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Paolo Fogliaroni  
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Eliseo Clementini *Editors*

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(COSIT 2017)

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# Cadmus and the Cow: A Digital Narratology of Space in Ovid's Metamorphoses

Gabriel Viehhauser, Robert Kirstein, Florian Barth  
and Andreas Pairamidis

**Abstract** We apply an interdisciplinary methodology to establish a digital-driven narratology of space on Ovid's Metamorphoses. Two approaches are employed: 1. We highlight the importance of nature in the text by exploring the frequencies of architectural and natural terms. 2. We delve into a single episode of the text (Cadmus) by using a collocation-network-approach that reveals the interrelations between characters and settings. We show that the results can feed an analysis in the light of Lotman's model of space semantics.

**Keywords** Spatial humanities · Narratology · Network analysis · Classical philology · Ovid's metamorphoses

## 1 Introduction

As in other disciplines of the humanities, the emerge of the so-called 'Spatial Turn' (Soja 1990) lead to a renewed interest in the category of space in literary studies as well. However, a large amount of work in this field focuses on space as a cultural phenomenon, very often drawing on a metaphorical understanding of the term. In contrast, the modeling of the means by which space is created in narrative texts has received less attention. Efforts to establish a narratology of space are thus still in their

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beginnings (cf., e.g., Ronen 1986; de Jong 2012; Bodenhamer et al. 2015; Barker et al. 2016).

This appears to be due to the fact that narrative space is a complex phenomenon. Rather than constructing a given physical space beforehand, stories tend to evolve their setting in relation to its characters that constitute space through their actions. Therefore, space is not depicted as a continuous and fully determined phenomenon and often evoked implicitly, which makes it hard to map “People read for the plot and not for the map”, as (Ryan 2003, p. 238) puts it.

New stimuli for a narratology of space can be expected from the emerging field of digital text analysis, an interdisciplinary methodology that combines literary studies with natural language processing and information retrieval. In our paper we will present first approaches towards such a digital-driven narratology of space by drawing on a central text from Classical Philology, Ovid’s *Metamorphoses*.

It has often been pointed out that nature and landscape play a crucial role in the *Metamorphoses*, not only as a setting for the various episodes that Ovid narrates in the 15 books of his work, but also because of the interconnection between the landscape and their characters (cf. e.g. Segal 1969; Hinds 2002). The constant state of change, the *leitmotif* of the *Metamorphoses*, affects settings as well as figures, blurring the boundaries between these two constituents of the narrative. Therefore, the text appears as a promising use case for a digital analysis of space that can also be linked back to an ongoing discussion in traditional literary studies.

We will approach the text in two steps of different scale: In the following section, we will perform a *distant reading* (Moretti 2000) on the macro-level of the *Metamorphoses* by detecting the frequency of space-markers to empirically test assumptions that have been made regarding the spatial structure of the text in traditional literary studies. In a second step, we will focus on a particular episode of the text (*Cadmus*) and explore a network-based approach towards space and its meaning for the basic structure of the episode. Here, we will make use of Juri Lotman’s theory of spatial semantics (Lotman 1977), which is one of the few ‘classic’ approaches towards space in narratology.

Since the application of methods from NLP on ancient languages might pose problems of domain adaptation we used an established modern German prose translation (Albrecht 2012) of the Latin text for modeling purposes; the German translation is relatively close to the Latin original and, above all, consistent in regard to the spatial terminology being applied.<sup>1</sup>

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<sup>1</sup>By doing so and by presenting the results in English we will operate with no less than three different languages (Latin/German/English). We are aware of the shortcomings connected to the multiplicity of languages. Since the project as presented is designed to blend in a larger project in which comparative linguistics plays a key role we hope to expand our analysis fully to both Latin and German to achieve by comparison a deeper insight into how space is created in Latin and German (literary) texts.

## 2 Macrolevel: Frequency of Landscape Terms

In the first step of our analysis, we determine the frequency of space markers in the text to verify the observation made in literary studies that nature and landscape are of major importance in the *Metamorphoses*. It has been argued that the landscape is often depicted in a stereotypic way, which has a unifying effect: “In addition to providing a general tonal unity for the poem as a whole, the landscape also helps hold together the narrative material of one or more books” (Segal 1969, p.39).

Spatial markers in a text come in different shapes. To establish a proxy for their frequency, we concentrate on place nouns, which we detect with the help of named entity recognition (NER, performed with the tool<sup>2</sup> and wordlists that have been assembled by manual annotation and by using the semantic word-net GermaNet (Hamp and Feldweg 1997; Henrich and Hinrichs 2010). We distinguish between place names (toponyms, as e.g., “Sparta” or “Styx”) and place nouns that are rather unspecified (e.g., “forest” or “cottage”). Both categories are divided into two subcategories in regard to their creation: natural spaces exist without the contribution of men whereas architectural objects are made by them.

The setting in the *Metamorphoses* is often established in remote and unspoiled regions that mostly cover natural space nouns (Kirstein 2015, p. 212). Compared to a corpus of 538 narrative texts (retrieved from the *TextGrid*-Repository, textgridrep.org), we clearly observe a deviation from the norm (cf. Fig. 1, top).<sup>3</sup>

While the occurrence of architectural vocabulary in the *Metamorphoses* (red) closely corresponds to the corpus (purple and blue), much higher values can be observed for terms from the word field of nature (green).<sup>4</sup> The difference is also statistically significant.<sup>5</sup>

Furthermore, a higher variance within the segments of nature can be observed compared to the category of architecture.<sup>6</sup> This corresponds with Kirstein’s observation that the variation of landscape entities between episodes is higher than it has been proposed in previous research (Kirstein 2015, p. 213). For toponyms, the proportion of natural terms is still greater, but in this case, the architectural frequencies are higher due to the frequent occurrence of city names (cf. Fig. 1, bottom).

Both distributions are likely to reflect significant structures of the work as a whole: The high density of natural terms especially in the first book indicate that the unifying, ‘stereotypic’ landscapes are introduced at the beginning of the text and only

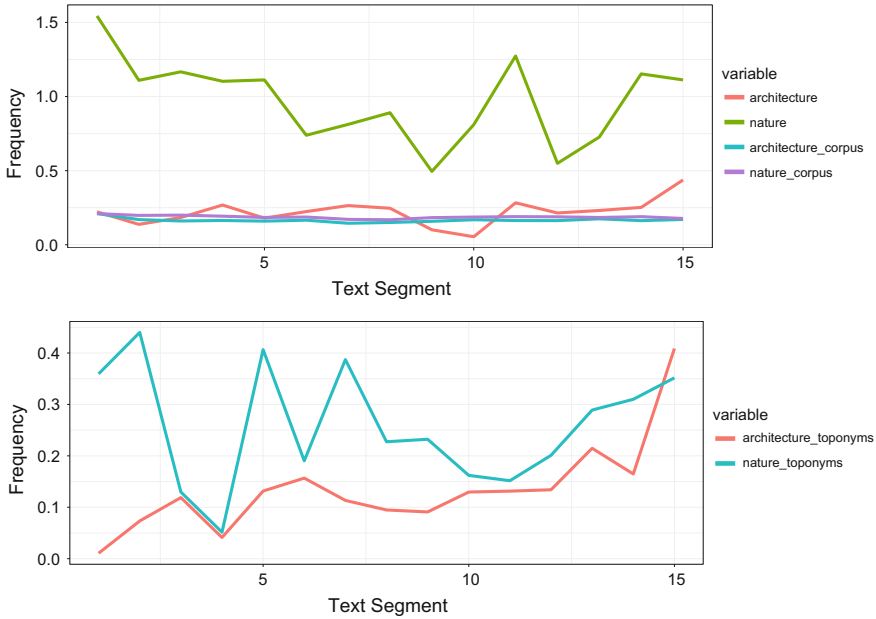
<sup>2</sup>WebLicht: Web-Based Linguistic Chaining Tool <https://weblicht.sfs.uni-tuebingen.de/>.

<sup>3</sup>Up to now, the corpus for comparisons mainly consists of texts from the 17th to the 19th century. We plan to include more contemporary texts in future work.

<sup>4</sup>All distributions are based on the relative frequencies of the natural and architectural terms in the *Metamorphoses* and the average of the relative frequencies in the corpus. The 15 segments consist of the 15 books of the *Metamorphoses* and of equally divided chunks from the texts in the corpus.

<sup>5</sup>We tested this with the Wilcoxon rank-sum test ( $p=1.289e-08$ ) as well as Mood’s median test ( $p=1.289345e-08$ ).

<sup>6</sup>Nature: 0.0860 (variance), 0.2932 (standard deviation); architecture: 0.0085 (variance), 0.0919 (standard deviation).



**Fig. 1** (Top) Relative frequencies of natural and architectural terms in the 15 books of the *Metamorphoses* compared to the average distribution in the corpus. (Bottom) Relative frequencies of toponyms in Ovid's *Metamorphoses*

mentioned briefly at a later point. As a consequence, this would mean that the intention of the *Metamorphoses* was a continuous, 'syntagmatic' reception rather than a selective reading of single episodes.

The incline of the architectural vocabulary in book 15 corresponds with the wider temporal horizon of the text that starts with the creation of the world from chaos and ends in Ovid's contemporary Augustan times, reflecting a development towards 'civilization' as well as a more concrete and detailed setting.<sup>7</sup>

As can be seen, the distant reading of place markers in the *Metamorphoses* opens up a variety of research questions. In the next section, we will combine these analyses on the macro-level with further quantitative, but also qualitative research on a more fine-grained micro-level.

<sup>7</sup>This view receives support from the Index of passages discussed in (Boyle 2003, p. 299) which shows a clear domination of book 15.

### 3 Microlevel: A Network of Places and Characters in Cadmus

As a first example for a detailed analysis, we explore the *Cadmus* episode, which opens the third book of the *Metamorphoses* (book 3, v. 1–137). The episode can be divided into three sections: (1) As predicted by the Delphic oracle, Cadmus, who has been banished from his fatherland while searching for his sister Europa, encounters an undomesticated cow on his journeys. In accordance with the verdict of the oracle, he follows her to the place where it settles down. Here he will eventually found his new city, Thebes in the region of Boiotia (cf. v. 129–131). First he speaks a prayer of thanks and kisses the earth, then he starts to prepare a ritual offering in honor of Jupiter (v. 1–27). (2) To gather water for the offering Cadmus sends out his companions. They get ambushed and killed by a monstrous serpent or dragon that belongs to the god Mars and resides in a cave in the nearby woods (v. 32 *Martius anguis*, ‘Dragon of Mars’, v. 38 *serpens*). Looking for his companions, Cadmus finds the beast and kills it in a fierce fight (v. 28–98). (3) Athena commands Cadmus to sow out the teeth of the dragon. Warriors grow out of the earth, who immediately start to fight each other. While Cadmus watches, only five of the newborn fighters survive and become his companions when they found the new city Thebes (v. 99–137).

For our analysis of the spatial structure of the episode, we choose a collocation-network-approach, which is visualized in Fig. 2.

The network is bimodal, as it includes characters and space-markers as nodes. The nodes have been extracted from the text with the help of NER (performed on the German translation with Weblicht (2012), the nodes have been translated into English for the purpose of this paper) and the aforementioned wordlists. Due to the Latin place and character names in the text the results of the NER had to be refined manually.

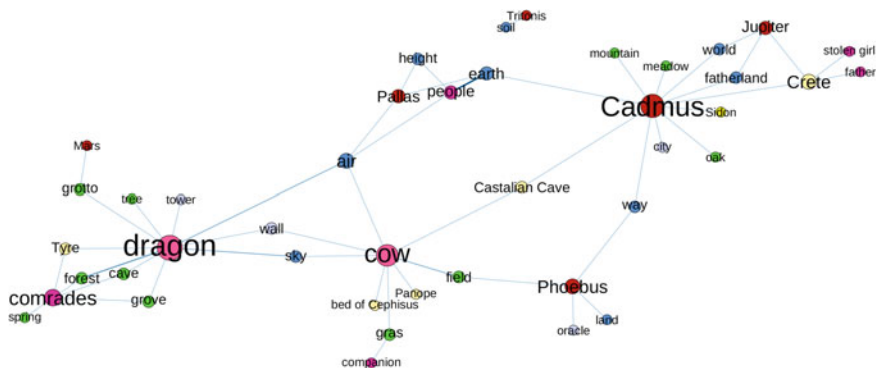


Fig. 2 Network of the *Cadmus*-episode (visualized with the tool GEPHI (Bastian et al. 2009))



In a straightforward approach, relations have been established whenever a character appears in the same sentence as a spatial marker. In the visualization, character nodes are further subdivided into the categories named persons (dark red), anonymous characters or groups of characters (violet) and animals, who often play a major role in Ovid's stories because of their intermediate position between nature and living beings.<sup>8</sup> Spatial markers are divided into toponyms (yellow), nature (green), architecture (light blue) and regions (dark blue).

The visualization does not only give an overview of the setting of the episode and the characters that move in it, but it can also be related to narratological models of space as Lotman's influential theory of spatial semantics (Lotman 1977). At the core of this theory lies the interconnection of space, characters and events: According to Lotman, narrative stories form a so-called *sujet* (i.e., an eventful plot), whenever a character transgresses the borders between two semantically distinct spaces. The idea is that the narration establishes a semantic field, which is divided into two spaces (at least) to which specific semantic values are attributed, and thus constitute the norm/order. The semantic values of the two spaces form a pair of opposition (e.g., "good-bad", "life-death", "friend-enemy", etc.). Usually, characters are not capable of crossing the border (i.e., violating the norm/order), rendering the latter impermeable and classifying the former as immobile characters. Some characters (e.g., the hero), however, do cross the border and are classified as mobile characters consequently. By doing so, they evoke an event.

The semantic value of a space is defined by the description of the inventory (e.g., buildings, plants, furniture, etc.) it hosts. Characters are part of this inventory as well, as they have features that comply to the space they originate (Nitsch 2015).

We will argue that common network measures can be used as a proxy, which can be related to the framework established by Lotman. In Fig. 2, the size of the nodes corresponds with their network-degrees (the number of their relations to other nodes). Cadmus and the dragon, which is turned into a central character by the story (*see below*), are the characters with the highest degree, meaning that they are connected to a wide variety of places, which marks them as the most mobile characters of the episode as well. This indicates that although Cadmus and his opponent are connected to a very distinct spatial setting (Cadmus to his homeland Crete and the dragon to a cave nearby Thebes), both characters also appear to be dynamic and able to transgress their ancestral spaces. Whereas this can be expected from a mobile hero like Cadmus, who has to find a new home on his journey, it is rather surprising in the case of the dragon, who, as a part of nature itself, could be expected to be strongly tied to the place which is about to get cultivated with the augured foundation of Thebes. But far from just being removed and substituted by civilization, the dragon gets active himself, thus changing its status from a passive element of the landscape to a mobile character (this corresponds to similar findings that resulted from an analysis of focalization aspects of the passage in Kirstein 2015, p. 233).

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<sup>8</sup>Periphrases of proper names (e.g. 'Agenor's son' for 'Cadmus') have been dissolved and subsumed under the same node. In contrast, co-references indicated by pronouns have not been considered yet.

In the case of the Cadmus-episode, the network is further complicated through the aforementioned Sects. 1 and 3 of the plot that edge the main conflict between the hero and the beast. Whereas the story of the dragon seed heroes that appears to be rather static is only reflected in a small section in the upper-middle part of the network (nodes ‘people’, ‘Pallas’, ‘earth’ and ‘height’), Cadmus’ pursuit of the cow occupies a much larger space. The degree of the node of the cow is almost as high as that of Cadmus and the dragon, which consequently means that the cow has to be regarded an almost as mobile ‘character’ as the two main opponents.

We will argue that this finding does not reflect a weakness of our model or Lotman’s conception but rather reveals a surprising structural similarity that positions the cow as sort of a linking character in between Cadmus and the beast. On the one hand, the cow accompanies Cadmus on his transgressing journey from his homeland via the oracle of Delphi into the foreign wilderness that he will transform into a new home by substituting nature through civilization. On the other hand, the cow is a part of nature itself and resembles the dragon. As the network reveals, this resemblance is also reflected in the spatial relations of the character. Both animals are linked to the spatial markers ‘air’ and ‘sky’. Whereas the dragon’s occupation of vertical space is a salient feature of the fight between him and Cadmus that also brings along a change in focalization (Kirstein 2015, pp. 226–228), the cow’s linkage to vertical space is uttered no less clearly, but at first glance, in a less noticeable way (Ovid, *Met.* 3. 20–23):

*bos stetit et tollens speciosam cornibus altis  
ad caelum frontem mugitibus inpulit auras  
atque ita respiciens comites sua terga sequentes  
procubuit teneraque latus submitit in herba.*

In the decisive moment, where Cadmus finds the place for his new home, the *vertical gestures* of the cow lifting first her head with its ‘high’ horns up to the sky and then sinking *down* on the ground and lowering her body onto the grass have a significant impact for the overall spatial order of the passage. The lifting of the head *up* towards the sky precludes the behavior of the dragon that resides in the wilderness and lifts its body to the sky (cf. v. 43 *leves erectus in auras*, ‘raises into thin air’) when awakened by the water Cadmus’ companions try to draw from the well. In a similar way the sinking *down* of the cow which indicates the right place for the city foundation precludes the kissing of the ground by Cadmus which indicates the hero’s willingness to accept the oracle’s guidance (cf. v. 24–25 *peregrinaeque oscula terrae/figit*, ‘kissing the foreign soil’). But the network analysis also suggests a *horizontal* dimension given to the ‘character’ of the cow. The cow, by guiding Cadmus and his group from Delphi to future Thebes, establishes and ‘embodies’ a horizontal link between two central spatial points of the story; furthermore, this horizontal orientation of the cow expands to Cadmus and his people, since both are strongly linked to each other by forming a group of ‘companions’ (the cow when approaching the right place to settle down looks back to Cadmus and his people who follow her: v. 22 *respiciens comites sua terga sequentes*). The cow, therefore, plays a central role in having both a vertical dimension by means of lifting and lowering its body and thus

preluding the ‘verticality’ of the dragon *and* a horizontal one by connecting Delphi and Thebes.

## 4 Conclusions

As it is the case with literary cartography “placing a literary phenomenon in its specific space [...] is not the conclusion of geographical work; it’s the beginning” (Moretti 1998, p. 7). This holds for our approach as well. It is also the beginning of scholarly interpretation, and we hope to have shown that an interdisciplinary framework that draws on a mixture of different methods appears promising and is able to open new perspectives on texts. Thus the network analysis of Ovid’s *Metamorphoses* 3 on the microlevel has shown that within the Cadmus-episode the two sections dealing first with the predictive cow and then with the monstrous dragon are, by their respective vertical dimensions, much more closely linked to each other than has been argued before. As a result the cow emerges as an important connecting node in the network, and its movement both vertically and horizontally foreshadowing the movement of the main actors, Cadmus and the dragon. This might open new perspectives in the longstanding debate about the unity of the *Metamorphoses* with its multiplicity of different stories, figures, and places.

Of course there are still aspects of our approach that need refinement. This includes the text-base (working with the original Latin text and a better balanced comparison corpus would be desirable) our detection of place markers (refinement of wordlists and NER), the network-based approach (operationalization of the relations between characters and space) and our modeling of Lotman’s theory (sentiment analysis of the spheres could be used to determine different semantic fields of narrative space). We plan to tackle these tasks in our future work and expand our analysis to more episodes of the *Metamorphoses* to substantiate our approach towards a digital-driven narratology of space.

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