Chapter 9

A DIGITAL PERIEGESIS: IMPLEMENTING SPATIAL RESEARCH INFRASTRUCTURES FOR CLASSICAL HISTORY AND ARCHAEOLOGY

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THE STUDY OF geographic space has a venerable tradition in historical research. The spatial representation of historical cultures dates from long before the spatial humanities became established as a discipline, most notably through cartography, the practice of drawing and studying maps. With the advent of digital technology, the spatial analysis of texts has been significantly enabled, not least by geographic information system (GIS) technologies.[1] Yet contemporary geographic information science and historical modes of describing space often appear to have disparate, even incompatible, viewpoints of the world.

Concerning ancient textual witnesses of geographic space in particular: manuscripts preserving Greek *periplous* (literally: sailing around) and Roman *itineraria* (itineraries) offer valuable spatial information regarding coastal ports and town infrastructures

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1 Dunn, *A History of Place*; Bodenhamer, Corrigan, and Harris, *The Spatial Humanities*, 28; Foka et al., "Mapping Socio-Ecological Landscapes"; Foka et al., "Semantically Geo-Annotating."

respectively.[2] *Periplous* narratives date back as far as the fifth century BCE, and present in catalogue form the ports on a sailing route, often accompanied by coastal description.[3] Similarly, the Roman *itineraria* are sparse texts, usually comprising a list of waypoints and the distances between them. These are route-based, or "hodological" (from the Greek *hodos*: "route"), narratives, which map out a traveller's journey, and may have been used for that purpose. Arguably, the most famous surviving "map" from antiquity, the Roman *Peutinger Table*, similarly represents space as stretched out along a series of routes, in a visual depiction of the Roman road network.[4] Therefore, describing place in antiquity shares a purpose: accessibility. Both Greek *periplous* and Roman *itineraria* texts serve the interests of users wanting to travel, with space conceived of from the ground, as a route. These hodological "maps" offer alternative and often disparate understandings of the world to the Cartesian bird's-eye view that has dominated modern cartography.

Ancient historiography further provides readers with highly idiosyncratic spatial information. Caesar's *Gallic Wars* reveals a comparable hodological perspective, manifested in his tendency to follow rivers. Herodotus's *Histories* uses spatial understanding as part of an explanatory framework of conflict. At the macro level, Persia's growing power structures the *Histories*, as Herodotus records peoples and their geography as and when they come under Persian attack or control;[5] at the micro level, in representing the different spatial horizons of his historical agents, Herodotus both captures their lived experience and reproduces a series of overlapping and increasingly complex networks[6] that challenge the notion of an abstract, mappable topography.[7] In this counter-cartographic text,[8] topological networks complicate and resist the centripetal drive to empire. These two ancient narratives, one Roman, one Greek, indicate that mapping pre-modern space is rarely a matter of documenting toponyms or establishing precise coordinates. Rather, they reveal space as place through interaction with historical agents[9] and the human footprint left on the ground in the form of monuments, religious sites, and other infrastructures.

Against this backdrop, this chapter examines the affordances and challenges in using contemporary digital spatial research infrastructures for the analysis of ancient narratives. Our case study is a well-known ancient narrative of space, namely Pausanias's *Periegesis Hellados* (*Description of Greece*), a ten-volume description of towns, villages,

2 Salway, "Travel, Itineraria and Tabellaria."

3 Janni, *La mappa e il periplo*.

4 Johnson, *Literary Territories*.

5 Rood, "Historiography Herodotus."

6 Barker et al., *New Worlds from Old Texts*.

7 Barker and Pelling, "Space-Travelling."

8 Purves, *Space and Time in Ancient Greek Narrative*.

9 De Certeau, *The Practice of Everyday Life*.

monuments, art works, and their histories from Attica to Phocis, following a circuit around the Peloponnese. The "Digital Periegesis" project, funded by the Marcus and Amalia Wallenberg Foundation (MAW 2017.0057; 2018–2021) and the Swedish Research Council ("Time and People in Pausanias' Description of Greece", 2021-02799; 2022–2025), and comprising an interdisciplinary team of scholars, builds on existing digital spatial research infrastructures, using maps as visual portals into narratives, as a means to interrogate rather than merely illustrate spatial information.[10]

At the same time, the Digital Periegesis team investigates the possibilities of combining research infrastructures more generally, incorporating information about time and people, into a reflexive process to illuminate change and development as a way of understanding place fully.[11] From the outset the Digital Periegesis scholars have utilized an existing ecosystem of digital spatial research infrastructure and analysis, but also additional and customized infrastructures that are used more widely, beyond Pausanias. The overarching argument presented here is that using contemporary technologies for old texts is an equally complex technological and epistemological endeavour. Infiltrating an ancient text through contemporary spatial research infrastructures brings to the fore its counter-cartographic spatial logic: the centrality of temporal and prosopographical data in any spatial research inquiry, as space becomes place in certain time periods because of its human footprint. This chapter further elucidates the potentials and limitations of digital spatial research infrastructures as technologies that require additional information to produce truly groundbreaking results. In what follows, we discuss previous scholarly attempts to geo-visualize ancient narratives with digital technology, as well as the complexity of mining *Periegesis Hellados* for spatial data, our close reading of data-gathering methods, our semantic annotation strategy and tools, and the implementation support provided by existing digital spatial research infrastructures, including their necessary customization.

Pausanias and the Study of Space

Writing in Greek at the time of Roman hegemony in the Mediterranean, sometime in the second century CE, Pausanias describes a ten-chapter journey around the Greek mainland, from Attica to Phocis, via a clockwise tour of the Peloponnese, with the canon essentially spatially organized, meaning that each volume is a place or a region.[12] Each of the ten chapters is dedicated and named after a particular region, with the exception of Elis, the location of Olympia, which has two volumes dedicated to it; see Figure 9.1. Pausanias's spatial description of the towns, buildings, and monuments through which the reader moves, has been widely used as a guide for interpreting those sites and their

10 Bodenhamer, "Narrating Space and Place," 19.

11 Bodenhamer, "Narrating Space and Place," 20–21.

12 Fowler, "Pausanias's Description of Greece," 357.

Figure 9.1. A map of regions numbered as Pausanias's volumes of the Periegesis Hellados. Openly licensed from Harvard Library, CC BY, https://dash.harvard.edu/handle/1/40939994 (accessed May 21, 2021).

archaeology, notably those at Athens, Corinth, and Olympia.[13] In response to broader theoretical movements in the humanities, such as narratology, the spatial turn, and post-colonialism, scholarly interest in Pausanias's *Periegesis Hellados* has intensified. A by no means exhaustive list of recent critical scholarship would include readings based

13 Dyson, "The Relevance"; Dyson, *In Pursuit of Ancient Pasts*; Shanks, *Classical Archaeology of Greece*; Habicht, *Pausanias's Guide*; Stewart, " 'Most Worth Remembering.' "

on narratology;[14] topographical and cognitive mapping;[15] mythology;[16] identity and memory;[17] and ethnicity and religion.[18]

At one level, the text represents a way of viewing and travelling through space as a landscape in which the traveller is immersed by narration. This description is not exactly compatible with how we see the world today; the view from above is a more recent way of understanding space—the Cartesian "bird's-eye" manner of post-Enlightenment cartography. Instead, not only does Pausanias conceive of places as spaced out along a path,[19] but the very spatial structure of his narrative follows a series of routes, around the Greek mainland. At another level, the text's hodological flow is compromised by the fact that Pausanias often forgoes descriptions of natural landscapes and road networks through which one would have to travel to visit the sites. Instead, the author's cognitive maps are centripetal, complicating the text's perceived linearity following different roads in sequence as they emanate out from large urban centres.[20] The reader's route is interrupted and rerouted by other sorts of information relating different spaces to one another and extending a purported itinerary. These "hyperbatic" moments disrupt "the topographic flow of the text and takes the reader to a far off-place."[21] Thus, essentially, Pausanias's narration moves through time and space: places and objects in space are described at different historical moments, from the mythological and heroic to his present day.

Given the complexity of this time–space matrix—the Pausanian *chronotope*, in Bakhtinian terms[22]—Pausanias is frequently "mined" for disparate temporal, spatial, social, and cultural information; a critical examination of these disparate elements as they perform within the narrative, particularly with regard to gendered space and mobility focus, is yet to emerge.[23] As a narrative that has the potential to illuminate the time depth problem of the Greek East—that is, by providing ways of compartmentalizing, and marking these "different temporalities of the long-study of urbanism in the Mediterranean East"[24]—Pausanias's text is also bound up with issues of the material cultural record and broader questions relating to archaeological reception, Hellenic identity, and the geospatial interstices of East and West.[25] Critical to this impression of

14 Akujärvi, *Researcher*; Habicht, *Pausanias's Guide*; Pretzler, *Pausanias*.

15 Hutton, *Describing Greece.*

16 Hawes, "Of Myths and Maps."

17 Alcock, *Empires*; Arafat, *Pausanias's Greece*.

18 Konstan, "To Hellēnikon Ethnos."

19 Janni, *La mappa e il periplo.*

20 Hutton, *Describing Greece.*

21 Cundy, *Axion Theas*, 146.

22 Bakhtin, "Forms of Time."

23 Konstantinou, *Female Mobility and Gendered Space*.

24 Stewart, " 'Most Worth Remembering,' " 236.

25 Koundoura, *The Greek Idea*, 8; Carastathis, "Is Hellenism an Orientalism?"

space as place is the role of Pausanias's mythical-historical agents, who transform the space into meaningful places, whether it is a hero establishing a ritual at a certain site or a political figure whose statue provides an opportunity to explore their contribution to the idea of Greece.

Seen in these terms, text-based literary research raises fundamental epistemological and ontological complexities for digital spatial research infrastructures, as it were.[26] Standard map projections used in geographic information systems or other digital mapping applications impose a frame of reference for viewing space that reproduces the modern Cartesian frame and, through the accuracy of satellite technology, promotes an impression of reality that may not always be fitting for a premodern spatial narrative. Lacking in these digital map representations is the co-implication of space, time, and people. The Digital Periegesis to some extent responds to this challenge, by examining Pausanias as a prime example of a historical, non-Cartesian geography, "woven together out of ongoing stories" of place, periodization and prosopography, where place is understood "as a moment within power-geometries, as a particular constellation within the wider topographies of space, and as in process, as unfinished business."[27]

The capacity to identify and actually map place information in ancient textual documents requires thinking with pre-Cartesian modes of spatial thinking. A good example are the *Histories* of the fifth-century BCE writer Herodotus, which, over the course of nine books detailing how Greeks and barbarians came into conflict with each other, sketches out the places of the known world and uses spatial understanding to explain the conflict. Using a digital version of this text, Barker's HESTIA project[28] demonstrated the insufficiency of depicting places as dots on a map, in favour of focusing on the lived experience of those places as events unfolded in the narrative. This included developing the idea of "proxies"—the individuals, social groups, or even non-human agents that belong to the geographical imagination described by Herodotus and that, importantly, represent in some shape or form those locations. For example, Darius, the Persian king, frequently stands as a representative (or proxy) for Persia. Place-names alone fail to capture the full complexity of spatial entities depicted in Herodotus's *Histories*.[29]

Places and their proxies in Herodotus are then studied according to their relatedness—that is, how, in order to explain the conflict, Herodotus linked places from across his known world. The resulting network model challenges the notion of an abstract topography that can be mapped, to leave readers to grapple with the multidimensions of the space around them in the world of the text.[30] Nevertheless, while

26 Harris, Bergeron, and Rouse, "Humanities GIS."

27 Massey, "For Space," 130.

28 See https://hestia.open.ac.uk (accessed May 21, 2021).

29 Barker et al., *New Worlds from Old Texts.*

30 Barker and Pelling, "Space-Travelling."

the counter-cartographic impulse is useful for drawing attention to the underlying place-boundedness of Herodotus's *Histories*,[31] its spatial organization and the role of people in the construction of space, it remains only a snapshot. There is little sense of how those relations evolve, break, run counter, etc. over the course of the narrative. Thus, the network models produced by HESTIA are time*less*, and do not provide ways of enabling the analysis of time and space together. In what follows we discuss and analyze how the very same and updated digital spatial research infrastructures needed to be often thought through and modified for the purposes of the Digital Periegesis project and how the team worked around with questions of temporal and prosopographical nature.

Digital Spatial Research Infrastructures for Classical Studies: The Importance of Linked Open Data and Existing Ecosystems

Digital and interactive editions of texts are only now being explored by scholars within a variety of data, settings, and platforms,[32] including the issue of completing or ending a digital publication. In creating digital and enriched editions there are additional and more general complexities that ought to be addressed, from both a technical and an epistemological perspective. Regarding technical complexity, although technology is by definition current, technological advances are not widely adopted in practice; for example, while semantic web technologies have been available for almost two decades, they are characterized by a lack of pioneering implementations.[33] Although there are incentives at an international level for FAIR (Findable, Accessible, Interoperable, and Reusable) principles for data, there is a general lack of tools and policies to aid the reuse of experimental interfaces such as digitally enriched editions of text with relevant metadata. Having interoperable research data means that, in semantic web environments, metadata are presented with standardized, documented, and accessible semantic descriptions, including vocabularies, terminologies, and specific and standardized ontologies. Epistemologically, data aggregation methods present additional complexities in terms of implementation. For example, crowdsourcing by subject specialists is often problematic, since academics lack technical skills to structure data or are unaware of concepts of interoperability. Another issue is that, while being aware of contemporary modes of organizing, thesauri and vocabularies for spatial descriptions, the project group chose the original vocabulary that Pausanias uses in the Greek language as far as possible, and generated a schema based on his description, rather than impose one from our own culture that would be culture-insensitive and even anachronistic.

31 Moretti, *Atlas of the European Novel*.

32 Barker, Foka, and Konstantinidou, "Coding for the Many."

33 Hyvönen, "Publishing and Using."

A digital research publication should ultimately mean that we take into consideration how rapidly technology progresses and that the research data we collect should, ideally, be open and reusable for future projects. There should also be clear conditions for data usage, such as metadata that are associated with detailed provenance information and are structured and documented in accordance with applicable domain-relevant standards and formats.[34] Additionally, General Data Protection Regulation (GDPR) rules should be taken into consideration, especially with regard to copyright for editions and translations as well as gazetteer compilations and databases for spaces and places that have to be open and available.

In this context, the team had to think through digital research infrastructures for the identification, disambiguation, and analysis of ancient places. These digital spatial research infrastructures, particularly for the study of the ancient Mediterranean, have in the past five years reached a level of maturity. First, concerning spatial ancient world data, there is already an established gazetteer ecosystem. A digital gazetteer, in this particular research context and for the purposes of this chapter, comes to mean the standards for structured information about space: global authority files that provide structured data vocabulary for different communities researching historical places.[35] For example, the "Pleiades" project is, essentially, an ancient world gazetteer that curates and aggregates data about places in the ancient world.[36] In addition, advances have been made to link different global gazetteers together, including a platform for publishing, linking, discovering, and visualizing contributed records of attested historical places, as with the World Historical Gazetteer initiative.[37]

The second point is that, as already discussed, should data be open, available, and interoperable, there needs to be a linked open data method in place. The Pelagios infrastructure initiative has established a simple, lightweight semantic annotation method for linking online resources through their place references.[38] This uses stable identifiers provided by the interlinked global gazetteers, and a schema based on the W3C Web Annotation standard. Pelagios has recently become a formal association of equal and independent partners, dedicated to the production and use of LOD across humanities disciplines; it is thus a well-sustained technical environment supported both by financiers and by a community of scholars.

Another useful digital spatial research infrastructure in its own right is the ToposText project, a public engagement platform, essentially both an infrastructure and a gazetteer, comprising the most diverse set of ancient texts in English on the Web.[39] These are

34 See www.fairsfair.eu, www.go-fair.org, and https://ec.europa.eu/info/sites/info/files/turning_fair_into_reality_1.pdf (all accessed May 21, 2021).

35 Goodchild and Hill, "Introduction to Digital Gazetteer Research."

36 See https://pleiades.stoa.org (accessed May 21, 2021).

37 See http://whgazetteer.org (accessed May 21, 2021).

38 See https://pelagios.org (accessed May 21, 2021).

39 See https://topostext.org/the-project (accessed May 21, 2021).

indexed to connect to primary sources for nearly any ancient place or personality as well as a highly detailed archaeological site map for Greece. This gazetteer is based on actual, granular, and accurate archaeological information for thousands of Greek historical sites, indexed to the ancient literary sources that mention them. It further allows users to freely download and to reuse them as compatible LOD files.

The Digital Periegesis research team uses the online Greek and English versions of Pausanias's ten volumes that are hosted by the Perseus Classical Library Scaife viewer,[40] which has been financed and sustained by a board of trustees since the end of the 1980s. Although there are several Greek editions and translations of Pausanias's *Description of Greece*, the Digital Periegesis's choice of text relates both to literary purposes as well as connecting to existing, open, and available classics-related digital research infrastructures more generally. The Digital Periegesis team decided to work directly with an already digital edition of the ten volumes of Pausanias's *Description of Greece*. The edition is canonical, and among the first complete critical (including scholia) editions of Pausanias's ten volumes, a text that has been compiled and collected by many different manuscripts from the late Byzantine era, including an old codex in Florence that is now lost.[41] This version is a standard edition used by the majority of the community besides the Loeb Classical Library edition, which appears to be behind a paywall. It was compiled by Spiro Friedrich in 1863 or 1864, and it has been further updated in the last decade under the supervision of experts, namely philologists Lisa Cerrato, William Merrill, Elli Mylonas, and David Smith.

Most importantly, the text is already digitized and ready for further use. The mission of Perseus is to provide up-to-date editions of classical literature. In doing so, the Perseus Scaife Digital library focuses on three categories of access that deem text versions canonical and critically enriched with additional data. These are: 1) human-readable information: digitized images of objects and texts; 2) machine-actionable knowledge, such as catalogue records, encyclopedia articles, lexicon entries, and other structured information sources that relate to the text (see Figure 9.2 for information pertaining to Pausanias text, lexicon entries, morphological information, and New Alexandra commentary); this feature helped Digital Periegesis's annotators to retrieve direct information about the digital text and consult with each other; and 3) machine-generated knowledge: this is a reading support feature that includes, for example, full-machine-translation morphological or syntactic analysis, or even named entity identification.[42] By working with a digital text retrieved via a long-standing and well-sustained classical world library infrastructure, the Digital Periegesis used a version of Pausanias's ten-volume *Description of Greece* that is already digitized, openly licensed in CC-BY, and free for reuse, provided by Tufts University. In doing so, the Digital

40 See https://scaife.perseus.org (accessed May 21, 2021).

41 Diller, "The Manuscripts of Pausanias."

42 See more at www.perseus.tufts.edu/hopper/research (accessed May 21, 2021).

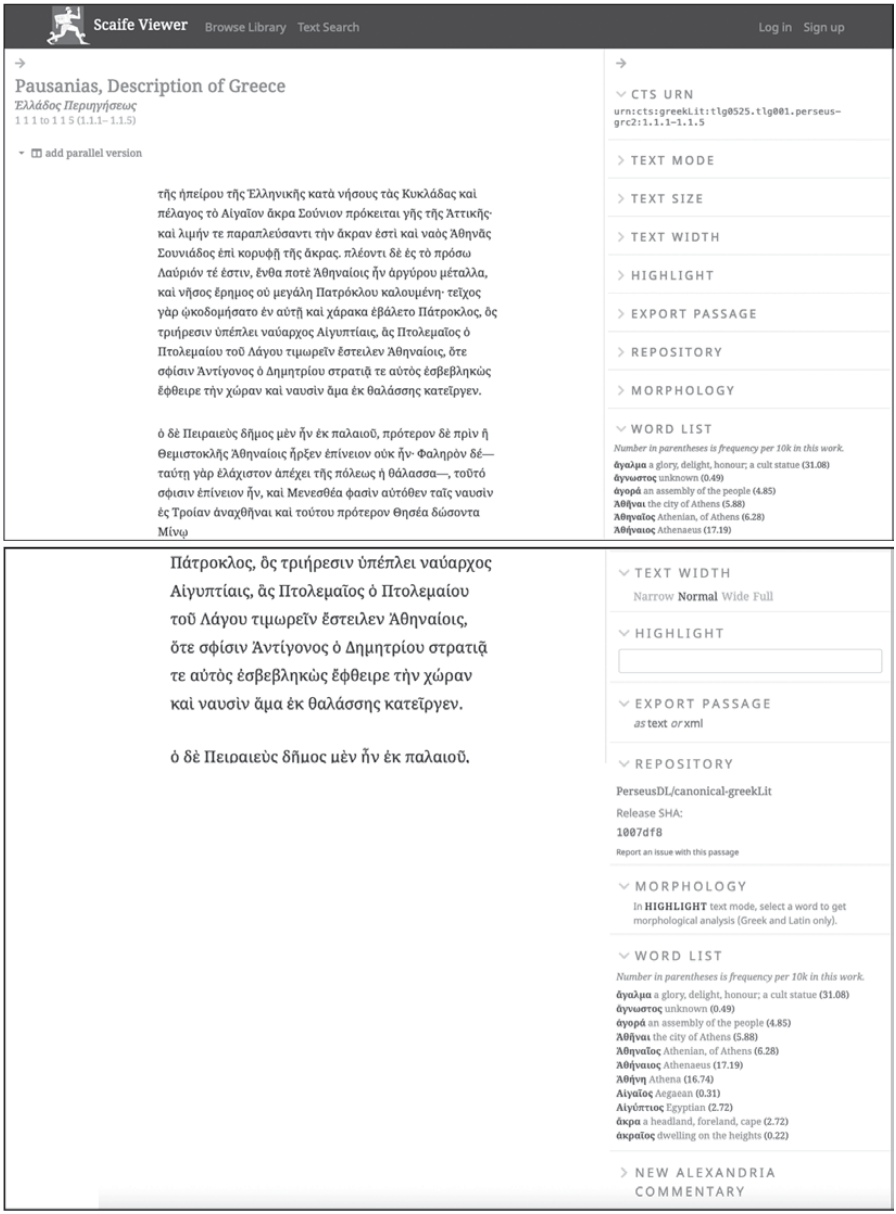

Figure 9.2 (a) and (b). Passages of Pausanias as they appear in the Scaife Digital Library Viewer Interface, including format options for exporting the passage, word list, morphology, and commentary. Openly licensed from Harvard Library, CC BY.

Periegesis team further does not violate any GDPR or edition and translation copyright rules. At the start of the project various forms of the text were used: its plain text format for the English translation (in txt format), and the TEI text for the Greek. To conclude, with its choice of a canonical text that is already digitally prepared for organizing and connecting information, the Perseus Classical Library Scaife viewer provides the possibility of exporting passages in txt or XML formats, which made it easiest to extract, upload, and annotate.

The platform used to annotate the text is Recogito.[43] This browser-based open-source software library was developed by Pelagios with funding from the Andrew W. Mellon Foundation; its range of functionality continues to be developed and sustained under the auspices of the Pelagios Network. Recogito enables the user to easily upload, mark up, and annotate the texts with additional information, focusing on spatial data but also offering, additionally, free-text options. In particular, Recogito was designed with spatial data as the primary entity for semantic annotation. Using a network of LOD global authorities on place information, a number of digital gazetteers, Recogito enables the user to identify a place-name, and to align that reference to an appropriate gazetteer, so that a user can, for example, disambiguate between two places and the marking up of named entities with identifiers from LOD vocabularies by the subject specialist, without need for coding skills.[44] Recogito provides a personal workspace for users to upload, collect, and organize source materials—texts, images, and tabular data—and collaborate in their annotation and interpretation. In addition, Recogito keeps track of version history and edit provenance, can be customized with different gazetteers for geo-resolution, and supports a range of import and export formats. It is being extended continually, so as to offer a growing number of integrating options with external sources and developing standards, such as IIIF, or TEI published through the CTS protocol.

Thus, the determining factors behind the production of an enriched edition of Pausanias's *Periegesis Hellados* are usability, sustainability, collaboration, and transparency. From the outset the project plan was to avoid the devotion of time and resources to build self-standing applications but to take a contrary approach; the emphasis in implementing Digital Periegesis was placed on the reuse and extension of data and tools that have already been produced, are sustained by larger institutions, trustees, and initiatives, and have a community of users around them. This meant primarily working together with other groups of scholars and developers, in order to benefit from the general landscape of digital (and spatial) research infrastructures available for the study of the Graeco-Roman world with computational methods and tools. In what follows we discuss the process of utilizing specific tools and platforms, and the platform's customization to fit the purposes of the Digital Periegesis project.

43 See https://recogito.pelagios.org (accessed May 21, 2021).

44 Simon et al., "Linked Data Annotation."

Structuring Data: Existing Gazetteer Ecosystems and Further Data Complexity

The manual process of digital semantic annotation is extensively described elsewhere, and so is only briefly presented here.[45] The method of semantic geo-annotation is twofold: 1) first, the researcher locates places in the uploaded online document, marks up the relevant word, and creates an annotation; 2) thereafter the researcher aligns annotations to a digital authority file (gazetteer) that provides the means to identify and disambiguate between different places, or even places with the same name. By aligning a place or a place-name record in a document to a global gazetteer, it is possible not only to disambiguate that place and map it but also to create linked open data, published according to the Web Annotation Data Model.[46] Aforementioned global gazetteer initiatives, such as the Pleiades Gazetteer of the Ancient World and the Digital Atlas of the Roman Empire, facilitate the alignment and disambiguation of ancient place information in documents in Recogito, but, though comprehensive, the spatial information is at times incomplete, relates to other time periods, or is not granular enough in a cartographic sense.

For example, Pleiades would, in theory, be sufficient when working on a text with place-names from the ancient world, as it covers the Roman Empire (and beyond, into Persia) over half a millennium (from 750BCE to 450 CE). Pausanias's *Description of Greece* presents a challenge, however, because his narrative takes place within settlements such as cities, towns, and villages. The challenge of analyzing spatial representation is the "thickness" of that description, whether Pausanias is taking the reader on a tour of a temple precinct while at the same time recalling the mythical stories associated with a simple-looking rock or reflecting upon the itinerary of a historical persona who, according to Pausanias, founded the nearest town. Although no tool will be able to solve automatically specific epistemological and ontological issues, Recogito enables the researcher to incorporate customized semantic modelling into the identification and analysis of spatial data that are both flexible and targeted, while robust and consistent.

Pausanias's descriptions include areas within a city (e.g., the Athenian agora, the Acropolis), usually buildings (e.g., temples) and objects (e.g., statues). Very few, if any, of these very granular places or *objects* have a record in the Pleiades Gazetteer of the Ancient World. To address this obvious omission the Digital Periegesis team hosted a local instance of Recogito at Umeå University, to which custom gazetteers could then be uploaded.[47]

To have more granular topographic and heritage data identifiers, the Digital Periegesis team imported three additional gazetteers. From ToposText.org, the comprehensive indexed collection of ancient texts and mapped places, the team took identifiers for ancient Greek sanctuaries and buildings that did not exist in the Pleiades Gazetteer of

45 Barker, Foka, and Konstantinidou, "Coding for the Many."

46 See www.w3.org/TR/annotation-model (accessed May 21, 2021).

47 See http://recogito.humlab.umu.se (accessed May 21, 2021).

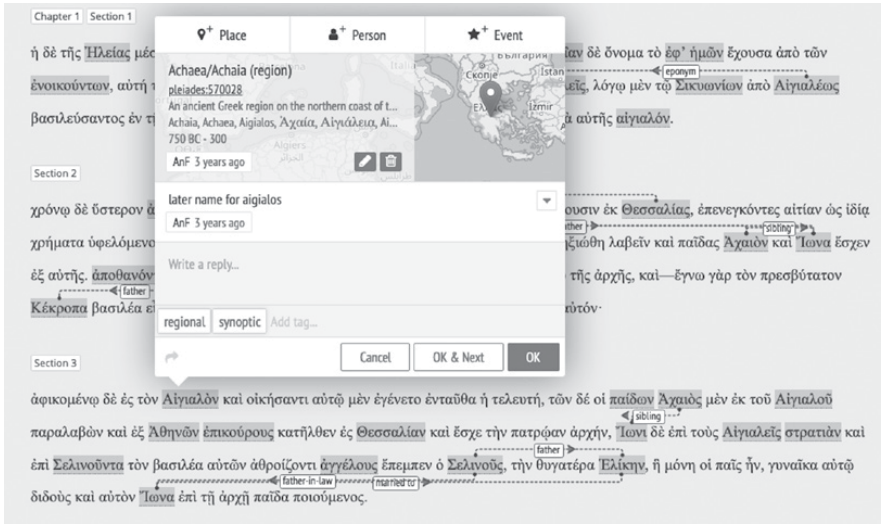

Figure 9.3. The Recogito user interface, including example of a regional name, its location on the map by Pleiades gazetteer alignment, and comment box. Image by Kyriaki Konstantinidou.

the Ancient World. For art historical artefacts and monuments in Athens, the Digital Periegesis team extrapolated coordinates from Judith Binder's *The Monuments and Sites of Athens: A Sourcebook*, as digitized by J. B. Kiesling for the Dipylon of the Society of Ancient Topography project.[48] Finally, the project utilizes a detailed database of ancient art objects mentioned by Pausanias, and included in the classical archaeological database Arachne of the Deutsches Archäologisches Institut, the German Archaeological Institute.[49] In turn, this helped the Digital Periegesis team to prepare the ground for future work in this area of intra-city gazetteer development. While this customization of our working platform is very useful, if no appropriate match can be found using any of these resources, by using the flagging option in Recogito and the comments box, details may be provided back to the relevant gazetteer developers to ensure that important new information is registered and utilized accordingly; see Figure 9.3.

Perhaps the most important point of annotation is that, for Digital Periegesis, the alignment of words to spatial information is entirely manual and completed by an interdisciplinary team of experts in the fields of classical philology, history, and archaeology. Although the Recogito platform further utilizes artificial intelligence algorithms to some extent, namely named entity recognition (NER), to enable the automatic alignment of place-names to selected gazetteer entries in a number of languages, the Digital Periegesis research team is focusing on the ancient Greek text,

48 See https://dipylon.org/en (accessed May 21, 2021).

49 See https://arachne.dainst.org (accessed May 21, 2021).

which has no language specific plug-in interface, and therefore manual annotation is the only option. Recogito's intuitive interface makes annotating the text a matter of scholarly work and interpretation, not technical know-how; slows down reading; and brings to the fore concepts and cultural interpretive challenges that need to be teased out.

Far from being a passive setting for historical action, space and place are a significant medium for the development and understanding of the past as revealed through their interaction with two other entities: time and people. To complicate matters, historiographical texts such as Pausanias's are also *about time*, in that they represent events occurring in time and space; and these temporal representations sometimes align with narrative time (chronological sequence), and sometimes do not. Of greater complexity is the fact that temporal information of ancient texts fundamentally cannot be straightforwardly mapped on to our modern dating system.[50] People, or prosopographical data, also pose a challenge: space becomes "place" once it is the locus of human activity.[51]

Neither data about time nor data about people—temporal and prosopographical data—are directly connected to existing digital spatial research infrastructures for classical literature; thus there exist no comprehensive authority files for time or people. Attempts to structure temporal data include various US and European initiatives, each currently independent of each other. The PeriodO project, funded by the National Endowment for the Humanities, is building a "gazetteer" of scholarly definitions of historical periods.[52] Trismegistos is a gazetteer-calendar that has emerged from the attempt to catalogue and describe papyri records from Egypt (from 3500 BCE to 1000 CE).[53] The iDAI.chronontology is a web service that connects period terms to dating information.[54] Lastly, there is the open, collaborative, and multilingual database of Wikidata,[55] which provides structured data for the support of Wikipedia. There are currently no methods and tools that can help to link these different resources, and future sustainability constitutes a potential problem. Trismegistos has recently had to move to a subscription-based model as an attempt to continue to provide the service.

Attempts to structure information about people, or prosopographical data, are least advanced at a scholarly level. Some are familiar: Trismegistos again provides a database of names from its Egyptian papyri holdings, while Wikidata provides open and flexible resources, although they are not scientifically rigorous. Others are still in the print medium, such as the *Lexicon of Greek Personal Names* or the *Prosopographia Imperii Romani*, which is a series of printed books listing senators and other elites from the first three centuries of the Roman Empire. One attempt to apply a Pelagios approach

50 Feeney, *Caesar's Calendar*.

51 Tuan, *Space and Place*.

52 See https://perio.do/en (accessed May 21, 2021).

53 See www.trismegistos.org/index.php (accessed May 21, 2021).

54 See https://chronontology.dainst.org (accessed May 21, 2021).

55 See www.wikidata.org/wiki/Wikidata:Main_Page (accessed May 21, 2021).

to annotate information about people has been made by the project "Standards for Networking Ancient Prosopographies: Data and Relations in Greco-Roman Names."[56] While not successful in gaining sustained funding, it has established baseline principles for using authoritative lists of person names to link information.

Finally, it is worth mentioning how the Digital Periegesis team actually annotates these two other features—time and people—beyond focusing on place information. Recogito's flexibility allows the team to mark up prosopographical and temporal data in addition to spatial data, albeit with an important limitation. Whereas marking place is a two-step process—identifying the place reference in the text, then aligning it to the gazetteer record—marking people or time involves only the initial step. This is because, at the time of writing, there is no global authority standard for recording people or time references in the same way as there is with places. Still, it seemed to the Digital Periegesis team that it was also important to mark both entities in Pausanias, not least because of their associations with place and their impact on how those places are viewed. Similarly to what Digital Periegesis has done with spatial data in terms of granularity, the team has developed lightweight, practical measures to disambiguate and authorize the prosopographical and temporal data as far as possible. For the former, this has meant manually aligning named persons in Pausanias to their Wikidata identifier, by which the team will be able to track the gods, heroes, artists, athletes, and politicians whose names recur throughout the narrative. For efficient workflow, the team annotates personal names in Recogito simply as "person" rather than align them individually. These annotated names are exported in Greek as batches, matched to their English/Latin forms, and aligned to Wikidata using Excel offline and outside the Recogito environment, as there is no Recogito support for this feature, and then reimported to the final annotation file, enriched with structured data extracted from Wikidata using OpenRefine—a Google tool for data cleaning.[57]

As for time, Pausanias's narrative moves rapidly back and forth in time, from the "golden age" of Greek myth to the wars of Hellenistic monarchs, to his own period of second-century CE. Capturing these varied chronological elements as one moves through the narrative is challenging. Even more difficult is rendering Pausanias's time descriptions as year dates. Again, there is a need to be sensitive and alert to the nuances of Pausanias's descriptions—the kind of discipline and period-specific terminology used in his narrative, as, say, in terms of an event such as "the Trojan War," or else through the figure of a mythical/historical person, such as "Ptolemy Soter." This is an important aspect to investigate, but such terms and their associated date ranges seldom map neatly to Pausanias's narrative, which tends to establish a working chronology by using known events, such as battles or Olympiads. Fortunately, Wikidata is rich in such items. It is therefore possible to annotate the 102nd Olympia mentioned by Pausanias with its Wikidata ID, Q57337793, and extract the year date as a temporal expression: "tx:372

56 See http://snapdrgn.net (accessed May 21, 2021).

57 See https://openrefine.org (accessed May 21, 2021).

BCE." It is then possible to use relation annotations to link persons, places, and events in Pausanias's narrative to a year that can be placed on a visualization timeline.

Conclusions: The Future of the Past

The rich ecosystem of spatial data infrastructures for classical studies has facilitated the process of creating to a large extent a genuine Digital Periegesis: with a semantic annotation platform and generic gazetteers such as DARE and Pleiades available, a scholar with no specific computational skills can read deeply into the texts, and mine and align spatial data. For the Digital Periegesis project, though, the team had to be more flexible and creative in their implementation. Because of the material record on the ground being fraught with difficulty and the thickness of its description in the text, the team opted for specific solutions. To begin with, existing digital spatial research infrastructures such as the semantic annotation platform Recogito had to be customized with additional, case-study-specific digital research infrastructures in order to connect the ten volumes of Pausanias's rich *Description of Greece* to gazetteers with equally granular spatial information focusing on archaeological data. Furthermore, the complexity of Pausanias's spatial analysis and the centrality of prosopographical and temporal data throughout the text dictated that the team had to customize CSV files offline and outside the Recogito platform so as to account for and to include the prosopographical and temporal data in question.

While the customization of digital spatial research infrastructures gave way to more complex theoretical inquiry concerning spatial data in the text, the impact of the Digital Periegesis project was initially thought of as bringing global initiatives together through the study of a single case study: Pausanias's *Description of Greece*. Indeed, the idiosyncrasies of the text provided an ideal case study for the identification, disambiguation, and analysis of these other entities beyond place, precisely because of the importance of both time and people in Pausanias's spatial representation of Greece. In doing so, the Digital Periegesis team in fact implemented all digital spatial research infrastructures. Working in tandem with these different approaches to mapping place alongside the primary humanistic purpose of the project, connecting words that denote place with the archaeology on the ground, the team produced a critical review on feasibility of current spatial data infrastructures. This includes: 1) developing a baseline methodology, on the model of the Pelagios initiative, for producing linked open data describing time periods or people; 2) supporting the development of Recogito in order to facilitate the easy semantic annotation of these data types; 3) showing the value of semantically annotating space, time, and people together—and the intersections between them—for analyzing a historical text; and 4) documenting the process in order to establish best practice.

The long-term impact of the Digital Periegesis project is to establish a practice of creating enriched digital editions and of using LOD methods in teaching and research. Digital Periegesis's ambition is that the digital edition will become a significant component of digital education in classics, ancient history, archaeological studies,

and scientific visualization more generally. The critical digital edition will enable scholars to radically reorient humanities' text-based scholarship toward comparative visual, geospatial, and material-archaeological discourse analysis with the help of existing and customized digital spatial research infrastructures. Last, but certainly not least, there is the dual gain of the project, from both humanistic-epistemological and technological-ontological perspectives. The Digital Periegesis team found ways to compartmentalize concepts of space in a centuries'-old narrative, but also to critically assess the possibilities of implementing digital spatial research infrastructures that can be sustained for decades and are used by the classics and archaeology communities.

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