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The Bosphorus: Gateway between the
Ancient West and East
(1st Millennium BC–5th Century AD)

Proceedings of the Fourth International Congress on Black
Sea Antiquities

Istanbul, 14th–18th September 2009

Edited by

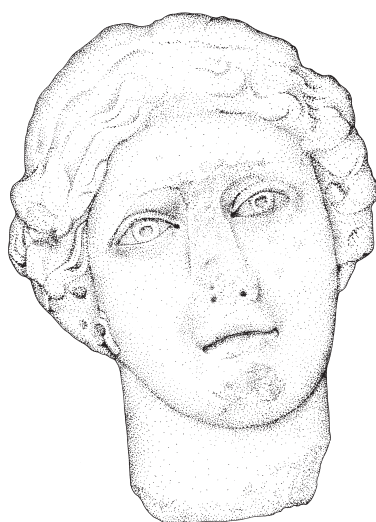
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EXTRACTING, INVESTIGATING AND REPRESENTING GEOGRAPHICAL CONCEPTS IN HERODOTUS: THE CASE OF THE BLACK SEA*

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ON VIEWING THE PONTUS

In a short break from his preparations for the invasion of Scythia, Darius stops off where the Bosphorus was bridged and sails to the Dark Rocks, apparently retracing the steps of the Argonauts.¹ ‘There’, Herodotus reports, ‘he sat on the headland and viewed the Pontus, a wonderful sight’ (ἐξόμενος δὲ ἐπὶ ῥίῳ ἐθηεῖτο τὸν Πόντον ἐόντα ἀξιοθέητον, 4. 85. 1).² In this paper, we aim to bring that wonderful sight to life using the latest digital technology, and to set out some of the ways in which the world that Herodotus describes can now be represented. At the same time, however, we will be concerned to show the potential of digital technologies for opening up new lines of enquiry, in particular the investigation of the ‘deep’ topological structures that underpin the *Histories*. After all, the Persian king is not the only figure to take an interest in the Pontus as a geographical concept: the historian too shows an interest in the Black Sea by extensively mapping the region and its place in the world, both before and after this episode (4. 37-45; 4. 99-101). The way that Herodotus articulates this space himself, which frames, and to a certain extent pre-empts, Darius’ invasion of Scythia, will be the concern of this paper.³

* We are very grateful to the Arts and Humanities Research Council of the United Kingdom (AHRC) for sponsoring this research, and to Gocha Tsetskhladze for inviting us to present our initial findings at the Fourth International Conference on Black Sea Antiquities, Istanbul.

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¹ Herodotus identifies the Dark Rocks as those ‘which the Greeks say formerly moved’ (τὰς πρότερον πλανακτὰς Ἕλληνες φασὶ εἶναι, 4. 85. 1).

² On wonders, see especially Munson 2001.

³ On Persian kings, their efforts to map their empire, and the relationship of that process to the historian’s enquiry, see Christ 1994; cf. Steiner 1994. Scythia is notorious for being unmappable: Hartog 1988.

BACKGROUND TO HESTIA

HESTIA (the Herodotus Encoded Space-Text-Imaging Archive) is an interdisciplinary project, sponsored by the AHRC and involving a team of academics drawn from the disciplines of Classics, Geography and Archaeological Computing. Its primary objective is to enrich contemporary discussions of space by developing an innovative approach to the study of Herodotus using the latest Information and Computer Technology to extract, investigate and represent relationships between all the geographical concepts mentioned in the *Histories*.⁴ It also has the aim of reaching a broad audience of scholars, students and enthusiasts world-wide by visualising Herodotus’ world through a series of web-mapping tools.⁵

With the increasing digitisation of different kinds of datasets, ancient texts can now be subject to a range of sophisticated computer-based querying. Using the text of Herodotus’ *Histories* freely available from the Perseus on-line library <<http://www.perseus.tufts.edu/hopper/>>, HESTIA has extracted all the geographical concepts mentioned by Herodotus in his *Histories* from the digitised text. Next, we have organised that spatial information in a geo-database in three key ways, by assigning each geographical concept: first, a set of co-ordinates that can locate it on a map; second, a unique identifier according to its mention(s) in the narrative; third, to one of three categories, either a:

⁴ While Herodotus’ conception of space has attracted some interest (see, for example, Immerwahr 1966; Romm 1994; Purves 2002), there has been no study dedicated either to the geographical concepts in Herodotus (Harrison 2007), or to the application of modern technologies. For discussions of historical GIS in geographical studies, see Berman 2005; Kwan and Ding 2008.

⁵ For more information, go to <<http://www.open.ac.uk/Arts/hestia/>>. For a survey of Greek mapping, including Herodotus, see Dilke 1985; cf. Babić 2007, 78-81. On the history of cartography more generally, see Harley and Woodward 1987; Jacob 2006.

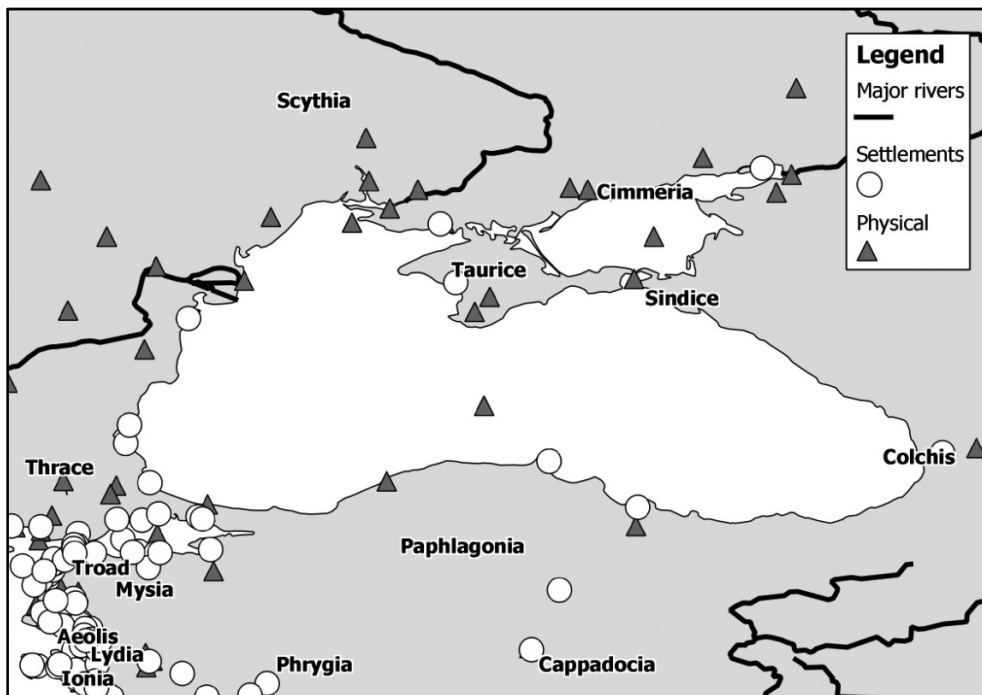


Fig. 1: Pontus in GIS (*Histories* all books)

- a) ‘settlement’: an identifiable community, encompassing both Greek *poleis* and other kinds of habitations, Greek and non-Greek; or,
- b) ‘territory’: a larger area which may contain a variety of communities, from *demes* to regions, countries, even continents; or,
- c) ‘physical feature’: a natural aspect of the environment, such as mountains, rivers, seas, etc.

By being organised in this format, Herodotus’ geographical concepts can be queried, represented and explored through a series of web-mapping tools. In the next section we outline a sample of the technologies that we have been developing, taking the Black Sea as an example to illustrate each.

THE BLACK SEA IN THE HESTIA GEOSERVER

The four kinds of maps that we have been experimenting with, and that are available for all users to exploit, are: 1. GIS; 2. automated network maps; 3. a GoogleEarth layer (KML); 4. the Herodotus Time-map.

1. Geographical Information Systems (GIS)⁶

The most basic maps that are generated simply represent a flat image of the spatial data, marking all the places that

⁶ As Kwan and Ding (2008, 444) note, ‘geographic information systems (GIS) are understood by many as largely a tool for the storage and analysis of quantitative data’—a position which they set out to challenge in arguing for its extension to qualitative research. See also Sheppard 2005, whose survey of GIS as ‘an area of research, application, student interest, and influence within geography’ (6), aims to lay the ground for the establishment of a *critical* GIS.

Herodotus mentions over the course of his work with a single point, and divided according to the three different kinds of spatial category: settlement, territory and physical feature. In this form the data can provide a snapshot of the scope of Herodotus’ world, identify toponyms when at a sufficient level of detail, or represent the world in any given book. Fig. 1 shows all the geographical concepts within the Black Sea area mentioned in the *Histories*, providing an indication of the scope and focus of the narrative and allowing comparison with other accounts.⁷

2. Database-Generated Network Maps

Since it is our aim to counter the conventional emphasis on Cartesian topography and refocus attention instead on the unique *topology* of the *Histories* and the ‘mental mapping’ of Herodotus’ world,⁸ a key next step has been to capture the co-presence of geographical concepts within a single sentence.⁹ Fig. 2 depicts one such co-

⁷ For a discussion of the Black Sea Greek colonies mentioned by ancient authors, including the difficulties of locating them precisely, see Tsetschladze 1998, 15-43, with maps on pp. 23-34. In the future it is hoped that all such data can be represented in GIS to increase the potential for comparative research.

⁸ For the theoretical basis of using GIS to investigate people’s lived experiences and to go beyond the ‘static and Cartesian framework of current GIS’ (445), see Kwan and Ding 2008. On the dominance of Cartesian-style maps in Western thinking, see Gurevich 1985. On mental mapping, see Bender (1999). Stephanie West (2004, 54-57) displays a great sensitivity to the complexity of Herodotus’ depiction of topography in her analysis of his account of the series of tribal displacements in and around the Black Sea.

⁹ The thesis that we want to test is whether Herodotus’ *Histories* represents a polarised world of West vs East (for example Hall 1989 and, with qualifications, Cartledge 1993; though see Pelling 1997b) or a more complex series of networks spanning and criss-crossing the Mediterranean – on which see, for example, Malkin 1998; Horden and

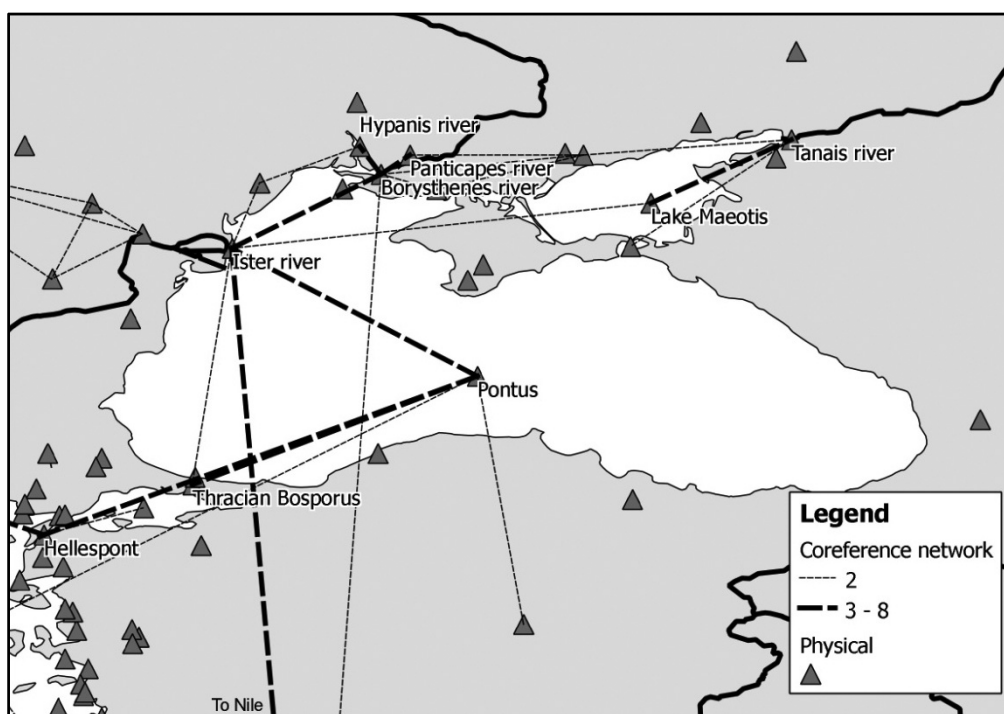


Fig. 2: Co-reference network map for the Pontus (*Histories* total)

reference network (with more than one connection) for physical features. Two relationships stand out. The first is the connection between the River Ister (the modern-day Danube) in Scythia and the Nile. The strength of this relationship points to Herodotus' use of Egypt as a means of comparison: what is being shown is not a 'real-life' network but the use of physical features to frame comments made by the author relating two places to one another (Scythia and Egypt), both of which are on the margins of the known world, though in rather different ways.¹⁰ The other strong connection marked in this map is between the Pontus and the Hellespont. This axis is important because it relates to the growing reach of the Persian empire, as Darius casts his eyes westwards from the Pontus towards the Hellespont, the bridging point between East and West, in a move that anticipates his son's literal bridging of the Hellespont in his invasion of Greece.¹¹ The map also demonstrates the extent to which physical features envelop anthropogenic constructs like territories, which acts as anchors for the geography of linkages between social formations constructed by Herodotus.

Purcell 2000; Constantakopoulou 2007; Malkin, Constantakopoulou and Panagopoulou 2009. McCormick (2002) and Isaksen (2008) derive networks from classical texts, but with a focus on movement and communications.

¹⁰ On the complexity of the Scythian other, see Braund 2004; *cf.* Hartog 1988; Heinen 2001, 5-6. Bowie (2006, 130-35) regards the Scythians as offering the Greeks a potential model not just a mirror.

¹¹ Pelling (1997a, 15) notes the difference between Aeschylus' and Herodotus' Darius: 'Herodotus intimates the continuity between father and son—at least between their actions, if not between their characters. Yet Aeschylus' Darius stresses how different Xerxes is from his predecessors, especially from Darius himself (759-86).' For the actions of Herodotus' Darius as prefiguring those of Xerxes, see also Braund 2004, 39; Greenwood 2007, 130, 144-45; Henderson 2007, 295; Tuplin 2010.

3. GoogleEarth

In order to start experimenting with wider public dissemination it was decided to expose the data as KML: a geo-data format that can be read by a variety of mapping applications including GoogleEarth.¹² Users with GoogleEarth can simply click the hyperlink on our web-site¹³ to launch their application with all the geographical concepts mentioned in Herodotus' *Histories* marked in red. When zooming in low, the icons become clickable points that reveal information about the location as recorded in the narrative. Fig. 3 depicts the Black Sea with one of the occasions on which it is mentioned (4. 24) highlighted. Users would be able to gather information in this way for all the other times that a given place occurs in the narrative.

4. The Herodotus TimeMap

Since it is difficult to visualise spatial change in either GIS or GoogleEarth, in collaboration with Nick Rabinowitz we have adapted a 'timeline' format¹⁴ to represent the book structure of Herodotus' narrative.¹⁵

¹² Keyhole Markup Language (KML) is an XML-based language schema for expressing geographical annotation and visualisation on web-based, two-dimensional maps and three-dimensional Earth browsers, and developed for use with GoogleEarth. See <http://en.wikipedia.org/wiki/Keyhole_Markup_Language>.

¹³ <http://hestia-geo.open.ac.uk:8080/geoserver/wms/kml?layers=hestia:google_earth>.

¹⁴ See <<http://code.google.com/p/timemap/>> and <<http://www.nickrabinowitz.com/timemap>>.

¹⁵ To 'access' the application go to <<http://www.open.ac.uk/Arts/hestia/findings/index.html>> Note that this kind of narrative 'time map' relates to the 'time' experience of reading through the *Histories* continuously, which do not always correspond to the chronology of the events described (since the text does not follow chronology rigidly).

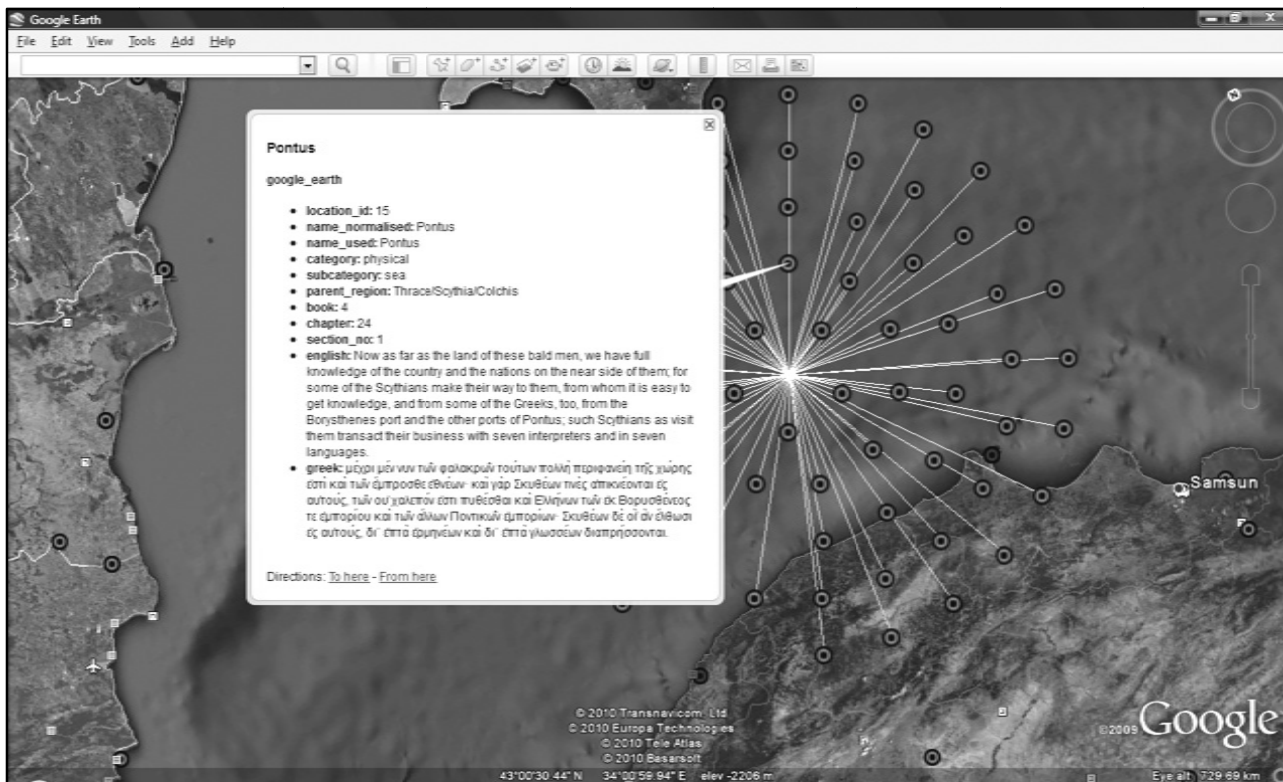


Fig. 3: GoogleEarth ‘mashup’ of the Pontus (Herodotus 4. 24)

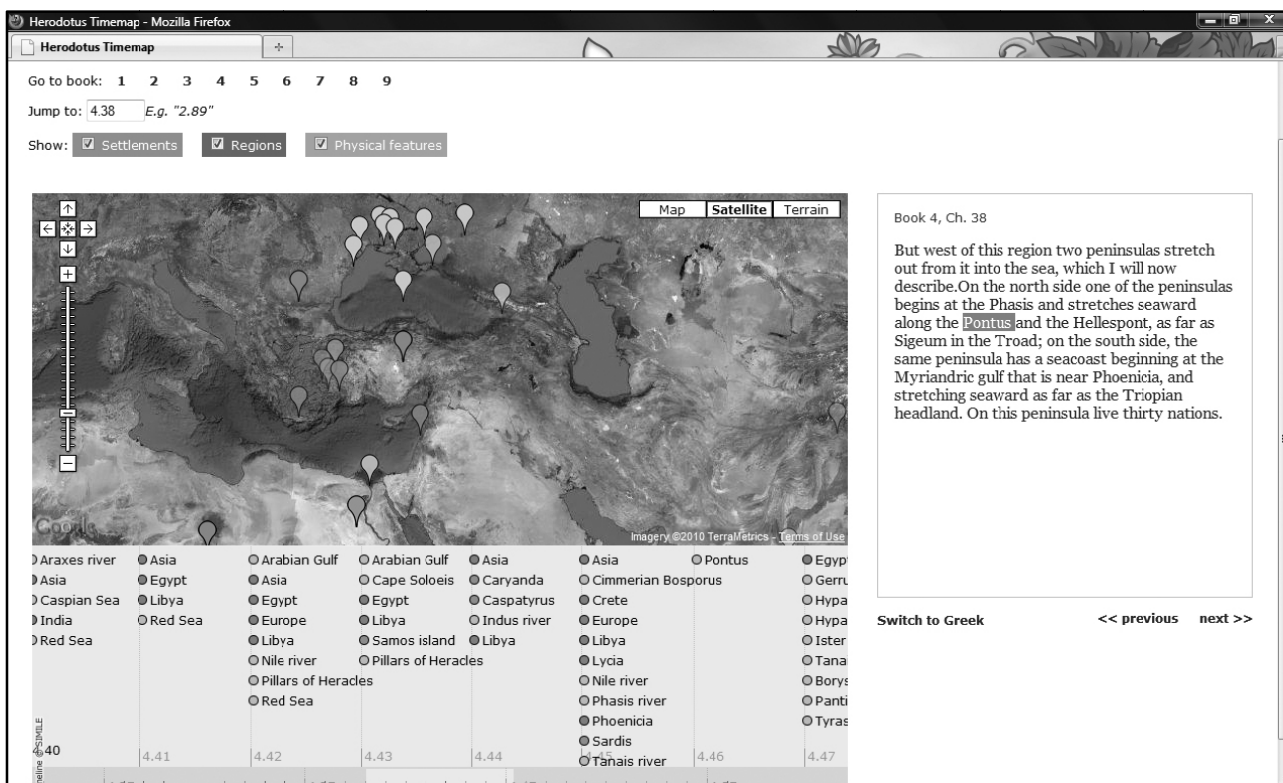


Fig. 4: The Pontus in the Herodotus TimeMap (Herodotus 4. 38)

The three reading panes show: a central GoogleMap on which the geographical concepts are plotted; a ‘narrative timeline’ bar underneath, showing the location of the places relative to the book section; and, finally, to the

right a window for the text itself. Fig. 4 shows all the places mentioned by Herodotus in 4. 38, divided according to settlement, territory or physical feature. Like GoogleEarth this application promotes the dissemination

of Herodotus' world: but, whereas GoogleEarth allows users to scan particular locations of interest, the Herodotus TimeMap focuses attention back on the reading experience of the *Histories*, and the relationship of geographical concepts to their place in the narrative. In fact, by trying to map as closely as possible the reading experience,¹⁶ we hope that the Herodotus TimeMap may have the additional utility of facilitating research into the ways in which geographical concepts in the *Histories* undergo change over time.¹⁷

In these four different ways users can obtain a snapshot of the geographical concepts mentioned in the *Histories*, experiment with different ways of visualising the data, and gain a broad sense of the topological connections between places. It should be emphasised that these maps are *not the end of enquiry*: instead, they should be regarded as *complementing* rather than replacing close textual analysis by prompting new questions and further investigation. In the last section of this paper we outline some of the problems and limitations of these computer-generated maps specific to the Black Sea, as well as suggesting an alternative kind of network map based on a qualitative assessment of the connections that Herodotus makes.

PROBLEMS AND ALTERNATIVES: THE NEXT STAGE?

Limitations to the Automated Process

There are a number of problems with the extraction of the spatial data from Herodotus' text and its organisation in the geo-database. Some are of a general nature, and have been discussed elsewhere.¹⁸ Others are specific and concern the Black Sea directly. For example, when deciding upon its spatial category, it was by no means clear to us whether the Black Sea should be considered a physical feature (for being a sea) or instead some kind of geo-political region (for describing an area encompassing several different communities)? Yet, upon analysing the text, we observed a comparable vacillation between the Black Sea as the 'Euxine' (Εὐξείνως), which appears to mark it as a physical concept within the landscape to the

north (Herodotus 1. 6, 1. 72, 1. 110; 2. 33; 3. 93; 4. 46; 6. 33; 7. 36),¹⁹ and the Black Sea as the 'Pontus' (Πόντος), a place which Greeks inhabit and whose peoples are about to come under Persian domination (Herodotus 4. 8, 10, 24, 46, 95, 99).²⁰ It is unclear whether the distinction is as highly marked as all that, or even whether it is consistently applied through the *Histories*; Herodotus frequently appears to talk about the Black Sea in both senses at the same time, as if he were acutely aware of the slipperiness between the two concepts of a natural physical concept and a geo-political territory.²¹ But, although our earlier mapping of the Black Sea distorts the picture somewhat by only treating it as a physical feature, even simply asking that question may not have been apparent had not the new form of medium – the computer technology – not obliged us to confront the problem in the first place.

This example also raises a rather more serious objection to the automated generation of networks (Fig. 2 above), which relies on 'counting' the number of times two or more places are connected to each other in a single sentence (in the English translation): it has little to say about the *kind or quality of* connection being drawn.²² We end this paper, then, with a tentative qualitative-based analysis, which attempts to categorise relationships according to fundamental geographical concepts of movement or transformation from a close reading of the text.²³

A Qualitative Approach: Principles

Our qualitative approach to network analysis rests on three primary principles.²⁴ First, we have defined as

¹⁹ It is also used, however, of individual settlements lying on the Black Sea, such as Sinope (1. 76; 2. 34) and Apollonia (4. 90), or of ships sailing out of the Black Sea (6. 5, 26).

²⁰ It is the term used when Darius surveys the sea (4.85, 87, 89) and the historian himself maps the world (4.38 and 86). It also occurs in the description of the bridging of the Hellespont: Herodotus 7. 36, 55, 95, 147.

²¹ See 4. 46, where Herodotus uses both terms simultaneously. Indeed, it is highly likely that Herodotus puns on the name 'Euxine' to mean 'friendly to foreigners' even when he is ostensibly referring to the Black Sea as a physical concept, such as at 1. 6, 4. 90 and 7. 36, which all occur in the context of doomed imperial expansion (Croesus, Darius and Xerxes respectively). In particular, Darius' march against what is easily envisaged as a physical feature prefigures the more elaborate sense in which Xerxes takes on land and sea by bridging the Hellespont, and shows how the land-based Persians have a real difficulty coping with the maritime-based Greeks: see Pelling 1991; cf. the advice of Bias/Pittacus to Croesus at 1. 27. On the political significance of punning in Herodotus, see Irwin 2007, especially 46-47.

²² Since the English text of the *Histories* is being used (because its geographical concepts had already been 'marked up'), it was felt that to worry too much about syntactical issues would lend misleading authority to a translation. Once the Greek text has been annotated, however, (and the Perseus project plan to do this), then using text-mining tools to extract the verbs used to connect the geographical concepts would be worth exploiting, on which see the eAQUA project <<http://www.eaqua.net/en/index.php>>.

²³ As Kwan and Ding (2008, 459) conclude, 'much research is still needed to extend the capabilities of existing GIS to provide better support for qualitative and mixed method research in geography.'

²⁴ According to Strauss and Corbin (1998, 10-11), qualitative analysis refers to 'any kind of research that produces findings not arrived at by statistical procedures or other means of quantification'. Among its subjects is research about people's lives and lived experiences, as well

¹⁶ When places are first mentioned, they appear flush to the right-hand side of the 'timeline' bar and bold on the map. As one moves through the narrative, however, they move to the left of the 'timeline' bar and become ever fainter on the map until in both cases, they drop out altogether, just as, when one reads, the echo of a place lingers on in the mind for a time after it is mentioned.

¹⁷ 'Spaces are always created, reproduced and transformed in relation to previously constructed spaces provided and established from the past': Tilley (1994, 11), quoted in Babić 2007, 86. Herodotus too is acutely aware of the extent to which geographical concepts change over time: he justifies his equal treatment of places of different size on the basis that those which were once great, most have now become small, while those which are presently great were small before (ὁμοίως σμικρὰ καὶ μεγάλα ἄστεα ἀνθρώπων ἐπεξίων· τὰ γὰρ τὸ πάλαι μεγάλα ἦν, τὰ πολλὰ σμικρὰ αὐτῶν γέγονε· τὰ δὲ ἐπ' ἔμευ ἦν μεγάλα, πρότερον ἦν σμικρὰ: 1. 5. 3-4).

¹⁸ The most obvious deficiency is the fact that an English translation of a Greek original is being used. For a full discussion of problems encountered and our responses to them, see Barker *et al.* 2010.

geographical concepts all phenomena that occupy a physical space in the topographical reality described by Herodotus, in addition to the names of social formations or individuals that may refer to those spaces.²⁵ This means that we mark not only an explicit geographical concept such as a settlement, physical feature or territory, but crucially also ‘proxies’; that is, we take peoples, either as groups or individuals,²⁶ or even non-human agents (such as monuments or temples),²⁷ as representatives of the particular place whence they come. Second, sentences are the basic unit of analysis: any mention of a connection between two geographical concepts in a given sentence is assigned a single entry in the database; if there are more connections within the sentence, then each receives an appropriate entry. We are not, however, talking primarily about syntactic subject/object, but rather the conceptual classification of which concept is operating on the other: that is, a passive voice construction such as ‘Scythia was invaded by Persia’ is rendered so that Persia is the conceptual subject and Scythia the conceptual object.

Third, while there are many ways in which the relationship between two concepts could potentially be described, such as by proximity, movement and conflict, we decided on a simple formulation based on two key ideas: whether the relationship expressed a static or fluid connection, and whether or not the relationship transformed one (or more) of the parties involved. This gave us the following schema:

1. Spatially static, non-transformative: for example, inclusion, proximity, origin;
2. Spatially fluid, non-transformative: for example, all kinds of movement;
3. Spatially static, transformative: for example, occupation, awareness;
4. Spatially fluid, transformative: for example; conflict, settlement, subjugation.

The classification also operates on the important basis that each relationship can be assigned to only one category, and that the higher order categories take precedence.

as about ‘organizational functioning... and interactions between nations’ (11).

²⁵ This approach differs markedly from the automated data capture, which has extracted only geographical toponyms from the text of Herodotus, though in the future the category ‘ethnic’ (also contained in the Perseus ‘mark-up’) could be extracted.

²⁶ In doing this, we appeal to Herodotus’ own practice of using, say, ‘Darius’ to stand for the whole of Persia, as in ‘Darius, having passed over the Bosphorus on the bridge of ships, journeyed through Thrace to the sources of the River Tearus, where he encamped for three days’ (Δαρειος δε ως διεβη τον Βόσπορον, κατά την σχεδίνην, έπορευετο διά της Θρηίκης, άπικόμενος δε επί Τεάρου ποταμού τας πηγάς έστρατοπεδεύσατο ήμέρας τρεΐς: 4. 89. 3): the singular Darius represents throughout the Persian force.

²⁷ In the sentence ‘[Darius] set up two pillars of white marble by it, engraving on the one in Assyrian and on the other in Greek characters the names of all the nations that were in his army’ (4. 87. 1), the pillars are treated as a non-human agent representing the Bosphorus, object to an act of commemoration by Darius (representing Persia). Very soon, these pillars are ‘carried by the Byzantines into their city’ (4. 87. 2), which is expressed as Byzantium intervening on the Bosphorus.

Figs. 5-8 present a sample set of results from a qualitative analysis of the Black Sea networks. All references to the Black Sea in the *Histories* have been examined and its relationships to other concepts recorded. In addition the dataset includes all other relationships in the same chapter, in order not only to capture the quality of Black Sea network but also to place that network in context and assess its relative importance or composition in comparison to other networks that are expressed in the same passage.

A Qualitative Approach: Analysis of Findings

Fig. 5 (type 1: static non-transformative) shows that of all those places/proxies, which occur in the same passage as the Pontus, the key nodal point is indeed the Black Sea. It occurs mainly as an object in a relationship (31), but as a subject it also ranks highly (20). Thinking of the kinds of relationships represented by category 1, this suggests that the Pontus is primarily used as a way of orienting the reader, as both a distinctive physical feature, which represents a hub of communication networks, and a geo-political territory on the margins of the known world. That is particularly true of its axis with Scythia: the Pontus turns out to be an important marker of Scythian space, for being both on its borders and a way into it. Other physical features, in particular water bodies, occupy a position close to the centre (for example the Hellespont, rivers, the Aegean sea), which again suggests a function as a point of reference.²⁸ On the other hand, while both Persia and Greece are linked to the Pontus, they have very few connections to other places, suggesting that, when these two places are mentioned, things tend to be happening (either spatially or transformatively).

The distinctive feature about Fig. 6 (type 2: fluid, non-transformative) is the fact that it mainly concerns movement. This aspect manifests itself clearly in the form of the ‘networks’ represented, which are strung out in a linear fashion like beads on a chain and are far longer than in the case of the other figures. This ‘chain’ effect fits quite nicely with the impression that Herodotus’ conception of space is hodological, even when he is not explicitly relating a journey.²⁹ The two places of roughly

²⁸ Not just physical, however: in the sub-category ‘proximity’, Herodotus compares the Ister to the Nile.

²⁹ This is most notable in Herodotus’ correction of other attempts to map the world in 4. 37: ‘The land where the Persians live extends to the southern sea which is called Red; beyond these to the north are the Medes, and beyond the Medes the Saspis, and beyond the Saspis the Colchians, whose country extends to the northern sea into which the Phasis river flows; so these four nations live between the one sea and the other.’ Rather than talking in terms of abstract conceptions of space, Herodotus narrates the geography from the perspective of one travelling: i.e. the order of description doesn’t necessarily map onto the nearest place but the one that comes next, as one travels to it. See Purves 2002, 117-21; cf. Jani 1984. In fact Herodotus here refers to the Black Sea as ‘the Northern Sea’ (ή βορηή θάλασσα), showing that its naming depends on perspective and from where one is viewing the land (compare 4. 42. 2, where the Northern Sea refers to the Mediterranean). In addition, in describing the world, Herodotus refers not to settlements but to physical features and ethnea. One possible reason is his interest in the *longue durée*; as this section on Scythia demonstrates more than adequately, peoples change places frequently. It is in this context, then,

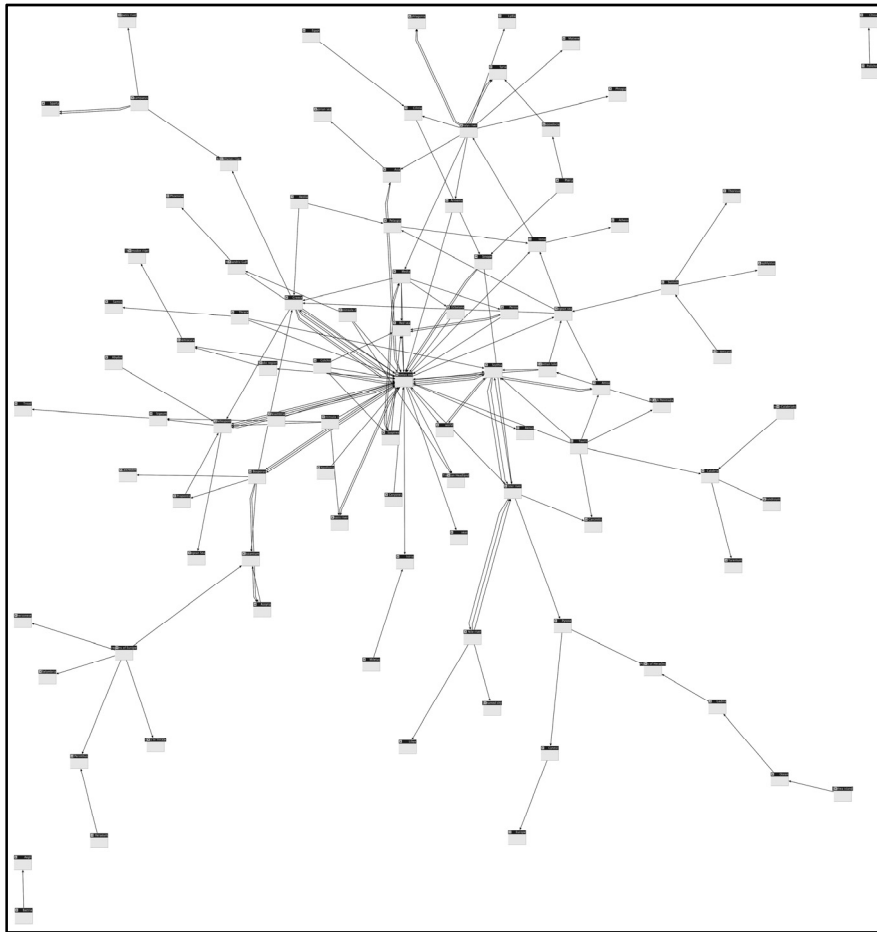


Fig. 5: Pontus Qualitative Network Map: Category 1 (detail)

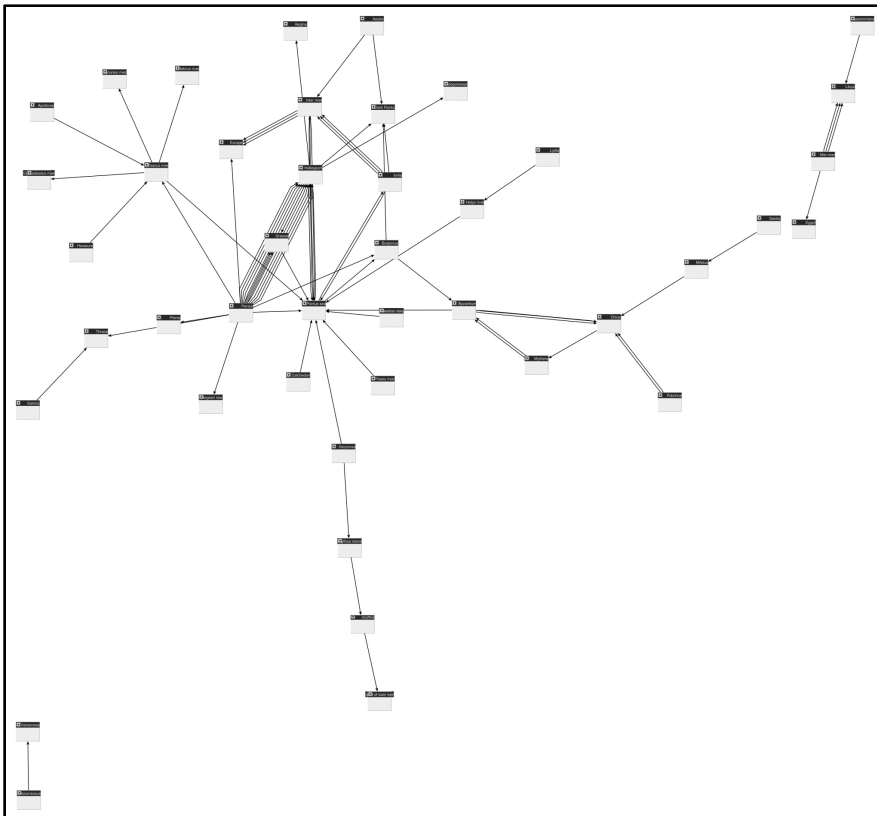


Fig. 6: Pontus Qualitative Network Map: Category 2 (detail)

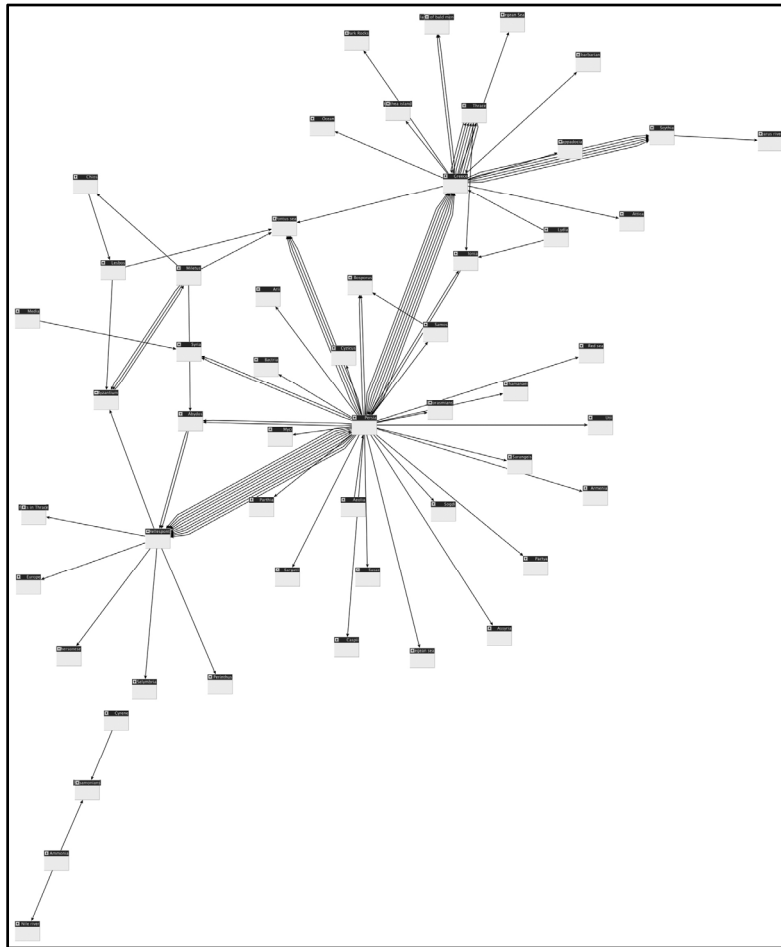


Fig. 7: Pontus Qualitative Network Map: Category 3 (detail)

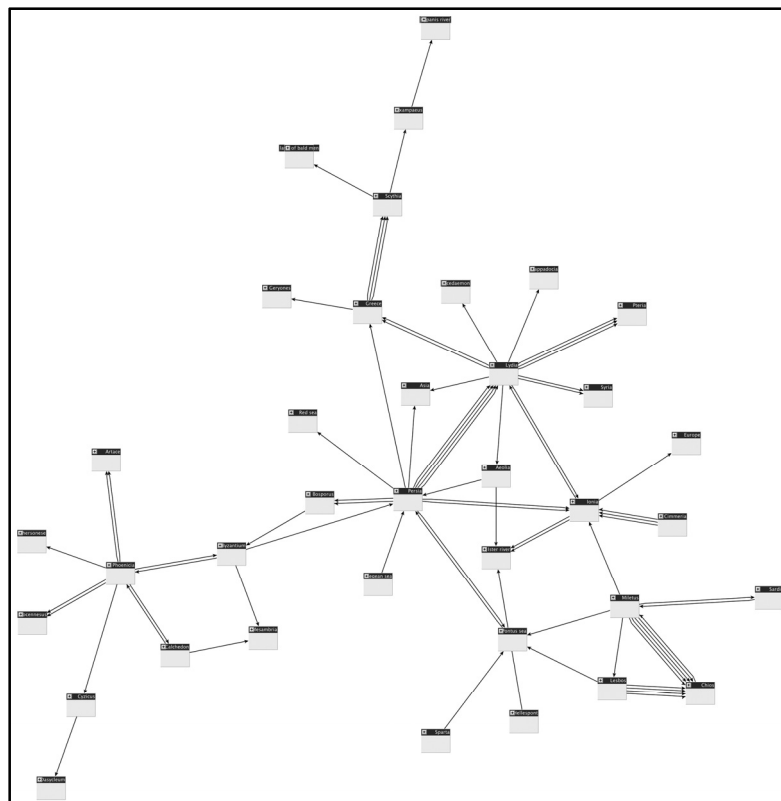


Fig. 8: Pontus Qualitative Network Map: Category 4 (detail)

equal importance that occupy the centre of this figure are the Hellespont and Persia. The Hellespont enjoys relationships (as the subject) to five or so places, including the Pontus. But the vast majority of its relationships are with Persia, all of which have it as the object to Persia as subject. This suggests that the Hellespont is a critical nodal point of Persian activity, as a place through which Persia goes to connect to other places. Since most of these references occur before the 'Persian Wars' officially start (in Book 7), this shows that Herodotus is carefully preparing his readers for one of Xerxes' most famous acts, his bridging of the Hellespont.

Fig. 7 (type 3: static, transformative) is the category which most clearly emphasises the role of the occupying force: it is, in essence, the trail of social and spatial transformations which expanding states leave behind. Our results emphatically locate Persia at its centre as that expanding force, as the dominant subject of spatial relationships, and with strong links to both the Hellespont and Greece. Greece itself, while also being an important node in this category of networks, is more complex in the direction of those relationships. For the most part it is object to Persia; but it also enjoys a subject relationship to both Scythia and Thrace. The importance, and yet complexity, of Greece in this higher order relationship suggests a battle over it may indicate how the meaning of Greece is being played out on the margins.

Finally, Fig. 8 (type 4: fluid, transformative), the highest order relationship, is the least well represented of those describing the passages in which the Pontus is mentioned, and even then the Pontus appears only on the margins. Indeed, it is noteworthy that the strongest connections are not in the centre of this network, but at its edge; the Chios/Miletus/Lesbos triangle forms an alternative, dense but isolated focal point to the other relationships depicted. Of those others, Persia again occupies the centre (though with fewer connections), reflecting Persian dominance of this highest order category, though Lydia too is important. Largely absent from the lower-order categories, Lydia dominates Book 1, where (as subject) it acts upon Greece (among others) and (as object) is acted upon by Persia. With its model of movement and intervention, Lydia acts as a forerunner of the later Persian expansion.

CONCLUSION

In this paper we have set out our methodology for applying digital technology to the analysis of spatial relationships in Herodotus, and tested out some of those web-mapping tools for the representation and examination of space in the Black Sea region. We ended by conducting an alternative qualitative analysis of spatial relationships based on a close textual reading of passages which mention the Black Sea. It was found that the Black Sea networks reveal a marked predominance in the

that Darius arrives to survey the land over which he hopes to exert lasting control.

lower-order non-transformative categories, which bears out Herodotus' description of Darius viewing the sea as a wondrous spectacle, as a place to pass through to an unknown world beyond. But these two ways of thinking about the Black Sea – as a geographical feature to pass through and as especially connected with margins of the world – do not sit easily together. The very paradox suggests the idea of Darius pushing dangerously at the limits, even as he takes stock and surveys the extent of his dominion. And in this he will be followed by his son's even more ambitious, and catastrophic, expedition.

Our initial findings, however, have also revealed that the automated process has captured thus far but a small percentage of the spatial relationships in Herodotus' text. Even as it is hoped that future development of digital technologies will close the gap between the automated generation of maps and the close textual analysis of the conceptual relationships linking geographical ideas, the task of enquiry remains. In the end, this is what distinguishes the wonder of the historian from that of the Persian king.

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