AN EXACT METHOD OF DESCRIBING IRON WEAPON POINTS:

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One of the commonest iron objects found by excavation is the head or point of a shafted weapon such as an arrow or spear, and it is at first somewhat surprising that no real attempt has been made to produce a typology for these, similar to that produced by Oakeshott for the sword in his books "The Archaeology of Weapons" and "The Sword in the Age of Chivalry".

Some types are described in detail by classical authors such as Polybius and Vegetius. Of these, some, such as the Roman Pilum, are well known to archaeologists. Other quite common types, such as the Verutum and Spiculum are not. Still others can be identified from their archaeological context.

Here, a little knowledge can be a dangerous thing, and technical terms which have a precise meaning to a military historian are often misused by being treated as a sort of grab bag into which stray finds may be tossed. We are therefore apt to find every Roman period quadrangular section weapon point being "identified" as a balista bolt, while every medieval point risks being ascribed to the too famous English longbow. This applies to other weapon types too. The Francisca is a very popular axe to find these days, and I have seen more than one innocent Roman securis so described, while bronze dagger axes, instead of being named correctly as Zaghnals, are invariably called Halberds, a weapon with which they have next to nothing in common. Be warned!

Oakeshotts reason for not extending his work to cover the points of shafted weapons was the large number of types found existing simultaneously. This in itself is the vital clue, that their design did not vary simply in accordance with changes in artistic taste or technical skill, but related to differing design functions. There is in fact a considerable literature covering weapon point design for various functions, most of which is not easily available in a western language. Some useful books that are, are: Saxton Pope "Hunting with the Bow", Elmer & Faris "Arab Archery" and Burton "The Book of the Sword". Much of my following remarks are culled from these, others derive from simple engineering, ballistics and logical inference.

Taking the widest view of its function first, the point of a shafted weapon is intended to inflict a penetration wound, which will be narrow but deep, as opposed to a cut from a sword, axe or similar arm, which produces a wide but shallow wound. Its action will be largely the same whether the weapon is retained in the hand and thrust, thrown, or shot from a bow or similar energy-storing engine.

Such a deep, narrow wound is especially suitable when hunting meat animals, as a hunting weapon must either produce an instant kill by lodging in some immediately fatal region such as the heart or else cause bleeding sufficient to bring the quarry down close enough to be followed up and recovered. A quarry that dies a lingering death from septaecemia some days later, or is pulled down by wolves because it has been lamed by a wound, depletes game stocks without feeding the hunter. A good hunting point should therefore ideally produce a quick kill if it strikes a vital area or a relatively minor wound if it strikes elsewhere. It will therefore tend to have a broad blade shaped head, to increase the chance of it cutting a major blood vessel, while often making only a minor slit, quickly healed, in the muscle of, say, a limb. It will rarely be barbed, as this on the one hand reduces bleeding by retaining the weapon in the wound, and on the other, can lead to the unnecessary loss of a weapon, or the identification of an illegal hunter, if the animal escapes. The main exception to this is when poison is used, when it may be helpful to retain this in contact with the wound.

In war, ideally all hits should disable, even when on non-vital areas, especially as the vital areas may well be protected with armour. A simple blade can then be less effective than such missiles as a lead slingshot, which will penetrate soft areas of the body, or make a limb useless by breaking the bone or bruising the muscles. However, because of their shape, sling missiles are ballistically inferior to arrows at long range, and cannot be retained in the hand at close quarters as can a spear or javelin. One answer is to barb an arrow or javelin so that it remains in the wound, causing pain each time disturbed. There is an inter-relationship between pain, fright and fatigue often not appreciated by laymen, so this will progressively lower the victims efficiency.

When the target is protected by armour, blade type points become much less efficient. The most effective shape of point against mail is a long bodkin type that can penetrate between the interlocked rings and possibly force them apart. Other kinds of armour, and wooden shields, are better penetrated by a much blunter point.

Having penetrated the armour or struck an unarmoured area, such points produce a less dangerous wound than the blade type, and one compromise is to have a quadrangular or triangular section instead of a round one, the sharp edges increasing the tissue damage. One such weapon was described as "three-edged", translated as "three-bladed", and led to learned comment on the use of tridents in war!

Other means of increasing armour penetration and wound shock are by maximising the striking velocity, as with the crossbow, or by increasing the projectiles weight, either by using a higher than normal proportion of iron to wood as in the Pilum, or by adding lead weights, as in the Martiobarbuli now being increasingly recognised on Roman sites in this country.

The design of weapon points is also affected by the intended range. Obviously the lighter the weapon, the further it can be shot or thrown provided the same means are used. However, this does not necessarily apply when different means are used. There is generally a great deal of confusion among archaeologists about weapon classification so this may be a good place to quote the classes normally used.

<u>Projectile</u> - shot by energy storing machine such as bow, crossbow, sling or balista.
<u>Dart</u> - thrown by hand. Too short to retain to thrust.
<u>Javelin</u> - primarily intended to be thrown. Sometimes retained to thrust.
<u>Spear</u> - primarily intended for thrusting. Sometimes thrown.
<u>Pike</u> - thrust with both hands. Cannot be thrown. (Post-Medieval only in Britain).

As you will see, there is no very hard and fast line between thrusting and throwing weapons. Greek cavalry thrust with a four foot javelin if they had to, and Byzantine cavalry were trained to throw the massive twelve foot Kontos. However, it is usually possible to guess the primary use. You will also see no mention above of the word lance, meaning a spear carried by cavalry. This is because it is insufficiently precise, including the Roman Lancea, primarily thrown, the Byzantine Kontos, usually thrust in one hand, and the Sarmatian Kontos, thrust with both hands.

The last feature of design to be considered is cost, which is linked to the question of whether a weapon is to be re-used. For example, an arrow intended for use a few times at most can be attached to its shaft by a tang, while to do so with a spear might lead to the shaft splitting at a crucial moment. If the point is to be attached by a socket, this can be carefully forged or made crudely by wrapping the base of the blade around the shaft.

I think I have now said enough to demonstrate how tightly a weapon points shape is dictated by its function, and conversely, how its specialised purpose and historical context could be estimated by examining its shape. Obviously, to get maximum value from this, we would need to compare large numbers of points from different sites of both known and unknown context. The first requirement is therefore a simple way of recording the important parameters of any weapon point.

The recording method described in the remainder of this paper derives from one I described in the first conference in this series in 1972, and with which we did some experimental computer runs. It became apparent then that the recording could be simplified without loss of accuracy. For example, you had to record whether the forward part of the weapon point was triangular or ogival in plan, when this was quite obvious from the relationship of two dimensions also recorded.

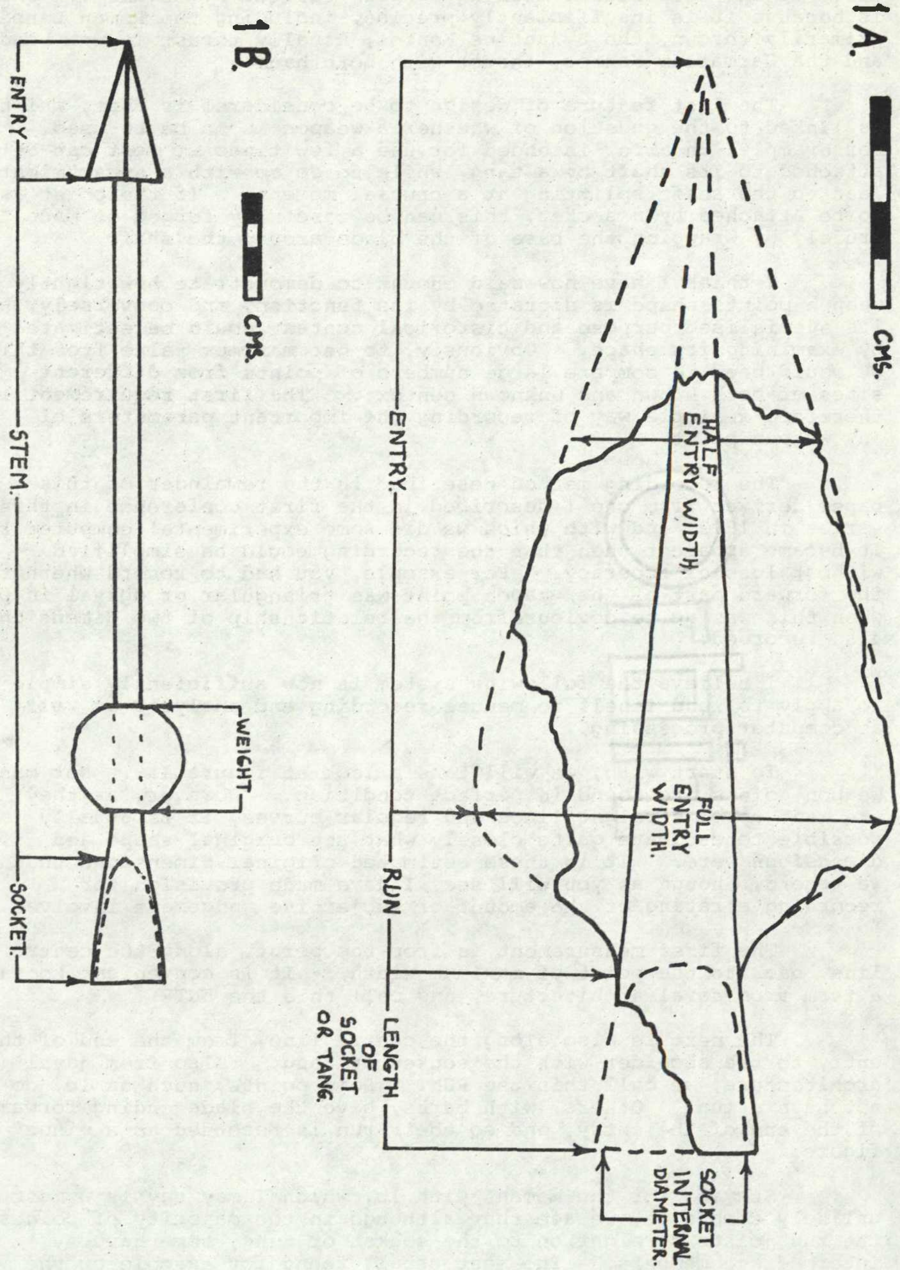
I believe the following system is now sufficiently simple to apply to lend itself to manual recording and analysis as well as computer processing.

To start with, we will take a look at figure la. Not many weapon points are found in perfect condition. However, as they are made up of straight lines and regular curves, it is usually possible to estimate quite closely what the original shape and dimensions were. It is these estimated original dimensions that we record, though as you will see, I have made provision for recording a rating of the amount of subjective judgement involved.

The first measurement is from the point, along the centre line, back to the point of maximum width. It is convenient to take a term from naval architecture, and call this the ENTRY.

The next is also along the centre line, from the end of the entry to the shoulder with the socket or tang. Also from naval architecture, we call this the RUN. Some points, such as lb, do not have a run. Others, with barbs, have the blade ending forward of the end of the entry, and so their run is recorded as a minus figure.

Staying for the moment with lb, which I may say is a most unlikely composite, we see that although in the majority of points the run joints straight on to the socket or tang, some have intermediate members. The most usual, found for example on the Pilum, we call the STEM. The stem is measured from the end of the


1A.
CMS.
HALF ENTRY WIDTH.
FULL ENTRY WIDTH.
ENTRY.
RUN
LENGTH OF SOCKET OR TANG.
SOCKET INTERNAL DIAMETER.
1B.
CMS.
ENTRY
STEM.
WEIGHT
SOCKET.

run to the point at which the hollow of the socket extends, or at which a tang passes into the next member. If there is no stem, the socket or tang, which we call the ATTACHMENT, is measured from the end of the run. The length of any attached weight is measured.

We now record the maximum width halfway along the entry, and at the junction of entry and run. If the head is circular in section at these points, measure the diameter, if quadrangular, between two flats, if triangular, from flat to edge. Next comes the width of the weight, if any, and then the internal diameter of the socket, if any. Internal diameter is specified because results to date indicate that in Roman times at least there was a range of standard shaft sizes, graded in fractions of a digit, there being 12 digits to the Roman foot.

That concludes the measurements, but we still have to specify the sectional shape, and the state of preservation. The sections recognised are flat, ribbed, triangular, quadrangular, and circular. The states of preservation recognised are nearly perfect, good, which indicates that some of the outline has had to be slightly restored, fair, which indicates that at least one feature involves a considerable degree of subjective judgement, and bad, which indicates "I think so but don't quote me".

A series of two letter codes have been devised as an aide memoire. These are:

LE Length of entry
LR Length of run
LS Length of stem
LW Length of weight
LA Length of attachment
LT Total length (as check)

WH Width at half entry
WE Width at full entry
WS Width of stem or tang
WW Width of weight
WI Internal diameter or socket

SF Flat section
SR Ribbed section
ST Triangular section
SQ Quadrangular section
SC Circular section

CP Condition nearly perfect
CG Condition good
CF Condition fair
CB Condition bad

Figure 2 shows how these are entered, either on an 80 column card for computer input or on separate cards for manual analysis. You will see that space has been allocated for defining the site at which found and an identification for the weapon point itself, as there will probably be several such. There is plenty of room left for any additional remarks in text. The entries are for the two heads depicted in figure 1, with an additional part entry for LR showing how a barbed head might appear. Except in the section and condition columns all entries are made as measurements in millimetres.

It is important that no entry be made without sound evidence. Say for example that a point has a well preserved entry and run but the socket has been completely destroyed. In this case the columns LA, LT and WI must be left blank. If it is quite certain that there was no stem or weight, which would usually be apparent in these circumstances, then the columns concerning these would have a zero inserted. We thus distinguish between lack of evidence and definite negative evidence.

The section and condition columns are one digit wide, so are filled in with the second letter of the two letter code, the first already standing at the top of the column.

Having collected a large number of entries what do we do with them? It will be immediately apparent that the relationship of one measurement to another may be a very good guide to the actual shape, and that shape is on the whole of more interest in demonstrating a relationship than size. We can therefore get the computer to calculate a number of relationships for us, such as half entry width to full entry width, or entry to run, or entry plus run to full entry width. We can then go on and get it to sort our weapon points into groups for us.

Another trick is to recalculate all dimensions in terms of an LT of 100 for manual comparison, computer sorting, or even for an optical projection. Whatever the method involved, it will have to be more sensitive to changes in shape than to small changes in dimensions, since neither the original artisan or our measurements can be assumed to be completely accurate.

What benefits may we expect? Well, we may be able to distinguish cavalry from infantry occupation, the presence of foreigners using native weapons like Sarmatian Laeti or Rhaetian Gaesati, native hunting weapons from Roman military. We may also get a basis for dating from change in weapon types, as we can already do a little today with the weighted and barbed varieties of hand missiles. Finally, it is worth bearing in mind that pacifist cultures are much rarer than non-ceramic ones.

SITE CODE	POINT NO.	LE	LR	LS	LW	LA	LT	WH	WE	WS	WW	WI	S	C	COLUMNS 38 TO 80 FOR REMARKS.
1	1	143	30	0	0	33	206	48	81	0	0	28	R	F	
1	2	53	0	258	40	46	357	14	28	10	42	19	Q	P	

FIGURE 2.