DHSI

DIGITAL HUMANITIES SUMMER INSTITUTE

Modeling Texts and Maps with Semantic Annotation

Chiara Palladino and Shai Gordin

ETCL
ELECTRONIC TEXTUAL CULTURES LAB

Social Sciences and Humanities
Research Council of Canada

Conseil de recherches en
sciences humaines du Canada

Welcome to DHSI 2023!

Thank you for joining the DHSI community!

In this coursepack, you will find essential workshop materials prefaced by some useful general information about DHSI 2023.

Given our community's focus on things computational, it will be a surprise to no one that we might expect additional information and materials online for some of the workshops—which will be made available to you where applicable—or that the most current version of all DHSI-related information may be found on our website at dhsi.org. Do check in there first if you need any information that's not in this coursepack.

Please also note that materials in DHSI's online workshop folders could be updated at any point. We recommend checking back on any DHSI online workshop folder(s) that have been shared with you in case additional materials are added as DHSI approaches and takes place.

And please don't hesitate to be in touch with us at **institut@uvic.ca** or via Twitter at **@AlyssaA_DHSI** or **@DHInstitute** if we can be of any help.

We hope you enjoy your time with us!

Statement of Ethics & Inclusion

Please review the DHSI Statement of Ethics & Inclusion available here: **https://dhsi.org/statement-of-ethics-inclusion/**

DHSI is dedicated to offering a safe, respectful, friendly, and collegial environment for the benefit of everyone who attends and for the advancement of the interests that bring us together. There is no place at DHSI for harassment or intimidation of any kind.

By registering for DHSI, you have agreed to comply with these commitments.

Virtual Sessions

Your registration in DHSI 2023 also includes access to the virtual **institute lecture** sessions. Access details for these talks will be shared as DHSI approaches.

Due to the high volume of attendees, please ensure your DHSI registration name or DHSI preferred name and your Zoom name match so that we know to let you into the virtual sessions.

DHSI Materials

DHSI materials (ex. videos, documents, etc.) are intended for registrant use only. By registering, you have agreed that you will not circulate any DHSI content. If someone asks you for the materials, please invite them to complete the registration form to request access or contact us at **institut@uvic.ca**.

Auditor and participant registration

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If you registered to **audit** any workshops, note that auditor involvement is intended to be fully self-directed without active participation in the workshop. The auditor option offers more flexibility regarding pace and time with the workshop content. Your registration as an auditor will include access to some asynchronous workshop materials only and does <u>not</u> include access to live workshop sessions and/or individual/group instruction or consultation. Please direct any questions about DHSI workshop auditing to **institut@uvic.ca**.

If you registered as a **participant** in any workshops, your registration includes access to asynchronous content + active participation in live workshop session(s). The workshop instructor(s) will contact you about the date(s), time(s), and platform(s) of the live workshop session(s).

If you are unsure whether you registered as an auditor or participant, please check your registration confirmation email. Further questions can be directed to **institut@uvic.ca**.

Schedule

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The at-a-glance schedule of DHSI 2023 courses, workshops, institute lectures and aligned conferences & events can be found here: **https://dhsi.org/timetable/**

All times are listed in North American **Pacific Time Zone**.

For those who registered as participants in any workshops, live sessions for online workshops are not currently listed on the above-referenced schedule. **Instructors will be in touch with registered participants directly about the exact date(s) and time(s) of their live workshop session(s).**

Acknowledgements

We would like to thank our partners and sponsors (including the Social Sciences and Humanities Research Council), workshop instructors, aligned conference & event organizers, institute lecturers, local facilitators, and beyond for making this possible.

Further information

General DHSI 2023 information: **https://dhsi.org/program/**

Full course listings (in-person): **https://dhsi.org/on-campus-courses/**

Full workshop listings (online): **https://dhsi.org/online-workshops/**

Aligned conferences & events (in-person): **https://dhsi.org/on-campus-aligned-conferences-events/**

Aligned conferences & events (online): **https://dhsi.org/online-aligned-conferences-events/**

Institute lectures: **https://dhsi.org/institute-lectures/**

Frequently asked questions: **https://dhsi.org/faq/**

Any questions not addressed in the above pages? Please email us at **institut@uvic.ca**!

Modeling Texts and Maps with Semantic Annotation

A DHSI 2023 course led by Chiara Palladino and Shai Gordin

Contents

1. Introduction

This course will focus on the use of annotation, and particularly semantic annotation, for the digital mapping of texts and images. We will introduce the concept of semantic annotation and what that means in the context of modeling the spatial aspects of documents. We will show the role of external vocabularies and ontologies in assigning "meaning" to annotated data, and the implications for the modeling process and how we think about our sources in the digital space. Then, we will discuss what it really means to "map" something and discuss some examples: what is the impact of different kinds of visualizations? What is the relationship between maps and the real space around us? Can we extract semantic information from text on historical maps? Are maps an effective way to represent semantic information and spatial storytelling, and are there other ways to do it?

On the first day, we will have a synchronous Zoom session with introductions and a discussion on the theoretical principles applied in the course. During the week, participants will have the

opportunity to use Recogito to map visual or textual sources. Optionally, participants will also be able to use ESRI or StoryMaps JS to create space-based visualizations of their sources. On the last day, we will hold another synchronous Zoom session, where participants will share their projects and their impressions, and we will have a last discussion about the process of "digital mapping as modeling".

2. Plan for the week

2.1. Monday, June 12

Meeting time: 3 PM UTC/ 5 PM CET / 11 AM EST / 8 AM PDT / 12 PM ART / 11 PM HKT
Greetings and introductions. Basic introduction of the theme of the workshop and theoretical foundations, overview of tools for mapping and visualization. This session will be live but recordings will be made available later.

Programme

- General introductions
- Instructors and participants introduce themselves, backgrounds, and interests.
- Introduction to the key concepts
  - Short history of Spatial Humanities and GIS
  - What is Semantic Annotation?
  - What does it mean to map and model a document in the digital space?
  - What is linked geographic data?
  - Tools for digital mapping: general overview
  - The shape of spatial data and their visualization
- Presentation of the course

2.2. Tuesday through Thursday

Participants are assigned selected readings from the coursepack and explore Recogito through the asynchronous tutorials and exercises. This part of the course is asynchronous, tutorials and exercises will be pre-recorded. Space for chat and conversation will be available through the course workspace on Slack.

Programme

- How to use Recogito: The Basics. Asynchronous tutorial on Youtube:
  https://www.youtube.com/playlist?list=PLNxRy673BFeCpJN3mrNb9cNJ7CS1ELaL2

- How to use Recogito: Advanced Features. Asynchronous tutorial on Youtube: https://www.youtube.com/playlist?list=PLNxRy673BFeDQ8sWEkMDeAJuBPxqmdXQn
- Overview of ESRI StoryMaps
- Overview of StoryMaps JS
- Exercises (asynchronous).
- Mini-projects. Participants choose if they want to work on the materials provided in the Course Folder or on their own dataset (asynchronous)
- Asynchronous Q&A and chat on the course workspace

2.3. Friday, June 16

Meeting time: 4 PM UTC/ 6 PM CET / 12 PM EST / 9 AM PDT / 1 PM ART / 12 AM HKT
Participants who are willing to present their mini-projects will do so during the synchronous final session. We will have a final discussion where we will reflect on the experiences from the course. This session will be live, but recordings will be made available afterwards.

Programme

- Participants present their results live if they can, or submit their presentations as asynchronous videos or short reports
- Discussion about Recogito and mapping a textual or visual source. How was the tool experienced? What insights did it contribute, what were the hindrances?
- Summing up and goodbyes

3. Enclosed readings

Barker, Elton, et al. "Coding for the Many, Transforming Knowledge for All: Annotating Digital Documents." PMLA, 135(1), 195–202 (2020).

Drucker, Johanna. "Humanities Approaches to Graphical Display." DHQ:
Digital Humanities Quarterly 5, no. 1 (2011). Also available online:
http://journals.tdl.org/paj/index.php/paj/article/view/11

Wood, Dennis. "The Fine Line between Mapping and Mapmaking." CAR-
TOGRAPHICA 30.4, P. 50–60 (1993). Also available online:
http://www.deniswood.net/content/papers/Fine%20Line.pdf

Barker, Elton, Rainer Simon, Valeria Vitale, Rebecca Kahn and Leif Isaksen. "Revisiting Linking Early Geospatial Documents with Recogito." e-Perimetron 14.3, P. 150–163 (2019). Also available online:
http://oro.open.ac.uk/68009/1/Simon_et_al.pdf

Simon, Rainer, Elton Barker, Leif Isaksen, and Pau de Soto Cañamares. "Linked Data Annotation Without the Pointy Brackets: Introducing Recogito 2." Journal of Map & Geography Libraries: Advances in Geospatial Information, Collections & Archives 13.1, P. 111–132 (2017). Also available online: http://oro.open.ac.uk/49745/7/Simon_Barker_etal_2017_Recogito.pdf

Palladino, Chiara. "New Approaches to Ancient Spatial Models. Digital Humanities and Classical Geography." Bulletin of the Institute of Classical Studies 59.2, P. 56–70 (2016). Also available online: https://onlinelibrary.wiley.com/doi/full/10.1111/j.2041-5370.2016.12038.x

Drucker, Johanna. "Non-representational approaches to modeling interpretation in a graphical environment." Digital Scholarship in the Humanities 33.2, p. 248-263 (2018).

Chiang, YY., Duan, W., Leyk, S., Uhl, J.H., Knoblock, C.A. "Creating Structured, Linked Geographic Data from Historical Maps: Challenges and Trends." Using Historical Maps in Scientific Studies. SpringerBriefs in Geography. Springer, Cham (2020) P. 37-63. https://doi.org/10.1007/978-3-319-66908-3_3

Palladino, Chiara. "Representing places in texts. A spatial investigation into Agathemerus' *Sketch of Geography.*" *International Journal of Humanities and Arts Computing* 15.1-2 (2021): 33-59. Online: https://www.euppublishing.com/doi/epub/10.3366/ijhac.2021.0261

Easton, Donald F. "Schliemann and his predecessors at Troy." *Troia. Schliemann und Tübingen.* Ed. by E. Seidl, S.W.E. Blum, M. Pieniążek, M. La Corte. Museum der Universität Tübingen MUT (2022). P. 48-63.

4. Web resources

4.1. Course Workspace for questions and chat

The course will have a Slack workspace. The invitation will be emailed to all participants.

4.2. Resources for access to course material

- Course material is available on Box (https://furman.box.com/s/8rd2enzlo7k6tudc3lnu4wwfgfchptqk) and in the official DHSI Dropbox folder.
- Recogito: https://recogito.pelagios.org/ and https://recogito.pelagios.org/help
- Pelagios: https://pelagios.org/
- Recogito Tutorial: basic: https://www.youtube.com/playlist?list=PLNxRy673BFeCpJN3mrNb9cNJ7CS1ELaL2

- Recogito Tutorial: advanced:
  https://www.youtube.com/playlist?list=PLNxRy673BFeDQ8sWEkMDeAJuBPxqmdXQn
- StoryMaps JS: https://storymap.knightlab.com/
- StoryMaps JS tutorial: https://digitalorientalist.com/2023/04/25/knight-lab-js-and-storytelling-tools/
- ArcGIS StoryMaps: https://storymaps.arcgis.com/
- Recogito and ArcGIS StoryMaps (Tutorial by Rebecca Seifried, 2019):
  https://storymaps.arcgis.com/stories/eb0430fbf7be42039900b5616589ae2b
- Other tutorials and exercises will be uploaded directly on Box. We may also use Recogito as a sharing platform for collaborative exercises.
- Zoom links to synchronous sessions and discussion will be shared with the course participants, and recordings may be made available later in the course folder.

Coding for the Many, Transforming Knowledge for All: Annotating Digital Documents

ELTON BARKER, ANNA FOKA, AND KYRIAKI KONSTANTINIDOU

ANNOTATION—"A NOTE ADDED TO ANYTHING WRITTEN, BY WAY OF EXPLANATION OR COMMENT"—IS AS OLD AS WRITING ITSELF ("ANNOTAtion"). Among the first texts to be written down, Homer's oral poems survive thanks first to Hellenistic scholars, whose comments and explanations formed the editions that came down to us, and second to later manuscript technology, which enabled the painstaking copying of both the texts and the notes associated with them (see fig. 1). At I Annotate 2019, Gardner Campbell reflected on the meaning of *to note* and identified as its essence the idea of signing: "A sign that we formulate, a sign that we leave, a sign that *points* to something, points to a meaning, points to another word, but also points to the *pointer*. We leave signs; *we* leave signs; *I* annotate. The agency in the word note is extraordinary" (00:07:35–58). To note is, as Campbell's key*note* put it, a fundamental act of attention, of sharing, as basic as "water" or "love" (00:06:16–00:07:25).[1] To note is an essential human act.

In this essay we reflect on the role and use of annotation in the digital humanities. Just as the manuscript medium provided new opportunities for annotation, the digital revolution has the potential to radically transform what and how (and even why) we annotate.[2] In spite of its potential, however, a culture has yet to emerge that broadly supports or makes use of digital annotation in ways that would, like manuscript production in monasteries, establish a mode of behavior—a scholarly practice.[3] Rather, communities that practice digital annotation are only just beginning to emerge, and we focus on one here: Pelagios.[4] While various methods for, as well as kinds of, annotation can be applied to a digital document, Pelagios has established a process that uses semantic annotation, where concepts (such as places, people, and organizations) are encoded with additional information that is machine-readable.[5] Semantic annotation enables humans to identify references to places in individual Web documents and align those references with global place authorities, or gazetteers.[6] Through this process, not only can otherwise individually created or curated Web documents be connected, but

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heterogeneous materials and resources, from texts to images and databases, can be brought together in dialogue. Through the semantic annotation of place references, Pelagios is building an infrastructure for linking historical or historically related data on the Web.

Annotating place has significance beyond linking data: people are born, live, and die in places; events happen somewhere. Far from being static containers for culture and history, space and place are social entities produced through human agency.[7] The spatial turn in the humanities has accelerated with the advent of digital technology, its new tools and methods giving rise to a new discipline, the spatial humanities. Even though "locating historical and cultural exegesis more explicitly in space and time . . . finds patterns, facilitates comparisons, enhances perspectives, and illustrates data" (Bodenhamer, "Potential" 28),[8] spatial humanities research struggles with the ways digital tools derive from, and tend to reproduce, positivist cartographic methods, making them a poor fit for working with the complexity, uncertainty, and plurality of literary phenomena.[9]

In the rest of this essay we use the process of semantically annotating place to study an early example of spatial representation and to think through issues associated with researching textual constructions of space more generally. Our witness is the second-century CE writer Pausanias, whose *Periegesis Hellados* (*A Description of Greece*) presents a ten-volume survey of the Greek mainland from Attica to Phocis, following a counterclockwise circuit around the Peloponnese (see fig. 2). His account of the routes through the towns, buildings, monuments and artifacts found in the Greek mainland has been widely used as a guide for interpreting archaeological sites (Hamilakis).

However, using Pausanias as a straightforward guide is problematic, and not only because he shows little interest in describing natural environs or infrastructure. As Pausa-

nias himself points out, in what amounts to a statement of his method: "Such in my opinion are the best-known stories [*logoi*] and sights [*theõrēmata*] that the Athenians possess, and from the beginning my own narrative [*logos*] has picked out, from such many things, those that stand out as worth writing-up [*sun-graphein*]" (1.39.3). Pausanias's description is predicated on what he finds interesting—past stories from the places through which he passes and the sights he wants us to see.[10] This is not a straightforward guide to topographical realities but a virtual pilgrimage through an imaginary space, a past-present Greece that exists not on the ground but in the text, and in the memories and myths of local landscape(s).[11] The challenge of analyzing the organization of space and place in the *Description of Greece* is the thickness of its spatial representation, whether Pausanias is taking the reader on a tour of a temple precinct, stopping on a road to take note of a statue, or recalling the mythical stories associated with a rock.[12]

We are working on a project to produce a digital *Periegesis*, which aims to identify, trace, and explore the spatial form of, and the forms of space in, Pausanias's narrative—the ways in which place, objects, and peoples in space are described and how the narrative is organized spatially.[13] In its similar investigation of the fifth-century BCE *Histories* of Herodotus, the 2008–10 project *Hestia* had demonstrated the value of digitally mapping literary constructions of space in ways that challenged normative views of that space, mapping and studying places according to how Herodotus related them to other places rather than according to topographical location (see fig. 3).[14] Challenges remained, however, not least of all because spatial information had to be encoded by hand in an *Excel* spreadsheet (Bouzarovski and Barker) and was of such complexity that visualizations resembled "spaghetti monsters" (Malkin 18).

This brings us back to the idea and practice of semantic annotation. In the effort to facilitate linking data, Pelagios has developed an open-source browser-based tool called Recogito, which enables researchers to semantically enrich their material without the need for coding skills.[15] Using this tool, the team working on the digital *Periegesis* is annotating both the entities (places, people, and events) that Pausanias describes and the relations among them, as he moves through space (and time) linking places, objects, and stories to each other. Annotating the places themselves follows the two-step process outlined above, first identifying a word as a place and then aligning that reference to a gazetteer, for which Recogito helps by providing a map-based pop-up of options. Its tagging feature further enables us to provide additional information on, and construct a schema for thinking about, place in more depth, such as specifying whether the place is physical (a river, mountain, etc.), built (a city, temple, altar, etc.), regional (a wider geographical area), or mythical (fig. 4). By developing this schema, we are in effect producing a searchable database created from, and directly linked to, our annotated text.

While annotating people provides important context for analyzing the text's spatiality,[16] using the "event" category to identify relations is a good example of how Recogito can be customized. Where Pausanias moves through or over space, describing places (or objects) in the landscape, we mark his description as topographic. Where he moves through time, noting the history of a particular place or object, we use the category chronotopic (Bakhtin's term). Finally, where Pausanias compares one place with another, we annotate it as analogic.[17] The first two categories can be further defined with tags. Pausanias's description of place or objects in space (topographic) can be understood as either hodologic—that is, a description of a place in its landscape as the narrator moves through it (e.g., "A little

farther away from the gateway, on the right as you go in, is a bronze Heracles," [2.3.2])—or synoptic, as when a place is described as if from above (e.g., "Corinth is part of the Argolid" [2.1.1]).[18] His movement through time (chronotopic movement) is potentially even more revealing of the depth of his description, since his (re)use of the past builds the sense of place. From our initial work, movement appears to be a key criterion: when Pausanias introduces a historical and mythical account, it is largely in terms of how a person representing one place moves to another, intervenes in it, or even transforms it, actions that can be categorized using the relational tagging feature (see fig. 5).[19] Annotations like these present a picture of how the narrative moves not only through space and time but through different spaces at different times.[20]

While Recogito offers a suite of different download formats to enable other applications to further analyze the annotations and place references,[21] insights can be gleaned simply from its built-in map visualization. While figure 2 reproduces Pausanias's tour of the Greek mainland, and shows the overt structure of his narrative, it fails to capture the breadth and relatedness (let alone depth) of his text's spatial construction. Contrast figure 6, which displays all the places currently annotated in the digital *Periegesis*. Though by no means comprehensive, it is enough to demonstrate the extent to which Pausanias relates this core territory to places all around the Greek world.

Annotating in Recogito has raised three key interrelated points. First, reading. Much of the new, exciting work of the digital humanities has focused on big data and seemed to emphasize distant reading. Paradoxically, our experience of working on a digital platform—and developing a practice of annotation—has meant thinking about individual places in terms of a broader schema and their relations to each other, bringing us closer to the text and slowing our progress through it. Second, visualization. The ability to "place"

theories and methodologies

places enables a narrative to be experienced spatially, the value of which extends far beyond simply mapping text. By creating a dialogue between the text and the map (through annotation) we can better trace and analyze how narrative is grounded in cultural ideas of space, and how, in turn, those ideas are deeply embedded in ideological structures.[22] Lastly, collaboration. The work that we have been describing here far exceeds the work of an individual scholar. Not only are we ourselves a team; we are using tools built by others and developing a methodology informed by scholars working on similar issues.[23] It is this vision of interdependent groups working alongside each other that we believe to hold the greatest potential for the digital humanities. It is a legacy that goes back to the many hands that, annotating alone and together, helped preserve the texts that we have in the first place.

NOTES

1. According to Campbell, the noun form of *note* is one of the earliest 2% of entries recorded in the *Oxford English Dictionary*, along with such words as *fall*, *run*, and *water*, and the verb form of *note* is one of the earliest 3% of entries, along with *call*, *love*, and *put* (00:06:16–28).

2. On the multitextual reading facilitated by manuscript technology, and the capacity for digital annotation to enable similar linking strategies, see Ebbott. See also Dué and Ebbott, which takes the long view on how various new technologies (the manuscript, the digital text) affect editorial choices.

3. On the interdependence of literary and sociopolitical form, see Levine, especially the discussion of the importance of the monastery in the formation of the university (57–65). On form structuring everyday experience, see Foucault. On communities of practice (*habitus*), see Bourdieu.

4. Hypothesis, the sponsor of I Annotate, is another such community (web.hypothes.is/about/).

5. For information about Pelagios, see its Web site, pelagios.org/about-us/; Barker and Isaksen; and Vitale et al. On semantic annotation, see "What Is Semantic Annotation?"

6. As well as providing information about places that are useful for their understanding—such as coordinates, type, and bibliography—gazetteers critically provide Uniform Resource Identifiers (URIs), which are essentially unique code numbers used to identify and disambiguate different places. See Simon et al., "The Pleiades Gazetteer"; and the World-Historical Gazetteer (whgazetteer.org/).

7. On space and place as active settings for historical action, see Certeau. On the notion that they are socials products, see Lefebvre. On the idea that place is space that is valued, see Tuan (1977). See also Cresswell; Massey.

8. On the potential to explore "subjective geographies through the spatial representation of qualitative, or fuzzy, data," see Gregory and Cooper 89.

9. Geographic information systems (GIS) find it difficult to handle uncertain, incomplete, and ambiguous data (Gregory and Healey). Text-based research raises "fundamental epistemological and ontological issues for GIS applications" (Harris et al. 228). Conventional cartography is "typically totalizing, usually two-dimensional, Cartesian, and very undialectical" (Harvey 4).

10. A greater literary appreciation for Pausanias's descriptions has emerged only recently, since Habicht. See Alcock and Osborne; Arafat; Pirenne-Delforge; Alcock et al.; Akujärvi; Hutton; Pretzler.

11. Whitmarsh observes how Pausanias presents his target of describing πάντα . . . τὰ Ἑλληνικά ("all that is Greek") in terms of what is ἄξιον μνήμης ("worthy of memory"; "Mnemology" 49). On Pausanias's constructed itineraries see Hutton. On the idea of virtual pilgrimage I have benefited from conversation with Jody Cundy; on this topic see also Elsner; Rutherford. On how Pausanias traces paths of knowledge, see Hawes, "Pausanias' Messenian Itinerary." On Pausanias and myth see Hawes, "Of Myths." On so-called glocalization see Whitmarsh, "Thinking Local."

12. Pausanias presents a thick account by offering a series of local snapshots in a broadly Hellenic framework (Hawes, "Pausanias").

13. See the project's Web site: periegesis.org/. Deriving from the verb *periēgeisthai* ("to lead or show around"), *Periegesis* has the double sense of description (of place) and movement (through space and time). The Digital *Periegesis* is funded by the Marcus and Amalia research foundation for three years (2018–21).

14. See the project's Web site: hestia.open.ac.uk/. For a discussion of the technology involved in the project, see Barker et al., "Telling Stories." For the argument that Herodotean space is fluid, transformative, and relational, see Barker and Pelling. On literary maps in general, see Moretti.

15. For details about Recogito (recogito.pelagios.org), see Simon et al., "Linked Data Annotation."

16. People are often proxies for place in that their actions occur in a particular time and place, or else they

can act as a proxy for place: e.g., when Herodotus mentions Darius, it is most frequently in his capacity as a representative of Persia (as the king) rather than as an individual. See Bouzarovski and Barker. Annotating people in Recogito is currently a one-step process, though attempts are ongoing to create global prosopographies on the model of gazetteers; see, e.g., SNAP:DRGN, a global authority list for ancient people (snapdrgn.net/).

17. The first two aspects have been broadly recognized. For movement through space, see Hutton. For movement through myth, see Hawes, "Pausanias" and "Pausanias' Messenian Itinerary." In her PhD dissertation, Cundy identifies an equivalent to our third aspect, when the text, which is for the most part "pedestrian" and "hodological," undertakes great leaps in space (141). The "hyperbatic" moment disrupts "the topographic flow of the text and takes the reader to a far off-place" (145).

18. On both aspects in Herodotus, see Bakker.

19. For movement and transformation as key markers of spatial relations, see Bouzarovski and Barker.

20. Other kinds of annotation can be made; e.g., tags can mark focalization, locatives, and time phrases.

21. Recogito enables many download options (e.g., CSV, KML, and JSON-LD) for use in a variety of applications, including simple spreadsheets (like *Excel*), GIS, and Gephi, as well as for consumption as linked data.

22. On maps as part of the investigative process and as a new critical practice, see Bodenhamer, "Narrating Space."

23. For instance, we are using Brady Kiesling's Web site topostext.org to build new gazetteers for ancient Athens and Corinth, contributing to the work of Greta Hawes and Scott Smith in compiling a list of mythical names from primary sources, and working with Chelsea Gardner and Rebecca Seifried to establish the ground truth of travel accounts of Mani. See Gardner and Seifried.

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Barker, Elton, et al. "Telling Stories with Maps: Digital Experiments with Herodotean Geography." Barker et al., *New Worlds*, pp. 181–224.

Barker, Elton, and Christopher Pelling. "Space-Travelling in Herodotus Book 5. Barker et al., *New Worlds*, pp. 225–52.

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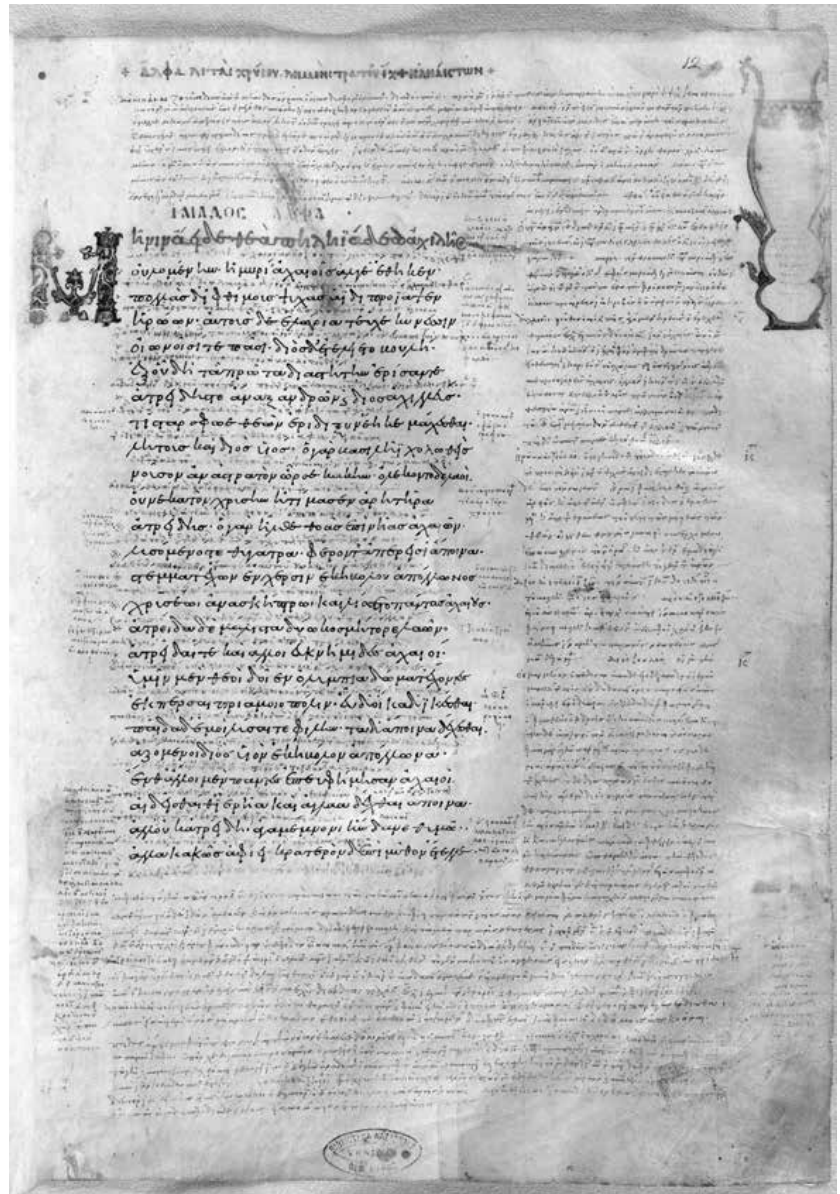
Fig. 1

A portion of the manuscript known as Marcianus Graecus Z.454 (= 822), or Venetus A, which is the earliest extant manuscript of Homer's *Iliad*. Shown here is folio 12 recto, which contains book 1, lines 1–25. The image can be found at www .homermultitext .org/hmt-image -archive/venetus-a/ VA012RN-0013.tif.
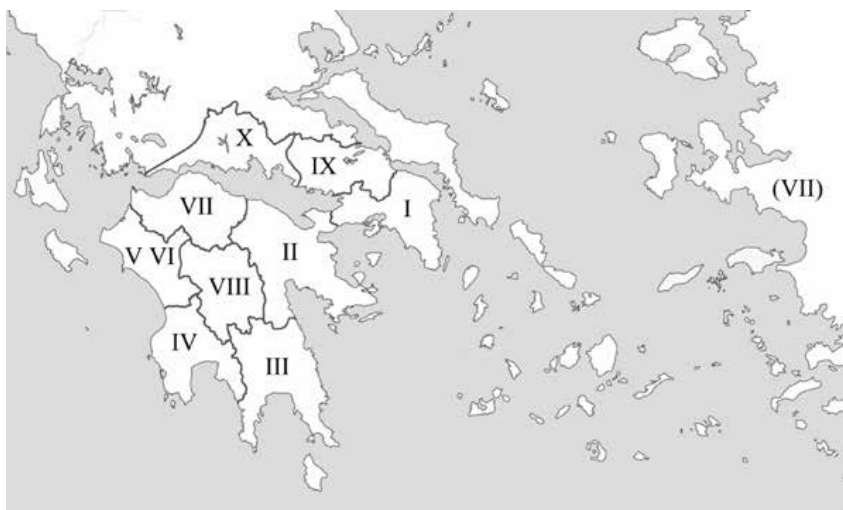
Fig. 2

The territories of mainland Greece that Pausanias describes and the order in which he describes them.
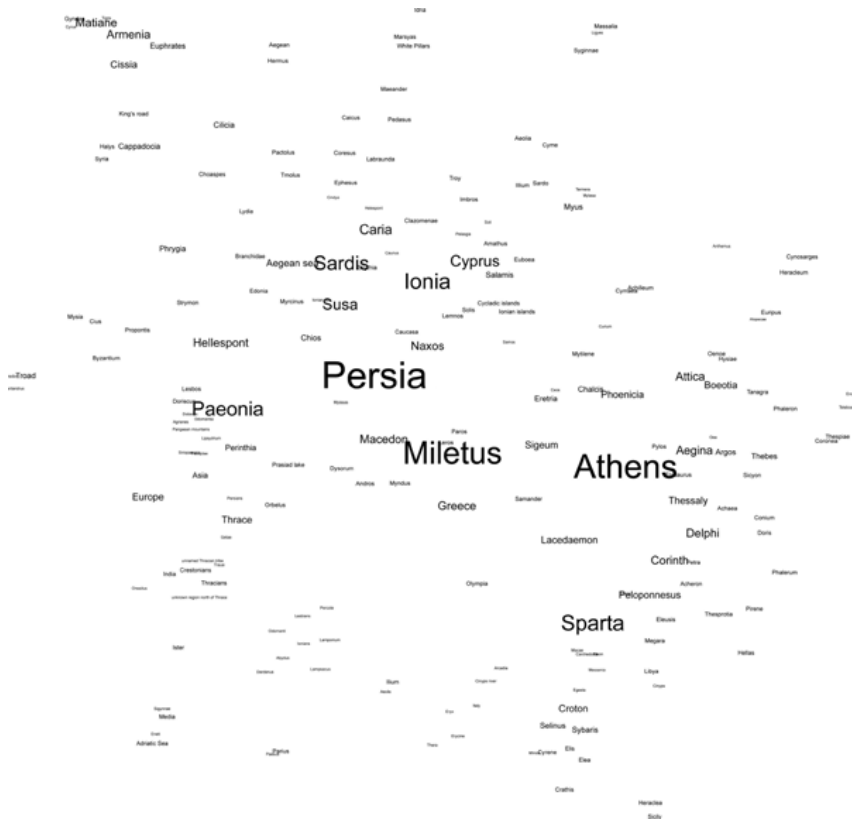
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FIG. 3

The world of book 5 of Herodotus's *Histories*, organized by action and influence rather than by topography, visualized using Science of Science (Sci2), a tool provided by Indiana University and SciTech Strategies (http://sci2.cns .iu.edu) with the support of Scott Weingart. The size of the font shows the strength of the relations of each place; the bigger the font, the more relations a place enjoys.
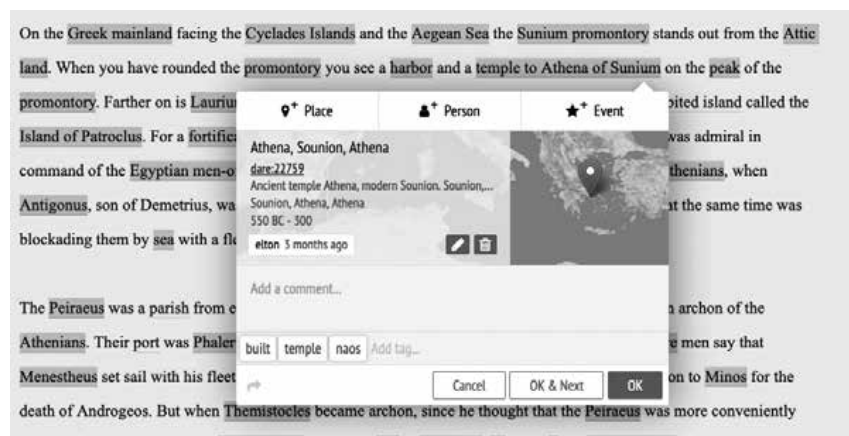
FIG. 4

Recogito allows researchers to annotate a place in Pausanias by identifying the character string as an entity, aligning it with a global gazetteer, and defining it by tags.
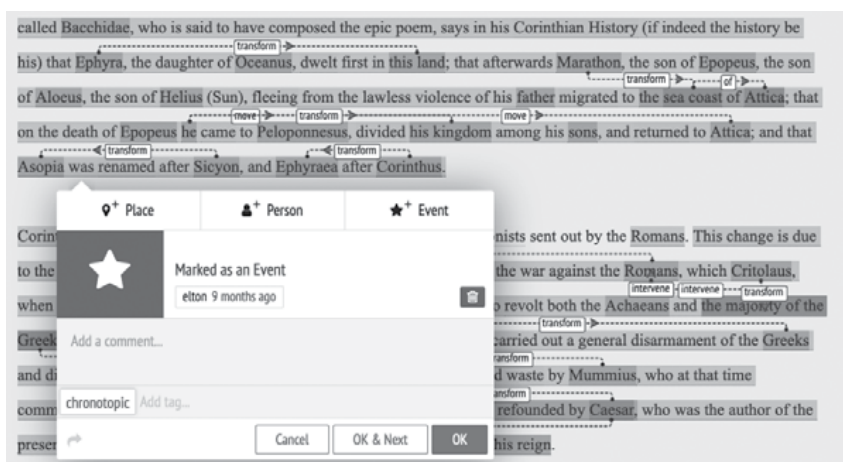
Annotating the "event" entity to mark all the relations in a given section according to whether they are topographic, chronotopic, or analogic.

All the places to which Pausanias refers in the *Periegesis* annotated using Recogito's built-in map visualization.

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Revisiting Linking Early Geospatial Documents with Recogito

Journal Item

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Revisiting Linking Early Geospatial Documents with Recogito

Summary: Recogito is a web-based environment for collaborative semantic annotation. It is open source software, and provides support for working with either text or image documents, including those served via the IIIF protocol. Originally, the tool has been designed for geographic annotation, i.e. the transcription, marking up and geo-resolving of maps and geographical texts (such as itineraries and travel reports) in the context of historical scholarship, e.g. to map or extract data from a source, or to prepare a digital edition. Over time, however, Recogito's feature set has grown to provide more general annotation functionality, broadening the scope for further potential application areas. Following up from an earlier article we published in e-Perimetron in 2015, in which we first introduced Recogito, this article looks back on the past four years of use and development. We present how Recogito has technologically evolved; how it has been applied in practice in different projects and for different purposes; and how a vibrant user community has sprung up around it that is shaping its further development. The paper also looks forward to some planned next steps, and sets out our future vision for Recogito's long-term development and sustainability.

Introduction

Recogito (https://recogito.pelagios.org) is an open source tool for semantic annotation: i.e. the marking up of text and images with references to controlled vocabularies. Recogito provides a personal workspace for users to upload, organize and share materials, and collaborate in their annotation and interpretation. Through an easy to use interface, users can: navigate digitised documents; create personal collections; transcribe toponyms on scanned maps; geo-resolve toponyms and textual place references by linking them to gazetteers; export their work in a range of data formats or display their results on interactive maps. Recogito also provides support for more general document annotation, such as adding free-form commentary or tags to text passages or image regions. Users can either work alone in a closed workspace, together as groups of collaborators, or in a public setting, using Recogito as a crowdsourcing platform. Recogito keeps track of version history and edit provenance, and can be customized with different name authorities for geo-resolution. It is also easy to apply Named Entity Recognition (NER) to texts, with the option to choose between different recognition engines and gazetteers. Recogito is being maintained and developed further under the umbrella and activities of the Pelagios Network (https://pelagios.org), an open, non-profit association advocating and enabling the production and use of linked open geo-data in the humanities and cultural heritage.

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We first introduced Recogito in a paper in e-Perimetron four years ago (Simon et al. 2015). Back then, Recogito had been developed as a tool for internal use by the project team of the *Pelagios 3* research project (Isaksen et al. 2014). By the end of the project, Recogito had attracted widespread community attention. This prompted us to seek additional funding to continue and expand its development. With renewed support from the Andrew W. Mellon Foundation, there was an opportunity to rethink the design of the whole platform from the ground up, taking into account what we had learned in Pelagios 3. The development of "Recogito 2.0" marks a complete rewrite of the system, with: a stronger focus on the user interface and its usability; support for general annotation and commentary in addition to geo-resolution; and a design that gives users the autonomy to create their own accounts and manage their own personal collections and collaborator groups (Simon et al. 2017). Officially released in December 2016, version 2 also included a number of technological additions, such as support for TEI-encoded text and the ability to work with images served via the IIIF protocol.

Since its release, Recogito has been in continuous use and development. It has progressed through another major and several minor releases (with the current release being v3.3), and earlier this year received the Digital Humanities Award for "Best Digital Humanities Tool or Suite of Tools".[1] At the time of writing, our public instance at https://recogito.pelagios.org hosts more than 4,200 registered users and almost 3.5 million annotations, and receives between 200 and 2,000 user edits in a given day. In this paper, we look back over the past four years to present and reflect on Recogito's evolution since our introductory paper, and to highlight some of the exciting work that scholars around the world have been doing using our tool. We also look forward to sketch out possible future steps in terms of functionality and architecture, before outlining how interested individuals and institutions can become involved in Recogito's further support and development by joining the Pelagios Network.

Related Work

Annotation is well-recognized as a fundamental scholarly practice common across disciplines (Unsworth 2000). The idea of adding notes or marginalia to documents dates back at least as far as the medieval manuscript. But it is within the digital realm that annotation emerges as a powerful means of facilitating research, by enabling researchers to share and exchange knowledge, and collaborate in the analysis and interpretation of source material on a global level (Barker and Terras 2016). Annotation of place names and other kinds of geographic entities—such as peoples, regions or natural features—can be an important first step in the analysis of many different kinds of historical sources, in particular travelogues, histories, encyclopedias and, of course, maps. At the same time, the ever-increasing importance of the web as a medium for publication, curation and exchange of research data, along with the growing adoption of computational tools in the humanities (Bodard and Romanello 2016), calls for the development of tools and platforms that any researcher can use.

In recent years, significant progress has been made towards enabling semantic digitization of old maps—i.e. reproducing not just the map image, but capturing aspects of the content through transcription, vectorization (Iosifescu et al. 2013), annotation of symbology and toponymy (Chiang and Knoblock 2014, Höhn and Schommer 2016), and geo-referencing (Fleet et al. 2012). Automated ap-

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[1] http://dhawards.org/dhawards2018/results/

proaches for implementing these tasks have become increasingly feasible, yet technical challenges remain high, especially when dealing with earlier, hand-drawn maps (Simon et al. 2014).

When we approached the task of semantically annotating a large corpus of maps and geographical texts in Pelagios 3, we felt that there was a distinct gap in the landscape of tools available to digital humanities scholars. We needed a tool that would, on the one hand, facilitate quick and efficient work by enabling a degree of automation but, on the other, emphasise manual intervention and strong editorial control to support the curation of quality data–all, of course, while being easy to use for a non-technical user. While environments that support manual annotation and editing tasks for digital humanists do exist, each has its own unique focus. Annotation Studio[2] and Hypothes.is,[3] for example, represent two general purpose annotation environments, not focused on semantic annotation (and, in the case of Hypothes.is, designed to work with existing online content rather than resources uploaded and managed by the users themselves, as was a requirement for us). Digital Mappa[4] is an open access Digital Humanities platform which includes annotation and linking functionality, but is designed for the creation and curation of digital scholarly publications. Another class of tools that Recogito is related to, and aims to complement rather than compete with, are transcription tools like FromThePage[5] or Scripto.[6] While (or because) the focus of these tools is different—namely the manual transcription of historical sources or the correction of OCR transcripts—we see significant benefit in their integration within a broader workflow. Allowing a researcher to transcribe from a source first, for instance, before moving to Recogito to perform NER, map toponyms collaboratively, and produce a TEI/XML edition for publication and storage in an institutional repository.

A Guided Tour of Recogito

While the core purpose of Recogito has remained largely unchanged from its initial idea in 2015—namely to provide an efficient environment to mark up texts and images with metadata about the places they refer to—its user interface, feature set, and technical architecture have undergone major revisions. New functionality has been added, from small productivity enhancements to major feature extensions, predominantly in response to direct feedback from our user community.

The component that has perhaps developed the most since Recogito's early days is the workspace. The workspace is where all document management functionality resides. It is the personal environment to which users upload texts, images or data tables, import documents from IIIF or CTS[7] endpoints, and perform standard file management operations like creating folders, or moving or deleting documents. The workspace interface (Fig. 1) underwent a complete redesign in January 2019. It now includes drag-and-drop import; functionality to configure the metadata fields or annotation metrics that are displayed in the documents table; options to customize folder views with additional introductory "readme" text; and search functionality, both within a user's own or shared documents, as well as within all public documents in the system.

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[2] https://www.annotationstudio.org/

[3] https://web.hypothes.is/

[4] https://www.digitalmappa.org/

[5] https://fromthepage.com/

[6] http://scripto.org/
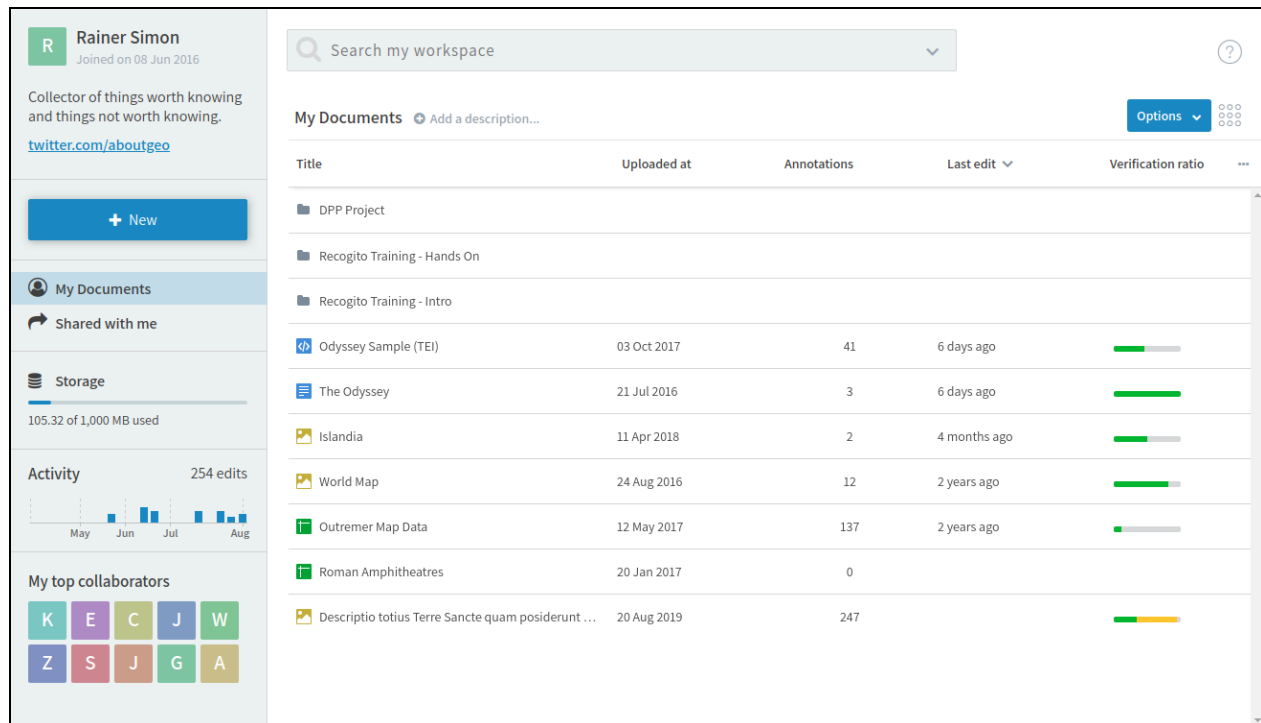
[7] http://cite-architecture.org/

Figure 1: The personal workspace.

When opening a document from the workspace, Recogito provides several document views:

- **the annotation view** offers tools to make selections on the source document, and add elements (commentary, tags, gazetteer identifiers, etc.) that together comprise the annotations
- **the map** visualizes the geographical metadata associated with the document by means of gazetteer annotations
- **the annotation statistics page** visualizes metrics on user activity, entity resolution and tag use in the form of interactive charts and lists
- **the downloads page** lists the data export options available for the document
- **the document settings** allow document owners to manage properties such as the document's descriptive metadata, gazetteer preferences, or sharing and collaboration modes.

The annotation view is where users will likely spend most of their time. It shows a reading view of the text or table, or a zoomable view in case of images (Fig. 2), and provides tools for selecting text passages, table rows or image areas, respectively. Texts can be annotated using standard mouse-selection behaviour, similar to that in any text processing software (i.e. clicking and dragging with the mouse or double-clicking a word). The image annotation view provides a number of selection tools, including basic point or rectangle selection, as well as specialized tools that have been added to support map-specific use cases, such as a tool for selecting a map symbol in connection with a toponym label. After making a selection, a popup window opens that allows the user to: add commentary and tags; reply to previous comments, if any; (in the case of images) add transcriptions; and optionally classify the highlighted section as a "place", "person" or "event". If a place classification is made, Recogito assigns it an automatic gazetteer match, marking it as "unverified". The match will remain unverified until a user reviews and confirms it, using the inline mini-map (a one-click operation), or corrects it through the built-in gazetteer search. Including this type of quality control workflow—

while at the same time ensuring the process remains quick and efficient—has been a fundamental design principle for us, and a core feature from the very beginning of the system.
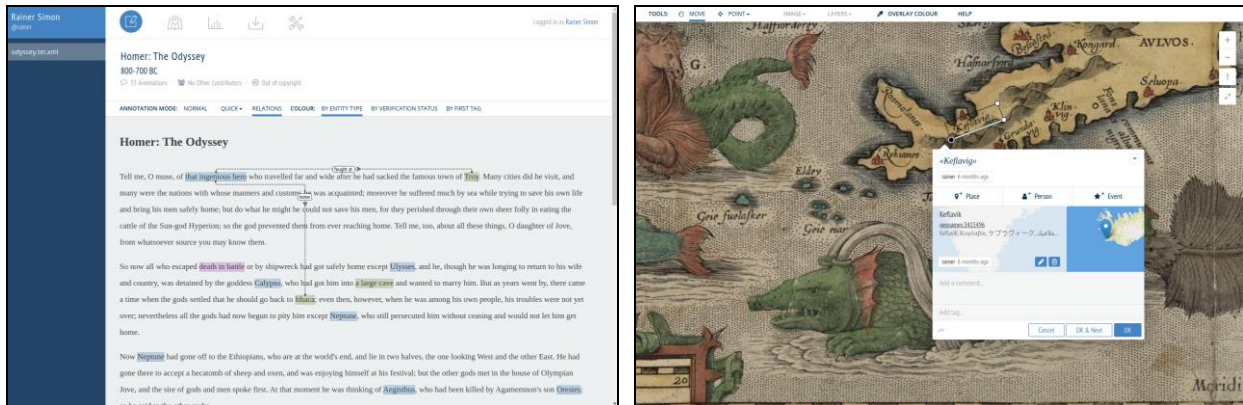

Figure 2: Text (left) and image annotation (right) views.

A key difference between the current version of Recogito and its first incarnation is a strong focus on supporting annotation as a fully collaborative process. Each single contribution to an annotation—comment, reply, tag, entity classification, gazetteer match—is individually associated with the user who made it, and the time it was made. This allows annotations to essentially function as "micro discussion threads" with multiple components and participants. Furthermore, because Recogito keeps an audit trail of additions and changes, it is possible to inspect the version history of the annotations, and revert the document to a previous state in time.

The map provides an overview of all places that have been identified in the document. Frequency of occurrence is symbolized by marker size—the bigger the marker, the more often the place appears in the document. Clicking a marker opens a popup showing the annotated text- or image-snippet (cf. Fig. 3), and enables the user to jump back directly to the corresponding section in the annotation view. The map also provides a number of colouring options in order to visualise different aspects of the annotation data. For example, it is possible to colourise the map based on document part, the tags used in the annotations, or the verification status of the gazetteer matches.

The annotation statistics interface provides charts and lists covering various annotation metrics, e.g. on editing activity, verification completeness, or the use of gazetteers and tags. These statistics can be useful, for example, in order for an instructor to survey progress in a team or among students, to spot outliers (such as the same toponym being assigned to different gazetteer identifiers), or to identify problem areas (such as a particular toponym being flagged for attention).
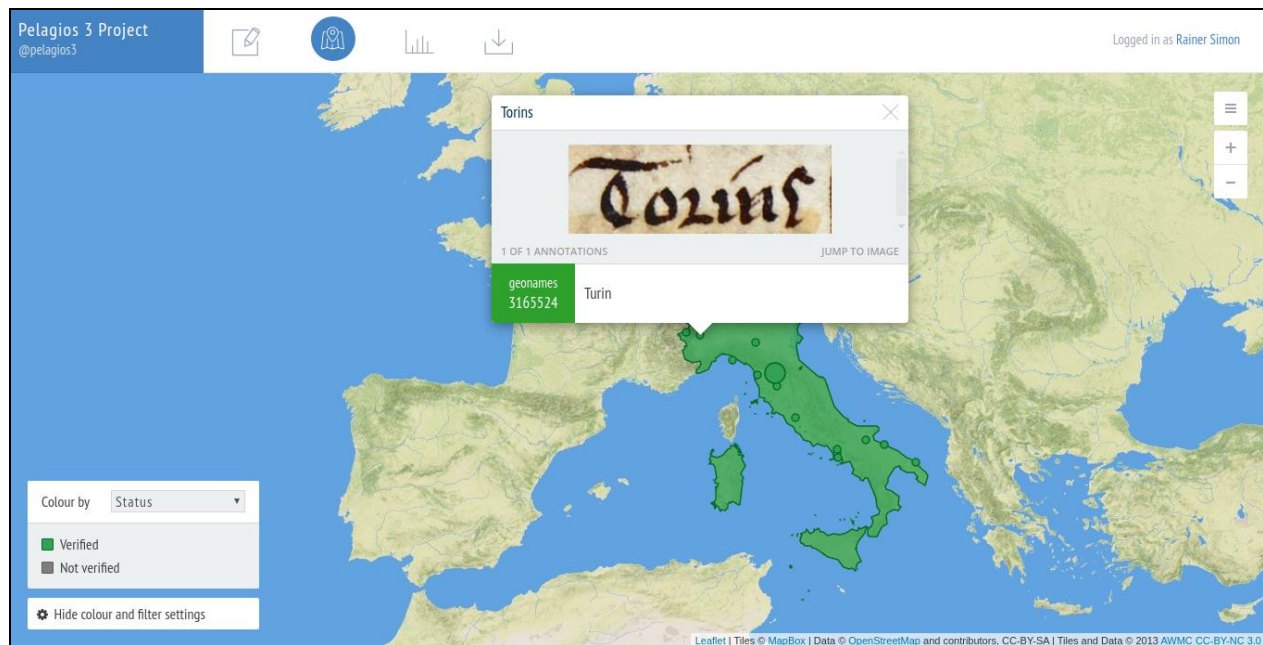
Figure 3: Map view.

The downloads page, while fairly minimal in appearance, perhaps reveals most about how our think-ing has evolved over time in relation to Recogito's role in the wider landscape of Digital Humanities research software. The initial version of Recogito offered only limited options for exporting data from the system—just enough to extract raw annotation data as a dump file, or for backup and restore pur-poses. A key goal when revisiting the system design was for Recogito to be more open, allowing us-ers to pull in data from different sources as seamlessly as possible, enrich them with annotations, and then easily move their data out of Recogito into other environments for further analysis, processing or publication. We want Recogito to be able to function as one step in a pipeline of tools, in a scholar's unique personal workflow. Extending the number of input and output channels, as well as catering for a wider range of user needs, skill sets and use cases, has been an important area of work. While such work can never be entirely finished, the downloads page represents an important step towards greater interoperability. The page lists a variety of available export options, depending on the format of the document (and the types of annotations it contains), and grouped by the nature of the export: "raw" annotation data can be downloaded in RDF, the native data format of linked data (following the W3C Web Annotation model),[8] as well as in a simple spreadsheet form. For users primarily interested in reusing the geographical data, e.g. in GIS tools or web mapping frameworks, Recogito offers GeoJSON and KML exports, including a KML flavour specifically designed for compatibility with the DARIAH GeoBrowser.[9] Text documents can be exported as TEI, with annotations embedded into the TEI markup. (In cases where the text was initially imported as a TEI/XML document, Recogito merges the annotations with the original TEI on the fly. If the text was uploaded as a plaintext .txt file, Recogito first applies a basic built-in XML template to transform the text to TEI.)

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[8] https://www.w3.org/TR/annotation-model/
[9] https://de.dariah.eu/geobrowser

The document settings allow users to control various administration-related aspects of their documents, in particular, privacy and access privileges. Turning Recogito from what was effectively a single-user tool into a collaboration platform has been a core goal in the transition from version 1 to version 2. Users now have fine-grained control over which aspects of their work they share, and with whom. Should they choose to, they can share a document with specific users only, allowing them either read-only or write access. Alternatively, they can make documents fully open to anyone on the web. In this case, it is possible to control whether visitors will be able to access the full document content (i.e. text, image or table), or only the map and annotation data, which would be necessary, for example, if the content itself is under copyright. It is also possible to enable public write-access: in this case, Recogito can function as a crowdsourcing tool that allows any visitor to create annotations. Sharing settings can also be applied to document collections as a whole, in order to simplify group management, as in classroom work.

In recent months we have experimented with a number of extensions, which have aimed either to address specific feature requests from our community, or to enhance social collaboration, visibility and discoverability of public content in Recogito. An example of the former is "relationship annotation",[10] a feature in the text annotation view that enables users to draw a connecting arrow between two annotations, in order, say, to express a relation between a particular person and a place (cf. Fig. 2, left). Examples of the latter include: activity feeds that enable collaborators to stay up to date with the activity of a certain group of users or on a particular document; a recommendation system able to suggest "related documents", based on similar metadata and the amount of correlation between the annotated entities; or the ability to create copies of another user's public documents in your own workspace (akin to the process of "forking", a well-known collaboration pattern in open source software development).

Scholarly Research with Recogito: Highlights

Recogito has had significant uptake among researchers, who are using it for different reasons and in different ways. Some are single scholars, working through a set of texts or images on their own, while others are part of larger groups, working collaboratively. Because soliciting and acting on feedback has been built into the way Recogito is developed and updated, we have been able to discover a great deal about how researchers are using our tool, and we realised early on that it is almost impossible to preemptively guess how researchers might use it, or what they might do with the resulting annotations. Being flexible and responsive to these various needs (such as making more storage space available to scholars working on large images, or incorporating unexpected feature requests) has resulted in us being able to build strong working relationships with scholars from a broad range of disciplines and regions. The four examples below illustrate some of the ways in which researchers are using Recogito to annotate complex documents, work with non-Latin alphabets, or integrate other tools and methods such as TEI and OCR.

The Lazarus Project is a multispectral imaging collaboration based at the University of Rochester which employs state-of-the-art technology to digitally recover faded, burned or otherwise damaged

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[10] https://recogito.pelagios.org/help/relations

documents (Davis and Zawacki 2019). Within the project, the team members responsible for processing the images need to effectively share their results, while the scholars deciphering the recovered texts need to be able to communicate (for example) which portions of the object need further processing, and create notes directly on the recovered digitized objects. The team commented on the inadequacy of workaround solutions (e.g. sharing via Dropbox, transcribing in standard word processing software), and stated that Recogito had solved both the sharing and the annotation problem for them. They also noted that Recogito's privacy control settings were invaluable for them, since many of their projects involved proprietary or sensitive objects, and are sometimes carried out under non-disclosure agreements.

Digging Into Early Colonial Mexico is a multi-disciplinary, collaborative project, run by the University of Lancaster (UK), the National Institute of Anthropology and History (Mexico), and the University of Lisbon (Portugal), which is developing methods and tools for mining data from textual and pictorial historical records (Murrieta-Flores and Bellamy, 2019). Their corpus is a part of the *Relaciones Geográficas de la Nueva España*, the results of an ordinance by King Philip II of Spain in 1577 to survey the Spanish realm, including the Viceroyalty of New Spain, which today covers the territory of Mexico and Central America. As well as needing to process some 2.8 million words in Spanish and 69 different indigenous languages, the *Relaciones* include over three dozen *pinturas*—plans of regions which depict a range of geographic information, such as streets, towns and villages, ports, coasts and islands. These *pinturas* are rich in both textual and pictographic information and their analysis requires a tool which is able to handle these simultaneously. Recogito offers the opportunity to do so, in a way which would not be possible without computational methods. The team also highlighted the value of Recogito's map view, which allows them to use both their own and other gazetteers to geographically locate the identifiable sixteenth-century places depicted on the pinturas, thereby highlighting the alternate ways in which space was conceptualised and represented by the creators of the paintings.

Kima[11] began in 2016 as a project which intended to lay the groundwork for a comprehensive, dynamic and interoperable gazetteer of historical place names in languages written in the Hebrew script (which includes Hebrew, Yiddish and Ladino). While the initial version of the Kima gazetteer provided a stable, shared digital reference for typonyms, it was also somewhat unbalanced: it consisted of substantial attestations from the ancient world and late antiquity, and a large number of modern and early modern catalogue-based attestations, but very few medieval sources. The breadth and variety of Kima was bolstered by the creation of a specialized Recogito NER plugin,[12] which enabled the automatic tagging of place names in Hebrew script texts. Making use of newly-digitised sources, OCR and OCR correction, and using Recogito to create annotations, Kima was able to add place names from two bilingual editions of medieval travel narratives. Both the Kima gazetteer and the Kima Hebrew NER plugin are now available to all users of Recogito.

Pelagios al Sur. While interest in the Digital Humanities as a scholarly field is growing in Latin America, the weakness and obsolescence of much of the digital infrastructures available to researchers is a significant hindrance. This prompted a group of scholars in Argentina to launch *Pelagios al*

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[11] https://geo-kima.org/kima
[12] https://github.com/dimidd/kimaner

Sur. Both a project and a network of researchers, it aims to extend Pelagios's free and open source tools beyond the Euro-Asian bias of ancient world, medieval, and early modern studies. In a recent case study, they used Recogito to geographically annotate a corpus of early Argentinian texts, producing a TEI edition by enriching it with references to an early colonial Americas gazetteer. Recogito offered both researchers and students an opportunity to work collaboratively online, without the need for programming knowledge or infrastructure setup. The Pelagios al Sur community has launched a new initiative in 2019, with the aim of further extending TEI support in Recogito, specifically regarding the creation of digital scholarly editions.

Recogito in Teaching

Recogito is also being increasingly adopted in teaching. Over the last few years, it has proven to be useful in various pedagogical contexts, from entry level undergraduate classes, with students who are approaching the Digital Humanities for the first time, to specialised training workshops for academics and professionals in the GLAM sector.

As a free, easy to use, and visually appealing platform, Recogito has featured regularly in Digital Humanities schools, targeting researchers who want to improve their digital skills and explore new approaches. For example, at the Oxford Digital Humanities Summer School and the Linked Open Data Indian Summer School in Mainz, Recogito has been used as an intuitive and engaging introduction to Linked Open Data, by virtue of emphasising concrete applications over abstract concepts like Semantic Annotation, RDF or URIs. On other occasions, in workshops held in (among other places) Sofia, Cluj-Napoca, Ankara, Tbilisi, London and Athens, Recogito has been used as part of a "reference suite" of entry-level Digital Humanities tools which are easy to learn, but flexible enough to be used in a number of research contexts. The range of download options available in Recogito makes it highly suitable to be used in conjunction with other tools, enabling instructors to demonstrate possible workflows, and inviting attendees to find their own. The most popular digital pipelines suggested in these contexts have exploited, for example, the use of Recogito to mark up epigraphy according to the TEI Epidoc standard; the export of data from Recogito into the free GIS application QGIS; or the visualisation and analysis of Recogito "relation annotations" in the free network analysis application Gephi. Recogito has also proven useful for more advanced topics, such as within postgraduate modules that focus on digital geography and mapping. In the "Maps and Apps" module at King's College London, for example, Recogito is now regularly used as a means to introduce students to digital mapping, and to show the potential of digital gazetteers and Linked Open data technology in action.

At the same time, we have witnessed an increasing demand for Recogito in humanities syllabi as a tool to explore, visualise, discuss and analyse historical texts and documents. At the undergraduate level, and more likely with younger students, Recogito and the gazetteers it includes have proven to be an effective way of bringing historical sources (often in their original language, like ancient Greek or Latin) to life. The interaction with the text through the annotation interface and the map visualisations, and the active discovery of the locations of ancient places supports collaborative and engaged learning. It also prompts discussion on the evolution of places, from both a geographic and linguistic perspective. As argued by Mostern and Gainor (2013), an approach that combines historical sources with the spatial information they disclose helps students understand the weight of spatial dynamics when observing and analysing historical and cultural phenomena. In this way, Recogito provides an

intuitive and versatile means of exploring historical and literary documents, where annotation is used as a gateway to close and critical reading, both individually and collaboratively.

Using Recogito in the classroom also supports the acquisition of methodological skills, especially when used collaboratively. A popular way of using Recogito in teaching involves self-organised group work, during which students have to come up with meaningful research questions that they aim to answer by means of using annotations, relevant tags, and suitable map visualisations. This process forces students to think harder about their questions and approach, discuss challenges and insights with other members of the team, and constructively agree on a common line of research. The use of tags, in particular, often stimulates discussion about what categories to use, in which ways, and whether there are any exceptions, which encourages critical analysis of concepts. Even deceptively simple labels such as "place" and "person" were, for example, discussed at length by a group of students of Classics at a class at the University of Zagreb.

Recogito's sharing options allow it to be used to submit official assignments, both individually or as a group. Each annotation has a specific author and time stamp, making the assessment straightforward and safe. The instructor can comment directly on each annotation, providing, potentially, very accurate feedback. Annotating documents in Recogito and producing related visualisations is currently used as an official way to assess students in at least three higher education institutions (University of London, Boğaziçi University, Istanbul and King's College London).

One last aspect we want to highlight is that the use of Recogito—particularly in conjunction with other tools—teaches, indirectly, another skill that is crucial to the digital humanist: the ability to use digital resources creatively, sometimes stretching their scope, and the promotion of a student's active role in the scholarly community. As demonstrated by undergraduate and postgraduate students in Historical Geography at Boğaziçi University, Istanbul, Recogito can be useful not only in the spatial analysis of historical documents, but also in support of the creation of entirely new resources. As a result of their efforts in annotating primary source Ottoman documents, they have also made the first steps towards building an Ottoman gazetteer.

Conclusion

In this paper we have presented an overview of Recogito, our open source platform for collaborative semantic annotation. Having reviewed its current state, and the past four years of development, we highlighted some ways in which scholars have applied it for their own research needs, and how it is being used in teaching. A key take-home point for us has been the huge variety—and the fair few surprises—in its usage: what features get used most (and how); what new functionality gets requested; and which use cases turn into "core interests" of the user community. To sum up what we have learned, we identify three key roles that have emerged for Recogito:

- As a *teaching tool*: Recogito provides an easy entrypoint, suitable for students making their first foray into the Digital Humanities. With a low barrier to entry, and a user interface that is easy to grasp, Recogito can teach basic digital skills before one turns to more complex data processing environments, or function as a gateway to close and critical reading of historical sources, especially in a collaborative setting. Out of the box, Recogito provides an accessible environment for going through the process of data preparation, marking up, and publishing a

minimal digital edition as the result of student assignments, without the need for specialised technical skills.

- As a *collaboration space*: Recogito makes it easy to share and discuss issues related to annotating a document within a team, even when globally dispersed or comprised of members with different roles and expertise (e.g. technical vs. domain specialists).

- For *extracting structured data*, as was our motivation for the development of Recogito in the first place: to serve as a platform for harvesting spatial metadata from historical sources, either to map documents and written accounts; for the purpose of building project-specific databases, specialist gazetteers, or editions; or to prepare data for participating in the LOD ecosystem, i.e. to publish data for others to query, harvest, remix and use in their own projects.

Throughout the development we have aimed to be as receptive to our users as possible. Their feedback has re-shaped our thinking (as well as our roadmap) on more than one occasion. As much as this has been a highly rewarding experience, we have also learned about some of the limitations of our system. For example, some projects have chosen to set up their own Recogito server, typically in order to work with a custom gazetteer, or to achieve closer integration with an existing repository. While we want to foster and support such custom installations more strongly, we are aware that Recogito currently has limits regarding the available technical interfaces for integration, customization and extension, branding and plugin development.

We firmly believe that an annotation tool, if it is to be in any way useful, ought not to be "all things to all people". However, even within the fairly narrowly defined space of the Spatial Humanities, we have learned that designing a tool malleable enough to cover the breadth and depth of existing and potential use cases is extremely challenging. To secure Recogito's longer-term strategic direction—as well as, critically, its sustainability—we believe two key things need to happen: one technical in nature, one social. In terms of technology, it will be crucial to further disaggregate the system architecture. This way, individual pieces of functionality will ideally become embeddable into other existing host environments and platforms; at the same time, a higher degree of separation will lower the bar for developers who want to customize, repurpose or extend specific parts of the system. On a social level, the recently founded Pelagios Network, a non-profit association that is open to individual and institutional members at no cost, now provides a framework through which a wider community of stakeholders can take a role in the future planning, open source development, and general support of Recogito, as well as curating the resources—training materials, gazetteers, technical guides, and so forth—that relate to it.

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Non-representational approaches to modeling interpretation in a graphical environment

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Abstract

This article presents an epistemological rationale, intellectual justification, and design outline for a non-representational approach to modeling interpretation in a graphical environment. It begins with a brief critical discussion of the representational approaches that are the common form of information visualizations and suggests that the less familiar non-representational approach could be used to augment these existing visualizations by supporting interpretative work that is closer to the practice of humanistic hermeneutic traditions. Representational display, based on large-scale processing, surrogates, and conventional visualizations, and non-representational modeling at the level of the individual interpretative act operate at very different scales to support intellectual work. In a representational approach, data precede display. Display is a surrogate produced according to automated protocols and algorithms. These cannot be altered or intervened except through rewriting their code, and the display, though interpretative and subject to interpretation, cannot be used as a means by which interpretation is actually modeled. While all visualizations express a model, they do not all provide a modeling environment. In the non-representational approach proposed here, graphical input serves as a primary means of interpretative work. More significantly, a graphical environment that supports direct modeling of interpretation allows traditional humanistic approaches, close reading, and marking of texts, documents, artifacts, or images, to be integrated with computationally produced visualizations. This research was developed as part of the 3DH (three-dimensional/digital humanities) project hosted at the University of Hamburg, between April and June 2016.

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1 Representational and Non-Representational Approaches to Visualization

Information visualization has become ubiquitous in digital humanities, but common tools for graphic expression of data have limited value as primary modes of interpretation—they do not provide the environment in which interpretation is actually done directly. The traditional work of scholarly interpretation, at the level of individual artifact or text, often seems at odds with the computational processing that produces data visualizations. An alternative, grounded in a non-representational approach to modeling interpretation in a graphical environment, could add crucial capacity to the existing methods and platforms by providing a space for direct creation and inscription of interpretative work.

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The term non-representational does not mean that the approach contains no graphic features. Quite the contrary, non-representational approaches use graphical means as a primary method of modeling human-authored interpretation rather than to display preexisting data sets. The distinction between display and modeling is meant to signal a crucial epistemological difference between the two approaches. Modeling is a primary mode of creating an abstract scheme or structure of analysis or argument.[1] The modeling approach uses graphical means to produce interpretative work using visual argument structures such as contradiction, ambiguity, parallax, and point of view that are fundamentally hermeneutic in character. It engages conventions and dimensions of graphicality not used in standard chart, graph, timeline, and mapping software with their entities and attributes. Developed in the context of the 3DH (three-dimensional/digital humanities) project at the University of Hamburg, this is a radically innovative addition to existing visualizations and meant to add new dimensions in the service of interpretation and modeling alongside representation and display.

The visualizations adopted by digital humanists (charts, graphs, diagrams, maps, and timelines) were mainly developed in the natural sciences, social sciences, statistics, business applications, and other fields. These bear the hallmarks of positivist, quantitative, and/or statistical approaches to knowledge that limit their application to interpretative practices in the humanities. This limit is structural and procedural: the work of interpretation cannot be readily performed through the display and the algorithms once they are in process, and these protocols cannot be altered through manipulation of the display. The display algorithms and protocols that generate visualizations are human authored, and thus perform interpretative work, but they are sealed off from direct engagement from the front-end interface (or, even within the back-end code, unless that is accessible). Even when displays support filtered, faceted, search for discovery, they are not a means of inputting or transforming data or of modeling the interpretative work. Practitioners skilled in statistically driven work are keenly aware of the ways data production embodies interpretative decisions, and are sophisticated about the statistical complexity and lifecycles of their data (from parameterization to display). But the conventions they use in these visualizations remain linked to a representational paradigm.

In a representational paradigm, the relation between data and display is uni-directional, the data precede the display, and the data are presumed to have some reliable representational relation to the phenomena from which they have been abstracted. The display functions as a surrogate for the data—which is itself a surrogate, adequate or inadequate, for some phenomena. Simply put, the display stands for the data, is a re-presentation of the data. But visualizations are generally taken to be a presentation, a statement (of fact, or argument, or process), rather than a representation (surrogate) produced by a complex process. Because of their presentational appearance, visualizations are what we would term 'declarative' statements. In the declarative mode (by contrast to the interrogative, the conditional, the subjunctive, for instance), statements are not qualified, they are statements that seem to simply state 'what is'. As a result, the lifecycle of data production is concealed in these visualizations; the features of their display (proximity, size, scale, color, etc.) are often read as semantically meaningful when they are frequently, actually, the result of display algorithms optimizing screen space, legibility, or other factors that are not intrinsically semantic. As conspicuous aspects of the display, these structures and graphical features are often taken as significant (how close something is to something else, for instance, might be simply an artifact of the display, that gets read as meaningful). Reading the artifacts as if they were the underlying or original phenomena, or even, accurate representations of or surrogates for it, ignores the complex processes of production and construction. Some features of visual display are semantically meaningful, others are not.

Instead, we should consider that visualizations are usually representations (constructions) passing themselves off as presentations (statements of self-evident fact). Again, in the representational mode, visualizations usually lack author attribution, any account of the lifecycle or parameterization of the

underlying data, are produced from a single viewpoint, and are impervious to direct input or variation in real time. They also erase the circumstances of what we might term their enunciation—and thus, the markers of the historical and cultural conditions of their production. The ethical issues in assumption of value-neutral visualizations are similar to those in any other human expression, leaving them open to the same critiques of unacknowledged bias.[2] When they are dynamic, visualizations use conventions based on an overview and zoom model, which supports faceted search, detailed query, and filtered display. These display methods can be very useful when applied to humanities projects and research. In their capacity as discovery tools, these visualizations use graphical display to expose patterns in data, to see data, and ask questions of it. This is particularly valuable for large data sets and this line of argumentation has been the standard support for the use of visualizations across fields. However, the display and discovery method of visualization does not exhaust the possibilities for the development of other graphically enabled interpretative work.

Concept modeling differs from standard visualizations in nearly every category of production and way of presenting information or interpretation in graphical form. Locating concept modeling in a succinct typology of visualizations should help make the specificity of the project clear. Visualization software can be divided into the following categories: (1) drawing programs that generate images algorithmically (Processing) or through rendering (Rhino) in pixel/raster or vector formats with surface textures and other visual effects; (2) visual displays of quantitative (numerical or statistical) information (Tableau, Google Fusion, Excel charts, scatter plots, etc.); (3) forced or directed graphs (Cytoscape, Gephi, and other network visualizations) generated through computational analysis of between-ness and other factors; (4) simulations of complex, non-linear, or dynamic systems (Game of Life, VisSim); (5) visualizations from integrated data analysis (Inscriptifact, imaging, forensics, etc.); (6) visual presentations of data mining or analysis (Voyant, Many Eyes). None of these are experience-based, all are driven by strict quantitative and/

or probabilistic statistical or algorithmic methods for analysis and display. All use standard metrics, uniformly measured spatial/graphical display, and continuous spatial environments. While these features are adequate for the visualization of information conceived within terms of homogenous metrics, they are not adequate for the creation of models of varying, discontinuous, or inflected experience of temporal, spatial, textual, emotional, or affective phenomena. While humanistic documents and materials can be reduced to quantitative data through certain processes of abstraction, and for particular purposes (counting and sorting), the dimensions of hermeneutic thought that play a major role in many humanistic works and enquiries cannot be modeled in graphical systems grounded in the empirical methods of the natural sciences.

By contrast to standard visualization approaches, concept modeling does not assume the existence of data or other representations in advance of the act of interpretative work. Modeling is an originary, productive, interpretative act that can be used to create data. Modeling does not re-present data in a chain of surrogates (from parameterization/extraction or abstraction/reduction/standardization/ and presentation). Instead, a modeling environment consists of graphical components, activators, and dimensions culled from visual and pictorial traditions to be put at the service of high level concepts (contradiction, ambiguity, comparison, etc.) that are regularly used in interpretation and experience. Modeling assumes that graphical platforms can support interpretation as primary means of knowledge production and/or interpretation.

A simple example should help make this clear: if I have a diagram on my screen and decide that two of the points in the display are related to each other in a particular way, I draw a bold line of connection between them. Connection is an interpretative concept. Connection is not a thing, not an entity being represented, it is a concept that is being modeled. The two points may have been part of a representational display, a conventional chart or graph. They might also have been created on a blank canvas or placed on a map or a timeline. But the point is that the connection between them is expressed as a deliberate and direct

interpretative act that is performed graphically by drawing the line of connection. The line is used in the service of the concept, and inscribes the interpretative model on the screen. This action models interpretation about the information in the visualization, using graphical means. The existence and weight of the connecting line are then registered in a table or other data structure or format. The data structure can hold a simple quantitative value or an expression of value, calculated as a factor of a variable that changes over time, or is calculated to any level of complexity (Fig. 1).[3]

Concept modeling thus supports direct acts of interpretation in the graphical environment. The visualizations are models of a particular interpretation, and they bear the signs of their production in author attributes, interpretative layers, and other features that stress the enunciative aspects of a graphical visualization.[4] They are clearly and markedly rhetorical. The term non-representational, as it is being used here, is borrowed from work in critical cartography and non-representational geography, particularly the work of Nigel Thrift.[5] In that context, the term non-representational is used to suggest that a map may not precede experience or a phenomenological engagement with landscape and its features, but instead may be made as an inscription of experience. The presumption of representation as an adequate surrogate, as knowledge, is therefore countered by the assertion that knowledge precedes inscription and presentation. The sequence
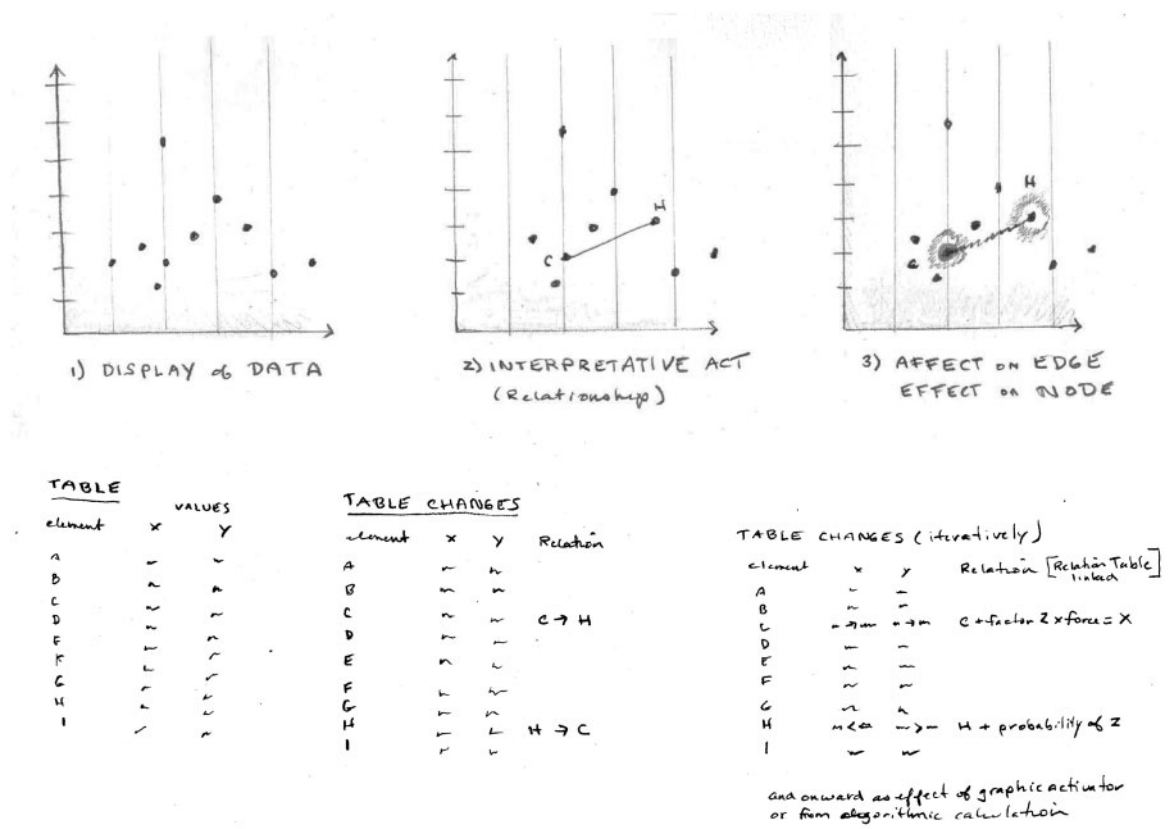
Fig. 1 Data display, interpretation, and table modification

of epistemological events is reversed. A map does not represent a territory, but is an interpretative and discursive artifact.

In concept modeling, the two-way potential of the screen (or other input field, if the interface is created spatially or in physical computing modes or other alternative modes) is activated, and the screen serves as a primary site of work. Interpretation is enacted in the screen or platform. A model is generated as a result, directly and iteratively. The concept modeling environment is designed as elements, activators, and dimensional features that can be put at the service of interpretative work. These function at a high level of conceptual work, such as the example of connection given above. By contrast, representational graphic platforms generally consist of a specific set of entities and attributes meant to represent data or things (e.g. timelines consist of points, intervals, dates, maps might have cities, rivers, roads, or borders and so on). The graphical features of the concept modeling environment are designed to express fundamental principles of interpretation: uncertainty, parallax, contradiction, partial knowledge, and so on. For instance, instead of a timeline that represents events as points, a temporal model is constituted by relations of before and after, simultaneity, duration, slow and fast time spans, and variable models of historical chronology or other conceptual elements.

The following graphical example is meant to show how concept modeling creates data input through direct manipulation of graphical features on a screen. In the first image, a display has been generated from a spread sheet. In the second, a line of connection has been drawn, a graphical inscription of an interpretative action. The table, below, registers the addition of a new set of attributes. In the final image, extra attributes, here termed 'affective' to indicate that they are generated through human, individual, decisions about significance and importance, have been added. These require more complex calculations of their value, registered in the table as a note about forces, probabilities, etc. The point is not to specify, in this example, what additional attributes or relationships might be modeled in the environment, but to show how the act of modeling

changes the underlying data structure through a direct act of interpretation inscribed using graphical means.

2 Justification

The justification for non-representational approaches to modeling interpretation is that visualizations generated by display protocols have served very well for large data sets processed according to statistical methods, and though, as already stated, these are human-authored and therefore already interpretative and rhetorical, they produce results in the form of statements that conceal or largely ignore these aspects of their presentation. The visualizations contain no graphical trace of the multiple decision points and processes of reduction, abstraction, standardization, or other procedures by which complex phenomena are turned into 'data' for display. The traditional approach to hermeneutic analysis in the humanities is modeled on the idea of a generative reading of a text, event score, performance, or other artifact of the cultural record. Such reading is generally close, individual, and meant to create an argument about how the artifact or text under consideration can be understood. Creating an environment in which to enact this interpretative work, generate data from it, and make it an intuitive mode of input is one justification for this project. But the deeper justifications are epistemological. As mentioned above, the declarative mode of representational visualizations often causes the artifacts of display to be taken as semantic features of the data, or, worse, of the phenomena for which the visualization and data stand in surrogate relation (as if a picture of 'data' were equivalent to a presentation of a phenomenon, rather than a highly mediated representation). In addition, the ability to alter the data structure of a visualization through direct input is largely foreclosed in conventional display.

A modeling environment adds the capacity to engage directly, graphically, in interpretative work on visualizations, artifacts, documents, texts, images, or any other file that is being displayed. In this environment, acts of specific, authored, varied,

contradictory, collective, and other interpretative readings can be modeled, marked, stored, made visible, revisited, revised, exported, and analyzed. The goal is to support rhetorical, argument-based, interpretative work, not statements that appear to be singular or self-evident. Concept modeling is an alternative to (and augmentation of) the declarative mode of conventional visualizations. One of its crucial epistemological premises is to emphasize an enunciative system of graphical expression. Enunciation marks visualizations as situated, partial, historical, authored, observer-dependent, and rhetorical. These shifts, from dimensions shift the declarative to the rhetorical, the display mode to the modeling one, the automatic to the hermeneutic, and the flat, sealed, space of the screen to the multi-dimensional one of virtual intellectual space and direct input are the core contributions of the project. Concept modeling supports humanistic methods of interpretation as specific ways of working, thinking, and producing knowledge.

To summarize, the intellectual principles of concept modeling are a non-representational approach that creates knowledge and interpretation directly, rather than using surrogates to generate display. The distinction between representation and modeling can be understood as that between the activity of 'designing' a house and 'modeling' a dwelling. In the first instance, you might begin by laying out a plan with a living room, dining room, front door, bedrooms, and so on that assumes a house contains 'rooms' which serve specific functions: eating, living, sleeping. The design platform might contain a kit of windows, walls, doors, and other entities from which the 'house' is composed. As an alternative, consider a modeling platform that is composed of high-level concepts: shelter, boundaries, ingress and egress, scale, pathways, sightlines, degrees of privacy and proximity, and so on. The 'model' created as a result is not entity-driven, but concept-driven, and the graphical platform is the environment in which the modeling takes place. The platform does not represent a house, it models a dwelling. In the first approach, the entities are set in advance in a menu of options as a pick list, in the second, concepts model a space whose functions and specific qualities emerge.

Concept modeling is meant to support interpretative approaches to knowledge which assume that knowledge is partial, situated, constructed, and authored (this differentiates it from empirical and positivist approaches whose assumptions are that knowledge is stable, repeatable, universal, and complete). This distinction can be articulated as the difference between observer-dependent and observer-independent approaches to knowledge production.

The observer-dependent and observer-independent distinction also underpins the difference between hermeneutic and mechanistic approaches to visualization. In hermeneutic visualization, the graphical environment is primary space for creating, marking, and processing interpretative work; in a mechanistic visualization, a display is generated through direct processing of data, statistical information, text, or other computationally tractable information. The display in a mechanistic visualization stands in a stable relation of underlying data to representation; the display is a surrogate, even if it can be queried, redrawn, filtered, or faceted, the display rarely changes the underlying data, and when it does, it does so mainly as a change in values, not a change in architecture or structure. In a hermeneutic visualization, no data or other intellectual information has to exist in advance of the process of graphical production (though base images such as maps or texts might be used as the ground on which to register a hermeneutic production). The hermeneutic approach is meant to be linked to a deliberately marked system of enunciation.

3 Design of the Concept Modeling Environment

The design guidelines for the graphical production environment are meant to embody the intellectual principles and goals of the project:

The environment should be able to (1) work with existing visualizations and (2) create completely new visualizations that generate data structures.

(1) In the context of 3DH, existing visualizations will include display of mark-up in Catma and displays generated in Voyant. These are both examples of visualizations generated for

humanities research. The mark-up in Catma is a deliberate act of textual interpretation and Voyant is interpretative by default of the design of the text mining tools. Catma displays are already direct, non-representational, by virtue of the way they are created through direct input. Voyant displays are representations of text analysis, and thus serve as examples of conventional visualization that could benefit from augmentation.

(2) New visualizations make use of a base image or are generated from a blank canvas. A historical map serves as a base for one of the examples, and provides the foundation on which to create spatial interpretations of historical events. The creation of relative chronologies with non-standard metrics provides an example of modeling directly in the graphical environment.

These four case studies will be identified as Catma, Voyant/Twitter, Map/Conflict, and Chronologies.

As noted above, the environment consists of a generalized set of graphical features, interpretative activators or inflectors that assign qualitative or affective value through graphical inflection (e.g. salience, reliability), and conceptual dimensions. Any and all of these can be customized for specific projects through labeling or selective use. The dimensions have structuring and syntactic implications for the relations among aspects of an interpretation, but they are not defined semantically. The dimensional features are therefore to be understood as components of interpretative work, not as entities that are being represented in graphical form. For example, making a comparison is a fundamental interpretative act, in which values within areas of an image or text are being put into relation to each other. An act of comparison is not entity-driven, but process driven. The dimensions of the conceptual modeling environment embody principles of interpretative activity.

The environment supports data inflection, the process of going from graphical input to data/infrastructure modification. As a model is created, modified, and augmented, the data structure is generated through a process of mathematical calculation. Regular tables and standard metrics do not have to be the only data structure created in the process.

Branching, layered, crazy-quilt tables, and other anomalies could also be generated by the conceptual modeling, which registers the many variable attributes of these structures.

The modeling environment consists of three graphical components:

graphical features (the palette of elements with which to work, drawn from standard literature in the field),
activators/inflectors (application of the features to enact, inflect, inscribe, and mark interpretative moves), and
dimensions (these draw on conventions of pictorial form such perspective, layering, parallax put at the service of the many aspects of a hermeneutic analysis).

3.1 Graphical features

The basic palette of graphical elements for static and dynamic visualization is shared by representational/display and modeling/interpretative approaches. The graphic primitives are taken from Jacques Bertin, Leland Wilkinson, and augmented by elements from animation (Fig. 2).[6] The graphic
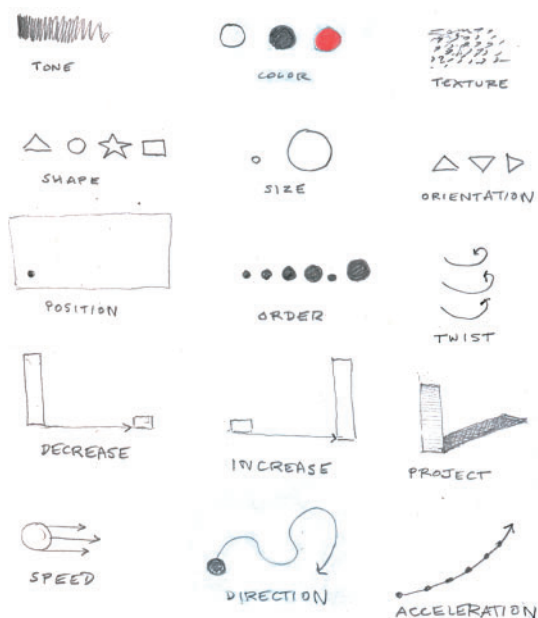
Fig. 2 Graphic attributes: activators
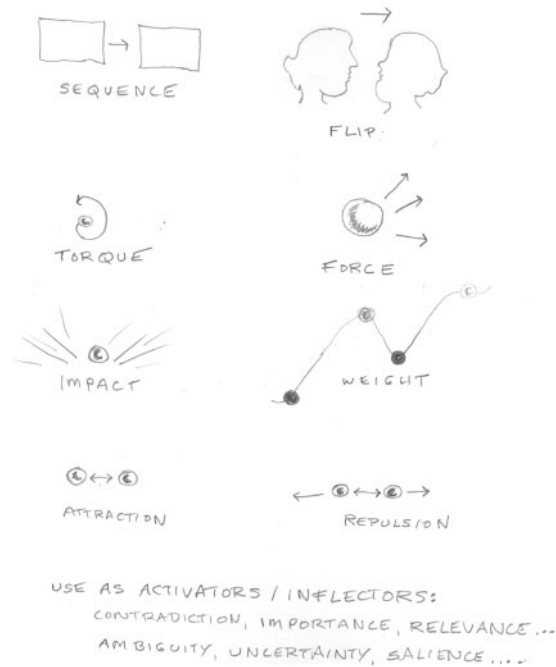
Fig. 3 Activators as inflectors

primitives include tone, saturation, color, transparency, texture, shape, orientation, size, and position. The dynamic elements include order, sequence, twist, decrease, increase, and flip (Fig. 3). Other dynamic graphic attributes include torque, weight, force, and attraction/repulsion. None of these carry semantic value in themselves, but all can be put at the service of concepts, values, or meaning-producing signs in a standard legend.

3.2 Activators and inflectors

Affective attributes are not simple statements of quantitative value, but are expressions of qualitative value. For example, when creating a map of a particular spatial experience, affective attributes might be used to register of smell, comfort, pleasantness, cold, fear, anxiety, etc. such that the geospatial information is generated as 'spatial coordinate plus a factor of X'. Such a formulation might also contain a formula for change over time, or modification in relation to any specifiable condition or aspect of the phenomenon. Affective attributes, like other generative and relative metrics, do not have to be arbitrary,

but they necessarily include the point of view of their author. The activators introduce syntactic, relational attributes while the inflectors, generally, introduce semantic attributes. Activators and inflectors are not entities, but qualities, and are made of the basic graphical features. Thus, salience might be indicated by glow or luminosity, ambiguity by tonal value and vague boundaries, contradiction by lines of force, and so on. Establishing conventions for a set of activators and inflectors relevant to a particular project makes sense, but a fundamental set of argument structures, rhetorical moves, such as those just mentioned, makes sense as well.

3.3 Dimensions of interpretation

The concept modeling dimensions listed here are not meant to be definitive or exhaustive. But they comprise the fundamental moves that can dimensionalize flat screen space. The system is extensible and customizable, though establishing some conventions of use will lend legibility to the project overall. The dimensions are literal interventions in and manipulations of the screen space put in the service of conceptual modeling (Fig. 4). A projection, for instance, should be understood literally and metaphorically. What kind of shadow or form is cast by a data visualization when it intersects with another plane (a value plane, ideological plane, hegemonic system, etc.). Some of these moves, like tilt, for instance, may seem abstruse at first, on account of their unfamiliarity, but they are meant to suggest ways of turning interpretative work into systematic metrics so that graphical displays are generated affectively as well as objectively. The metrics are dependent on interpretative values, not mechanistic ones. The model makes the values, and the values become the basis of a system.

1. Point of view is indicated by a number of features such as author attribute, vanishing point, horizon line, picture plane, now sliders, and multiple viewpoints. Point of view embodies the place from which an image is constructed, and thus assigns the image and its scale to a particular, rather than a general, owner or author. Introducing point of view within data displays dimensionalizes them in ways that radically alter the neutral or objective approach to visualization and returns them to an

Fig. 4 Dimensions

enunciative system. This shift is crucial for moving from a user-independent model of visualization to a user-dependent one. A point of view can be constructed from a historical or spatial vantage point as well as one owned by an individual or a group. Relative scales (see #8 below) can be used to contrast points of view based on differing metrics. Perspective systems embody point of view by using eye-lines, vanishing points, and horizons all of which inscribe scale and positionality within the scene. Single point of view systems are monocular and omniscient, but the use of multiple perspectival systems is also possible to introduce relative viewpoints (see #10 parallax below) (Fig. 5).

2. Layers allow information to be brought forward, pushed backward, and changed in tonal value or intensity. Layers are used to distinguish a base layer from the interpretative materials, or, without a base layer, to create a model from scratch. Layers can be used to hold contradictory arguments, varied uses of evidence, to display any aspect of a project that can be articulated independently (Fig. 6).

3. Slicing makes cuts across data objects, visual models, graphical artifacts, or displays, to reveal patterns across another axis. Slicing is primarily a discovery tool, but it can be used in an active, modeling, mode to create and study patterns, record them, create analyses in an interactive

process of modeling, display, and modeling. Introducing a slice into a model implies depth that can be actively intervened and engaged within the presentational field (Fig. 7).

4. Annotation adds information, labeling, and/or commentary into any model and can be added to any feature of a data set present in a display: a node, edge, point, text, image. Annotations can be recorded in a data structure as attributes noting connections, relations, or other analytic and interpretative features (Fig. 8).

5. Tilt moves layers through an angle of interpretative inflection to distort the display. The angle might be generated systematically through a generative metric (rate of change of any variable) or through an interpretative principle (bias, sentiment) or affective metric. The tilt angle can be calculated through a generative process (see #7 below) from some other feature of the model, or it can be used as a graphical tool of manipulation that reveals some aspect of the model to which a value is then assigned (Fig. 9).

6. Projections are common modes of creating mathematical transformations in geometric renderings or spatial constructions. Casting a shadow is a basic projection move, and creates a new, distorted, derived version of a form through an angle of transformation. This angle, like other affective or

DATA POINTS IN SCATTER PLOT

HIGH VANISHING POINT
LOTS of DEPTH

LOW VANISHING POINT
SPATIAL COMPRESSION

Fig. 5 Point of view

DATA POINTS IN SCATTER PLOT

LAYERS SEPARATING ISSUES
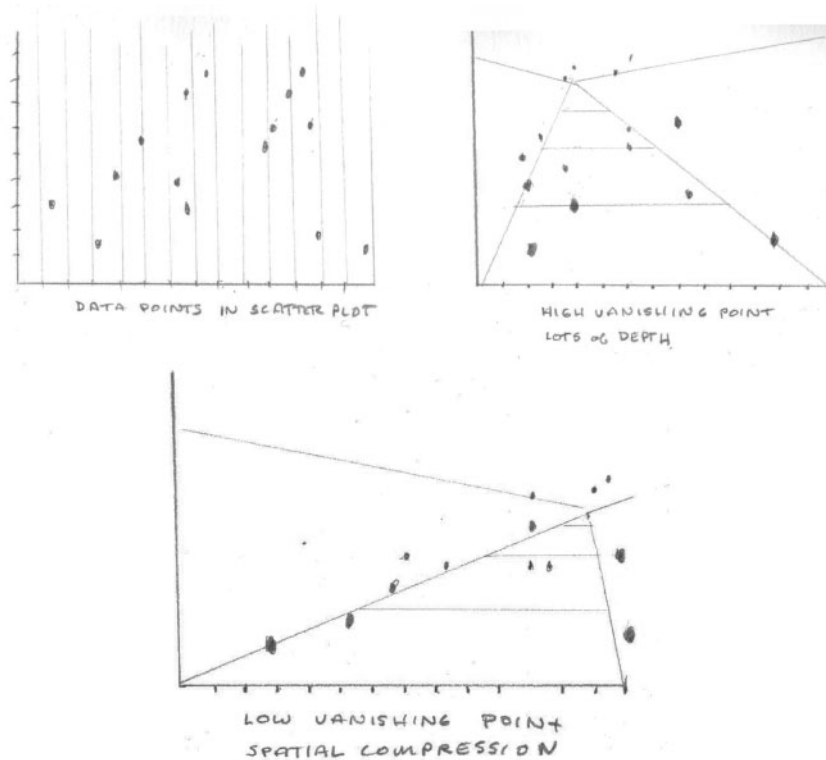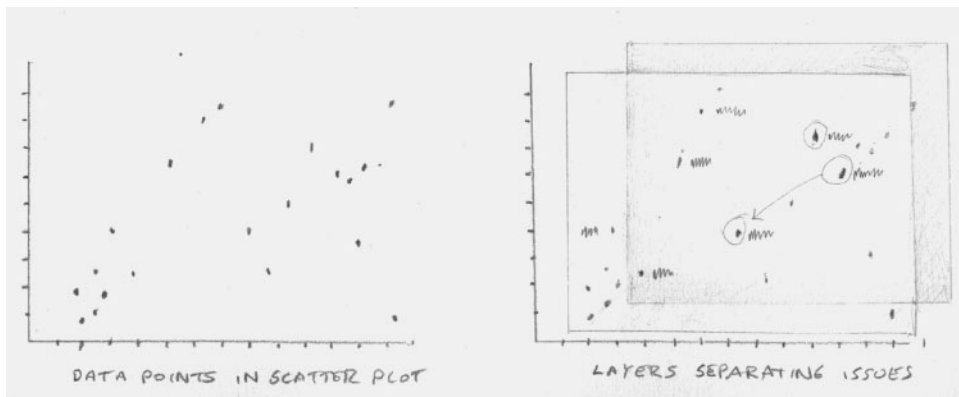
Fig. 6 Layers

interpretative metrics, can be generated systematic-
ally or arbitrarily. If I want to show the influence
cast on a scene in a narrative by a specific character,
I can project it, for instance, according to an angle
of influence, force, power, etc., generated through a
contrast of power-terms, vocabulary, or any other
text mining tool. Anamorphic projections can also
be created using generative metrics (see #7 below).
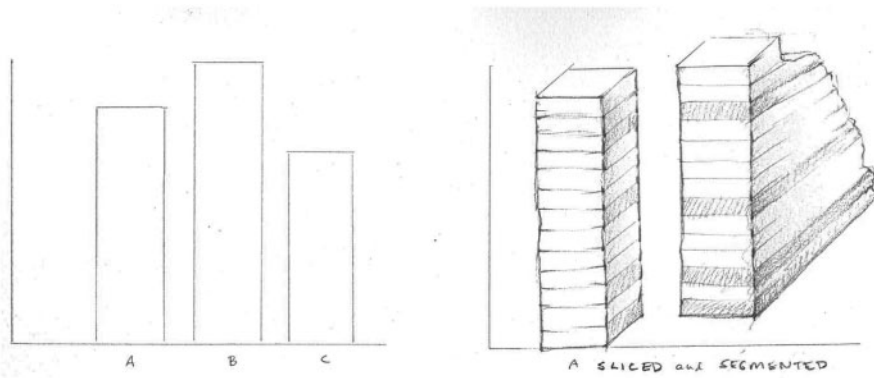
Fig. 7 Slicing
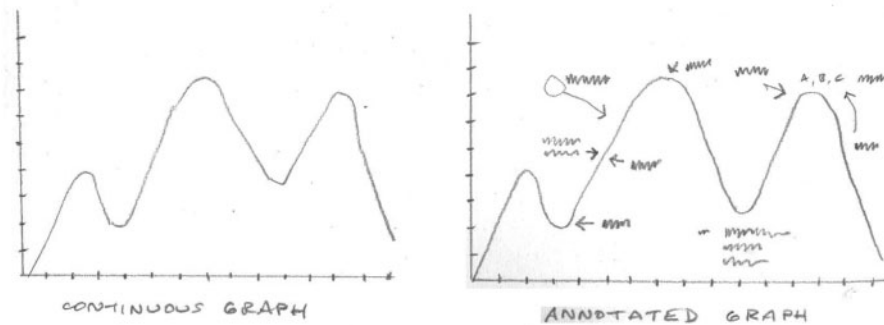
Fig. 8 Annotation

The plane onto which a projection is made can be a mere convenience, a device to hold the projection. But a plane can also have a defined identity, such as a plane of history, of ideology, of bias, and its angle to the projection can be assigned an attribute (e.g. salience, contradiction, ambiguity) (Fig. 10).

7. Generative metrics are created by taking a feature of a graphical artifact and using it to generate a new scale. For instance, the length of line between data points on a graph, though they are the result of a change in value, can be used to make a new scale by rotating the line lengths downward to create points on a line that define a new metric standard. The scale generated in this way is not arbitrary, but derivative. Such a metric might inscribe biases recorded as biases and by mapping a graphical

element from one metric system to another the distorting effects become evident (Fig. 11).

8. Relative scales are essential for showing differences among taxonomies and other systems of classification, knowledge production, and epistemological models. Relative metrics can be generated from textual interpretation, intuitive graphing, and other ways of engaging with non-standardized metrics such as varied chronological scales and relative models of historical time.[7] They can be correlated at certain points of alignment, but never fully reconciled since their units, scales, and assumptions about the completeness of their own models are each distinct. The use of relative scales is essential for exposing the differences among taxonomies, world views, value systems, and other features of knowledge
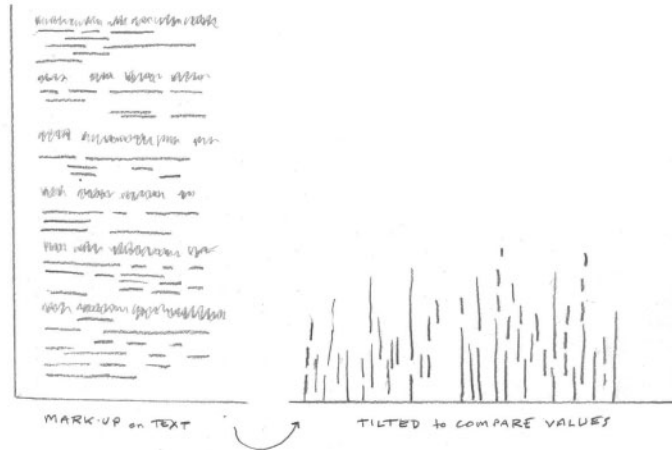
Fig. 9 Tilt
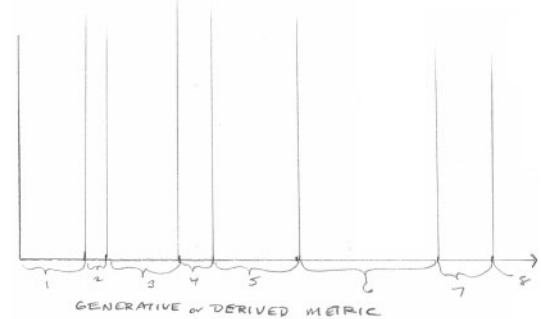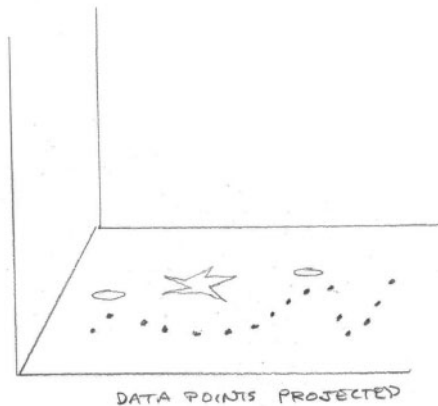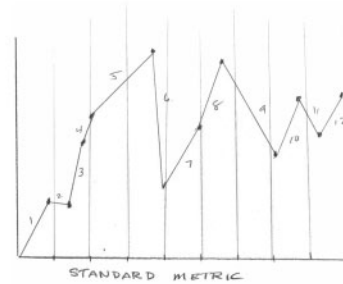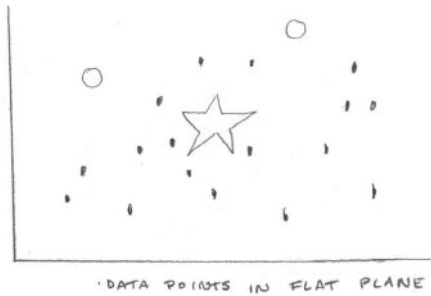
Fig. 10 Projection

Fig. 11 Generative

production, classification, and management. It is fundamental to the humanistic critique of positivist and empirical models of data visualization (Fig. 12).

9. Fold allows different areas of a model to be brought into connection with each other to see how they relate, what patterns they share and/or make, and what comparisons emerge in the process. Folding is a powerful structuring tool, and making concept models that are multi-dimensional depends on folds, edges, planes, angles, and other geometric principles. The line of fold can be derived from the
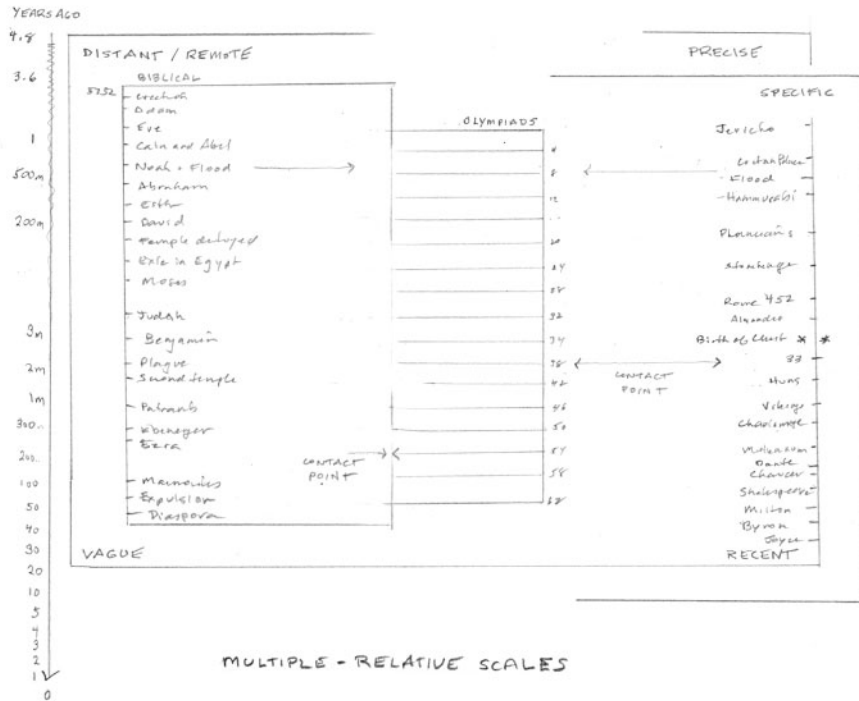
Fig. 12 Relative scales

action of folding, or it can be determined through a deliberate choice. Folds are able to show change as a contrast of values, rather than as a continuum. Folding can take place at regular intervals or arbitrary ones. Folding also reverses part of the graphic image, and allows visual alignments and coincidences to appear (Fig. 13).

10. <u>Parallax</u> involves the use of perspectival systems to indicate more than one viewpoint in a model or display. It can be used within representational as well as modeling environments to break the singularity of presentation in graphical environments. The degree of parallax, or differential between positions or points of view, can be generated systematically or arbitrarily. Points of view can be unassigned, or not attributed, and used as interpretative tools according to the shifts of eyeline, horizon line, and other structural features (Fig. 14).

11. <u>Split</u> is a division within a document, scene, argument, or image to show contradictions within the evidence or rhetorical direction of an argument. If parallax registers multiple viewpoints, split can be

Fig. 13 Fold

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SHAPES IN PLOT OR GRAPH

PARALLAX VIEWS

Fig. 14 Parallax

BAR CHART INTACT

SPLIT TO FOCUS ON DISCREPANCIES

Fig. 15 Split
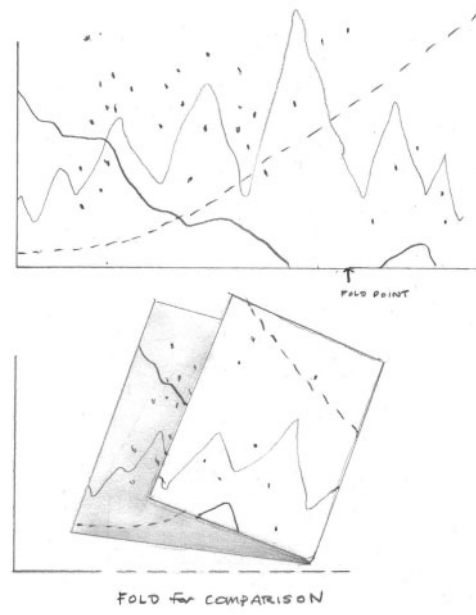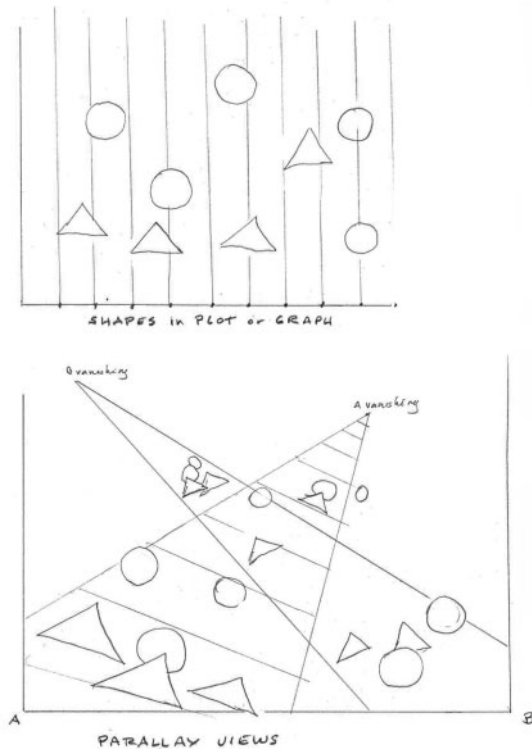
used within a single author's arguments to refract its multiple aspects (Fig. 15).

12. Other spatial moves can be used to model interpretative actions, such as stack, slip, shift. In other words, any graphical action that can add a dimension to the visual field can be semanticized. Understanding the links between these moves and their semantic value will require research and study, user testing, and experimental project modeling. Dimensions are used in combination with activators and inflectors.

4 The Idea of Graphical Enunciation

The development of a means of systematically inscribing enunciation in visualizations seems essential to advancing the hermeneutic agenda. The absence of conventions to mark the 'speaker' of a visualization, whether it is a display or a model, hampers the development of an approach that acknowledges the discursive modality of visualization. The inclusion of point of view inscribes data within an enunciative system so that the display is expressed from a specific historical and authorial position. This allows for contrast, parallax, and multiple views into the same data. Enunciative markers allow historical, cultural, or other positions to be registered in the display. Author attribution, the explicit use of positionality as a locator for the enunciating subject, and the analysis of the enunciated subject, all need to be marked graphically in features that expose the structuring activity of graphical expressions (Fig. 16).
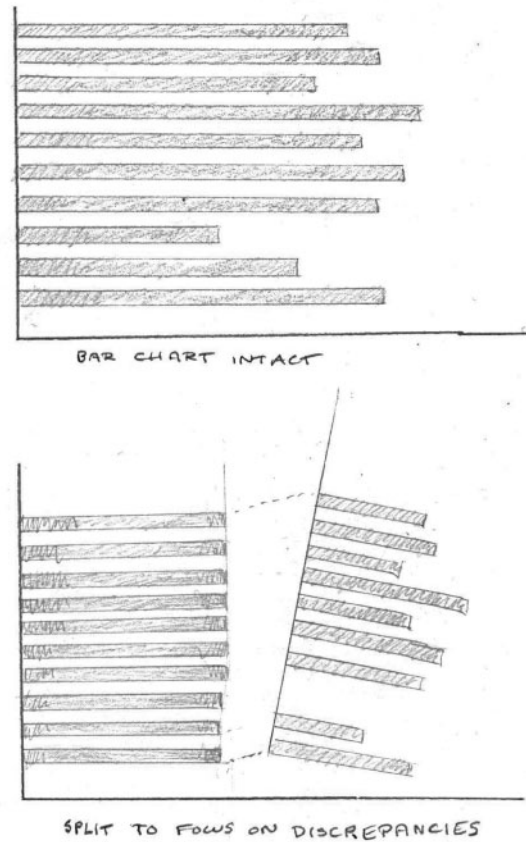
Thinking about data visualization as an enunciative system is essential, but it is not a familiar
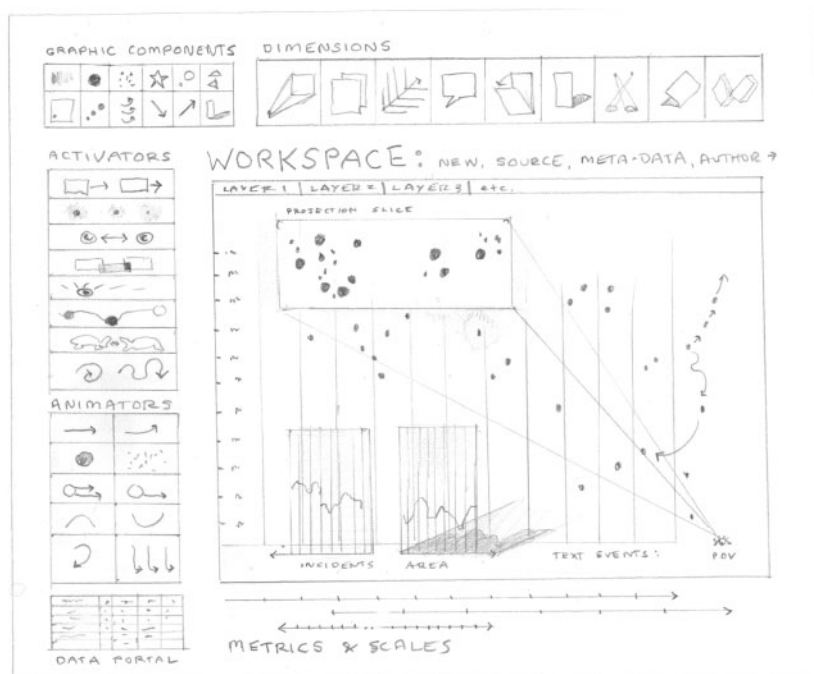
Fig. 16 Wireframe scheme of project space

convention of current visualization systems. In addition to mining the conventions of pictorial image production, the project draws on narrative theory, linguistic theory, film theory, critical race and gender studies, and post-colonial analyses where concepts of subject formation and enunciation have been developed. Not all of these are text based, and, in fact, the pictorial conventions provide well-developed foundations for graphical enunciation systems. Developing a set of graphical markers for such a system is part of the research ahead.

4.1 Future work and development

The development of this project will proceed by taking a defined set of case study images noted above: (1) an example of markup in Catma, (2) a Voyant graph, (3) a base map, preferably historical, (4) a space for modeling chronologies. Creating a mocked-up palette of graphical features and activators/inflectors to model interpretative values provides the paint-box for interpretative work. The dimensions need to be shown in action as graphical manipulations. Taking each and even

every one of the four case study images and using the palette and the dimensions will provide a graphical exercise as well as an intellectual one. Specific case study information or scenarios can drive these experiments, but the graphical experiments should also drive the models. So, a description of the relative chronologies and interpretative work being done in layers, point of view, parallax, etc. is essential, but then folding, splitting, and moving around inside these models is important as well.

Though innovative in many regards, particularly in some of the dimensions and activators/inflectors, the system should become intuitive, particularly if users understand that a limited subset of features—layers, annotations, semantic inflectors—can serve as a starting point. The more conceptual features—such as fold or parallax—will probably need time to develop habits of use and legibility. The concept modeling environment is driven by the conviction that interpretative work can be supported by graphical means, and, that these means can supplement existing visualization conventions

of representation and display. By providing a primary and direct method of doing interpretative work, non-representational modeling augments existing mechanistic visualizations with hermeneutic approaches that are much closer to traditional interpretative methods in the humanities.

The 3DH project was convened by Jan Christoph Meister at the University of Hamburg. The project team included Geoffrey Rockwell, Marco Petris, Rabaea Kleymann, Evelyn Guis, Jana Berens, and myself.

Notes

1 Modeling in this context should not be confused with the way the term is used in software for rendering special effects or 3D visual images.

2 The arguments about experiential, situated, and embodied forms of knowledge in contrast to the observer-independent empirical approaches have a long and distinguished pedigree, from pragmatism, phenomenology, feminist studies, critical race studies, queer theory, and other domains. For one specific reference, an anonymous and generous reviewer of this article suggested Donna Haraway's 'Situated Knowledges' (*Feminist Studies* 14:3, Autumn 1988).

3 Mindmapping software is often brought up as an example of this approach, but, again, the tools are reductive, the ground on which the figures are drawn is standardized, Cartesian, and inadequate to express discontinuity, affective metrics, and other features of inflected experience.

4 The concept of enunciation I am invoking here is directly linked to the work of linguist Emile Benveniste, 'La nature des pronoms', *Problèmes de linguistic générale* (Prais: Gallimard, 1966).

5 Nigel Thrift, *Non-Representational Geography* (London and New York: Routledge, 2007).

6 Jacques Bertin, *Semiology of Graphics* (Madison, WI: University of Wisconsin Press, 1983), Leland Wilkinson, *Grammar of Graphics* (NY: Springer-Verlag, 2005). See also my *Graphesis: Visual Forms of Knowledge Production* (Cambridge, MA: Harvard University Press, 2013), and 'Humanities Approaches to Graphical Display', *Digital Humanities Quarterly*, Vol. 5, No. 1, for an extensive bibliography and discussion of the background to the current project. http://www.digitalhumanities.org/dhq/vol/5/1/000091/000091.html (Accessed 23 March 2017).

7 The extensive inventory of timelines in Anthony Grafton and Daniel Rosenberg, *Cartographies of Time* (NY: Princeton Architectural Press, 2010) contains no examples of non-linear time. While the recognition that mapping physical space relies upon projections created according to conventions, no similar critique occurs in analysis of timelines. The historical archive of visualizations dishes up many idiosyncratic maps, and a few examples of using 3D structures to show history, but they do not model narrative or experiential temporality. Emma Willard's *Temple of Time*, for instance, is a lovely graphic, but its spaces and orderings, like other time-flow charts, is still linear, uni-directional, and homogenous in its metrics, and Elizabeth Palmer Peabody's *System of Chronology* is a mnemonic logical system for information, not a timeline. When we were developing the original Temporal Modeling System in 2001–03, we went through this literature and historical inventory with great attention. Information on that project is to be found in *SpecLab* (Chicago: University of Chicago Press, 2006), pp. 37–64.

Troia

Schliemann
und Tübingen

Troia
Schliemann
und Tübingen

Herausgegeben von
Ernst Seidl, Stephan W. E. Blum, Magda Pieniążek, Michael La Corte

INHALT

INHALT

SCHLIEMANN AND HIS PREDECESSORS AT TROY

Donald F. Easton

Before Schliemann

The general situation of Homer's Troy was never in doubt: on a plain traversed by two rivers, on the Asiatic side of the Hellespont. But there was uncertainty over its precise location from Greek and Roman times onwards. Many European travellers of the Middle Ages and later, wanting to see the ruins of Troy, were satisfied by a visit to coastal sites of the Troad such as Sigeion and Alexandria Troas.[1] Not until the seventeenth century did a more critical attitude begin to develop. Visitors such as George Sandys (1610) and George Wheler (1675) realised that a location in an inland plain, not on the coast, was needed. But as yet there were no maps on which to record any individual forays, hence we do not know, for example, quite where Richard Pococke (1740) got to. An imaginary map was produced by Alexander Pope in 1716 to accompany his translation of the *Iliad*. Geographically it was valueless, but it helped stimulate Robert Wood to search for Troy on behalf of the Society of Dilettante (1750). He came up with a location so far inland as to be completely implausible (Figs. 1–2).

What put the topography of the Troad on a firm footing was the work of an expedition under the Comte de Choiseul-Gouffier, initiated when he was French ambassador to the Sublime Porte from 1784 and continued sporadically until 1820: a complete cartographic survey of the northeast Aegean.[2] Active in this enterprise was his private secretary, Jean-Baptiste Chevalier, who in 1785–87 investigated the southernmost end of the Trojan Plain and decided that he had found the site of Homer's Troy. There on the Ballıdağ there was indeed a striking combination of features: a steep hill with remains of ancient fortifications, bounded on two sides by a ravine through which ran the principal river of the Trojan Plain, the Mendere Su. From the summit there was a commanding view, and strung out along the top were four burial mounds. On the slopes below were the apparent remains of a lower town, and at the foot of the hill at Pınarbaşı was a suite of natural springs feeding a smaller stream, the Pınarbaşı Su. It all seemed to fit Homer: a citadel, a lower town, burial mounds of heroes, the two rivers Scamander and Simois, and the springs which fed the Scamander. It was an attractive theory, first published in 1791, and it provided the first concrete location for ancient Troy.[3] It was to hold the field for the best part of the next century.

What we now call the site of Troy, namely Hisarlık, was apparently first noted by another of Choiseul-Gouffier's assistants, Franz Kauffer who in 1793 was sent to the Troad to check and amplify Chevalier's observations.[4] He did not initially propose any identification for it, and certainly did not think of it as Homer's Troy. But by 1803 his maps were suggesting that the Hisarlık ruins were those of the capital begun by Constantine before he decided on Byzantium.

This suggestion was soon supplanted by one that was more soundly based. In 1801 Edward Daniel Clarke, visiting the Troad, was shown coins minted at the classical city of Ilion and was told that they had come from Hisarlık.[5] A visit to the site revealed inscriptions which confirmed the identification — an identification which still holds.

That Hisarlık should be classical Ilion was seen as entirely compatible with Chevalier's view that Homer's Troy was at Pınarbaşı because it accorded with Strabo's belief (*Geography* Bk. 13) that the two cities were on separate sites. But as more travellers followed in their path, the criticisms of the Pınarbaşı theory began to mount: the remains were too trifling, it was too far from the sea, the springs (contrary to Homer) were all the same temperature. It was Charles Maclaren, however, who put his finger on the crucial point.

What became in its day the decisive study of Trojan topography began as an essay in *The Edinburgh Magazine* in March and April 1820, was expanded into a 270-page book in 1822, and was revised in the light of a personal visit in 1863.[6] Maclaren saw that Chevalier had got his rivers wrong. In Homer it is the Scamander which is the principal river of the Troad. This had to be the modern Mendere Su, and could not be Chevalier's feeble Pınarbaşı Su. If this was so, then the whole Pınarbaşı theory fell to the ground. There was, Maclaren pointed out, another very suitable site near the confluence of two rivers, namely Hisarlık. This lay between the Mendere Su and the Dümrek Su, the latter flowing into the Trojan Plain from the East. And if this were Homer's Troy, then in view of Clarke's discovery, it lay beneath the ruins of classical Ilion exactly as most ancient writers other than Strabo believed it to do.

The publication of Maclaren's 1863 book seems to have spurred an English resident of the Troad into making the first substantial soundings at Hisarlık. This was Frank Calvert, the youngest of a family of land-owners, farmers and diplomats.[7] Already in 1855–56, however, the first known excavations at Hisarlık had taken place. These excavations had been a very brief affair under John Brunton, the engineer in charge of building the British hospital at Erenköy during the Crimean War. Brunton says that he found the ruins of a temple, in particular a Corinthian capital, and cleared a neighbouring room which had painted walls and a boar-hunt mosaic, but that was all.[8]

Frank Calvert and his brother Frederick had themselves conducted various casual excavations in the Troad, and had come to the view that Troy — by which they meant Strabo's „Village of the Ilians" — lay on Frederick's land near Pınarbaşı, at Hanay Tepe. But with the publication of Maclaren's book Frank now made some soundings on the Ballıdağ and concluded that the citadel there was no earlier than the Fifth Century BC and had nothing to do with Troy. This is significant in being the first attempt to put Trojan topographical theory to the test of excavation – an innovation often, and wrongly, credited to Schliemann. Frank Calvert then went straight to Hisarlık, dug a twelve-foot long trench on the east side of the site, and saw enough to convince him that he had struck the Ilian Temple of Athena. He applied for help with the cost of further excavation to the British Museum, who turned the request down. This rejection may seem surprising, especially as Calvert was by now building up considerable expertise. But his application was framed in the sketchiest terms, and gave no indication of the site's potential or even its supposed identity; moreover his brother Frederick was in disgrace having only recently emerged from a stretch in prison for financial fraud, and Frank too had been fined and imprisoned the previous year. So it is conceivable that the trustees of the British Museum may have been unwilling to risk financial involvement with the family.

Frank Calvert therefore went ahead on his own. To the 2,000 acres he already owned in the valley of the Dümrek Su he added an

additional field containing the northeast part of the Hisarlık mound, and in 1865 he dug three trenches there, one of which went four or five metres deep. Although he found nothing dateable to earlier than the Seventh Century BC, he made the crucial observation that there were yet more remains at a deeper level which must go back to an even more remote date. This was what was needed if Homer's Troy were to lie beneath the ruins of classical Ilion. Calvert himself lacked the money to take the project any further, so this is how the matter lay when Schliemann appeared on the scene in August 1868. It is worth remarking that, already by this date, the site that we now call Troy had been discovered, identified and first tested by excavation; and that Schliemann, although popularly credited with all of these achievements, was actually responsible for none of them.

Schliemann[9]

Schliemann's autobiographical preface to his book *Ilios* (1880) famously claims that his work at Troy was the fulfilment of a lifetime's ambition.[10] His more detailed, 1869 account of his first visit to the Troad further claims that he arrived there in 1868 already firm in the conviction that Hisarlık, not Pınarbaşı, was the site of Homer's Troy.[11] Both claims have been exploded. While he may as a child have had some enthusiasm for the subject of Troy, it is plain that his engagement with it as an adult came as a solution to a midlife crisis, and that his interest specifically in Hisarlık was kindled by Frank Calvert in August 1868.[12] Schliemann almost certainly arrived in the Troad hoping to prove that Pınarbaşı was the site of Troy.[13] It was only after making disappointing soundings there that he learned from Calvert of Maclaren's

theory pointing to Hisarlık and of the promising results of Calvert's own excavations. Calvert proposed that Schliemann should come back and dig. The idea was mutually beneficial. For Calvert there was the prospect of a rich man to whom he could sell antiquities found on his half of the site. To Schliemann, who had sold up his business in St Petersburg and abandoned his Russian wife and children, it provided an instant solution to the question what he should do with the rest of his life (Fig. 3).

After some brief, unauthorised soundings in 1870, Schliemann spent seven seasons at Troy: 1871–73, 1878–79, 1882 and 1890. He had no previous experience of disciplined digging and little understanding of archaeology. Initially his methods, horrifyingly crude by modern standards, were drawn largely from the techniques of quarrying and mining. Once alerted to the need, however, he made a daily record of his progress which he documented with drawings of the objects found and a note of the depth from which each had come. From these records it has proved possible to piece together a fairly detailed reconstruction of what he discovered during the years 1870–73 and to propose original find-spots for several thousand objects.[14] The chief lack in his early years is of any proper record of the architectural features he found and removed, for he left plans only of those features still visible at the end of each season (Fig. 4).

His idea was that the ruins of Troy would lie buried at the very bottom of the mound, and that he had simply to remove the fourteen metres of overburden. He began his exploration in 1871 by cutting a massive North-South trench through the mound. By the end of the season he had found a burnt stratum of substantial

buildings at 10m below the summit, and this he took to be the first glimpse of Priam's legendary city. His work in 1872–73 was devoted to uncovering this stratum over a wider area in the centre of the mound (Fig. 5). In 1873 his efforts were rewarded by the discovery of the splendid fortifications of Late Troy II, of a building which he supposed to be Priam's palace, and the notable collection of metalwork which he assumed to be a part of the household treasure of King Priam alluded to by Homer (*Iliad* XXIV.228). Schliemann left Troy happy in the belief that in stratum 2 he had revealed the war-torn ruins of Homer's Troy. He had, however, also recognised the presence of an earlier occupation (stratum 1) and of three subsequent ones (strata 3–5). Finds from all of these had likewise been collected and documented. He published an account of his work in these years by gathering into one volume the despatches he had throughout been in the habit of writing to newspapers, and illustrated it by an *Atlas* of drawings and photographs (Fig. 6).[15]

In 1878–79, after digging at Mycenae in 1874 and 1876, he returned to Troy and now continued to expose the burnt stratum, mainly extending the excavations eastwards. Here he uncovered a warren of smaller buildings. The entire second stratum he now re-designated „City III''. This was because he had found an earlier architectural phase which belonged between his previous strata 1 and 2.[16] In addition he now recognised the existence of a VIth or „Lydian'' city, deduced solely from its distinctive pottery which, in the centre of the mound, he found immediately below the classical deposits but, at the edges, he saw scattered on the surface. No associated structures had yet come to light, and the recognition of City VI at this date from

such insubstantial evidence shows Schliemann, despite his shortcomings, as having a genuinely archaeological intellect (Fig. 7).

In these seasons of 1878–79 Schliemann also studied the tumuli of the Troad, making soundings at Üvecik Tepe and Beşik Tepe. Rudolf Virchow examined the flora, fauna and geology of the Troad and Frank Calvert dug at Hanay Tepe. The two seasons' work was reported in Schliemann's monumental work *Ilios* (1880) in which he sought to present all his findings since 1870 in a systematic way, period by period (Fig. 8).

He returned to Troy again in 1882, this time with the two architects Wilhelm Dörpfeld and Josef Höfler. Of these the former is the more important, for he came with experience of the excavations at Olympia and was to remain with Schliemann throughout the following years and continue the Troy excavations after his death. The 1882 excavations focussed largely on exploration of the stratum below City III. Once the warren of small buildings was removed there appeared just below them yet another new architectural phase which had to be inserted into the sequence. This exhibited a suite of parallel megaron-style structures, large halls with porches at each end, some with marked signs of burning. Schliemann called the phase II.2 and re-numbered his former City II, which underlay it, as City II.1. Because the megaron buildings of II.2 were so heavily burnt he decided, on his architects' advice, that the burnt debris which overlay them must have derived from their destruction and not, as he had previously supposed, from that of City III. He thereby re-assigned to City II.2 the treasures and objects (but not the buildings) found in it which in *Ilios* he had attributed to City III (Fig. 9).[17]

Fig. 1 General map of the Troad including the country that stretches from Cape Sigeum to Mount Gargaros Marie-Gabriel-Florent-Auguste Comte de Choiseul-Gouffier. Voyage pittoresque de la Grèce. Paris, J.-J. Blaise M.DCCC.IX, 1809.

Fig. 2 Topographic chart of the Troian area based on Filippo B. Webb's observations in 1819

Fig. 3 Eugene Broerman (1861–1932), Heinrich und Sophia Schliemann, oil on canvas, without date, 50,1 x 77,4 inches, Berko Fine Paintings: Knokke-Zoute, picture number: XKL60216

Fig. 4 Troia based on the Schliemann excavations between 1870 and 1873 (Schliemann 1881, p. 77, no. 18) Universitätsbibliothek Tübingen, Sign. Fo XX 197 c
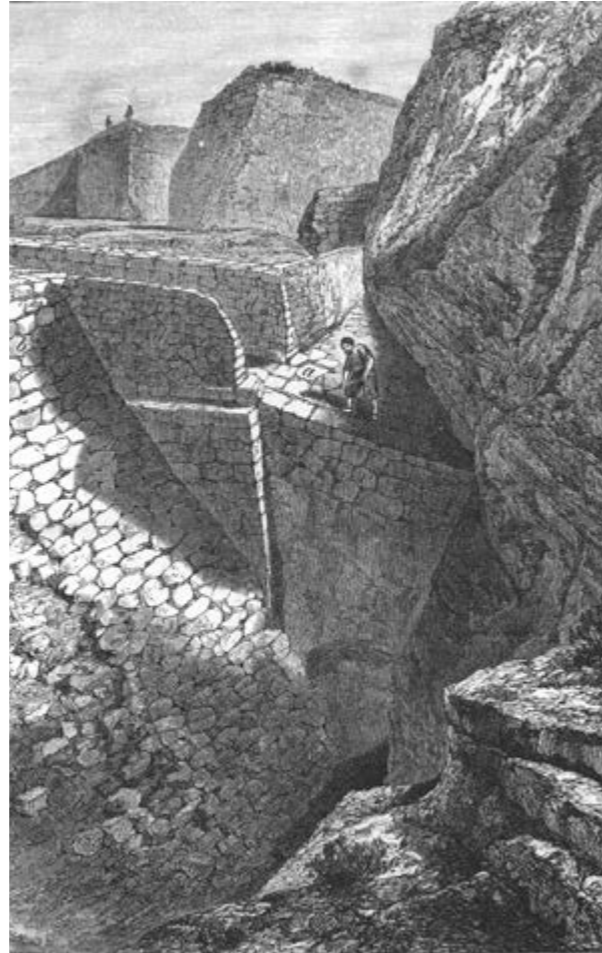
Fig. 5 View of the large substructure of the acropolis wall (Schliemann 1884b, p. 62a, no. 15) Universität Heidelberg: https://doi.org/10.11588/ diglit.21#0109
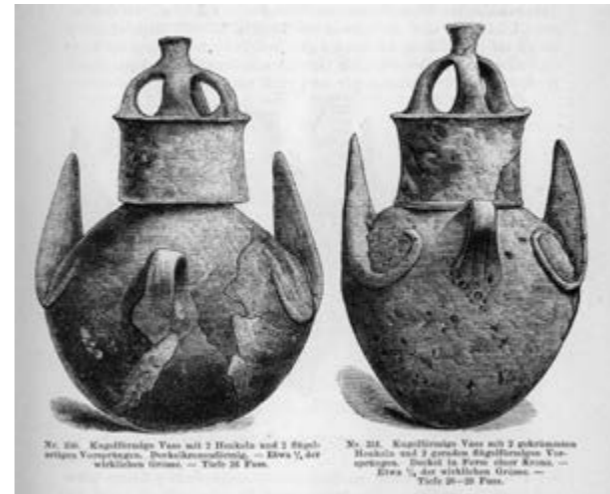
Fig. 6 Spherical vases each with two curved handles and two straight wing-shaped projections (Schliemann 1881, p. 427) Universitätsbibliothek Tübingen, Sign. Fo XX 197 c

Fig. 7 View of the remains of the south gate (Schliemann 1884b, p. 80a, no. 19) Universität Heidelberg: https://doi.org/10.11588/ diglit.21#0109

Fig. 8 Vases with owl face (Schliemann 1881, p. No. 235 u. 236) Universitätsbibliothek Tübingen, Sign. Fo XX 197 c

Fig. 9 So-called treasure of Priam (Schliemann 1874b, plate 204 Universitätsbibliothek Tübingen, Sign. 30 B 2001-2/2

Schliemann published his latest findings in his book *Troja* (1884). Here the influence of Dörpfeld is immediately apparent. There are detailed architectural drawings and plans, and there has been a systematic attempt to assemble all the data relating to the Greek and Roman settlements.

One of Schliemann's concerns in 1882 was with the apparently small size of his site compared with that to be expected of Homer's Troy. He therefore turned his attention to the plateau stretching away to the south of the citadel mound, to the area where the remains of the classical lower town were known to lie. He had made a number of small soundings here in 1873, but now he explored the whole area more thoroughly. Five long test-trenches confirmed the widespread presence of prehistoric deposits, and he proposed a possible line for the outer limits of a lower town for Homeric Troy (his City II.2).[18] Both findings have been strikingly replicated by the new excavations under Professors Korfmann and Pernicka. He also explored a complex of man-made caves on the western edge of the site and saw that they might supply the sacred springs mentioned by Homer but until then missing from Hisarlık.[19] The new excavations have greatly extended the exploration of these caves and have been able to confirm their early date.[20]

High-profile excavations on world-class sites are liable to attract the attention of cranks and know-alls. One such emerged during Schliemann's final years: Captain Ernst Bötticher, who argued in a variety of publications that Schliemann had all along been digging nothing more than a cremation cemetery.[21] He was, of course, utterly misguided, but his attacks became so persistent that Schliemann determined to avert them by calling a conference of experts on the site. This he did in 1889 and, when the attacks continued, on a more definitive scale in 1890. He then continued his excavations in a season which was to prove his last.

Dörpfeld was again with him, and produced a full and accurate plan of the Troy I and II buildings then visible.[22] This plan is notable for having introduced the three dimensional system of coordinates used by all subsequent excavators. The 1890 excavations tackled for the first time an area not in the centre of the citadel mound but on its southern periphery, and with two very important consequences. The first was that Schliemann and Dörpfeld were now able to identify seven phases of occupation overlying Troy II. This increased the total of architectural phases to nine and, although it has since been vastly refined and supplemented, this scheme still provides the conventional framework for dividing up the site's 3,500 years' worth of deposits into manageable periods. Later analysis by Dörpfeld showed why so little of phases V–VIII had been discovered before: they had been removed from the centre of the mound in classical times when a huge platform was built for the Temple of Athena.[23]

The second consequence lay in the discovery for the first time of buildings belonging to Troy VI, the „Lydian" phase first identified from its pottery in 1878–79. But now among these deposits was found also a different sort of pottery: sherds of Mycenaean ware, for the first time on the site well stratified. Since at Mycenae it was already regarded as a hallmark of the period when the Trojan War should have taken place, the conclusion was unavoidable that at Troy it should therefore be with Troy VI, and not with Troy II, that the Trojan War was

associated. Schliemann, at the age of 68, now faced the collapse of the main historical theories he had developed. Not surprisingly he tried to avoid it, by arguing for instance that the pottery might have belonged to descendants of fugitives who had fled Mycenae at the time of Troy II.[24] But Dörpfeld saw the truth and, it seems, persuaded him.[25] Schliemann intended to return in 1891 to expose more of the Troy VI citadel and its lower town. But this was not to be.

For many years Schliemann had been suffering from deafness and pain in the ears. In November 1990 he was diagnosed with numerous bony growths in the auditory canal, probably caused by his habit of daily swimming, and underwent surgery to have them removed. It seems likely that in the course of the operation the delicate base of the skull was inadvertently broken through.[26] In the following weeks an infection developed in the brain, and on the way home for Christmas Schliemann collapsed and died in Naples. At his own direction he was finally laid to rest in a specially designed mausoleum in the First Cemetery in Athens. Schliemann amassed a large archive of correspondence, diaries and other papers during his lifetime. These are held in the Gennadius Library of the American School of Classical Studies in Athens.[27] Much of the archive is now available online.[28] What of his finds? Under the terms of his permits these were divided at the end of each season with the Imperial Museum in Constantinople (now the Istanbul Archaeological Museum), although he bought back many objects in 1885 and some were lost in the museum. His own collection in Athens included his agreed share from those divisions but also other pieces which at various times

he had smuggled out of Turkey. These latter included „Priam's Treasure," his ownership of which was legitimised in 1875 by a deal with the Turkish government. Most of the collection passed eventually to the Königliche Museen in Berlin, first by a major gift in 1881, by some subsequent smaller gifts, and finally by the bequest of the remainder upon his death.[29] A catalogue of the Berlin collection was published in 1902,[30] and a new, more detailed, catalogue is in the process of being compiled and published.[31] Some parts of the Berlin collection were lost or destroyed in the Second World War. The Troy „treasures" – mainly vessels and jewellery of gold and silver but also a quantity of bronzes – were seized by a Russian delegation in May 1945[32] and are now mostly in Moscow and St Petersburg.[33] They are seen by Russia as cultural restitution legitimately taken, an opinion not shared by Germany.[34]

Schliemann in Retrospect
Schliemann and his achievements are given widely different evaluations.[35] To some he is the father of scientific archaeology, the heroic amateur who proved the experts wrong; to others he is little more than a wrecker, a treasure-hunter and a charlatan. Some archaeologists even take the view that you cannot believe a word he says. How then should he be assessed?

It is wrong to dismiss him as a treasure-hunter. There is no sign that he thought about treasures at all until the so-called „Priam's Treasure" came to light in May 1873, and even then he saw their value mainly as demonstrating the importance of the site and its identification as Priam's Troy. It is true that he also saw them as having a monetary value, but the same was

true for all his finds. He hoped to sell them and thereby recoup some of the huge sums he had spent on the excavation.[36] His motive for moving into archaeology had much more to do with finding an occupation to fill the second half of his life. He set himself to uncover the world written about by Homer, and this developed into a real scholarly quest.

The crudeness of his excavation methods can be greatly exaggerated. It is certainly the case that, in order to reach down to the „homeric" level as quickly as possible, he at first employed methods and equipment normally used in mining, and proceeded by cutting out huge chunks of earth – he mentions winches and battering rams[37] – but from 1873 he progressively abandoned such methods in favour of a more stratigraphic approach, removing one layer at a time (Fig. 10).

He was in fact a methodical man. It should not be forgotten that he had a training in double-entry book-keeping and for many years kept a careful track of the dealings of his own, sizeable business. He approached the site of Troy in a similar manner. For plotting the exact location of buildings and objects, a modern system of three-dimensional co-ordinates was introduced only in 1890 by Dörpfeld. But Schliemann had from the start used a rough co-ordinates system of his own, in that he had made a (somewhat sketchy) contour-plan of the mound[38] and plotted his activities by reference to its edge and to its surface. With some exceptions he recorded each day in his diary where he had dug and what he had found. Into it he also drew objects of interest, each with a note of the depth at which it had been found, usually in round metres. For 1870–73 the photographs in his *Atlas* provide
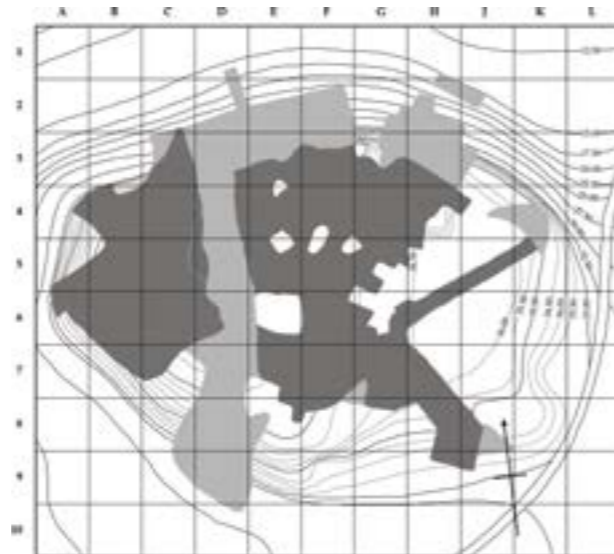

Fig. 10   Approximative extent of the ares excavated in 1889–1890 (paler areas excavated in earlier seasons) Grafik von Donald F. Easton

a fuller documentation of his finds, and to accompany this he wrote a descriptive catalogue in which each object had a number of its own. This served as a sort of inventory, except that the numbers were never copied onto the objects themselves. This means that in the case of closely similar objects (such as bronze flat axes) it is now not always possible to determine which is which. He kept and recorded objects from all periods, because he wanted to identify, date and understand all phases of occupation. He did not record sherds unless they had some distinctive feature such as painted decoration, but otherwise he kept and recorded everything that he thought might have any importance. There must have been more than 10,000 objects, for the 1902 catalogue of the Berlin collection has 9,704 entries, some representing more than one object, and this does not include items given by Schliemann to others or the duplicates given away by the museum.

At the end of each season a plan of the site was drawn, showing the buildings which had been exposed. This always focussed on the buildings of „homeric" Troy (City II or III), reflecting the fact that he kept very little record of the overlying buildings of later periods which he removed in order to reach it (Fig. 11). This is a serious loss. It should be noted, however, that the oft-repeated calumny that Schliemann destroyed the Hellenistic Temple of Athena is completely untrue. The evidence is clear that it
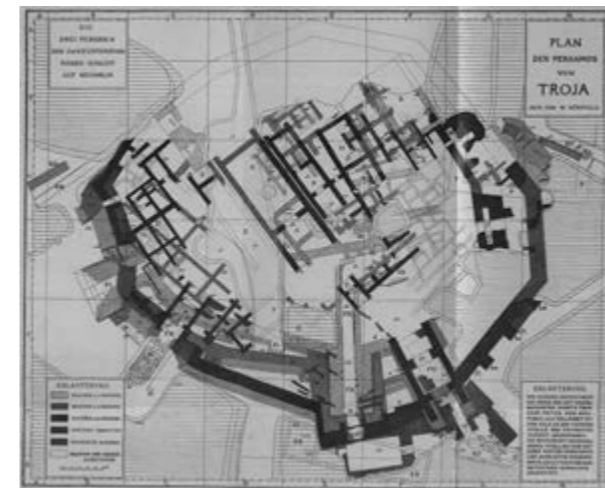

Fig. 11   Features of the Troy IOI citadel visible at the end of the 1890 season Dörpfeld 1902, Taf. III

had been almost entirely robbed out at some previous date.[39]

He was both observant and thoughtful. After his 1873 season he realised that a type of pottery with distinctive knobs, now known as Knobbed Ware or Buckelkeramik, present among his finds in only very small quantities, had to come from a period earlier than that of the Greeks but from which he had found no other remains.[40] In 1878–79 he saw that

a scatter of Grey Minyan ware on the sides of the mound had to derive from the same, broad „Lydian" period. He also realised that the period in question had been razed off the centre of the mound in Hellenistic times to create a level platform when the new Temple of Athena was built.[41] These were quite sophisticated deductions. It was Dörpfeld, however, who brought to Troy the skill needed to put such observations into clear diagrammatic form and to make clear and accurate plans of the architecture.

These examples show how Schliemann modified his understanding of the stratigraphy and history of the site from year to year as the excavation progressed. One such change is of particular importance, and this is the revision of 1882 involving his City III, mentioned earlier (Fig. 12).[42] Unfortunately Blegen misunderstood the revision to mean that Schliemann had re-assigned to Troy II everything that he had previously attributed to Troy III,[43] whereas in fact he re-assigned to Troy II no more than the stratum of burnt mudbrick debris and the epithet „burnt." Blegen's misunderstanding led to a muddle in which, without it being recognised, his late Troy II and Troy III were equivalent to Schliemann's Troy III and Troy IV, and his Troy IV to part of Schliemann's Troy V.[44] This confusion has to be allowed for in any attempt to compare Blegen's findings with Schliemann's.

Schliemann was delving into barely known periods where the discipline of classical art history was of very little use, so he needed to wrest information from the much less familiar materials of prehistory: pottery, metalwork, bone, stone, plant remains, changing landscape. To the study of these he brought qualified experts,[45] a novelty far ahead of its day. He was

Troy and its Remains	Ilios	Troja	Troja 1890	Troja and Ilion	Blegen	Troia Projekt
V	VII	VII	IX	IX	IX	IX
			VIII	VIII	VIII	VIII
	VI	VI	VII	VII	VII	VII
			VI	VI	VI	VI
IV	V	V	V	V	V	V
					IV	IV
III	IV	IV	IV	IV	III	III
II	III	III	III	III		III
		II,2	II,3	II,3		
Ib	II	II,1	II,2	II,2	II	II
			II,1	II,1		
Ia	I	I	I	I	I	I

Fig. 12   Comparison of schemesFor numbering the strata at Troy
Grafik von Donald F. Easton

early – possibly the first – to use photography for archaeological documentation. In the *Atlas* this was done with only limited success, but the quality of Dörpfeld's photographs from 1890 and later is so high that none made on the site since can rival them. In these respects Schliemann was an innovator.

There are therefore aspects of his work that one can admire. It was conscientious and thoughtful, even if it was crude by today's standards or compared with the best excavations of his own day.

A widely publicised criticism in recent decades has been that during his Troy excavations Schliemann set aside individual metal objects as he found them – vessels and jewellery of gold, silver and bronze, and bronze tools and weapons – and then fraudulently claimed to have found them in hoards, representing them as „treasures''[46] (Figs. 13–14). The Berlin catalogue of 1902 listed 19 such „treasures,'' although not all of them were considered treasures by Schliemann. In most instances the case against authenticity does not rise above speculation, and attention has been focussed mainly on the very large hoard (Berlin's „Treasure A'') found on 31st May 1873 and later published by Schliemann as the main component in the wider group which he thought constituted „Priam's Treasure.''

Setting aside matters simply of suspicion, the concrete essentials of the case against Treasure A are (a) that six of the bronze items in it can be seen from Schliemann's own records to have been found earlier in the 1873 season;[47] and (b) that the gold jewellery appears in Schliemann's documentation only after he had returned to Athens nearly a month later, so must have been added there having perhaps been found in earlier seasons.[48] Neither claim stands up. Careful comparison of the six bronze items in the treasure with those recorded earlier in 1873 shows every one to be different; and Schliemann's letters to his publisher show that the entire treasure (as described in *Trojanische Alterthümer* chapter xxiii), including the jewellery, had originally been recorded in a consecutive series of drawings made at Troy in the days immediately following 31st May 1873 and not, as has been thought, in photographs made later in Athens.[49] This means that there

Fig. 13   Find-spots of ''treasures'' possible deposited in Troy IIc
Grafik von Donald F. Easton

Fig. 14   Find-spots of ''treasures'' possibly deposited in Eraly III
Grafik von Donald F. Easton

is no solid evidence at all against the integrity of Treasure A, just suspicion and innuendo. Like the rest of the treasures it is probably genuine.

Since Schliemann's excavations closed in 1890 there have been three further sets of excavation: by Wilhelm Dörpfeld (1893–1894), by Carl Blegen and the University of Cincinnati (1932–1938), and most recently by the University of Tübingen, led initially by Manfred Korfmann (1987–2005) and subsequently by Ernst Pernicka (2006–2012). All of these excavations in their different ways have been more detailed than Schliemann's and to a higher standard. So what can Schliemann's work contribute today? Is it still of any value? A fundamental point is that Schliemann dug more of the site than any of his successors, so a complete understanding of the archaeology is impossible unless is work his taken into account. But this is problematic. Dörpfeld made a good record of the buildings exposed by Schliemann, mainly in Troy I and II, and on paper they can usually be connected up with buildings found by the later excavations. The task is not entirely straightforward because, for example, Schliemann discerned three building phases in Troy II while Blegen distinguished eight. When the results of Schliemann, Dörpfeld and Blegen are combined with those of the new excavations, it looks as though there were eleven or twelve phases in Troy II.[50] It is a tricky jigsaw puzzle, but it can be solved.

Much more troublesome are the pottery and other finds. The difficulty here is that, as mentioned, Schliemann recorded such items by their depth, usually using only whole metres (1m, 2m, 3m and so on). It was on this basis that he assigned them to periods. This made no allowance for irregularities such as pits or

foundation trenches, and in any case one must probably allow for an error of perhaps ± 50 cm in the measurement. Schliemann's various „cities" (periods) generally have a depth of deposit amounting to two or three metres, so statistically more of his attributions should be correct than incorrect. And if one examines the way in which the pottery assemblage changes over time, then in broad terms there is quite a good match between Schliemann's pottery sequence and Blegen's.[51] Nevertheless the crudeness of Schliemann's recording means that there will always be some uncertainty when it comes down to the level of the individual item.

Should we then, in the interests of accuracy, not use Schliemann's pottery? A point to bear in mind is that, of the many different shapes of pot found by Schliemann in Troy I–V, 89 do not appear in the material excavated by Blegen. Furthermore, of those which do, 40 appear to have a chronological distribution which is longer.[52] As the dating of archaeological periods depends in part on finding similarities with the pottery at other sites, this sort of discrepancy can raise important questions.

Since the publication of the Cincinnati excavations, the usual approach amongst archaeologists has been to disregard Schliemann where his findings are not consistent with those of Blegen, and to rely on Blegen as being more accurate. There will be a temptation to do the same with the Tübingen results. It is an approach which has its merits. It aims at certainty by cutting out anything which is uncertain. The difficulty is that, in doing so, it creates a different uncertainty in that it excludes a large amount of evidence some of which might be reliable and might change the picture. There is therefore perhaps a case for a holistic approach.

Including Schliemann's material in our evaluations will admittedly bring in the uncertainty that is due to the crudeness of his recording, but there will be uncertainty either way. The advantage is that it may sometimes suggest new lines of enquiry.

Schliemann undoubtedly believed his claim to fame to lie in the fact that he had discovered Troy. Was he justified in this? This simple-looking question conceals several different issues. He was not the person who first discovered the site, nor was he the first to identify it as Homer's Troy. Those honours belong to Franz Kauffer and Charles Maclaren. Nor was he the first to conduct excavations there, that distinction belonging to John Brunton followed by Frank Calvert. But their excavations were no more than trials, and it is true that Schliemann was the first to dig there on a large scale. But was it really Troy that he dug? The position of the site certainly agrees with that described by Homer: on the south side of the Hellespont, in a plain, between two rivers. It was occupied at the time that Homer seems to point to. At that time, the Thirteenth Century BC, the Hittites in central Anatolia knew of a city and a territory which they called *Wilusa* and *Tarwisa*, writings which probably correspond to Greek *Ilios* and *Troia*,[53] and these seem clearly to have lain in northwest Anatolia and very plausibly in the Troad.[54] So the place may well have been called Troy although we have no inscription from the site itself to put this beyond doubt. Supposing that it really was Troy, did Schliemann prove that the Trojan War had taken place? Until 1890 he believed that the burnt remains of Troy II (or III), with its treasures, were those of Priam's Troy destroyed by the Achaeans. In 1890 Dörpfeld persuaded him

that Troy VI, violently destroyed 1,000 years later, was the better candidate. Blegen preferred the burnt remains of Troy VIIa, again a century later.[55] The fact that these were three very different settlements shows that any proof lay only in the imagination of the excavators and not in the archaeology. From the point of view of the dating, either of the latter two could be compatible with an attack of some sort by Mycenaean Greeks, c.1300 or 1200 BC, but neither clearly points to one. We currently have no evidence for the historical existence of Helen, Menelaus, Hector, Priam, Paris, a grand coalition of Greeks, an expedition of 1,000 ships or a ten-year war. It is perhaps difficult to suppose that the story of the Trojan War is completely without historical basis, but the mute archaeology of the site has never produced one. What Schliemann did discover is a physical and cultural setting in which to imagine the age of the Greek heroes and the Trojan War.

If he was not in any strict sense the discoverer of Troy, and if he did not prove the historicity of the Trojan War, what then was his achievement? At Troy he plunged deep into prehistory and revealed a major site of the Bronze Age with a sequence continuing into Greek and Roman times. It was occupied, probably continuously, for 3,500 years. This was something quite new, and the long sequence of occupation has made Troy a reference point even today for archaeologists working in Greece, the Aegean, Anatolia and further afield. He published promptly and thoroughly in books, and by means of numerous articles in newspapers and learned journals he stirred up a new public interest in archaeology which has never dwindled. He pursued related questions at other

sites – Mycenae, Tiryns, Orchomenos – and so opened up a whole field of scholarship which is still being explored. Although he was far from perfect, these achievements entitle him to a rightful, if slightly tarnished, place among the founding fathers of archaeology.

Th Schliemann
Athens 13 Jan⁴ 1889

1 For the early researches see Cook 1973, pp. 14–51; Easton 1991, pp. 111–129; Aslan 2014, pp. 18–31.
2 Choiseul-Gouffier 1822.
3 Chevalier 1791.
4 Easton 1991, p. 114.
5 Clarke, Cripps 1803; Clarke 1817, pp. 130–133.
6 Maclaren 1820, pp. 195–209, 313–328; Maclaren 1822; Maclaren 1863.
7 For Frank Calvert see Allen 1999; Easton 1991, pp. 119–25; Robinson 1994, pp. 153–168; Robinson 1995, pp. 323–342; Robinson 2006.
8 Clapham 1939, pp. 68–9. On the hospital at Erenköy see Silver 2007.
9 For a more detailed account of Schliemann's work at Troy see Easton 2014, pp. 32–103.
10 Schliemann 1880, p. 1.
11 Schliemann 1869, chapters 14–22.
12 Calder 1986, pp. 17–47.
13 Traill 1984b, pp. 296–310.
14 Easton 2002.
15 Schliemann 1874a; Schliemann 1874b.
16 Easton 2000, pp. 74–76.
17 Easton 2000, pp. 76–77.
18 Schliemann 1884b, pp. 25–26, 62–63, Plan VIII.
19 Schliemann 1884b, pp. 63–67, Plan VIII.
20 Korfmann et al. 2006, pp. 337–342.
21 On Bötticher see Zavadil 2009. Bötticher's numerous publications are listed in Korres 1974, pp. 83–102.
22 Schliemann 1891, Plate III.
23 Schliemann 1891, p. 14; Dörpfeld 1902, p. 34, Fig. 6.
24 Schliemann 1891, p. 18; also Dörpfeld 1891, p. 60.
25 Sperling 1986, p. 30; Easton 1994a, p. 174.
26 Staecker et al. 2006, pp. 12–18
27 Easton 1982, pp. 93–110; Kennell 2007, pp. 785–817.
28 www.ascsa.org.gr/research/personal-papers-and-archives.
29 For general accounts of the collection see Bertram 1992, pp. 397–401; Saherwala et al. 1993.
30 Schmidt 1902a.
31 Wemhoff et al. 2014.
32 Staatliche Museen zu Berlin 1993; Akinsha, Koslow 1994, pp. 67–72; Akinsha, Koslow 1995a; Akinsha, Koslow 1995b.
33 The two collections have published exhibition catalogues: Antonova et al. 1996; Piotrowsky 1998.
34 Boguslavsky 1997, pp. 186–190; Urice 1997, pp. 204–206.
35 The literature is enormous, but see Easton 1998, pp. 335–343; Korfmann 1990a, pp. vii–xxix; Korfmann 1993b; Traill 1995.
36 Fitton 1991, pp. 9–17, letters of 26th July and 4th September 1873 to Charles Newton. Some of Schliemann's expenses are noted at Schliemann 1880, p. 65 f.
37 Schliemann 1874a p. 140; Schliemann 1875 p. 185.

38 Schliemann 1874b, plate 116; Dörpfeld 1902, fig. 1. A fuller contour plan of the site before excavation is reconstructed in Easton 2002, fig. 6.
39 Calvert and Schliemann both refer to a depression which they found in this area of the mound, and excavation revealed only the temple's foundation trenches. Meyer 1953, p. 198; Schliemann 1874a, p. 99; Easton 2002, p. 82.
40 Schliemann 1874a, p. lvif; 1875, p. 54 f.
41 Schliemann 1880, p. 587 f.
42 Schliemann 1884b, p. 52 f.
43 Blegen et al. 1950, p. 207. See also Easton 2000, p. 78f and Jablonka 2000, p. 103.
44 Easton 2002, pp. 61–63.
45 Examples may be seen at Schliemann 1875 pp. 340, 361f; Schliemann 1880 pp. 84, 114–116, 317–323, 477 f., appendices VI, VII; Schliemann 1884b appendices II, III.
46 Traill 1984a, pp. 96–115; also chapters 11–16 Traill 1993.
47 Traill 2000, pp. 17–35.
48 Traill 1984a, pp. 105–106.
49 Letters of 11th and 18th October 1873 in the Schliemann Archive, Gennadius Library, Athens, ref: BBB 33: 146, 182; also Schliemann's original catalogue text at BBB 32: 411–8, 421–2, 477–482. Since Schliemann's practice was to use photography in Athens but drawings at Troy, it is safe to conclude that the drawings were made at Troy. Their numbering as Plates 192–209 shows them to have been made in the days following 31st May because Plate 188 includes an object (no. 3447) found on 29th May 1873. The photographs published in the Atlas show a mostly different arrangement of the objects.
50 Easton 2002, p. 307f; Ünlüsöy 2010.
51 As demonstrated by Correspondence Analysis in: Easton, Weninger 2018, pp. 42–45.
52 It is equally true that, of the pottery shapes identified by Blegen in Troy I–V, 67 do not appear in Schliemann and, of those which do, 25 seem to have a longer chronological spread.
53 Gurney 1990, pp. 45–47.
54 Hawkins 1998, fig. 11; and The Historical Geography of the Hittite Texts in: Easton et al. 2002, pp. 94–101.
55 Blegen 1963b, pp. 161–164.

63