeological interpretation? Working with this type of archaeological material comes with its own reconstruction particularities. The experimental work demands a whole raft of behavioural requirements. All instruments I have made myself or in collaboration with others, with a couple of exceptions<sup>83</sup> [Figure 8.1]. The requirement to make your own flute in itself creates new situations before one has even started thinking about what it will sound like and what will be played on it, who it will be played with, and where, and when, and why. Procuring swan radii, vulture radii and mammoth ivory directed and influenced the chronology of experiments; these activities are not easy to control. Whilst context plays a role in such outcomes in various ways diachronically, it starts to emerge that these processes in themselves are *like* the phenomenon under study in respect of fluting. The past, in this sense, is reflected in the present. Aurignacian Achtalians also would have first required a material to make a flute from, and they would have needed tools to make a flute, but this is not to assert that what I do is somehow a duplication of what happened in the past because that would be ridiculous.

Whilst it is useful to look back at what has happened, *a posteriori* using inductive logic, and also predict *a priori*, what might be expected using deductive logic, I am making the point in this thesis that this is not the only way to go about Experimental Archaeology, even if some suggest that for Music Archaeology that it is an impossible choice between only the two options (e.g., García Benito *et al.* 2016a: 249). Simply put, the surprises and *eureka* moments that happen *en route* in contextual-archaeological experiments are theorised as a means to get insight into what phenomena are like by using abduction logic, engaging *with, through and about* materials, semiotically, as dynamic icons [Figure 8.2]. The experiments in this research are often designed to release what I call the *experimental dimension* [Figure 6.1] facilitating a transparency of possibility recognised in context of the experiment, laying the ground work for chance events to occur spontaneously. It is the experience of the human in the moment that I believe has significance for studying phenomena via such approaches in reconstruction because whilst unlike symbols (which we know are fakes) and indices (which we know are real), the crafty icon feels real even though we know that it is fake. The icon therefore confuses us, or as Malafouris describes it regarding such processes as fetishisation (2013) there is conflation between the signifier and signified. What seems like a pipe is not a pipe [Figure 8.3]. Maybe a sense of ‘realness’ will dominate a sense of ‘going through the motions’ like it did for the opera singer suddenly and actually terrified on stage (Damasio 1994: 149). The icon would seem to be a paradox which is attractive for the purpose of finding out what phenomena are like because the privilege affords real experience which can be

---

<sup>83</sup> I commissioned a flute from Erik Sampson and later a flute from Wulf Hein. I also borrowed a flute made by Anna Friederike Potogowski and Johannes Wiedmann for one experiment.

recorded, documented and recognised in different ways. In fact the methods of collecting the experiences may be inventive and innovative in their own way.

In conclusion, I believe that it is too easy to get caught in the idea of the ‘end product’ rather than appreciate the experimental process as also bearing similarity to processes experienced by humans responsible for the Swabian Aurignacian, even when we use anachronisms. Do we even know if the doing or the making process is less or more authentic – in cognitive respects – than the flute reconstructions, or what we read from the original artefacts themselves? Inversely, the reconstruction GK3-FG/FT/PG/PS-1(2012) as a process investigates authentic ivory working, and yet the end product does not look anything like an *Ach flute*. It is clear to me and to others too, that being a flautist in the act of archaeological reconstruction isn’t about faking an event but rather effecting a situation which constitutes a real engagement now in the present. Simon Wyatt in his poem *Hollow Rumble of Wings* (2021) [Figure 8.4] infers a synergy between bird, flute and player which is a timeless engagement. The poem also indicates that where the bird, the flute, and the player all start and end is impossible to calibrate. To experience an image taken by Wulf Hein [Figure 8.5] showing a room where there is a vulture, a flautist and a flute (made from a vulture radius) together in the same physical context also seems to make the point that these contextual situations we create are in themselves real ones. The vulture’s wings seem like a large cloak in span mode, elsewhere a swan opens its wings looking to embrace [Figure 8.6] yet the photographer behind the guard of a lens, and our processing of images from safe distances, is theatre. The vulture is not a vulture and the swans are not swans. They are photographs (static icons) of these birds. The interface between human and non-human animals in the wild is far from this order, as one is reminded, reading the animal poetry of Ted Hughes<sup>84</sup>, and encountering the ontological relation between flautist and bird in the phoenix of Wyatt’s poem.

## 8.2 LIFE SITUATIONS

Setting up a given experiment is one thing, but real life situations in themselves can become experimental opportunities, or rather experiments are always life situations. Eureka moments are not experienced by design, but catch us by surprise in all sorts of strange places, e.g., for Archimedes, it was bath time. A request to perform at a funeral of a famous Swedish artist propelled me into a large room in a castle where I spent the day before the event practising on GK1-FG-1(2016) in the new space. This wasn’t playing a flute for the sake of an experiment, but for the purpose of honouring the life of a human at the express wishes of that human whose request was only imparted after she had died. I ask why this context shouldn’t be considered any less acute in its fluting engagement than in some type of artificial lab, if an artificial lab even exists for immutable fluting behaviour. I would even argue that such real-life context is pushing open the possibilities for experimental completeness even further – in the case for the *Ach flutes* – than experiments confined only to hypo-deduction. During this practice session in the castle, I reported the following technical *fetishisation*.

---

<sup>84</sup> I will not reference any specific poems by Ted Hughes.

As the flute warms up, and the muscles in the mouth are exercised, the tuning is pushed as far to the edge of each note becoming sharper without the note cracking. Then the tuning is steered wholesale into a lower playing range in which fingers still manipulate the pitches. The flute takes on a different material character when it is warm and moist inside. The honing of the embouchure, and attention to listening, converge in the quality of tone production.

Experiment 7.14 called 'Monica's house' (Observations)

What do I mean about the playing range becoming wholesale flatter? I abduct that the warm wetness inside the tube, created by my breath, coats the walls of the interior of the bone momentarily with a kind of insulating gloss giving the flute a new physical internal character. The cylindrical bone interior becomes even smoother and its dimension changes slightly because of this. There is sudden uniformity of heat and smoothness. In such a situation the cognitive engagement is excited during the process; the physical relation between fingers and pitch are paired creating a moment of technical, artistic and musical control over the instrument's tone across pitches, absolutely and suddenly controlled by finger movements. It felt, at the time, to be what some flautists may call *in the zone of tone*.

### 8.3 ACOUSTIC SPACES

Due to the fact that such situations (like the flautist preparing to play at a funeral) are real – often heightened by emotional salience which we know that music (mysteriously) helps to foster – the capacity to recall musical experience as an event of the past would seem to be a cognitive marvel of individual and/or collective memory. In the very first experiment (Experiment 7.1 called 'Seeberger's flute') I was thrown in at the deep end without any chance to prepare, bringing only what I could (my own fluting experience) to the task of playing one of Seeberger's flutes. The first impression was that the sounds are not especially loud:

Three different pitches are noted and the sounds feel intimate and quiet.

Experiment 7.1 called 'Seeberger's flute' (Observations)

Despite the apparent quietness, this in itself should be noted as a sonic misnomer. Recalling those first visits to Blaubeuren museum where this experience took place (before its extensive renovation), there was one particular experience that I always recall, and this was a surprise shared and discussed by many visitors. This was the sounding of a recording of Seeberger's playing which could be heard all over the old museum from his recordings, set in motion by visitors pressing buttons to hear the sounds of the flutes. This wasn't something that only I experienced; it was noticed by everyone. There is a collective memory of the sound of the tiny flute permeating into every nook and cranny of the museum. The place in relation to the flute I also experienced from playing on Seeberger's flute in the museum's acoustic:

The timbre is sinusoidal and whilst the amplitude is quiet, the frequencies are high so that the sound of the tiny instrument cuts into the atmosphere.

## Experiment 7.1 called 'Seeberger's flute' (Results)

From this it is concluded that whilst we know that sounds go round corners, some types of sounds outperform others. Seeberger's GK1 reconstruction would seem to be one such penetrative case. I also recall playing on GK1-FG/WH-1(2011) for the first time at home encountering the same obstacles that I had experienced on first playing Seeberger's flute in the museum, i.e., wispieness and lack of clarity in tonal quality before a good tone emerged. I was therefore surprised when my son came running into the room asking me "what's that sound?" Even when *a good tone* is not developed, such flutings are detectable and may easily catch the attention of others (*cf.* Wyatt 2016b 201-205). This also puts me in mind of playing jazz flute trying to catch the timbral resonance that lies between the fundamental and first octave, which can be compared with the following perspective:

In a discussion of shakuhachi playing, Wallmark (2012, 1) cites a manuscript from the 1820s which states that a good tone should not be sought. This stance draws a line between musical and spiritual practice (Wyatt and García Benito 2016b: 197 footnote 1).

How effectively the *Ach flutes* can be heard across much longer distances and in the open air was the focus of one particular experiment in the Ach Valley. This is where I tested how far the sound of GK3-FG/WH-1(2021) would carry across the valley:

...there is a point at which the two researchers cannot see each other, but the sound of the flute and voice calling from Sirgenstein is still heard clearly. This indicates that the marvel of the *Ach flute* phenomenon should be understood as extending from the cave into other parts of the valley.

Experiment 7.17 called 'Across the valley from Sirgenstein (Comment)

On an earlier occasion playing from the other side of the valley at Geissenkloesterle with the flute GK3-FG/FT/PG/PS-1(2012), I had written:

If the weather had been windy that day it is questionable as to whether any reasonable sound would have been possible from this instrument.

Experiment 7.3 called 'Playing at Geissenklösterle (Comment)

The experimental context at Geissenklösterle however was different to Sirgenstein in respect of the model of flute being played. GK3-FG/FT/PG/PS-1(2012) in itself does not closely resemble any of the *Ach flutes* because its design was led by a different focus on the material working of mammoth-ivory.

A problem with the cave shelter Geissenklösterle is that it is not easy to access in order to play inside it. It is light inside due to its exposed character geologically, and rather surreal with drizzles of long hanging red strings that are suspended vertically from a metal grid hovering under the ceiling connected to the gate and walls. The red strings kept plumb with weights at their ends mark the archaeological squares and this symmetry adds to the impression of an art installation, magnified by heavy metal gates in close proximity. As a substitute for how Geissenklösterle may

once have been, I think instead of the similarly smallish space one encounters inside the cave, Sirgenstein. Sirgenstein is a cave not only similar to Geissenklösterle in size but also located in a position high in the fells of the Ach Valley. On the same day, and before the experiment ‘Across the valley from Sirgenstein’, I generated some sound sketches inside the cave with Mandy Bertram which I have not featured in Chapter Seven of this thesis. I can briefly report here that playing with the ‘ney’ technique inside the small dark cave brought a more soothing ambience than the shrillness of the ‘shak’ technique, experienced by playing different ends of GK3-FG/WH-1(2021). It made the cave feel rather comfortable and homely. The acoustic suggests softer music in terms of both timbre and amplitude.

“Go away you scary monster” were the words I initially internalised when I first initiated an experiment with GK1-FG-1(2016) - a swan radius with newly-scraped fingerholes copying GK1. This was because the context of the experiment was the real life fluting situation of a lullaby. The words and the melody at first seemed to fit together emanating from the situation holistically. The acoustic atmosphere in the experimental context I observed as follows:

The setting playing the flute feels very natural, where ears are acutely tuned into the night-time atmosphere that correspondingly is very quiet everywhere. The lack of amplitude is no problem since the high pitches carry so well, and the music becomes a dominant part of the acoustic in situ of the experiment.

Experiment 7.9 called ‘Copying Seeberger’ (Comment)

One of the salient points to be taken from this first experience of the flute GK1-FG-1(2016) was the requirement to play quietly whilst still maintaining control of the tone, although as observed above playing inside Sirgenstein, timbral quality is mellower using the ‘ney’ technique so is a good option for playing a lullaby. All good flautists know that to play softly is a challenge because the reduction in air pressure can lead to the tones sounding flatter. However, the techniques for influencing tuning between a flute played as a ‘ney’, and as a ‘shak’ are different; for a flute played with the ‘ney’ technique, morphology of the buccal cavity is required, whereas blowing utilising a ‘shak’ (or normative flute) technique, requires more effective movements from the chin. In both circumstances however, this is where the human *musical ear* is needed to guide intonation, which in the ‘lullaby’ context of the experiment happened to be particularly attuned because of a secondary musical focus which was anticipating new fingering possibilities about to set forth new musical pitches for the first time.

Prior to this lullaby experiment (Experiment 7.9 called ‘Copying Seeberger’) I had been experimenting exclusively with the bendy-blowing technique (‘ney’ or Seeberger technique, facilitating the oral glissando) on the same radius bone prior to it having fingerholes. Blowing techniques (together with the harmonic series emanating from 14 cm-long swan-wing radii and ulnae) was a focus on *tube flutes* in the 2014 Experiment 7.6 called ‘Shak or Ney?’ In this prior experiment it was necessary to isolate the embouchure morphology without being distracted or disturbed by the presence of fingerholes in order to better understand the blowing technique which I was seeking to master. In the subsequent ‘lullaby’ experiment, the cognitive mix was given two new chance agents being firstly, the newly-scraped fingerholes, and secondly, the real

life situation (the act of a mother's lullaby). I had deliberately chosen this context as an ideal space to practice because I knew I would not be disturbed during the process<sup>85</sup> illuminating the additional agent of the flautist's space, in context. The point of the practice was to utilise the time continuing to hone my embouchure technique but with the promise of new and specific fundamentals from the new fingerholes. Another priority was to establish a one-to-one ratio of fingering morphology to frequency output. The balance between this relation and the impact of the glissando technique in flux is an important aspect of the subject discussed in "The Conversation" between Anna Friederike Potengowski, Gabriele Dalferth and me, transcribed for Chapter 5.

#### 8.4 MELODIC AND HARMONIC MUSICALITY

Susanne Münzel had always talked about the ulna of a swan being a potential tube for a flute. It is also clear that a swan ulna is similar in diameter to GK3. From my experiment extracting a radius bone from swan wings, one would expect from two wings a provision of two radii and two ulnae. However, one radius in the Blekinge experiment from the two swan wings (from one swan) showed signs of a previous injury and due to the way that the fracture had healed, this radius is unusable as a flute. During my experiment with ivory in 2012, I took time to consult Patrick Geiger about making a block flute from one of the two ulnae from the Blekinge swan. Following the pattern of GK1 from the flute GK1-FG/WH-1(2011), I machine drilled the finger holes in Frank Trommer's workshop to include a fourth finger hole, and also a space near the blowing end to fashion a block made from beeswax [Figure 8.7]. The instrument is easy to play and the tones are clear. The fundamentals of the ulna blockflute are C6, D6, F6, B6, and E7. By comparing this tonometrical series with those resulting from various reconstructions of GK1 that are made from radius bones of a swan, and also metals substitutes, the similarities override the differences, generally, when lengths are similar. It can be predicted that tunings will never be absolutely the same even when all instruments follow the same 'standard'. Gabriele Dalferth has recently compiled a detailed overview of the "Basic parameters causing pitch variability in reconstructions of flutes" (Potengowski *et al.* 2023: 64-79). She explains aspects of pitch variability in relation to width of the tube, voicing and fingerhole morphologies including aspects of blowing pressure, culminating in a section concerning "very thin nay flutes" testament to the Seeberger technique and GK1 as previously discussed in 'The conversation' (the end of Chapter 5).

The sonic similarities across tonometrical series from reconstruction models of archaeo-organological examples that are patterned similarly and played as flutes, *a fortiori*, from the results investigating GK1, can be said to outweigh the differences, generally speaking, when lengths are similar. However, not all musicians may agree with me. I perceive that tuning objectives may concern personal musical appreciation, conditioning, and dogma. For example, I keep a

---

<sup>85</sup> I also know from discussions with some of my contemporaries, that they have practiced in similar situations, including traffic jams!

deliberately out-of-tune piano in the house, and squeaky doors. Some musical visitors have actual physical difficulties with these sound phenomena and complain about the squeaks and recoil at the piano tuning. Others embrace the differences as a source of interest and joy. As variations go – across reconstruction models of the *Ach flutes* played in different ways as flutes – the differences, *a priori*, would be greater than, for example, machine-exacted modern orchestral flutes, given that players do not always produce identical sound waves from the same fingerings, blown using the same technique on the same instrument, even on modern examples. Even when Palaeo-organological flute reconstructions are practically identical and played the same way by musicians with developed intonation skills, tuning discrepancies still emerge, as was experienced in the performance of a duet using the ‘ney’ technique on two almost identical swan radius flutes copying GK1 (Experiment 7.10). In order to eliminate intonation wholesale (and also eliminate a sense of the pulse or beat), the experimental composition *Finding wolves* was formulated for an isophonic context in order to unleash a sense of free tonal energy towards chance tonality (Experiment 7.12). The remaining ulna from the Blekinge swan I keep as a simple tube flute to play on, either as a little trumpet, block the bottom and play it like a panpipe with a ‘shak’ embouchure, or voice it like Seeberger using the ‘ney’ technique for his GK1 models. I like the way the different options (‘blockless duct’ / ‘block’ / ‘ney’ / ‘shak’ / ‘lip reed’ / ‘finger blocked’) all sound similar but each has its own personality just like the phenomenon of human voices. The lip-reed voicing of the ulna gives the lower octave, as does the bone when blocked with the bottom finger and played like blowing over a bottle.

Flute-voicing techniques were used together in Experiment 7.8, called ‘Bone tubes’, to demonstrate the versatility of simple tube flutes (flutes without fingerholes), and the numerous harmonic textures which can be produced naturally if, firstly, all tubes are cut to the same length, and secondly, played together. To note for the context of this experiment is the fact that the harmonic possibilities that are characteristic of each way of playing across these tubes are only heard in synchrony when mixed together simulating an ensemble situation. True it is that the possibility to mix tracks in a studio was not possible in the Stone Age. Nevertheless, this should not take away from the fact that the will to mix the sounds together as an experiment was in itself partly a result of the sonic suggestions provided from playing the 14 cm-long swan-wing bones during an the earlier experiment. This is to say that many sonic suggestions that had been initiated or emerged in Experiment 7.6 called ‘Shak or Ney?’ motivated the outcome of the subsequent experiment which involved recording 4 tracks of melody, and then mixing them to make harmony.

How might such technical direction of available or anticipated harmony, as described, have been utilised and mediated between people of the Aurignacian Achtal, based on a hypothesis that one swan equals two radii and two ulnae providing tube flutes for four players? Taken further, when all cut to the same length, and their harmonic nature explored as a natural resource for a coalition of fluting behaviour, just how special, salient or appealing is this natural resource of swan ulnae and radii as a harmonic phenomenon? With regard to the harmonic complex, I observed the following:

By blocking the bottom of the ulna with a finger (like each single pipe is stopped or blocked in the organological case for panpipes) the lowest pitch blown with a ‘shak’ technique is a D an octave above

middle C (the D in the bottom register of an orchestral piccolo). This note provides a ground base for the polyphony. Using this same technique and overblowing, notes from the harmonic series that can be achieved include an A (in the middle register of the piccolo), and a top F sharp (in the higher register of the piccolo). The A and F sharp provide a second line of melody. For a third melody line, the ulna adds a C natural fundamental (two octaves above middle C) which can be overblown to the A above it, from which a falling glissando is possible played using the 'ney' technique. The fourth part is played on the radius which provides a D fundamental (two octaves above middle C) which can be overblown up to the A above it (in the middle register of the piccolo) played with the 'ney' technique.

Experiment 7.8 called 'Bone tubes' (Observations)

Fundamentals coming from the playing lengths of tubes of the same length with smallish diameters (replicating swan radii and ulnae) vary between 'shak' and 'ney' methods of voicing, in which the 'ney' technique renders a slightly lower or flatter pitch playing on the same tube. When fingerholes are involved, the same thing happens so that whilst results are the same in absolute terms, in relative terms the whole tonal pattern is flatter. It means that on an ulna of about 14 cm length where the natural harmonic series is based approximately around D, the fundamental playing note on this tube using a 'ney' technique is found tuned towards a C. This provides the pleasing or diatonic texture described above as the harmonic complex of D5, A5, C6, D6, A6, and F#7, (or chord of D major with added seventh). This can in part some way go to answer the question about the natural resource of swan ulnae and radii as used to unlock a powerful musical phenomenon of physical harmonic consonance.

Presumably, technical direction of available or anticipated harmony utilised and mediated between people of the Aurignacian *Achtal* without written music may have become manifest in much the same way as folk musicians talk about music today, by using analogy. For example, I know folk musicians who refer to *spider fingering* when they are talking about cross fingering. There is no way to prove this but it is useful to know that the will to play together which *a priori* drives language development, may have been very much in existence as a force for both music and language development in the Aurignacian *Achtal* especially if harmony was a draw. I speculate that this would have been common practice for children and young adults engaging with such materials together. The immutable desire to play (music) would surely have driven language development in a dialectic also developing musicality. This is where the agency of music, *a fortiori*, the natural-harmonic-sonic structures of engaging swan bones, appears to concern a level of human surrender to the material which is part of the rationale for *immutable flute*.

A relevant reference from the ethnomusicological literature is reported from Cajsa S. Lund. She gives an account of a man called Valfrid Svensson who was born in 1888. Boys of seven years old, including the man reporting on his experiences of the 1890s to 1900s, were in the habit of making and playing bone flutes on the farms of Kinnekulle in Västergötland (Sweden), one of the motivations being getting to use a real knife to do it. He explained that it wasn't usual at the time for adults to have bone flutes although he could remember that some adult shepherds did have flutes in the 1870s and 1880s before the demise of their practices as a tradition of working life<sup>86</sup>.

---

<sup>86</sup> This was due to the wool and textile industry.

Children were never left to guard sheep alone for fear of predators like wolves and it was one of the roles of the flute to scare away such predators. Lund considers that the flute remained afterwards for a time in the hands of children as play tools, such as the case had been with Valfrid Svensson. These flutes have a block, and were played for self-enjoyment. He knew a boy who had herded cattle whose playing had been especially melodic, and whose flute had more than the usual number of finger holes. Melodies were invented (Lund 1983: 33). Valfrid Svensson's memory of multiple fingerholes is a poignant perspective on how young people look to each other in their converging lives, noting how one individual went that extra mile, so to speak. When such events and happenings are recalled as memories it appears to be the musical events that have made the strongest impressions. Whilst the ethnological analogy is not one specifically reflecting the Upper Palaeolithic, I think it makes an important point about children, and young adults expressing their desire to use adult tools and create their own flutes used in a number of ways, e.g., for protection, for their own pleasure, and to show off their musical skills in relation to adoration of peers. It can be abducted that the *Ach flutes* originally defined music along a number of similar lines, and I will return to the subject of toys at the end of the chapter.

Some surprises that occurred in context of the experiments are worth noting to demonstrate how engagement is real, leading to abductions that qualify the immutable flute hypothesis. To do this it was necessary to open the laboratory into the natural world itself. The following contextual examples led to the abduction that playing in a forest situation stimulates musical response and in one respect it starts to provide some understanding for the answer to the question posed in Chapter One about how the *Ach flutes* define music. They respond in real life to the environment, and the environment responds to them, which as a correspondence is reflected in acts of sound patterning, producing concrete patterns of sound material. In this way it is possible to contemplate an exchange between the flutes and the natural world (in dialogue):

One observation made in one of the experimental sessions concerns how the outside environment plays a role in what is being played, e.g., "I hear a bird call. My fingers move to the notes before the brain has had time to think. I play the notes intuitively. I have articulated the rhythm with my tongue".

Experiment 7.4 called 'Like blowing through a straw, (GK1)' (Observations)

Not only did I encounter how the forest context engaged me cognitively in the moment and directly influenced the melodic output in the experiment (as above), but in another experimental context, I noticed how I seemed to engage it:

The process is an engagement with the forest. On more than one occasion, the first note breaking into the sound of the forest seems to attract the attention of all living things in the forest and there is a shock of silence for a miniscule but palpable moment.

Experiment 7.6 called 'Shak or ney?' (Observations)

In addition to the engagement between the natural world and the flute, there is another engagement between the flute and the human body. This continues to reverberate in the environmental engagement:

Switching on the field recorder to record each of the ten episodes creates a feeling of the commitment to make music, where that music is unknown; it raises a sense of expectation and slight anxiety. The response from each flute feels to acknowledge this and they answer back in sonorous tones as though addressing the task and helping to lead the way. It starts to feel like a conversation between the body and the flute through which the net result is the music. For the **18 cm/Ney**: - the music feeling is wistful whilst hopeful, and super-bendy glissandi give a sensation as if the flute is talking, like a voice (and birds in the forest respond).

Experiment 7.16 called 'Aluminium for Ivory' (Observations)

The dyadic flute player and flute materially engaged (after [Malafouris 2013](#)), cradled phenomenally in the environment, can then be considered holistically as an ecological niche for *H. sapiens* of the Aurignacian Achatal. The dyad affected by the environment affects the environment, in relation to the two parts of the dyad being likewise locked in intense agential interchange with each other. This ecology can be abducted therefore as a pedagogic place for the young human to flourish. In this sense, the natural world takes on the role of surrogate mother to the human, a species which in itself is defined in one way by its altricial infants where even adults may remain 'young at heart' throughout ontogeny. A human mother may appear selfless but this is to misunderstand the survival instincts at play in the human mother-infant dyad which are actually selfish because the mother's love for her child is "one of the strongest of which the mind is capable" ([Darwin 1872: 215](#)). There is a reversal here which is particular for humans in which these human behaviours of selfishness are actually cognised by the human infant as being selfless ones. Young human beings cognise these behaviours in the nurturing ecology of extended dependency learning the rules of altruism, which is a behavioural trait that humans are known for (after [Griffith 2016](#)).

It would seem that acts of sound patterning are both intrinsic and extrinsic to this evolutionary development for humans. When the child is old enough to 'survive' on their own, the natural world steps in to continue the nurturing, especially if, for example, children have been given a flute to play. This immutability of playing with sound in this way is what I call immutable flute, existing in relation to the *Ach flutes* which are the first melodic instruments in the archaeological record to securely document this momentous transfer of temporal patterns into the artificial domain which is also the real domain. As a trio of three flutes representing many such more, these immutable icons of instrument, sound and music, are instantly recognisable to us now in the present. They reach into our deepest collective memories and remind us who we are, it can be abducted, and that this is why many humans cry when they hear them because they represent the natural loving, and nurturing human condition we remember. A collective memory is almost lost to human beings yet nevertheless is lodged in our species' deep consciousness (after [Griffith 2016](#)). We also know that flute playing stimulates an increase in delta waves. These "normally occur during non-REM sleep and are associated with the transference of episodic memory to long-term memory ([Wyatt 2016a: 171](#) referring to [Miller and Goss 2014](#)).

In addition to aspects of melodic invention at play via fluting contextualised as the ecology of the child and their environment (to include convergences with other children) – as abducted for the Upper Palaeolithic societies of the Aurignacian *Achatal* – are the possibilities for harmonic invention too. I have touched upon this above discussing the playing of swan wing bones used as tube flutes of equal length and played together (which was simulated via the studio mixing of

four separate recorded tracks). Firstly I would like to discuss the use of echo and the lag of sound (*cf. Wyatt 2016a: 179*) in its role as a harmony maker from single-linear melodic lines of temporal patterning. A cave like the hall of Hohle Fels in this sense is a perfect example of the flautist, the flute and the cave interacting as a mutual organ. One of the things that should be mentioned also is the fact the acoustic from outside the cave is also part of this relation as sounds of motorbikes outside the Hohle Fels were quite intrusive on some recordings from my experiments playing inside the hall of the cave there in 2011 (Experiment 7.2 called ‘playing inside Hohle Fels’). When the motorbikes were not polluting the sonic atmosphere and playing commenced properly, the following was noted.

The decay of sound is slow so that the melodic gestures linger in time creating textural blankets of sound. This opens up possibilities to play with harmonic complexes. There is a temptation to find different motifs that create chords of sound.

Experiment 7.2 called ‘playing inside Hohle Fels’ (Comment).

This experiment from 2011 is linked to the experiment from 2022 reconstructing the flute HF1-FG-1(2022). Once again, as soon as echoes are part of the context, the possibility for harmony increases.

The three tracks *Psychopomp I*, *Psychopomp II* and *Psychopomp III* from a live session at the end of the flute-making process are enhanced later in production in which lingering echoes are left resonating as new notes create textures of more than one note, forming harmonic complexes.

Experiment 7.18 called ‘Vulture-radius flute’ (Composition).

In the piece called *14 cm* which offers players a chance to take turn each playing a 14 cm long metal tube resembling swan ulna dimension – and which took place for the first time outside – players stood in a large spiral and passed their sound patterns like a baton around the shape. I was part of the performance and was able to experience the different ways the performer-composers approached their part of the composition:

The author decided to call one technique ‘palm pops’ in which the end of the tube is hit in the palm of the hand and it produces a resonance in the tube. Another was by blocking the end of the tube with the finger such as the case for blocked ends of tubes found in panpipes. Playing a swan-ulna as a ‘shak’ is also considerably easier when blocked at the bottom like this. The players in the group, being mainly professional artists, offered an uninhibited engagement with the material tubes; there was no expectation or agenda for music to sound in a certain way.

Experiment 7.7 called ‘14 cm and Green Källa’ (Observations)

In Chapter 7, I presented the piece *14 cm* together with the piece *Green Källa* mainly because they had both been attached to another project running simultaneously with my doctoral research. The physical pattern of the path in the composition *14 cm* (being an open-air field for the performers to be situated) is also a way to think about the development of a flute player. Beginning without first-hand experience of fluting, they progress in a developmental spiral taking stock of previous experiences, as skills are developed and honed via recalling previous processes

perfecting attitudes and sonorities in a cyclic fashion. *Green Källa* is the first piece that was developed for my own playing of GK1-FG-1(2016) after extensive practice, firstly on the flute without fingerholes, and then with fingerholes, ultimately toward meeting the established skill I have accomplished as a modern-day flautist. The focus of the piece is therefore geared towards more technical challenges. In this sense, *Green Källa* is actually a ‘study’ which is a type of piece designed to train certain aspects of a player’s technical ability.

Two opposite impressions emerged working from the contrasting contexts of *14 cm* and *Green Källa* which serve somewhat as an inadvertent reminder about Western music practices. The first citation refers to the solo piece, and the second to the ensemble piece:

One perspective from the experience highlights how the nerves of the author are affected in the performance. This is one consideration in a discussion concerning the question about ensemble versus solo playing in relation to the *Acb flutes* and participants in context.

Experiment 7.7 called ‘14 cm and Green Källa’ (Observations)

There was a definite sense in the performance of the ensemble piece that the musical experience seemed to belong to everyone who had had an equal share in making it. The author made the tubes into a gift for those who wished to keep the instrument that they were playing, and there were no returns.

Experiment 7.7 called ‘14 cm and Green Källa’ (Comment)

The work on bone tube playing with the studio mix called *Bone tubes*, and the results from *14 cm* which emanated from the experiment voicing tubes called ‘Shak or ney?’ culminated in the invention of notated symbols for the encountered extended-techniques together with the transcription of the melodic phrases and motifs which had emerged. The symbols were for the purposes of documentation, and for composing new music from this specific swan-sound palette in a conventional score. *Dance for Cajsa*, a piece honouring Cajsa S. Lund, gave me an opportunity to do this, paired in its performance with the studio mix *Bone tubes* which follows it.

From the flute study for GK1-FG-1(2016) called *Green Källa* I then wrote the duet called *Duet for Anna* for myself and Anna Friederike Potengowski following the discussion by a group of us ahead of the symposium on Stone Age music in Slovenia (mentioned earlier) about ensemble playing. One aspect raised was the matter of playing in unison, and therefore tuning became an issue for the composition and the performance, given that flute reconstructions tend to differ slightly, such as in their lengths, the size and shape, sometimes quantity of finger holes, and the physicalities of the bone. I employed polyphony for the texture of some parts of the piece, and structured some call-and-echo features in order to synchronise two players on two similar flutes. The flutes in the performance of this piece differed slightly in their lengths and so intonation discrepancies were adjusted in performance. The glissando possibilities from the tiny flutes enable considerable tuning possibility but only descending from the fundamentals. Due to the fact that Potengowski has honed her tone production skills to the maximum, she has the versatility to compensate in performance for tuning discrepancies which I observed that she accomplished effortlessly even when her Seeberger flute is slightly longer than mine by a

centimetre. How we each compensated for tuning is a question we must revisit another time. We didn't seem to manage absolute synchrony in this respect yet this was in itself noted as one of the most interesting aspects of the performance from the organiser of the symposium where the piece was first performed.

A contrasting compositional context was created in the piece called *Finding Wolves*. For this, I moved away from the structural aspects generating synchrony of regular rhythm, and intonation, into exploring textural dimensions of isophony in a piece for a small ensemble (or pack) of players. This piece is designed to utilize the plasticity of the glissando technique on reconstructions of GK1. The actual instruments belonging to the players who performed for this piece's debut, whilst not described in this thesis, are pictured as part of the image for the title page for Experiment 7.12 called 'Wolves and Isophony'. Playing in the way that this piece is designed to function may have been a more natural way for flute players of the Aurignacian to unite in music making but this is speculation. Playing in unison together or engaging polyphonic structures are equally as possible to predict, for example. There are countless more possibilities.

A number of points emerge from the research for GK1. One point concerns the relation of the instrument's radius bone from a swan wing in association with a corresponding ulna bone which is in turn similar in shape and size to GK3. The experimental work using radius and ulna bones from swans played as tube flutes – to create harmonic polyphony from the natural harmonic series – together with the evidence of the tendencies from the results of various tonometrical series for GK1 (towards consonance, suggestive of pentatonicism, in multiple contexts) do in themselves hint strongly towards a rich palette of diatonic tonality predicted for the playing of such instruments. These instruments first belonged to members of Aurignacian societies of the Achatal region. Taken with the extremities of dissonance which are made available to players using the glissando technique, and presence of some dissonant intervals emerging from the fundamentals on some models, the arrow points toward Derrida's *différance* (Bell 2009) or Kramer's "availability of alternatives" (2006) as a way to rationalise the phenomenon of the *Achtal flutes* with regard to interpreting their playing methods and musics. Limitless more ways to engage flutes when added to the contexts already discussed above may be highlighted as a feature of the immutable flute hypothesis from which it can be abducted that this force is one that in itself drove the musical development of Aurignacian Achatalians to a much greater degree than other musical opportunities that may have been available to them. Limitless possibilities include different methods of sound production in addition to the 'ney', 'shak', block flute, blockless duct flute, trumpet, and extended techniques discussed above.

Given that the original interpretation for HF1 is as a flute with a double notch, the suggestion of a double reed too may also be mooted although I have not encountered in the literature examples of a double reed being discussed anywhere in detail. Even Experiment 7.11 called 'Copper for bone' testing different lengths of copper pipe with fingers replicating GK1, may inadvertently reflect some type of game that Aurignacian children of the *Achtal* played with a selection of tubes of their own (radii and ulnae), mastering sounds on different lengths whilst processing the physics of the experience as a cognitive benefit to include how acoustics work in practice. My results for this experiment found a sweet spot around 14 cm or 15 cm for GK1 which offered the most favourable lengths in terms of resonance and tonometrical balance even though longer

and shorter lengths in the experiment rendered pleasing and interesting tonal results as well (*cf.* [Praxmarer 2023](#)).

Using a single reed is also a possibility already discussed for the *Ach flutes* by researchers like Jean-Loup Ringot, Simon Wyatt, Carlos García Benito, Barnaby Brown and Michael Praxmarer (although not for GK3 made from mammoth ivory). A first point to raise here is the relation of these researchers' 'voices' seemly the ones most interested in reedy interpretations of the *Ach flutes*. Were those playing the *Ach flutes* with reeds in the Aurignacian possibly the boys (gender correctness accepted)? Given that reed insertion closes one end of the tube it can be noted that the affect is a lowering of the pitch by an octave reflecting a tangible analogy with the second permanent lowering of the voice for human males in puberty. Gender preferences for the sounds of the *Ach flutes* voices with reeds can be raised because it is not just the lowered octave but the reedy timbral quality, leaning to what Trevor Wye describes for his synaesthetic 'purple' tone colour which is dark and rich as opposed to the hollow and light 'yellow' tone colour ([2014:10](#)).

A second point concerns the argument that using reeds makes such instruments easier to play. Having tried Ringot's GK1 owned by Potengowski in Experiment 13 called 'Reed play' I can confirm that the glissandic possibilities on such a small flute were firstly a surprise. This made tone control quite unstable from a beginner's perspective, and not at all easy. Secondly, simply blowing a GK1 reconstruction as a blockless duct flute (like through a straw) is surely easier than this which I have demonstrated is very possible from my engagement of a reconstruction of GK1 played as a blockless duct flute. Here in Experiment 7.4 called 'Like blowing through a straw, (GK1)' I explored this tonametrical potential more extensively than was first undertaken by Hein and Hahn around the time of its discovery, i.e., to include spider fingerings. As noted above from creating a block on an ulna to make a blockflute (or a recorder) with beeswax, such voicing possibilities are also really 'easy'. Voicing a flute with the 'ney' technique is also easy when you know how, as was demonstrated by a child of ten years learning to play it in a short space of time, which was proved in Experiment 7.15 called 'The children'. None of the ways of playing are difficult. I believe that the territorial prowess of flautists, like birds, may prevent others from having a go, or persisting if they are at first unsuccessful, such is the nature of human competition, and where music is concerned, a mysteriously aggressive form. In this very respect, music's impact on the survival of the Neanderthals at the time may be considered in relation to *H. sapiens* winning the race which in view of music's 'mystery' and coupled with its potential for unequivocal beauty, is salt in the wound. This is amplified further when it is considered that our musical roots all belong to the same ancestor, and that according to Mithen ([2005](#)), Neanderthals were particularly musical.

There are at least two examples where I have noted that finger patterns have been discerned as being like each other. For instance reversing my vulture flute HF1-FG-1(2022) reveals that the fingering pattern has a symmetry to it [[Figure 5.41](#)], and that this pattern of HF1 was also noticed as being similar to the pattern of GK3 so much so that it was considered, in one instance, a substitute model for GK3 ([Potengowski et al. 2023](#)). Is it a pure coincidence that my vulture radius flute, and the ivory flute I play made by Hein are both 22 cm long. Due to the close relation between the similarities and the differences posed here, and from the premise that different lengths of tube in relation to fingering patterns also merit their own charm, it is possible

to abduct that multifarious playing possibilities were available in the Aurignacian *Achtal* for humans armed with a bone tube with finger holes, blown using one or a number of methods, and from one of their ends or another. The fact that similar tonametrical patterns can be heard to exist for different models of the same flute with similar lengths, the temptation to play them together is unstoppable, is it not?

## 8.5 THE NEW KIDS ON THE BLOCK FLUTE

One aspect of this research that I haven't had time to develop as I might have wished is the relation of Swabian Aurignacian mobile art, to the *Ach flutes*. This took on its own direction in a recent trip to a school where I played various flute reconstructions to classes of children ranging in age from seven to twelve. I took with me a copy of the mammoth figurine from Vogelherd. Because I wished to let the children hold the mammoth figurine, I realised that I would need to find a way to share the experience and charm of this little mammoth but I only possess one replica figurine like this. I looked in a drawer of figurines that my own children had collected over the years and was surprised by the fact that like the many figurines of animals from the Swabian Aurignacian, the contemporary figurines in the drawer are all very similar in size to each other, and they all ignore the differences in scale of represented animals of the natural world, in relation to each other [Figure 8.8]. This I had not realised earlier when I was considering the methodological perspectives of the bricoleur in terms of the experimental dimension:

Art and science, and the use of scale are mentioned by Claude Lévi-Strauss in his reference to the lace around François Clouet's portrait of Elizabeth of Austria. Clouet did not copy things life-size and this in relation to the artist as bricoleur is relevant since it is through this process that an artist "constructs a material object which is also an object of knowledge". In relation to changing scale and specifically to miniatures he goes on to write: "they are therefore not just projections or passive homologues of the object: they constitute a real experiment with it (Gill 2020: 71-72 citing Lévi-Strauss 1966: 22 and 24).

I took the collection of figurines to the classroom and gave each child a figurine to hold. During the class, I began flute playing whilst I observed the children's behaviour. One child played with her animal figurine held in her hand so that the animal appeared to be dancing to the music in the air as she directed the animal's moving movements with her arm and wrist. If we consider this type of play as an artificial cradle that evolved for extended periods of nurturing in humans (which moulded human cognition and the mind), it is the first time we see it in in such proliferation with flutes and animal figurines in the Swabian Aurignacian. The dates for the *Ach flutes* are very early indeed [Figure 8.9]. In Experiment 7.15 called 'The Children', I note that a child has no problem learning to play the fundamental tones of a reconstruction of GK 1 using a 'ney' technique (the method employed by Seeberger). The abduction that the flute players of the Aurignacian *Achtal* were children and young adults, in respect of, i.e., "the role of play objects and object play in human cognitive evolution and innovation" (Riede *et al.* 2048: 46), is given more credence when it is considered:

Excavators recovered most of the flutes in deposits containing multiple classes of artifacts and domestic refuse suggesting that these finds were used in daily life rather than being contextually isolated (Conard 2011: 235).

The meaning of the word ‘toy’, may be regarded, perhaps as a pejorative term to appropriate artefacts like the mammoth figurine made from mammoth ivory from Vogelherd, or the diving waterbird from Hohle Fels [Figure 3.1] and yet as a tools of play (like a flute is also a tool of ‘musical’ play), it is possible to make the abduction that these play tools are directly contributing to the survival of humans stimulating the brain, the mind, and the imagination.. It is possible, therefore to overturn the hypothesis by Conard *et al.* (2009: 740) that “The presence of music in the lives of early Upper Palaeolithic peoples did not directly produce a more effective subsistence economy and greater reproductive fitness”. Here I argue that on the basis of experimental evidence, and observations that ‘music’ (as fluting) *directly* increases fitness.

Another perspective is based in the opinion that music itself is as nutritious as a good dinner for “bodily well-being” (Spencer 1857: 404). It may be considered that if “Upper Palaeolithic people consumed fish and aquatic birds routinely, while no Neanderthal did...” (Klein 2009: 668), and “the avian fauna is suggestive of a shift toward more intensive use of ptarmigan and other species beginning with the Aurignacian” (Conard *et al.* 2013: 185), then the use of bones for flutes – as a conscious benefit of procuring, i.e., a swan – would have been part of the cognitive disposition manifest in that hunt. It is perhaps like going shopping for food and bringing home a toy for the children; bringing a swan home is bringing home a toy for the child too. This can be regarded, actually, as a direct benefit. A swan’s wing radius is filled with air for flight, granting the absolute perfect natural gift for a child to play as a flute. As was also noted in Experiment 7.5 called ‘The Infant’, a radius bone from a swan is a perfect teething implement for a very young child. From memories of childhood, I have documented the following:

A few of us were given the chance to learn the recorder in Meltham, Huddersfield. We were six years old. We were meant to bring money to give Mrs Dunn for our new recorders. My heart dropped because in the envelope I gave to her was a piece of paper. I didn’t know it was a cheque. I was surprised but thrilled to get one anyway. A year later I tried a transverse flute. Mr Elton gave us young flautists, and clarinetists bonbons. The old school flute smelt strange and it wasn’t easy to play. At some point, I was given a case at home which had a brand new flute in it with the same name as a make of motorcycles which caught the attention of the boys at school. Sometimes a boy would take my flute case and put it between his legs and drive it round the playground making the sound of a motorbike. I soon learnt that to play it caught the attention of more than the boys. During this time my mum put something on the mantelpiece for me at home. She said, “When you’re ready”. It was a piece of music called *Syrinx* by Debussy.

(Frances Gill - diary)

“Play Object Play: A database of toys and tools made for and/or used by children from subsistence societies” by Felix Riede (2025) includes the following musical instruments: - *roarer*; *rattle*, *bull roarer*, *whistle*, *buzz*. This new database is from the project *The role of early-age niche provisioning in technological innovation and adaptation*.<sup>87</sup> Titles of articles from this research are worth mentioning to trace an outline of what I consider is relevant for the topic of the *Ach flutes* in light of the contribution that this direction will moreover afford research in Music Archaeology and vice versa, in the future. Titles include: - “Hunter-gatherer children’s object play and tool use: An

<sup>87</sup> The project started at the beginning of 2022 and will run till the end of 2026. It’s researchers are Elena Miu, Felix Riede, Marc Malmdorf Andersen, Sheina Lew-Levy.

ethnohistorical analysis” (Lew-Levy *et al.* 2022); Toys as teachers: A cross-cultural analysis of object play and enskillment in hunter gatherer societies” (Riede *et al.* 2022); “Playing to Survive: Children and Innovation During the Little Ice Age in Greenland” (Meyer *et al.* 2025); and “Children as Playful Artists: Integrating Developmental Psychology to Identify Children’s Art in the Upper Palaeolithic” (Wisher *et al.* 2025). It continues to be the case that

Children’s agential behaviours in the archaeological record have often been overlooked  
(Wisher *et al.* 2025)

In the last experiment of the series of experiments for Aurignacian Rhapsody is Experiment 7.19 called ‘The bullroarers’ where I have identified a musical instrument in category 4 of Lund Probability Grouping. This is the find from Geissenklösterle cultural horizon IIa+b belonging to the Upper Aurignacian cultural group, and it is an ivory baton with 4 perforations. I was always curious to know if this would function in the same way as batons with one eyehole perforation, and it does!! Following this experiment, the discovery of a similar artefact also in ivory with four holes emerged in the Ach Valley from Hohle Fels cultural horizon Va belonging to the lower Aurignacian cultural group. What would seem to nail the hypothesis that both these two batons therefore are also serving bullroarers is the new research proving that they were used to make rope (Conard and Rots 2024). If rope were the first consequence of this purpose, then rope was surely used to play them as bullroarers which I believe would have been invented by adolescents playing around with them, but with the muscle to make them sound loudly. There are three such ivory batons from Vogelherd in the Lone Valley all from the Aurignacian, one already called a bullroarer with one perforation, another called a “gorget” with two perforations, and a fifth one with one perforation but without a special name. These are all serving bullroarers in LPG 4<sup>88</sup> in my opinion.

In this thesis I have abducted that the *Ach flutes* were heard all over the Ach Valley during the Aurignacian and perhaps not even commonly played in the large hall at Hohle Fels which I suggest is a formulation that is assumed and yet this may be the biggest anachronism yet. The geoarchaeology would suggest that the cave was avoided in the Aurignacian because it is located beyond a dumping zone used for rubbish accumulation during occupations to include foul-smelling burnt bones. This and the fact that artefacts are not found to be deposited in the hall itself suggest that the large space was not a cherished environment for fluting. This claim supports the immutable flute hypothesis that the *Ach flutes* were played in different parts of the valley in contexts that required finding and establishing via experimental practices. Those modern humans who were best at finding these places were probably children and young adults.

A way forward for this research in the future will be in the application of teaching flutes of this type to children, I suggest. Recently, the school curriculum in Sweden has (re-)introduced the requirement for children to play recorders. One unique aspect of the *Ach flutes* is the questions that they pose which children themselves may wish to engage. Making copies of these instruments is not expensive using metal, and such projects may even lead to children taking up

---

<sup>88</sup> I have been invited to present this information as a poster at the ISGMA symposium in 2025 but do not have the funding to take this further.

playing wind instruments. Holding flutes whilst manipulating fingers is rather like holding a video-game controller in that when one opens and closes the holes (like pressing buttons), things happen. The flute is also somewhat like a mobile phone with its powerful signalling potential carrying over long distances. Flutes are democratic in that they are similar but can be modified according to personal preference. Perhaps trying to pin down a definitive standard for the *Ach flutes* is counter intuitive, for instance, when one considers all the different playing positions with the flutes to the mouth this way and that [Figure 8.10]. One needs to regulate breathing and control the airstream to create the tone. The instrument is held to the lips and due to the breathing, and the close proximity to the body (especially the face), the flute is an intimate and personal object for the player. Then there is the music. These are recognisable human behaviours that the *Ach flutes* first represented, and they define music by redeeming melody and harmony in the tangible land of artifice. Fluting is ontological design beyond the beauty of notches, elegant tubes, and crafted fingerholes as real buttons to press. Just like pressing a button to hear Seeberger in a museum, the fingerholes on the *Ach flutes* are real buttons, and perhaps the first ever artificial buttons in this sense of using several digits to make them work. Prior to this, bones for flutes with more than one finger hole are not common. Such is the fetishisation of engaging this material that it is little wonder we are still pressing buttons to make sounds all over the world. We are also still playing with the strings which we twanged on bracelets, and whirled around our heads. The *Ach flutes* bring about the real possibility of flutescapes generating salience which is important for memory. This is achieved in relation to the potential gift the *Ach flutes* tangibly represent for melody and harmony. In the case of the Ach Valley, the *Ach flutes* take possession of the space giving the ecology a new sonorous identity which in turn creates new identities for the humans playing them. Such is the territorial agency of the *Ach flutes* that hunting in the Aurignacian Achat concerned bringing home the music as well as the food, it is abducted. In these ways the *Ach flutes* directly produced greater reproductive fitness and a more effective subsistence economy when such music is understood as prey. Music must have helped to maintain larger social networks but it had powers to regulate them, because whilst music is prey, it also preys on us when we use it. What this tells us about human cognition in the Aurignacian is only just scratching the surface.

The closing sentence for this research comes from a source which stimulated my own personal fluting adventures which is inspired also by the knowledge that our mothers are our first music teachers. I give my mother the last word in this book which was made in response to reading it. She said:

“all this, from a flute”



FIGURE 8.1. Reconstructions of the Ach flutes belonging to the author

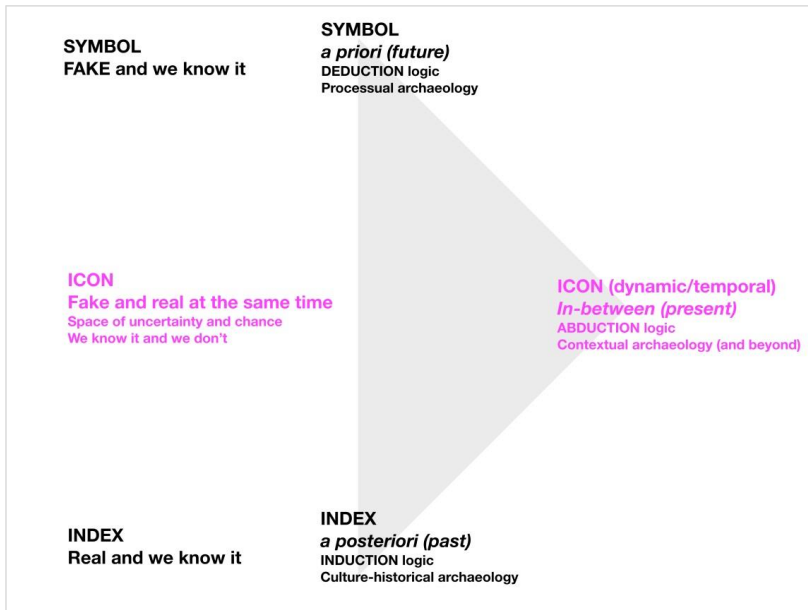


FIGURE 8.2. The temporal icon



FIGURE 8.3. *This is not a pipe.* Graphic drawing Hannah Gill

**HOLLOW RUMBLE OF WINGS**

The self-destructive tendencies of the flautist  
 Make mockery of common sense, rejecting I,  
 Bereft of sight, immanent in breath alone...

and

Perhaps, the dancing digits. A focal lotus, here  
 The Self is nought but extended ephemeral ether;  
 Breath of life and niche of belief. The earliest self-  
 Awareness, found in aeronautical conjuring of sound.  
 But in the head, a still and silent vortex, inspired  
 Expiration, destructive, yet enactive, as from wreckage  
 A conscious Phoenix spreads melodic wings,  
 As flotsam mind soars on high, expired thermal.

Simon Wyatt

Wyatt, Simon. 2021  
 Neither Billiard Balls nor Disembodied Spirits. Collected Poems by Simon Wyatt 2016-2021

FIGURE 8.4. *HOLLOW RUMBLE OF WINGS* by Simon Wyatt



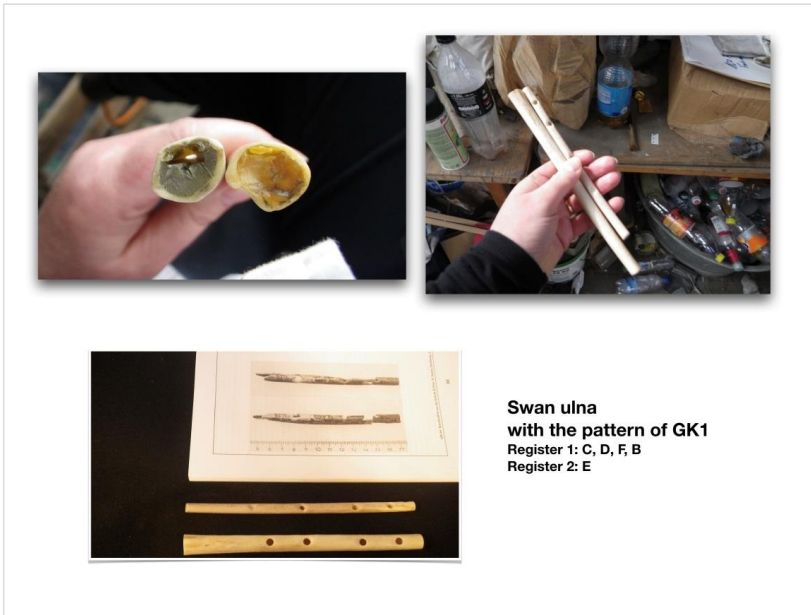
Bernadette Käfer at Kassel (Germany) with a reconstruction of HF1 by Wulf Hein, February 2012. Photograph by Wulf Hein (published with permissions). The situation is the making of *Raptor's rapture*, a video installation by Jennifer Allora and Guillermo Calzadilla, for "documenta13" art festival in Kassel, Germany (taken in a studio in Kassel, 29th February 2012).

*FIGURE 8.5. A vulture, a flute and a flute player*



Image of swans from Videsjöns fågeltorn, Lessebo kommun (with permission from Jörgen Ludvigsson). Photograph ©Jörgen Ludvigsson

*FIGURE 8.6. Swans*



*FIGURE 8.7. Swan ulna blockflute following GK1*



*FIGURE 8.8. Animal icons of the earth*

Fundort	GH/AH	Datum BP	Quelle	Datum cal BP (OxCal 4.4, 95,4% Wahrscheinlichkeit)
Hohle Fels	IId	29.560 + 240/- 230	(Conard und Bolus 2003, 2008)	32.602
		30.010 ± 220		32.983
	IIe	30.640 ± 190	(Conard und Bolus 2003, 2008)	33.443
		27.600 ± 800		31.995
	IIIa	29.710 + 210/- 200	(Conard 2009; Conard und Bolus 2003)	32.641
		31.140 +250/- 240		34.175
	IIIb	29.780 + 330/- 310	(Conard 2009; Conard und Bolus 2003)	33.123
		29.990 + 340/- 330		33.285
	IV	28.750 ± 750	(Conard 2009; Conard und Bolus 2003, 2008)	32.658
		33.090 + 260/- 250		36.973
Va	31.750 ± 260	(Conard 2009; Conard und Bolus 2008)	34.696	
	34.570 ± 260		38.440	
Vb	31.290 ± 180	(Conard 2009)	34.158	
	40.000 ± 500		42.460	
Geißenklösterle	II	30.625 ± 796	(Conard und Bolus 2003, 2008; Hahn 1983; Higham et al. 2012; Richter et al. 2000)	35.029
		35.700 ± 700		40.002
	III	30.100 ± 550	(Conard und Bolus 2003, 2008; Hahn 1983; Higham et al. 2012; Richter et al. 2000)	33.833
		38.900 ± 1000		42.472

**Dating the Ach flutes**  
Table from Ewa Dutkiewicz (2021: 57/table 2)

FIGURE 8.9. Dating the Ach flutes

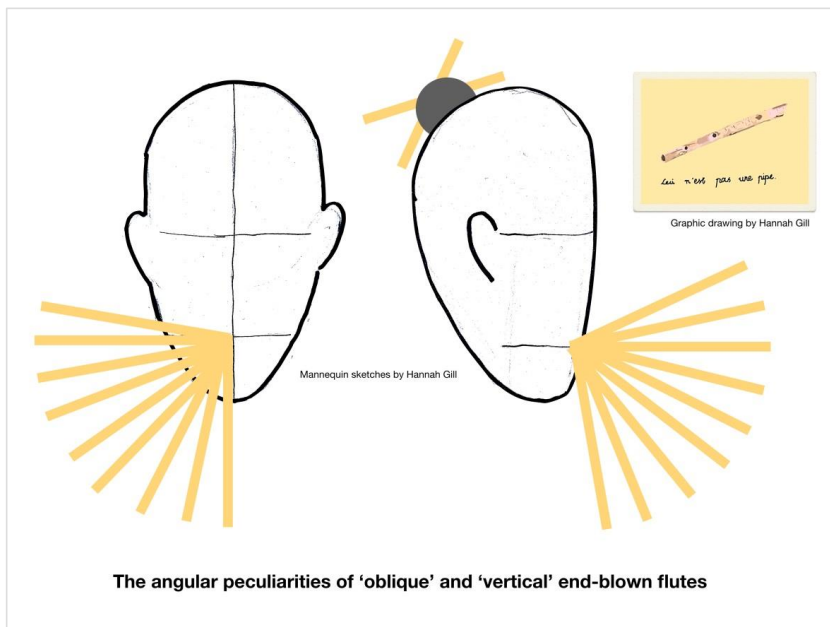


FIGURE 8.10 The attitude of the flute

## APPENDICES

## APPENDIX 1. Birds in GHs 12-14 (Geissenklösterle)

<i>Latin</i>	<i>GH12</i>	<i>GH13</i>	<i>GH14</i>	<i>English</i>
	1	4	3	unspecified bird bones
<i>Anatinae indet.</i>			1	unspecified ducks
<i>Anas crecca</i>		3		Teal
<i>Anas platyrhynchos</i>	2	2		Mallard
<i>Gyps fulvus</i>		1		Griffon vulture
<i>Falco tinnunculus</i>	2			Kestrel
<i>Phasianidae indet.</i>	1	1	2	unspecified game bird
<i>Phasianus colchicus</i>		1		Pheasant
<i>Perdix o. Alectoris</i>		1		Partridge or rock partridge
<i>Lagopus sp.</i>	9	13	1	unspecified ptarmigan
<i>Lagopus mutus</i>	2	5	1	Rock ptarmigan
<i>Lagopus lagopus</i>	1			Red grouse
<i>Lyrurus tetrix</i>	2			Black grouse
<i>Tetrao urogallus</i>		1		Wood grouse
<i>Otis tarda</i>	1			Great bustard
<i>Charadriidae indet.</i>			1	unspecified plover
<i>Calidris alpina</i>	8		2	Dunlin
<i>Lymnocyptes minimus</i>		1		Jack snipe
<i>Limosa limosa</i>		1		Black-tailed godwit
<i>Columba oenas</i>			1	Dove
<i>Nyctea scandiaca</i>	1			Snowy owl
	2	2		unspecified songbird, small
		1		unspecified songbird, large
<i>Galerida cristata</i>	1			Crested lark
<i>Ptyonoprogne fuligula</i>	2	2		Rock martin
<i>Cinclus cinclus</i>		1		Dipper
<i>Corvidae undet.</i>		1		unspecified raven
<i>Corvus corax</i>		6	1	Raven
<i>Coccothraustes coccothraustes</i>		2		Hawfinch
	35	49	13	

## APPENDIX 2. Sound tools from Aurignacian layers in the Ach Valley

<i>Cave</i>	<i>Square and find number</i>	<i>Description</i>	<i>Material</i>	<i>Geo-horizon</i>	<i>Archaeo-horizon</i>	<i>References</i>	<i>LPG according to Frances Gill</i>
GK	67-1016	Pierced baton / bullroarer	Ivory	13	IIa/IIb	Hahn 1988: plate 45/19; Conard and Bolus 2006: 214/fig.13.25; Dutkiewicz 2021: 325; 429/plate 47.1-4.	4
HF	31-1683	Pierced baton / bullroarer				Dutkiewicz 2021: 370; 429/plate 47.5.	4
GK	26-80	Scraper and/or bone-tube flute	Raven ulna	13	IIb	Hahn 1988: plate 45/17; Dutkiewicz 2021: 325; 296/plate 35, 1.	2
GK	47-59	Band/ Mouthbow	Antler	13	IIb	Hahn 1988: 220; plate 45.18; Kerig 2004: 18; 2009/fig. 404; Praxmarer 2019: 90/table 1; 2022: 126/fig.4.7, 1; Dutkiewicz 2021: 312-313; 420/plate 38.5-6	4
GK	34-303	Band/ Mouthbow	Ivory	13	IIb	Dutkiewicz 2021: 312; 420/plate 38.4.	4
HF	89-1637	Band/ Mouthbow	Ivory	7a	Va	Dutkiewicz 2021: 310; 420/plate 38.1.	4
HF	89-1654	Band/ Mouthbow	Ivory	7a	Va	Dutkiewicz 2021: 311; 420/plate 38.2.	4
HF	24-1231.2	Band/ Mouthbow	Ivory	6b	IIIb	Dutkiewicz 2021: 311; 420/plate 38.3.	4

APPENDIX 3. Ivory and bone flutes, flute and bone-tube fragments, from Ach and Lone Valleys

Name	Year	Cat. ref. no. from Dutkiewicz 2021	Cave	GH	AH	Square - find number	Techno-complex	Material	First published
GK3	1974, 2004	31	GK	13	I Ib	48-	Aurignacian II	Ivory	Hahn 1988/plate 45.12; Conard <i>et al.</i> 2004.
HF3	2008	32.1	HF	8	Vb	89-1691.1	Basal Aurignacian	Ivory	AABW 2008; Conard <i>et al.</i> 2009.
HF2	2008	32.2	HF	7a	Va	89-1648.1	Aurignacian	Ivory	AABW 2008; Conard <i>et al.</i> 2009.
	1990	32.3	GK	13	I Ib	34-349	Aurignacian II	Ivory	Dutkiewicz 2021: 284
	1974	32.4	GK	13	I Ib	37-155.2	Aurignacian II	Ivory	Dutkiewicz 2021: 284
	1974	32.5	GK	13	I Ib	46-555	Aurignacian II	Ivory	Dutkiewicz 2021: 285
	1974	32.6	GK	13	I Ib	47-	Aurignacian II	Ivory	Dutkiewicz 2021: 285
	1983	32.7	GK	13	I Ib	75-374	Aurignacian II	Ivory	Dutkiewicz 2021: 286
VH2	2008	32.8	VH	HL/KS		37/75-71.3	(Vermutlich) Aurignacian	Ivory	AABW 2008; Conard <i>et al.</i> 2009.
GK3?	1989	32.9	GK	15	IIIa	56-975	Aurignacian III	Ivory	Dutkiewicz 2021: 287
GK3?	1974	32.10	GK	13	I Ib	58-227	Aurignacian II	Ivory	Dutkiewicz 2021: 288
GK3?	1974	32.11	GK	13	I Ib	35-	Aurignacian II	Ivory	Dutkiewicz 2021: 287
GK3?	1974	32.12	GK	12	I Ia	48-125	Aurignacian II	Ivory	Dutkiewicz 2021: 288. ID unclear according to database.
	2012	32.13	VH	HL/KS		33/67-8.1	(Vermutlich) Aurignacian	Ivory	AABW 2015
	2007	32.14	VH	HL/KS		39/67-7.1	(Vermutlich) Aurignacian	Ivory	Wolf 2015 /plate 42.30
	2007	32.15	VH	HL/KS		45/69-21.1	(Vermutlich) Aurignacian	Ivory	AABW 2014
	2012	32.16	VH	HL/KS		53/65-6.1	(Vermutlich) Aurignacian	Ivory	Dutkiewicz 2021: 290
	2010	32.17	VH	HL/KS		77/66-18.1	(Vermutlich) Aurignacian	Ivory	AABW 2014
HF1	2008	33	HF	8	Vb	89-1667	Basal Aurignacian	Bone	AABW 2008; Conard <i>et al.</i> 2009.
GK1	1973; 1990. (1995)	34.1-5	GK	13	I Ib	34-197	Aurignacian II	Bone	Hahn and Münzel 1995. The information in Dutkiewicz 2021: 291 is a mistake. AH = I Ib; and, square = 34, are correct.
GK2	1973	34.6	GK	12	I Ia	47-9000.1	Aurignacian II	Bone	Hahn and Münzel 1995
mini flute 2	2011	34.7	VH	HL/KS		62/61-33.3	(Vermutlich) Aurignacian	Bone	Dutkiewicz 2021: 293
mini flute 1	2007	34.8	VH	HL/KS		39/69-73.1	(Vermutlich) Aurignacian	Bone	AABW 2011/2015
	2008	34.9	VH	HL/KS		40/70-49.1	(Vermutlich) Aurignacian	Bone	Dutkiewicz 2021: 293

VH1	2005	34.10	VH	HL/KS		71/64-50.1	(Vermutlich) Aurignacian	Bone	AABW 2005
	2010	34.11	VH	HL/KS		75/63-13.1	(Vermutlich) Aurignacian	Bone	AABW 2014
(Raven- ulna giuro)	1975	35.1	GK	13	Iib	26-80	Aurignacian II	Bone	AA 1977; Hahn 1988
	2014	35.2	HF	7ab	Vab	27-2318	Aurignacian	Bone	AABW 2014
	1977	35.3	GK	12	Ila	16-96.1	Aurignacian II	Bone	Dutkiewicz 2021: 296
<b>GK2</b>	1973	35.4	GK	12	Ila	47-9000.1	Aurignacian II	Bone	Hahn and Münzel 1995
<b>GK2</b>	1973	35.5	GK	12	Ila	47-9000.2	Aurignacian II	Bone	Hahn and Münzel 1995
	2012	35.6	VH	HL/KS		33/70-48.1	(Vermutlich) Aurignacian	Bone	Dutkiewicz 2021: 298
	2012	35.7	VH	HL/KS		33/72-97.1	(Vermutlich) Aurignacian	Bone	AABW 2014
	2008	36.1	VH	HL/KS		36/74-8.1	(Vermutlich) Aurignacian	Bone	Dutkiewicz 2021: 298
	2008	36.2	VH	HL/KS		37/68-84.1	(Vermutlich) Aurignacian	Bone	AABW 2015
	2008	36.3	VH	HL/KS		37/70-64	(Vermutlich) Aurignacian	Bone	Dutkiewicz 2021: 299
	2009	36.4	VH	HL/KS		37/79-11.1	(Vermutlich) Aurignacian	Bone	Dutkiewicz 2021: 300
	2008	36.5	VH	GF/KS		38/75- 193.1	(Vermutlich) Aurignacian	Bone	Dutkiewicz 2021: 300
	2008	36.6	VH	HL/KS		39/73-35.1	(Vermutlich) Aurignacian	Bone	Dutkiewicz 2021: 300
	2006	36.7	VH	HL/KS		43/71-88.1	(Vermutlich) Aurignacian	Bone	AABW 2015
	2008	36.8	VH	HL/KS		43/76-13.1	(Vermutlich) Aurignacian	Bone	Dutkiewicz 2021: 301
	2011	36.9	VH	HL/KS		61/63-12.1	(Vermutlich) Aurignacian	Bone	Dutkiewicz 2021:302
	2006	36.10	VH	HL/KS		64/63-24.2	(Vermutlich) Aurignacian	Bone	Dutkiewicz 2021: 302
	2006	36.11	VH	HL/KS		64/63-67.1	(Vermutlich) Aurignacian	Bone	Dutkiewicz 2021: 302
<b>VH1</b>	2005	36.12	VH	HL/KS		67/65-78.1	(Vermutlich) Aurignacian	Bone	AABW 2005
	2011	36.13	VH	HL/KS		68/62-9.1	(Vermutlich) Aurignacian	Bone	Dutkiewicz 2021: 303
	2011	36.14	VH	HL/KS		68/62-39.1	(Vermutlich) Aurignacian	Bone	Dutkiewicz 2021: 304
<b>VH1</b>	2005	36.15	VH	HL/KS		68/66-27.1	(Vermutlich) Aurignacian	Bone	AABW 2005
	2010	36.16	VH	HL/KS		78/65-40.1	(Vermutlich) Aurignacian	Bone	AABW 2014
	2009	36.17	VH	DKS		99/99- 1333.1	(Vermutlich) Aurignacian	Bone	Dutkiewicz 2021: 305

## REPORT

### APPENDIX 4. *Swabian Aurignacian flute fragments: a report, and notes on Appendix 3*

Fragments coming from the Swabian Aurignacian that are considered as fragments from flutes have recently increased in number due to the work of Ewa Dutkiewicz (2021). In Appendix 3, I present the ivory items first, followed by the bone items copying the sequence from Dutkiewicz's format. I give a column for the name of the item (if it has a name), then give further columns for: - the year the item was excavated; a catalogue reference number for the item taken from Dutkiewicz' inventory and catalogue; the cave where the item was found; the Geographical Horizon for the item; the Archaeological Horizon for the item; the square and find number for the item; the Techno-complex for the item; the material from which the item is made or marked; and the detail for the first publication(s) associated with the item. I have also created a visual reference taking each of the four plates (*tafel*) 32, 34, 35, and 36 from her catalogue and placed them together, with plates 34 and 36 (top left and right), and plates 32 and 35 (bottom left and right) respectively. I have then added a layer of notes and some visual aids for cross referencing purposes. Plate 32 is for flutes, and possible flutes made from ivory. Plate 34 is for flutes made from bone. Plates 35 and 36 are for possible flutes and tubes made from bone. There is not the scope in this thesis to present all the details Dutkiewicz gives for all of the fragments. It should be noted that these categories for the finds across plates 32, 34, 35, and 36 are those defined by Dutkiewicz (2021), see further.

Whilst the inventory builds heavily on Dutkiewicz's inventory, some information might differ from information in her report according to: - my recent cross-referencing of the data for this inventory; and an independent comprehensive cross-referencing in 2025 of all this data (to include checking my cross-referencing) by Svenja Schray (kindly undertaken at my request). Any changes or challenges to information in the inventory are highlighted in yellow and any necessary notes for these are found at the end of this report.

The organological part of her work which falls under the umbrella of Music Archaeology is to be found in her 2021 monograph called "*Zeichen. Markierungen, Muster und Symbole im Schwäbischen Aurignacien*" (English translation: Signs. Marks, Patterns, and Symbols in the Swabian Aurignacian). In this report, I give a brief overview of her work first presenting her perspective for designating fragments from the Swabian Aurignacian as flute fragments. However, I find it necessary to illuminate some points having worked and been familiar with these fragments for over ten years. These include incidences of previously published fragments that had been refitted, or grouped together, as one flute, which for some reason have then become separated (either physically, and/or across various publications), but are found currently re-added in her inventory as singular fragments. There are some general points to make about the history of the flute fragments too, and terminology. There are also some comments to make about some of the finds themselves, like the mini-flutes from Vogelherd. Independent of Dutkiewicz's research there may be more incidences of fragments without markings in the archaeological record from the Swabian Aurignacian, which are not currently recognised in the inventory.

Dutkiewicz has inspected 575 artefacts, analysing 2,569 lines, 1,640 notches and 571 dots (Conard 2021: 9). The 575 artefacts all come from Aurignacian layers in the Swabian archaeological cave sites of Hohle Fels and Geißenklösterle in the Ach valley, and Bockstein-Törl, Hohlenstein-Stadel and Vogelherd in the Lone valley (Dutkiewicz 2021: 19-42). From 260 artefacts (of the original 575) that Dutkiewicz designates as carrying ‘symbolic’ markings, no less than fifty-one of these objects fall into a category that she calls “flutes of all kinds” (*ibid.* 127). This is to say that from the entire assembly of 260 artefacts carrying ‘symbolic’ markings from the archaeological record appertaining to the Ach and Lone Valleys in the Swabian Jura, and dated to the Aurignacian, a colossal fifth of these are currently designated as being, quite likely, to be fragments or possible fragments, of flutes, according to her count. Dutkiewicz has therefore newly allocated various finds into categories of flutes during her extensive research, thus considerably increasing the number of flute-related finds in the (music-) archaeological record for the Swabian Aurignacian.

In the categories for flute she has: - “elfenbenflöten” (*ivory flutes*); “mögliche elfenbenflöten” (*possible ivory flutes*); and “knochenflöten” (*bone flutes*) (*ibid.* 282-305). In a fourth and final category for flutes she bundles together both “mögliche knochenflöten und röhren/tuben” (*possible bone flutes and pipes/tubes*) thus subsuming all pipes and tubes in the one category of ‘flute’. Anthropogenic cutmarks (‘signs’) are engraved in the osseous material in different ways. She allocates cutmarks according to three conceptual types in which markings are interpreted as having: - “symbolic meaning, utilitarian significance or unintentional character” (*ibid.* 95) besides a fourth category in which markings do not fall readily into any of the above. 260 artefacts that form the main focus of Dutkiewicz’ research are identified as carriers of ‘symbolic’ markings on the basis of considered criteria that typify a *carrier* such as an item of jewellery, flute, or a figurine (and carriers may also include ‘tools’) in relation to the *intentionality*, *production* and *regularity* from which their markings are understood to have been executed in context (*ibid.* 95). The broad categories for objects she identifies as carrying symbolic markings are: - “kunstobjekte” (*mobile art*); “flöten” (*flutes*); “röhren und tuben” (*pipes and tubes*); “schmuck” (*personal ornamentation*); “geweih objekte” (*antler objects*); and “werkzeuge” (*work tools*) (*ibid.* 90-93).

A proportion of the 51 flute-related artefacts include flute fragments previously published in context of early publications for the pieces GK1, GK2 and HF1 (the *Ach flutes*). Some fragments have only been published generally with other finds in reports for annual site excavations, for example, those from Vogelherd (see final report in the re-excavation at Vogelherd: [Conard, Zeidi and Janas 2016](#)). Some fragments are published only for the first time in the monograph. All of those previously published have been systematically re-measured by Dutkiewicz to include new measurements contributing specific anthropogenic cutmark data. Some information is noted to differ and where possible in this thesis, I have logged the differences. Dutkiewicz’ inventory is the most recent and thorough inventory of the entire current assembly of Swabian Aurignacian flutes and flute fragments, albeit considerably supplemented in quantity with data from tubes and pipes. Ivory and bone material predominates for objects with symbolic markings (Dutkiewicz 2021: 127):

Ivory is used in 65% of the objects with symbolic markings. Hohle Fels has the largest share with 79%, followed by Geißenklösterle with 67% and Vogelherd with 62%. Of the symbolically marked objects, 30%

are made from bone, with the largest share (35%) at Vogelherd, 27% at Geißenklösterle and only 17% at Hohle Fels. The remaining 4% relate to antler (3%), tooth, fossil, sandstone, clay-slate and other are represented with one object each. (Dutkiewicz 2021: 127).

For the markings on the flute-related material to qualify as being ‘symbolic’ the chosen artefacts must have cutmarks of a certain kind and fulfil the intentionality, regularity and production criteria, although flutes are already imbued with special significance. From further categories given for principle-cutmark types defined as: - *Lines*; *Notches*; *Dots*; *Crosses*, *Vs*; and a category of miscellaneous-pattern types called *Other* which deals with complex singular patterns (*ibid.* 96 and 106), all of the flute-related finds are identified as bearing only one type of principle-cutmark type, and these are *notches* which are distinguished from *lines* as follows: -

The notch is a short line; however, it is listed separately here, since the depth, and not the length, is important. Notches are usually, but not exclusively, applied on the edges of objects (Dutkiewicz 2021: 96).

In Chapter Five I discussed notches as a term used by organologists for the blowing end of some types of wind instruments. This has been used in context of the *Ach flutes* in the literature for both the supposed blowing end of GK3 as a notched flute, and the supposed double notch of HF1. On GK3 the notch is the blowing edge or labium itself. This proves difficult for the narrower notch context for HF1 which is why many practitioners have sought alternatives for playing reconstructions of it. So, for clarity’s sake, these notches associated with the blowing ends of wind instruments are not the same as Dutkiewicz’ notch criteria in evidence as, pertinently, the only type of cutmark found on flutes, possible flutes, and bones tubes in her inventory. The presence of two bold units of notch patterns on GK3 – perhaps one of the most emphatic instances of the use of parallel notches on an item from this period and place – is therefore not related to organological-notch features suggestive of labiums and places to seat reeds. This is to re-emphasise that when one term applies to two unrelated features on one and the same artefact, clarity is essential even if it is obvious to some. Of further pedantry is that the notches on the side-seams of the ivory flute GK3 are actually utilitarian (and not therefore ‘symbolic’) if the idea is that they helped to increase the surface for the mastic, provide an airtight seal, and were used to guide and match the contact between the two longitudinal halves to complete an ivory tube. This builds into an argument about design and ergonomics as discussed in chapter 8.

Dutkiewicz defines various pattern and constellation types to provide a list for the details of largely geometric pattern variations appropriated to each category of marks. Those appertaining to just notches (relevant for the flute-related material) are: - *Single notch*; *Parallel notches, regular distance*; *Parallel notches, irregular distance*; *Parallel, oblique notches, regular distance*; *Parallel, oblique notches, irregular distance*; *Irregular notches*; *Radial notches*; *Circumferential notch*; *Notch area* (*ibid.* 96). She measures the markings in terms of pattern units which would seem to be a very useful way to look at markings, for example, on GK3 there are, as just mentioned, two separate units of patterns one on each lateral side of the flute. Informed by experimental work (*ibid.* 106-123), she also explores the type of skill and technique in which cutmarks are understood to have been executed in practice under the heading of “manufacturing techniques”. These techniques include: - *cutting*; *sawing*; *sawing-and-turning*; *scribbling*; *grooving*; *levering*; *swivelling*; *scraping*; *punch*; *punch-and-drill* (*ibid.* 95). Additionally she considers the cutting profiles from 6 profile schemes (e.g., trough, V-shape profiles, etc.). This becomes part of an integrated set of categories that in full comprise: -

*angle of tool; pressure; profile scheme; and description of cutting morphology* (*ibid.* 101/fig. 27). Finally, each individual mark – respective notch for the flute data – is classified as being either *fine* or *coarse* with a further category in-between fine and coarse that she calls “medium” (*ibid.* 96), or for the word ‘medium’, I prefer the word *fair* or *fairly* when paraphrasing her data in English, e.g., this notch has been *fairly* executed.

### Query One: GK2

Seven fragments for the complex Flute Two (GK2) all come from square 47, Archaeological Horizon IIa. GK2 is listed by Dutkiewicz and shown as a single item labelled as 47-9000.1 (Dutkiewicz 2021: 292; 416/fig. 34, 6) but it should be noted that this item was previously shown by Münzel *et al.* in two parts, with one above the other but not in the order which they are refitted (2002: 115/fig. 5b), although the original publication of GK2 by Hahn and Münzel (1995) does show the two parts as a refit (Hahn and Münzel 1995: 10/fig. 6). Whilst this is not so puzzling, it must be raised that in both Hahn and Münzel (1995) and Münzel *et al.* (2002), the figures showing the parts of GK2 respectively both include two other parts but these are not counted as belonging to GK2 in Dutkiewicz’ inventory for bone flutes, but reallocated in her category of possible bone flutes and tubes.

These are the finds labelled 47-9000.1 (Dutkiewicz 2021: 296; 417/fig. 35, 4), and 47-9000.2 (Dutkiewicz 2021: 297; 417/fig. 35, 5) which is rotated on the vertical in her image. In the visual aid presented at the bottom of this report, fragments of GK2 are to be found in the two categories across plates 34 and 35 which I have framed in blue.

### Query Two: VH1

Three worked tubular bone fragments from Vogelherd (two with notches and one with a bevelled edge) were first published in 2006 by Conard and Malina in an article called *Schmuck und vielleicht auch Musik am Vogelherd bei Niederstotzingen-Stetten ob Lontal, Kreis Heidenheim* (2006: 24/fig. 7 numbers 1.0.2.3). They were subsequently superimposed onto a drawing of GK1 in a later publication by Conard (2007: 353/fig. 6) which I have copied into the visual aid that features at the bottom of this report. Conard and Malina refer to the three of them as one bone flute in their first article in English about GK3 (2009:16). The three pieces are noted as coming from one flute in a subsequent article about HF1 (Conard *et al.* 2009) where in combination they are given the name Vogelherd 1 (VH1). I have highlighted the first of these fragments marking it in a circle on Dutkiewicz’ plate 34 (for bone flutes). This one fragment of VH1 carries the label 71/64-50.1 (Dutkiewicz 294: 416/fig. 34, 10). Also in her plate 36 (for possible bone flutes and tubes), she has placed the other two fragments of VH1 (36, 12 and 36, 15). These two fragments carry the labels 67/65-78.1 (Dutkiewicz 303: 418/fig. 36, 12), and 68/66-27.1 (Dutkiewicz 304: 418/fig. 36, 15), respectively. They all came from the same 2005 excavation at Vogelherd but were published for the first time in 2006.

### Query Three: More fragments of GK3?

There are four ivory fragments in plate 32 (9-12), that come from Geissenklösterle that are splint-like in character. I have marked the four fragments together in a blue frame in the visual aid. Maria Malina commented verbally to me (in Tübingen in May 2023) that 32, 12 may be from GK3. I checked to see if this and any of the other splint-like fragments coming from Geissenklösterle are from the same GH and AH as GK3. Find 32, 10 and find 32, 11 (from the catalogue reference in Dutkiewicz's thesis) both come from AH IIb, like GK3. This raises the question as to whether all four may be from GK3 given the stratigraphic situation which has recently been under review by Svenja Schray.

These fragments are: - 32.9 labelled 56-975 ([Dutkiewicz 287: 414/fig. 32.9](#)); 32.10 labelled 58-227 ([Dutkiewicz 288: 414/fig. 32.10](#)); 32.11 labelled 35- ([Dutkiewicz 287: 414/fig. 32.11](#)); and 32.12 labelled 48-125 ([Dutkiewicz 288: 414/fig. 32.12](#)). Please note that according to the database for the square and find number, the ID for the last fragment in the list here ([Dutkiewicz 288: 414/fig. 32.12](#)) is "unclear". This is the one that Malina raises as a possible fragment of GK3.

A way to cross reference these four finds with GK3 is to check whether the way that the notches on them are made corresponds to the technique used for the notches on GK3. It seems that the technique does not correspond, as follows: -

[Dutkiewicz 287: 413/fig. 31.1-5](#)  
[Dutkiewicz 287: 414/fig. 32.9](#)  
[Dutkiewicz 288: 414/fig. 32.10](#)  
[Dutkiewicz 287: 414/fig. 32.11](#)  
[Dutkiewicz 288: 414/fig. 32.12](#)

*Herstellungstechnik ist das Schneiden (page 283);*  
*Technik ist das Sägen (page 287);*  
*Technik ist das Sägen (page 288);*  
*Technik ist das Sägen (page 287);*  
*Technik ist das Sägen (page 288).*

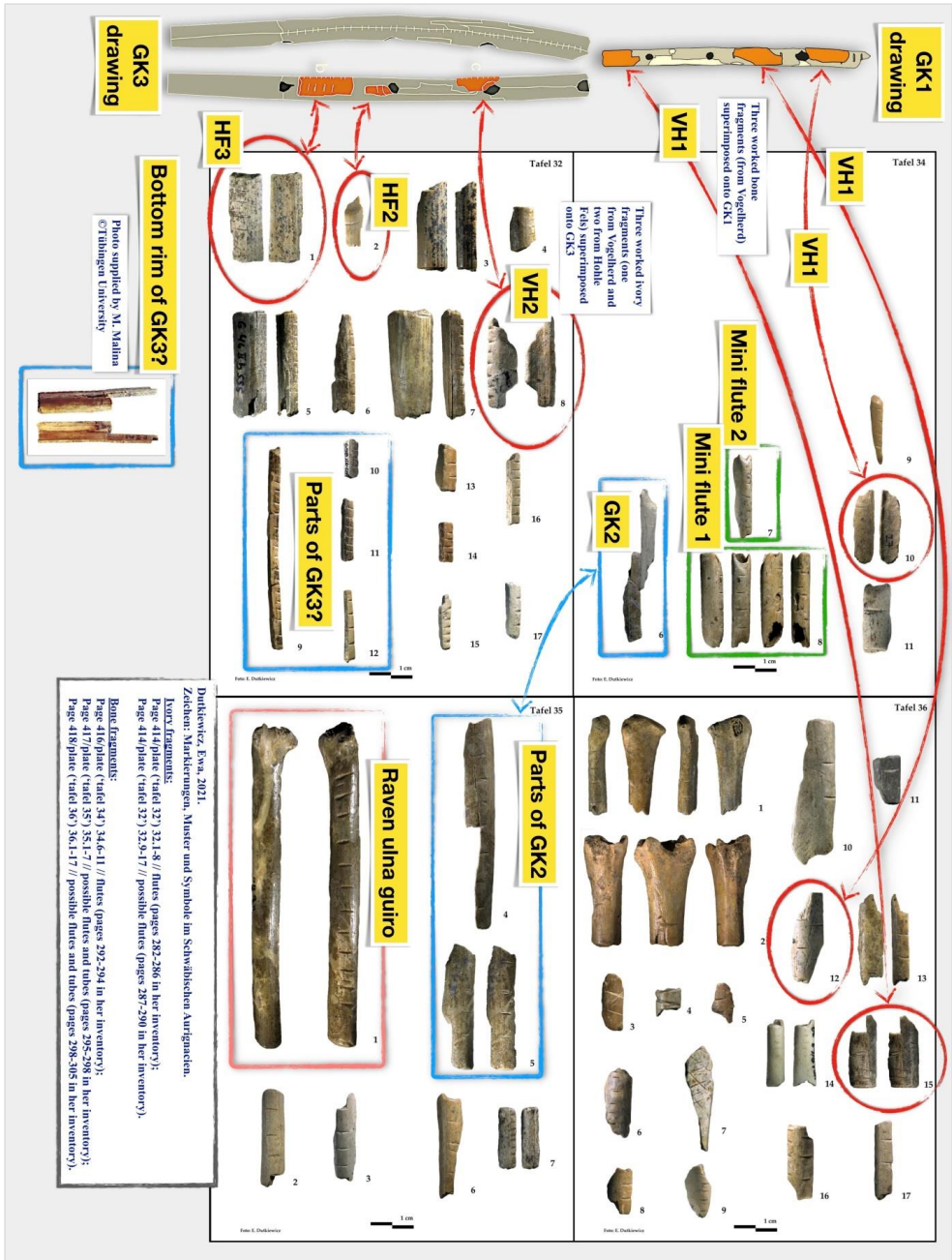
### Query Four: Are mini flutes, flutes?

It is possible with the right flute embouchure to blow a sound from a piece of dried macaroni, which in size is similar to the very small tubes of goose bone from Vogelherd known as mini flute 1 and mini flute 2. Certainly in the Cajsja Lund category of sound tools these are ideally situated in LPG 5. Whether it is possible to regard them in any of the other four groups remains to be seen (or heard). I believe one would need very small fingers indeed to play such a small instrument.

### Query Five: Are there other finds to add?

I have suggested that there is at least one fragment that I have spotted from Hohle Fels which postdates Dutkiewicz' research, and by now there may be others. This is a small piece of curved bone from AH Vab with nine lateral marks ([Conard and Malina 2019: 58/plate 32.17](#)) which is

suggestive of a decorated bird bone of the type associated with small flutes. Certainly, the *ivory-flute-blank-stave* should be given a place in the inventory, as should the find that is probably belonging to the rim end of GK3.



## AN INDEX FOR ICONS

## DISCOGRAPHY

Baka Beyond, 2009.

Baka in the Rainforest. (CD, Album) UK March Hare Music (MAHA CD29).

DiscogsID: r3452243

Christoph Haas, Banda Maracatú, 2014.

Mother Earth (Ensemble, Percussion, Vocals – Banda Maracatú Flute – Susanne Schietzel-Mittelstraß Musician [Klingende Steine] – Manfred Von Bebenburg Percussion, Vocals, Arranged By – Christoph Haas). [CD] Germany, not on label.

DiscogsID: r14882520

Dalferth, Gabriele, 2016.

Ice Age Heritage Sounds. Klänge aus der Urgeschichte. Gabriele Dalferth Musik, production Samuel Dalferth.

Dimkaroski, Ljuben, 2013.

Sonorities of the Tiddibab, In: Horvat, Jana/Pleterski, Andrej/Velušček, Anton, (Eds.), Divje babe I.

Upper Pleistocene Palaeolithic site in Slovenia Part II: Archaeology. Opera Institutu Archaologici Sloveniae 29, Ljubljana, CD supplement.

Dylan, Bob, 1964.

The Lonesome Death of Hattie Carroll. The 'Times They Are A-Changin' (LP, Album, Mono, Pitman Press) US Columbia (CL 2105).

DiscogsID: m4030

Hammarteg, Lars, 1984.

T.18 Balkákra-gongen / The Balkákra Gong from Fornnordiska klanger / The Sounds of Prehistoric Scandinavia (Vinyl, LP) Sweden His Master's Voice (1361031).

DiscogsID: r3651471

Hoffman, Al/Manning, Dick, 1954.

Gilly Gilly Ossenneffer Katzenellen Bogen By The Sea. From: The Four Lads – Gilly Gilly Ossenneffer Katzenellen Bogen By The Sea / I Hear It Everywhere.

DiscogsID: m1262686

Lund, Cajsa S., (Producer), 1991.

Fornnordiska klanger / The Sounds of Prehistoric Scandinavia (CD, Album) Sweden Musica Sveciae (MSCD 101).

DiscogsID: r4772908

Pink Floyd, 1973.

The Great Gig in the Sky. From: Dark Side of the Moon (Vinyl, LP, Album, Gatefold Sleeve) UK Harvest (SHVL 804, 1E 064 o 05249).

DiscogsID: m10362

Potengowski, Anna Friederike / Wagner, Georg Wieland, 2017.

T.4 Ryoanji (John Cage is the composer) from *The Edge of Time: Palaeolithic bone flutes from France & Germany* (CD) UK Delphian (DCD34185).

DiscogsID: r22701419

Seeberger, Friedrich, 2003.

T.2 Shaman 2:24; T.4 Tonumfang 0:52; T.5 Vogelstimmen 3:21; T.7 Miko 1:00; T.8 Michaelstein 0:38; T.9 Falkenstein 0:37; T.11 Gafluna 0:36; T.12 Meersburg 0:55; T. 14 J. Hahn 0:32; T. 16 Shaman 1:44; T.17 Michaelstein 0:37. Tracks from: *Klangwelten der Altsteinzeit* (CD) Urgeschichtliches Museum, Blaubeuren.

Sherman, Robert B./Sherman, Richard M., Year Unknown.

Supercalifragilisticexpialidocious. From: *Cricketone Chorus & Orchestra – Supercalifragilisticexpialidocious / Scarlet Ribbons*.

DiscogsID: m1255797

Spice Girls 1996

Wannabe (CD, Single) UK Virgin (VSCDT 1588).

DiscogsID: r2111398

The Beatles, 1967.

Lucy In The Sky With Diamonds. From: *Sgt. Pepper's Lonely Hearts Club Band* [LP, Album, Mono] UK Parlophone (PMC 7027).

DiscogsID: m23934

Williams, John, Towner, 1977.

*The London Symphony Orchestra – Star Wars*. [2 x Vinyl, LP, Album, Gatefold] 20th Century Records (2T-541).

## VIDEOGRAPHY

- BBC, 2021.  
The Australian songbird that's 'forgotten its song'.  
<https://www.bbc.com/news/av/science-environment-56424317>  
Last accessed 25<sup>th</sup> June 2025.
- Chytroschek, Tristan, (Director) 2011.  
Songs of War. (Documentary). The a&e buero filmproduktion in association with ZDF and ARTE Germany.
- Dilley, James, 2021b.  
How to Make an Ovate and Pointed Handaxe. In: AncientCraftUK, YouTube, 15th December 2021.
- Downer, John, 2020.  
The Tropics. In: Downer, John (Director), Spy In The Wild – Series 2, John Downer Productions Ltd. First air date (BBC) 9pm Wednesday 22nd January, 2020.
- Gill, Frances, 2014a.  
Sound experiment Geissenklösterle. In: youtube Flute Origins.  
<https://www.youtube.com/watch?v=PjipHWo09tc>  
Last accessed 25<sup>th</sup> June 2025.
- 2014b.  
Sound experiment Hohle Fels. In: Flute Origins.  
<https://www.youtube.com/watch?v=DC8Iv2AamrE>  
Last accessed 25<sup>th</sup> June 2025.
- Gill, Frances // Magnusson, Ylva, 2016.  
The Green Källa, Geissenklösterle & Sandby Borg. In: Flute Origins.  
[https://www.youtube.com/watch?v=-zoN\\_RhYM5g](https://www.youtube.com/watch?v=-zoN_RhYM5g)  
Last accessed 25<sup>th</sup> June 2025.
- Herzog, Werner, 2010 (director, writer, narrator).  
Cave of Forgotten Dreams. Nelson, Erik / Ciuffo, Adrienne (Producers); Nelson, Erik / Harding, Dave / Hobbs, Julian / Jackson, Tabitha (Executive Producers); Zeitlinger, Peter (Cinematographer); Bini, Joe / Hawke, Maya (Eds); Spitzer, Eric (Sound); Reijseger Ernst (Music).
- Jagatia, Anand, 2014.  
Musical Bones, Musical Stones. Radio Documentary. On: SoundCloud, published 26 Oct 2014.
- Nettl, Bruno, 2010.  
Bruno Nettl lecturing on North American Indian Music in Prague 29 April 2010. Vimeo.  
Currently off-line.
- Ringot, Jean-Loup, 2020.  
Making a Bone Flute, Klänge der Vorgeschichte (European Music Archaeology Project). In: Professor Chill, YouTube, 8th June 2020, m:s, 0:07 - 5:50.
- Salisbury, Mike, 2003.  
Life of mammals. BBC, Bristol.

Stringer, Chris, 2022.

The Origins Of Homo Sapiens With Professor Chris Stringer (from Natural History Museum in London).  
In: History Hit, YouTube, 10th June 2022.

Thorne, Simon, 2010.

Neanderthal. Full performance of the music composition. Vimeo.

## AN INDEX FOR SYMBOLS

## BIBLIOGRAPHY

- Ackerman, Jennifer, 2016.  
The Genius of Birds. Scribe Publications, Brunswick.
- Aiello, Leslie C / Dunbar, Robin, I. M., 1993.  
Neocortex size, group size, and the evolution of language. *Current anthropology* 34 (2), 184-93.
- Aitkin, Lindsay M. / Merzenich, Michael M. / Irvine, Dexter R. F. / Clarey, Janine C. / Nelson, John E., 1986.  
Frequency representation in auditory cortex of the common marmoset (*Callithrix jacchus jacchus*). *The Journal of Comparative Neurology*.
- Albrecht, Gerd / Holdermann, Claus Stephan / Kerig, Tim / Serangeli, Jordi, 1998.  
“Flöten” aus Bärenknochen - Die Frühesten Musikinstrumente? *Archäologisches Korrespondenzblatt* 28, 1-19.
- Albright, Ann Cooper, 1997.  
Choreographing Difference: The Body and Identity in Contemporary Dance. Wesleyan University Press, Hanover, NH.
- Alemseged, Zeresenay / Spoor, Fred / Kimbel, William / Bobe, René / Geraads, Denis / Reed, David L. / Wynn, Jonathan G., 2006.  
A juvenile early hominin skeleton from Dikika, Ethiopia. *Nature* 443, 296-301.
- Alexander, Richard D. 1987.  
The biology of moral systems. Gruyter, New York.
- Alley, Richard, 2000.  
The two-mile time machine: ice cores, abrupt climate change, and our future. Princeton University Press, Princeton.
- Al-Shawaf, Laith / Lewis, David M. G., 2018.  
The Handicap Principle. Shackelford, Todd K. / Weekes-Shackelford, Viviana A., (Eds.), *Encyclopedia of Evolutionary Psychological Science*. Springer, [https://doi.org/10.1007/978-3-319-16999-6\\_2100-1](https://doi.org/10.1007/978-3-319-16999-6_2100-1)
- Altenmüller, Eckart, 2018.  
Vom Neandertal in die Philharmonie. Warum der Mensch ohne Musik nicht leben kann. Springer-Verlag GmbH Germany, Berlin.
- Andersen, Katrine K. *et al.*, 2006.  
The Greenland ice core chronology 2005, 15-42 ka. Part 1: constructing the time scale. *Quatern. Sci. Rev.* 25, 3246-3257.
- Arensberg, Baruch / Schepartz Lynne A. / Tillier, Anne-Marie / Vandermeersch, Bernard / Rak, Yoel, 1990.  
A reappraisal of the anatomical basis for speech in middle Palaeolithic hominids. *American Journal of Physical Anthropology* 83 (2), 137-46.
- Arom, Simha, 1994.  
Intelligence in traditional music. In: Khalfa, Jean (Ed.), *What is intelligence?* Cambridge University Press, Cambridge, pp. 137-160.
- Arwill-Nordbladh, Elisabeth, 2001.  
Genusforskning inom arkeologin. Högskoleverket, Stockholm.

- Atema, Jelle, 2014  
Musical Origins and the Stone Age Evolution of Flutes. *Acoustics Today*, Summer 26-34.
- Austin, John Langshaw, 1962.  
How to Do Things with Words. (Eds.) Urmson J.O., / Sbisà, Mariana. Harvard University Press  
Cambridge, Massachusetts.
- Averbouh, Aline / Pétilion, Jean-Marc, 2011.  
Identification of “debitage by fracturation” on reindeer antler: case study of the Badegoulian levels at the Cuzoul de Vers (Lot, France). In: Baron, Justyna / Kufel-Diakowska, Bernadeta (Eds.), *Written in Bones: Studies on Technological and Social Contexts of Past Faunal Skeletal Remains*. Institute of Archaeology, University of Wrocław, pp. 41-51.
- Bahuchet, Serge, 1993.  
L'invention des Pygmées. *Cahiers d'Etudes africaines* 33 (1), 153-181.
- Balikci, Asen, 1970.  
The Netsilik Eskimo. Natural History Press, Garden City, NY.
- Barrett, Margaret, S. 2006.  
Inventing songs, inventing worlds: the 'genesis' of creative thought and activity in young children's lives. *International Journal of Early Years Education* 14 (3), 201-220.
- Barsalou, Lawrence W., 1999.  
Perceptual Symbol Systems. *Behavioral and Brain Sciences* 22 (4), 577-660.
- Barsalou, Lawrence W., 2005.  
Abstraction as Dynamic Interpretation in Perceptual Symbol Systems. In: Gershkoff-Stowe, Lisa / Rakison, David H. (Eds.), *Building Object Categories in Developmental Time*, Carnegie Mellon Symposium Series on Cognition. Carnegie Mellon Symposium Series on Cognition, Mahwah, NJ, pp. 389-431.
- Barshay-Szmidt, Carolyn / Normand, C., / Burr, George / Hodgins, Greg / LaMotta, Sarah, 2010.  
AMS 14C dating the Protoaurignacian / Early Aurignacian of Isturitz, France. Implications for Neanderthal-modern human interaction and the timing of technical and cultural innovations in Europe. *J. Archaeol. Sci.* 37, 758-768.
- Bar-Yosef, Ofer. 1992.  
The role of western Asia in modern human origins. In: Aitken, Martin Jim / Stringer, Chris B. / Mellars, Paul A. (Eds.), *The Origin of Modern Humans and the Impact of Chronometric Dating*. *Phil. Trans. R. Soc. B* 337, 193-200.
- Bataille, Guido / Conard, Nicholas J., 2018.  
Blade and bladelet production at Hohle Fels Cave, AH IV in the Swabian Jura and its importance for characterizing the technological variability of the Aurignacian in Central Europe. *PLOS ONE* 13 (4). E0194097.
- Bateson, Gregory, 1979.  
Mind and nature: A necessary unity. Dutton.
- Beck, Anna S., 2011.  
Working in the Borderland of Experimental Archaeology. On Theoretical Perspectives in Recent Experimental Work. In: Petersson, Bodil / Narmo, Lars Erik (Eds.), *Experimental Archaeology. Between Enlightenment and Experience*. *Acta Archaeologica Lundensia Series altera in 8°* 62. Lund, pp. 167-194.
- Bednarik, Robert G. 1998.  
The "Australopithecine" Cobble from Makapansgat, South Africa. *The South African Archaeological Bulletin* 53, 4-8.

1992.  
Palaeoart and archaeological myths. *Cambridge Archaeological Journal* 2 (1), 27-43.
- Beebe, Beatrice / Lachmann, Frank, M., 1994.  
Representation and internalization in infancy: Three principles of salience. *Psychoanalytic Psychology* 11, 127-165.
- Bell, Catherine M., 2009.  
Ritual Theory, Ritual Practice. Oxford University Press, New York.
- Bertacchi, Alex, 2017.  
Subsistence strategies and environmental change during the Middle and Upper Palaeolithic in the Swabian Jura (SW Germany): insights from Sirgenstein cave. M.Sc. Thesis, Eberhard Karls Universität.
- Besson, Mireille / Schön, Daniele, 2003.  
Comparisons between language and music. In: Peretz, Isabelle / Zatorre, Robert J. (Eds.), *The Cognitive Neuroscience of Music*. Oxford University Press, pp. 269-293.
- Bettes, Barbara A., 1988.  
Maternal depression and motherese: temporal and intonational features. *Child Dev.* 59 (4), 1089-1096.
- Bickerton, Derek, 1995.  
Language and Human Behavior. University of Washington Press, Seattle.
- Binford, Lewis R., 1987.  
An interview with Lewis Binford (edited by A. Colin Renfrew). *Current Anthropology* 28, 683-694.
- Björndal, Cato R. P., 2005.  
Det värderande ögat: observation, utvärdering och utveckling i undervisning och handledning. Liber, Stockholm. Translation (Swedish) by Björn Nilsson.
- Blaauw, Maarten / Wohlfarth, Barbara / Christen, J. Andrés / Ampel, Linda / Veres, Daniel / Hughen, Konrad A. / Preusser, Frank / Svensson, Anders M., 2010.  
Were last glacial climate events simultaneous between Greenland and France? A quantitative comparison using non-tuned chronologies. *J. Quatern. Sci.* 25, 387-394.
- Blacking, John, 1973.  
How musical is man? University of Washington Press, Seattle.
1976.  
Dance, conceptual thought and production in the archaeological record. In: Sieveking, Gale de Giberne / Longworth, Ian H. / Wilson, Kenneth E. (Eds.), *Problems in Economic & Social Archaeology*. Duckworth, London, pp. 3-13.
- Blake, Elizabeth / Cross, Ian, 2008.  
Flint Tools as Portable Sound-Producing Objects in the Upper Palaeolithic Context. In: Cunningham, Penny / Heeb, Julia / Paardekooper, Roeland (Eds.), *Experiencing Archaeology by Experiment*. Proceedings of the Experimental Archaeology Conference, Exeter 2007, pp 1-19.
- Bloyer, Paul. 2017.  
Sémiologie du son pour une mémoire des sites de stockage de déchets nucléaires. Outils pour une conception signalétique. *Communication & langages* 193(3): 101-116.
- Blumentritt, Reiner / Mall, S., 1979.  
Der Hohlefels bei Schelklingen, Alb-Donau-Kreis, Eine urgeschichtliche Fundstelle im Achtal. *Kulturdenkmale in Baden-Württemberg, Kleine Führer, Blatt 46*.
- Bojs, Karin, 2015.  
Min europeiska familj : de senaste 54 000 åren. Bonnier, Stockholm.

- Bolus, Michael, 2003.  
 The cultural context of the Aurignacian of the Swabian Jura. In: Zilhão, João / d'Errico, Francesco (Eds.), The chronology of the Aurignacian and of the transitional technocomplexes: dating, stratigraphies, cultural implications. Proceedings of Symposium 6.1 of the XIVth Congress of the UISPP (University of Liège, Belgium, September 2-8, 2001). Lisboa: Instituto Português de Arqueologia (Trabalhos de Arqueologia; 33), pp. 153-163.
2004.  
 Der Übergang vom Mittel- zum Jungpaläolithikum in Europa. Eine Bestandsaufnahme unter besonderer Berücksichtigung Mitteleuropas. *Germania* 82, 1-54.
- 2015a.  
 The Transition from the Middle to the Upper Paleolithic in the Swabian Jura, Southwestern Germany. *Anthropologie* 53, 167-179.
- 2015b.  
 History of Research and the Aurignacian of the Sites in the Swabian Jura. In: Sanz, Nuria (Ed.), Human Origin Sites and the World Heritage Convention in Eurasia. *Heads* 4, vol. II. UNESCO, Paris / Mexico City, 32-49.
- Bolus, Michael / Conard, Nicholas J., 2001.  
 The late Middle Paleolithic and earliest Upper Paleolithic in central Europe and their relevance for the out of Africa hypothesis. *Quaternary International* 75, 29-40.
- Bond, Gerard / Heinrich, Hartmut / Broecker, Wallace / Labeyrie, Laurent / McManus, Jerry / Andrews, John / Huon, Sylvain / Jantschik, Ruediger / Clasen, Silke / Simet, Christine / Tedesco, Kathy / Klas, Mieczysława / Bonani, Georges / Ivy, Susan, 1992.  
 Evidence for massive discharges of icebergs into the North Atlantic ocean during the last glacial period. *Nature* 360, 245-249. <https://doi.org/10.1038/360245a0>
- Borg, Erik / Counter S. Allen, 1989.  
 The middle-ear muscles. *Scientific American*, August 1989, 63-68.
- Bourdieu, Pierre, 1977.  
 Outline of a Theory of Practice. Translated by Richard Nice, Cambridge University Press, Cambridge.
- Bowie, Fiona, 2008.  
 The anthropology of religion. An introduction. Second Edition. Blackwell Publishing, Oxford.
- Brade, Christine, 1975.  
 Die mittelalterlichen Kernspaltflöten Mittel- und Nordeuropas. Karl Wachholtz Verlag, Neumünster.
- Bramble, Dennis M. / Lieberman, Daniel E., 2004.  
 Endurance running and the evolution of Homo. *Nature* 432, 345-352.
- Brandt, Anthony / Gebrian, Molly / Slevc, L. Robert, 2012.  
 Music and early language acquisition. *Frontiers in Psychology: Auditory Cognitive Neuroscience* 3, Article 327, 1-17.
- Brenner, M., 2013.  
 Die Feuerstelle des neuentdeckten Fundplatzes Börslingen-Eisenberg im Kontext der steinzeitlichen Feuerstellen Südwestdeutschlands. Bachelor essay, Tübingen University, Tübingen.
- Bronk Ramsey, Christopher, 2001.  
 Development of the radiocarbon calibration program OxCal. *Radiocarbon* 43, 355-363.
- Brown, Barnaby, 2016.  
 The world's oldest tune and pipe. In: Pibroch Network, 23 June 2016. <https://pibroch.net/learning/the-worlds-oldest-tune-and-pipe/>

- Brown, Steven, 2000.  
The “Musilanguage” Model of Music Evolution. In: Wallin, Nils L. / Merker, Björn / Brown, Steven (Eds.), *The Origins of Music*. MIT Press, Cambridge, MA, pp. 271-300.
- Brown, Steven / Martínez, Michael J. / Parsons, Lawrence M., 2006.  
Music and language side by side in the brain: a PET study of the generation of melodies and sentences. *European Journal of Neuroscience* (23) 2791–2803.
- Bräuer, Günter, 2008.  
The origin of modern anatomy: by speciation or intraspecific evolution? *Evol. Anthropol.* 17, 22-37.
- Budil, Ivo, 1994.  
A functional reconstruction of the supralaryngeal vocal tract of the fossil hominid from Petralona. In: Wind, Jan / Jonker, Abraham / Allott, Robin / Rolfe, Leonard (Eds.), *Studies in Language Origins: Volume 3*. Benjamins, Amsterdam, pp. 1-19.
- Buisson, Dominique, 1990.  
Les flûtes paléolithiques d'Isturitz (Pyrénées- Atlantiques). *Bulletin de la Société préhistorique française* 87, pp. 10-12; 420-433.
- Burkart, Judith, M. / Allon, O. / Amici, Federica / Fichtel, Claudia / Finkenwirth, Christa / Heschl / Huber, J. / Isler Karin / Kosonen, Z. K. / Martins, E. / E. J. Meulman / Richiger, R. / Rueth, K. / Spillmann, B. / Wiesendanger, S. / Schaik, Carel P Van, 2014.  
The evolutionary origin of human hypercooperation. *Nat Commun* 5, 4747.
- Burke, Janine, 2012.  
*Nest: The Art of Birds*. Allen & Unwin, Sydney.
- Burns, Edward, M. 1999.  
Intervals, scales and timing. In: Deutsch, Diana, (Ed.), *The psychology of music* (2nd Edition). Academic Press, San Diego, pp. 215-264.
- Butler, David, 1989.  
Describing the perception of tonality in music: a critique of the tonal heirarchy theory and proposal for a theory of intervallic rivalry. *Music Percept.* 6 (3), 219-241.
- Böhme, G., 2019.  
Skelettreste von Fischen, Amphibien und Reptilien aus der jungpleistozänen Schichtenfolge der Geißenklösterle-Höhle bei Blaubeuren. In: Conard, Nicholas J. / Bolus, Michael / Münzel, Susanne, C. (Eds.), *Geißenklösterle. Chronostratigraphie, Paläoumwelt und Subsistenz im Mittel- und Jungpaläolithikum der Schwäbischen Alb*. Tübinger Monographien zur Urgeschichte. Kerns V, Tübingen, 117–136.
- Cage, John, 1961.  
“Experimental Music”, in *Silence: Lecture and Writings*. Wesleyan University Press, Middleton.
1963.  
*A year from Monday*. New Lectures and Writings by John Cage. Wesleyan University Press, Middleton, Connecticut.
- Callaway, Ewen, 2010.  
'Grandmother hypothesis' takes a hit. *Nature* (2010).
- Catlin, Amy, R., 1982.  
Speech surrogate systems of the Hmong: From singing voices to talking reeds. In: Downing, Bruce T. / Olney, Douglas P. (Eds.), *The Hmong in the West: Observations and Reports*. Southeast Asian Refugee Studies Project, Center for Urban and Regional Affairs, University of Minnesota, Minneapolis, pp. 170-197.

1985.  
Harmonizing the generations in Hmong musical performance. *Selected Reports in Ethnomusicology* 6, 83-97.
1992.  
Homo Cantens: Why Hmong sing during interactive courtship rituals. *Selected Reports in Ethnomusicology* 9, 43-60.
- Chase, Philip G., 1989.  
How Different was Middle Palaeolithic Subsistence?: A Zooarchaeological Perspective on the Middle to Upper Palaeolithic Transition. In: Mellars, Paul / Stringer, Christopher (Eds.), *The Human Revolution: Behavioural and Biological Perspectives on the Origins of Modern Humans*. Edinburgh University Press.
1991.  
Symbols and Paleolithic artifacts: style, standardization, and the imposition of arbitrary form. *Journal of Anthropological Archeology* 10, 193-214.
- Cheney, Dorothy, L. / Seyfarth, Rpbert, M., 2003.  
Signallers and receivers in animal communication. *Annual Review of Psychology*. 54 145-173.
- Chomsky, Noam, 1980.  
Rules and Representations. Columbia University Press, New York.
- Christensen, Marianne, 1999.  
Technologie de Pivoire au Paléolithique supérieur. Caractérisation physico-chimique du matériau et analyse fonctionnelle des outils de transformation. BAR International Series 751. Oxford.
- Chung, Andrew Jay, 2019.  
Music as Performative Utterance: Towards a Unified Theory of Musical Meaning with Applications in 21st-Century Works and Social Life. A Dissertation Presented to the Faculty of the Graduate School of Yale University in Candidacy for the Degree of Doctor of Philosophy.
- Clark, Gary / Henneberg, Maciej, 2017.  
Ardipithecus ramidus and the evolution of language and singing: An early origin for hominin vocal capability. *Homo* 68 (2), 101-121.
- Clifford, Elle / Bahn, Paul, 2020.  
A new view of the so-called 'Lion-Man' CWA 100.
- Clynes, Manfred, 1977.  
Sentic: The Touch of Emotion. Souvenir Press, London.
- Cocker, Mark, 2013.  
Birds and People. Jonathan Cape, London.
- Coles, John, M., 1979.  
Experimental Archaeology. Academic Press, London.
- Conard, Nicholas J., 2003.  
Palaeolithic ivory sculptures from southwestern Germany and the origins of figurative art. *Nature* 426, 830-832.
- 2003b.  
Eiszeitlicher Schmuck auf der Schwäbischen Alb. In: Kölbl, Stefanie / Conard, Nicholas, J. (Eds.), *Eiszeitschmuck – Status und Schönheit*. Urgeschichtliches Museum, Blaubeuren, Museumsheft 6, 15-49.

2004.  
 Altsteinzeitliche Ausgrabungen in den Höhlen der Schwäbischen Alb und die Anfänge der Kunst und Musik. Festvortrag Archäologie-Preis Baden-Württemberg 2002. Archäologische Informationen aus Baden-Württemberg 48, 30-48.
2005.  
 An overview of the patterns of behavioral change in Africa and Eurasia during the Middle and Late Pleistocene. In: d'Errico, Francesco / Blackwell, Lucinda / Malauzat, Bernard (Eds.), From tools to symbols: from early hominids to modern humans. Witwatersrand University Press, Johannesburg, pp. 294-332.
2007.  
 Les flûtes aurignaciennes des grottes du Geissenklösterle et du Vogelherd (Jura souabe) / Flöten aus dem Aurignacien der Höhlen Geißenklösterle und Vogelherd auf der Schwäbischen Alb. In: Floss, Harald (Ed.), Das Aurignacien und die Anfänge der Kunst in Europa, allemand. Ed. Musée. forum Aurignac, 2007, 345-354.
2008.  
 A critical view of the evidence for a southern African origin of behavioural modernity. South African Archaeological Bulletin (Goodwin Series) 10, 175-179.
2009.  
 A female figurine from the basal Aurignacian of Hohle Fels Cave in southwestern Germany. Nature 459, 248-252.
2010.  
 Cultural modernity: Consensus or conundrum? PNAS, 107 (17), 7621-7622.
2011.  
 The Demise of the Neanderthal Cultural Niche and the Beginning of the Upper Paleolithic in Southwestern Germany. In: Conard, Nicholas J. / Richter Jürgen (Eds.), Neanderthal Lifeways, Subsistence and Technology: One Hundred Fifty Years of Neanderthal Study. Vertebrate Paleobiology and Paleoanthropology Series. Springer, Dordrecht, pp. 223-240.
2015.  
 Cultural Evolution During the Middle and Late Pleistocene in Africa and Eurasia. In: Henke, Winfried / Tattersall, Ian (Eds.), Handbook of Paleoanthropology. Springer, Berlin and Heidelberg.
2017.  
 The Path to UNESCO World Cultural Heritage Status for the Caves and Ice Age Art in the Swabian Jura. Mitteilungen der Gesellschaft für Urgeschichte 26, 153-168.
2021.  
 Forward to the Monograph - Zeichen: Markierungen, Muster und Symbole im Schwäbischen Aurignacien by Ewa Dutkiewicz. In: Conard, Nicholas, J. (Ed.), Zeichen: Markierungen, Muster und Symbole im Schwäbischen Aurignacien. Kerns Verlag, Tübingen, pp. 9-10.
- Conard, Nicholas J. / Langguth K. / Uerpmann, Hans-Peter, 2001.  
 Die Ausgrabung im Gravettien des "Hohle Fels" bei Schelklingen. Alb-Donau-Kreis. Archäologische Ausgrabungen in Baden-Württemberg 2000, 18-22.
2002.  
 Neue Aurignacien-Fundsichten im Hohle Fels bei Schelklingen. Alb-Donau-Kreis. Archäologische Ausgrabungen in Baden-Württemberg 2001, 22-26.
2004.  
 Die Ausgrabungen 2003 in den Gravettien- und Aurignacien- Schichten des Hohle Fels bei Schelklingen, Alb-Donau-Kreis, und die kulturelle Entwicklung im frühen Jungpaläolithikum. Archäologische Ausgrabungen in Baden-Württemberg 2003, 17-22.

Conard, Nicholas J. / Malina, Maria, 2002.

Neue Ausgrabungen in den unteren Aurignacien und des Mittelpaleolithikums im Geißenklösterle bei Blaubeuren, Alb-Donau-Kreis. Archäologische Ausgrabungen in Baden-Württemberg 2001, 16-21.

2003.

Abschließende Ausgrabungen im Geißenklösterle bei Blaubeuren, Alb-Donau-Kreis. Archäologische Ausgrabungen in Baden-Württemberg 2002, 17-21.

2005.

Die Ausgrabungen 2004 in den frühen jungpaläolithischen Schichten des Hohle Fels bei Schelklingen. Alb-Donau-Kreis. Archäologische Ausgrabungen in Baden-Württemberg 2004, 17-21.

2006.

Neue Ergebnisse zum Mittelpaläolithikum, zum Aurignacien und zu den letzten Neandertalern am Hohle Fels bei Schelklingen, Alb-Donau-Kreis. Alb-Donau-Kreis. Archäologische Ausgrabungen Baden-Württemberg 2005, 17-20.

2007.

Schmuck und vielleicht auch Musik am Vogelherd bei Niederstotzingen-Stetten ob Lontal, Kreis Heidenheim. Archäol. Ausgr. Baden-Württemb. 21-25.

2007.

Die Ausgrabungen am Hohle Fels bei Schelklingen, Alb-Donau-Kreis. Archäologische Ausgrabungen Baden-Württemberg 2006, 17-20.

2008.

Die Ausgrabung 2007 im Hohle Fels bei Schelklingen, Alb-Donau-Kreis, und neue Einblicke in die Anfänge des Jungpaläolithikums. Archäologische Ausgrabungen Baden-Württemberg 2007, 17-20.

2008.

New Evidence for the Origins of Music from the Caves of the Swabian Jura. In: Both, Arnd Adje / Eichmann, Ricardo / Hickmann, Ellen / Koch Lars-Christian (Eds.), Studies in Music Archaeology VI, Challenges and Objectives in Music Archaeology. Verlag Marie Leidorf GmbH, Rahden/Westf, pp. 13-22.

2009.

Spektakuläre Funde aus dem unteren Aurignacien vom Hohle Fels bei Schelklingen. Alb-Donau-Kreis. Archäologische Ausgrabungen Baden-Württemberg 2008, 19-22.

2009.

Spektakuläre Funde aus dem unteren Aurignacien vom Hohle Fels bei Schelklingen, Alb-Donau-Kreis. Archäologische Ausgrabungen Baden-Württemberg 2008, 19-22.

2010.

Neue Belege für Malerei aus dem Magdaénien vom Hohle Fels. Archäologische Ausgrabungen Baden-Württemberg 2009, 52-56.

2011.

Neue Eiszeitkunst und weitere Erkenntnisse über das Magdaénien vom Hohle Fels bei Schelklingen. Archäologische Ausgrabungen Baden-Württemberg 2010, 56-60.

2012.

Neue Forschungen in den Magdalénien-Schichten des Hohle Fels bei Schelklingen. Archäologische Ausgrabungen Baden-Württemberg 2011, 56-60.

2013.

Grabungen in Schichten des Mousterien und Gravettien im Hohle Fels bei Schelklingen. Archäologische Ausgrabungen Baden-Württemberg 2012, 78-83.

2015.  
Eine mögliche zweite Frauenfigurine vom Hohle Fels und Neues zur Höhlennutzung im Mittel- und Jungpaläolithikum. *Archäologische Ausgrabungen Baden-Württemberg* 2014, 54-59.
2016.  
Außergewöhnliche neue Funde aus den aurignacienzeitlichen Schichten vom Hohle Fels bei Schelklingen. *Archäologische Ausgrabungen Baden-Württemberg* 2015, 60-66.
2019.  
Weiterführende Ausgrabungen im Hohle Fels bei Schelklingen und neue Einblicke in die Nutzung von Ocker im Jungpaläolithikum. *Archäologische Ausgrabungen in Baden-Württemberg* 2018, 56-59.
2020.  
Fortsetzung der Ausgrabungen am Hohle Fels und neue aurignacienzeitliche Werkzeuge aus Mammutfelbein. *Archäologische Ausgrabungen in Baden-Württemberg* 2019, 47-51.
- Conard, Nicholas J. / Bolus, Michael, 2003.  
Radiocarbon Dating the Appearance of Modern Humans and the Timing of Cultural Innovations in Europe: New Results and New Challenges. *Journal of Human Evolution* 44, 331-371.
2006.  
The Swabian Aurignacian and its Place in European Prehistory. In: Bar-Yosef, Ofer / Zilhão, João (Eds.), *Towards a definition of the Aurignacian - Proceedings of the Symposium held in Lisbon, Portugal, June 25-30, 2002*. *Trabalhos de Arqueologia* 45, Lisboa, 211-239.
2008.  
Radiocarbon dating the late Middle Paleolithic and the Aurignacian of the Swabian Jura. *Journal of Human Evolution* 55, 886-887.
- Conard, Nicholas J. / Dippon, Gerlinde / Goldberg, Paul, 2003.  
Chronostratigraphy and archaeological context of the Aurignacian deposits at Geißenklösterle. In: Zilhão, João / d'Errico, Francesco (Eds.), *The Chronology of the Aurignacian and the Transition Technocomplexes. Dating, Stratigraphies and Cultural Implications*. *Trabalhos de Arqueologia*, vol. 33. Instituto Português de Arqueologia, Lisbon, pp. 165-176.
- Conard, Nicholas J. / Langguth, K. / Uerpmann, Hans-Peter, 2003.  
Einmalige Funde aus dem Aurignacien und erste Belege für ein Mittelpaläolithikum im Hohle Fels bei Schelklingen, Alb-Donau-Kreis. *Archäologische Ausgrabungen in Baden-Württemberg*, 2002, 21-27.
- Conard, Nicholas J. / Malina, Maria / Münzel, Susanne C. / Seeberger, Friedrich, 2004.  
Eine Mammutfelbeinflöte aus dem Aurignacien des Geissenklösterle: Neue Belege für eine Musikalische Tradition im Frühen Jungpaläolithikum auf der Schwäbischen Alb. *Archäologisches Korrespondenzblatt* 34, 447-462.
- Conard, Nicholas J. / Bolus, Michael / Goldberg, Paul / Münzel, Susanne C., 2006.  
The last Neanderthals and first modern humans in the Swabian Jura. In: Conard, Nicholas J. (Ed.), *When Neanderthals and modern humans met*. Kerns, Tübingen pp. 305-341.
- Conard, Nicholas J. / Malina, Maria / Münzel, Susanne C., 2009.  
New flutes document the earliest musical tradition in southwestern Germany. *Nature* 460, 737-740.
- Conard, Nicholas J. / Kitagawa, Keiko / Krönneck, Petra / Böhme, Madelaine / Münzel, Susanne C., 2013.  
The Importance of Fish, Fowl and Small Mammals in the Paleolithic Diet of the Swabian Jura, Southwestern Germany. In: Clark, Jamie L. / John D. Speth, (Eds.), *Zooarchaeology and Modern Human Origins: Human Hunting Behavior During the Later Pleistocene*. *Vertebrate Paleobiology and Paleoanthropology*. Springer, New York, pp. 173-190.

- Conard, Nicholas J. / Janas, Alexander / Malina, Maria, 2014.  
 Vielfältige Funde aus dem Aurignacien und ein bemalter Stein aus dem Magdalénien vom Hohle Fels bei Schelklingen. *Archäologische Ausgrabungen Baden-Württemberg* 2013, 58-63.
- Conard, Nicholas J. / Bolus, Michael / Dutkiewicz, Ewa / Wolf, Sibylle, 2015.  
 Eiszeitarchäologie auf der Schwäbischen Alb: Die Fundstellen im Ach- und Lonetal und in ihrer Umgebung. *Tübingen Publications in Prehistory*, Kerns Verlag, Tübingen.
- Conard, Nicholas J. / Zeidi, Mohsen / Janas, Alexander, 2016.  
 Abschließender Bericht über die Nachgrabung am Vogelherd und die Sondage in der Wolfthalhöhle. *Archäologische Ausgrabungen Baden-Württemberg* 2015, 66-72.
- Conard, Nicholas J. / Janas, Alexander / Rudolf, S., 2017.  
 Weitere Grabungsergebnisse zu den Aurignacienzeitlichen Schichten vom Hohle Fels bei Schelklingen. *Archäologische Ausgrabungen Baden-Württemberg* 2016, 54-58.
- Conard, Nicholas J. / Janas, Alexander, 2018.  
 Fortsetzung der Ausgrabungen am Hohle Fels und die Entdeckung einer markierten Mammutrippe aus dem Gravettien. *Archäologische Ausgrabungen Baden-Württemberg* 2017, 52-55.
2021.  
 Ausgrabungen im Hohle Fels: Fundschichten aus dem Mittelpaläolithikum und Neues zur Jagdtechnik der Neandertaler. *Archäologische Ausgrabungen in Baden-Württemberg* 2020, 60-65.
- Conard, Nicholas J. / Rots, Veerle, 2024.  
 Rope making in the Aurignacian of Central Europe more than 35,000 years ago. *Sci. Adv.* 10, eadh5217(2024).
- Conkey, Margaret W. / Gero, Joan M. (Eds.), 1991.  
*Engendering Archaeology. Women and Prehistory*. Basil Blackwell, Oxford.
- Cooke, Deryck, 1989.  
*The Language of Music*. Clarendon Press, Oxford. Originally published in 1959.
- Coolidge, Frederick L. / Wynn, Thomas, 2005.  
 Working Memory, its Executive Functions, and the Emergence of Modern Thinking. *Cambridge Archaeological Journal*, 15 (1), 5-26.
- Corbeil, Marieve / Trehub, Sandra E. / Peretz, Isabelle, 2013.  
 Speech vs. singing: infants choose happier sounds. *Front Psychol* 4, 372.
- Coumont, Marie-Pierre, 2002.  
 Approche méthodologique de l'étude des instruments sonores en os de la préhistoire: aspects taphonomiques et fonctionnels. In: Patou-Mathis, Marylène / Cattelain, Pierre / Ramseier, Denis (Eds.), *L'Industrie osseuse Pré-et-protohistorique en Europe. Approches technologiques et fonctionnelles. Actes du colloque 1.6, XIVe congrès de l'UISSP, Liège, 200*, *Bulletin du Cercle archéologique Hesbaye-Condruz*, Amay 26, 87-95.
- Coward, Fiona / Gamble, Clive, 2014.  
 Big brains, small worlds: Material culture and the evolution of the mind. In: Dunbar, Robin Ian MacDonald / Gamble, Clive / Gowlett, John (Eds.), *Lucy to language: the benchmark papers*. Oxford University Press, Oxford, pp. 461-480.
- Cox, Daniel T. C. / Shanahan, Danielle F. / Hudson, Hannah L. / Plummer, Kate E. / Siriwardena, Gavin M. / Fuller, Richard A. / Anderson, Karen / Hancock, Steven / Gaston, Kevin J., 2017.  
 Doses of Neighborhood Nature: The Benefits for Mental Health of Living with Nature. *BioScience*, 67 (2), 147-155.

- Cram, Fiona, 2017.  
Method or methodology, what's the difference? Community research.
- Cross, Ian, 1999.  
Is music the most important thing we ever did? Music, development and evolution. In: Yi, Suk Won (Ed.), Music, mind and science. Seoul National Univesity Press, Seoul, pp. 10-39.
2001.  
Music, mind and evolution. *Psychology of Music* 29, 95-102.
2003.  
Music and Emotion: lecture notes.
- 2003b.  
Music and biocultural evolution. In: Clayton, Martin / Herbert, Trevor / Middleton, Richard (Eds.), *The cultural study of music: a critical introduction*. Routledge, London, pp. 19-30.
- Cross, Ian / Morley, Iain, 2008.  
Music and evolution: the nature of the evidence. *Communicative Musicality*.
2009.  
The evolution of music: theories, definitions and the nature of the evidence. In: Malloch, Stephen / Trevarthen, Colwyn (Eds.), *Communicative Musicality*. Oxford University Press, Oxford, pp. 61-81.
- d'Errico, Francesco / Doyon, Luc / Colagé, Ivan / Queffelec, Alain / Le Vraux, Emma / Giacobini, Giacomo / Vandermeersch, Bernard / Maureille, Bruno, 2017.  
From Number Sense to Number Symbols. An Archaeological Perspective. *Phil. Trans. R. Soc. B* 373: 20160518, 1-37.
- d'Errico, Francesco / Henshilwood, Christopher / Lawson, Graeme / Vanhaeren, Marian / Tillier, Anne-Marie / Soressi, Marie / Bresson, Frédérique / Maureille, Bruno / Nowell, Aril / Lakarra, Joseba / Backwell, Lucinda / Julien, Michèle, 2003.  
Archaeological evidence for emergence of language, symbolism, and music – An alternative multidisciplinary perspective. *Journal of World Prehistory* 17, 1-70.
- d'Errico, Francesco / Lawson, Graeme, 2006.  
The Sound Paradox: How to Assess the Acoustic Significance of Archaeological Evidence? In: Scarre, Chris / Lawson, Graeme (Eds.), *Archaeoacoustics*. McDonald Institute monographs, Oxford, pp. 41-57.
- Dahl, Roald, 1964.  
Charlie and the Chocolate Factory. George Allen & Unwin.
- Damasio, Antonio R., 1989.  
Time-Locked Multiregional Retroactivation: A Systems- Level Proposal for the Neural Substrates of Recall and Recognition. *Cognition* 33, (1-2), 25-62.
- 1994 (2006).  
Descartes' Error: Emotion, Reason and the Human Brain. Avon Books, New York.
- Dams, Lya, 1985.  
Palaeolithic lithophones: descriptions and comparisons. *Oxford Journal of Archaeology* 4 (1), 31-46.
- Daniel, Hal J., 1990.  
The vestibular system and language evolution. In: Wind, Jan / Pulleyblank, Edward, G. / de Grolier, Éric / Bichakjian, Bernard, H., (Eds.), *Studies in Language Origins: Volume 1*. John Benjamins Publishing Company, Amsterdam, pp. 257-271.

- Dart, Raymond A., 1925.  
*Australopithecus africanus: The Man-Ape of South Africa.* Nature 115, 195-199.
- Darwin, Charles, 1871.  
*The Descent of Man, and Selection in Relation to Sex.* John Murray, London.
- 1871a.  
*The Descent of Man, and Selection in Relation to Sex, Volume I.* John Murray, London.
- 1871b.  
*The Descent of Man, and Selection in Relation to Sex, Volume II.* John Murray, London.
1872.  
*The Expression of Emotion in Man and Animals.* John Murray, London.
1877.  
 A biographical sketch of an infant. *Mind. A Quarterly Review of Psychology and Philosophy*, 2 (7), 285-294.
1905.  
*Voyage of the Beagle.* John Murray, London (first published 1839).
- Daughtry, J. Martin, 2015.  
*Listening to War: Sound, Music, Trauma, and Survival in Wartime Iraq.* Oxford University Press, Oxford.
- Dauvois, Michel, 2005.  
*Homo musicus palaeolithicus et Palaeoacustica.* *Munibe (Antropologia-Arkeologia)* 57, 225-241.
- Davies, Stephen, 2001.  
 Philosophical Perspectives on Music's Expressiveness In: Juslin, Patrik N. / Sloboda, John A. (Eds.), *Music and Emotion: Theory and Research.* Oxford University Press, Oxford, pp. 23-44.
2010.  
 Emotions expressed and aroused by music. Philosophical perspectives. In: Juslin, Patrik N. / Sloboda, John, (Eds.), *Handbook of Music and Emotion: Theory, Research, Applications.* Oxford University Press, Oxford, pp. 15-43.
2018.  
 Evolution, Aesthetics, and Art: An Overview. In: Joyce, Richard, (Ed), *Routledge Handbook of Evolution and Philosophy.* Routledge, Oxon/NY, (359-371).
- Davis Pamela, J. / Zhang, Shi, Ping / Winkworth, Alison / Bandler, Richard, 1996.  
 Neural control of vocalisation: respiratory and emotional influences. *Journal of Voice* 10, 23-38.
- de Waal, Frans B. M., 1996.  
*Good natured: the origins of right and wrong in humans and other animals.* Harvard University Press, Cambridge, MA.
- Deacon, Terrence W., 1997.  
*The Symbolic Species: The Co- Evolution of Language and the Brain.* W. W. Norton, New York.
- Derricourt, Robin, 2018.  
*Unearthing childhood. Young lives in prehistory.* Manchester University Press, Manchester.
- Derrida, Jacques, 1978.  
*Writing and Difference.* University of Chicago Press, Chicago (transl. Alan Bass).
1982.  
 Signature Event Context. In: *Margins of Philosophy.* Translated by Alan Bass, University of Chicago.

- Descola, Philippe, 2013.  
*Beyond Nature and Culture*. Translated by Janet Lloyd, and foreword by Marshall Sahlins. The University of Chicago Press, Chicago.
- Dikmans, Greg, 1991.  
 The performance practice of early 18th century French flute music. MA Thesis, La Trobe University, Melbourne.
- Dikmans, Greg, 2000-2012.  
 Early Music and Historically Informed Performance Practice. Ph.D. Thesis, Melbourne University.
- Dilley, James, 2021.  
 An experimental approach to understanding Aurignacian projectile technology in NW Europe. PhD thesis, University of Southampton.
- Dimkaroski, Ljuben, 2014.  
 Musical research into the flute from suspected to contemporary musical instrument. In: Horvat, Jana / Pleterski, Andrej / Velušček, Anton, (Eds.), *Divje babe I*. Upper Pleistocene Palaeolithic site in Slovenia Part II: Archaeology. Opera Instituti Archaeologici Sloveniae 29, Ljubljana, pp. 215-222.
- Dinnis, Rob / Bessudnov, Alexander / Chiotti, Laurent / Flas, Damien / Michel, Alexandre, 2019.  
 Thoughts on the Structure of the European Aurignacian, with Particular Focus on Hohle Fels IV. *Proceedings of the Prehistoric Society* 85. Cambridge University Press, 29-60.
- Dissanayake, Ellen, 1992.  
*Homo Aestheticus: Where Art Comes From and Why*. Free Press, New York.
1999.  
 Antecedents of musical meaning in the mother-infant dyad. In: Cooke, Brett/Turner, Frederick (Eds.), *Biopoetics: Evolutionary Explorations in the Arts*. Paragon House, New York, pp. 367-397.
- 2000a.  
 Antecedents of the temporal arts in early mother-infant interaction. In: Wallin, Nils L. / Merker, Björn / Brown, Steven (Eds.), *The Origins of Music*. MIT Press, Cambridge, MA, pp. 389-410.
- 2000b.  
*Art and Intimacy: How the Arts Began*. University of Washington Press, Seattle.
2006.  
 Ritual and ritualization: musical means of conveying and shaping emotion in humans and other animals. In: Brown, Steven / Vogelsten, Ulrich, (Eds.), *Music and manipulation: on the social uses and social control of music*. Berghahn Books, Oxford and New York, pp. 31-56.
2018.  
 Ancestral Minds and The Spectrum of Symbol. *Early Rock Art of the American West: The Geometric Enigma*, of Ekkehart Malotki and Ellen Dissanayake. University of Washington Press, Seattle, pp. 91-129.
- Donald, Merlin, 1991.  
*Origins of the Modern Mind*. Harvard University Press, Cambridge, Massachusetts.
- Douglas, Mary, 1973.  
*Natural Symbols*. Random House, New York.
1976.  
*Purity and Danger: An Analysis of Concepts of Pollution and Taboo*. Routledge and Kegan Paul, London and Henley. Originally published 1966.
- Dowling, W., Jay / Harwood, Dane, L., 1986.  
*Music Cognition*. Academic Press, London.

- Drake, Carolyn / Bertrand, Daisy, 2003.  
The Quest for Universals in Temporal Processing in Music. In: Peretz, Isabelle / Zatorre, Robert J. (Eds),  
The Cognitive Neuroscience of Music. Oxford on line.
- Driesch, A. von den and J. Boessneck 1981.  
“über drei Gekerbte Schulterblätter im archäologischen Fundgut Archäologie und Naturwissenschaften  
Norsuntepe/ Ostanatolien,” 2, Mainz, pp. 72-75.
- Duchin, Linda E., 1990.  
The evolution of articulate speech: comparative anatomy of the oral cavity in Pan and Homo. *Journal of  
Human Evolution* 19, 687-697.
- Dunbar, Robin, I. M., 1996.  
Grooming, gossip and the evolution of language. Faber & Faber, London.
1998.  
Theory of mind and the evolution of language In: Hurford, James Raymond/Studdert-Kennedy, Michael /  
Knight, Chris (Eds.), *Approaches to the evolution of language*. Cambridge University Press Cambridge, pp.  
92-110.
- Durkheim, Émile, 2001.  
The Elementary Forms of Religious Life. Translated by Carol Cosman. Abridged with an introduction and  
notes by Mark S. Cladis. Originally published 1912. Oxford University Press, Oxford.
- Dutkiewicz, Ewa, 2021.  
Zeichen: Markierungen, Muster und Symbole im Schwäbischen Aurignacien. Kerns Verlag, Tübingen (Ed.  
Nicholas Conard).
- Eco, Umberto, 1976.  
Peirce’s Notion of Interpretant. *MLN* 91 (6), 1457-72.
- Eibl Eibesfeldt, Irenäus, 1989.  
Human ethology. Gruyter, Hawthorne, NY.
- Einwögerer, Thomas / Käfer, Bernadette / Fladerer, F. A., 1998.  
Eine jungpaläolithische Knochenflöte aus der Station Grubgraben bei Kammern, Niederösterreich.  
*Archäologisches Korrespondenzblatt* 28, 21-30.
- Elbert, Thomas / Pantev, Christo / Wienbruch, Christo / Rockstroh, Brigitte / Taub, Edward, 1995.  
Increased cortical representation of the fingers of the left hand in string players. *Science* 270, 305-307.
- Ellen, Roy, 1988.  
Fetishism. *Man (N.S.)* 23, 213-235.
- Ellsworth, Phoebe C., 1994.  
Some reasons to expect universal antecedents of emotion. In: Ekman, Paul / Davidson, Richard, J. (Eds.),  
*The Nature of Emotion: Fundamental Questions*. Oxford University Press, New York, pp. 150-154.
- Elowson A. Margaret / Snowdon, Charles T. / Lazaro-Perea, Cristina, 1998.  
“Babbling” and social context in infant monkeys: parallels to human infants. *Trends Cogn. Sci.*, 2, 31-37.
- Epstein, Steven, 1994.  
A Queer Encounter: Sociology and the Study of Sexuality. *Sociological Theory*, 12, (2), 188-202.
- Etkin, William, 1954.  
Social behavior and the evolution of man's faculties. *The American Naturalist* 88, 129-142.
- Etxepare Ricardo / Irurtzun Aritz 2021.  
Gravettian hand stencils as sign language formatives *Phil. Trans. R. Soc.* B37620200205.

European Music Archaeology Project (EMAP).

Fages, Gilbert / Mourer-Chauviré, Cécile, 1983.

La flûte en os d'oiseau de la grotte sépulcrale de Veyreau (Aveyron) et inventaire des flûtes préhistoriques d'Europé. In: Poplin, F. (Ed.), *La faune et l'homme préhistorique, dix études en hommage à Jean Bouchud*. Mémoires de la Société Préhistorique Française 16. Société Préhistorique Française, Paris, pp. 95-103.

Fales, Cornelia, 2002.

The Paradox of Timbre, *Ethnomusicology*, 46 (1), 56-95.

Falk, Dean, 2004a.

Braindance: New Discoveries about Human Origins and Brain Evolution (revised and expanded edition). University Press of Florida, Gainesville, Florida.

2004b.

Prelinguistic evolution in early hominins: whence motherese? *Behavioural and Brain Sciences* 27.

Feld, Steven, (1982) 2012.

Sound and Sentiment Birds, Weeping, Poetics, and Song in Kaluli Expression. Third Edition. Duke University Press, Durham & London. Originally published 1982, Philadelphia.

Feld, Steven / Fox, Aaron, A., 1994.

Music and language. *Annual Review of Anthropology* 23, 25-53.

Feliks, John. 2011.

The golden flute of Geissenklosterle: Mathematical evidence for a continuity of human intelligence as opposed to evolutionary change through time. *Journal of Applied Mathematics* 4 (4), 157-162.

Fernald, Anne 1992a.

Meaningful melodies in mothers' speech to infants. In: Papoušek, Hanuš / Jürgens, Uwe / Papoušek, Mechthild (Eds.), *Nonverbal Vocal Communication: Comparative and developmental approaches*. Cambridge University Press, Cambridge, pp. 262-282.

1992b.

Human maternal vocalisations to infants as biologically relevant signals: an evolutionary perspective. In: Barkow, Jerome H / Cosmides Leda / Tooby, John (Eds.), *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*. Oxford University Press, Oxford, pp. 391- 428.

Fernald, Anne / Simon, Thomas, 1984.

Expanded intonation contours in mothers' speech to newborns. *Developmental Psychology*, 20 (1), 104-113.

Fewlass, Helen / Talamo, Sagra / Wacker, Lukas / Kromer, Bernd / Tuna, Thibaut / Fagault, Yoann / Bard, Edouard / McPherron, Shannon P. / Aldeias, Vera / Maria, Raquel / Martisius, Naomi L. / Paskulin, Lindsay / Rezek, Zeljko / Sinet-Mathiot, Virginie / Sirakova, Svoboda / Smith, Geoffrey M. / Spasov, Rosen / Welker, Frido / Sirakov, Nikolay / Tsanova, Tsenka / Hublin, Jean-Jacques, 2020.

A 14C chronology for the Middle to Upper Palaeolithic transition at Bacho Kiro Cave, Bulgaria. *Nature, Ecology and Evolution* 4, 794-801.

Fitch, William Tecumseh, 2000.

The phonetic potential of nonhuman vocal tracts: comparative cineradiographic observations of vocalizing animals. *Phonetica* 57 (2-4), 205-218.

2000b.

The evolution of speech: A comparative review. *Trends in Cognitive Sciences* 7, 258-267.

2002.

Comparative vocal production and the evolution of speech: reinterpreting the descent of the larynx. In: Wray, Alison (Ed.), *The transition to language*. Oxford University Press, Oxford, pp. 21–45.

2009.  
Fossil cues to the evolution of speech. In: Botha, Rudolf / Knight, Chris (Eds.), *The Cradle of Language*, Oxford University Press, Oxford, pp. 108-130.
2015.  
Four principles of bio-musicology. *R. Soc. B* 370: 20140091, 1-12.
- Floss, Harald, 2007.  
Die Kleinkunst des Aurignacien auf der Schwäbischen Alb und ihre Stellung in der paläolithischen Kunst. In: Floss, Harald / Rouquerol, N. (Eds.), *Les Chemins de l'Art aurignacien en Europe – Das Aurignacien und die Anfänge der Kunst in Europa. Colloque international Aurignac, 16-18 septembre 2005. Éditions Musée-forum Aurignac, Aurignac*, pp. 295-316.
2015.  
The Oldest Portable Art: the Aurignacian Ivory Figurines from the Swabian Jura (Southwest Germany). *Palethnologie. Archéologie et sciences humaines* 7. <https://doi.org/10.4000/palethnologie.888>
- Floss, Harald / Fröhle, Simon / Schürch, Benjamin / Wettengl, Stefan, 2017.  
Open air occupations in a cave dominated archaeological landscape – new perspectives on the Palaeolithic of the Swabian Jura (southern Germany). *Anthropologie, LV/1–2*, 43-73.
- Floss, Harald / Hoyer, C. / Dutkiewicz, Ewa / Frick, J. / Poenicke, H.-W., 2012.  
Eine neu entdeckte paläolithische Freilandfundstelle auf der Schwäbischen Alb – Sondagegrabungen in Börslingen. *Archäologische Ausgrabungen in Baden-Württemberg* 2011, 71-74.
- Floss, Harald / Schürch, Benjamin, 2015.  
Paläolithische Oberflächenfunde von der Blaubeurer Alb. *Mitteilungen der Gesellschaft für Urgeschichte*, 24, 121-140.
- Foucault, Michel, 1979.  
*Discipline and Punish: The Birth of the Prison*. Transl. by Alan Sheridan. Vintage Books, New York.
1984.  
“Space, Knowledge and Power” an interview with Michel Foucault. In: Rainbow, Paul (Ed.), *The Foucault Reader*. Pantheon, New York, pp. 239-256.
- Freyer, David, W. / Nicolay, Chris, 2000.  
Fossil evidence for the origin of speech sounds. In: Wallin, Nils L. / Merker, Björn / Brown, Steven (Eds.), *The Origins of Music*. MIT Press, Cambridge, MA, pp. 217-234.
- Freeman, Andrea, 2019.  
*Skimmed: Breastfeeding, Race, and Injustice*. Stanford University Press, Stanford.
- Freeman, Walter, J., 1995.  
*Societies of Brains. A Study in the Neuroscience of Love and Hate*. Erlbaum, New Jersey.
2000.  
A neurobiological role for music in social bonding. Wallin, Nils L. / Merker, Björn / Brown, Steven (Eds.), *The Origins of Music*. MIT Press, Cambridge, MA, pp. 411-424.
- Früberg, Anders / Sundberg, Johan, 1999.  
Does music performance allude to locomotion? A model of final ritardandi derived from measurements of stopping runners. *Journal of the Acoustical Society of America*, 105 (3), 1469-1484. <https://doi.org/10.1121/1.426687>
- Fröhle, Simon, 2013.  
Die Oberflächenfunde der neu entdeckten paläolithischen Freilandfundstelle Börslingen. Bachelor essay, Tübingen University, Tübingen.

Fu, Qiaomei / Hajdinjak, Mateja / Moldovan, Oana Teodora / Constantin, Silviu / Mallick, Swapan / Skoglund, Pontus / Patterson, Nick / Rohland, Nadin / Lazaridis, Iosif / Nickel, Birgit / Viola, Bence / Prüfer, Kay / Meyer, Matthias / Kelso, Janet / Reich, David / Pääbo, Svante, 2015.

An early modern human from Romania with a recent Neanderthal ancestor. *Nature* 524, 216-219.  
<https://doi.org/10.1038/nature14558>

Fubini, Enrico 1990.

The History of Music Aesthetics. Macmillan, London.

Fuglestedt, Ingrid, 2010a.

Animals, Churingas and Rock Art in Late Mesolithic Northern Scandinavia. In: Goldhahn, Joakim / Jones, Andrew Meirion / Fuglestedt, Ingrid (Eds.), *Changing Pictures: Rock Art Traditions and Visions in the Northernmost Europe*. Oxbow Books, Oxford, 23-34.

2010b.

Humans, Material Culture and Landscape: Outline to an Understanding of Developments in Worldview on the Scandinavian Peninsula, ca. 10,000-4500 BP. In: Cannon, Aubrey (Ed.), *Structured Worlds. The Archaeology of Hunter Gatherer Thought and Action*. Equinox Publishing, London, 32-53.

2018.

Rock Art and the Wild Mind. Visual Imagery in Mesolithic Northern Europe. Routledge, London/New York.

Fuller, David, 1989.

The performer as composer. In: Brown, Howard Mayer / Sadie, Stanley (Eds.), *Performance Practice: Music after 1600*. Macmillan, London pp. 117-146.

Fürniss, Susanne, 2006.

Aka polyphony: music, theory, back and forth. In: Tenzer, Michael (Ed.), *Analytical Studies in World Music*. Oxford University Press, New York and Oxford, pp. 163-204.

Gabrielsson, Alf / Lindström, Erik, (2010).

The Role of Structure in the Musical Expression of Emotions. In: Juslin, Patrik N. / Sloboda, John, A. (Eds.), *Handbook of Music and Emotion: Theory, Research, Applications*. Oxford University Press, Oxford, pp. 367-400.

Gamble, Clive, 1999.

The Palaeolithic Societies of Europe. Cambridge University Press, Cambridge.

García Benito, Carlos / Alcolea, Marta / Mazo, Carlos, 2016a.

Experimental study of the aerophone of Isturitz: Manufacture, use-wear analysis and acoustic tests. *Quaternary International* 421, 239-254.

García-Benito, Carlos / Mazo Pérez, Carlos / Alcolea Gracia, Marta, 2018.

Calling for the deer. An eunuch flute at Le Placard? In: Delage, Christophe (Ed.), *New considerations on an exceptional prehistoric site*. Archaeopress, Oxford, pp. 124-145.

Gaser, Christian / Schlaug, Gottfried, 2003.

Brain structures differ between musicians and non-musicians. *J. Neurosci.* 23, 9240-9245.

Gell, Alfred 1998.

Art and Agency: An Anthropological Theory. Oxford University Press, Oxford.

Geyer, Otto F. / Gwinner, Manfred P., 1979.

Die Schwäbische Alb mit ihrem Vorland. Sammlung Geologischer Führer, Borntraeger, Berlin.

1991.

Geologie von Baden-Württemberg. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart.

- Gibson, Kathleen Rita, 1988.  
Brain size and the evolution of language. In: Landsberg, Marge E. (Ed.), *The Genesis of Language: A different judgement of evidence*. De Gruyter Mouton, Berlin, pp. 149-172.
- Gicqueau, Arthur / Schuh, Alexandra / Henrion, Juliette / Viola, Bence / Partiot, Caroline / Guillon, Mark / Golovanova, Liubov / Doronichev, Vladimir / Gunz, Philipp / Hublin, Jean-Jacques / Maureille, Bruno, 2023.  
Anatomically modern human in the Châtelperronian hominin collection from the Grotte du Renne (Arcy-sur-Cure, Northeast France). *Scientific Reports*, (2023) 13:12682.
- Gill, Frances, 2012.  
Flute Lines: Experiencing Reconstructions Concerning Music. Bachelor dissertation in archaeology. School of Cultural Sciences, Linnaeus University, Kalmar/Växjö.
2016.  
Foraging for Sound: Towards a Palaeolithic Flutescape and its Tonal Associations. In: Eichmann, Ricardo/Fang Jianjun / Koch, Lars-Christian (Eds.), *Studies in Music Archaeology X, Sound – Object – Culture – History*. Verlag Marie Leidorf GmbH, Rahden/Westf, pp. 251-255.
2020.  
Ears to the Ground: On Cajsá Lund's Legacy and Moving Movements. In: Kolltveit, Gjermund / Rainio, Riitta (Eds.), *The Archaeology of Sound, Acoustics and Music: Studies in Honour of Cajsá S. Lund*. ICTM Study Group on Music Archaeology, Vol. 3, Ekho Verlag, Berlin, pp 55-96.
- Gill, Frances / Petersson, Bodil / Weheliye, Fadumo 2021.  
An experimental approach to heritage and music through a SOUNDmound at Sandby borg, Sweden: developments in method and practice. In: Maloney, Liam / Schofield, John (Eds.), *Music and Heritage: New Perspectives on Place-making and Sonic Identity*. Routledge, London, pp. 201-211.
- Gluckman, Max, 1962.  
Les Rites de passage. In: Gluckman (Ed.), *Essays on the Ritual of Social Relations*, pp. 1-52.
- Goldhahn, Joakim, 2002.  
Roaring rocks – an audio-visual perspective on hunter-gatherer engravings in Northern Sweden and Scandinavia. *Norwegian Archaeological Review*, 35, 29-61.
2019.  
Birds in the Bronze Age: A North European Perspective. Cambridge University Press: Cambridge.
- Goldstein, Michael H. / King, Andrew P. / West, Meredith J., 2003.  
Social interaction shapes babbling: Testing parallels between birdsong and speech. *PNAS* 100 (13), 8030-5.
- Goodall, Jane 1986.  
The chimpanzees of Gombe. Harvard University Press, Cambridge, MA.
- Gosselin, Nathalie / Samson, Séverine / Adolphs, Ralph / Noulhiane, Marion / Roy, Mathieu / Hasboun, Dominique / Baulac, Michel / Peretz, Isabelle, 2006.  
Emotional responses to unpleasant music correlates with damage to the parahippocampal cortex. *Brain* 129, 2585-2592.
- Grant, Morag Josephine, 2014.  
Pathways to music torture. *Transposition, Musique et Sciences Sociales* 4, 1-23.
2016.  
J. Martin Daughtry, *Listening to War: Sound, Music, Trauma and Survival in Wartime Iraq*. *Transposition, Musique et Sciences Sociales* 6, 1-4.
- Gratier, Maya, 2008.  
Liminal spaces and narratives of voice and body in infant vocal interchange (commentary on Morioka). *International Journal for Dialogical Science* 3 (1), 143-154.

- Greenfield, Susan, 2016.  
*A Day in the Life of the Brain: The Neuroscience of Consciousness from Dawn Till Dusk.* Penguin, London.
- Griffith, Jeremy. (2016).  
*The Freedom: The End of the Human Condition.* WTM Publishing & Communications Pty, Limited. Sydney.
- Grundtvig, Frederik Lange, 1883.  
*Fuglene i folkets digtning og tro.* Karl Schonberg Boghandel, Kjøbenhavn.
- Gräslund, Bo, 2001.  
*De första stegen : urmänniskan och hennes värld.* Atlantis, Stockholm.
- Gräslund, Bo, 2005.  
*Early Humans and Their World.* Routledge, Oxon.
- Grün, Rainer / Pike, Alistair / McDermott, Frank / Eggins, Stephen / Mortimer, Graham / Aubert, Maxime/Kinsley, Lesley / Joannes-Boyau, Renaud / Rumsey, Michael / Denys, Christiane / Brink, James / Clark, Tara / Stringer, Chris, 2020.  
 Dating the skull from Broken Hill, Zambia, and its position in human evolution. *Nature*, 580 (7803), 372-375.
- Gurney, Edmund, 1880.  
*The Power of Sound.* Smoth, Elder, & co., London.
- Hagen, Edward, H. / Bryant, Gregory A., 2003.  
 Music and dance as a coalitional signaling system. *Human Nature* 14, 21-51.
- Hahn, Joachim, 1977.  
 Nachgrabungen im Hohlen Felsen bei Schelklingen, Alb-Donau-Kreis. *Archäologisches Korrespondenzblatt, Mainz* 7, 241-248.
1978.  
 Die altsteinzeitliche Schichtenfolge des "Geissenklösterle" bei Blaubeuren nach der Grabung 1977. *Arch. Ausgr. Baden-Württemberg* 1977, 7-10.
1979.  
 Ausgrabungen in urgeschichtlichen Fundstellen des Achtealeszwischen Blaubeuren und Schelklingen, Alb-Donau-Kreis. *Arch. Ausgr. Baden-Württemberg* 1978, 11-15.
1983.  
 Eiszeitliche Jäger zwischen 35000 und 15000 vor heute. In: Müller-Beck, Hansjürgen (Ed.), *Urgeschichte in Baden-Württemberg* (Stuttgart 1983), 273-350.
1986.  
 Kraft und Aggression. Die Botschaft der Eiszeitkunst im Aurignacian Süddeuschlands? Verlag *Archaeologica Venatoria*: Tübingen.
1988.  
 Die Geißenklösterle-Höhle im Achtal bei Blaubeuren I. Fundhorizontbildung und Besiedlung im Mittelpaläolithikum und im Aurignacien. *Forsch. Ber. Vor- u. Frühgesch. Baden-Württemberg* 26. Konrad Theiss Verlag, Stuttgart.
1989.  
 Zur Funktion einer Aurignacien-Feuerstelle aus dem Geißenklösterle bei Blaubeuren. *Baden-Württemberg* 14, 1989, 1-22.

1992.  
Ausgrabungen im Hohle Fels bei Schelklingen, Alb-Donau-Kreis, mit B. Fischer und C. Saier. Arch. Ausgr. Baden- Württemberg, 1992, 38-41.
1993.  
L'origine du Paléolithique supérieur en Europe Centrale: Les datations C14. In: Cabrera Valdés, V. (Ed.), El origen del hombre moderno en el Suroeste de Europa. Madrid: Universidad Nacional de Educación a Distancia, pp. 61-80.
1996.  
Neue Beschleuniger-14C-Daten zum Jungpaläolithikum in Südwestdeutschland. Eiszeitalter u. Gegenwart 45, 1995, 86-92.
1999.  
Flûtes aurignaciennes de la grotte Geissenklösterle, Jura Souabe. In: Julien / Averbouh / Ramseyer / Bellier / Buisson / Cattelain / Patou-Mathis / Provenzano (Eds.), Préhistoire d'os. De l'Université de Provence, Aix-en-Provence, pp. 159-163.
- Hahn, Joachim / Münzel, Susanne, 1995.  
Knochenflöten aus dem Aurignacien des Geißenklösterle bei Blaubeuren, Alb-Donau-Kreis. Fundberichte aus Baden-Württemberg 20, 1-12.
- Hahn, Joachim / Hein, Wulf, 1995.  
Eiszeitorchester - Experimentelle Nachbildung von Knochenflöten aus der Jüngeren Altsteinzeit. In: Eiszeitwerkstatt Experimentelle Archäologie, Museumsheft 2, Urgeschichte Museum, Blaubeuren, 16-23.
- Hajdinjak, Mateja / Mafessoni Fabrizio / Laurits Skov / Vernot, Benjamin / Hübner, Alexander / Fu, Qiaomei / Essel, Elena / Nagel, Sarah / Richter, Julia / Moldovan, Oana Teodora / Constantin, Silviu / Enderova, Elena / Zahariev, Nikolay / Spasov, Rosen / Welker, Frida / Smith, Geoff M. / Sinet-Mathiot, Virginie / Paskulin, Lindsey / Fewlass, Helen / Talamo, Sahra / Rezek, Zeljko / Sirakova, Svoboda / Sirakov, Nikolay / McPherron, Shannon P. / Tsanova, Tsenka / Hublin, Jean-Jacques / Peter, Benjamin M. / Meyer, Matthias / Skoglund, Pontus / Kelso, Janet / Pääbo, Svante, 2021.  
Initial Upper Palaeolithic humans in Europe had recent Neanderthal ancestry. Nature 592, 253-257
- Hall, Brian K., 2001.  
Organic selection: Proximate environmental effects on the evolution of morphology and behaviour. Biology and Philosophy, 16 (2), 215-237.
- Hardus, Madeleine E. / Lameira, Adriano R. / Van Schaik, Carel P. / Wich, Serge, A., 2009.  
Tool use in wild orangutans modifies sound production: a functionally deceptive innovation? Proc. R. Soc. B 276, 3689-3694.
- Harmand, Sonia / Lewis, Jason E. / Feibel, Craig S. / Lepre, Christopher J. / Prat, Sandrine / Lenoble, Arnaud / Boës, Xavier / Quinn, Rhonda L. / Brenet, Michel / Arroyo, Adrian / Taylor, Nicholas / Clément, Sophie / Daver, Guillaume / Brugal, Jean-Philip / Leakey, Louise / Mortlock, Richard A. / Wright, James D. / Lokorodi, Sammy / Kirwa, Christopher / Kent, Dennis V. / Roche, Hélène, 2015.  
3.3-million-year-old stone tools from Lomekwi 3, West Turkana, Kenya. Nature 521, 310-315.
- Harrison, R. A., 1978.  
A pierced reindeer phalanx from Banwell Bone Cave and some experimental work on phalanges. Proceedings of the University of Bristol Spelaeological Society 15, 7-22.
- Hawkes, Kristen, 2004.  
The Grandmother Effect. Nature 428, 128-129.
- Hawkes, Kristen / O'Connell, James F. O. / Blurton Jones, Nicholas G., 1997.  
Hadza women's time allocation, offspring provisioning, and the evolution of long postmenopausal life spans. Current Anthropology 38 (4), 551-577.

- Heckel, Claire, E. / Wolf, Sibylle, 2014.  
Ivory debitage by fracture in the Aurignacian: experimental and archaeological examples. *Journal of Archaeological Science* 42, 1-14.
- Hein, Wulf / Hahn, Joachim, 1998.  
Experimentelle Nachbildung von Knochenflöten aus dem Aurignacien der Geissenklösterle-Höhle. In: Fansa, M. (Ed.), *Experimentelle Archäologie in Deutschland, Bilanz 1997*. *Archäologische Mitteilungen aus Nordwestdeutschland Beiheft* 19, 65-73.
- Heinsohn, Robert / Zdenek, Christina, N. / Cunningham, Ross, B. / Endler, John, A. / Langmore, Naomi, E., 2017.  
Tool- assisted rhythmic drumming in palm cockatoos shares key elements of human instrumental music. *Sci. Adv.* 3, e1602399.
- Hennig, Willi, 1966.  
*Phylogenetic Systematics*. University of Illinois Press, Urbana.
- Henrich, Joseph / Heine, Steven J. / Norenzayan, Ara, 2010.  
The Weirdest People in the World? *Behavioral and brain sciences*, 33 (2-3), 1-75.
- Henshilwood, Christopher / Dubreuil, Benoît, 2011.  
The Still Bay and Howiesons Poort, 77-59 ka: Symbolic materials and the evolution of the mind during the African Middle Stone Age. *Current Anthropology* 52, 361-400.
- Henshilwood, Christopher S. / d'Errico, Francesco, Yates, Royden / Jacobs, Zenobia / Tribolo, Chantal / Duller, Geoff A. T. / Mercier, Norbert / Sealy, Judith C. / Valladas, Helene / Watts, Ian / Wintle, Ann G., 2002.  
Emergence of modern human behavior: Middle Stone Age engravings from South Africa. *Science* 295 (5558), 1278-1280.
- Herd, Gilbert H., 1982.  
Fetish and fantasy in Sambia initiation. In: Herdt, Gilbert H. (Ed.) *Rituals of Manhood: Male Initiation in Papua New Guinea*. University of California Press, Berkeley and Los Angeles, pp. 44-98.
- Higham, Thomas / Basell, Laura / Jacobi, Roger / Wood, Rachel / Ramsey, Christopher Bronk / Conard, Nicholas J., 2012.  
Testing models for the beginnings of the Aurignacian and the advent of figurative art and music: The radiocarbon chronology of Geißenklösterle. *Journal of Human Evolution* 62, 664-676.
- Higham, Tom / Douka, Katerina / Wood, Rachel / Ramsey, Christopher Bronk / Brock, Fiona / Basell, Laura / Camps, Marta / Arrizabalaga, Alvaro / Baena, Javier / Barroso-Ruiz, Cecilio / Bergman, Christopher / Boitard, Coralie / Boscato, Paolo / Conard, Nicholas J. / Caparrós, Miguel / Draily, Christelle / Froment, Alain / Galván, Bertila / Gambassini, Paolo / Garcia-Moreno, Alejandro / Grimaldi, Stefano / Haesaerts, Paul / Holt, Brigitte / Iriarte-Chiapusso, Maria-Jose / Jelinek, Arthur / Jordá Pardo, Jesús, F. / Maíllo-Fernández, José-Manuel / Marom, Anat / Maroto, Julià / Menéndez, Mario / Metz, Laure / Morin, Eugène / Moroni, Adriana / Negrino, Fabio / Panagopoulou, Eleni / Peresani, Marco / Pirson, Stéphane / de la Rasilla, Marco / Riel-Salvatore, Julien / Ronchitelli, Annamaria / Santamaria, David / Semal, Patrick / Slimak, Ludovic / Soler, Joaquim / Soler, Narcís / Villaluenga, Aritza / Pinhasi, Ron / Jacobi, Roger, 2014.  
The timing and spatiotemporal patterning of Neanderthal disappearance. *Nature*, Vol 512, 306-309.
- Hiller, Georg, 2007.  
Nachruf auf Friedrich Seeberger (1938–2007). *Mitteilungen der Gesellschaft für Urgeschichte* 16, 109-114.
- Hodder, Ian, 1982.  
*Symbols in Action: Ethnoarchaeological Studies of Material Culture*. Cambridge University Press,
- Hoebel, E. Adamson, 1968.  
*The Law of Primitive Man*. Atheneum, New York.

- Hofstadter, Douglas R., 2001.  
 Epilogue: Analogy as the Core of Cognition. In: Gentner, Dedre / Holyoak, Keith J. / Kokinov, Boicho N. (Eds.), *The Analogical Mind: Perspectives from Cognitive Science*. MA: MIT Press, Cambridge, pp. 499-538.
- Holdermann, Angela / Wiedmann, Johannes / Trommer, Frank, 2013a.  
 Der Nachbau einer prähistorischen Flöte aus Mammutfelbein. *Windkanal* 2013-1.
- 2013b.  
 Der Nachbau einer prähistorischen Flöte aus Mammutfelbein - neue Erkenntnisse zu Technik und Zeitaufwand. In: *Experimentelle Archäologie in Europa, Bilanz 2013, Heft 12*. Unteruhldingen: EXAR, 60-69.
- Holdermann, Claus-Stephan, 2001.  
 Musik und Tanz. In: Müller-Beck, Hansjürgen / Conard, Nicholas / Schürle, Wolfgang (Eds.), *Eiszeitkunst im Süddeutsch-Schweizerischen Jura*. Theiss, Stuttgart, pp. 88-94.
- Holtorf, Cornelius, 2007.  
 Archaeology is a brand! The meaning of archaeology in contemporary popular culture. *Archaeopress, Oxford*.
2010.  
 Meta-stories of archaeology. *World Archaeology Issue 3*, 381-393.
- Homo-Lechner, Catherine, 1998.  
 False. Authentic. False authenticity. Contributions and Failures of Experimental Archaeology as applied to Music Instruments. In: Buckley, Ann (Ed.), *Hearing the Past. Essays in Historical Ethnomusicology and the Archaeology of Sound*. Etudes et Recherches Archéologiques de l'Université de Liège, pp. 29-64.
- Honing, Henkjan / ten Cate, Carel / Peretz, Isabelle / Trehub, Sandra E., 2015.  
 Without it no music: cognition, biology and evolution of musicality. *Philosophical Transactions Royal Society B* 370: 20140088, 1-8.
- Horusitzky, François Zoltán 2006.  
 "Flûte" et pointes de la Grosse Badlhöhle, Autriche / "Flute" and points from Grosse Badlhöhle, Austria. *L'Anthropologie* 110, 318-354.
- Horvat, Jana / Pleterski, Andrej / Velušček, Anton, (Eds.), 2014.  
 Divje babe I. Upper Pleistocene Palaeolithic site in Slovenia. Part II: Archaeology. *Opera Instituti Archaeologici Sloveniae* 29, Ljubljana.
- Howitt, Alfred Willaim, 1889.  
 Notes on Australian Message Sticks and Messengers. *The Journal of the Anthropological Institute of Great Britain and Ireland*, 18, 314-32.
- Hrdy, Sarah, Blaffer 2009.  
 Mothers and others. Harvard University Press, Cambridge, MA.
- Hublin, Jean-Jacques, 2015.  
 The modern human colonization of western Eurasia: when and where? *Quaternary Science Reviews* 118, 194-210.
- Hublin, Jean-Jacques / Ben-Ncer, Abdelouahed / Bailey, Shara E. / Freidline, Sarah E. / Neubauer, Simon / Skinner, Matthew M. / Bergmann, Inga / Le Cabec, Adeline / Benazzi, Stefano / Harvati, Katerina / Gunz, Philipp, 2017.  
 New fossils from Jebel Irhoud, Morocco and the pan-African origin of Homo sapiens. *Nature* 546, 289-292.

Hublin, Jean-Jacques / Sirakov, Nikolay / Aldeias, Vera / Bailey, Shara / Bard, Edouard / Delvigne, Vincent / Enderova, Elena / Fagault, Yoann / Fewlass, Helen / Hajdinjak, Mateja / Kromer, Bernd / Krumov, Ivaylo / Marreiros, João / Martisius, Naomi L. / Paskulin, Lindsey / Sinet-Mathiot, Virginie / Meyer, Matthias / Pääbo, Svante / Popov, Vasil / Rezek, Zeljko / Sirakova, Svoboda / Skinner, Matthew M. / Smith, Geoff M. / Spasov, Rosen / Talamo, Sahra / Tuna, Thibaut / Wacker, Lukas / Welker, Frido / Wilcke, Arndt / Nikolay, Zahariev / McPherron, Shannon P. / Tsanova, Tsenka, 2020.

Initial Upper Palaeolithic Homo sapiens from Bacho Kiro Cave, Bulgaria. *Nature* 581, 299-302.

Hunt, Chris O. / Pomeroy, Emma / Reynolds, Tim / Tilby, Emily / Barker, Graeme, 2023.

Shanidar et ses fleurs? Reflections on the palynology of the Neanderthal 'Flower Burial' hypothesis. *Journal of Archaeological Science*, 159, (105822).

Huron, David, 2001.

Is music an evolutionary adaptation? *Annals of the New York Academy of Sciences* 930, 43-61.

Huron, David / Margulis, Elizabeth Hellmuth, 2010.

Musical expectancy and thrills. In: Juslin, Patrik N. / Sloboda, John, A. (Eds.), *Handbook of Music and Emotion: Theory, Research, Applications*. Oxford University Press, Oxford, pp. 575-604.

Hussain, Shumon / Floss, Harald, 2015.

Regional ontologies in the Early Upper Palaeolithic: the place of mammoth and cave lion in the 'belief world' (Glaubenswelt) of the Swabian Aurignacian. In: Bueno-Ramírez, Primitiva / Bahn, Paul G. (Eds.), *Prehistoric Art as Prehistoric Culture. Studies in Honour of Professor Rodrigo de Balbín-Behrmann*. Archaeopress Publishing Ltd, Oxford, pp. 45-57.

Huxley, Julian, 1966.

Introduction: A Discussion on Ritualization of Behaviour in Animals and Man. Organized by Sir Julian Huxley. *Philosophical Transactions of the Royal Society of London, Series B. Biological Sciences* 772, 249-271.

Högberg, Anders, 2008.

Playing with Flint: Tracing a Child's Imitation of Adult Work in a Lithic Assemblage. *J. Archaeol. Method Theory* 15, 112-131.

Ingold, Tim, 2000.

The Perception of the Environment. *Essays on livelihood, dwelling and skill*. Routledge, London.

2007.

Lines. *A Brief history*. Routledge, London and New York.

Inizan, Marie-Louise / Reduron-Ballinger, Michèle / Roche, Hélène / Tixier, Jacques, 1999.

Technology and Terminology of Knapped Stone. *Préhistoire de la Pierre Taillée*, volume 5, CREP, Meduon, France.

Jacobs, Zenobia R. G. / Roberts, Richard F., 2008.

Testing times: old and new chronologies for the Howieson's Poort and Still Bay industries in environmental context. *South African Archaeological Bulletin (Goodwin Series)* 10, 9-34.

Jacobs, Zenobia R. G. / Roberts, Richard F. / Galbraith, Rex F. / Deacon, Hilary J. / Grün, Rainer / Mackay, Alex / Mitchell, Peter / Vogelsang, Ralf / Wadley, Lyn, 2008.

Ages for the Middle Stone Age of southern Africa: implications for human behaviour and dispersal. *Science* 322, 733-735.

Jameson, Fredric, 1972.

The Prison-House of Language. Princeton University Press, Princeton.

Janáček, Leoš, 1989.

Janáček's uncollected essays on music. Selected, translated, and edited by Mírka Zemanová, Marion Boyars, London.

- Jansson, Erik V., 1978.  
Tone Characteristics of the Violin. *Svensk Tidskrift för Musikforskning* 60 (1), 83-103.
- Jarvenpa, Robert / Brumbach, Hetty, Jo, 2014.  
Hunter-gatherer gender and identity. In: Cummings, Vicki/Jordan, Peter/Zvelebil, Marek (Eds.), *The Oxford Handbook of the Archaeology and Anthropology of Hunter-Gatherers*, pp. 1243-1265.
- Jelinek, A.J. / Debénath, A. / Dibble, H. L., 1988.  
A preliminary report on evidence related to the interpretation of economic and social activities of Neandertals at the site of La Quina (Charente), France. In: Otte, Marcel (Ed.), *L'Homme de Néandertal*, Volume 6, La Subsistence. *Études et Recherches Archéologiques de l'Université de Liège, Liège*, pp. 99-106.
- Jensenius, Alexander R., 2012.  
Disciplinarity: intra, cross, multi, inter, trans.
- Johanson, Donald C. / Edgar, Blake, 2006.  
From Lucy to Language. 2nd edition. Simon & Schuster, New York.
- Johanson, Donald C. / White, Tim D. / Coppens, Yves, 1978.  
A new species of the genus *Australopithecus* (Primates: Hominidae) from the Pliocene of Eastern Africa. *Kirtlandia* 28, 2-14.
- Johnsgard, Paul A., 1997.  
The Hummingbirds of North America. Smithsonian Institution Press, Washington, DC.
- Johnston, Thomas F. 1989.  
Song categories and musical style of the Yupik Eskimo. *Anthropos* 84, 423-431.
- Juslin, Patrik N. / Sloboda, John A. (Eds.), 2001.  
Music and Emotion: Theory and Research. Oxford University Press, Oxford.
2010.  
Handbook of Music and Emotion: Theory, Research, Applications. Oxford University Press.
- Jürgens, Uwe, 1992.  
On the neurobiology of vocal communication. In: Papoušek, Hanuš / Jürgens, Uwe / Papoušek, Mechthild (Eds.), *Nonverbal Vocal Communication*. Cambridge University Press, Cambridge, pp. 31-42.
1998.  
Neuronal control of mammalian vocalization, with special reference to the squirrel monkey. *Naturwissenschaften* 85 (8), 376-88. doi: 10.1007/s001140050519.
2002.  
Neural pathways underlying vocal control. *Neuroscience and Biobehavioural Reviews* 26, 235-258.
- Jürgens, Uwe / Alipour, Mahnaz, 2002.  
A comparative study on the cortico-hypoglossal connections in primates, using biotin dextranamine. *Neuroscience Letters*, 328 (3), 245-248.
- Kaplan, Gisela T., 2004.  
Australian Magpie: Biology and Behaviour of an Unusual Songbird CSIRO Publishing, Clayton South.
- Kehoe, Alice, B., 1999.  
Blackfoot and other Hunters on the North American Plains. In: Lee, Richard, B. / Daly, Richard (Eds.), *Cambridge Encyclopaedia of Hunters and Gatherers*. Cambridge University Press, Cambridge, pp. 36-40.

- Kerig, Tim, 2004.  
 Flöten und Schwirrblattbrummen - Zur Erforschung altsteinzeitlicher Klänge. In: Kerig, Tim (Ed.), *Schwannflügelknochen-Flöte. Vor 35 000 Jahren erfinden Eiszeitjäger die Musik (Württembergisches Landesmuseum)*. Verlagsbüro Wais & Partner, Stuttgart, 16-19.
2009.  
 Steinzeitliche Nachklänge? Eine Ethnoarchäologie der Musik. In: Rau, Susanne (Ed.), *Eiszeit: Kunst und Kultur; Begleitband zur Großen Landesausstellung Eiszeit - Kunst und Kultur im Kunstgebäude Stuttgart*, 18. September 2009 bis 10. Januar 2010. Jan Thorbecke Verlag, Ostfildern, pp. 327-331.
- Khlopachev Gennady A. / Giry, Evgeiy Y., 2010.  
 Secrets of ancient carvers of Eastern Europe and Siberia: Treatment Techniques of ivory and reindeer antler in the Stone Age. Based on archaeological and experimental data. Nauka, Saint-Petersburg.
2018.  
 Experimental data on the splitting and knapping of mammoth tusks and reindeer antlers. In: Christensen, Marianne / Goutas, Nejma (Eds.), *La fracturation des matières osseuses en Préhistoire : discussion autour d'une modalité d'exploitation en apparence simple et pourtant mal connue*. Société préhistorique française, Paris, pp. 325-340.
- Killin, Anton, 2016.  
 Musicality and the evolution of mind, mimesis, and entrainment. *Biology & Philosophy*, 31 (3), 421-434.
2017.  
 Plio-Pleistocene foundations of hominin musicality: Coevolution of cognition, sociality, and music. *Biological Theory*, 12 (4), 222-235.
2018.  
 Music and Human Evolution: Philosophical Aspects. In: Joyce, Richard, (Ed), *Routledge Handbook of Evolution and Philosophy*. Routledge, Oxon/NY, (372-386). Source taken from: academia.edu pp. 1-25.
- 2018b.  
 The origins of music: Evidence, theory, and prospects. *Music & Science* 1 (1-23).
- Kind, Claus-Joachim / Ebinger-Rist, Nicole / Wolf, Sibylle / Beutelsbacher, Thomas / Wehrberger, Kurt, 2014.  
 The Smile of the Lion Man. Recent Excavations in Stadel Cave (Baden-Württemberg, south western Germany) and the Restoration of the Famous Upper Palaeolithic Figurine. *Quartär* 61, 129-45.
- Klee, Felix, 1962.  
 Paul Klee: His Life and Work in Documents, selected from posthumous writings and unpublished letters. George Braziller, New York. (Originally translated by Richard and Clara Winston).
- Klein, Richard G., 1994.  
 The problem of modern human origins. In: Nitecki, Matthew H. / Nitecki, Doris V. (Eds.), *Origins of anatomically modern humans*. Plenum Press, New York, pp. 3-17.
2000.  
 Archeology and the evolution of human behavior. *Evolutionary Anthropology* 9, 17-36.
2001.  
 Southern Africa and modern human origins. *Journal of Anthropological Research* 57, 1-16.
2008.  
 Out of Africa and the evolution of human behaviour. *Evolutionary Anthropology* 17, 267-281.
2009.  
 The Human Career. *Human Biological and Cultural Origins*, Third Edition. University of Chicago Press.

2016.  
Issues in human evolution. *Proc Natl Acad Sci* 113 (23), 6345-6347.
2019.  
Population structure and the evolution of *Homo sapiens* in Africa. *Evolutionary Anthropology* 28, 179-188.
- Klip, André / Sluiter, Göran, (Eds.) 2005.  
Annotated Leading Cases of International Criminal Tribunals: The International Criminal Tribunal for the Former Yugoslavia 2001–2002, vol. 8. Intersentia, Cambridge, pp. 417, 601, 620, 655, 1052.
- Klusen, Ernst, 1967.  
Das Gruppenlied als Gegenstand. *Jahrbuch für Volksliedforschung*, 12, 21-41.
- Knight, Chris, 1991.  
Blood relations: menstruation and the origins of culture. Yale University Press, New Haven, CT.
- Knight, Chris / Lewis, Jerome, 2017.  
Wild Voices: Mimicry, Reversal, Metaphor, and the Emergence of Language. *Current Anthropology* 58 (4), 435-453.
- Kochetkova, Veronika Ivanovna, 1978.  
Paleoneurology. Winston & Sons, Washington.
- Kolltveit, Gjermund, 2012.  
Classification of Sound, Sound Tools and Soundscapes. In: Ikäheimo, Janne / Salmi, Anna-Kaisa / Äikäs, Tiina (Eds.), *Sounds Like Theory: XII Nordic Theoretical Archaeology Group Meeting in Oulu 25–28.4.2012*, Monographs of the Archaeological Society of Finland, Vol. 2, Helsinki, pp. 73–84
- Kolltveit, Gjermund / Rainio, Riitta (Eds.), 2020.  
The Archaeology of Sound, Acoustics and Music: Studies in Honour of Cajsa S. Lund. ICTM Study Group on Music Archaeology, Vol. 3, Ekho Verlag, Berlin.
- Kramer, Lawrence, 2006.  
Tropes and Windows: An outline of Musical Hermeneutics. In: Kramer, Lawrence, (2006), *Critical musicology and the responsibility of response : selected essays*. Ashgate Publishing Limited, Aldershot, pp. 1-21. Originally published 1990.
- Krasheninnikova, Anastasia, 2019.  
Grandmother Hypothesis. In: Vonk, Jennifer / Shackelford, Todd K. (Eds.), *Encyclopedia of Animal Cognition and Behavior*, *Encyclopedia of Animal Cognition and Behavior*. Springer, Cham.
- Kristiansen, Kristian, 2014.  
Towards a New Paradigm? The Third Science Revolution and its Possible Consequences in Archaeology. *Current Swedish Archaeology*, Vol. 22, 11–34.
- Krönneck, Petra 2019.  
Die Vogelfauna aus dem Geißenklösterle. In: Conard, Nicholas J. / Bolus, Michael / Münzel, Susanne C. (Eds.), *Chronostratigraphie, Paläoumwelt und Subsistenz im Mittel- und Jungpaläolithikum der Schwäbischen Alb*. Kerns, Tübingen, pp. 101-116.
- Kuhl, Patricia K., 1988.  
Auditory perception and the evolution of speech. *Human Evolution* 3, 19-43.
- Kuhn, Steven L., 2003.  
In what sense is the Levantine initial Upper Paleolithic a “transitional” industry? In: Zilhão, João / d’Errico, Francesco (Eds.), *The Chronology of the Aurignacian and of the Transitional Technocomplexes: Dating, Stratigraphies, Cultural Implications*. Instituto Portugues de Arqueologia, Lisbon, pp. 61-70.

2014.  
 Signaling Theory and Technologies of Communication in the Paleolithic. *Biol Theory*. Thematic issue article: symbols, signals, and the archaeological record.
- Kuhn, Steven L. / Stiner, Mary C. / Güleç, Erksin / İsmail, Özer / Yılmaz, Hakan / Baykara, İsmail / Açıkkol, Ayşen / Goldberg, Paul / Molina, Kenneth Martínez / Ünay, Engin / Suata-Alpaslan, Fadime, 2009.  
 The early Upper Paleolithic occupations at Üçağızlı Cave (Hatay, Turkey). *Journal of Human Evolution* 56, 87-113.
- Kvifte, Tellef, 1989.  
 Instruments and the Electronic Age. Towards a Terminology for a Unified Description of Playing Technique. Solum, Oslo.
- Käfer, Bernadette, 1998.  
 Paläolithische Knochenflöten im Ostalpenraum und dem nordöstlich vorgelagerten Lößgebiet "Knochenklang". Magisterarbeit vorgelegt von Bernadette Käfer. University of Music, Vienna.
- Käfer, Bernadette / Thomas Einwögerer, 2002.  
 Die jungpaläolithische Knochenflöte aus der Station Grubgraben bei Kammern, Niederösterreich, und ihre Spielweise im Nachbau mit Silexwerkzeugen. In: Hickmann, Ellen / Kilmer, Anne Draffkorn / Eichmann, Ricardo, (Eds.), *The Archaeology of Sound: Origin and Organisation. Studies in Music Archaeology III*. Verlag Marie Leidorf GmbH, Rahden / Westf, pp. 91–103.
- Källén, Anna, 2004.  
 And Through Flows the River. Archaeology and the pasts of Lao Pako. University of Uppsala, Uppsala.
- Lachenmann, Helmut 1966.  
 Interieur for solo percussion.
- LaGasse, Linda L. / Neal, A. Rebecca / Lester, Barry, M., 2005.  
 Assessment of infant cry: acoustic cry analysis and parental perception. *Ment Retard Dev Disabil Res Rev*, 11 (1) 83-93. doi: 10.1002/mrdd.20050.
- Laitman, Jeffrey T., 1984.  
 The anatomy of human speech. *Natural History* 93, 20-27.
- Laitman, Jeffrey T. / Heimbuch, Raymond C., 1982.  
 The basicranium of Plio-Pleistocene hominids as an indicator of their upper respiratory systems. *American journal of physical anthropology* 59, 323-344.
- Laitman, Jeffrey T. / Heimbuch, Raymond C. / Crelin, Edmund S., 1979.  
 The basicranium of fossil hominids as an indicator of their upper respiratory systems. *American journal of physical anthropology* 51, 15-33.
- Laitman, Jeffrey Todd / Reidenberg, Joy S., 1988.  
 Advances in understanding the relationship between the skull base and larynx, with comments on the origins of speech. *Human Evolution* 3, 99-109.
- Lakoff, George / Johnson, Mark, 1980.  
*Metaphors we live by*. University of Chicago Press, Chicago.
- Lakoff, George / Núñez, Rafael, 2000.  
*Where mathematics comes from*. Basic, New York.
- Lartet, Édouard, 1862.  
 Lartet on human remains. *The Natural History Review* 2, (5) 53-71.
- Latour, Bruno, 1999.  
*Pandoras Hope: Essays on the Reality of Science Studies*. Harvard University Press.

- Lawson, Graeme, 2010.  
Epistemology and Imagination. Reconciling Music-Archaeological Scholarship and Ancient Music Performance Today. In: Eichmann, Ricardo / Hickmann, Ellen / Koch, Lars-Christian (Eds.), *Musical Perceptions - Past and Present. On Ethnographic Analogy in Music Archaeology*. Studies in Music Archaeology VII, Verlag Marie Leidorf GmbH, Rahden / Westf, pp. 265-276.
2020.  
The Mammoth in the Room: Did Musical Necessity Drive Innovation in Ancient Technology? In: Kolltveit, Gjermund / Rainio, Riitta (Eds.), *The Archaeology of Sound, Acoustics and Music: Studies in Honour of Cajsa S. Lund*. ICTM Study Group on Music Archaeology, Vol. 3, Ekho Verlag, Berlin, pp. 117-150.
- Lawson, Graeme / Scarre, Chris / Cross Ian / Hills, C., 1998.  
Mounds, megaliths, music and mind: some acoustical properties and purposes of archaeological spaces. *Archaeological Review from Cambridge* 15 (1), 111-134.
- Lawson, Graeme / d'Errico, Francesco, 2002.  
Microscopic, Experimental and Theoretical Re-Assessment of Upper Palaeolithic Bird-Bone Pipes from Isturitz, France: Ergonomics of Design, Systems of Notation and the Origins of Musical Traditions. In: Hickmann, Ellen / Kilmer, Anne Draffkorn / Eichmann, Ricardo, (Eds.), *The Archaeology of Sound: Origin and Organisation*. Studies in Music Archaeology III. Verlag Marie Leidorf GmbH, Rahden/Westf, pp. 119-142.
- Leahey, Richard, 1994.  
The Origin of Humankind. Weidenfeld & Nicolson, London.
- Lechtman, Heather, 1977.  
Style in Technology - Some Early Thoughts. In: Lechtman, Heather / Merrill, Robert, S. (Eds.), *Material Culture: Styles, Organization, and Dynamics of Technology*. West Publishing Co., St. Paul, pp 3-20.
- Lewis, Ingrid / Lewis, Nikolas / Lewis, Jermome, 1998.  
Massana: moments in Yaka play and ritual. JIN Films.
- Lew-Levy, Sheina / Andersen, Marc Malmdorf / Lavi, Noa / Riede, Felix, 2022.  
Hunter-gatherer children's object play and tool use: An ethnohistorical analysis. *Frontiers in Psychology*, 13: 824983.
- Lewis, Jerome, 2008.  
Ekila: blood, bodies and egalitarian societies. *Journal of the Royal Anthropological Institute* 14, 297-315.
2009.  
Congo Pygmy hunting, mimicry, and play. In: Botha, Rudolf / Knight, Chris (Eds.), *The cradle of language*. Oxford University Press, Oxford, pp. 236–256
- Lewis, Morris, Michael, 1936/1951.  
Infant Speech. A Study of the Beginnings of Language. Routledge and Kegan Paul, London.
- Lévi-Strauss, Claude, 1936.  
Contribution à l'étude de l'organisation sociale des Indiens Bororo. *Journal de la société des américanistes Année 1936*, 28 (2), 269-304.
1964.  
Totemism. London: Merlin Press.
1966.  
The Savage Mind. The University of Chicago Press, Chicago.
1970.  
The Raw and the Cooked (Translated by John and Doreen Weightman). Cape, London.

- 1970-1981.  
Introduction to a science of mythology, 4 vols. Cape, London.
1981.  
The Naked Man: Introduction to a Science of Mythology, volume 4. Translated by by John Weightman and Doreen Weightman, Harper and Row, New York.
- Liberman, Alvin, M. / Cooper, Franklin S. / Shankweiler, Donald / Studdert-Kennedy, Michael, 1967.  
Perception of the Speech Code. *Psychological Review* 74, 431-461.
- Libin, Laurence (Ed.) 2014.  
The Grove Dictionary of Musical Instruments, Second Edition, 5-volume set. Oxford University Press, New York.
- Lieberman Philip / Klatt, Dennis H. / Wilson, William H., 1969.  
Vocal tract limitations on the vowel repertoires of rhesus monkey and other nonhuman primates. *Science* 164 (3884), 1185-7.
- Lieberman, Philip, 1992.  
Human speech and language. In: Jones, Steve / Martin, Robert / Pilbeam, David (Eds.), *The Cambridge Encyclopedia of Human Evolution*. Cambridge University Press. New York, pp. 134-137.
- Liégeois-Chauvel Catherine / Giraud Kimberly / Badier Jean-Michel / Marquis Patrick / Chauvel, Patrick, 2003.  
Intracerebral evoked potentials in pitch perception reveal a functional asymmetry of human auditory cortex. In: Peretz, Isabelle / Zatorre, Robert, J. (Eds.), *The Cognitive Neuroscience of Music*. Oxford University Press, pp. 152-167.
- Locke, David, 1996.  
Africa: Ewe, Mande, Dagbamba, Shona and BaAka. In: Tilton, Jeff Todd (Ed.), *Worlds of music: an introduction to the music of the world's people* (3rd Edition). Schirmer, New York, pp. 83-144.
- Lovejoy, C. Owen, 2009.  
Reexamining Human Origins in Light of *Ardipithecus ramidus*. *Science* 326 (5949) 74-74e8.
- Lowenthal, David 2006.  
From harmony of the spheres to national anthem: Reflections on musical heritage. *GeoJournal* 65, 3-15.
- Lubbock, John, 1913.  
*Prehistoric times*. (7th edition). Williams & Norgate, London. Originally published in 1865: *Prehistoric times as illustrated by ancient remains and the manners and customs of savages*.
- Lucas, Gavin, 2015.  
The Mobility of Theory. *CSA* 23, 13-32.
- Lucius, Erwin, 1969.  
Das Problem der Chronologie jungpaläolithischer Stationen im Bereiche der europäischen UdSSR. *Mitteilungen der Prähistorischen Kommission der Österreichischen Akademie der Wissenschaften*, 13, 14.
- Lumley, Henry de, 1969.  
A Palaeolithic camp at Nice. *Scientific American* 220 (5), 42-50.
- Lumley, Henry de / Pillard, B. / Pillard, F., 1969.  
L'habitat et les activités de l'homme du Lazaret. In: Lumley, Henry de (Ed.), *Une Cabane Acheuléenne dans la Grotte du Lazaret (Nice)*. *Mémoires de la Société Préhistorique Française* 7, Paris, pp. 183-222.
- Lund, Cajsa S., 1979.  
Metoder och problem inom Nordens musikarkeologi: Bakgrund och nuläge. *Svensk tidskrift för musikkforskning*, Vol 1, 47-64.

- 1979a.  
Nordens äldsta spaltflöjt. *Fornvännen* 1979 (1), 2-9.
1980.  
Methoden und Probleme der nordischen Musikarchäologie. *Acta Musicologica*, Vol 52, 1-13.
- 1981a.  
The archaeomusicology of Scandinavia. In: Megaw, J. Vincent S. (Ed.), *World Archaeology* 3 (1981), pp. 246-265.
- 1981b.  
A Medieval Tongue-(Lip-)and-Duct Flute. *The Galpin Society Journal* 1981, 34, 106-109.
1983.  
Benflöjten i Västergötland - Fynd och Traditioner. In: Vi Äro Musikanter Alltifrån Skaraborg- Studier i Västgötsk Musikhistoria. Jan Ling / Musikvetenskapliga Institution, Göteborg; Ulla Andersson / Skaraborgs Länsmuseum; Assar Larsson / Stifts, och Landsbiblioteket i Skara, pp. 13-40.
1985.  
Bone Flutes in Västergötland, Sweden - Finds and Traditions. *Acta Musicologica* 1985, LVII (Fasc.I), 9-25.
1986.  
The "Phenomenal" Bronze Lurs: Data, Problems, Critical Discussion. In: Lund, Cajsa, S. (Ed.), *Second Conference of the ICTM Study Group on Music Archaeology*, Vol. II, *The Bronze Lurs*. Kungl. Musikaliska akademins skriftserie, Stockholm, pp. 9-50.
1987.  
Music-Archaeological Activities in Sweden During 1985. *Archaeologia Musica* 2, 37-40.
1988.  
The Archaeology of Early Musical Cultures: On animal calls in ancient Scandinavia: theory and data. In: Hickmann, Ellen / Hughes, David W., (Eds.), *Third International Meeting of the ICTM Study Group on Music Archaeology*. Verlag für systematische Musikwissenschaft GmbH, Bonn, pp. 289-303.
1997.  
Strövtåg i den fornnordiska terrängen. In: Andersson, Greger (Ed.), *Musik i Norden*, Kungl. Musikaliska Akademien, Stockholm, pp. 33-50.
1998.  
What is wrong with music archaeology? A critical essay from a Scandinavian perspective, including a report about a new find of a bullroarer. In: Buckley, Ann. (Ed.), *Hearing the Past. Essays in Historical Ethnomusicology and the Archaeology of Sound*. *Etudes et Recherches Archéologiques de l'Université de Liège*, pp. 17-28.
2010.  
Music Archaeology in Scandinavia, 1800-1990. In: Mirelman, Sam, (Ed.), *The Historiography of Music in Global Perspective*. Gorgias Press, Piscataway, New Jersey, pp. 177-207.
2012.  
Sound Tools, Symbols or Something Quite Different? On Possible Percussion Instruments from Bronze-Age Sweden – Including Methodological Aspects of Music-Archaeological Research. In: Eichmann, Ricardo / Fang, Jianjun / Koch Lars-Christian (Eds.), *Sound from the Past. The Interpretation of Musical Artifacts in an Archaeological Context*. *Studien zur Musikarchäologie VIII, Orient-Archäologie* 27. Rahden/Westf., pp. 61-73.
2020.  
In the Mind of a Music Archaeologist. In: Kolltveit, Gjermund / Rainio, Riitta (Eds.), *The Archaeology of Sound, Acoustics and Music: Studies in Honour of Cajsa S. Lund*. ICTM Study Group on Music Archaeology, Vol. 3, Ekho Verlag, Berlin, pp. 323-344.

- Lund, Cajsa, S. / Mannermaa, Kristiina / Rainio, Riitta / Ringot, Jean-Loup / Tamboer, Annemies, 2015.  
Sound Tool or a Fisherman's Tool? An Experimental Approach to the Mesolithic Bird Bone Artefact from the "Antrea Net Find". *Finsk Museum*, Vol. 2013–2015, 6-23.
- MacCormack, Carol, P., 1980.  
Nature, culture and gender: a critique. In: MacCormack, Carol, P. / Strathern, Marilyn (Eds), *Nature, culture and gender*. Cambridge University Press, Cambridge, London, New York, New Rochelle, Melbourne, Sydney, pp. 1-24.
- MacLarnon, Ann / Hewitt Gwen, 1999.  
The evolution of human speech: the role of enhanced breathing control. *American Journal of Physical Anthropology* 109, 341-363.
- MacLean, Evan L., 2016.  
Unraveling the evolution of uniquely human cognition. *Proc Natl Acad Sci* 113 (23), 6348-6354.
- Magriples, Urania / Laitman, Jeffrey, 1987.  
Developmental change in the position of the fetal human larynx. *American Journal of Physical Anthropology* 72, 463-72.
- Majkić, Anna / Evans, Sarah / Vadim, Stepanchuk / Tsvelykh, Alexander / d'Errico, Francesco, 2017.  
A decorated raven bone from the Zaskalnaya VI (Kolosovskaya) Neanderthal site, Crime. *PLoS ONE* 12 (3): e0173435.
- Malafouris, Lambros, 2013.  
*How Things Shape the Mind: A Theory of Material Engagement*. MIT Press, Cambridge, Massachusetts.
2019.  
Mind and material engagement. *Phenomenology and the Cognitive Sciences* 18, 1-17.
- Malina, Maria / Ehmann, Ralf, 2009.  
Elfenbeinspaltung im Aurignacien. Zur Herstellung der Elfenbeinflöte aus dem Geißenklösterle. *Mitteilungen der Gesellschaft für Urgeschichte* 18, 93-107.
- Maloney, Liam / Schofield, John, (Eds.), 2021.  
*Music and Heritage: New Perspectives on Place-making and Sonic Identity* Routledge, London.
- Maloney, Liam/Schofield, John, 2021.  
Sonic identity and the making of heritage: 'This must be the place'. In: Maloney, Liam / Schofield, John (Eds.), *Music and Heritage: New Perspectives on Place-making and Sonic Identity*. Routledge, London, pp. 1-9.
- Mang, Esther, 2005.  
The referent of children's early songs *Music Education Research*, 7 (1), 3-20.
- Marean, Curtis W, 2015.  
An evolutionary anthropological perspective on modern human origins. *Annual Review of Anthropology* 44, 533-556.
- Marin, Oscar, S. M. / Perry, David, W. 1999.  
Neurological aspects of music perception and performance. In: Deutsch, Diana (Ed.), *The Psychology of Music* (2nd ed.), Academic Press, New York, pp. 653-724.
- Marshall Thomas, Elizabeth, 2006.  
*The old way: a story of the first people*. Crichton, New York.
- Martin, Jacquelyn / Gomez Licon, Adriana / Tang, Terry, 2022.  
Baby formula shortage highlights racial disparities. *Associated Press*, May 27, 2022.

- Martínez, Ignacio / Arsuaga, Juan Luis / Quam, Rolf / Carretero, José Miguel / Gracia-Téllez, Ana / Rodríguez, Laura, 2008.  
 Human hyoid bones from the middle Pleistocene site of the Sima de los Huesos (Sierra de Atapuerca, Spain). *Journal of Human Evolution* 54, 118-124.
- Martínez, Ignacio / Rosa, M. / Arsuaga, Juan Luis / Jarabo, P. / Quam, Rolf / Lorenzo, C. / Gracia-Téllez, Ana / Carratero, José Miguel / Bermúdez de Castro J.-M. / Carbonell, E., 2004.  
 Auditory capacities in Middle Pleistocene humans from the Sierra de Atapuerca in Spain. *Proc. Natl. Acad. Sci. U.S.A.* 101, 9976-9981.
- Massey, Doreen, 1994.  
 Space, Place and Gender. University of Minnesota Press, Minneapolis.
- Masson, J. F. / McCarthy, S., 1996.  
 When Elephants Weep: The Emotional Lives of Animals. Delta Book, New York.
- Mattioli, Tommaso / Díaz-Andreu, Margarita, 2017.  
 Hearing rock art landscapes: a survey of the acoustical perception in the Sierra de San Serván area in Extremadura (Spain). *Time and Mind* 10 (1), 81-96.
- Maynard Smith, John / Harper, David, 2003.  
 Animal signals. Oxford University Press, Oxford.
- McAllester, David, P., 1996.  
 North America / Native America. In: Titon, Jeff Todd (Ed.), *Worlds of music: an introduction to the music of the world's people* (3rd Edition). Schirmer, New York, pp. 33-82.
- McBrearty, Sally / Brooks, Alison S., 2000.  
 The revolution that wasn't: a new interpretation of the origin of modern human behaviour. *Journal of Human Evolution* 39, 453-563.
- McComb, Karen / Packer, Craig / Pusey, Anne, 1994.  
 Roaring and numerical assessment in contests between groups of female lions, *Panthera leo*. *Animal Behavior* 47, 379-387.
- McConville, Brigid, 1994.  
 Mixed Messages: Our Breasts in Our Lives. Penguin books press, London.
- McGregor, S. L. / Murname, J. A., 2010.  
 Paradigm, methodology and method: Intellectual integrity in consumer scholarship. *International Journal of Consumer Studies* 34 (4), 419-427.
- McPherron, Shannon P. / Alemseged, Zeresenay / Marean, Curtis W. / Wynn, Jonathan G. / Reed, Denné / Geraads, Denis / Bobe, René / Béarat, Hamdallah A., 2010.  
 Evidence for stone-tool-assisted consumption of animal tissues before 3.39 million years ago at Dikika, Ethiopia. *Nature* 466, 857-860.
- Megaw, J. Vincent S., 1968.  
 Problems and Non-Problems in Palaeo-Organology. In: Coles, John M. / Simpson, Derek, (Eds.), *Studies in Ancient Europe: Essays presented to Stuart Piggott*. Leicester University Press, Leicester, pp. 333-358.
- Mellars, Paul, 1996.  
 The Neanderthal Legacy. Princeton University Press, Princeton, New Jersey.
- Mercier, Norbert / Valladas, Hélène / Joron, J.-L. / Reyss, J.-L. / Lévêque, F. / Vandermeersch, B., 1991.  
 Thermoluminescence dating of the late Neanderthal remains from Saint-Césaire. *Nature* 351, 737-739.
- Merker, Björn, 1999.  
 Synchronous chorusing and human origins. *Musicae Scientiae, Special Issue* 59-73.

- Merleau-Ponty, Maurice, 2012.  
Phenomenology of Perception. Translated by Donald A. Landes. Originally published 1945, Paris. Routledge, Oxon.
- Messiaen, Oliver, 1952.  
Le Merle Noir. Alphonse Leduc, Paris.
- Meyer, Julien, 2004.  
Bioacoustics of human whistled languages: an alternative approach to the cognitive processes of language. *An. Acad. Bras. Ciênc.* 76 (2), 405-412.
- Meyer, Mathilde Vestergaard / Riede, Felix, 2025.  
Playing to Survive: Children and Innovation During the Little Ice Age in Greenland. *European Journal of Archaeology* 28 (1), 81-100.
- Meylan, Raymond, 1992.  
Permanence de la Flûtes Oblique Autour de la Méditerranée. *Actes du Colloque de Musicologie*, 135-151.
- Miall, David, S. / Dissanayake, Ellen, 2003.  
The poetics of babytalk. *Human Nature* 14, 337-364.
- Michell, Edward Blair, 1959.  
The Art and Practice of Hawking. Holland Press, London.
- Miller, Christopher E., 2015.  
A Tale of Two Swabian Caves. *Geoarchaeological Investigations at Hohle Fels and Geißenklösterle*. Kerns Verlag, Tübingen.
- 2015b.  
Geoarchaeology and the interruption of the past in the caves of Swabia: current and future research priorities. In: Sanz, Nuria (UNESCO), *Human origin sites and the World Heritage Convention in Eurasia*, Volume 2 of World heritage series: papers. UNESCO Publishing, France and Paris pp. 60-73.
- Miller, Eric B. / Goss, Clinton F., 2014.  
An Exploration of Physiological Responses to the Native American Flute, Conference of the Interdisciplinary Society for Quantitative Research in Music and Medicine (ISQRMM) 2013, Athens, Georgia 1-17.
- Miller, Geoffrey F., 2000.  
Evolution of human music through sexual selection. In: Wallin, Nils L. / Merker, Björn / Brown, Steven (Eds.), *The Origins of Music*. MIT Press, Cambridge, MA, pp. 329-360.
- MIMO, 2011.  
Instrument Families. In: *Musical Instrument Museums Online*.
- Mithen, Steven J., 1994.  
The Mesolithic Age. In: Cunliffe, B. (Ed.), *Prehistoric Europe: an illustrated history*. Oxford University Press, pp. 79-135.
2005.  
The Singing Neanderthals: the Origins of Music, Language, Mind and Body. Weidenfeld & Nicolson, London.
2006.  
Reply (Review feature on *The Singing Neanderthals: the Origins of Music, Language, Mind and Body* by Steven Mithen). *Cambridge Archaeological Journal* 16, 97-112.

- Montagu, Jeremy, 2009 and 2012,  
It's time to look at Hornbostel and Sachs again. *Muzka* 1 7-27, reprinted *Animusic, Liranimus I*, Vol. 1, writings on Organology, sound, science and art.
2017.  
How Music and Instruments Began: A Brief Overview of the Origin and Entire Development of Music, from Its Earliest Stages. *Front. Sociol.* 2 (8).
2018.  
Tutti Fluti: A brief description of different ways of sounding flutes (from the Montagu Collection). Hataf Segol Publications, the website of Jeremy Montagu.
- Morley, Iain, 2003.  
The Evolutionary Origins and Archaeology of Music: An Investigation into the Prehistory of Human Musical Capacities and Behaviours, Using Archaeological, Anthropological, Cognitive and Behavioural Evidence. PhD Thesis, University of Cambridge.
2005.  
The Long-Forgotten Melody? Music in the Mesolithic. In: Milner, Nicky / Woodman, Peter (Eds.), *Mesolithic Studies at the Beginning of the 21st Century*. Oxbow Books, Oxford, pp. 212-225.
2013.  
The Prehistory of Music. Human Evolution, Archaeology, and the Origins of Musicality. 2018 paperback edition. Oxford University Press, Oxford.
2014.  
A multi-disciplinary approach to the origins of music: perspectives from anthropology, archaeology, cognition and behaviour. *Journal of Anthropological Sciences* 92, 147-177.
- Morton, Eugene S., 1977.  
On the Occurrence and Significance of Motivation-Structural Rules in Some Bird and Mammal Sounds. *The American Naturalist*, Vol. 111, no. 981, 855-869.
- Mulvaney, Derek John / Kamminga, Johan, 1999.  
Prehistory of Australia. Smithsonian Institution Press, Washington DC.
- Mylopotamitaki, Dorothea / Weiss, Marcel / Fewlass, Helen / Zavala, Elena Irene / Rougier, Hélène / Sümer, Arev Pelin / Hajdinjak, Mateja / Smith, Geoff M. / Ruebens, Karen / Sinet-Mathiot, Virginie / Pederzani, Sarah / Essel, Elena / Harking, Florian S. / Xia, Huan / Hansen, Jakob / Kirchner, André / Lauer, Tobias / Stahlschmidt, Mareike / Hein, Michael / Talamo, Sahra / Wacker, Lukas / Meller, Harald / Dietl, Holger / Orschiedt, Jörg / Olsen, Jesper V. / Zeberg, Hugo / Prüfer, Kay / Krause, Johannes / Meyer, Matthias / Welker, Frido / McPherron, Shannon P. / Tim Schüller / Hublin, Jean-Jacques, 2024.  
Homo sapiens reached the higher latitudes of Europe by 45,000 years ago. *Nature* 626, 341-346.
- Müller, U. C., / Schönfelder, A., 2005.  
Die Umweltbedingungen der Übergangszeit vom Neandertaler zum anatomisch modernen Menschen. In: Conard, Nicholas J. / Kölbl, S. / Schürle, W. (Eds.), *Die Umweltbedingungen der Übergangszeit vom Neandertaler zum anatomisch modernen Menschen*. Ostfildern, Thorbecke, pp. 39-46.
- Münzel, Susanne C., 1999.  
DFG-Abschlussbericht zur Großsäugerfauna aus dem Geißenklösterle. Unpublished manuscript.
2001.  
The production of Upper Palaeolithic mammoth bone artefacts from southwestern Germany. In: Cavarretta, G. / Gioia, P. / Mussi, M. / Palombo, M. R., (Eds.), *The world of elephants*. Consiglio Nazionale delle Ricerche, Roma pp. 448-454.

2005.  
Mammoth remains in the Upper and Middle Paleolithic layers of Geißenklösterle Cave (Ach Valley, Swabian Jura, Southwestern Germany). Hunting season, acquisition of raw material and tool production at Geißenklösterle Cave. In: Vialou, D. / Renault-Miskovsky, J. / Patou-Mathis, M. (Eds.), *Comportements des hommes du Paléolithique moyen et supérieur en Europe: territoires et milieux*. Eral 111, Liège pp. 39-49.
- Münzel, Susanne / Morel, Philippe / Hahn, Joachim, 1994.  
Jungpleistozäne Tierreste aus der Geißenklösterle-Höhle bei Blaubeuren. *Fundberichte aus Baden-Württemberg* 19, 63-93.
- Münzel, Susanne C. / Langguth, K. / Conard, Nicholas, J. / Uerpmann, Hans-Peter, 2001.  
Höhlenbärenjagd auf der Schwäbischen Alb vor 30.000 Jahren. *Archäologisches Korrespondenzblatt* 31, 317-328.
- Münzel, Susanne C. / Seeberger, Friedrich / Hein, Wulf, 2002.  
The Geißenklösterle Flute – Discovery, Experiments, Reconstruction. In: Hickmann, Ellen / Kilmer, Anne Draffkorn / Eichmann, Ricardo, (Eds.), *The Archaeology of Sound: Origin and Organisation*. *Studies in Music Archaeology III*. Verlag Marie Leidorf GmbH, Rahden/Westf, pp. 107-118.
- Münzel, Susanne C. / Conard, Nicholas J., 2004a.  
Change and continuity in subsistence during the Middle and Upper Palaeolithic in the Ach valley of Swabia (South-West Germany). *International Journal of Osteoarchaeology*, 14, 225-243.
- 2004b.  
Cave bear hunting in Hohle Fels cave in the Ach valley of the Swabian Jura. *Revue de Paléobiologie*, 23(2): 877-885.
- Münzel, Susanne, C. / Hein, Wulf / Potengowski, Anna Friederike / Conard, Nicholas, J., 2015.  
Flötenklang aus fernen Zeiten. Die ältesten Blasinstrumente von der Schwäbischen Alb. *Archäologie in Deutschland* 7 (Sonderheft), 30-37.
- Münzel, Susanne C. / Conard, Nicholas J. / Hein, Wulf / Gill, Frances / Potengowski, Anna Friederike, 2016.  
Interpreting Three Upper Palaeolithic Wind Instruments from Germany and One from France as Flutes. (Re)construction, Playing Techniques and Sonic Results. In: Eichmann, Ricardo/Fang Jianjun/Koch, Lars-Christian (Eds.), *Studies in Music Archaeology X, Sound – Object – Culture – History*. Verlag Marie Leidorf GmbH, Rahden/Westf, pp. 225-243.
- Narmo, Lars Erik, 2011.  
The Unexpected In: Petersson, B., Narmo, L. E., (Eds.), *Experimental Archaeology. Between Enlightenment and Experience*. Lund University, Department of Archaeology and Ancient History, in cooperation with Lofotr Viking Museum, Norway, pp. 195-226.
- Neal, Lara Carol, 2013.  
The Earliest Instrument: Ritual Power and Fertility Magic of the Flute in Upper Paleolithic Culture. Phd Dissertation, University of Texas at Austin.
- Nettl, Bruno, 1956.  
*Music in Primitive Culture*. Harvard University Press, Cambridge, MA.
1964.  
*Theory and method in ethnomusicology*. Collier Macmillan, London.
1992.  
North American Indian music. In: Nettl, Bruno / Capwell, Charles / Bohlman, Philip V. / Wong, Isabel K.F. / Turino, Thomas (eds.), *Excursions in World Music*. Englewood Cliffs NJ: Prentice Hall, pp. 260-277.

- Niemitz, Carsten, 2010.  
The evolution of the upright posture and gait—a review and a new synthesis. *Naturwissenschaften* 97, 241-263.
- Nikolsky, Aleksey, 2018.  
Commentary: The 'Musilanguage' Model of Language Evolution. *Front Psychol* Front Psychol. 2018 Feb 26;9X75.
- Niven, Laura, 2006.  
The Palaeolithic Occupation of Vogelherd Cave. Implications for the Subsistence Behavior of Late Neanderthals and Early Modern Humans. *Kerns, Tübingen.*
2007.  
From carcass to cave: large mammal exploitation during the Aurignacian at Vogelherd, Germany. *Journal of Human Evolution*, 53 (4), 362-382.
- Nyman, Michael, 1999.  
*Experimental Music: Cage and Beyond (Music in the Twentieth Century)* 2nd Edition. Cambridge University Press, Cambridge. Originally published 1974.
- Oakley, Kenneth P. / Andrews, Peter / Keeley, Lawrence H. / Clark, J. Desmond, 1977.  
A Reappraisal of the Clacton Spearpoint. *Proceedings of the Prehistoric Society*, 43, pp. 13-30.
- Okely, Judith, 1983.  
*The Traveller-Gypsies.* Cambridge University Press, Cambridge.
- Oliva, Martin, 2006,  
The Upper Paleolithic Finds from the Mladeč Cave. In: Teschler-Nicola, Maria (Ed), *Early Modern Humans at the Moravian Gate.* Springer, Viennam, pp. 41-74.
- Olsen, Bjørnar, 2003.  
Material Culture after Text: Re-membering things. *Norwegian Archaeological Review* 36 (2), 87-104.
- Panksepp, Jaak / Trevarthen, Colwyn, 2009.  
The neuroscience of emotion in music. In: Malloch, Stephen/Trevarthen, Colwyn (Eds.), *Communicative Musicality: Exploring the Basis of Human Companionship.* Oxford University Press, Oxford, pp. 105-146.
- Papoušek, Harmš, 1996.  
Musicality in infancy research: Musicality in infancy research: biological and cultural origins of early musicality. In: Deliège, Irene / Sloboda, John (Eds.), *Musical Beginnings: Origins and Development of Musical Competence.* Oxford University Press, Oxford, pp. 88-112.
- Parker Pearson, Mike, 1999.  
*The Archaeology of Death and Burial.* Sutton Publishing Ltd, Stroud.
- Parker, Sue / Milbrath, Constance, 1993.  
Higher intelligence, propositional language, and culture as adaptations for planning. In: Gibson, Kathleen R. / Ingold, (Eds.), *Tools, Language and Cognition in Human Evolution.* Cambridge University Press, Cambridge, pp. 314-333.
- Parkington, John E., 2001.  
Milestones: the impact of systematic exploitation of marine foods on human evolution. In: Tobias, Phillip V. / Raath, Michael A. / Moggi-Cechi, Jacopo / Doyle, Gerald A, (Eds.), *Humanity from African naissance to coming millennia.* Firenze University Press, Florence, pp. 327-336.
- Pauketat, Timothy R., 2013.  
*An Archaeology of the Cosmos: Rethinking Agency and Religion in Ancient America.* Routledge, London and New York.

- Peirce, Charles Sanders, 1931.  
Hartshorne, Charles / Weiss, Paul (Eds.), *Collected Papers of Charles Sanders Peirce*, vol. 5: Pragmatism and Pragmaticism (Harvard Lecture VII, 1903). Harvard University Press. Cambridge, MA.
1998.  
The Essential Peirce Selected Philosophical Writings Vol. 2, (1893-1913). Peirce Edition Project (Eds.), Indiana University Press, Indiana.
1955.  
Philosophical Writings of Peirce. Edited by Justus Buchler. Dover, New York.
1960.  
Collected Papers of Charles Sanders Peirce. Edited by Charles Hartshorne and Paul Weiss. Belknap Press of Harvard University Press: Cambridge, MA.
- 1991  
Peirce on Signs. University of North Carolina Press. Edited J. Hoopes.
- Pellegram, Andrea, 1998.  
The message in paper. In: Miller, Daniel, (Ed.), *Material Cultures. Why Some Things Matter*, UCL Press, Peretz, Isabelle, 2010. *Towards a Neurobiology of Musical Emotions*. In: Juslin, Patrik N. / Sloboda, John (Eds.), *Handbook of Music and Emotion: Theory, Research, Applications*. Oxford University Press, Oxford, pp. 99-126.
- Peretz, Isabelle 2010.  
*Towards a Neurobiology of Musical Emotions*. In: Juslin, Patrik N. / Sloboda, John (Eds.), *Handbook of Music and Emotion: Theory, Research, Applications*. Oxford University Press, Oxford, pp. 99-126.
- Peretz, Isabelle / Zatorre, Robert, J. (Eds.) 2003.  
*The Cognitive Neuroscience of Music*. Oxford University Press, Oxford.
- Petersson, Bodil / Burke, Danny 2020.  
*Experimental Heritage as Practice - Approaching the Past through the Present at the Intersection of Art and Archaeology*. *Internet Archaeology* 55.
- Petersson, Bodil / Narmo, Lars Erik (Eds.), 2011.  
*Experimental Archaeology. Between Enlightenment and Experience*. Lund University, and Lofotr Viking Museum, Bostad. *Acta Archaeologica Lundensia Series in 8°*, No 62.
- Petersson, Bodil / Narmo, Lars Erik, 2011b.  
A Journey in Time. In: Petersson, Bodil / Narmo, Lars Erik (Eds.), *Experimental Archaeology. Between Enlightenment and Experience*. *Acta Archaeologica Lundensia Series altera in 8°* 62. Lund, pp. 28-48.
- Petrides, Michael / Cadoret, Geneviève / Mackey, Scott, 2005.  
Orofacial somatomotor responses in the macaque monkey homologue of Broca's area. *Nature* 435, 1235-1238.
- Peyrégne, Stéphane / Slon, Viviane / Kelso, Janet, 2024.  
More than a decade of genetic research on the Denisovans. *Nature Reviews Genetics* 25 (February) 83-103.
- Pinker, Steven, 1997.  
*How the Mind Works*. Allen Lane, London.
2011.  
*The better angels of our nature: the decline of violence in history and its causes*. London: Penguin.
- Pitulko, Vladimir V. / Basilyan, Aleksandr E. / Pavlova, Elena Y., 2014.  
*The Berelekh Mammoth "Graveyard": New Chronological and Stratigraphical Data from the 2009 Field Season*. Scientific editing by Jamie Woodward.

- Platel, Hervé / Price, Cathy / Baron, Jean-Claude / Wise, Richard / Lambert, Jany / Frackowiak, Richard, S. J. / Lechevalier, Bernard / Eustache, Francis, 1997.  
The structural components of music perception. A functional anatomical study. *Brain: A Journal of Neurology*, 120 (2), 229-243.
- Podlipniak, Piotr, 2024.  
The evolution of musicality and cross-domain co-evolutionary interactions. *Musicae Scientiae* 2025, 29 (1) 5-26.
- Polanyi, Michael, 1983.  
The Tacit Dimension. Peter Smith, Gloucester Mass. Originally published 1966.
- Porr, Martin, 2018.  
Eya. *Mitteilungen der Gesellschaft für Urgeschichte*, 27, Blaubeuren and Tübingen, 145-151.
- Posth, Cosimo, et al., 2016  
Pleistocene Mitochondrial Genomes Suggest a Single Major Dispersal of Non-Africans and a Late Glacial Population Turnover in Europe. *Current Biology*, 26 (6), 827-833.
- Potengowski, Anna Friederike / Münzel, Susanne, C., 2015.  
Die musikalische "Vermessung" paläolithischer Blasinstrumente der Schwäbischen Alb anhand von Rekonstruktionen. Anblastechniken, Tonmaterial und Klangwelt. *Mitteilungen der Gesellschaft für Urgeschichte* 24, 173-191.
- Potengowski, Anna Friederike / Dalferth, Gabriele / Hein, Wulf / Spreer, Barbara / Wiedmann, Hannes / Malina, Maria / Münzel, Susanne C., 2023.  
On Experimental Reconstructions of the Mammoth Ivory Flute from Geißenklösterle Cave (GK3) and Other Palaeolithic Wind Instruments from South-West Germany. *Journal of Music Archaeology* 1, 59-102.
- Power, Camilla, 2001.  
"Beauty magic": deceptive sexual signaling and the evolution of ritual. PhD thesis, University of London, London.
2009.  
Sexual selection models for the emergence of symbolic communication: why they should be reversed. In: Botha, Rudolf / Knight, Chris (Eds.), *The cradle of language*. Oxford University Press, Oxford, pp. 257–280.
2014.  
The evolution of ritual as a process of sexual selection. In: Dor, Daniel / Knight, Chris / Lewis, Jerome (Eds.), *The social origins of language*. Oxford University Press, Oxford, pp. 196–207.
2017.  
Comments. In: Knight, Chris / Lewis, Jerome. *Wild Voices: Mimicry, Reversal, Metaphor, and the Emergence of Language*. *Current Anthropology* 58 (4), 447-448.
- Power, Camilla / Aiello, Leslie, C., 1997.  
Female proto-symbolic strategies. In: Hager, Lori D. (Ed.), *Women in human evolution*. Routledge, New York, pp. 153.171.
- Praxmarer, Michael, 2019.  
Blasinstrumente aus dem europäischen Jungpaläolithikum. Fundmaterial, Interpretation und musikwissenschaftliche Aspekte. *Archaeologia Austriaca* 103, 75-97.
2022.  
Music(s) in the European Upper Palaeolithic: The Melting Pot Theory. Institutes for Musicology and Archaeologies. Leopold Franzens University Innsbruck. Doctoral Thesis (publication forthcoming).

2023.  
Different Blowing Techniques for Palaeolithic Aerophones: Animal Calls, Clarinets, and Flutes. *Journal of Music Archaeology* 1, 39-57.
- Proschan, Frank, 1992.  
Poetic parallelism in Kmhmu verbal arts: From texts to performances. *Selected Reports in Ethnomusicology* 9, 1-31.
- Provine, Robert, R., 2000.  
Laughter: a scientific investigation. Penguin, Harmondsworth, UK.
- Prüfer, Kay / Posth, Cosimo / Yu, He / Stöessel, Alexander / Spyrou, Maria A. / Deviese, Thibaut / Mattonai, Marco / Ribechini, Erika / Higham, Thomas / Velemínský, Petr / Jaroslav Brůžek / Krause, Johannes, 2021.  
A genome sequence from a modern human skull over 45,000 years old from Zlatý kůň in Czechia. *Nature Ecology & Evolution* 8, 820-825.
- Purser, John, 2002.  
The Womb of Sound. In: Hickmann, Ellen / Kilmer, Anne Draffkorn / Eichmann, Ricardo, (Eds.), *The Archaeology of Sound: Origin and Organisation. Studies in Music Archaeology III*. Verlag Marie Leidorf GmbH, Rahden/Westf, pp. 27-38.
- Queiroz, Joao / Ribeiro, Sidarta, 2002.  
The Biological Substrate of Icons, Indexes, and Symbols in Animal Communication: A Neurosemiotic Analysis of Vervet Monkey Alarm Calls. In: Shapiro, Michael (Ed.), *The Peirce seminar papers*. Berghahn Books, New York, Oxford, pp. 69-78.
- Rainio, Riitta, 2016.  
Sucked trumpets in prehistoric Europe and North America?: A technological, acoustical and experimental study. In: Eichmann, Ricardo / Fang Jianjun/Koch, Lars-Christian (Eds.), *Studies in Music Archaeology X, Sound – Object – Culture – History*. Verlag Marie Leidorf GmbH, Rahden/Westf, pp. 151-160.
- Ramírez-Esparza, Nairán / García-Sierra, Adrián / Kuhl, Patricia K., 2014.  
Look who's talking: speech style and social context in language input to infants are linked to concurrent and future speech development. *Dev Sci.* 17 (6), 880-891.
- Rappaport, Roy A., 1999.  
Ritual and religion in the making of humanity. Cambridge University Press, Cambridge.
- Reimer, Paula J. / Baillie, M. G. L. / Bard, Edouard / Bayliss, Alex / Beck, J. W. / Blackwell, Paul G. / Bronk Ramsey, Christopher / Buck, Caitlin E. / Burr, George / Edwards, R. L. / Friedrich, Michael / Grootes, P. M. / Guilderson, Thomas P. / Hajdas, Irka / Heaton, T. J. / Hogg, Alan G. / Hughen, Konrad A. / Kaiser, K. F. / Kromer, B. / McCormac, F. G. / Manning, S. W. / Reimer, R. W. / Richards, D. A. / Southon, J. R. / Talamo, S. / Turney, C. S. M. / van der Plicht, J. / Weyhenmeyer, Constanze E., 2009.  
Intcal09 and Marine09 radiocarbon age calibration curves, 0-50,000 years cal BP. *Radiocarbon* 51, 1111-1150.
- Repp, Bruno H. 1991.  
Some Cognitive and perceptual aspects of speech and music. In: Sundberg, Johan / Nord, Lennart / Carlson, Rolf (Eds.), *Music, Language, Speech and Brain*. MacMillan Press, Basingstoke, pp. 257-268.
- Reznikoff, Iégor, 2002.  
Prehistoric Paintings, Sound and Rocks. In: Hickmann, Ellen/Kilmer, Anne Draffkorn / Eichmann, Ricardo, (Eds.), *The Archaeology of Sound: Origin and Organisation. Studies in Music Archaeology III. Orient-Archäologie* 10, Rahden/West, pp. 39-56.
2006.  
The Evidence of the Use of Sound Resonance from Palaeolithic to Medieval Times. In: Scarre, Chris / Lawson, Graeme, (Eds.), *Archaeoacoustics*. McDonald Institute monographs, Oxford, pp. 77-84.

- Rhodes, Sara E., 2019.  
 A Synthesis of the Paleoeecology of the Ach Valley during the Middle to Upper Paleolithic Transition. With an expanded discussion of the small mammal record from Hohle Fels and Geißenklösterle Caves. *Mitteilungen der Gesellschaft für Urgeschichte* 28, 51-104.
- Richter, Daniel / Waiblinger, J. / Rink, W. J. / Wagner, G. A., 2000.  
 Thermoluminescence, Electron Spin Resonance and 14C-dating of the Late Middle and Early Upper Palaeolithic Site of Geißenklösterle Cave in Southern Germany. *Journal of Archaeological Science* 27, 71-89.
- Richter, Daniel / Krbetschek, Matthias, 2015.  
 The age of the Lower Paleolithic occupation at Schöningen. *Journal of Human Evolution* 89, 46-56.
- Riede, Felix (2025).  
 Play Object Play: A database of toys and tools made for and/or used by children from subsistence societies
- Riede, Felix / Johannsen, Niels N. / Högberg, Anders / Nowell, April / Lombard, Marlize, 2018.  
 The role of play objects and object play in human cognitive evolution and innovation. *Evolutionary anthropology* 27 (1), 46-59.
- Riede, Felix / Lew-Levy, Sheina / Johannsen, N.N. / Lavi, N. / Andersen, Marc Malmendorf, 2022.  
 A cross-cultural analysis of object play and enskillment in hunter gatherer societies. *Journal of Archaeological Method and Theory*.
- Riehl, Simone / Marinova, Elena / Deckers, Katleen / Malina, Maria / Conard, Nicholas J., 2015.  
 Plant use and local vegetation patterns during the second half of the Late Pleistocene in southwestern Germany. *Archaeological and Anthropological Sciences* 7, 151-167.
- Riek, Gustav, 1934.  
 Die Eiszeitjägerstation am Vogelherd im Lonetal I: Die Kulturen. Akademische Buchhandlung Franz F. Heine, Tübingen.
1973.  
 Das Paläolithikum der Brillenhöhle bei Blaubeuren (Schwäbische Alb), Teil I. Verlag Müller & Graf, Stuttgart.
- Riley, Murdoch, 2001.  
 Māori bird lore: an introduction. Viking Sevenses NZ Ltd., Paraparaumu.
- Ringot, Jean-Loup, 2011.  
 Die steinzeitlichen Aerophone: Flöten oder Schalmeyen? *Experimentelle Archäologie in Europa, Bilanz* 2011 (10), 188-198.
- Roederer, Juan G., 1984.  
 The Search for a Survival Value of Music. *Music Perception: An Interdisciplinary Journal* 1 (3) Dedicated to Helmholtz, 350-356.
- Rose, Gerald, 1987.  
 The Fisherman and the Cormorants. Bodley Head, London.
- Ross, Marina Davila / Owren, Michael J. / Zimmermann, Elke, 2010.  
 The evolution of laughter in great apes and humans. *Commun. Integr. Biol.* 3 (2), 191-194.
- Rothgänger, Hartmut, 2003.  
 Analysis of the sounds of the child in the first year of age and a comparison to the language. *Early Human Development, Volume 75* (1-2), 55-69.

- Rougier, Hélène / Milota, Stefan / Rodrigo, Ricardo / Gherase, Mircea / Sarcina, Laurentiu / Moldovan, Oana / Zilhão, João / Constantin, Silviu / Franciscus, Robert G. / Zollkofer, Christoph P. E. / Ponce de León, Marcia / Trinkaus, Erik, 2007.  
Peștera cu Oase 2 and the cranial morphology of early modern Europeans. *Proc. Natl. Acad. Sci.* 104 (4), 1165-1170.
- Rousseau, Jean-Jacques, 1817.  
ESSAI SUR L'ORIGINE DES LANGUES, où il est parlé de la Mélodie, et de l'imitation musicale. édition A. Belin, Paris. (Originally published posthumously in 1781).
- Rutherford, Stephanie, 2011.  
Non-representational Theory; Space, Politics, Affect - By NIGEL THRIFT. *Tijdschrift voor economische en sociale geografie*, Royal Dutch Geographical Society KNAG, 102 (2), 248-249.
- Sagreras, Julio Salvador, 1954.  
El Colibri. Ricordi Americana, Buenos Aires.
- Saier, C., 1994.  
Das Material der "Altgrabungen" vom Hohlen Felsen, Gemeinde Schelklingen, Alb-Donau-Kreis. (Unpublished Magister thesis). Eberhard Karls University of Tübingen, Tübingen.
- Saint-Georges, Catherine / Chetouani, Mohamed / Cassel, Raquel / Apicella, Fabio / Mahdhaoui, Ammar / Muratori, Filippo / Laznik, Marie-Christine / Cohen, David, 2013.  
Motherese in Interaction: At the Cross-Road of Emotion and Cognition? (A Systematic Review). *PLoS ONE* 8 (10): e78103.
- Sample, Geoff, 1996.  
Collins Field Guide: Bird Songs and Calls of Britain and Northern Europe (Contains 2 accompanying CDs). Collins, London.
- Sartre, Jean-Paul, 1968.  
Search for a Method. Vintage Books, New York.
- Saussure, Ferdinand De, 1916.  
Cours de Linguistique Générale. Publié par Charles Bally et Albert Sechehaye. Avec la Collaboration de Albert Riedlinger. Payot & Cie, Lausanne and Paris.
1966.  
Course in General Linguistics. McGraw-Hill Book Co., New York, Toronto, London. (Edited Charles Bally and Albert Sechehaye, translated Wade Baskin).
- Savage, Patrick E. / Loui, Psyche / Tarr, Bronwyn / Schachner, Adena / Glowacki, Luke / Mithen, Steven / Fitch, W. Tecumseh, 2021.  
Music as a coevolved system for social bonding. *Behavioral and Brain Sciences* 44, 1-22.
- Scarre, Chris / Lawson, Graeme (Eds.), 2006.  
Archaeoacoustics. McDonald Institute Monographs, McDonald Institute for Archaeological Research, Cambridge.
- Schellenberg, E., Glenn / Trehub, Sandra E. 1994.  
Frequency ratios and the perception of tone patterns. *Psychon. Bull. Rev.* 1 (2), 191-201.
- 1996a.  
Natural musical intervals: evidence from infant listeners. *Psychol. Sci.* 7 (5), 272-277.
- 1996b.  
Children's discrimination of melodic intervals. *Dev. Psychol.* 32 (6), 1039-1050.

- Scherer, Klaus R., 1986.  
 Vocal affect expression: A review and a model for future research. *Psychological Bulletin*, 99 (2), 143-165.
- Schiegl, Solveig / Goldberg, Paul / Pfreztschner, Hans-Ulrich / Conard, Nicholas J., 2003.  
 Paleolithic Burnt Bone Horizons from the Swabian Jura: Distinguishing between in situ Fireplaces and Dumping Areas. *Geoarchaeology* 18 (5), 531-565.
- Schiller, Friedrich, 1795.  
 Erziehung des Menschen in einer Reihe von Briefen. Horen. Source in English - "Letters on the Aesthetic Education of Man" - taken from *Stanford Encyclopaedia of Philosophy*.
- Schlaug, Gottfried, 2001.  
 The brain of musicians: a model for functional and structural adaptation. *Ann. NY Acad. Sci.* 930, 281-299.
- Schlebusch, Carina M., 2010.  
 Genetic variation in Khoisan-speaking populations from southern Africa. PhD dissertation, University of Witwatersrand, Johannesburg.
- Schmidt, Robert Rudolf, 1912.  
 Die diluviale Vorzeit Deutschlands. With contributions by Koken, E. / Schliz, A., (3 vols). E. Schweizerbartsche Verlagsbuchhandlung, Stuttgart.
- Schray, Svenja (in press).  
 A research historical review of the stratigraphy of Geißenklösterle Cave near Blaubeuren. *Mitteilungen der Gesellschaft für Urgeschichte* 33.
- Schuback, Marcia Sá Cavalcante, 2012.  
 The Poetics of the Sketch. In: Sallis, John (Ed.), Paul Klee: Philosophical Vision: From Nature to Art. McMullen Museum of Art, Boston College, pp. 149-156.
- Schulz, GERALYN / Varga, M. / Jeffires, K. / Ludlow, Christy, L. / Braun, Allen, R., 2005.  
 Functional neuroanatomy of human vocalization: An H2150 PET Study. *Cerebral Cortex* 15, 1835-1847.
- Scothern, Paula Marie Theresa, 1984a.  
 The musical evidences of the Palaeolithic (undergraduate dissertation). University of Leicester: Department of Archaeology.
- 1984b.  
 Presentation of a music-archaeological research project. The musical evidences of the Palaeolithic: A palaeo-organological survey. In: Lund, Cajsa S. (Ed.), Second conference of the ICTM study group on music Archaeology. Volume 1. General Studies. Royal Swedish Academy of Music 53, Stockholm, pp. 73-79.
1992. (Referred to extensively as from 1992 but is registered at Cambridge University as dated 1993).  
 The music-archaeology of the Palaeolithic within its cultural setting. Doctoral thesis, Cambridge University.
- Scudder, Samuel Hubbard, 1868.  
 Notes on Stridulation. *Proc. Boston. Soc. of Nat. Hist.*, Vol xi.
- Searle, John, R., 1996.  
 The construction of social reality. Penguin, London.
- Seeberger, Friedrich, 1998.  
 Zur Spielweise paläolithischer Knochenflöten. *Archäologisches Korrespondenzblatt* 28, 31-33.
1999.  
 Sind jungpaläolithische Hirtenflöten Vorläufer mediterraner Hirtenflöten? *Archäologisches Korrespondenzblatt* 29, 155-157.

2002.  
Steinzeit selbst erleben! Waffen, Schmuck und Instrumente – nachgebaut und ausprobiert. Wais and Partner, Stuttgart.
- Sergent, Justine / Zuck, Erik / Terriah, Sean / MacDonald, Brendan, 1992.  
Distributed neural network underlying musical sight-reading and keyboard performance. *Science* 257, 106-109
- Serjeantson, Dale, 2009  
Birds, Cambridge University Press.
- Shackelford, Todd K. / Weekes-Shackelford, Viviana A. (Eds.), 2012.  
The Oxford handbook of evolutionary perspectives on violence, homicide, and war. Oxford University Press, Oxford.
- Shakespeare, William, 1603.  
Hamlet. Quarto edition, at British Library, London.
- Shanks, Michael, 2008.  
Post-Processual Archaeology and After. In: Maschner, Herbert D. G. / Chippindale, Christopher / Bentley, R. Alexander (Eds.), *Handbook of archaeological theories*. AltaMira Press, Lanham, MD; Plymouth, pp. 133-144.
- Shapiro, Anne, Dhu / Talamantez, Inés, 1986.  
The Mescalero Apache girls' puberty ceremony: The role of music in structuring ritual time. *Yearbook for Traditional Music* 18, 77-90.
- Shepard Roger N., 1982.  
Geometrical approximations to the structure of musical pitch. *Psychol. Rev.* 89, 305-333.
- Shimelmitz, Ron / Kuhn, Steven L. / Jelinek, Arthur / Ronen, Avraham / Clark, Amy E. / Weinstein-Evron, Mina, 2014.  
“Fire at will”: the emergence of habitual fire use 350,000 years ago. *Journal of Human Evolution* 77, 196-203.
- Shute, Brenda / Wheldall, Kevin, 2010.  
How Do Grandmothers Speak to their Grandchildren? Fundamental Frequency and Temporal Modifications in the Speech of British Grandmothers to their Grandchildren. *An International Journal of Experimental Educational Psychology* 21 (4), 493-503.
- Slatkin, Montgomery / Racimo, Fernando, 2016.  
Ancient DNA and human history. *Proc Natl Acad Sci* 113 (23), 6380-6387.
- Slimak, Ludovic / Zanolli, Clément / Higham, Tom / Frouin, Marine / Schwenninger, Jean-Luc / Arnold, Lee J. / Demuro, Martina / Douka, Katerina / Mercier, Norbert / Guérin, Gilles / Valladas, Hélène / Yvorra, Pascale / Giraud, Yves / Seguin-Orlando, Andaine / Orlando, Ludovic / Lewis, Jason E. / Muth, Xavier / Camus, Hubert / Vandevelde, Ségolène / Buckley, Mike / Mallol, Carolina / Stringer, Chris / Metz, Laure, 2022.  
Modern human incursion into Neanderthal territories 54,000 years ago at Mandrin, France. *Science Advances* 8, eabj9496.
- Sloboda, John A., 1985  
The Musical Mind: The Cognitive Psychology of Music. Oxford University Press, Oxford.
1998.  
Does Music Mean Anything? *Musicae Scientiae* 2 (1), 19-31.

- Sloboda, John A. / Juslin, Patrik N., 2001.  
 Psychological perspectives on music and emotion. In: Juslin, Patrik N. / Sloboda, John A. (Eds.), *Music and Emotion: Theory and Research*. Oxford University Press, Oxford, 71-104.
- Small, Christopher, 1998.  
*Musicking: The Meanings of Performing and Listening*. Wesleyan University Press, Connecticut.
- Smith, Geoff M. / Ruebens, Karen / Zavala, Elena Irene / Sinet-Mathiot, Virginie / Fewlass, Helen / Pederzani, Sarah / Jaouen, Klervia / Mylopotamitaki, Dorothea / Britton, Kate / Rougier, H  l  ne / Stahlschmidt, Mareike / Meyer, Matthias / Meller, Harald / Dietl, Holger / Orschiedt, J  rg / Krause, Johannes / Sch  ler, Tim / McPherron, Shannon P. / Weiss, Marcel / Hublin, Jean-Jacques / Welker, Frido, 2024.  
 The ecology, subsistence and diet of ~45,000-year-old *Homo sapiens* at Ilsenh  hle. *Nature Ecology & Evolution* 8, 564-577.
- Snow, Dean R. 2013.  
 Sexual Dimorphism in European Upper Paleolithic Cave Art. *American Antiquity* 78, (4), 746-761. Cambridge University Press.
- Solomon, Su / Minnegal, Monica / Dwyer, Peter, 1986.  
 Bower birds, bones and archaeology. *Journal of Archaeological Science* 13 (4), 307-318.
- Sorensen, Andrew C., 2019.  
 The Uncertain Origins of Fire-Making. *Mitteilungen der Gesellschaft f  r Urgeschichte* 28, 11-50.
- Spencer, Herbert, 1857.  
 The origin and function of music. *Fraser's Magazine for Town and Country* 56 (October 1857), 396-408.
- Sperber, Dan, 1975.  
*Rethinking symbolism*. Cambridge University Press, Cambridge.
- Spoor, Fred / Wood, Bernard / Zonneveld, Frans, 1994.  
 Implications of early hominid labyrinthine morphology for evolution of human bipedal locomotion. *Nature*, 369: 645-648.
- Spoor, Fred / Zonneveld, Frans, 1998.  
 Comparative review of the human bony labyrinth. *Yearbook of Physical Anthropology Volume (107)* S27, 211-251.
- Starkovich, B. M. / M  nzel, Susanne C. / Kitagawa, Keiko / Kr  nneck, Petra / Riehl, Simone / Bocherens, H. / Drucker, D / Conard, Nicholas J., in press.  
 Environment and subsistence during the Aurignacian of the Swabian Jura. In: Conard, Nicholas J. / Dutkiewicz, Ewa (Eds.), *Early Symbolic Material Culture and the Evolution of Behavioral Modernity*. Kerns.
- Stember, Marilyn, 1991.  
 Advancing the social sciences through the interdisciplinary enterprise. *The Social Science Journal*, 28 (1), 1-14.
- Stern, Daniel N., 1977.  
*The First Relationship: Infant and Mother*. Barbara Lloyd (Series Editor), Harvard University Press: Cambridge MA.
- Stewart, Nigel, 1998.  
 Relanguaging the body: phenomenological descriptions and the body image. *Performance Research*, 3, 42-58.
- Storr, Anthony, 1993.  
*Music and the Mind*. (New Edition). Harper Collins, London.

- Strathern, Marilyn, 1980.  
No nature, no culture: the Hagen case. In: MacCormack, Carol / Strathern, Marilyn (Eds.), *Nature, culture and gender*. Cambridge University Press, Cambridge, pp. 174-222.
- Stringer, Chris, 2002.  
Modern human origins: progress and prospects. *Phil. Trans. R. Soc. B* 357, 563-579.
2016.  
The origin and evolution of *Homo sapiens*. *Phil. Trans. R. Soc. B* 357, 563-579 B 371.
- Struhsaker, Thomas T., 1967.  
Auditory communication among vervet monkeys (*Cercopithecus aethiops*). In: Altmann, Stuart A. (Ed.), *Social Communication Among Primates*. Cambridge University Press, Cambridge, UK, pp. 281-324.
- Sundberg, Johan / Friberg, Anders / Frydén, Lars, 1992.  
Music and locomotion: a study of the perception of tones with level envelopes replicating force patterns of walking. *KTH STL-QPSR* 33 (4), 109-122.
- Suwa, Gen / Kono, Reiko T. / Simpson, Scott W. / Asfaw, Berhane / Lovejoy, C. Owen / White, Tim D., 2009.  
Paleobiological Implications of the *Ardipithecus ramidus* Dentition *Science* 326 (69), 94-99.
- Svanberg, Ingvar, 2013.  
Fåglar i svensk folklig tradition. Dialogos, Stockholm.
- Svensson, Anders M. / Andersen, Katrine K. / Bigler, Matthias / Clausen, Henrik Brink / Dahl-Jensen, Dorthe / Davies, Siwan M., / Johnsen, Sigfús Jóhann / Muscheler, Raimund / Rasmussen, Sune Olander / Rothlisberger, Regine / Steffensen, Jørgen Peder / Vinther, Bo Møllesøe, 2006.  
The Greenland ice core chronology 2005, 15-42 ka. Part 2: comparison to other records. *Quatern. Sci. Rev.* 25, 3258-3267.
- Svensson, Anders M. / Andersen, Katrine K. / Bigler, Matthias / Clausen, Henrik Brink / Dahl-Jensen, Dorthe / Davies, Siwan M. / Johnsen, Sigfús Jóhann / Muscheler, Raimund / Parrenin, F. / Rasmussen, Sune Olander / Rothlisberger, Regine / Seierstad, I. / Steffensen, Jørgen Peder / Vinther, Bo Møllesøe, 2008.  
A 60,000 year Greenland stratigraphic ice core chronology. *Clim. Past* 4, 47-58.
- Swain, Joseph P., 1997.  
*Musical Languages*. Norton, New York.
- Szombathy, Josef, 1925.  
Die diluvialen Menschenreste aus der Fürst-Johanns- Höhle bei Lautsch in Mähren. *Die Eiszeit* 2, 1-34; 73-95.
- Sümer, Arev P. / Rougier, Hélène / Villalba-Mouco, Vanessa / Huang, Yilei / Iasi, Leonardo N. M. / Essel, Elena / Mesa, Alba Bossoms / Furtwaengler, Anja / Peyrégne, Stéphane / de Filippo, Cesare / Rohrlach, Adam B. / Pierini, Federica / Mafessoni, Fabrizio / Fewlass, Helen / Zavala, Elena I. / Myopotamitaki, Dorothea / Bianco, Raffaella A. / Schmidt, Anna / Zorn, Julia / Nickel, Birgit / Patova, Anna / Posth, Cosimo / Smith, Geoff M. / Ruebens, Karen / Sinet-Mathiot, Virginie / Stoessel, Alexander / Dietl, Holger / Orschiedt, Jörg / Kelso, Janet / Zeberg, Hugo / Bos, Kirsten I. / Welker, Frido / Weiss, Marcel / McPherron, Shannon P. / Schüller, Tim / Hublin, Jean-Jacques / Velemínský, Petr / Brůžek, Jaroslav / Peter, Benjamin M. / Meyer, Matthias / Meller, Harald / Ringbauer, Harald / Hajdinjak, Mateja / Prüfer, Kay / Krause, Johannes, 2025.  
Earliest modern human genomes constrain timing of Neanderthal admixture. *Nature* 638, 711-717.
- Tajadura-Jiménez, Ana / Våljamäe, Aleksander / Västfjäll, Daniel, 2008.  
Self-Representation in Mediated Environments: The Experience of Emotions Modulated by Auditory-Vibrotactile Heartbeat. *Cyberpsychology Behaviour* 11 (1), 33-38.

- Taller, Andreas / Conard, Nicholas J., 2019.  
Transition or Replacement? Radiocarbon Dates from Hohle Fels Cave (Alb-Donau-Kreis / D) and the Passage from Aurignacian to Gravettian. *Archäologisches Korrespondenzblatt* 49, 165-181.
- Tambiah, Stanley J., 1968.  
The Magical Power of Words. *Man* (3) 2, 175-208.
- Tamboer, Annemies, 2020.  
The Rommelpot of the Netherlands as a Case Study in Cajsja Lund's Probability Groups. In: Kolltveit, Gjermund / Rainio, Riitta (Eds.), *The Archaeology of Sound, Acoustics and Music: Studies in Honour of Cajsja S. Lund*. ICTM Study Group on Music Archaeology, Vol. 3, Ekho Verlag, Berlin, pp. 97-116.
- Tarasov, Nik, 2005.  
Die Ältesten Flöten Der Welt. *Windkanal* 2005 1, 6-11.
- Tartter, Vivien, C., 1980.  
Happy talk: Perceptual and acoustic effects of smiling on speech. *Perception & Psychophysics* 27 (1), 24-7.
- Tartter, Vivien, C. / Braun, David, 1994.  
Hearing smiles and frowns in normal and whisper registers. *Journal of the Acoustical Society of America*, 96 (4), 2101-2107.
- Taruskin, Richard, 1988.  
The pastness of the present and the presence of the past. In: Kenyon, Nicholas (Ed.), *Authenticity and early music: a symposium*. Oxford University Press, Oxford, pp. 193-194.
- Taylor, Colin F., (Ed.), 1991.  
The Native Americans. Salamander Books (Tiger Books), Twickenham.
- Ternhag, Gunnar, 2007a.  
Musikinstrumentforskning på Nytt. In: Bohman, Stefan / Lundberg, Dan / Ternhag, Gunnar (Eds.), *Musikinstrument berättar: Instrumentforskning idag*. Gidlunds, Malmö, pp. 9-17.
- 2007b.  
Organologi: systematik, morfologi och kulturanalys. In: Bohman, Stefan / Lundberg, Dan / Ternhag, Gunnar (Eds.), *Musikinstrument berättar: Instrumentforskning idag*. Gidlunds, Malmö, pp. 18-52.
- Testart, Alain, 1986.  
Essai sur les fondements de la division sexuelle du travail chez les chasseurs-cueilleurs. Éditions de l'École des Hautes Études en Sciences Sociales, Paris.
- Thieme, Harmut, 1997.  
Lower Palaeolithic hunting spears from Germany. *Nature*, 385, 807-810.
- Thompson, Robert Francis, 1995.  
Impulse and repose: the art of Ituri women. In: Meurant, Georges / Thompson, Robert Francis (Eds.), *Mbuti Design: Paintings by Pgymy Women of the Ituri Forest*. Thames and Hudson, London, pp. 185-214.
- Thrift, Nigel, 2008.  
Non-representational Theory; Space, Politics, Affect. Routledge, London & New York.
- Till, Rupert, 2020.  
Sound Archaeology and the Soundscape. In: Kolltveit, Gjermund / Rainio, Riitta (Eds.), *The Archaeology of Sound, Acoustics and Music: Studies in Honour of Cajsja S. Lund*. ICTM Study Group on Music Archaeology, Vol. 3, Ekho Verlag, Berlin, pp. 31-53.
- Tolbert, Elizabeth, 1990.  
Women cry with words: Symbolization of affect in the Karelian lament. *Yearbook for Traditional Music* 22, 80-105.

- Tomasello, Michael, 2008.  
Origins of human communication. MIT Press, Cambridge, MA.
- Tomlinson, Gary, 2015.  
A Million Years of Music. The Emergence of Human Modernity. Zone Books, New York.
- Tostevin, Gilbert, 2013.  
Seeing Lithics: A Middle-range Theory for Testing for Cultural Transmission in the Pleistocene. Oxbow Books, Oxford and Oakville.
- Trærup, Birthe, 1981.  
Wedding musicians in Prizrenska Gora, Yugoslavia. *Studia Instrumentorum Musicae Popularis* 6, 43-52.
- Trainor, Laurel J. 2015.  
The origins of music in auditory scene analysis and the roles of evolution and culture in musical creation. *Philosophical Transactions Royal Society B* 370: 20140089, 1-14.
- Trainor, Laurel J. / Austin, Caren, M. / Desjardins, René, N., 2000.  
Is Infant-Directed Speech Prosody a Result of the Vocal Expression of Emotion? *Psychological Science* 11 (3), 188-195.
- Tramo, Mark, Jude / Cariani, Peter / Delgutte, Bertrund / Braidia, Louis D., 2003.  
Neurobiology of harmony perception. In: Peretz, Isabelle / Zatorre, Robert, J. (Eds.), *The Cognitive Neuroscience of Music*. Oxford University Press, pp. 126-151.
- Trehub, Sandra E. / Schellenberg, E. Glenn / Kamenetsky, Stuart B., 1999.  
Infants' and adults' perception of scale structure. *J. Exp. Psychol. Hum. Percept. Perform.* 25, 965-975.
- Trehub, Sandra E. 2003.  
Musical predispositions in infancy: an update. In: Peretz, Isabelle / Zatorre, Robert, J. (Eds.), *The Cognitive Neuroscience of Music*. Oxford University Press, pp. 3-20.
- Trevarthen, Colwyn, 1999.  
Musicality and the intrinsic motive pulse: evidence from human psychobiology and infant communication. *Musicae Scientiae*.
- Trigger, Bruce G., 2006.  
*A History of Archaeological Thought (Second Edition)*. Cambridge University Press, Cambridge.
- Trinkaus, Erik / Milota, Stefan / Rodrigo, Ricardo / Gherase, Mircea / Moldovan, Oana, 2003.  
Early modern human cranial remains from the Peștera cu Oase, Romania. *Journal of Human Evolution* 45, 245-253.
- Truss, Lynne, 2003.  
*Eats Shoots and Leaves: The Zero Tolerance Approach to Punctuation*. Profile Books, London.
- Turino, Thomas, 1992.  
The music of Sub-Saharan Africa. In: Nettle, Bruno / Capwell, Charles / Bohlman, Philip V. / Wong, Isabel K.F. / Turino, Thomas (eds.), *Excursions in World Music*. Englewood Cliffs NJ: Prentice Hall, pp. 165-195.
- Turk, Ivan, (Ed.), 1997.  
Mousterian "bone flute" and Other Finds from Divje babe I Cave Site, Slovenia. *Opera Instituti Archaeologici Sloveniae* 2, ZRC Publishing, Ljubljana.
- Turk, Ivan / Dirjec, Janez / Kavur B., 1995.  
Ali so v Sloveniji našli najstarejšo glasbilo v Evropi? (The oldest musical instrument in Europe discovered in Slovenia?) *Razprave 4. razreda SAZU* 36, 287-293.

- Turk, Ivan / Dirjec, Janez / Turk, Matija, 2014.  
19 years after its discovery. Critique of the taphonomic interpretation of the find. In: Horvat, Jana / Pleterski, Andrej / Velušček, Anton, (Eds.), *Divje babe I. Upper Pleistocene Palaeolithic site in Slovenia Part II: Archaeology*. Opera Instituti Archaeologici Sloveniae 29, Ljubljana, pp. 253-268.
- Turk, Matija / Turk, Ivan / Dimkaroski, Ljuben / Blackwell, Bonnie, A.B. / Horusitzky, François, Zoltán / Otte, Marcel / Bastiani, Giuliano / Korat, Lidija, 2018.  
The Mousterian Musical Instrument from the Divje babe I cave (Slovenia): Arguments on the Material Evidence for Neanderthal Musical Behaviour. *L'anthropologie* (2018).
- Turk, Matija / Turk, Ivan / Otte, Marcel, 2020.  
The Neanderthal Musical Instrument from Divje Babe I Cave (Slovenia): A Critical Review of the Discussion. *Applied Sciences* 10, no. 4: 1226.
- Turnbull, Colin, 1962.  
The Forest People. Simon & Schuster.
- Turq, Alain, 1988.  
Paléolithique inférieur et moyen en Haut-Agenais: état des recherches. *Revue de l'Agenais*, 115, 83-112.
- Tylor, Edward, Burnett, 1871.  
Primitive Culture: researches into the development of mythology, philosophy, religion, art, and custom. John Murray, London.
- Unknown, c. 1744.  
Hickory Dickory Dock. *Roud Folk Song Index*: 6489.
- Van Gennep, Charles-Arnold, Kurr, 1960.  
The rites of passage. Translated Monika B. Vizedom and Gabrielle L. Caffee. Routledge, London. Originally published in 1909.
- Van Hooff, Jan, A. R. A. M. / Preuschoft, Signe, 2003.  
Laughter and smiling: the intertwining of nature and culture. In: De Waal, Frans B. M. / Tyack, Peter, L. (Eds.), *Animal social complexity*. Harvard University Press, Cambridge, MA, pp. 260-287.
- Vaneechoutte, Mario / Skoyles, John R., 1998.  
The memetic origin of language: modern humans as musical primates. *Journal of Memetics* 2 (2) 84-117.
- Veenstra, Adolf, 1964.  
The Classification of the Flute. *The Galpin Society Journal* 17 (Feb), 54-63.
- Velliky, Elizabeth C., 2019.  
Identifying diachronic changes in ochre behaviours throughout the Upper Palaeolithic (ca. 44-12.5 kya) of Southwestern Germany. PhD dissertation, Eberhard Karls Universität Tübingen.
- Verdu, Paul / Beckerm, Noémie S. A. / Froment, Alain / Georges, Myriam / Grugni, Viola / Quintana-Murci, Lluís / Hombert, Jean-Marie, *et al.* 2013.  
Sociocultural behavior, sex-biased admixture and effective population sizes in Central African Pygmies and non-Pygmies. *Molecular Biology and Evolution* 30 (4), 918-937.
- Viereck, George Sylvester, 1929.  
What Life Means to Einstein: An Interview by George Sylvester Viereck. In: *The Saturday Evening Post*. Curtis Publishing Company, Philadelphia, Oct 26th, 17, 110 & 113.
- Villinger E., 1986.  
Untersuchungen zur Flussgeschichte von Aare-Donau/Alpenrhein und zur Entwicklung des Malm-Karsts in Südwestdeutschland. *Jahreshefte des geologischen Landesamtes in Baden-Württemberg*, 28, 297-362.

- Viveiros de Castro, Eduardo, 2015.  
The relative native. *HAU: Journal of Ethnographic Theory* 3 (3), 473-502.
- Wagner, Eberhard, 1983.  
Das Mittelpaläolithikum der Großen Grotte bei Blaubeuren. Alb-Donau-Kreis, Kommissionsverlag K. Theiss.
- Waksman, Steve 2003.  
Reading the Instrument: An Introduction. *Popular Music and Society* 26 (3), 251-261.
- Wallmark, Zaqchary, 2012.  
Reading Sacred Abjection in Zen Shakuhachi, *Ethnomusicology Review* 17.
- Wisher, Izzy / Riede, Felix / Matthews, John / Pagnotta, Murillo / Tylén, Kristian, 2025.  
Children as Playful Artists: Integrating Developmental Psychology to Identify Children's Art in the Upper Palaeolithic. *Hunter Gatherer Research* 11, 1-39.
- Watt, Roger / Ash, Roisin L., 1998.  
A Psychological Investigation of Meaning in Music. *Musicae Scientiae*, 2, 33-54.
- Watts, Ian, 2002.  
Ochre in the Middle Stone Age of southern Africa: ritualised display or hide preservative? *South African Archaeological Bulletin* 57, 15-30.
2014.  
The red thread: pigment use and the evolution of collective ritual. In: Dor, Daniel / Knight, Chris / Lewis, Jerome (Eds.), *The social origins of language*. Oxford University Press, Oxford, pp. 208-227.
- Watts, Ian / Chazan, Michael / Wilkins, Jayne, 2016.  
Early evidence for brilliant ritualized display: specularite use in the Northern Cape (South Africa) between ~500 and ~300 Ka. *Current Anthropology* 57 (3), 287-310.
- Weninger, Bernard Paul / Jöris, Olaf, 2008.  
A 14C age calibration curve for the last 60 ka: the Greenland-Hulu U/Th timescale and its impact on understanding the Middle to Upper Paleolithic transition in Western Eurasia. *J. Hum. Evol.* 55, 772-781.
- West, Meredith J. / King, Andrew P., 1990.  
Mozart's starling. *American Scientist*, 78, 106-114.
- Wettengl, Stefan, 2013.  
Die Kleine Scheuer im Rosenstein und das Paläolithikum um Heubach – Altfunde und neue Forschungen. Bachelor essay, Tübingen University, Tübingen.
- Wild, Eva M. / Teschler-Nicola, Maria / Kutschera, Walter / Steier, Peter / Trinkaus, Erik / Wanek, Wolfgang, 2005.  
Direct dating of Early Upper Palaeolithic human remains from Mladec'. *Nature, Letters*, 435, 332-335.
- Will, Manuel / Conard, Nicholas J. / Tryon, Christian A., 2019.  
Timing and trajectory of cultural evolution on the African continent 200,000 - 30,000 years ago. In: Sahle, Yonatan/Reyes-Centeno, Hugo/Bentz, Christian (Eds.), *Modern human origins and dispersal*. Kerns Verlag, Tübingen.
- Wind, Jan, 1989.  
The evolutionary history of the human speech organs. In: Wind, Jan / Pulleyblank, Edward G. / de Grolier, Éric / Bichakjian, Bernard, H., (Eds.), *Studies in Language Origins: Volume 1*. John Benjamins Publishing Company, Amsterdam, pp. 471-540.
- Wolf, Sibylle, 2015.  
Schmuckstücke. Conard, Nicholas J., (Ed.), Kerns Verlag, Tübingen.

2015.  
Schmuckstücke: Die Elfenbeinbearbeitung im Schwäbischen Aurignacien. Tübinger Monographien zur Urgeschichte. Kerns Verlag, Tübingen.
- Wolf, Sibylle / Heckel, Claire E., 2014.  
Ivory debitage by fracture in the Aurignacian: experimental and archaeological examples. *Journal of Archaeological Science* 42, 1-14.
- Wolf, Sibylle / Münzel, Susanne C. / Dotzel, K. / Barth, M.M. / Conard, Nicholas J., 2016.  
Projectile weaponry from the Aurignacian to the Gravettian of the Swabian Jura (Southwest Germany): Raw materials, manufacturing and typology. In: Langley, M.C., (Ed.), *Osseous Projectile Weaponry*. Springer, Netherlands, 71-87.
- Wolfe, Joe, 1997.  
Open vs Closed pipes (Flutes vs Clarinets). In: *Music acoustics at UNSW* (phys.unsw.edu.au).
- Wolff, Peter H., 1987.  
The Development of Behavioral States and the Expression of Emotions in Early Infancy. *New Proposals for Investigation*. The University of Chicago Press Books, Chicago.
- Woodburn, James, 1982.  
Social dimensions of death in four African hunting and gathering societies. In: Bloch, Maurice / Parry, Jonathan, (Eds.), *Death and the regeneration of life*. Cambridge University Press, Cambridge.
- World Health Organization, 2002.  
Infant and young child nutrition. Global strategy on infant and young child feeding. A55/15 16 April 2002, Report by the Secretariat.
- Wrangham, Richard, 2009.  
*Catching Fire: How Cooking Made us Human*. Basic Books, New York.
- Wright, Ron / Schofield, John, 2021.  
The city as archive: How industry and electronic music forged Sheffield's sonic identity. In: Maloney, Liam / Schofield, John (Eds.), *Music and Heritage: New Perspectives on Place-making and Sonic Identity*. Routledge, London, pp. 91-102.
- Wyatt, Simon, 2009.  
Soul Music: Instruments in an Animistic Age. In: Banfield, Stephen (Ed.), *The Sounds of Stonehenge*. BAR British Series 504, 11-16.
2010.  
Psychopomp and Circumstance or Shamanism in Context: An Interpretation of the Drums of the Southern Trichterbecher-Culture. In: Eichmann, Ricardo / Hickmann, Ellen / Koch, Lars-Christian (Eds.), *Studien zur Musikarchäologie*, Vol. VII, Verlag Marie Leidorf GmbH, Rahden / Westf, pp. 129-150.
2012.  
Sound Production in Early Aerophones. Short Report on a Work in Progress. In: Eichmann, Ricardo / Fang, Jianjun / Koch Lars-Christian (Eds.), *Sound from the Past. The Interpretation of Musical Artifacts in an Archaeological Context*. *Studien zur Musikarchäologie VIII, Orient-Archäologie* 27. Rahden/Westf, pp. 393–398.
- 2016a.  
Musiqualia and Vultural Adaptation. In: Eichmann, Ricardo / Fang Jianjun / Koch, Lars-Christian (Eds.), *Studies in Music Archaeology X, Sound – Object – Culture – History*. Verlag Marie Leidorf GmbH, Rahden/Westf, pp. 169-194.

- 2016b.  
Whistle Up a Storm. A Further Report on Sound Production in Early Aerophones. In: Eichmann, Ricardo / Fang Jianjun / Koch, Lars-Christian (Eds.), *Studies in Music Archaeology X, Sound – Object – Culture – History*. Verlag Marie Leidorf GmbH, Rahden / Westf, pp. 201-212.
2020.  
TRB Drums and Rituals of Transformation. In: Kolltveit, Gjermund / Rainio, Riitta (Eds.), *The Archaeology of Sound, Acoustics and Music: Studies in Honour of Cajsa S. Lund*. ICTM Study Group on Music Archaeology, Vol. 3, Ekho Verlag, Berlin, pp 227-246.
- Wyatt, Simon / García Benito, Carlos, 2016.  
Structuring Prehistoric Sound Informed by Artefacts, Imagery, Ethnography and Place. In: Eichmann, Ricardo / Fang Jianjun / Koch, Lars-Christian (Eds.), *Studies in Music Archaeology X, Sound – Object – Culture – History*. Verlag Marie Leidorf GmbH, Rahden/Westf, pp. 43-47.
- 2016b.  
Whistle Down the Wind. Introduction to the Workshop on Bird-Bone Palaeolithic Aerophones. In: Eichmann, Ricardo / Fang Jianjun / Koch, Lars-Christian (Eds.), *Studies in Music Archaeology X, Sound – Object – Culture – History*. Verlag Marie Leidorf GmbH, Rahden / Westf, pp. 197-199.
- Wye, Trevor, 2014.  
*Practice Books For The Flute - Omnibus Edition Books 1-6 (CD Edition)*. Novello & Co Ltd., London.
- Wynn, Thomas, 1985.  
Piaget, stone tools and the evolution of human intelligence. *World Archaeol.* 17, 32-43.
- Wynn, Thomas / Coolidge, Frederick L., 2004.  
The Expert Neandertal Mind. *Journal of Human Evolution* 46, 467-487.
- Zagiba, Franz, 1976.  
*Musikgeschichte Mitteleuropas I: Erster Teil*. In: Zagiba, Franz (Ed.), *Forschungen zur älteren Musikgeschichte*. Veröffentlichungen des Musikwissenschaftlichen Institutes der Universität Wien. Verband der wissenschaftlichen Gesellschaften Österreichs, Wien 160, 7-59.
- Zahavi, Amotz, 1975.  
Mate selection – A selection for a handicap. *Journal of Theoretical Biology*, 53 (1), 205-214.
- Zahavi, Amotz / Zahavi, Avishag, 1997.  
The handicap principle: a missing piece in Darwin's puzzle. Oxford University Press, Oxford.
- Zbikowski, Lawrence, 2017.  
*Foundations of Musical Grammar*. Oxford University Press, New York.
- Ziegler, Reinhard, 2019.  
Die Kleinsäugerfauna aus dem Geißenklösterle. In: Conard, Nicholas J. / Bolus, Michael / Münzel, Susanne, C. (Eds.), *Geißenklösterle. Chronostratigraphie, Paläoumwelt und Subsistenz im Mittel- und Jungpaläolithikum der Schwäbischen Alb*. Tübinger Monographien zur Urgeschichte. Kerns V., Tübingen, 83-100.