Text Mapping as Modelling

Øyvind Eide
Welcome to DHSI 2018!

Thanks for joining the DHSI community!

In this booklet, you will find essential course materials prefaced by some useful information about getting settled initially at UVic, finding your way around, getting logged in to our network (after you’ve registered the day before our courses begin), and so on.

Given our community’s focus on things computational, it will be a surprise to no one that we might expect additional information online for some of the classes - your instructors will let you know - or that the most current version of all DHSI-related information may be found on our website at dhsi.org.

To access the DHSI wifi network, simply go into your wireless settings and connect to the “DHSI” network and enter the password “dhsi2018”.

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 ....
The 2018 schedule is just about ready! A very few things to confirm, add, etc, but this is the place to be to find out what is happening when / where ... 

Psst: Some Suggested Outings

If you're here a day or two before we begin, or staying a day or two afterwards, here are a few ideas of things you might consider doing ....

▼ Suggested Outing 1, Botanical Beach (self-organised; car needed)

A self-guided visit to the wet, wild west coast tidal shelf (and historically-significant former research site) at Botanical Beach; we recommend departing early (around 8.00 am) to catch low tide for a better view of the wonderful undersea life! Consider bringing a packed lunch to nibble-on while looking at the crashing waves when there, and then have an afternoon drink enjoying the view from the deck of the Port Renfrew Hotel.

▼ Suggested Outing 2, Butchart Gardens (self-organised)

A shorter journey to the resplendently beautiful Butchart Gardens and, if you like, followed by (ahem) a few minutes at the nearby Church and State Winery, in the Saanich Peninsula. About an hour there by public bus from UVic, or 30 minutes by car.

▼ Suggested Outing 3, Saltspring Island (self-organised; a full day, car/bus + ferry combo)

Why not take a day to explore and celebrate the funky, laid back, Canadian gulf island lifestyle on Saltspring Island. Ferry departs regularly from the Schwartz Bay ferry terminal, which is about one hour by bus / 30 minutes by car from UVic. You may decide to stay on forever ....

▼ Suggested Outing 4, Paddling Victoria's Inner Harbour (self-organised)

A shorter time, seeing Victoria's beautiful city centre from the waterways that initially inspired its foundation. A great choice if the day is sunny and warm. Canoes, kayaks, and paddle boards are readily rented from Ocean River Adventures and conveniently launched from right behind the store. Very chill.

And more!

Self-organised High Tea at the Empress Hotel, scooter rentals, visit to the Royal BC Museum, darts at Christies Carriage House, a hangry breakfast at a local diner, whale watching, and beyond!) paddle-boarding, a tour of used bookstores, and more have also been suggested!

9:00 to 4:00

▼ Early Class Meeting: 4. [Foundations] DH For Department Chairs and Deans (Hickman 120, Classroom)

Further details are available from instructors in mid May to those registered in the class. Registration materials will be available in the classroom.

3:00 to 5:00

DHSI Registration (MacLaurin Building, Room A100)

After registration, many will wander to Cadboro Bay and the pub at Smuggler's Cove OR the other direction to Shelbourne Plaza and Maude Hunter's Pub OR even into the city for a nice meal.

Monday, 4 June 2018

Your hosts for the week are Alyssa Arbuckle, Ray Siemens, and Dan Sondheim.

7:45 to 8:15

Last-minute Registration (MacLaurin Building, Room A100)

8:30 to 10:00

Welcome, Orientation, and Instructor Overview (MacLaurin A144)
Classes in Session (click for details and locations)

3. [Foundations] Making Choices About Your Data (MacLaurin D109, Classroom)
4. [Foundations] DH For Department Chairs and Deans (Hickman 120, Classroom)
5. [Foundations] Introduction to Javascript and Data Visualization (Clearihue D132, Classroom)
6. [Foundations] Introduction to Computation for Literary Criticism (Clearihue A195, Lab)
7. Out-of-the-Box Text Analysis for the Digital Humanities (Human and Social Development A160, Lab)
8. Sounds and Digital Humanities (MacLaurin D111, Classroom)
9. Digital Humanities Pedagogy: Integration in the Curriculum (MacLaurin D106, Classroom)
10. Text Processing - Techniques & Traditions (McPherson Library A003, Classroom)
11. 3D Modelling for the Digital Humanities and Social Sciences (MacLaurin D010, Classroom)
12. Conceptualising and Creating a Digital Edition (MacLaurin D103, Classroom)
13. Visualizing Information: Where Data Meets Design (MacLaurin D107, Classroom)
14. Introduction to Electronic Literature in DH: Research and Practice (MacLaurin D115, Classroom)
15. Race, Social Justice, and DH: Applied Theories and Methods (MacLaurin D105, Classroom)
16. XML Applications for Historical and Literary Research (Clearihue A103, Lab)
17. Processing Humanities Multimedia (Human and Social Development A150, Lab)
18. Digital Games as Tools for Scholarly Research, Communication and Pedagogy (MacLaurin D116, Classroom)
19. Web APIs with Python (Human and Social Development A170, Lab)
20. Ethical Data Visualization: Taming Treacherous Data (MacLaurin D101, Classroom)
21. Digital Publishing in the Humanities (Clearihue D131, Classroom)
22. Linked Open Data and the Semantic Web (Clearihue D130, Classroom)
23. Introduction to IIIF: Sharing, Consuming, and Annotating the World’s Images (MacLaurin D114, Classroom)
24. Feminist Digital Humanities: Theoretical, Social, and Material Engagements (Cornett A229, Classroom)
25. The Frontend: Modern JavaScript & CSS Development (Clearihue A030, Classroom)

10:15 to Noon

12:15 to 1:15

Lunch break / Unconference Coordination Session (MacLaurin A144)
(Grab a sandwich and come on down!)

Undergraduate Meet-up, Brown-Bag (details via email)

1:30 to 4:00

Classes in Session

Institute Panel: Perspectives on DH (or, #myDHis ...)
Chair: Alyssa Arbuckle (U Victoria)
(MacLaurin A144)

Milena Radzikowska (Mt Royal C): "Release the Kraken: Story-Driven Prototyping for the Digital Humanities."
Abstract: I have spent the last 15 years of my career designing text analysis tools for use by humanities scholars. In this brief presentation, I propose to share a concept-based approach to interface design for DH.

Emily Murphy (U Victoria): "#MyDHis Edgy."
Abstract: I will build upon—or, possibly, perform a misprision of—a tweet by Polina Vinogradova; "#myDHis messy, dusty, edgy, and radically inclusive!" Vinogradova evokes the mess and dust of the archives, the edges that connect nodes of a network, and the political impetus to think of cultural history and community together. I argue that these aspects of DH have a renewed importance as we head into a moment of feminist historiography.

Margaret Konkol (Old Dominion U): "Prototyping Mina Loy’s Alphabet with a 3D Printer."
Abstract: This talk discusses the interpretive and methodological implications of using 3D printing technologies to prototype the archival diagrams of a proposed but never constructed plastic segmental alphabet letter kit—a game designed by modernist poet Mina Loy for F.A.O Schwarz. Although intended as a toy for young children, "The Alphabet that Builds Itself," as a work of "object typography" articulates a theory of language as kinetic, geometric, recombinant, and open to mutation. Alphabetic segments extend into the x, y, and z coordinates in exponential iterations and conjoin with magnets. Combining elements of contemporaneous typefaces like Futura and Gill Sans, which represented modernity’s functional ideals and democratic principles of simplicity, these recombinant letters represent, as this talk argues, Loy’s unpublished modernist poem, an articulation of Loy’s concept of language as a physical fact in which substance, not just form, is semantic.

Lee Zickel (Case Western Reserve U): "Comfortably Trepid."
Abstract: #myDHs found outside the well-established, DH-friendly institutions, at an institution that is devoted predominantly to Medicine and Engineering. I, and with increasing frequency other DH practitioners and instructors, am not positioned in a DH Lab or Humanities Center, but in ITS. Part teacher, part technologist, part translator, I will briefly discuss my work supporting humanities and social scientists, particularly those who are new to or less comfortable with computational methodologies.

Dorothy Kim (Vassar C): "#MyDHis Antifascist."
Abstract: I've spent a lot of time in the last 12 months thinking about fascism, digital humanities, its long histories, and what it means to do DH work that centers social justice particularly in this global rise of late fascism. I will speak briefly about DH’s history, including the medieval history related to Busa but how that history really connects to data systems that created the Holocaust and also participated in the Cold War nuclear military complex.
Randa El Khatib (U Victoria): "Learning from the Iterative Process."
Abstract: #MyDHis Iterative. In addition to the improvements that come with iterative projects, the iterative process itself is a fruitful area for scholarly inquiry. Within this iterative context, the various teams that I work with and I have been reflecting on and rethinking central DH practices, such as what it means to collaborate, prototype, remix, and implement DH values in our work. In this talk, I will present the various lessons learnt along the way.

Sarah Melton (Boston C): "#MyDHis...People."
Abstract: Taking seriously Miriam Posner’s exhortation to “commit to DH people, not DH projects,” I invite us to reflect on how people are the core of DH. In this brief talk, I will explore the intersections between DH, labor, and infrastructure.

Tuesday, 5 June 2018

5:00 to 6:00
Opening Reception (University Club)
We are grateful to Gale Cengage for its sponsorship.

9:00 to Noon
Classes in Session

12:15 to 1:15
DHSI Lunchtime Workshop Session (click for workshop details and free registration for DHSI participants)
1. 73. Introduction to ORCID (Digital Scholarship Commons, Classroom).

1:30 to 4:00
Classes in Session

4:15 to 5:15
DHSI Colloquium Lightning Talk Session 1 (MacLaurin A144)
Chair: James O'Sullivan
- New Modes of DH and Archival Skills Acquisition in a Graduate Public History Course. Paulina Rousseau (Ryerson U)
- Walking a Transect: Exploring a Soundscape. John Barber (Washington State U)
- Centering the Edge Case: Designing Services for Humanities Data Research. Grace Afari-Mamagani (New York U)
- Orwellian Vocabulary and the 21st-Century Politics. Ilgin Kizilgunesler (U Manitoba)
- Making Open Data from a Gray Archive. Sara Palmer (Emory U)

6:00 to 8:00
DHSI Newcomer’s Beer-B-Q (Felicitas, Student Union Building)

Wednesday, 6 June 2018

9:00 to Noon
Classes in Session

12:15 to 1:15
DHSI Colloquium Lightning Talk Session 1 (MacLaurin A144)
Chair: James O’Sullivan
- New Modes of DH and Archival Skills Acquisition in a Graduate Public History Course. Paulina Rousseau (Ryerson U)
- Walking a Transect: Exploring a Soundscape. John Barber (Washington State U)
- Centering the Edge Case: Designing Services for Humanities Data Research. Grace Afari-Mamagani (New York U)
- Orwellian Vocabulary and the 21st-Century Politics. Ilgin Kizilgunesler (U Manitoba)
- Making Open Data from a Gray Archive. Sara Palmer (Emory U)

1:30 to 4:00
Classes in Session

Alexandra Branzan Albu is an Associate Professor with the Department of Electrical and Computer Engineering and cross-listed with Computer Science. Her research interests are related to image analysis, computer vision, and visual computing. She is actively pursuing outreach activities dedicated to increasing the women's presence in electrical engineering and computer science.
Thursday, 7 June 2018

9:00 to Noon
Classes in Session

12:15 to 1:15
UVIC Library/ETCL lunchtime talk: “A Humanities Application of 3D printing and Machine Translation in the ChessBard and Loss Sets” by Dr. Aaron Tucker
Digital Scholarship Commons, 3rd floor, Mearns Centre for Learning / McPherson Library
Bring your lunch and come on up!*

1:30 to 4:00
Classes in Session

4:15 to 5:15
DHSI Colloquium Lightning Talk Session 3 (MacLaurin A144)
Chair: James O'Sullivan
- Documenting Deportation: A Collaborative Digital Collection. Paulina Rousseau (Ryerson U)
- Unleashing the Power of Texts as Networks: Visualizing the Scholastic Commentaries and Texts Archive. Jeffrey Witt (Loyola U Maryland) and Drew Winget (Stanford U)
- #haunteDH: Punching holes in the International Busa Machine Narrative. Arun Jacob (McMaster U)
- Text in World: Computational Analysis of Trauma in Genocide Narratives. Nanditha Narayananmooorthy (U York) and Krish Perumal (U Toronto)

7:30 to 9:30
(Groovy?) Movie Night (MacLaurin A144)

Friday, 8 June 2018 [DHSI; DLFxDHSI Opening]

9:00 to Noon
DHSI Classes in Session

12:15 to 1:15
DHSI Lunch Reception / Course E-Exhibits (MacLaurin A100)

1:00 to 2:00
DLFxDHSI Registration (MacLaurin A100)

1:30 to 1:50
[DHSI] Remarks, A Week in Review (MacLaurin A144)

Abstract: The basic constitution of our digital collections becomes vastly more important in the face of two understandings: first, that archives of modernity are archives of the sixth great mass extinction of life on our planet; and next, that we no longer steward cultural heritage for human readers alone. In the same way that we people are shaped by what we read, hear, and see, the machine readers that follow us into and perhaps beyond the Anthropocene have begun to learn from "unsupervised" encounters with our digital libraries. What will we preserve for the living generations and artificial intelligences that will come? What do we neglect, or even choose to extinguish? And from an elegiac archive, a library of endings, can we create forward-looking, speculative collections--collections from which to deep-dream new futures? The most extra/ordinary power we possess is the power to make poetry from records of the past. Could it be called on, one day, to reconstitute the world?
**Saturday, 9 June 2018 [DLFxDHSI + DHSI Conference and Colloquium]**

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<tr>
<td>8:30 to 9:00</td>
<td>DLFxDHSI Registration (MacLaurin A100)</td>
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<td>9:00 to 5:30</td>
<td>DLFxDHSI UnConference Sessions</td>
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<td><strong>DFSI All Day Workshop Session</strong></td>
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<td>(click for workshop details and free registration for DHSI participants)</td>
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<td>9:00 to 4:00</td>
<td><strong>53. Building Your Academic Digital Identity</strong> (MacLaurin D105, Classroom)</td>
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<td><strong>DHSI Colloquium Day Conference</strong> (MacLaurin A144)</td>
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**Welcome**

People I: Documenting Online Lives. Chair: Molly Nebiolo (University of New York)
- Examining Gendered Harassment Online and in Silicon Valley. Andrea Flores (Utica College)
- This is Just to Say I Have <X> the <Y> in your <Z>: Modernist Memes in an Era of Public Apology. Shawna Ross (Texas A&M University)

**Break**

People II: Documenting Lives Online. Chair: Dheepa Sundaram (College of Wooster)
- Youtube Yoga and Ritual on Demand: The Virtual Economics of Hindu Soteriology. Dheepa Sundaram (College of Wooster)
- The Resemblage Project: Creativity and Digital Health Humanities in Canada. Andrea Charise (University of Toronto) and Stefan Krecsy (University of Toronto)

**Lunch**

Projects I: Building and Analyzing. Chair: Yannis Rammos (New York University)
- Building the ARTECHNE Database: New directions in Digital Art History. Marieke Hendriksen (Old Dominion University)
- The Ineffective Inquisition: The Holy Office’s Sphere of Influence in Early Modern New Spain. Kira Homo (Pennsylvania State University)

**Break**

Projects II: Mapping and Visualizing. Chair: Innocent Opara (Qumet Institute)
- Mapping Sarah Sophia Bank’s Numismatic Collection. Erica Hayes (North Carolina State University) and Kacie Wills (University of California, Riverside)
- Text Mining and Visualizing 18th Century American Correspondence. Ashley Sanders Garcia (University of California, Los Angeles)

**Break**

Practices: Digital Scholarship on Campus and in the Classroom. Chair: Alyssa Arhuckle (University of Victoria)
Concluding Remarks

Sunday, 10 June 2018 [SINM + DHSI Registration, Workshops]

8:30 to 9:00 Symposium on Indigenous New Media Registration (MacLaurin A100)

9:00 to 5:00 DHSI Registration (MacLaurin A100)

9:00 to 4:00 SINM Sessions
- 63. Symposium on Indigenous New Media: Reading Group (Hickman 105, Classroom)
- 72. Symposium on Indigenous New Media: Indigitization (Hickman 120, Classroom)
Full details here

9:00 to 4:00 DHSI All Day Workshop Sessions (click for workshop details and free registration for DHSI participants)
- 53. Building Your Academic Digital Identity (MacLaurin D105, Classroom)
- 54. An Introduction to the Archaeology of 1980s Computing (MacLaurin D114, Classroom)

9:00 to Noon DHSI AM Workshop Sessions (click for workshop details and free registration for DHSI participants)
- 55. Regular Expressions (MacLaurin D111, Classroom)
- 56. 3D Visualization for the Humanities (MacLaurin D010, Classroom)
- 58. DH Fieldwork Methods (MacLaurin D016, Classroom)
- 60. Pedagogy of the Digitally Oppressed: Inculcating De-/Anti-/Post-Colonial Digital Humanities (MacLaurin D107, Classroom)
- 61. Introduction to #GraphPoem. Digital Tools for Poetry Computational Analysis and Graph Theory Apps in Poetry (MacLaurin D101, Classroom)
- 62. Creating a CV for Digital Humanities Makers (MacLaurin D115, Classroom)

1:00 to 4:00 DHSI PM Workshop Sessions (click for workshop details and free registration for DHSI participants)
- 64. Agent-Based Modelling in the Humanities (MacLaurin D111, Classroom)
- 65. Unleash Linux on MacOS (MacLaurin D010, Classroom)
- 66. DHSI Knits: History of Textiles and Technology (MacLaurin D016, Classroom)
- 67. Crowdsourcing as a Tool for Research and Public Engagement (MacLaurin D109, Classroom)
- 69. Web Annotation as Critical Humanities Practice (MacLaurin D103, Classroom)
- 70. Dynamic Ontologies for the Humanities (MacLaurin D107, Classroom)
- 71. Social Media Research in the Humanities (MacLaurin D101, Classroom)

4:10 to 5:00 Joint Institute Lecture (DHSI and SINM):
David Gaertner (U British Columbia): "A Landless Territory?: CyberPowWow and the Politics of Indigenous New Media."
Chair: Deanna Reder (Simon Fraser U)
(MacLaurin A144)

Abstract: Following the 1997 launch of Skawennati’s (Mohawk) CyberPowWow, digital space has become a vital new territory for the resurgence of Indigenous storytelling and cultural practice: "We have signed a new treaty," Cree artist Archer Pechawis wrote of this period, "and it is good. We have the right to hunt, fish, dance and make art at www.CyberPowWow.net, .org and .com for as long as the grass grows and the rivers flow." This talk will critically explore the theoretical, cultural, political-economic, and gendered dynamics underwriting the histories and futures of Indigenous new media. Particular attention will be given in examining the ways in which new media and digital storytelling connect to and support key issues in the field of Indigenous studies, such as sovereignty, self-determination, decolonization, and land rights.

After the day, many will wander to Cadboro Bay and the pub at Smuggler's Cove OR the other direction to Shelbourne Plaza and Maude Hunter’s Pub OR even into the city for a bite to eat.

Monday, 11 June 2018 [DHSI + SINM]
Your hosts for the week are Ray Siemens and Dan Sondheim.

7:45 to 8:15  DHSI Last-minute Registration (MacLaurin A100)
8:30 to 10:00  DHSI Welcome, Orientation, and Instructor Overview (MacLaurin A144)
9:00 to 4:00  SINM Sessions

- DHSI Classes in Session (click for details and locations)
  - 29. [Foundations] Models for DH at Liberal Arts Colleges (& 4 yr Institutions) (MacLaurin D109, Classroom)
  - 32. Stylistometry with R: Computer-Assisted Analysis of Literary Texts (Clearihue A162, Lab)
  - 33. Digital Storytelling (MacLaurin D114, Classroom)
  - 34. Text Mapping as Modelling (Clearihue D131, Classroom)
  - 35. Geographical Information Systems in the Digital Humanities (Clearihue A105, Lab)
  - 36. Open Access and Open Social Scholarship (MacLaurin D115, Classroom)
  - 37. Introduction to Machine Learning in the Digital Humanities (Cornett A229, Classroom)
  - 38. Queer Digital Humanities: Intersections, Interrogations, Iterations (MacLaurin D110, Classroom)
  - 39. Using Fedora Commons / Islandora (Human and Social Development A160, Lab)
  - 41. Documenting Born Digital Creative and Scholarly Works for Access and Preservation (MacLaurin D115, Classroom)
  - 43. Games for Digital Humanists (MacLaurin D118, Classroom & Human and Social Development A170, Lab)
  - 44. XPath for Document Archeology and Project Management (Cornett A128, Classroom)
  - 46. Surveillance and the Digital Humanities (MacLaurin D103, Classroom)
  - 47. Text Analysis with Python and the Natural Language ToolKit (Clearihue A103, Lab)
  - 49. Wrangling Big Data for DH (Human and Social Development A150, Lab)
  - 50. Accessibility & Digital Environments (MacLaurin D101, Classroom)
  - 51. Critical Pedagogy and Digital Praxis in the Humanities (MacLaurin D105, Classroom)
  - 52. Drupal for Digital Humanities Projects (MacLaurin D107, Classroom)

10:15 to Noon

Lunch break / Unconference Coordination Session (MacLaurin A144)

DHSI Undergraduate Meet-up, Brown-Bag (details via email)

1:30 to 4:00  DHSI Classes in Session

- Joint Institute Lecture (DHSI and SINM): Jordan Abel (Simon Fraser U): "Indigeneity, Conceptualism, and the Borders of DH.
  Chair: Michelle Brown (U Hawaii) (MacLaurin A144)

Abstract: This talk brings together digital humanities discourses in computational textual analysis and Indigenous Literary Studies to analyze a corpus comprised of every book of Indigenous poetry published in Canada, extending from Pauline Johnson's 1895 book The White Wampum to Marilyn Dumont's 2015 book The Pemmican Eaters. While the main goal of this research project initially centered on the topic modeling of a corpus of Indigenous poetry, the project also addresses the systemic barriers that have prevented such work gaining traction, and likewise attempts to address the specific challenges that Indigenous writing (and in particular Indigenous poetry) present to current Digital Humanities methodologies.

5:00 to 6:00  Joint Reception: DHSI and SINM (University Club)

Tuesday, 12 June 2018

9:00 to Noon  Classes in Session

12:15 to 1:15  Lunch break / Unconference
  "Mystery" Lunches
  DHSI Lunchtime Workshop Session (click for workshop details and free registration for DHSI participants)

- 73. Introduction to ORCID (Digital Scholarship Commons, Classroom).
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<td>▼  DHSI Colloquium Lightning Talk Session 4 ([MacLaurin A144])</td>
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<td>Chair: Lindsey Seatter</td>
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<td>- Mapping Indigenous and Chicana/o Environmental Imaginaries using GIS. Stevie Ruiz (California State U, Northridge), Quetzalli Enrique (California State U, Northridge), Enrique Ramirez (California State U, Northridge), and Tomas Fiqueroa (California State U, Northridge)</td>
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<td>- &quot;But is it any good?:&quot; A quantitative approach to the popularity of digital fanfiction. Suzanne Black (U Edinburgh)</td>
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<td>- The American Prison Writing Archive (APWA). Doran Larson (Hamilton C), Janet Simons (Digital Humanities Initiative, Hamilton C), and William Rasenberger (Hamilton C)</td>
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<td>4:15 to 5:15</td>
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<td>- Faraway, so close: Has the political environment really changed in Ecuador?. Luis Meneses (Electronic Textual Cultures Lab, U Victoria)</td>
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<td>- Re-mixing Melville’s Reading: Text Analysis of Marginalia with R and XSLT. Christopher Ohge (U London, School of Advanced Study) and Steven Olsen-Smith (Boise State U)</td>
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<td>- Developing Interactive and Open-Source OER: Inquiry-Based Music Theory. Evan Williamson (U Idaho)</td>
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<td>- Spatial Humanities and the Web of Everywhere. Ken Cooper (SUNY Geneseo)</td>
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<td>6:00 to 8:00</td>
<td>DHSI Newcomer's Beer-B-Q ([Felicitas, Student Union Building])</td>
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<td>Lunch break / Unconference <em>Mystery</em> Lunches</td>
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<td>Chair: Lindsey Seatter</td>
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<td>- Composition not Inheritance: Imagining a Functional Digital Humanities. Andrew Pilsch (Texas A&amp;M U)</td>
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<td>- Plotting Our Trajectories: Navigating, Situating, and Re-Inventing Research Topoi with R. Sean McCullough (Texas Christian University) and Jongkeyong Kim (Texas Christian U)</td>
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<td>- Herb Simon and His Books. Avery Wiscomb (Carnegie Mellon U) and Daniel Evans (Carnegie Mellon U)</td>
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<td>- (De/Re)Defining &quot;The Digital&quot;: A Decolonial Approach to Digital Humanities. Ashley Caranto Morford (U Toronto) and Arun Jacob (McMaster U)</td>
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<tr>
<td>7:30 to 9:30</td>
<td>(Groovier?) Movie(r) Night ([MacLaurin A144])</td>
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<td>12:15 to 1:15</td>
<td>Lunch Reception / Course E-Exhibits ([MacLaurin A100])</td>
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1:30 to 2:30

Abstract: Much has changed and continues to change in digital humanities since the formal establishment of Iter in the Fall of 1997. However, the mandate of the not-for-profit partnership to support “the advancement of learning in the study and teaching of Middle Ages and Renaissance (400–1700) through the development and distribution of online resources” continues to have relevance. This presentation explores the striking challenges faced by Iter and presents our current thinking on the realization of this mandate for the future through a platform with a focus on facilitating the discovery of the academic resources necessary to our work; creating an environment for collaboration, sharing and developing projects; and on enabling the distribution and publication of our scholarship.

2:40 to 3:00

Awards and Bursaries Recognition
Closing, DHSI in Review (MacLaurin A144)

Contact info:
institut@uvic.ca  P: 250-472-5401  F: 250-472-5681
Text Mapping as Modelling

_A DHSI 2018 course_

led by Øyvind Eide

Contents

1 Introduction 1
2 Plan for the week 2
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1 Introduction

Modelling the Textual Universe Through Mapping: Modelling the Textual Universe Through Mapping: This course will question one of the most important practices in Digital Humanities, namely, digital mapping of texts. The students will go through an extensive model building experiment using the map exhibition tool Neatline. They will also create reports in the form of textual blogs and compare what can be expressed in each of the two media. By comparing the different student projects in discussion sessions we will look into what kind of maps can be made based on different types of texts, and the degree to which mapping is meaningful for different texts.

Through the course the students will understand better where the information we put on maps come from. How much is read from the text and how much is added from other sources, including the reader’s previous knowledge? To what degree is
the information silently adjusted to fit the map medium? How much of what we express in text and as maps are steered by the medium? Through this course the students will not only learn how to make map exhibitions based on texts but will also explore how modelling in the form of media transformation can be used as a text analysis tool.

This course combines lecture and hands-on activities. Consider this offering in complement with: Geographical Information Systems in the Digital Humanities; Digital Storytelling; Visualizing Information: Where Data Meets Design; Creating LAMP Infrastructure for Digital Humanities Projects; and more!

2 Plan for the week

Monday

*Overview and introductions. Basic features of maps and texts will be introduced, and map semiotics will be shown to work differently from text semiotics. Modelling and text mapping will be introduced and the students will learn to use the Neatline mapping tool.*

Programme

- Introduction to mapping
  - What is a map
  - What is a text
  - What is modelling
  - Mapping as modelling
- Introduction to Neatline.
  - Philosophy behind and how it is meant to work
  - Neatline training
Tuesday

Groups of 2-4 students will work together to create map exhibitions based on the reading of selected texts. Different groups may model the same text in order to compare the results.

Programme

- Introduce texts for mapping
- Discuss goals for mapping
- Mapping
- Plenary discussions of problems and questions whenever needed
- More on modelling

Wednesday

The groups will continue mapping. An introduction to the use of stylesheets in Neatline will be given. Towards the end of the day the groups will compare the mappings. What is similar and what is different? Are there any interesting tendencies?

Programme

- How to design a good map exhibition
- Introduction to Neatline styling
- Mapping
- Plenary discussions of problems and questions whenever needed
- Compare mappings
- Discussion
Thursday

Each group will create a text document in the form of a blog as an alternative to the map exhibitions. The blog will be a textual description, like an essay. Towards the end of the day the groups will compare the blogs. What is similar and what is different? The groups will compare between each other, between different base texts, and between the two different media of deep map and blog. There will be further discussions of mapping and modelling in the light of media transformations, following up on the Monday introductions and the experiences from the practical work. This will include looking into alternative tools.

Programme

- On textual mapping
- Write textual blog
- Comparisons
- Revisiting mapping as modelling
- Media transformations
- Alternative tools

Friday

Based on their experiences from the mapping and the textual blog each participant will reflect on his or her experiences from the course. Based on the reflection a general discussion will be used to sum up the course. Through the results and the discussion the class will learn things about texts and maps that none of the participants knew on beforehand.

Programme

- Write reflection notes
• Discussion about Neatline. How was the tool experienced?
• Discussions
• Summing up
• Present work to the other DHSI participants

3 Enclosed readings


   Also available online: https://academic.oup.com/dsh/article/28/4/692/1079085


   Also available online: http://journals.tdl.org/paj/index.php/paj/article/view/11


   Also available online: http://journals.tdl.org/paj/index.php/paj/article/view/11

4 Web resources

Previous course blogs

- https://textmappingasmodelling.wordpress.com
- https://textmappingasmodelling2016.wordpress.com

Resource page

- http://www.oeide.no/dhsi/

*Will be developed throughout the course*

Useful background material

- Neatline webpage: http://neatline.org
  With documentation and demos.
- Neatline stylesheets: http://docs.neatline.org/neatline-stylesheets.html
Neatline manual

Step by step to an exhibition
Øyvind Eide

Create exhibition

Log into Neatline from the address given. Go to “Neatline” in the left menu and select “Create an exhibit”. Enter title and a narrative describing the exhibition. This can be changed later. Select which background maps to make available and which of them will be the default one.

Add SIMILE Timeline as a Widget.
It is also possible to use a static image available on the web as the background map.

Spatial Querying and Public should be checked.

Save the exhibition.

**Zooming and viewport**

Once the exhibition is created, open it by clicking on its title in the Browse Exhibits window. Choose Styles. Zoom and move to the most relevant part of the world and the most relevant resolution. Then select “Use Current Viewport as Default” and save.
Timeline

If you want a timeline, select “SIMILE Timeline” from the Plugins and save. For this short tutorial, please add a timeline.

Under “plugins – SIMILE Timeline” you can decide the starting point for the timeline, its time density, and some other details.

Create a record

Moving to “Records” select “New Record” to put your first record on the map.
In the record, enter Slug (a short description), the title, and a body. HTML can be used, which means, for instance, that media objects such as images can be inserted into the body. Save your data and move over to “Map”.

Under “Map” you can then select what kind of a mark you want to put on the map and put it there using the mouse. The easiest way is just a point. Zoom and pan to the right place and zoom level and add the symbol to the map. Save the geometry and a basic record is made and linked to the map.
View your map

Go back to Omeka and select the “Public view” of your new exhibition. Mousing over the point on the map the title comes up.

Clicking on the point makes the body come up, including the image for which the reference was included in the body.
Add timeline slot for record

The last thing we will do in this short introduction is to add a slot in the timelines for the new record. Go back to editing the record and choose “Style.” Select “SIMILE Timeline” under “Widgets.” The timeline must be selected for each record you want to appear on the timeline.
The start and end dates will define the length of the bar in the timelines. If they are empty the record will not be on the timeline. The before and after dates will decide when the record will disappear from the map during timeline scrolling. If they are empty the record will never leave the map because of timeline scrolling.

Here you can also define the default focus and zoom level for this specific record. This can be done most easily by zooming and panning and then click on “Use Current Viewport as Default.”
The map/time exhibition

Going back to the “Public view” the record is now available both on the map and on the timeline.
Geo-Temporal Interpretation of Archival Collections with Neatline

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Abstract

This article provides a brief description of Neatline, an open-source, Web-based suite of software produced by the Scholars’ Lab at the University of Virginia Library. Neatline allows scholars and curators to interpret digitized cultural heritage collections with special attention to their temporal and geospatial dimensions. Here we describe the theoretical goals of Neatline, pragmatic decisions made during development of the toolset, and its primary features and affordances.

At Digital Humanities 2012 in Hamburg, Germany, the University of Virginia Library Scholars’ Lab released Neatline, a Web-based tool with which students, scholars, and curators can express the geo-temporal dimensions of literary, historical, or other digital collections. These customized interfaces take the form of highly interpretive exhibits that link together interactive maps, timelines, texts, images, sound and video files, and archival objects. Neatline’s geo-temporal visualizations are built using open-source software and standards-based approaches to geospatial data, and they allow scholars to illustrate collections they have independently digitized or to draw on open-access archival content and standardized metadata created by cultural heritage institutions. That said, each use of Neatline is imagined as a carefully designed narrative or exhibit—a subjective story told through small-scale interpretive decision making, rather than (as is commonly pursued in our era of ‘big data’ visualization) a more passively derived algorithmic output. In the broadest terms, Neatline is conceived as a contribution—to multidisciplinary place-based interpretive scholarship using primary humanities sources.

This short article describes: (1) the theoretical goals of Neatline, including our assertion of the place of hand-craftedness and iterative sketching in humanities interpretation using digital tools; (2) the decision-making process that led us to build Neatline not as a stand-alone application, but as a set of mix-and-match plugins for Omeka, a popular open-source platform for online collections and exhibits; and (3) the results of work in two project phases, undertaken in 2010 with Digital Humanities Start-Up Grant funding from the National Endowment for the Humanities (NEH), and in 2011 and 2012 with support from the United States Library of Congress, in collaboration with the Roy Rosenzweig Center for History and New Media (RRCHNM) at George Mason University.

Neatline makes three claims to innovation in the sphere of geo-temporal humanities visualization. These align roughly with notions of content, audience, and method. First, by building on primary resources expressed in portable metadata standards like Dublin Core (DC), Encoded Archival Description (EAD), and Visual Resources Association (VRA) Core, Neatline creates a pragmatic path for collaboration among metadata providers and humanities scholars. Although these formats have long been used by academics working in concert with archivists (as in the Walt Whitman Archive), they have typically been used as straightforwardly
bibliographical tools—as finding aids for archival collections, or for the production of new catalogs of manuscripts and letters (Catapano et al., 2010). They have rarely been used as a stepping-stone to rich, interpretive or theory-based expression (much less visualization) of the content of those primary resources (Kramer-Smyth et al., 2007; Whitelaw, 2009). Neatline aims to demonstrate the value of archival metadata to interpretive scholarship, and thereby to strengthen connections among scholars and the stewards of humanities collections.

Next, Neatline aims for ease of use by scholars new to the digital humanities. This was a major argument in our bid for NEH funding, and our rationale for shifting from development of a stand-alone downloadable tool (installable as a single server-side application) to a modular collection of interchangeable plugins for the open-source Omeka platform is arguably the most important contribution of the project to the current scene of humanities computing software development. Neatline was first imagined as a self-contained single-function application that nonetheless allowed easy access ‘under the hood’ for expert users to customize and contribute to its open-source code. For a stand-alone tool, this would have been the right approach, but we quickly realized that we had the opportunity to model a more productive and collaborative set of open-source software practices. The Scholars’ Lab has now shared source code for ten completed Neatline-related plugins with the Omeka developers’ community, and Omeka forms the backbone for basic content management functionality in our project (Fig. A1). We feel strongly that our shift to Omeka plugin production retains or enhances all of the desired qualities of our originally proposed system, while adding two great benefits. First, Neatline has become mix-and-match. In other words, users no longer have to participate in an entire, integrated, ideal Neatline workflow to use parts of our work—and in fact, we are seeing great interest in and use of individual Scholars’ Lab plugins in Omeka user communities and scholarly and archival contexts far removed from those focused on geo-temporal interpretation. Second, our close collaboration with the Omeka team at George Mason University and with the tool’s open-source developers’ community is leading to advancements in the core code of Omeka itself, again benefiting a far wider audience than anticipated. Not only were we able to leverage Omeka as a technical and social framework for Neatline, but our work (stemming from the curatorial perspective of a digital humanities lab embedded in a university library) has made its underlying system a more attractive option for research and special collections libraries—even those who possess a sophisticated technical and repository infrastructure of their own.

Finally, Neatline makes a theoretical contribution to digital humanities methodology by asserting the value of hand-crafted visualization as a mode of praxis and scholarly inquiry. Analog sketching and graphical storyboarding are regularly taught as part of the earliest design processes for digital projects in the Scholars’ Lab. These activities demonstrate the value of iterative interpretation and knowledge production manifested in visual form—particularly in fields like history and literary studies, in which the interpretation of visual artifacts is rarely taught and physical drawing is infrequently modeled as (in William J. Turkel’s formulation) ‘a way of knowing’. Neatline seeks to re-insert visual, incremental knowledge production, or graphesis, into the digital design process for humanities interpretation, by producing drawing and editing interfaces that are painterly: highly aesthetic and tangible, relatively simple to use, and nearly identical to a finished, end-user’s view. Neatline encourages experimentation and gradual refinement; instead of providing only a medium for finalized interpretations, the software is designed as a scratch pad on which users can formulate, refine, or discard ideas about time and space. Neatline users are always sketching, erasing, and drawing again their arguments on the screen.

Interpretive subjectivity was a matter of great interest to the creators of Neatline. Our map and timeline-related plugins offer users the ability to model multiple backgrounds (including historical spaces or alternative readings) independently from the foreground of their critical attention, and to express all of these fields and their interrelations visually. The spatial and temporal foreground of a
Neatline exhibit provides a space for scholarly commentary and intervention in the visual field, by way of textual annotation, freeform vector illustration on the map, and temporal visualization on the timeline (Fig. A2). Conflicting or congruent interpretations can be created, using a single, shared data set. Meanwhile, user-specified backgrounds may be empirical or unabashedly subjective—precisely geo-referenced or wholly speculative.

For example, one set of demonstration exhibits made available on our Neatline Web site uses maps and letters created by U.S. Civil War cartographer Jedediah Hotchkiss. Geographic Information Systems layers are brought into Neatline from modern satellite imagery and stylized vector maps, from scans of Hotchkiss’ own surveyed-and-drawn battlefield maps, and from the historical atlases that served—to use Geographic Information Systems terminology—as the surveyor’s mental ‘base layer’. Against these, we have geo-referenced (or morphed and rubber-sheeted for matching display) an informal child’s-eye map of the Chancellorsville battlefield that Hotchkiss sketched in the margins of a letter to his young daughter, Nellie (Fig. A3; Papers of Jedediah Hotchkiss). Neatline allows all of these documents, designed for different audiences and purposes, to be plotted and annotated in space and time (Fig. A4).

Concrete products of the Neatline project undertaken between 2010 and 2012 include improvements to the codebase of Omeka (in collaboration with RRCHNM) and a new suite of open-source plugins by the Scholars’ Lab. Each plugin can be used independently but they have been designed to gain value in combination, comprising the entire Neatline system:

1. EAD Importer: Allows for the easy and easily adjusted import of Encoded Archival Description metadata into an Omeka exhibit.
2. Neatline Maps: Provides map display through one or more GeoServer instances or through any specification-compliant Web Map Service (WMS).
3. Neatline Features: Allows users to draw points, lines, and polygons on map layers, encoding and editing formal geospatial shape information.
4. Neatline Time: Incorporates an updated and aesthetically improved version of the well-known Simile Timeline Javascript framework into Omeka, to provide chronological visualization of Omeka items. When used as part of the core Neatline installation, this tool also includes the ability to express temporal ambiguity, uncertainty, and nuance.
5. Neatline: Serves as a single, easily installed version of the full suite of Neatline functionality, allowing users to combine illustrative, annotative, or aesthetic information specific to their Neatline installation with underlying Omeka collections, to build unified, interactive, and highly interpretive presentations.

In addition, our work on Neatline led us to develop five other plugins that users can use in the creation and display of their Omeka exhibits. These plugins greatly extend the basic capacity of Omeka and make it a more attractive option for individual scholars and collections stewards. They also increase the likelihood of engagement by better-resourced libraries, digital humanities centers, and cultural heritage institutions—a constituency well positioned to contribute further software development time to the open-source code of Neatline and Omeka alike.

1. FedoraConnector: Makes it possible to display, comment on, annotate, and otherwise use digital objects inheriting behaviors from a Fedora Commons repository.
2. GenericXmlImporter: Permits users to import any arbitrary, flat XML data into Omeka.
3. SolrSearch: Allows use of the powerful Solr search engine with Omeka collections, which greatly improves the quality of search results and makes it possible to create faceted browsing interfaces.
4. TeiDisplay: Allows users to render and style Text Encoding Initiative (TEI) files in HTML format and to attach them to Omeka items—facilitating the first formal connection between Omeka and the TEI.
5. VRACoreElementSet: Allows users to bring the VRA Core Element Set (designed as...
The Neatline project concluded its round of funding from the Library of Congress with a major launch of the finished product and its source code in July 2012. This launch coincided with the release of a number of Neatline demonstration projects, a sandbox environment for evaluation, and end-user documentation at http://neatline.org/, http://omeka.org/, and http://github.com/scholarslab/.

During the second half of 2012, Neatline saw widespread uptake among scholars and students, with an equal level of interest in short-term classroom and long-term research project use. Building on user feedback from the first release, the development team spent the following academic year building towards a second major release of the core Neatline plugin, incorporating a number of additions and improvements designed to make the software more scalable, expressive, and flexible. These include:

- Improved vector-drawing tools, including the ability to import high-fidelity Scalable Vector Graphics (SVG) illustrations from specialized vector-editing tools like Adobe Illustrator and Inkscape;
- New features that allow users to build exhibits using annotated base layers that are not explicitly geospatial in nature, such as manuscripts, printed pages, scanned artworks, and other images;
- Improved performance and scaling characteristics enabling users to build extremely large interactive exhibits that incorporate hundreds of thousands of entities, which makes Neatline a viable platform for research collaborations that need room for long-term growth;
- An expanded Application Programming Interface (API) that makes it easy for developers to extend the core Neatline feature set with custom functionality for specific projects—everything from custom user-interface elements to deep modifications that expand the core data model or add completely new interactions.

From early prototypes to its recent 2.0 release, Neatline has focused on archival and cultural heritage metadata—itself already an interpretation of a given literary or historical collection—to allow scholars to illustrate connections among documents or objects and the spatial and temporal dimensions that arise through their reading. In this, it embodies a theme of much work in the UVa Library Scholars’ Lab: that method is a path to argument, and that interpretive digital humanities scholarship may be best enacted in iterative, visual modes.

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**References**


Notes
2 Omeka is an open-source product of RRCHNM, freely available at http://omeka.org/.
3 On the neglect of visual training in humanities education, see Jessop (2008a). Jessop’s (2008b) follow-up article in LLC treats the implications of this neglect for geospatial scholarship in the digital humanities, and was a major inspiration to the Scholars’ Lab’s training programs (including a 2-year NEH-funded institute on Spatial Humanities: http://spatial.scholarslab.org/), which deeply informed the Neatline project.
4 See Turkel and Elliott (2010), as well as Turkel’s description of a 2009 NiCHE (Network in Canadian History and Environment) workshop on Hacking as a Way of Knowing: ‘Practically every kindergarten in the country is better equipped for hands-on exploration than the kinds of spaces that we teach our graduate students in. And that’s a shame, because physical objects and artifacts constitute a vast part of our knowledge of the world. Manipulating is a way of knowing, making is a way of knowing, hacking is a way of knowing’. http://niche-canada.org/hackknow.
5 On graphesis, see Drucker (2009), Drucker and Nowviskie (2004), Nowviskie (2012), and British artist Bridget Reilly (2009): ‘You cannot deal with thought directly outside practice as a painter: ‘doing’ is essential in order to find out what form your thought takes... It is only through the experience of working that answers may be discovered within the inner logic of an invented reality’.
**APPENDIX**

**Fig. A1** Neatline is built as a collection of modular plugins for Omeka, an open-source publishing platform for digital collections and exhibits, which provides a flexible, extensible foundation for content management. Shown here, basic administrative functionality for our Neatline plugins is added to the default Omeka interface.
Fig. A2 The core Neatline plugin creates an integrated, interactive exhibit-building environment in Omeka, allowing the user to sketch out ideas on a canvas that looks almost identical to the final public-facing instantiation of the project.

Fig. A3 Neatline can accommodate a wide variety of textual and geospatial ‘backgrounds’. Here, a contemporary letter containing a small sketch of troop movements at the Battle of Fredericksburg has been cut into pieces and georeferenced. The battle map has been layered over its corresponding location on the modern terrain, with pages of the letter spread out around it and annotated with reference to physical landmarks.
Fig. A4 When the user drags this Neatline timeline backwards, from the writing of the letter in Fig. A3 to the moment of the battle, a different map is layered over the sketch, making it possible to toggle back and forth to compare documents positioned in time as well as space.
THREE

Geographic Information Science and Spatial Analysis for the Humanities

KAREN K. KEMP

INTRODUCTION

Geographic Information Science (GISci) is the science behind the technologies of Geographic Information Systems (GIS). As a science, GISci evolved in a context of precision, quantitative measurement, and notions of accuracy. As such, it might seem that its technology has little application in the humanities where imprecision, qualitative information and individual, sometimes conflicting, interpretations of “facts” are the norm. Fortunately, GISci has a strong intellectual foundation in the discipline of geography, a field that sits astride the science/social science divide, and its practitioners are generally comfortable addressing the challenging issues that arise when we attempt to represent the complex and ever changing places in which we live within the rigorous structure of the digital computer.

In a somewhat circular definition, GISci is an information science that focuses on the collection, modeling, management, display, and interpretation of geographic information. It is an integrative field, combining concepts, theories, and techniques from a wide range of disciplines, allowing new insights and innovative synergies for increased understanding of our world. By incorporating spatial location (geography) as an essential characteristic of what we seek to understand in the natural and built environment, geographic information science and systems GIS provide the conceptual foundation and synergistic tools to explore this frontier.²

Geographic information is defined simply as any data or information that has a geographic reference. While attaching latitude and longi-
I It may be useful to note that GISci authors seem to spend an inordinate amount of printed text distinguishing data, which are facts, from information, which includes some interpretation, though one frequently finds that one person's information is another person's data. In this chapter, an attempt is made to keep to the facts versus interpretation distinction while not being overly strict in the definitions.

What is important about assigning a geographic reference to data is that it then becomes possible to compare that characteristic, event, phenomenon, etc. with others that exist or have existed in the same geographic space. What were previously seemingly unrelated facts become integrated and correlated. Importantly, it allows us to perform spatial analysis, which might be thought of simply as what we do with geographic information once it is in the computer. Spatial analysis helps us understand what is going on in our geographic information. As will be seen later, however, the term has been defined in so many different ways that a clear practical definition is difficult to constrain.

For humanists who wish to begin seeing their work in a spatial perspective, perhaps even to work with GIS, it is necessary to understand some of the key fundamental themes in geographic information science that are essential in modeling and analyzing the world using a computer. As will become clear, many of the basic assumptions on which the technology was designed do not play well with the methods and information used in the humanities. Fortunately, this misalignment is the point at which insight and learning can take place, making the application of spatial reasoning and geographic technologies a new frontier in the humanities.

The chapter begins with a discussion of how we conceptualize, categorize, and represent the geographic complexity of the world. Where and what we describe about the places and people we are interested in are key characteristics we must articulate clearly. Once we have spatially conceptualized the things of interest, we must create representations of these conceptualizations in geometric form so they can be quantified and stored as bits of data in the computer. Once the data is stored, the fun begins. Then we can start analyzing our data and turning it into information and hopefully, with insights gained, into knowledge. All of these stages are required, whether we are trying to understand physical process in the natural environment or human processes across the social, cultural, and historical landscape.

**DECOMPOSING THE INFINITELY COMPLEX WORLD**

The world is composed of an infinite number of things and characteristics. Look at a landscape and you might see lakes and mountains, or you might see trees and meadows, or maybe the roads and rivers. What you see is determined by what you are looking for or what interests you. If you ask a group of people to individually sketch a map of "here," each person will create a different map composed of different things. What you see or record on a sketch map depends on your professional background and interests, the size and nature of the study area, the tools you have available to measure phenomena in the environment, the data that you already know exists, and so on. Let us consider a few of these key aspects.

**SCALE**

Scale is perhaps one of the most important characteristics geographers and others consider, consciously or unconsciously, when they are trying to describe what they see in the world. Unfortunately, the definition of the term is often muddled. One way we often use the term scale is to describe the size of the region we are considering. Thus a large-scale project might mean one that involves a large region, a lot of people and/or a lot of money. A small-scale project will just cover a small area and/or cost a small amount of money. A small-scale project will just cover a small area and/or cost a small amount of money.

In contrast, in geography and thus in GISci, there is a technical definition of the term scale that has a completely opposite meaning. In this formal definition, scale is measured as the mathematical relationship between the real world and its representation, usually on a map. So, scale may be, for example, expressed as "1 cm on the map represents 1000 km on the ground," or perhaps, a map may be said to be "1 inch to the mile." Formally this relationship is called the representative fraction and often is stated as a ratio; the scale 1:50,000 means 1 unit of length on the map represents 50,000 units on the ground. When speaking of scale in this manner, then, a small-scale map is one that has a small ratio with the right
side being a large number, such as 1:1,000,000. This map would show a very large area and, using the first definition, it would be a large scale map (see Figure 3.1). Hence, the confusion.

To the purist, only the second definition is correct, but in the rapidly democratizing world of GIS—think Google Earth and other sites on the Web that allow everyone to become cartographers—we have to accept and acknowledge both. Suffice it to say, whenever anyone mentions scale in the context of GIS, be sure that the meaning is agreed upon by all parties. We will return to exploring the role that scale plays in GIS later in this chapter.

No matter the definition, scale is essential in understanding how we conceptualize the world. If we consider the world on a continental scale, the entities of interest will be broadly defined and their locations perhaps imprecise though still capable of being mapped. If our area of interest is very local, then there will be many detailed items in our world and their locations may be very precisely known, or not. Importantly, if we are thinking about integrating studies that have both regional and local perspectives, the difference in how we view the world at these different scales will have profound impacts on what we record and analyze.

OBJECTS OR FIELDS?

When we look out across a landscape, we see the world filled with objects scattered across a continuous background. Think about a pastoral landscape. The background of rolling green fields is dotted with objects—houses, barns, fences, cows, roads, and farmers on tractors. In 1992, in what is now a classic article in the relatively young field of geographic information science, Helen Couclelis, who often writes classically styled philosophical essays in GISci, posited that "people manipulate objects (but cultivate fields)." This statement encapsulates an important tension that we confront as we begin thinking about representing the complexity of our places in the computer.

Some of the entities in the world are continuous. The land surface is perhaps the easiest to think of in this manner, but there are many other such entities, including air temperature or pressure, noise levels, and soil moisture. In the continuous view of the world, it is possible to measure the value of the phenomenon we are interested in at any location. You can go anywhere on land and measure a value of elevation, and you can measure the value at almost infinitely fine scales—once every kilometer, once every meter, centimeter, and so forth—until you reach the molecular level. In GIS, we do not usually go to such small scales, but we do agree that the land surface is a continuous phenomenon. In physics, continuous entities are called "fields," and this term is often used in GIS. In a spatial field, the value of the phenomenon under study is associated with the location at which it is measured and a value can be measured anywhere.

We conceive other entities in the world as discrete objects. In fact, if you ask someone to describe a scene or a landscape, most of their description will involve objects. Objects often, though not always, have discrete boundaries and may be moveable. Objects are scattered across our areas of study and, depending on what objects of interest we have defined, there are likely to be many locations where there are none of these objects. In our pastoral landscape, for example, between the cows there are no cows. At any point you could measure "cow" and the result would be simply yes or no. Importantly, objects have identities that are usually unrelated to their location. Thus the cow Daisy exists no matter where in the pasture it grazes.

![Figure 3.1: Two ways of thinking about small scale versus large scale.](image-url)
Of course, it is not quite so simple. A lot of objects do not have discrete boundaries, mountains being an excellent example. Conceptually, a named mountain is an object. You can point to it on a map at a specific location and elsewhere that mountain does not exist. But where is the edge of the mountain? Where does it begin as you move from a location that is not that mountain to a location that is mountain? There is no absolute answer to this question; its implementation is one of the largely unresolved challenges in most geographic information systems and one which has major implications in the spatial humanities. Here many of our objects of interest are spatially imprecise or uncertain, often as a result of gaps in the historical record or due to different interpretations of the object. For example, in the U.S., neighboring Native American tribes and the federal government may all fix the boundaries of Indian territories in different locations.

An advanced approach to handling this challenge, rarely implemented, involves the formal use of fuzzy set theory. Simply, rather than a location being either mountain or not mountain, fuzzy set theory allows us to measure the "mountainness" of each location. At the peak of the mountain it is definitely mountain, for instance, 5 on a scale of 5. In the valley it is definitely not mountain, 0 on the scale. In between, where the land just begins to slope upward, its "mountainness" might register as 2. This measure of belonging to a class allows users to impose various interpretations of where class boundaries lie, and it supports advanced mathematical analyses.

Sometimes we create pseudo-fields from objects. For example, the map in Figure 3.2 shows population density of the U.S. in 1850. The shaded areas cover the map continuously (except for that gap of the still "unorganized" territory) so it is possible to determine a value at any location. However, these maps are actually based on aggregate counts of the number of individuals (objects) within defined areas, not values of a continuous field. Importantly, the values are dependent completely upon the size and shape of the regions over which individuals are aggregated. Figure 3.3 illustrates this problem known as the Modifiable Areal Unit Problem (MAUP). The MAUP is another of the great unresolved and often overlooked challenges in GIS. It is particularly important when we use historical census data because the areas over which populations are counted rarely have the same boundaries over time. How can we estimate changes in populations when the numbers change as a result of area changes? Do they reflect real changes in the population characteristics or just different arrangements of people?

**CATEGORIES, ONTOLOGIES, AND SEMANTICS**

Another question we think about when we try to articulate what we will put in a GIS is: what are the things we are going to "map" or store in our database? Humans have a natural inclination to categorize what we see in the world. It helps us build structure in the otherwise overwhelming complexity our senses perceive. When we look at a crowd, we see "people." But what we see depends upon how we think about the world. For instance, when most people look at a forest closely, they see "trees," "shrubs," or "grasses," but when botanists look at a forest, they see various species of plants, all with precise definitions and names.
FIGURE 3.3. An example of the modifiable areal unit problem. Box A shows a distribution of entities across a landscape. Boxes B and C show the same distribution grouped into three areas, the numbers show how many entities are in each area. The shading reflects the relative density of entities within each region. Note how the resulting density map would change based on changes in the area boundaries.

From categories we build ontologies, a term that is gaining increasingly prominent use in GISci as our databases become large and data is shared among them. This term has both philosophical and computing foundations. In philosophy, there is only one ontology, the single, fundamental structure of how humans understand the world. Ontology is simply the "study of being" or the "study of what is." This definition is not pragmatic enough for computer scientists, of course, so in the computing context an ontology is a description of the concepts in an area of knowledge. Such descriptions identify the kinds of entities that exist and their relationships. Unlike in philosophy, a multitude of ontologies can and do co-exist. Thus, as we seek to build computer representations of our complex world by identifying the objects and fields that interest us,
we identify the categories, how they are distinguished from one another, how one category is related to other categories, and if there are subcategories. Ontologies are generally visualized as tree structures with links between branches. Figure 3.4 depicts a simple ontology we might build for the spice trade of the sixteenth century.

Ontologies are the fundamental means by which we design our databases for GIS. In the world of database management, this stage is called database design and in it we construct what is called the database schema, which essentially is an ontology with all the characteristics of and relationships between each kind of entity in the database specified. For smaller projects, often in humanities GIS projects, a formal ontology may not be constructed at the beginning; rather, it evolves organically from the data collection efforts. While this approach may require a complete redesign of the system later, sometimes it is useful to proceed slowly, gradually constructing a structure for understanding the components of the world we are studying.

Finally, it is important to mention semantics, the meaning of the words we use to name categories and thus the terms in our ontologies. While all of us might agree on the name of a category being "road," wildlife ecologists may conceptualize it as a boundary that is a barrier to animal movement, economists as a line that forms part of a transportation and communication network, and engineers as an area of pavement that has a specific width, thickness, and surface slope. Trying to incorporate all these meanings into a single database schema would be impossible. Thus we build different ontologies for different communities and efforts may be made later to "cross-walk" the ontologies, identifying terms with different words for similar meetings and vice versa. While a discussion of semantics in GIScI can fill books, we mention it here simply as a potential area of confusion about which all users of GIS should be aware.

**ATTRIBUTES**

Briefly, it is important to mention the term attribute. In GIS, this is such a commonly used and understood concept that its practitioners are often surprised to discover others do not understand it. Attributes simply are the characteristics that we identify and record about the entities in our database. So a collection of information about "towns" might include the attributes of name, population, date founded, and location. Attributes are often structured into tables, conveniently called attribute tables. Table 3.1 shows a small part of an attribute table with each row containing information about a single entity and columns containing information about a single attribute. Note, these columns are often called "fields," but this should not be confused with the different use of this term as it is described above.

There are generally considered to be five different categories of values we can store as attributes. While the same alphabetic or numeric characters may be used to express attribute values for various categories, understanding these semantic and functional differences is critical. These categories are:

1. Nominal—alphanumeric values that are labels, names, or IDs. They have no mathematical value. Examples are people's names or social security numbers, archaeological site numbers.
2. Ordinal—alphanumeric values that have an inherent order, but the "distance" between adjacent values cannot be calculated. Examples are places in a race or competition (first place, second place, last place) or suitability ranking (best, good, poor).
3. Interval—numeric values that are a quantitative measure, but the scale on which they are measured has no absolute zero. Years and elevation are two good examples. The number we assign to a year depends on when we choose to begin counting years, and it is possible to have "negative years" (BC). Likewise, elevation is measured from sea level, but the precise positioning of sea level varies even within single countries, and it is quite possible to have negative values (below sea level).

<table>
<thead>
<tr>
<th>Place Name</th>
<th>County</th>
<th>Grid Reference</th>
<th>Year Established</th>
<th>Population 1850</th>
<th>Population 1860</th>
</tr>
</thead>
<tbody>
<tr>
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<td>TQ1016</td>
<td>1771</td>
<td>280</td>
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<td>Abram Brow</td>
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<td>Inverness-shire</td>
<td>NH5535</td>
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tations can be mapped.

A position for the one entity to which all others are directly or indirectly
related.

Finally, we come to location. In order to build a GIS, which by defini-
tion requires “geographic information,” we must have some means of
formally describing the location of a place. First, location can be rela-
tive or absolute. The former describes locations relative to the location
of other places. So, northwest of London, beside the lake, and 100 miles
east of the crossroads are simple relative locations. It is possible to build
a map using only relative locations, if we begin by arbitrarily assigning
a position for the one entity to which all others are directly or indirectly
related. So, put the crossroads at the center and all other related de-
scriptions can be mapped.

However, relative location only works for a single set of related data. If
we want to see how very different sets of data are related in space, then
we need to find some way of anchoring them to the earth so that inter-
actions in geographic space can be explored. This is absolute location.
Absolute location fundamentally requires at least some of the data to be
anchored to a coordinate system. Latitude/longitude, often shortened
to lat/long, is a universal coordinate system, widely used, but there are
many others including Universal Transverse Mercator (UTM), State
Plane, and various National Grids. All of these horizontal coordinate sys-
tems anchor point locations to the earth’s surface, and they are described
exhaustively in any text on cartography or GIS. Some of the modern
coordinate systems also allow a vertical coordinate to be designated, so
that it is possible to specify a location in 3-D space, above or below the
earth’s surface.

Once we begin to work with coordinate systems, the advanced con-
cept of datums comes into play. The accurate and precise specification of
the location of points on the earth’s surface is the domain of the field of
geodesy. With the huge advances in global positioning systems that al-
low us to determine location from a perspective in space as opposed to a
perspective tied to the place we are trying to measure, location measure-
ments can now be so accurate and precise that it is possible to record the
changing latitude and longitude of locations as the surface of the earth
moves under the forces of plate tectonics. At this level of precision, the
lat/long values of places on the earth’s surface actually depend on date
and time. But for most of us, this kind of precision and accuracy is un-
necessary.

You can think of a geodetic datum as a spherical grid that is laid
over the earth that we use to measure the latitude and longitude values
for any location. We could orient and shape this grid in an infinite num-
ber of ways. Fortunately, the World Geodetic System 1984 (WGS 84) is
now a global standard. It and the virtually equivalent North American
Datum 83 (NAD 83) are the datums you should use as much as possible
when working with geographic coordinates. Most GISs have translation
functions to recalculate latitude and longitude coordinates from other
datums. Given a consistent datum, we can assume that a location on the
earth’s surface will always have the same latitude and longitude.

A related dichotomy in how we specify location is that of direct and
indirect location. Direct locations are those that are stated in coordinates
as described above. Indirect location uses references to other objects
whose direct location is known. The two most commonly used indirect

- Ratio—numeric values that measure quantity; there is an absolute
  zero and negative numbers are not possible. Examples include
  a person’s height, amount of rainfall, number of years a site was
  occupied.
- Cyclic—numeric values that have a limited top value and that cycle
  back to 0 after that value is reached. Degrees on a compass are an
  example of this. Continue clockwise from 359 degrees and the next
  number is 0 degrees.

Understanding these categories is important in ensuring that inap-
propriate operations are not performed on data. Nominal and ordinal
values cannot be manipulated by mathematics. For example, while the
number 10 may be stored in the computer as a value for any of these
categories, if it is an ID (a nominal value), we cannot subtract it from
ID number 15 to get any meaningful result. If it is the rank of longevity
of emperors, multiplying it by 2 would likewise produce a meaningless
number. Interval numbers can be subtracted (year 1995 minus year 1965
gives 30 years) but they cannot be divided or compared as ratios (year
1000 is not half of year 2000). Cyclic numbers have problems with addi-
tion and subtraction when the value will pass the 0 point (345 degrees
plus 50 degrees is 35 degrees). Keeping these distinctions in mind when
coding data into a database is important for how it might be manipulated
later.

DETERMINING AND SPECIFYING LOCATION

Finally, we come to location. In order to build a GIS, which by defini-
tion requires “geographic information,” we must have some means of
formally describing the location of a place. First, location can be rela-
tive or absolute. The former describes locations relative to the location
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related. So, put the crossroads at the center and all other related de-
scriptions can be mapped.

However, relative location only works for a single set of related data. If
we want to see how very different sets of data are related in space, then
we need to find some way of anchoring them to the earth so that inter-
references are place names and addresses. If you have a GIS dataset (i.e., a GIS map) of cities and a separate attribute table that contains the names and other information about a subset of those cities, you can associate that attribute table with geographic location through the common key of "name." This capability allows you to explore and map all of these associated attributes in the spatial context of the GIS, though you started only with a simple table of text values. Addresses work in a similar way if there is a GIS dataset that contains the locations of the streets and addresses along those streets. The entities described by any attribute table with an address as one of the attributes can then be associated with this geography.

Indirect locations are vitally important in the spatial humanities. Importantly, in order to use a geographic reference that is not a coordinate, it is necessary to have or to construct the geographic framework of the named locations. Gazetteers are one major source of this kind of framework, but there are others. Constructing this geography can be a significant challenge when trying to map historic events from text documents. Ruth Mostern, a historian who has written extensively on the design of gazetteers as a foundation for historical GIS, has spent several years mapping the changing geography of administrative units during the Song dynasty in China from geographic descriptions recorded in administrative documents from that period.4

**PROJECTIONS**

Another advanced concept worth mentioning here is projection, which is the method by which the spherical earth is "projected" onto a flat surface (i.e., a sheet of paper or a computer screen). Think of peeling an orange (a sphere) and pressing out the peel so that it is flat (like a piece of paper). Clearly, you cannot make the peel rectangular simply by pressing it down.

Figure 3.5 shows one kind of projection. While many projections are geometrical operations like this, many of them require mathematical equations to convert latitude and longitude coordinates into rectangular map coordinates. The important point to remember is that maps made with different projections cannot be overlaid—the same location will appear in different map locations if the projections are different. Figure 3.6 illustrates this.

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4. Figures 3.5 and 3.6 are illustrations of different map projections. Figure 3.5 shows a reversed projection of Africa through an Earth "wireframe." Figure 3.6 illustrates several map projections: A) Loximuthal, B) Cube (this projection is designed to be cut out of paper and folded into a cube), C) Polyconic, D) Cylindrical equal area.
SPATIAL AUTOCORRELATION

One final term, spatial autocorrelation, must be introduced as it is upon this concept that all of GIS (and much of geography) is founded. Spatial autocorrelation is famously described by computer cartography pioneer Waldo Tobler’s First Law of Geography, “Everything is related to everything else, but near things are more related than distant things.” It is because of spatial autocorrelation that we can construct digital representations of our infinitely complex world. We cannot possibly categorize, code, and record everything in the world, but because of spatial autocorrelation, we can make many good guesses about the places not mentioned in our databases that are near to the places included in them. The elevation of the land surface is a good example of this. We can measure and store in our database the elevation at a number of points and know that locations close to these points are likely to have similar elevations. Spatial autocorrelation does break down in certain contexts (changes in taxation rates across a national boundary, for example) but wherever there are distinct boundaries, it is useful to keep in mind that people and places each side of that boundary may be more similar to each other than to places farther away (local dialects for example).

REPRESENTING GEOGRAPHIC CONCEPTS DIGITALLY

Now that we have conceptualized the world in formal structures that involve ontologies, categories, objects, fields, and scale, we have to put all of that into the computer. The next step is to decide how to represent the geography of our formalized world. The field/object dichotomy gives us two fundamental data models for GIS—vectors and rasters. How we represent the world determines how we can analyze it, so it is important to understand this important divide in GIS.

Objects are usually represented in GIS in the geometric form of points, lines, and polygons (areas). Formally, this means that the location of a point (a 0-dimension object) is specified by a pair of coordinates, lines (1-dimension) are a connected series of points and polygons (2-dimensions) are defined by a connected set of lines. Current GIS are not well equipped to handle 3-dimensional objects, so we will not explore that here. Collectively this form of representation is called vectors. Like the objects, vectors define precise locations and sharp boundaries. The topographic maps that most of us are familiar with are vector maps.

An important aspect of the vector data model is its ability to store and allow the analysis of geometric relationships, which is usually called topology, a concept that originates in mathematics. The development in the late 1970s of simple relational database structures that can store topology spurred the evolution of GIS and spatial analysis as we know it today. By storing (or determining on-demand) topology, the computer can quickly determine what polygons are adjacent, what points fall inside a polygon boundary, or which line segments connect to others in a network.

Since fields are continuous, the computer representation for them also must be continuous in concept. The most commonly used representation for fields are rasters. Here, the surface of the earth is divided into a grid of (usually) rectangular cells. Each cell is assigned a value representing the average (or sometimes maximum or minimum) measurement of the characteristic of interest over that area on the earth’s surface. Satellite images are common examples of rasters. If you zoom into an image far enough, the rectangular cells become visible. The values stored for each cell is often displayed as ranges (e.g., less than 10, 10-20, 21-30, etc.) and assigned specific color hues or intensities. Figure 3.7 shows elevation mapped as vectors and as a raster.
Once again, it is not quite that simple. It is possible to represent objects as rasters (think about pictures you take with your digital camera—you can discern the people in the images, even though it is raster data) and fields as vectors (here the best example is the field of elevation that we commonly represent on topographic maps using contour lines, as shown in Figure 3.7). Generally, however, it is useful to think of vector representations of objects and raster representations of fields. If that does not match the conceptualization, then here is one of those important places of disconnection from which additional insight can come.

It is important to mention briefly another aspect about scale that comes into play once we represent our data digitally. Earlier, we mentioned the problem of integrating data that is conceptualized on a regional scale with data that is conceptualized on a local scale, in which case the ontologies may differ. Additionally, if the same feature is shown on maps of very different scales, there will always be a difference in their representations when it is extracted and stored in GIS. A line captured from a larger scale map is likely to be more sinuous than from the small scale map. Points may appear in different locations due to the different levels of precision with which location can be determined. So, before GIS (or map) data from very different sources can be used together, it is essential to resolve differences in how similar objects are represented.

SPATIAL ANALYSIS FROM A TO Z

Spatial analysis can be defined very broadly as any form of data analysis in which the results depend on location and will change if the location of the objects under study changes. In a GIS, once we have the geographic and related attributes stored in the computer, spatial analysis can begin. In its simplest form, spatial analysis takes place when we look at a map. We see relationships between entities (suggesting causal relationships), concentrations of objects ("hot spots"), and variations across the landscape that inspire understanding. Of course, this is not really simple as these kinds of insights from visual analysis result from the complex interaction of our innate visual and computational capacities. These human abilities are so powerful that many of the mathematical and geometric techniques used in computational spatial analysis have been designed to mimic them.

Beyond visual analysis, there is a plethora of spatial analysis techniques. Fortunately, in the humanities, as elsewhere, the handful of techniques most often used are conceptually uncomplicated. While it is not possible in a brief chapter to provide a summary of all relevant techniques, the following "A to Z sample" illustrates a few of the most commonly used ones. Many others are illustrated elsewhere in this volume.

Areal interpolation allows data aggregated to a particular set of zone boundaries (population counts for census tracts) to be mapped onto a
different set of zone boundaries (school districts). It is applied to vector data only. You might do this if you want to know how many students live in each school district or to determine population change between two different population censuses (there are always some census tract boundaries that change between censuses). In the most simple form of areal interpolation, it is achieved by determining the proportion of each source zone covered by each target zone (see Figure 3.8). This proportion is used to apportion the total count of the source zone to each overlapping target zone so that the count in the target zone is a sum of all the portions calculated for each overlapped source zone. Like many spatial analysis techniques, this version of areal interpolation has a fundamental assumption that the population in the source zones are evenly distributed across the study area. Of course, few objects are evenly spread across space, so here the modifiable areal unit problem mentioned earlier comes into play. How do we account for unequal distributions and boundaries that change over time? Fortunately, many enhancements and refinements are available to the simple procedure, and these techniques, too numerous, and too complex to be described simply, will be useful to humanists.

Buffer is perhaps the most frequently used form of spatial analysis, though some experts claim it is spatial data manipulation, not spatial analysis. While it is implemented in very different ways for the two data models, raster and vector, conceptually it is very simple—a zone is extended beyond the object of interest to a specified distance. Figure 3.9 illustrates several buffers. If the object is a point, then the buffer becomes a circle of the given radius. If the object is a line or a polygon, then the feature becomes a polygon extended outward in all directions by the buffer distance. The result of a buffer operation in the vector data model is always to create a polygon feature. Buffers are often used to determine if other objects are "within" a certain distance. If they fall within the buffer, then they are closer than the distance. A set of buffers with increasing buffer distances can be used to create a set of concentric circles around a point that may be used to show, for example, zones of travel time (e.g., under 5 minutes, 5–10 minutes, etc.) or noise levels (e.g., over 100 decibels, 75–100 db, etc.).

Overlay analysis was popularized by Ian McHarg in his 1969 book Design with Nature, though others arguably should receive some credit for its conception. Although McHarg's implementation used transparent acetate overlays of maps of suitability classes for various uses (e.g., a set of criteria that determines the suitable locations for a particular land use), implementing overlay analysis in the GIS is an extremely powerful and multifaceted tool. The idea is to overlay a set of maps (or GIS layers), each showing a different attribute, that are of the same place and geographically aligned so that coincidences in space can be identified. Overlay can be done with both raster and vector data, though again their implementa-

Figure 3.9. Fifty mile buffers around a line (Columbia River), a polygon (Idaho) and a point (Calgary). From this process it is possible to tell that the most northerly point of Idaho is less than 50 miles from the Columbia River and that the northern border of the state is more than 150 miles from Calgary.
Near the river
Well drained
Relatively level
Close to a spring

**FIGURE 3.10.** A simple example using overlay of a site suitability analysis to locate a good site for establishing a settlement. The black region in the box in the lower right shows the area that satisfies all the criteria.

Beginning with a set of rasters, all with the same cell size, origin, and orientation (in other words, covering the same location), it is quite simple to determine a large range of characteristics about places using simple cell-by-cell calculations. Raster analysis generally is far simpler to implement than vector analysis. Many map algebra functions are a form of overlay analysis, but it also can be carried out on a single raster by comparing the values of adjacent cells. Say, for example, you have two rasters of population counts. To calculate population change, you simply subtract the values in each cell in one raster from the corresponding cell in the other. Map algebra in its original formulation categorized functions into:

- **Local**—calculations on individual cells, such as difference, sum, and mean;
- **Focal**—calculations on cells in relation to their neighbors. For example, using a raster of elevation values, calculate the direction of flow by comparing the elevations of adjacent cells—water will flow to the lower cell;
- **Zonal**—calculations such as area and total count when one raster in the overlay stack identifies zones as contiguous areas of cells with the same value; and
- **Global**—which produce a single value summarizing the raster.

All good GIS textbooks provide descriptions of the most important basic spatial analysis techniques. Grouping them all into a small set of categories provides a way to appreciate the full spectrum on offer without taking a GIS course. Although there are many ways to do this grouping, David Unwin and David O'Sullivan, authors of *Geographic Information Analysis*, a required text on the bookshelf of any informed GIS user, suggest one such categorization:

- **Spatial data manipulation** is the core functionality provided by GIS. Techniques are diverse and include area and distance measures, buffer, point-in-polygon, overlay, and raster to vector conversion. These are the basic GIS skills.
- **Spatial data analysis** includes those techniques that are descriptive and exploratory such as point pattern analysis, viewshed analysis, and determining the shortest paths along a network. Advanced analytical techniques might include spatial data mining, exploratory spatial data analysis (ESDA) and spatialization (though many of these are statistically based so they might be placed in the following category).
Spatial statistical analysis produces measures that help users determine whether results are unusual or unexpected, thus statistically significant. These are generally more advanced techniques that require an understanding of basic statistics and an awareness of the limitations of traditional statistical techniques in the context of spatial autocorrelation. (Traditional statistical techniques assume that each sample is independent, whereas Tobler's First Law reminds us that almost all geographic data are spatially dependent.) Spatial statistical techniques include those such as spatial regression (including its related indexes such as Moran I and Geary C), geostatistics (a set of techniques that includes kriging) and trend surface analysis.

Spatial modeling produces predictive results. Models can be used, for example, to predict movement of goods, people or water, or to predict changes in the landscape. Predictions can be used in historical contexts to compare one's theory as to change over time with what is recorded. Neural networks and agent-based modeling are among these advanced modeling techniques.

Besides the seemingly endless number of spatial analysis techniques, there are many different ways to combine and implement them. The magic of spatial analysis is in figuring out how to apply the generic techniques to your specific problem. Since many of the techniques come out of the environmental sciences, when we apply them in the spatial humanities, the result can be surprisingly innovative and thought-provoking. For example, the focal map algebra method to calculate flow of water described above can also be used when the raster is cost of transportation. This technique might be used to investigate the failure of the antebellum South to build roads, at least before the investment in railroads, because of the ready availability of (low cost) navigable streams and rivers, or the movement of migrants along a line of least resistance, as when southern colonials moved west via the Cumberland Gap. Therefore, when learning to use GIS, some focused effort should be expended on exploring the range of techniques available so that a number of possible methods for investigating a specific problem can be considered.

Often a set of techniques will be chained together into a processing model so that the output from the analysis of input layers flows into subsequent analytical steps. Figure 3.11 depicts one such processing model. Such models make it easy to visualize the analysis stages and most commercial GIS now provide functionality to store processing models, along with the specification of input data, for reuse, fine-tuning, and sharing.

DEALING WITH ERROR AND UNCERTAINTY

One final topic must be mentioned, albeit briefly. All representations of the world, whether they are maps, attribute tables, or GIS data layers, are incomplete and contain errors. Error arises in every step of our work from conceptualizing our world, to representing it, measuring attributes, storing values and analyzing data. Uncertainty is a result of this error, though it can also arise from, to name a few, lack of semantic clarity, imprecise measurements, missing data, temporal inconsistencies (using data collected over several different time periods), or the use of proxy measures for data we cannot collect (such as using level of education, which is available from the census, as a proxy for sophistication of voters). In some circumstances it is possible to estimate the amount of error that is likely in data; GPS measurements are often reported with +/- meters or feet estimates and most statistical analyses produce error estimates.
However, in many circumstances it is not possible to identify all the sources and impacts of the unknown error. When working with GIS in the humanities it is essential always to ask questions about the quality of the data, the fidelity of the representation used, the inherent error, and whether the resulting maps or spatial analysis truly represent the world that has been modeled. Many of the issues mentioned in this chapter highlight sources of error and uncertainty in the use of GIS. The best we can do is be aware that error exists, understand the quality and “fitness for use” of the data we are using, attempt to reduce the level of error and uncertainty in our work as much as possible and/or determine the effect of the probable error through sensitivity analysis, and be honest in how we represent the reliability of our results.

CONCLUSION

GIS and spatial analysis has huge potential for use in the humanities. While time has traditionally been the primary dimension of focus in most humanities disciplines, the spatial dimension has always been lurking in the data collected. In addition to the widely accessible mapping tools now available on the Web (such as Google Maps, Google Earth and Microsoft Virtual Earth), the advanced tools provided by modern GIS have finally reached a level of maturity and relative ease of use that make them appropriate for the non-expert to begin exploring those hidden spatial data. As the other chapters in this volume demonstrate, there is an unlimited frontier awaiting those willing to venture forth into this new dimension.

NOTES

How do we know where we are? When I navigate my way through an unknown landscape with the help of a map, keeping the synchronization between me as a moving body in the landscape and the spot on the map representing my current position is of key importance. Sometimes I come to a sudden realization: I am not where I think I am. The route I have been following through the landscape has a different representation on the map from the one I thought it had. This could be expressed as, ‘I thought I knew where I was, but it turned out I was wrong’. And if I have no clue as to where the spot I am occupying is on the map—that is, what place on the map represents the place in the landscape where I am—I would say, ‘I am lost’.

The map I use to find my way is there in the landscape with me—it has to be in order to be used for navigation. But it is also outside the landscape, representing it. When I point at the map saying, ‘Here I am’, I make a claim about my location in the landscape represented by the map. This is different from the claim made if I point to somewhere on a page of text describing a landscape claiming, ‘Here I am’. The latter would usually be taken as a reference to where I am in reading the text, rather than a claim of where I am in an external reality referred to by the text.

Maps and texts refer differently to the landscape. I claim in this chapter that not only do we express the same knowledge about landscapes in different ways in the two media, but also that the knowledge that can be expressed using each of the two media differs. This claim is supported by research presented in the next section, where I review a series of modelling experiments in which differences between texts and maps were studied in detail. The study was made through a computer assisted close reading of one specific text. I then show how the differences are linked to the way we relate to the
landscape and outline the connections to media comparisons in general; each medium can mediate only certain aspects of a total reality. I conclude by looking briefly into one of the most important aspects of the ongoing digital spatial turn,¹ namely, the use of maps and texts in integrated geocommunication systems.

Experimental evidence

Neither the text nor the map is the landscape we experience directly. Further, they are distinct from the landscape in different ways. How can these differences be investigated using the digital humanities tool of experimental modelling?² To investigate this I based my modelling experiments on a collection of documents from the 1740s used in the border negotiations between Denmark (including Norway) and Sweden (including Finland) leading up to the border treaty of 1751, printed as Schnitler (1962).³ The documents were written in Danish, which was also the written language used for Norwegian dialects at the time.

In Scandinavia in the mid-eighteenth century, common people were seen as an important source of information in the resolution of boundary disputes. This perception was linked to the two main principles behind the establishment of the border—topography and possession—and how they were understood at the time.⁴ The topographical principle stated that the border should follow the highest mountain ridge. The principle of possession, however, was based on tax subjects; the area of a country was the area possessed by the subjects of the country’s sovereign. This point was problematic, however, as much of the border area was inhabited by seminomadic Sami.

¹The spatial turn is discussed in several places in Bodenhamer et al. (2010), most explicitly in Ayers’s article.
²The experiments summarized below were part of my PhD research. For more detailed coverage of the experiments, see Eide (2013). The full description can be found in the thesis (Eide 2012). They were based on the well-established method of modelling in digital humanities (McCarty 2005).
³For details on the source text, the printed edition, and the process of digitizing it, see Eide and Sveum (1998).
⁴For more details, see Schnitler (1962, XIII–XXXIII) and Sámi Instituhtta (1989).
reindeer herders who used land on both sides of what was later to become the border and paid taxes to both the Swedish and the Danish kings.

The resolution of the boundary disputes included input from the local population: officials travelled the area and conducted court investigations, questioning the common people—Norwegian, Swedish, Sami, and Finnish farmers as well as Sami reindeer herders—about their perceptions of the border location as well as their general knowledge of the area. Schnitler’s protocols include these court proceedings, together with older written sources, as well as summaries written by Schnitler himself.

The modelling experiments were performed in a stepwise formalization process inspired by the concept of deformation found in McGann (2001), using a computer program developed for the task. The first step established statements close to the textual way of expressing spatial understanding, whereas the latter steps established increasingly ‘maplike’ statements. The statements, in the form of triples, rephrased expressions in the source text. If the text said ‘place A is east of place B’, then three things were included in the model: two place references, A and B, and a link between them, which is the statement that A is east of B. The modelling was in line with conceptual analysis as used in the development of ontologies such as CIDOC-CRM (Doerr 2003).

The statements of the model are rather simple. However, by putting a number of them together, a more complex structure is established. The model created this way was used in four case studies where experiments were run on parts of the source text modelled in great detail. Each of the statements went through the formalization steps as shown in the example in Table 13.1. This process showed how information had to be added and taken away in order to reach the goal of, namely, expressing the statements in the form of maps.

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On the digital sources in general and the computer program used in the analysis, see http://www.oeide.no/dg/dp/ (visited on 22 February 2013).
Table 13.1 Example of stepwise formalization from text to vector data

<table>
<thead>
<tr>
<th>Text</th>
<th>Primary model</th>
<th>Primary model</th>
<th>Vector data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some ¼ mile east of A is B</td>
<td>Some ¼ mile</td>
<td>2 kilometres</td>
<td>A = (0,0)</td>
</tr>
<tr>
<td>Direction: east</td>
<td>Direction: 90°</td>
<td>B = (2000, 0)</td>
<td></td>
</tr>
</tbody>
</table>

There is no single correct interpretation of the fact that A is east of B in the spatial language used in maps. The semantic potential of ‘east’ includes not only straight east, but also grades of north-east and south-east. Looking into the longer history of spatial expressions in Norwegian, we can see how Holtsmark (1961) describes the Nordic medieval system in which a direction includes the area around the angle. Old Norse used a system of eight directions. In line with this system, east can be taken to represent the span from $67\frac{1}{2}^\circ$ to $112\frac{1}{2}^\circ$. This system was used in Norway in the eighteenth century, also doubled to a system of 16, which is still used in the Norwegian language today.

A topographical map, however, expresses one direction only. When we make the map, not only can we choose one interpretation of this geographical relationship at the cost of losing all the other possible ones, but we actually have to make such a choice. One could, of course, draw a sector on the map showing a possible interpretation of east of a specific place. This would, however, introduce an area of possible location for a place, which is normally a well-defined object on topographical maps. In addition, the span representing the possible location conveyed by the sector drawn on the map would still remain a different expression from the textual one. The figure on the map would have lost some underspecification compared to the textual expression. The width of the sector remains open in the text; east can be more or less than $45^\circ$ wide, whereas it must be specified on the map.

In the experiments, comparable differences were found for distances between places. Other types of relationships between places were even less specified in the text, such as the claim that a place is between two other places. Such underspecification was found not only in descriptions of the relationships between places, but also in the spatial descriptions of each place. In two of the case studies, fewer than 10 per cent of the places mentioned in the text had been given measurements of either length or width (Eide 2013).
—and none of the places’ forms were described to a level where they could be drawn unambiguously based on the description alone.

What I call ‘underspecification’ here is relative to the task at hand; the text is underspecified relative to what is needed to create a map based on the text only. If the task was to express the spatial understanding read from the text on a pre-existing map—for instance, one of Schnitler’s own maps—it may be the case that the text is only underspecified in a limited number of cases, if at all. The same can be said of the description of the places: if the description and the place name suffice to locate the place on the map, the place description is not underspecified in reference to the task at hand.

The cases of underspecification are examples in which the text provides too little information; it does not say what we need to know in order to make the map. We can still make maps based on such a text, but not one single definite map; rather, significantly different maps that each conform to the text can be made. Thus, the exact spatial expression found in the text cannot be represented as a map. When textual expressions are anchored to pre-existing maps, a large number of choices are made en bloc.

In some cases the text provides too much information to make one single map. One example is a sequence of Schnitler’s aggregation where he explains how two groups of witnesses claim that a border mark is located on either one or another mountain (Schnitler, 1962, 174). The two mountains are presented on his list of border mountains with an ‘or’ between the two names. The information expressed by the word ‘or’ cannot be expressed on one single static map image in any other way than using a textual disjunction to explain the situation. On a dynamic map, changes over time may be used to express disjunction.

Other situations push the limits of the map even further. While the text may use expressions such as, ‘there are no neighbouring farmers, before eight miles to the west’ (Schnitler 1962, 142), this is hard to express on a map. Blankness on a map would seem logical, but blankness does not convey ‘no farms’, but rather ‘nothing of interest’. Farms could be there even where the map is blank. In order to make the lack of a symbol signify

6Translated from the Danish by the author.
no farms, one needs to add every single farm to the map and inform the map users through a text about this completeness. However, that would not work in the case of a map made to represent this text, for the text does not describe all farms. So there would be no way of telling if a spot on the map had no farm symbol because the text found farms in the area unimportant and did not mention them, or because the text said explicitly ‘no farms’. The only way to express it would be through a textual description on or connected to the map, thus creating a hybrid document—a geocommunication system.

**Texts, maps, and landscape**

When we compare the problems discussed above with the third corner of the triad established in the introduction—namely, the landscape itself—we see how the text and the map alike are underspecified in the sense that they can never express everything about the landscape. However, if we look at the landscape as a space of travel for people with certain knowledge, then both the text and the map may be well specified. As long as the text or the map gives you enough information to understand where the places mentioned are located, then it is sufficiently specified for the task.

Texts and maps as representations of a landscape can be seen as two opposites, as in the discussion above. If we look at their semiotic systems they are indeed quite different. Texts have nothing resembling the indexical grid lines of a map. Written texts and maps both exist as documents, but their systems of reference differ. They are complementary; a textual document can easily include a map, and maps generally include short texts.

Studies of US university students show that route descriptions in texts specify quite similarly what drawings of the same routes do (Tversky and Lee 1999). The drawings in question are graphical figures of the way to go, but the distances and the angles of turns represent the landscape differently from the way a topographical map

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7Some examples question this; see, for example, Squire (2011). These are rare, however, and are not considered here.
would. A turn to the right tends to be drawn as a sharp angle, different from a
topographical map, where the actual angles in the landscape would be reproduced. The
route figures look more like metro network maps; what is represented is quite similar to
textual expressions such as ‘turn right,’ which does not indicate the accurate angle of the
turn either. The topographical map claims an accurate specific angle as a consequence of
the map genre, whereas metro maps or route description figures make no such claims.

The growth in map production in Europe in early modern times affected also the
two Scandinavian powers, Denmark and Sweden, often in connection with military needs
and territorial claims (Woodward 2007, 1792–95), and maps and charts were used for
navigation by the army and seafarers, for instance. But I have found no evidence for the
use of maps for navigation among Sami people or other people of the lower classes in the
border areas between Denmark-Norway and Sweden-Finland in the eighteenth century. It
is impossible to completely rule out use of ephemeral maps, of course. But no remains of
paper or vellum maps used for navigation, and no evidence in the sources for such use,
indicates that their use must have been limited at best. Schnitler knew the area quite well,
having worked there for more than two decades, and he did not use maps in the
interviews with his more than 100 witnesses from the lower classes. He received a map
from only one source, a priest.

In the Sami tradition, symbolic representations that to our modern eyes would
look like maps were well known. The ritual drums, as well as the layout of the interior of
a Sami tent or turf hut, are seen as maps of selected parts and aspects of the world
(Mathisen 1991). But this had little or nothing to do with wayfinding in the physical
landscape. The only known use even remotely close to navigation is for making hunting
decisions (Keski-Säntti 2003).

But even if paper maps were not used, what about cognitive maps? One theory
holds that humans, as well as other species—including rats—carry cognitive maps in
their heads, maps that are representations of the world they live in. When Tolman (1948)
used ‘map’ for what we have in our heads, this was based on a functional similarity; his
aim was to argue against a simple stimulus–response interpretation of rats’ ability to find
the way. Gibson, however, criticizes the idea of cognitive maps as confusion between categorically different things:

The getting of a bird’s-eye view is helpful in becoming oriented, and the explorer will look down from a high place if possible. Homing pigeons are better at orientation than we are. But orientation to goals behind the walls, beyond the trees, and over the hill is not just a looking-down-on, and it is certainly not the having of a map, not even a ‘cognitive’ map supposed to exist in the mind instead of on paper. A map is a useful artifact when the hiker is lost, but it is a mistake to confuse the artifact with the psychological state the artifact promotes. (Gibson 1986, 199)

The map as a document is categorically different from the landscape—not only because the map is scaled and created by humans, but also because maps are used differently from the way the landscape is used. The wayfinder is inside the landscape. When one looks at a map to find out where one is (on the map), one is physically outside the map, but conceptually in the map. Thus one is outside the landscape looking down at it with a bird’s-eye view. One moves through a landscape, whereas one is outside the map (Ingold 2000, 227–34). This also has consequences for our sensorial system. We mainly move the eyes while looking at the map, but we are embodied creatures, constantly moving the full eye-head-body system, when travelling through the landscape. Documents and landscapes both relate to practice, but they do so in different ways.

In an interview at the Brain Science Podcast, Nicolelis clarified his view on the use of ‘map’ when describing the brain’s spatial systems:  

I don’t even use the word ‘maps’ anymore. ‘Maps’ gives us an impression of a static 2D or 3D; and that’s the reason they were used, actually. When Penfield first described them in humans, and Sherrington, in animals, I think this was actually the intent: to show that there was a static, carved-in-stone representation of the world. But I think that, once this revolution comes—in neuroscience, I mean—the word ‘maps’ is going to disappear; because they carry too much baggage with them.

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8Miguel Nicolelis is a medical professor of neuroscience and founder of Duke University’s Center for Neuroengineering.
I like to talk about dynamic representations, or dynamic models. That’s what I think the brain is doing: the brain is creating; continuously creating and updating. (Nicolelis 2011, 21)

The idea of the cognitive map was developed as an ‘as-if’ concept. If we see the brain as carrying a cognitive map, how far can we get in understanding how the brain works? I believe we have reached the end of that road—that more useful metaphors can be found to describe the wayfinding and navigation systems of the brain. The use of conceptual modelling of textual information can play a role in clarifying these new metaphors. Such modelling is central to the digital component of the research I describe in this chapter.

Texts and maps are sign systems, whereas the landscape is not; rather, the landscape only becomes a sign system when we make it one (Basso 1996). The landscape itself is outside the map, and also outside the text. Wayfinding is done by employing a combination of words, body, brain, senses, landscape, fellow creatures, and, quite recently, also maps. The ways in which it is done vary significantly. We can actively engage in finding the way. We can discourse with our fellow travellers, use maps, remember a route description told to us earlier, or make an inner argument: ‘If I go this way, then I will find that valley, which will take me to the lake.’

However, much evidence points towards another possible method of finding our way: we can do it without thinking in words, by ‘just knowing’ where to go, as seen in cultures where people have perfected dead reckoning (Levinson 2003, 5). We can find the way ‘without thinking’, that is, in an automatized way, without consciously remembering it afterwards (Tuan 1975, 207). I aim to see how the use of maps is a special case, as is the use of an oral or written text. We may have a map with us, or we may have memorized a map image. We may have a textual route description with us, or remember such a description, possibly as a song or a chant. It could be a memorized series of highly descriptive place names. Some cultures use tone patterns in expressions referring to places, so that musical expressions become part of a place name.⁹

⁹This is how the Sami joik may refer to places (Tirén 1942). Collignon (2006) gives a good example of the use of a complex system of place names (or rather named relations between point of observation and the observed place) among the Inuinnat, another Arctic culture.
The landscape, again, is something different from both maps and texts. The landscape has a physical presence independent of observers, but the landscape we have access to is encultured. We have names for features, both at type level and at particular level. In my experience, maps, especially topographical maps and the like, tend to focus attention on the landscape as a physical structure with all rivers, contour lines, and roads denoted. Texts tend to open more up for the human experience of the landscape. My understanding based on personal communication with Sami people falls well in with the claim made by Keski-Säntti:

>[The Chukchi’s] method of spatial depiction is comparable to what we learn from a number of sources about the spatial depictions of the Inuit in the Arctic: instead of drawing a map, both the Chukchi and the Inuit describe their surroundings and their journeys orally. These often-repeated descriptions include place-names and details of the shape of the landscape and of memorable landmarks. (Keski-Säntti 2003, 120)

In this way, the map expresses the actual physical layout of the landscape more clearly; thus, we must be told that maps lie (Monmonier 1996), but not that texts lie.

**Intermediality**

Maps and texts alike fall short in representing the landscape as the total reality available to our experiences. No media expression can capture everything we experience while moving around in a landscape. Further, texts and maps are able to capture different aspects of this reality, as would other media such as music or theatre. ‘Every medium has the capacity of mediating only certain aspects of the total reality’ (Elleström 2010, 24), as we saw above: a text can say ‘east’, whereas a grid-based map must express exact geometric relationships between places. This causes differences in how the aspects of reality presented by a text and a map are experienced. These differences not only apply to how things are expressed but also influence what is said. The messages presented to

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10One example is that First Nation map surveys are based on the telling of stories from which information is extracted and put on a map (Tobias 2009).

11Such differences were already pinpointed in Greek antiquity (Eide 2014).
Schnitler by the witnesses were more than the medium in which they were expressed, but they were clearly influenced by the medium. If a witness had been asked to draw a scaled map, different aspects would have been presented.

So we have three different things: a landscape offering itself to our senses, and two different ways of expressing our understanding, feeling, and sense of the landscape. Two different texts will express different aspects of that reality. So will two different maps. Even two different readings of the same text or the same map will be different. Because a text includes points of contact that depend on an understanding reader in order to be realized, and because these points of contact cannot at the level of meaning be disconnected from the reading instance, and because each and every reading and reading instance is unique, the text cannot be the same in two readings. That is, the text is not self-identical (McGann 2001, 188–89). But the differences between expressions adhering to the different semiotic systems of maps and texts operate at another level.

In a certain sense, all media expressions are intermedial (Arvidson, Askander, Bruhn, and Führer 2007, 13–14), but many expressions are close to being single-media expressions—for instance, Schnitler’s texts and his maps. Combining such expressions creates combined utterances with a more outspoken intermediality. Combining maps and oral or written texts, and possibly other media as well, constitutes a case of geocommunication (Brodersen 2008). Geocommunication is commonly used in modern digital map systems. Google’s route services is a well-known example in which maps, images, and texts are combined to advise the user how to find the way to a certain place.

But geocommunication is not new. When a person uses a map as the background for describing a past, future, or ongoing journey, a situation of geocommunication is created, combining the map with an oral text to produce an ephemeral intermedial document. The court sessions documented by Schnitler were likely to have been geocommunication situations in which oral text, gesture, and possibly even maps were used to convey a story. This story was then taken down by the scribe as a textual document. What can be seen as a translation from oral to written can also be seen as a
translation from a kind of geocommunicative staging, where the landscape itself was used as an affordance in the process of telling a story.

Some of the many choices being made in court were free choices in the sense that one can choose to mention a mountain—or not. One also has to make choices based on the medium used, as seen above: when the text says ‘east’, it includes an openness that cannot survive on the map—the mapmaker has to choose the exact geometrical angle between two places. On the other hand, the scribe could not choose to include the specific odour in a valley in his text, he could only include a description of that smell—this was not a free choice. But the fact that no such descriptions are included was a free choice.

The main role of digital modelling experiments in my research is to find the details that are needed to establish a larger picture of media understanding. The algorithmic processing of text is different from the meaning-seeking reading of humans. I use the stupid explicitness of the computer to get to the core of things. The strength of unknowing, decontextualized computers is similar to the problems of situatedness and embodiment in artificial intelligence research, as Pfeifer and Scheier discuss (1999, 71–73), seen from the other side. What is problematic in artificial intelligence becomes an asset in my work (McGann 2001, 190–91). Digital humanities exploits the fact that computers are less goal-oriented than we are, less framed in sympathetic exchanges with desire for meaning, so they can help us find other readings than the ones we see. All humanists know that media are different. Modelling experiments can tell us how these differences play out at the micro level. In order to understand the meaning of the micro-level differences, however, the digital may not be of much help; humanists may rather need to work with different disciplines within the humanities as well as beyond: history, linguistics, psychology, anthropology, neuroscience, geography, and cartography, to mention just a few relevant to the work at hand.

The landscape we envisage when we know it only from a text is different from the landscape we know from another text, from a map, or from travelling the landscape. These differences are systematic. Two texts have the potential to present the same impression, and two maps have a similar potential. But as shown in the examples above,
trying to transfer a message conveyed by a text onto a map expression is fruitless. The
textual message simply cannot be presented as a map, and the fullness of the landscape is
ungraspable in either medium.

It is naive to believe that what a text can express about a landscape can be
transferred to a map-based expression without significant loss of meaning. But it is
similarly naive to believe that adding a map to a text, or a text to map, will not create a
richer story. This richer story may not be truer, but it tells the reader more. It is often the
case that the reader will experience a loss in freedom as a result; in the case of historical
texts, such a loss in freedom is often seen as a gain in knowledge, but not always. A map
can manipulate. Still, the necessary tension between the text and the map, the fact that
they convey different parts of the full reality, opens up a space for conflicting stories that
the clever creator of the expression can use, and that can assist the aware reader in
gaining deeper understanding. In my opinion, this is digital mapping’s most important
role as a critical tool.

To make the one and only map of a text would imply that one could capture the
one and only stable text, which is not possible. As we saw above, a text is not self-
identical. One can only make a map of one or several readings of a text; the map is a
model expressing one or several interpretations. This is the case no matter if the text is a
paragraph or a million books. When digital humanities methods are used to create
detailed models of short texts, modelling becomes a microscope and the subjectivity of
the map model is obvious. However, the subjectivity of the map may be harder to see
when one is mapping thousands or millions of books. Modelling in close and distant
reading are both useful digital humanities practices, but they focus on different
perspectives. The users of distant-reading binoculars may be well advised to pay attention
to what the microscope users do, and perhaps to look into the microscope of digital close
reading from time to time. In addition, we who use the microscope can learn from
looking through the binoculars to see a larger picture.


Mapping Fiction
Spatialising the Literary Work

Sally Bushell

The true ground, the ‘it’, is everywhere and nowhere. It can be located on no map.

(J. Hillis Miller, Topographies 52)

How do we move through and negotiate the experience of the literary work of art? What do we understand by ‘literary place’ or ‘space’ and what are the implications of this for the mapping or spatialising of literary texts in digital media? This chapter will begin to address such questions as well as raise some of the difficulties involved in applying concepts of mapping to literature. Unlike other chapters in this collection it does not emerge from a current digital project but, instead, considers ways forward for future projects in the field of Literary Studies. Throughout the chapter Thomas Hardy’s novel, The Return of the Native, is used as an example to ground ideas.

Mapping Literary Place and Space

A map is the most effective, visual, means of presenting spatial and geographical information in a way that enables us to negotiate and make sense of things. It provides us with a spatial and intellectual confidence that extends beyond ourselves and it enables ‘Gestalt’ understanding of an environment beyond immediate visual perception.1 Without it, or if we get lost, our experience of place will be radically different. ‘Mapping’, on the other hand, concerns an internalised cognitive process that may apply to the use of a map, but is also relevant to many other areas of life, where a sense of location or situatedness might be important. For literary mapping, the secondary activities contained in mapping – viewing the world from multiple

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1 A gestalt theory of visual perception (originating in Germany in the 1920s) argues that the mind will organise related visual images into a whole in order to make sense of them. See, for example, Arnheim.
perspectives; the relative situating of objects in space; the locating of the self and a sense of ‘mapping things out’ (in relation to the fictional world, movements of characters or the literary work) – are likely to be as important as the tangible object of a map (which is occasionally given alongside the text).

An interest in mapping leads inevitably into the on-going theoretical debate over the distinction between place and space and the relative priority given to either. This is not the context in which to engage fully with a discussion that has been at the centre of the so-called ‘spatial turn’ in the humanities and social sciences. Instead, my aim here is to consider the relevance of this ‘real-world’ debate for the understanding of literary place and space. The approaches that prove most productive for literary studies tend to be those which allow for active, performative interaction between the two concepts (Tuan; Lefebvre; Soja; Massey; De Certeau; Thrift) – albeit in a wide range of ways with different underlying political and ideological agendas. In such approaches, ‘the focus lies in relating location to place through the experience of human beings as agents’ (Agnew, 324). The binding together of place and space through objects and agents is essential in order to allow for the double dimension of representation and experience by characters, reader and writer and through the represented fictional, imaginative world as well as the material object of the book. It may be helpful to try and apply underlying concepts that inform the larger place/space debate to a particular literary example to understand the issues involved.

John Agnew identifies three fundamental dimensions to place and space that ‘tend to reoccur across the various theoretical positions’ (326) and that can help to ground discussion here. He defines these as: location or ‘a site in space where an activity or object is located’ (326); locale (‘place as a series of locales or settings where everyday-life activities take place’ [326]) and sense of place: ‘identification with a place as a unique community, landscape and moral order’ (327). Agnew also notes of this last that ‘In this construction, every place is particular, and thus singular’ (327). What happens, then, if we apply Agnew’s three-part definition to literary place and space?

Thomas Hardy’s The Return of the Native is strongly centred upon a particular site, Egdon Heath, with the author deliberately conforming to a unity of place. In a letter to his publisher, about the map for The Return of the Native, Hardy states: ‘Unity of place is so seldom preserved in novels that a map of the scene of action is as a rule impracticable: but since the

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2 For a succinct and highly informative, account of the distinction between the two terms (looking back to a fundamental distinction between Newtonian and Leibnizian accounts of space) see Agnew; a lengthier account is also given by Cresswell.
present story affords an opportunity of doing so I am of opinion that it would be a desirable novelty, likely to increase a reader's interest' (Letters 1: 61). Unsurprisingly, then, location is often given in detailed and specific ways:

The distance to the boy’s house was not more than three-eighths of a mile, his father’s cottage, and one other a few yards further on, forming part of the hamlet of Mistover Knap: the third and only remaining house was that of Captain Vye and Eustacia, which stood quite away from the small cottages. (66)

These sorts of clear geographical description enable the reader to respond to the novel as if it describes a fixed objective coordinate upon the earth (corresponding to a traditional standard understanding of place as a specific location). However, the moment we attempt to map those fixed coordinates, problems arise. In the first edition of the novel (1878) Hardy provided a map of the Heath (Figure 6.1); but later, in the Wessex edition of 1895–96 and subsequent editions, this was removed and replaced with a smaller scale regional map given at the front of all the books (Figure 6.2).3 Ostensibly, the verbal text provides locations that can be verified by means of the map at the front of the book. However, this is explicitly entitled ‘sketch map’ so that the kind of mapping it enables is less about ‘accuracy’ (impossible anyway since there is no real world space for it to be accurate to) than about relative positioning and what we might call a ‘human geometry’ created by the lives and movements of the characters. In fact, the ‘accuracy’ of the literary map – measurable in terms of visual/verbal correspondence – is also immediately brought into question, even for the quotation given above, by the absence of less important elements on the map (for example, the boy’s cottage is not marked, only the house of Captain Vye). The outlines of the second map, given in the Wessex edition, correspond to the actual English coastline, and place-names on the map consist of a mixture of real and fictional towns and spots so that here imaginary, literary place is enfolded within actual place.4 But none of the locations in the novel really ‘exist’, even though Hardy’s blurring of the boundaries between fictional and real spaces encourages us to respond as if there is a real world correspondence.5 What is literary location then?

3 This map itself was subject to numerous revisions. The map given here is that published in the 1912 Wessex edition based on Hardy’s own sketch. For a helpful account see Plietzch.

4 See Pite’s discussion of this and of Hardy’s mapping of Wessex 169–77.

5 Egdon Heath is also reputedly drawn from heath land east of Hardy’s birthplace at Higher Bockhampton, but in his Preface of 1895 Hardy states that in Egdon Heath ‘are united or typified heaths of various real names, to the number of at least a dozen’ (5).
Figure 6.1 Map in first edition of *The Return of the Native* (1878).
Source © The Author.

Figure 6.2 Wessex map in Macmillan edition of *The Return of the Native* (1912).
Source © The Author.
Something that we are to experience *as if* it were real (since this is a realist novel)? Something that closely resembles actual mappable places that can be visited, but is always other by virtue of its existence in the form of literary representation?

The *locale* of the novel is Egdon Heath and those who dwell on and around it, but this is not merely a material setting: the heath is given its own distinct identity. It is presented from the start as a prior place, exceeding the human and of a different order:

> It could best be felt when it could not clearly be seen, its complete effect and explanation lying in this and the succeeding hours before the next dawn: then, and only then, did it tell its true tale. (8)

Cresswell states of locale that, ‘Even imaginary places, like Hogwarts school in Harry Potter novels, have an imaginary materiality of rooms, staircases and tunnels that make the novel work’ (7). Maybe so (although Hogwarts is actually unmappable since those rooms and staircases are also described as constantly moving in a way that actual interiors cannot), but *literary* locale is able to have an extraordinary richness and depth that far exceeds the account of it as background for social relations. The true nature of the Heath can only be described in terms that mark its absolute otherness from the human: it can only be fully experienced when there is no-one there to experience it.

According to Agnew’s third category, *sense of place* is strongly depicted through individuals, who are defined by their unique feelings towards it. This functions for fictional characters in a directly comparable way to a lived sense of place in the world. However, within the form of the novel, it also allows for unifying themes and all kinds of spatial responses (for example, in terms of inside/outsideness; boundaries; paths; meeting points and so on) that explore the complex relationship between character and environment. So, the two main characters in *Return of the Native* are defined in and through a sense of place in relation to their immediate environment. Eustacia hates the Heath whilst Clem is the human embodiment of it: ‘He might be said to be its product. His eyes had first opened thereon’ (148). At the same time, there is a larger spatio-temporal opposition between the present ‘here’ of this remote provincial setting and the absent ‘there’ of fashionable Paris from which Clem has returned (and to which Eustacia seeks to escape). These basic acts of self-situating, through which identity is bound up with attitudes towards place, tell us from the outset that their relationship is doomed. Equally, though, a sense of place within the novel also extends outward to generate multiple readerly responses: to the fictional world and the characters within it; to the ‘world’ of Hardy; in relation to the reader’s larger intertextual knowledge; to the reader’s own life experiences and
so on. Literary place, and the mapping of it, thus immediately presents particular problems both within the confines of a particular work and beyond.

We will return to these problems in the final part of the chapter. For now, though, it may be helpful to develop further the distinction between place and space by considering that made by Michel de Certeau in his work *The Practice of Everyday Life*. For de Certeau, ‘place’ corresponds to an imposed power structure associated with authority (in his terms a ‘strategy’) whereas ‘space’ corresponds to the effects and acts produced within place (a ‘tactic’) that challenge and undo the dominant order:

A place (lieu) is the order (of whatever kind) in accord with which elements are distributed in relationships of coexistence. It thus excludes the possibility of two things being in the same location (place).

A space exists when one takes into consideration vectors of direction, velocities, and time variables. Thus space is composed of intersections of mobile elements. It is in a sense actuated by the ensemble of movements deployed within it. (117)

In de Certeau’s terms, then, things are fixed and specifically located in place, which is associated with the rigid imposition of order. In contrast, space is mobile, fluid, adaptable. He famously concludes that: ‘space is a practiced place. Thus the street geometrically defined by urban planning is transformed into a space by walkers’ (117). The effect of this distinction is to make the concept of space less abstract (it is not about geometric structures so much as made patterns and connections) and to reverse the assumed priority of (empirical) place over (abstract) space by giving agency to the lived experience that creates ‘space’.

De Certeau’s value for literary mapping lies in the way he neatly connects his account of literal movement and pathways (space) through a city (place) to other ‘everyday’ systems (writing, reading, cooking). He describes ordinary reading as a kind of wandering through a system which can be resisted and undone by means of the plurality of meaning held within it. So, the text (and the assertion of authorial intention it holds) functions as the structure of power whilst the reader, making his or her own meaning through acts of reading, is creating resistant space by ‘moving’ in ways that the author may not have wanted. De Certeau states that, ‘an act of reading is the space produced by the practice of a particular place: a written text, i.e. a place constituted by a system of signs’ (117). In his terms, then, the material text is literary place, the act of reading brings into existence literary space. Literary place is associated with the grounded physical object of the work of art and encompasses the materiality of the book, meaning as held in the written marks upon the page and the intentions of the writer. Literary space concerns the
activation of the imaginary world through the act of reading: indeed, space can only be created through this active engagement with place. If we relate this to literary mapping, then an actual map given within a work would be seen as a literary place (presenting a unified authorial sense of place that seeks to impose order and predetermine the world that has not yet been described) but the reader’s use of that map, or negotiation of the fictional world when no map is provided, involves space-making. Crucially, for de Certeau, narratives are not seen as somehow secondary to lived spatiality but a vital element of it:

The story does not express a practice. It does not limit itself to telling about a movement. It makes it. One understands it, then, if one enters into this movement oneself. (81)

If this is true then we might begin to consider that literature presents not mere representations of place but the possibility of a shared experience that is not at one step removed from how we experience place in the world but a more sophisticated articulation of that experience into which we enter and by which our own sense of place can be changed (even back out into the supposed realist point of reference in the world).

Distant Reading and Deep Mapping

The first part of this chapter has attempted to establish some key terms for literary mapping; I want now to turn to the digital exploration and mapping of literature. Key here is Franco Moretti and his two highly influential books: *Atlas of the European Novel* (1998) and *Graphs Maps Trees* (2005). The first point to make is that Moretti is not interested in working with authorial maps (such as Hardy’s) but in generating maps from spatial information within the text. He is also not concerned directly with digital mapping, although his methods naturally extend in this direction (and have been highly influential here) so that it is essential to engage with his ideas.

Moretti’s declared intention is to move beyond the use of maps as merely illustrative or decorative in relation to literature, and to use them instead as ‘analytical tools: that dissect the text in an unusual way, bringing to light relations that would otherwise remain hidden’ (*Atlas* 3). His techniques work to bring to the fore that which was previously treated as ‘background’ or ‘setting’ with the primary aim of ‘mak[ing] the connection between geography and literature explicit’ by means of a map, here defined as ‘a connection made visible’ (3). Moretti’s succinct account of his own method makes clear the nature of his approach:

in the end this is what literary geography is all about: you select a textual feature . . . find the data, put them on paper – and then you look
at the map. In the hope that the visual construct will be more than the sum of its parts: that it will show a shape a pattern that may add something [...] (Atlas 13)

So, for example, he goes on to compare the city spaces of London and Paris in nineteenth-century fiction to argue that the spaces of London are socially demarcated, whereas in Balzac’s Paris ‘the magnetism of desire orients the city’ (95) so that characters start in one kind of space but rapidly re-orientate themselves towards another. The series of maps generated by Moretti corroborates this hypothesis.

Although he does not directly articulate this himself, Moretti is effectively undertaking thematic mapping in relation to data derived from literary texts. A thematic map ‘concentrates on the distribution of a single attribute or the relationship among several’ (Robinson et al. 13). Its design is:

concerned with portraying the overall form of a given geographical distribution. It is the structural relationship of each part to the whole that is important. Such a map is a kind of graphic essay dealing with the spatial variations and interrelationships of some geographical distribution. (Robinson et al. 317)

When they emerged in the nineteenth century, such maps were focused on the representation of data such as population numbers or the spread of disease (a famous example is Dr John Snow’s use of the dot map to represent the spread of cholera in London in 1854). Thematic maps thus focus attention on a particular measurable issue represented in a powerful visual and spatial way. This is worth bearing in mind in terms of the intended purpose of Moretti’s maps (and the maps of those who develop models based on his approach in the digital medium). The map may well function quite dramatically to enable us to see things anew, or to make a specific spatial point, but how does this bear in meaningful ways upon our understanding and interpretation of an entire text? Essentially what Moretti does is to apply spatial models to narrative structures and he does this extremely effectively. What he does not do is to convert the spatial model into anything other than a spatial model and this can make him strangely wasteful of the rich data he produces. In other words, he does not go on to show fully how a spatial revelation can fundamentally alter interpretation and, without this, his work has clear limits for Literary Studies.

As a result, Moretti’s work tends to divide his audience. Within the context of Literary Studies it is subject to considerable critique by some, whilst adopted by others. In broader digital application, core ideas such as ‘distant reading’ or the generating of quantitative analysis from literary texts have been assimilated and adapted across a range of disciplines. Moretti explicitly defines his method as one ‘in which the reality of the
text undergoes a process of deliberate reduction and abstraction’ (*Graphs* 1) and defines Distant Reading as a practice in which ‘distance is however not an obstacle, but a specific form of knowledge: fewer elements, hence a sharper sense of their overall connection’ (1). Such activities work well in terms of digital mapping, where information is typically drawn from across a database to generate a Geographic Information Systems representation of physical locations within literature or across a range of works in a particular genre or form.6

We can look briefly at how his ideas have been developed further, albeit with far greater awareness of cartography and cartographic practices, in the work of Barbara Piatti and others at ETH Zurich on the *Literary Atlas of Europe* project. Piatti takes Moretti’s ideas forward into the digital environment by means of a more explicitly scientific and systematic project centred on ‘literary geography’ (a key term that Moretti adopts) understood as mapping fiction onto real-world locations. The project maps three distinct areas of Europe that have dense literary settings across a range of authors with the hope that:

> Creating maps based on the elements the author used to build up his fiction will not only better show where fiction takes place . . . it will also demonstrate new correlations between these two worlds. (*Mapping Literature* 2)

As in Moretti (who maps literary movements onto outline maps of real-world places), there is a degree of conflation between actual and literary geographies here. Different accounts of the project repeatedly make the claim that ‘[o]ne of its traditional starting points is precisely the assumption that a large part of fiction indeed refers to the physical/real world’ (*Literary Geography* 4). This is problematic from a literary perspective since it assumes (or leads the user of such maps to assume) a straightforward correspondence between real world and fictional world. In other words, it fails to understand the complex nature of ‘realism’ in the novel or the fundamental point that the literary representation even of a supposedly ‘real’ place is always of a different order.

That said, there is something refreshing about the way Piatti and her colleagues focus upon the actual making of maps, as there is in their willingness to acknowledge and address the practical problems involved. In ‘Cartographies of Fictional Worlds’ they describe how fiction is mapped through five geographical components: setting; zone of action; projected space; route; marker (Piatti and Hurni, 220). Piatti states that ‘Every topographic or geographic mention within the story belongs to one of these

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6 For recent accounts of the potential of these ways of reading see Matthew L. Jockers, *Macroanalysis: Digital Methods and Literary History* and Franco Moretti, *Distant Reading.*
categories’ (Mapping Literature’ 2). These primary elements are then further broken down into attributes and categories. So, ‘setting’ exists in terms of a point, a line, a polygon, naming; and the system also allows for different uses of setting within literature as: simple scenery; thematic scenery; mythical-symbolic; physical protagonistical; protagonistical-psychic. Piatti also allows for indeterminate space and has developed graphic methods ‘to represent uncertainty’ (‘Mapping Literature’ 7) as well as acknowledging that ‘some aspects of literary geography remain unmappable, for example completely imaginary spaces’ (‘Mapping Literature’ 11). The detailed level of spatial attributes fed into the database allows for the generation of a wide range of maps, to be followed by ‘implementation of the second approach, using statistical methods for analysing literary elements from different texts’ (10).

I want to consider the usefulness of thematic mapping by a crude application of it to the authorial map of The Return of the Native. The variable I have mapped here concerns all the journeys on foot recorded within the book. I have chosen to map these onto the sketch map provided by Hardy (see Figure 6.3) simply by drawing a line for each journey made. This immediately reveals that almost all the journeys in the book are undertaken on foot: the space contains roads, but few people use forms of vehicular transport. In fact, only the reddleman regularly travels by cart along the roads and he is also the only principal character repeatedly to enter and leave the place of the Heath (within the space of the book).

Within the confines of the book, the map is presented vertically with non-standard compass orientation but this presents a slightly misleading sense of the landscape that does not match Hardy’s own verbal description of it. His account of the roads – ‘The above-mentioned highway traversed the lower levels of the heath, from one horizon to another’ (11) – clearly corresponds to the horizontal rather than vertical image which would also position North in the standard orientation at the top of the image. When we turn the map sideways (as in Figure 6.3) there is a far stronger sense of the long hill called Rainbarrow as ‘the pole and axis of this heathery world’ (15) and equally of Eustacia as ‘standing so dead still as the pivot of this circle of heath-country’ (49). The visualisation of human pathways also makes clear that the entangled relationship between the three main characters of Eustacia, Clym and Wildeve creates a strong spatial pattern of movement between their three houses (at Mistover, Bloom’s End and the

7 See also Cooper and Gregory’s account of four levels of mapping (base map; analytical map; exploratory map; interactive map) and attempts to map ‘mood’ in similar ways.
8 There are times where Clym or Wildeve or Eustacia wander around the Heath in unspecified ways but these are not represented.
9 For an alternate spatial reading of The Return of the Native centred on the Roman road, see Rode 19–58.
Figure 6.3 Static map depicting routes on foot in *The Return of the Native*.

Source © The Author.
Quiet Woman inn) that dominates the entire novel. Mapping out the routes thus increases the sense of physical geography which, in turn, is absolutely bound up with a human geometry of feelings, relationships and meetings. A literal love-triangle of movement situates and establishes the emotional one. It also, perhaps more surprisingly, reveals the importance of the single location of Bloom’s End (the home of Clym’s mother). This site functions as a kind of funnel from which, or to which, many of the journeys begin or return. This makes clear the spatial centrality of Clym himself, but also the extent to which his identity is grounded in his mother as much as in place. In fact, when we view the heath horizontally the shape of the barrow and the roads connecting to it seems to take on the form of an eye, with the lens directed towards Bloom’s End and the optic nerve leading back to Clym’s new house at Alderworth.

This is strongly enhanced by the addition of routes onto the map which increase the sense of focus onto the location of Clym’s mother and the relationship between them and shows the threads of connection stretched to breaking point. This reading of the landscape and movement across it may seem fanciful until we recall the description of the heath itself as ‘full of a watchful intentness’ (9) or bear in mind Clym’s loss of sight that occurs when he leaves his birthplace, or the way in which sight/vision and being seen or not is an essential element in the tragedy of his mother’s journey of reconciliation (travelling along that nerve) that goes horribly wrong. Hardy describes how Mrs Yeobright’s ‘eyes were fixed on the ground; within her two sights were graven – that of Clym’s hook and brambles at the door, and that of a woman’s face at a window’ (238). Mapping onto the authorial map (in a way that Moretti and Piatti do not) also raises interesting questions about the nature of imaginative visualisation and between different forms of spatial representation. It partly releases one from the attempt to be absolutely ‘accurate’ (since the ground is not purporting to be in the real world) and uncovers inconsistencies between visual and verbal representation.

For the critic, such a map can clearly work to identify key areas of further spatial exploration within the text. Nevertheless, in terms of the full complexity of ‘acts of mapping’, which are central to our understanding and interpretation of literary spatiality, the static map only represents a first step. A literary critic would want to use the findings of this visualisation as outlined above to undertake a full textual analysis of a particular character’s movements or a particular journey – such as the highly charged nature of Mrs Yeobright’s last walk – and the powerful combination of external physical conditions, internal states, human actions and the misinterpretation of those actions, that bring about the tragedy. Distant reading clearly can uncover new areas of interpretation through the visual/spatial uncovering of core meanings held verbally within the text. The question is whether it must stand alone against its implied opposite (close reading) or whether it can only truly find fulfilment when
reintegrated with it. Despite the attractions of these kinds of approach, then, it should be clear that I find them self-limiting, particularly for a discipline that engages in the interpretation of textual objects which themselves display a rich and complex understanding of the experience of place and space. I see no need for distant reading to set itself off against close reading or, for that matter, full socio-historical contextual reading. Only the uniting of multiple approaches and forms of analysis in the digital environment will adequately serve the needs of Literary Studies.

**Deep Mapping and the Synchronic and Diachronic Axes**

It should be clear by now that the digital mapping of literary place and space is problematic primarily because the represented place and space of the literary work of art (and many of the characteristics that make it literary) so significantly exceed in richness, complexity and depth the attempt to generate maps from them. Moreover, the digital mapping of literary space and place needs also to allow for acts of mapping by characters and readers not just the production of maps. How can such problems be overcome?

One possible solution is offered by ‘deep mapping’ as a newly emerging practice that begins to allow for qualitative as well as quantitative ways of mapping digitally. The origins of deep mapping are not absolutely clear, although the concept seems to emerge out of psychogeography and the work of early French Situationists such as Guy Debord in the 1960s. The term is first used by the American author William Least Heat-Moon in *PrairyErth: A Deep Map* (1991) to describe a composite work focused upon a particular circumscribed place, Chase County, Kansas. In an article on this writer, Gregory-Guider compares *PrairyErth* to an earlier work *Blue Highways* (a ‘quintessential post-Kerouac road novel’ [4]), to suggest that:

*PrairyErth* exchanges breadth for depth concentrating entirely on a single relatively obscure county in Kansas. This shift from horizontal to vertical journeying is discernible in a subgenre of American travel-writing that seeks to discover the new directly beneath the feet[.]. (4)

It is clear, then, that the first conception of ‘deep mapping’ is concerned with trying to access and create a different kind of engagement with place that draws upon the individual lives and histories that well up out of it.

If ‘deep mapping’ starts as a form of adapted psychogeography, it has since been adopted more broadly as a term to describe new ways of spatialising geography for the Humanities in the digital environment, whilst
retaining some sense of being a voice for the ordinary lived experience of place. Cliff McLucas from the Stanford Media Lab retains a sense of deep mapping as ‘genuinely multimedia, not as an aesthetic gesture or affectation, but as a practical necessity’ and argues for non-authoritative forms of mapping: ‘Deep maps will not seek the authority and objectivity of conventional cartography’. Taking such ideas forward, David Bodenhamer (also in this collection) and others at the Virtual Center for Spatial Humanities, Purdue University, Indianapolis, have started to develop the concept specifically in relation to spatial narratives. Bodenhamer gives a fuller definition of deep maps:

They are meant to be visual, time-based, and structurally open. They are genuinely multi-media and multilayered. They do not seek authority or objectivity, but involve negotiation between insiders and outsiders, experts and contributors, over what is represented and how. Framed as a conversation and not a statement, deep maps are inherently unstable.[(174)]

A second, apparently independent, development of the same idea is put forward by Shelley Fishkin at Stanford who defines ‘Digital Palimpsest Mapping Projects’ as DPMPs and suggests ‘that we pronounce the acronym DPMPs as ‘Deep Maps’(2). In a recent paper Fishkin gives the following account:

Deep maps are palimpsests in that they allow multiple versions of events, of texts, of phenomena (both primary and secondary) to be written over each other – with each version still visible under the layers. They involve mapping, since the form of display – the gateway . . . – would be a geographical map that links the text, artifact, phenomenon, or event to the location that produced it, that responded to it, or that is connected with it. (3)

Fishkin then goes on to describe a range of possible deep map projects focused on particular sites or events and responses to them over time (for example, Hiroshima; Dachau) as well as on transnational cultural forms that might bring together different responses to the same phenomena in different cultures. Deep maps certainly seem to offer an alternative to distant reading in terms of the kinds of literary maps produced and the nature of the engagement with place that they offer. But I want to pull back at this point and look more carefully at the underlying structure that may be informing both deep mapping and distant reading to help us understand how they can be brought together.

In his late essay ‘An Ontological Consideration of Place’ Heidegger describes ‘horizontal’ and ‘vertical’ modes of Being:
Man is involved in ‘place’ in two dimensions, horizontal and vertical. The horizontal dimension is determined by his political relationship. Vertically, being is a dimension hiding the uniqueness of Being, but at the same time it is the place of Being. (19)

The individual is held in place vertically in relation to the self (ontologically) and horizontally in relation to others (existentially; politically); but the two dimensions are bound together and vitally inform each other: ‘our horizontal “place” can never be totally eliminated without the consequent denial of our ontological “place”. This is true because ontological place reveals itself through existential “place”’ (25). In fact, Heidegger was himself drawing upon the earlier famous articulation of the distinction between synchronic (‘all at one time’) and diachronic (‘over time’) axes made by Ferdinand de Saussure in relation to language in his Course in General Linguistics (1916). As well as revolutionising his own discipline, Saussure’s model has proved extremely influential across the humanities and social sciences. So, if we turn from Linguistics to Literary Studies, in a less dramatic way, the same two axes can also be understood to denote an implicit division between literary critics and textual critics/editors in relation to the textual stability of the literary work of art. The German textual critic, Hans Walter Gabler, makes this clear when he argues that ‘works of literature are essentially based on this concept of the text as a synchronous and thereby . . . static structure’ (306). However, the reality is that:

the work may be said to comprise all its authorial textual states. By such definition, the work attains an axis and extension in time from earliest draft to final revision. Its total text presents itself as a diachronous structure correlating the discrete synchronous structures discernible, of which that conferred by publication is only one, and not necessarily a privileged one. (309)

So, literary critics generally seek to respond to the literary work through the superficially stable form of a published text in a single state in relation to the historical and philosophical context of a particular time (synchronic). By contrast, textual critics and editors seek to validate the multi-layered process of textual production over time and to allow for the evolution of texts across pre-publication and post-publication states (diachronic).

I want to suggest that the two concepts of ‘distant reading’ and ‘deep mapping’ considered above could be understood to correspond to the synchronic/diachronic distinction. ‘Distant reading’ primarily treats elements within texts as single fixed entities whose value is revealed only through comparison to other similar forms understood on a horizontal
axis. In contrast, ‘deep mapping’ suggests a vertical model which contextualises and privileges an individual item within the database allowing its full history to emerge. In so doing, it also allows the possibility of readerly mapping and spatialisation. One question (emerging from Saussure’s absolute distinction between the two axes) might be whether these two forms of digital mapping imply a major divide in terms of underlying principles and conceptions (as Saussure suggests) or can be brought together and even need each other in order to be fully understood (Heidegger). Can we also allow for a diachronic model in which each new response need not supplant the preceding one, but instead is cumulative and accretive in nature?

Such ideas are taken forward by Ridge, Lafreniere and Nesbit in their account of the relationship between deep maps and spatial narratives that allows that ‘the spatial narrative may be developed as a route through a deep map’ (178). Their account describes a pyramid structure for which the bottom of the pyramid is an ideal base consisting of a ‘universe of potential data’ with middle layers of a ‘Deep map prime’ and ‘Deep map personal’ (184) and the top of the pyramid as the spatial narrative. Deep maps provide the platform that enable personal routes through a site.

One other emerging approach is worth considering here. In a remarkably forward-thinking paper Christina Ljungberg poses the question: ‘Are we, as some suggest, at the point of entering a new shift of mapping paradigm similar to the one that occurred in early modernity?’ (37). Rather than starting with the form of map to be presented, she centres her consideration on the user, convincingly making the point that new technologies not only require new forms of mapping but ultimately have the potential to re-determine the subject:

Although maps have to some extent always fulfilled these functions, what is different today are the technologies at our disposal which not only generate new dynamic spaces but also demand the development of new mapping strategies allowing for both improvisational and subjective positioning in constant negotiations for space. (38)

If in earlier periods, ‘as maps were plotted a new self emerged which was partly defined by the relationship of the self to space’ (39), then what new subject emerges from re-orientation through digital space? Ljungberg uses the example of the way in which contemporary artists interact with technology to suggest ‘that we relinquish the subject-object framework for that of implicated agent and expansive field’ in ‘agential space’ (39). Her model results in ‘meshworks’ (40) as ‘diagrammatic thought of illimitable scope rather than closed systems of finite objects’ (40). In the account given here, she provides a much more versatile and flexible form of synchronicity – of the horizontal axis – consisting of: ‘a dialogic
and communicative self immersed in incessant recontextualisation’ (40). As she also points out, though, ‘The Humanities have not yet taken full account of what this development implies’ (40). In relation to Literary Studies, it would suggest a strong emphasis upon the reader/user but also a shift from ‘the reader’ to multiple creative readers; to readers as agents.

Spatialising the Literary Work of Art

The final part of this chapter begins to consider how such a dialogue might be developed for the place and space of literature. What we find in literary works (which Hardy’s novels fully exemplify) is a deeply spatialised form in which place and space are fully bound up with the central meanings and structures of the work but, more than this, in which we are potentially enabled to experience through forms of representation a richer spatiality in relation to a non-existent place than we can ourselves experience out in the world. Should we use the term ‘spatialise’ rather than map? Spatialising texts involves mapping but extends far beyond this and allows for the possibility of mapping not just movement across and within place (geographical; physical) and space (projected; dreamed; imagined; interiorised response to place) but also for finding ways of exploring the significance of situated being through language – which would seem to be ultimately what the mapping of literature is all about.

In Topographies, literary critic and theorist J. Hillis Miller picks up where de Certeau and Moretti leave off by approaching the experience of literary landscape as a performed speech act. Place does not function as setting but as something that comes into being through the act of reading: ‘The landscape “as such” is never given, only one or another of the ways to map it’ (6). In a chapter on Heidegger and Hardy, Hillis Miller makes a number of points that are directly relevant to the experience of literary space and place. First, he allows the possibility that a novel can and must be mapped in the kinds of ways suggested by Moretti and Piatti’s work:

Every narrative, without exception . . . traces out in its course an arrangement of places, dwellings, and rooms joined by paths or roads. These arrangements could be mapped. They tend in fact to be mapped, at least implicitly, in the mind of the reader as he or she reads the novel. (10)

The realist novel – which presents a landscape ‘as if’ it corresponds to a place in the world that can be located – creates a relationship between literary place and geographical place that assumes the landscape already exists and that the literary version of it is an imitative form so that ‘real country
remains as a solid base giving a grounding in material reality to the act of transposition’ (19). However, in Hillis Miller’s account, there is an ‘alogue of text and context, figure and ground, work and “hors d’oeuvre”’ (20) with the result that ‘[i]f the landscape is not prior to the novel and outside it, then it cannot be an extratextual ground giving the novel referential reality’ (21). The apparent realism of the realist novel is misleading because it creates a false relation between literary world and real world, *as if* the literary is referential when by its very nature it cannot be (by the nature of existing only in and through language).

If this is true, how is this landscape able to be so powerful and convincing? Here we need to return to de Certeau’s account of space as ‘a practiced place’. If human acts and movements in the real world make real places meaningful, this is also true in relation to place in the novel. Literary space is experiential not static. We might also want to note that the creation of space, making place meaningful, occurs twice over; for characters existing within that world and moving through it, and for the reader activating a work of literature through the act of reading. The novel itself functions as a network of relations ‘a multitude of objects and persons distributed on a topographical surface connected by a reticulation of lines’ (39). However, for the reader each reading is potentially *a new mapping* since there is no absolutely fixed and static place out of which space is generated or through which to locate ourselves. Hillis Miller makes just this point:

> the investigation of the spatial design of the action leads ultimately to the necessary hypothesis of the atopical or of the placeless. The true ground, the ‘it’, is everywhere and nowhere. It can be located on no map. (52)

The primary focus of deep mapping, in its current form, seems to be on bringing together geography and history rather than considering what it might mean for the literary work of art. Even those projects that have begun to develop in more literary ways are often concerned with networks *between* writers rather than the oeuvre of a single author or an individual work and, therefore, are as much historical as literary and primarily horizontal rather than vertical. The point I seek to make is that there are layers and depths to real landscapes out in the world; but there are also layers and depths to the fictional landscape *and* to its manifestation in the form of a literary work which is *intrinsically layered* – not only in terms of its own history of composition and publication but also at each moment of reading (for writer,

10 See, for example: *Six Degrees of Francis Bacon* or Stanford University’s *Mapping the Republic of Letters* project.
characters and reader) and in the experience of the represented fictional world (for characters ‘living’ there; for the narrator; for the reader; for the reader re-reading).

One way in which deep mapping for Literary Studies could work effectively is by a re-centring of the act of mapping onto the work itself. If we took the documentary model common in German editing, and enlarged it in ways that the digital space enables, then each version of a work in a particular form could be represented diachronically (to allow a total view of changes over time) whilst on the horizontal access, in theory, one could present the work in every manifestation (each republishing). In other words, one could be mapping the literary work across all forms and states and across all published forms, or alternatively select key stopping points along the diachronic axis. Fishkin outlines a good example of the kind of project I am proposing here in creating a deep map based upon the translation of a literary work (Mark Twain’s *Huckleberry Finn*) into different languages (10). Using *The Return of the Native* again as an example, one could present this work in the forms of: surviving manuscript, first serial publication in the *Belgravia*, the first edition of 1878; the first collected edition of 1895–96; the Wessex edition of 1912. The text itself (in terms of content) is then also capable of a full range of historical and geographical contexts at each synchronic point along the diachronic axis through visual annotation, photographs, film and so on creating a network of contextual meanings.

In relation to the language and form of the text, more detailed acts of mapping could be undertaken. In *The Return of the Native* active visualisation of a mapped route could be presented visually alongside/behind the account of that route given in the text. One might compare the movement of different characters in a generated sequence, or focus on a single journey with each stage linked to the passage describing it. The text could either be presented cleanly or hold within it pockets of interpretation at key moments (stopping points) with the identification and analysis of key sentences (or of changes made to a key sentence over versions). This adapts the deep map/spatial narrative pyramid in ways that specifically address space and place in literature, allowing for a full range of response from macro to micro levels. Such a model works inward from distant reading that produces static maps of place illuminating particular concepts or movements, to spatialised criticism (integrating maps/acts of mapping and text) and acts of close-reading (detailed interpretation of complex ideas and images). The full oeuvre of certain British authors who communicate a strong sense of place throughout their work (such as Wordsworth or Hardy) offer perfect examples for exploring the deep mapping of literature and problematising the complex layers of actual, mapped, photographed, represented, fictionalised, dreamt, imagined and internally experienced place and space that constitute the experience of literary spatiality.
How can such literary deep mapping be opened up to the public? If real world deep mapping is about allowing a kind of open, shared, creative space for a region and those who inhabit or have inhabited it, then for Literary Studies it would have to be about readerly mapping of the narrative and the different ways in which readers respond to the world of the text. Readers could add their own annotations to particular sections or characters, or they could be directed to make particular contributions that might be geographically or historically subjective. To take a single example, one could ask readers to respond in terms of where they first read this book or where they are reading it now and build up a fascinating resource around the place of reading linked to a single text.¹¹

Finally, (following Ljungberg) there also needs to be full consideration of how readers actually map either texts or digital sites. Crucial to the digital mapping of literary texts is the need for heightened self-conscious awareness about the way in which the user negotiates the multiple layers of space being created. An ideal project to explore such issues would use strategies of spatial reading and path-finding through digital space in a highly self-conscious way in relation to a particular body of literary texts that are themselves highly spatial in terms of the meaning held within them. At this point, spatial meaning becomes intertwined with materiality and the replication of the manuscript or printed text object in digital space, as well as with the means by which we negotiate and interpret that object, and that object’s relationship to the content (meaning) of the text. If deep mapping is to achieve its potential for literature then it has to allow for the extraordinary spatial potential of literature itself.

Works Cited


¹¹ For a project that works in this kind of way see the Digital Reading Network.


In 1823, at a small school in western Vermont, Frances Alsop Henshaw, the 14-year-old daughter of a prosperous merchant, produced a remarkable cartographic and textual artifact. Henshaw’s “Book of Penmanship Executed at the Middlebury Female Academy” is a slim volume, later bound in marble boards, containing – in addition to the expected, set copy-texts of a practice-book – a series of hand-drawn, delicately-colored maps of our nineteen United States, each one paired with a geometrically-constructed and embellished prose passage selected from the geography books available to a schoolgirl in the new American republic.\(^1\) Henshaw’s maps and texts alike are interpretive representations of the body of geodetic and descriptive literature from which she read geography. Formally, many of the textual passages that accompany her maps are designed within a framework of aesthetically-inflected cardinal coordinates, representing (either conceptually or in their spatial contours) the states they describe, and positioning political and natural boundaries in cartographically appropriate margins of the page [see Figures 1 and 2]. The book, clearly treasured, travelled west with Henshaw to Illinois, and later to Missouri, after her marriage to the clergyman and historian Truman Marcellus Post in 1835. It is the dated “April 29, 1823,” and bears an 1872 inscription to their oldest son, T. A. Post.\(^2\)
**Figure 1:** Connecticut, one of 19 maps in Frances Henshaw’s “Book of Penmanship Executed at the Middlebury Female Academy,” 29 April 1823. Library of David Rumsey. List No. 2501.005. See larger figure.

**Figure 2:** Descriptive and positional text accompanying the Connecticut map; Frances Henshaw, 1823. Library of David Rumsey. List No. 2501G. See larger figure.

Henshaw’s “Book of Penmanship” is no less remarkable in its artistic and imaginative accomplishment for being exemplary of larger trends in the geographic education of nineteenth-century Americans. A sampler in codex form, it constitutes a set of interrelated pedagogical and personal exercises in geospatial and textual graphesis, or
subjective knowledge-production through the creation of images and texts-as-image. This essay builds outward from Henshaw’s lovely and deceptively naïve constructions to an analysis of the present state of geospatial scholarship in the humanities – particularly spatial analysis and practice as it relates to fields like literary and textual criticism, where geographic specificity may prove less important than interpretive possibility. Attention to the processes and products of Henshaw’s exercises can be as fruitful for modern scholars, grappling with the integration of geospatial technologies into the interpretive humanities, as geographers and literary historians demonstrate the exercises themselves to have been for meaning-making among an increasingly literate populace in the early years of the American republic.3

Frances Henshaw was a pupil at the Middlebury Female Academy, the first school established by noted American educational reformer, Emma Willard. Willard had moved on from Middlebury by the time Henshaw was designing her map-book, to a larger role as a writer of treatises (including an 1818 Plan for Improving Female Education) and textbooks – beginning with A System of Universal Geography, authored with William Channing Woodbridge in 1822, and Geography for Beginners, published in 1826. Emma Willard is best remembered today as the founder of America’s pre-eminent academy for young women, and particularly for future teachers. Her influential Troy Female Seminary, established in 1821 when she left Frances Henshaw’s school in Vermont, is still in operation in upstate New York as the Emma Willard School for Girls.4 Frances Henshaw’s Book of Penmanship makes clear, however, that the arts-based geospatial exercises Willard developed early in her career as a teacher – and on
which her later textbooks, spatial and temporal visualizations, and curricula were based—had endured among instructors and students at Middlebury into the 1820s.  

Willard’s pedagogical innovation was to base geographical instruction and discovery-learning on the construction, by her students, of personalized, localized, graphical maps. While geography had long been accepted as a discipline suited to female education and was emerging as an important path to literacy and the development of a common national identity in early America, until the 1820s it was taught almost entirely through prose. The chief geographical textbooks of the day (Jedediah Morse’s *Geography Made Easy* and Noah Webster’s collection of grammars and spellers) were designed to suit a pedagogy that understood the cultivation of memory as a purely textual and verbal exercise. Jedediah Morse (who served as a primary resource for Frances Henshaw’s work in 1823) offers complex and evocative textual descriptions of places and spaces on the American continent, but relegates maps to costly and less well-circulated supplementary volumes to his primary text. Likewise, Martin Brückner identifies Noah Webster’s closest gesture toward *graphical* expression of geography in a prose “map” that positioned, without presentation of any natural or political boundary-lines, the typeset names of American states and European countries in rough spatial relation to each other. In contrast, Willard privileged the visual, asking her students to begin their mastery of American geography by sketching maps of the spaces and places well known to them—their homes, schools, villages, and towns. Willard’s students then moved outward from local representation to national and international mapmaking, but persisted in the basic exercise of creating their own graphical visualizations as an aid to developing geospatial memory.
Susan Schulten, in an examination of Emma Willard’s temporal and spatial mapping exercises, cites the cartographic impulse of her early pedagogical practice as stemming from a “more general fascination with the idea of graphic representation” (543). This fascination, which evolved and was tested at the Middlebury Female Academy, is everywhere evident in Willard’s later textbooks – a body of work that quickly moved from synchronic spatial imagery in geography primers to diachronic geo-temporal visualization in history books. A powerful graphic intervention in the field, this contribution is notable for having evolved through pedagogical and methodological practice to influential and widely-distributed printed expression in schoolhouse literature – leading Willard to make an unblushing claim: “In history, I have invented the map.”7

**A shift in scale.**

In conceptualizing the modern landscape of the digital humanities, we often (as in Willard’s cartographic pedagogies) move from a survey of local communities and networks to the sketching of path-finding representations of a larger field. Over the past two years, a set of activities focused at the Scholars’ Lab at the University of Virginia Library has led my own research group into productive conversation with outside scholars, software developers, librarians, and archivists eager to contribute to a new community of practice. Local activities have included: implementation of an open source and web-services based infrastructure for discovery and delivery of geospatial datasets (including scanned and geo-referenced historical maps as well as complex metadata and vector and raster spatial data layers); design of geospatial technology seminars and training programs, meant to serve humanities scholars in addition to environmental
scientists and urban planners who have historically engaged with GIS (Geographical Information Systems) at UVa; support of projects undertaken by faculty and by our Scholars’ Lab Graduate Fellows in Digital Humanities, among whom we note heightened engagement with geospatial technology and a distinct intellectual trend toward the study of space and place; design and hosting of the seventh annual Mellon-sponsored Scholarly Communication Institute, which focused on spatial tools and methods; and work on two projects funded by the National Endowment for the Humanities: the Institute for Enabling Geospatial Scholarship – a large-scale training program with tracks for librarians, programmers, and humanities scholars – and Neatline, a tool that allows scholars to express subjective, geographic and temporal interpretations of archival collections.⁸

Along the way, we have formed local, national, and international partnerships.

We are heartened that our collaborators are not only librarians, scholars, and higher education IT staff, but also include representatives of the commercial and entrepreneurial “neo-geography” community and governmental and international non-profit agencies – groups whose external orientation aligns nicely with opportunities for geospatial technology in the public humanities. The rapid pace of these developments – moving outward from a simple resolution, in 2007, to get our own house of haphazardly-collected geospatial data in order and extend a hand to the local humanities community – demonstrates powerfully that there is great energy in this area of digital scholarship. We have also noted a shared eagerness in the wider community of scholars, administrators, and funders to bring geospatial approaches and tools into productive tension with the aims and customs of interpretive (as well as strictly analytical) humanities research.
I rehearse these developments in our local scene out of certainty that similar work and interest in the geospatial humanities is growing – at a variety of scales, and with a variety of institutional inflections – in libraries, academic departments, and digital centers around the world. And yet scholars interested in the documentary record immediately press up against a series of obstacles, pragmatic and conceptual, in their use of geospatial tools and methods. Solid work is being done in the area of historical, archaeological, and analytical GIS, but space and place are cross-cutting concepts that attract scholars from across the disciplines. Are the conditions ripe for new collaborative teams to posit with Emma Willard that – in the ongoing interchange of the larger digital humanities – *we could invent the map*?

I will argue that a fresh, steady look at cartographic and geospatial technologies for the digital humanities should not be taken alone in the context of spatially-oriented disciplines (such as anthropology, area studies, archaeology, urban planning and history, and environmental history) that have more traditionally made use of these tools and datasets and have, to greater and lesser extents, made peace with their present limitations – a set of assumptions that underlie and circumscribe the expressive power of geographical information systems. Instead, I want to extend our examination of GIS technologies and the administrative, pedagogical, and scholarly publishing systems that support them *into the realm of interpretive literary and textual studies* – and imagine them at a variety of scales: from support for complex mapping of print-culture production and distribution networks through space and time; to the visualization of highly subjective spatial expression within and about historical and literary documents; to an examination of the spatial and typographical features of a single page, or class of page.
designs. What potential might geographical tools and methods have for illuminating the spatial, semantic, and intertextual features of books as well as landscapes? Can we imagine a next generation of these tools in support of visualization and aesthetic provocation for humanities interpretation?

If our aim is to promote, among colleagues in fields like literary studies and digital history, a new and timely engagement with geospatial visualization as interpretive practice (timely both in terms of the burgeoning development and use of what have been called crowd-sourced or “volunteered” spatial datasets and popular or “vernacular” interfaces outside of the academy, and in the context of a growing interest in a return to methodological training in graduate education within it), we must ask the following question: what is required of our shared tools, methods, and pedagogical practices to allow us to make as meaningful a visual and pragmatic intervention in our current scene as Emma Willard did in hers?

The deficiencies (from a humanities perspective) of existing geospatial applications and the social and academic systems that support and promote their use are well recognized. They have been thoroughly surveyed by Martyn Jessop of King’s College, London, who identifies four factors contributing to what he terms a strange “inhibition” of the use of geospatial information among digital humanists, a community not generally daunted by the need to learn new software tools, metadata standards, and data curation practices. The “first and most fundamental” of these inhibiting factors “concerns the use of data visualization and images per se in the discourse-based research methodology of the humanities” (42). That most humanities disciplines only make superficial use of images and image-based methodologies suggests an opportunity, if not
a need, to interrogate our habitual interpretive practices and the ways in which graduate education perpetuates a longstanding marginalization of the visual – particularly infelicitous in light of the opportunities for production and analysis afforded by new media.11 Other factors involve our tools and the data we ask those tools to act upon: the suitability of current geospatial software packages to the treatment of issues like subjectivity and emotion, temporality as experienced and expressed in the documentary record, or interpretive inflection in the humanities; and those specific qualities of humanities information unsuited to software designed for synchronic analysis of incredibly dense datasets (rather than for sparse, temporally-inflected data), with a scientific eye toward filtering out – rather than celebrating and analyzing – uncertainties or ambiguities. Finally, Jessop treats broader issues of scholarly communication: issues in funding, producing, evaluating, and distributing innovative geospatial scholarship in disciplines whose structures evolved in response to different conditions and expectations. With Jessop, I will argue that, although geographic information science is often regarded as positivist and mechanistic by humanities scholars, “its greatest contribution to the humanities… may be not as an analytical or information presentation tool but as a reflexive one,” allowing us not only to engage with the “highly experiential” and qualitative features of our datasets, but also to reflect on how we construct our disciplines (48).

Frances Henshaw’s “Book of Penmanship” – which we might view as a sophisticated 1820s pen-and-ink GIS – serves here as an example of both an illuminative process for, and a potential exemplary product of, hermeneutic involvement on the part of scholars with textual surrogates and geospatial interfaces. We lack digital tools expressly
crafted to promote the kind of ludic and spatial engagement with book design and geographical expression that is everywhere evident in the Henshaw cartifact. But the components of these tools are all around us. It is less a technical than an institutional and intellectual problem to identify the small pieces – and practices – that must be loosely joined in order for scholars interested in aesthetics and the interpretation of literary and cultural documents to move forward in the arena of geographic and textual graphesis, or knowledge-making through visual expression.

Is there a methodological approach that presents itself as a way to crack open analytically – or perhaps just allow us to replicate and play with, in digital environments – the easy brand of spatial and literary intertextuality evinced in Henshaw’s schoolgirl exercise? Several classes of tools and digital humanities practices might be examined in order to get at this question, including: the iterative, interpretive, and structured sketching prototyped in Temporal Modelling and Neatline; the concepts of “aesthetic provocation” and the “inner standing point” as materialized in the Ivanhoe Game; options for data-mining for geography in massive text corpora through tools like MONK and TAPoR, and what the Google Books research repositories and efforts like HATHItrust and OCLC must enable in their APIs to contribute to this field; textual and graphical collation interfaces predicated on visualization rather than – or as much as – on structured markup (such as Juxta and Sapheos); the narrative and ludic affordances of mobile, GPS-powered tools and toys; the nature of map libraries, online and off; and of powerful, analytical desktop and web-based GIS applications, not at all designed for hermeneutics and textual studies, but ready nonetheless for some dedicated gate-crashing. This article will treat
only a few of these tools and methods, but will, I hope, provoke thought about the
possibilities of a wider set of them in the context of the Henshaw document.

**Orienteering.**

Henshaw’s book, available as high-quality page scans in the open-access
repository of map collector David Rumsey, must be historically situated before we can
examine, in a modern context, the spatial practices it models. Its production follows a
rise, beginning in the 1790s, of embroidered sampler-work that added cartographic
representation to the more conventional alphabetic and didactic texts that had long
characterized schoolgirl embroidery. As briefly described above, Henshaw’s document
itself is a witness to the emergence of geographic education in the early American
republic and helps to illuminate the contributions of Emma Willard and her peers to a
complex, shared textual and visual endeavor of nation-building in the early years of the
nineteenth century. Martin Brückner’s treatment of the relation of geography and
geodesy to literacy and national identity in the American colonies and newly-united
States, and Susan Schulten’s placement of Willard at “the graphic foundations of
American history” offer a necessary background to an appreciation of Frances Henshaw’s
exercises.

It is, however, an 1840s critique by Marcius Willson of Willard’s textbook maps
as “insufficiently geographical” and “focused instead on human events and boundaries”
*(my emphasis)* that gets at the heart of her enterprise, Henshaw’s exercise-book, and the
example they offer to spatially-minded scholars of the interpretive humanities. Susan
Schulten cites this criticism as an attack by a rival author on Willard’s attempts to
“reconceptualize the past on a plane rather than in a narrative” (554). It is essential that we recognize the necessity, for such a reconceptualization, of emphasis on perspective and dimensionality in both spatial and temporal visualization. In moving from geospatial to spatialized temporal depictions – that is, from geography to history – Willard produced fold-out “chronographer” timelines that depicted events and cultural influences as a river widening toward the present-day reader at the bottom of the page, and structural “temples of time” that raised architectural columns and a pediment of historical personages above the chronographic streams that now presented themselves on and as a mosaic floor. In both cases, these visualizations emphasize the subjective positioning of the viewer or interpreter through means of exaggerated visual perspective.

Graphesis, perspective (both conceptual and pictorial), and a necessary, attendant privileging of individualized response are hallmarks of Willard’s later geographic and visualized historical pedagogy. A product of Willard’s curriculum and educational philosophy, Henshaw’s “Penmanship” document shows us one way these basic principles played out in nascent form, played out in text and watercolor on an American landscape in 1823.

In thinking and talking about Henshaw’s work over the course of the past year, I have been surprised at the response of many GIS professionals to my questions about what their tools might offer to scholars of cartography, art history, literary studies, and the history of the book. My inquiries are admittedly as cartographic and exploratory as they are geospatially-grounded or analytical. A common conclusion is that the research and interpretive questions Henshaw raises are “inappropriate to GIS,” because they lack sharp geographic focus on coordinates entirely within a real and not partly-imagined
world, and (in their exploratory dimension) they lack clarity about what might constitute an acceptable answer to be derived from GIS tools and methods. (In that sense, they open themselves, like Emma Willard’s “insufficiently geographical” focus on subjective imagery and lived experience, to Marcius Willson’s old critique.)

This orientation toward spatial tools and methods is succinctly stated on the very first page of Gregory and Ell’s *Historical GIS: Technologies, Methodologies, and Scholarship*: “the researcher using GIS should be asking, ‘What are the geographical aspects of my research question?’ rather than ‘What can I do with my dataset using this software?’” An appropriate GIS inquiry along these lines may be exemplified by Anne Knowles’s beautiful study, “What Could Lee See at Gettysburg?” which is able to get at qualitative and psychological questions of battlefield strategy through analytical work on an historical viewshed. Though highly effective in putting GIS tools to the purposes for which they were designed and assisting scholars in getting more rapidly to answerable questions, the “appropriateness” stricture voiced by Gregory and Ell is unnecessarily limiting with respect to experimental visualization practices in fields like literary and textual studies.

An examination of spatial decision-making and of the interplay among text, image, and geographical source material in Frances Henshaw’s “Book of Penmanship” suggests relations among her enterprise and the hermeneutic possibilities some scholars intuit for geospatial technology in the humanities. These relations hinge on openness of the academy to graphesis and iterative design as legitimate methodologies in digital scholarship. It is not my aim to argue this consideration here. It may be enough to show
how fascinating and delightful Henshaw’s enterprise is, and to move through the ways in which I began to analyze it.

I first encountered the “Book of Penmanship” in person, during a visit to David Rumsey’s library, when I idly inquired whether his collection included maps designed by or for children. I had in mind another subjective mapmaking exercise – a family letter, in the University of Virginia’s Special Collections library, in which Civil War cartographer Jedediah Hotchkiss (on the scene to make tactical maps for Stonewall Jackson’s troops) sketches the battle of Fredericksburg in a manner suited for the eyes of his young daughter, Nellie. In response, Mr. Rumsey shared the Henshaw book. It triggered many of the same associations for me as the Hotchkiss document, and I had the opportunity to pore over it for a short while. Nothing more was known of its history than was evident from the title page, and subsequent research revealed that mis-readings of Henshaw’s name (“Frances H.” for “Frances A.”) and of its inscribed date (“1828” for “1823”) had further obscured the book’s provenance.

I relate this sequence of events because – even though David Rumsey has been remarkably generous in making his private collection available online, and has invested personally in the development of technology to share and distribute maps (including creation of the Luna Browser and partnerships with Google Earth and Second Life) – I am confident that my interest and engagement with the book was heightened by an initial, physical encounter in a way not presently enabled through digital library interfaces. My critique is not a tired one about the “aura” of the book. I am too deeply appreciative of the individuals and institutions working to make cultural resources such as these freely
available over the Web. Instead, this encounter encouraged me to reflect on and talk with other scholars about the differing affordances of physical and virtual map libraries.

University of Virginia map historian Max Edelson characterizes his experience in physical Special Collections libraries as a series of tantalizing glimpses that thwart real comparative, analytical attention: “they bring one map out,” he said, “and take another away.”21 Tools that emerged from image-based humanities computing projects a decade ago – like the Blake Archive’s image viewer and Matthew Kirschenbaum’s “virtual lightbox” – offered more sophisticated comparison modes, but many of the digital library “lightbox” widgets currently en vogue take a step backward, in centering on only one image at a time – or offering a dazzling wall of images, interesting in that they provide a macro-view of an entire collection, but ultimately poorly suited for close comparison and scholarly attention. Rumsey’s interface, like that created by Nate Strout in consultation with Diana Sinton at the University of Redlands, offers the capacity for free positioning and synchronized scrolling of a set of maps aligned for simultaneous examination.22 Not supported are re-projection and geo-rectification (warping of one map to fit another) or the creation of freely-adjusted transparent layers for examination of maps in overlay on each other, or against a standardized geospatial or political base map. This kind of operation has long been available in proprietary, desktop GIS software. However, the hurdles of training and expense, as described above – along with a (self-perpetuating) dearth of stimulating examples of humanities interpretation done through high-powered, desktop geographic information systems – have resulted in poor penetration of these technologies in literary and cultural studies.23 For interpretive humanities scholars even to begin to engage analytically with GIS, it is critical that we bring to bear the same Web
browsing platforms through which (increasingly) they *discover* historical maps and geospatial information – and that we improve that process and move it from the realm of catalogue and text search to true spatial discovery. Research and development groups at the University of Virginia Library and the New York Public Library, alongside specialized scholarly projects like Pleiades, the Tibetan and Himalayan Library, Harvard AfricaMap, and Hypercities, are making advances in this arena.24

But most of these interfaces persist in treating maps as unary objects – with little attention to the special affordances of *books of maps*, or *maps in books* – and certainly little appreciation for the codex form and interplay of print or manuscript text and cartographic imagery, in the way that bibliographers and textual critics would like to examine them. For example, although the Henshaw book contains 57 leaves, only 39 were originally available to me through the Luna browser interface when I returned home. At my request, David Rumsey later kindly scanned more pages, to place online the ones that bore copied text not directly correlated to the 19 graphical maps in the volume. Grasping at ways to continue to consider the Henshaw book as book, even on the screen, I downloaded these open-access images and began putting them into a simple “page-turner” interface of the sort I had rarely found useful or interesting for literary documents. I was quickly stymied by a lack of verso scans. Quite understandably, given the gallery-like and single-image affordances of common Web interfaces for map collections, it had not been at all evident to Rumsey and his staff – nor had it even occurred to me, until I began to remediate the book as e-book – that the needs of a textual scholar would also be served by scans of blank pages.
My point is not that we require one interface that is all things to all people. It is rather that basic information-sharing protocols should exist that offer flexible ways to access and manipulate geospatial and cartographic information, including historical scanned maps (rectos and versos!). Most important for engagement by humanities scholars is that these protocols function well with information derived from the historical record – from the world of broadsides and atlases, manuscripts and books – and that they foster iterative thinking and work as part of the read/write Web. Scholars should educate themselves about the possibilities of Web service protocols like WMS (Web Mapping Service) and WFS (Web Feature Service), and of APIs (Application Programming Interfaces) that open up GIS data and cartographic imagery – alongside bibliographic and textual data and imagery – to the huge variety of analytical and access-oriented applications that researchers and software developers could collaboratively imagine. Then we must seek out the partnerships with libraries and digital humanities centers and institutes that can give our imaginings form.

**Graphesis and a geographical education.**

I turn now to an examination of Frances Henshaw’s enterprise, with an eye toward what it illuminates and obscures.

The first 35 pages of the “Book of Penmanship” consist of astronomy, geography, and American history texts, primarily copied from a pre-1814 Thomas and Andrews printing of Jedidiah Morse’s *Geography Made Easy.* These passages seem to have been selected, by Henshaw or her schoolmistress, for their instructional value as a basis for geographical understanding. The first of them, headed “Astronomical Geography,”
posits that “a complete knowledge of Geography cannot be obtained without some acquaintance with Astronomy.” Henshaw duly proceeds to abridge and copy passages on “the several Astronomical Systems,” including the Ptolemaic, Brahean, and Copernican – one per page, presented in ornamental styles [see Figure 3]. Tables of astronomical distances, symbols, and periods follow, as do sections on comets, the “doctrine of the sphere,” the equator, meridian, tropics and colures, poles and zones, and principles of latitude and longitude. In the style of Morse, and despite a geometric and spatially-descriptive bent to the content of the text, all of these sections are presented by Henshaw without meaningful illustration – beyond an ornamental flourish or two, and a page on the calculation of the “ecliptick” enlivened by a branch of painted roses. In other words, no diagrammatic impulse is evident in the opening pages of the book. Images are not offered here as aids to the understanding of quite complex geospatial and astronomical relations Henshaw expresses in prose.

Perhaps indicating the focus of the remainder of the volume and of her lessons in an Emma Willard-influenced school, the introductory section of Henshaw’s book concludes with her own abridgment of an historical text: Jedidiah Morse’s Columbian “Discovery of America.” Interestingly, in moving to history, Henshaw skips over some of Morse’s most direct and provocative instructions for the design and reading of maps. This is a section of Geography Made Easy (itself largely devoid of cartographic illustration) which proscribes – again in prose – a symbology for rivers, mountains, forests, harbors, and roads, and offers a fanciful justification for disparate conventions in cardinal directions, concluding: “in books of geography therefore by the right hand we must understand the east; in those of astronomy, the west; in such as relate to augury, the
south; and the writings of poets, the north” (28, “Of Maps and Their Use”). The cartographic exercises in Henshaw’s book will hover opportunistically between geography and augury, as the shape of states often dictates the positioning of illustrations and therefore the orientation of her maps. Texts, however, when Henshaw imagines them as operating within a framework of Cartesian coordinates, invariably mark north (with the geographers, rather than the poets) at the top of the page.

Figure 3: “The Brahean System.” Frances Henshaw, 1823. Library of David Rumsey. Note that Henshaw, either in the style of embroidered samplers or subtly honoring the emphasis on the local in Willard’s geographic pedagogy, balances her design with a positional heading: “Middlebury, Vermont.” List No. 2501X. See larger figure.

With no particular introduction or indication of a shift after the historical copy-exercise, Henshaw’s penmanship book then opens up into a series of 19 hand-colored maps and accompanying texts, at least ten of which have been designed to sit in a particular spatial relationship to the American states they describe. The maps are organized on a principle of adjacency, and, in order, comprise: Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Maryland, Delaware, Virginia (including what is now West Virginia),
North Carolina, South Carolina, Georgia (including the western panhandle of the Florida Territory), Tennessee, Kentucky, Ohio, and Indiana. By the time of Henshaw’s writing, in 1823, 24 states had joined the Union. She does not draw Louisiana, Mississippi, Illinois, Alabama, Missouri, or any of the territories – but does, however, implicitly represent Maine as a state rather than as a district of Massachusetts (which it remained until the Missouri Compromise in 1820). Henshaw’s choices seem to reflect the conceptual and actual limits of American statehood in the atlases available to her at home and at school – identified in Rumsey’s catalog as the 1805 edition of Carey’s *American Pocket Atlas* and an 1812 edition of Arrowsmith and Lewis. The Rumsey metadata also concludes that Henshaw’s Indiana was drawn from an “unknown source.” In addition, the vast Louisiana Purchase, from which Louisiana was codified into statehood in 1812 and which was indeed represented in the Arrowsmith and Lewis volume, is omitted entirely.

If – as it seems – Henshaw is selecting, consciously omitting, and recombining maps for representation in her book, can any principles on which she bases that activity be discerned from an examination of the documentary record? A few, simple searches in full-text archives – followed by rudimentary collation of a sampling of passages using Juxta – led me to a wealth of information and an ability to draw reasonable conclusions about the sources for Henshaw’s prose. But a similar research approach to the geographical imagery in the book is almost unimaginable, because we lack sufficiently-large, open corpora of scanned historical maps and widely-adopted systems for identifying, geo-rectifying, comparing, and collating them. What would it take, both technically and socially, for libraries, archives, and other data providers to enable fluid
discovery of maps and lay the groundwork for collation of them, as they have done for texts?

The audience of map historians may be forever too small to support such a vision at Google-scale. However, Henshaw’s manuscript – because it combines cartographic representation with other graphical flourishes and textual ornaments – illustrates powerfully that many of the same protocols and software tools that would promote sophisticated research on historical maps would also be of use to scholars of book history and graphic design. Clearly, textual ornaments and graphical features of both manuscript and print texts lack the lingua franca of real-world geospatial referents that make maps mutually intelligible, and their embedded coordinates and systems of scale are not procedural (or process-able) as are maps warped against particular geographical projections. But what might comparative searches across vast textual and graphical corpora, aided by image-recognition software operating at a variety of scales, teach us about the history of such documentary markings, or about the informational and artistic structures in which they are positioned? What might a process like geo-rectification reveal when performed across a set of similar textual features over time and in a variety of media – features like, say, the flourishes in Figure 3, above? And how might the limits of this activity – imposed by the same lack of common, standardized, or “actual” spatial datapoints that sometimes provoke experienced GIS users to identify humanities queries as inappropriate to GIS – illustrate the limits of the tools and systems we have inherited from the sciences? How might they illuminate the impulse of humanities scholars to “rectify” historical and imaginative maps against each other, not only against a modern, accepted street grid or set of GPS-derived datapoints? If our current suite of GIS tools
aren’t the ‘droids we’re looking for, where are they? – or what should we understand and carry over from geographic information science in order to build them within a humanities framework?

Figures 1 and 2 above – the Connecticut pages – are typical of Frances Henshaw’s marriage of text design with geospatial visualizations of the American states. However, each map/text pair in her book is arranged differently. Henshaw also makes unique textual, geographic, color, and design choices throughout the book, including choices about the shape and nature of the textual passages that accompany the maps. We will examine only two further pairs here, by way of briefly demonstrating the subjective character of her work and the degree to which she both performs within and presses against cartographic norms.

The first pair presents the state of Virginia in its antebellum contours. About the graphical map (Figure 4) I will note only that the political boundary of the northern panhandle is treated in a noticeably lighter wash of color than is the natural, geographical boundary of the Monongahela River – itself by no means as wide as depicted in Henshaw’s drawing. Was a merchant’s daughter simply sensitive to waterways? A close examination of her source maps and of Henshaw’s treatment of natural and political boundaries in other drawings would be necessary in order to draw conclusions about her choices here – and most crucially to avoid reading too much into a set of schoolgirl drawings. It is, however, tempting to think that we may observe an unresolved tension between two conceptual layers or dimensions to the map in this region, as represented by Henshaw on a single plane. (Argumentation and accurate or inaccurate representation through the symbologies and aesthetics of maps require a brand of cartographic decision-
making just as necessary in the framework of our current GIS toolset\textsuperscript{30} – but it is interesting to contemplate the degree to which modern tools have conditioned us to disambiguate spatial data into “layers.” Textual scholars will recognize the tension between informational and poetic or aesthetic structures in maps – and the degree to which computer representation does violence to ambiguity – as akin to the longstanding issue of “overlapping hierarchies” in TEI markup.\textsuperscript{31}

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure4.png}
\caption{The state of Virginia by Frances Henshaw, ca 1823. Library of David Rumsey. List No. 2501.012. \textcolor{blue}{See larger figure}.}
\end{figure}

We’ll shift now to the textual representation of the state of Virginia, which is useful to us in thinking through the rules Henshaw sets for herself in her artistic production, and the occasions on which she permits them to be broken. At least ten of Henshaw’s 19 state-by-state textual passages are laid out, as described above, within a Cartesian grid in which the north/south axis is drawn between the top and bottom margins of the page. Implied cardinal directions for Henshaw’s \textit{texts} (with the gutter of the book invariably to the west) hold even in cases, as with the Virginia, where the shape of the corresponding state \textit{map} prompts Henshaw to maximize drawing space by placing it lengthwise on the page – and therefore orienting it on a different north-south axis.
Henshaw suggests directional or map-like qualities to her textual passages through insertion of boundary notations, in which she locates and labels – as in the Connecticut map, Figure 2 – the neighbor-states and bodies of water bordering her state of interest. Such notations (“Bounded North by Massachussetts,” “south by the Atlantick,” etc.) are positioned appropriately in the margins, given the convention that figures northerly orientation toward the top of the page. A notable exception to this convention exists in Henshaw’s textual representation of the state of Virginia (Figure 5).

**Figure 5.** Text accompanying the Virginia map, Frances Henshaw, ca. 1823. Library of David Rumsey. List No. 2501N. [See larger figure](#).

Here, she offers a fairly un-poetic and disjointed selection of passages from *Morse’s Geography Made Easy* – and caps her penmanship exercise with an elaborate ornamental cherub holding a sweeping ribbon or banner emblazoned with the state name. Because the cherub occupies the “northern” field of the page, Henshaw is unable to position her “North by MARYLAND” boundary label appropriately. The aesthetic force of the textual ornament, in other words, has trumped directionality. Maryland is now
displaced to the west – where it crowds Kentucky toward the south, into a position where one might now seek, and fail to find, Tennessee.

A second set of pages, treating the state of Ohio, demonstrates similar interpretive and aesthetic decision-making in the construction of text/map pairs. Here, Henshaw’s text (Figure 6) lacks labeled directionality but may have been designed to echo the rectilinear north and rough diamond-like shape of the southern portions of Ohio, as she depicts it cartographically on the previous page. At least two editions of *Geography Made Easy* and possibly three or more source documents seem to have gone into Henshaw’s selection and editing process for this very short passage. Her reference to Indian mounds and earthworks (the “number of old forts in Kentucky county” which are “the admiration of the curious and a matter of Speculation”) can be traced to an 1802 edition of *Geography Made Easy* which pre-dates Ohio’s statehood by a year – a book that terms this region of interest the “territory NW of the Ohio [River].” Henshaw’s copy text for her final statement, that the Ohio River “nearly half surrounds the state,” only appears in later, post-statehood editions of Morse’s textbook. I am unable to locate a source for her seemingly erroneous statement that Columbia is the “seat of government.”
It is, of course, possible that continued digitization and open-access publication of searchable geodetic documents from the early 19th century (a period of rampant copying and borrowing) will reveal other, perhaps amalgamated, sources – but it seems that Henshaw has taken a deliberately pastiche approach to assembling texts, even in this very brief passage. I am attracted to an interpretation of her textual methods as patchwork, because I feel that it suggests parallels to the graphic design of the page. Henshaw’s choppy Ohio passages are most legible to readers who understand the construction formula of interlocking light and dark angles in a traditional “log cabin” quilt square pattern.32
The map version of Henshaw’s “Ohio” (Figure 7) is equally interesting as a study in interpretive selectivity. David Rumsey identifies her source for this drawing as differing from that of all but one other map in the booklet, concluding that Henshaw has used an 1812 edition of Arrowsmith and Louis (Figure 8) rather than her wonted 1805 Cary’s *American Pocket Atlas*. 
I am skeptical about this attribution, or would at least like to suggest that Henshaw employed multiple sources for her graphical map in the same way she did for her textual representation of Ohio. This is because I note significant differences in the positioning of rivers, boundary-lines, and settlements between Henshaw’s map and her putative 1812 source. Some of these differences (like the strong east/west line of the Indian Boundary, which appears in Arrowsmith and Louis with a distinct northwesterly pitch) may be accounted for by free-hand drawing and creative interpretation, but spelling changes (like “Cincinata” for “Cincinnatti”) and the complete absence of a referent for Henshaw’s “Ft Meigs #” notation indicates that further investigation is warranted. A first step would involve collation (with and without georectification) of
possible source maps, and as careful an examination of historical place names as was necessary to draw conclusions about her sources for the Ohio text page.

But this map also suggests a need for further research in Emma Willard-inspired geospatial pedagogy of the 1820s. Is it possible that Henshaw was analyzing an unvisualized geodetic text, like that of Morse, and attempting to position forts and internal boundary-lines based on descriptive prose? The “Cincinata/Cincinnatti” shift, and a parallel substitution, on Henshaw’s map, of “Nassauville” for “Masseyville,” also suggests an aural component to her exercise. Could, for instance, a schoolmistress have been reading aloud and directing her students to make imaginative placements on the sketched maps before them? Whatever Henshaw’s cartographic practice may have been, it is clear that it is predicated on selection and interpretation, rather than completeness and verisimilitude. Are these emotional landscapes? Despite the overwhelming density of geological features, waterways, settlements, marked historical events, and placenames which – in her possible sources – fill the “Indian Lands” of northern Ohio, Henshaw’s map contains a solitary, poignant notation: “Major Truman killed.”

Analysis of the production process for cartographic artifacts like this is perhaps best done through experimental performance of similar processes – in the way that students of bibliography may fold sheets into gatherings better to understand the construction of a book. Our current digital toolsets have been designed neither for creating documents like Henshaw’s nor for analyzing them – but that is not to say that they are completely infelicitous in either of those contexts. We might take the constraints of existing GIS software – in handling ambiguity, imaginative and variable spatial metrics, sparse and imprecise data, interpretive selectivity, and the subjective and
aesthetic dimensions of cultural production – as constructive, not merely constrictive, in relation to spatial inquiry and expression in the digital humanities. We see all of these problems in even a cursory glance at the Henshaw document. And Henshaw’s work also offers us an opportunity to examine artistic constraint – the rules she inherits or imposes for her textual and visual exercise, thrown into relief (as with the warping cherub of Virginia) when she bends them.

The intellectual framework through which humanities scholars approach geographic information systems will undoubtedly owe as clear a debt to the arts as to the scientific disciplines from which GIS tools and methods are derived. Therefore simply operating, in a reflective way, within the mechanical frame presented by these tools may be as useful to us in analyzing documents like Henshaw’s as would be the creation, from whole cloth, of new spatial tools and methods expressly designed for humanities inquiry. We would do well to look closely at liberating and ludic aspects of constraints-based methodology, recognized by wranglers of poetic form throughout history, and self-consciously addressed through aleatory and procedural experimentation in 20\textsuperscript{th}-century art and poetry. This is well-trodden ground, for which our best pathfinders are not critics, but performers and practitioners.\textsuperscript{33} English artist Bridget Riley writes lucidly, for instance, about the degree to which “prohibitions and denials are always a challenge and a powerful spur to inquiry.”\textsuperscript{34}

\textit{New landscapes.}

The principles on which I posit Henshaw’s book is constructed – Emma Willard’s pedagogical emphasis on graphesis and privileging of the subjective, interpretive
response – are the same principles on which Johanna Drucker and I based our “Temporal Modelling” prototyping exercise, ca. 2001. This was a project for the iterative sketching of subjective, humanistic timelines, which Drucker cites as a digital humanities success story in “demonstrating that visualization could serve as a method of creating interpretive analysis, not merely of displaying it.”35 While Temporal Modelling and its sister project, the Ivanhoe Game, were not conceived in a geospatial framework, they may serve to illuminate a set of questions motivating humanities scholars who experiment in the interpretive margins of computer-assisted research on space and place. These are questions about the aptness of various methodological approaches to subjectivity, ambiguity, aesthetic provocation, and knowing through sketching in visual environments.

My design for a Temporal Modelling prototype stemmed from our research into both traditional and highly idiosyncratic representations of time and temporal relations, and from conversations with scholars from a variety of humanities disciplines – not only about how they might wish to visualize events, points, and intervals in their areas of study, but also how acts of visualization could function as part of their interpretive processes, and what (both conceptually and practically) an experiment in graphesis might return to their work. We ultimately produced, in collaboration with Jim Allman and Petra Michel, the Temporal Modelling “PlaySpace,” a tool built around an empty stage, extensible both as a plane and in the free addition of transparent layers, on which users could spawn, populate, label, color-code, adjust, connect, or delete timelines that made few assumptions about regular metrics, directionality, causality, and influence.36

The tool was designed to enable an iterative and (for many of its users) new spatial or visual engagement with primarily narrative and documentary objects of study.
Temporal Modelling was to be an experiment in visualization as a data modelling method in the digital humanities. Bridget Riley reflects on the brand of graphesis we were trying to promote, in which “drawing is an inquiry, a way of finding out,” played out in the marking of an indeterminate field:

It is as though there is an eye at the end of my pencil, which tries, independently of my personal general-purpose eye, to penetrate a kind of obscuring veil or thickness. To break down this thickness, this deadening opacity, to elicit some particle of clarity or insight, is what I want to do… It is this effort ‘to clarify’ that makes drawing particularly useful and it is in this way that I assimilate experience and find new ground.

You cannot deal with thought directly outside practice as a painter: ‘doing’ is essential in order to find out what form your thought takes… It is only through the experience of working that answers may be discovered within the inner logic of an invented reality such as the art of painting.\textsuperscript{37}

We conceived Temporal Modelling as an intervention in the field of humanities computing, which was, at that time and from our vantage point at the University of Virginia, preoccupied with purely textual and informational approaches to literary scholarship. In common digital practice, the visual – if it were fore-grounded at all – emerged passively and algorithmically as a product of structures developed in the abstract and expressed in words. We wished to turn this practice on its head. Visualization would not be a final, algorithmic output of ontology design and database creation or text markup, but rather an integral part of the very process of data modeling. The first phase of our project was completed in 2002.\textsuperscript{38}
We were led to a second (uncompleted) phase of Temporal Modelling activity by a conviction that, in Riley’s terms, the “inner logic of an invented reality” – which scholars might wish to express by using our tool for literary interpretation and the study of subjectivity in the historical record – could be extracted in some useful and even constructivist form from the data underlying a sketched timeline. Thanks to the contributions of software developer Jim Allman, every timeline drawn in the PlaySpace and, just as crucially, every user-declared “temporal model” – consisting of one or more timelines resting individually or in clusters on named, transparent layers – could be expressed as well-formed XML and exported or shared by its creator.

It was our intention (although the project ended before this phase could be fully developed and tested) that users might analyze and transform these XML representations into formal, temporal markup schemata through which their texts of interest could be newly encoded. Documents marked up to the specifications of – for instance – a user-
customized Temporal Modelling extension to TEI (Text Encoding Initiative) standards would be at once reasonably interoperable and able to be represented and processed experimentally according to an “inner logic” derived from their editor’s defamiliarizing visual and (utterly familiar) hermeneutic engagement in the PlaySpace. I further projected creation of a DisplaySpace that might complete the hermeneutic circle by allowing import and presentation of Temporal Modelling-style visualizations of documents so encoded. But visualization of these marked-up documents as timelines in the DisplaySpace was not imagined to be the final “product” of a Temporal Modelling session. Instead, we hoped that users would reflect on the aptness of the data model they had created and, perhaps provoked by our mechanical, visual extrapolation of it across the marked dataset, return to a PlaySpace mode for further graphical (and therefore structural) refinement. The notion of “aesthetic provocation” such a system might engender – the system’s provocation to its user to tinker further, re-visualize and reinterpret – returned to our SpecLab research group later as a defining interface design principle for the Ivanhoe Game.39

The Ivanhoe Game – an environment for ludic, persona-centered pedagogy and experimentation in literary studies and other textually-oriented disciplines – is another artifact of conversations that happened in our SpecLab research group at the University of Virginia between the years 1999 and 2004. As it has been thoroughly treated elsewhere, I will limit my discussion here to the later phases of interface design for the project, when, in collaboration with Nick Laiacona and other programmers at the NINES project, Jerome McGann and I worked through problems of spatial arrangement and aesthetic provocation.40 Because gameplay in Ivanhoe was essentially roleplay, we
searched for ways to foreground subjectivity and perspective, while still providing a common view of a “discourse field” that could be collaboratively constructed as players introduced new documents and altered the texts already in play. We created an “attentional” Ivanhoe interface – a primary visualization of the game’s discourse field, in which players were pictured as migrating marbles in a circular area around which documents were represented as arcs of varying length. The positions of player icons and the sizes and locations of document arcs were continuously evaluated and re-generated as a function of gameplay – specifically, as visualizations of the quality and degree of attention players were paying to certain texts in the discourse field. Players who collaborated in editing certain texts (and, perhaps, in ignoring others) would be seen to aggregate in proximity to their objects of interest. Texts that received a greater degree of attention during gameplay grew to occupy a larger ratio of our 360-degree visualization. And color-coded rays, representing the different sorts of emendation possible in Ivanhoe, extended from player icons to the texts in the ring, serving to highlight the actions of gameplay, their sources in individual player interventions, and their overall impact on the field of discourse. A timeline and set of animation controls allowed players to reel back collaborative changes, or play them through as a fast-paced visualization from start to finish.
Design of the Ivanhoe Game predated widespread use of code versioning software in the digital humanities, and certainly came before the emergence of spatial visualizations of change to a code-base over time, as seen in Michael Ogawa’s code_swarm software. As students of bibliography, we therefore grappled with new ways to allow players both to generate and to inhabit a landscape of textual variation that is more typically pictured in traditional stemmatics – graphs depicting the genealogy of a particular documentary instantiation of a work of literature by demonstrating its descent from other versions. It was our particular concern not only to define the discourse field spatially as regions of text-oriented activity, but also to provide a visualization that might serve as an aesthetic provocation to players. Where the Ivanhoe Game pictures you, might vex you. Perhaps you have a different mental model for the spatial relations among players and texts in the game you believe you are playing – or perhaps the crystallization of your actions into an absolute positional grid (recalculated though it may be on a move-by-move basis) will provoke you to resist, and play the game differently, in order to generate a different visualization. To what degree was Frances Henshaw playing
an Ivanhoe Game with her source texts and maps? And how would we begin to find out, except by playing along?

Both of the tools I have described are oblique to Henshaw’s exercise, but suggest an orientation toward image-based procedural activity in the interpretive digital humanities that we could extend to the realm of geospatial tools and methods. Temporal Modelling speaks to knowledge creation though visualization and especially through iterative refinement of sketches. Ivanhoe’s spaces are not geospatial in terms of geographic referents, but literary scholars may ultimately be as interested in dynamic “discourse fields” that both construct internal spatial relations and reflect on their interpenetration with alternate coordinate systems – imaginative and real. We are, at the same time, concerned with the material forms our texts take, and the ways in which these can be “mapped,” both internally, as designed objects, and – in their production and reception histories – in relation to each other. What do tools designed for real-world geospatial representation and analysis have to say to us? Are the cartographic procedures of our own day instructive?

And what’s next? We should push the evolution, not just of tools with which we might approach space and place, but also of our practices and attitudes toward methodological (as opposed to strictly theoretical) work. We must also share better, and not just within narrow disciplinary silos. This will require adequate resourcing of map and data repositories built with the guidance of humanities scholars, examination of the sustainability of humanities publications and the geospatial datasets they build on, and new engagement of professional societies and digital and traditional humanities centers with methodological training. A growing emphasis on the public humanities –
especially as locative technologies become more ubiquitous and empowering of larger communities – can help fuel this activity, but ultimately novel modes and practices are only taken up in scholarly communication insofar as they offer disruptive models for producing insight, and provocations that change the conversation. To that extent – and even as we work to normalize and better support our publishing procedures for the spatial humanities – the creative application of geospatial tools and approaches to problems in our disciplines may remain an area well-suited to evocative one-off projects. (The one-off has in fact has characterized our early engagement with GIS).

An especial challenge for GIS may then be – at this particular juncture in the digital evolution of humanities scholarship – to promote excellent work that is at once idiosyncratic (befitting our varied objects of interest and disparate research agendas) and yet mutually intelligible, building on common, open datasets, standards, delivery protocols and tools. Scholarly prose has proven a remarkably flexible, fungible, and sustainable medium for our centuries-long conversation about human culture. We are now, however, presented with novel opportunities for the study of spatial relations and place-based humanities – most of which involve appropriation of methods and tools designed for other purposes. Where can we most usefully intervene – both in the practicalities of tool and project development, and in the spirit and methodological course of our disciplines – to make a real contribution to humanities interpretation through the use of spatial and geospatial technology? To whom will we look for inventions of the map?

Bethany Nowviskie
University of Virginia Library
Notes

1 Library of David Rumsey, Pub List No. 2501.000; available: http://bit.ly/dmbgHL


5 I am presently working with Matthew Knutzen, Assistant Chief of the Maps Division at the New York Public Library, to determine whether further examples of such exercise books may have survived.

6 Brückner, pp. 114-115, and see his Figure 31 for an example.


“Vernacular” was a term adopted by participants in the 7th annual Scholarly Communication Institute to address commercial, cloud-based, and open-source “neo-geo” tools and interfaces based on mobile technologies, GPS, virtual globes, and Web-based slippy maps. See the final report and executive summary of the Institute for further discussion: http://www.uvasci.org/archive/spatial-technologies-and-methodologies-2009/summary/


See also Martyn Jessop on “Digital Visualization as a Scholarly Activity” in Literary and Linguistic Computing, September 2008; 23: 281 - 293.

Brueckner, 137-9; and Judith Tyner, “The World in Silk: Embroidered Globes of Westtown School,” The Map Collector, #74, Spring 1996, pp. 11-14. (Thanks to Julie Sweetkind-Singer for this reference.)

See Schulten, 556-62 and Figures 3-7. A further example of Willard’s visualization is reproduced in Rosenberg and Grafton, Cartographies of Time: A History of the Timeline. Princeton Architectural Press, 2010. (Figure 33, page 201).

I have made myself tiresome by publicly noodling over the suitability of spatial tools and methods to research on documents like this at: the “Digital Dialogues” lecture series at the Maryland Institute for Technology in the Humanities; Digital Humanities ’09 in College Park; the 7th annual Scholarly Communication Institute in Charlottesville, Virginia; and will continue to do so at the upcoming Digital Humanities ’10 conference in London.


This work is published, along with other excellent case studies, in Anne Knowles’s edited volume, Placing History: How Maps, Spatial Data, and GIS Are Changing Historical Scholarship. ESRI Press, 2008.

I am grateful to David Rumsey for introducing me to the physical document in his personal library, and for having additional pages scanned and mounted online at my request. With this essay, I finally discharge my duty to “do something with them” in return!

Jedediah Hotchkiss to Nellie Hotchkiss, 17 December 1862, Hotchkiss Family Papers, Albert and Shirley Small Special Collections Library, University of Virginia. This letter, along with small subset of Hotchkiss maps and correspondence, forms a test case for the Neatline project on which I am collaborating with Adam Soroka and other colleagues at the Scholars’ Lab.
Records – including obscure, local historical society tracts – digitized through Google Books and the Internet Archive quickly confirmed these readings and led to a wealth of biographical information including, among the collections of the Illinois State Historical Library, a figurine of Henshaw as one of Illinois’ prominent women, prepared by sculptor Mina Schmidt for the World’s Columbian Exposition in 1929.

Private conversation, October 2009. In collaboration with the Scholars’ Lab and IATH at the University of Virginia, Edelson is undertaking an NEH- and ACLS-supported project to address this issue: the Cartography of American Colonization Database.


Anne Knowles’ edited volumes are a notable exception, and we can look forward to a forthcoming Indiana University Press collection on The Spatial Humanities (edited by David Bodenhammer, John Corrigan, and Trevor Harris). The National Endowment for the Humanities has also recently funded an historical GIS clearinghouse to be developed by the Association of American Geographers as well as a spatial humanities community website to be developed by UVA’s Scholars’ Lab (including a project showcase, Q&A forum, and “Step by Step” how-tos.)


26 Henshaw’s text for this section of the book seems to be a match to an 1802 edition of Morse’s Geography Made Easy: Being an Abridgement of the American Universal Geography…, printed and published by Thomas and Andrews in Boston. This is the 8th, author-corrected edition. Morse’s book went through 20 editions between 1784 and 1819, and Henshaw’s source document certainly pre-dates the 12th edition, which saw substantive revision.

27 See records for List No. 2501… at http://davidrumsey.com/ A misconstrued date for the Henshaw book (1828 for 1823) explains, in part, the puzzlement expressed in Rumsey’s metadata about her use of such noticeably out-of-date sources.

28 See note 26 on the textual history of Henshaw’s copy-exercises. Google Book scans of public domain texts were highly effective for my research despite recognized limitations of poor OCR and a limited API. The Juxta textual collation system is available at http://juxtasoftware.org/ – and see note 42.

29 Unlike Juxta, which operates on transcribed text, the Sapheos project takes page images as its basic unit for collation. This work has been funded by a 2009 NEH start-up grant to project director Randall Cream: http://sapheos.org/


32 The earliest absolutely-dated American log cabin quilt stems from the pattern’s heyday, just after the Civil War. However, textual evidence from 19th-century America and much earlier, dated quilts from Europe indicate that the pattern would have been part of the domestic vocabulary of Henshaw’s day. Textile historian Barbara Brackman discusses the history of the log cabin quilt pattern and, interestingly, challenges a popular assumption that these quilts had map-like qualities (articulated, for example, by Jacqueline Tobin and Raymond Dobard in Hidden in Plain View: the secret story of quilts and the Underground Railroad). See Brackman’s Quilts from the Civil War: nine projects, historic notes, diary entries, C&T Publishing, 2009.

33 This is a subject I took up in an unpublished 2004 dissertation from the University of Virginia: Speculative Computing: Instruments for Interpretive Scholarship, a key chapter of which (“Ludic Algorithms,” with a central case study on Ramon Llull, who figures the user of his mechanical, constraints-based systems for generating hermeneutic prompts as an artista) is being revised for publication in Pastplay, a volume of essays stemming
from a 2010 symposium on “Playful Technology in History:”

http://playingwithhistory.com/.


36 The original Temporal Modelling project was the work of a four-person team: Johanna Drucker was PI of the Intel Corporation grant that funded our work. I served as design architect and project manager, Jim Allman led our programming and data management efforts, and CalArts student Petra Michel contributed to the design of timeline elements to express concepts like mood, influence, and subjective point-of-view.


38 A record of the original Temporal Modelling Project may be found at http://www.iath.virginia.edu/time/. A newly-constituted Temporal Modelling Research group was funded by SSHRC under the direction of Stan Ruecker in early 2010. Partners in this effort include Ruecker, Geoffrey Rockwell, Susan Brown, Megan Meredith-Lobay, Johanna Drucker, and Bethany Nowviskie. The team will examine a set of case studies in “timelines for conflicting witnesses,” supplied by Rockwell, Meredith-Lobay, and Nowviskie – a first presentation of which was made at the 2010 conference of the Canadian Historical Society in Montreal.
Several members of the SpecLab group treated the Ivanhoe Game in a special issue of Text Technology (12:2, 2003): available at

http://texttechnology.mcmaster.ca/archives.html This issue includes my own essay, “Subjectivity in the Ivanhoe Game: Visual and Computational Strategies.”

The game itself, in its latest instantiation, can be found at http://ivanhoegame.org/

Working documents, designs, and prototypes have long been preserved at

http://speculativecomputing.org/ but at the time of this writing are unavailable.

http://vis.cs.ucdavis.edu/~ogawa/codeswarm/

Our own response to the opportunities of visualization for more traditional forms of textual criticism later came in the design of Juxta, a piece of collation software that displays textual variation across a corpus of texts as a “heatmap” of degrees of difference:

http://juxtasoftware.org/

These are issues being taken up by the Scholars’ Lab at the University of Virginia Library, in the context of its Institute for Enabling Geospatial Scholarship:

http://lib.virginia.edu/scholarslab/geospatial/ Look also, by late 2010, for a release of an NEH-funded Spatial Humanities informational portal, showcase, and community site, at

http://spatial.scholarslab.org/

I offer sincere thanks to the steering committee of the Scholarly Communication Institute for discussion of these issues.
Abstract

As digital humanists have adopted visualization tools in their work, they have borrowed methods developed for the graphical display of information in the natural and social sciences. These tools carry with them assumptions of knowledge as observer-independent and certain, rather than observer co-dependent and interpretative. This paper argues that we need a humanities approach to the graphical expression of interpretation. To begin, the concept of data as a given has to be rethought through a humanistic lens and characterized as capta, taken and constructed. Next, the forms for graphical expression of capta need to be more nuanced to show ambiguity and complexity. Finally, the use of a humanistic approach, rooted in a co-dependent relation between observer and experience, needs to be expressed according to graphics built from interpretative models. In summary: all data have to be understood as capta and the conventions created to express observer-independent models of knowledge need to be radically reworked to express humanistic interpretation.

Introduction

As digital visualization tools have become more ubiquitous, humanists have adopted many applications such as GIS mapping, graphs, and charts for statistical display that were developed in other disciplines. But, I will argue, such graphical tools are a kind of intellectual Trojan horse, a vehicle through which assumptions about what constitutes information swarm with potent force. These assumptions are cloaked in a rhetoric taken wholesale from the techniques of the empirical sciences that conceals their epistemological biases under a guise of familiarity. So naturalized are the Google maps and bar charts generated from spreadsheets that they pass as unquestioned representations of “what is”. This is the hallmark of realist models of knowledge and needs to be subjected to a radical critique to return the humanistic tenets of constructed-ness and interpretation to the fore. Realist approaches depend above all upon an idea that phenomena are observer-independent and can be characterized as data. Data pass themselves off as mere descriptions of a priori conditions. Rendering observation (the act of creating a statistical, empirical, or subjective account or image) as if it were the same as the phenomena observed collapses the critical distance between the phenomenal world and its interpretation, undoing the basis of interpretation on which humanistic knowledge production is based. We know this. But we seem ready and eager to suspend critical judgment in a rush to visualization. At the very least, humanists beginning to play at the intersection of statistics and graphics ought to take a detour through the substantial discussions of the sociology of knowledge and its developed critique of realist models of data gathering[1] At best, we need to take on the challenge of developing graphical expressions rooted in and appropriate to interpretative activity.

Because realist approaches to visualization assume transparency and equivalence, as if the phenomenal world were self-evident and the apprehension of it a mere mechanical task, they are fundamentally at odds with approaches to humanities scholarship premised on constructivist principles. I would argue that even for realist models, those that presume an observer-independent reality available to description, the methods of presenting ambiguity and uncertainty in more nuanced terms would be useful. Some significant progress is being made in visualizing uncertainty in data models for GIS, decision-making, archaeological research and other domains.[2] But
an important distinction needs to be clear from the outset: the task of representing ambiguity and uncertainty has to be distinguished from a second task — that of using interpretations that arise in observer-codependence, characterized by ambiguity and uncertainty, as the basis on which a representation is constructed. This is the difference between putting many kinds of points on a map to show degrees of certainty by shades of color, degrees of crispness, transparency etc., and creating a map whose basic coordinate grid is constructed as an effect of these ambiguities. In the first instance, we have a standard map with a nuanced symbol set. In the second, we create a non-standard map that expresses the constructed-ness of space. Both rely on rethinking our approach to visualization and the assumptions that underpin it.

To overturn the assumptions that structure conventions acquired from other domains requires that we re-examine the intellectual foundations of digital humanities, putting techniques of graphical display on a foundation that is humanistic at its base. This requires first and foremost that we reconceive all data as capta. Differences in the etymological roots of the terms data and capta make the distinction between constructivist and realist approaches clear. Capta is "taken" actively while data is assumed to be a "given" able to be recorded and observed. From this distinction, a world of differences arises. Humanistic inquiry acknowledges the situated, partial, and constitutive character of knowledge production, the recognition that knowledge is constructed, taken, not simply given as a natural representation of pre-existing fact.

My distinction between data and capta is not a covert suggestion that the humanities and sciences are locked into intellectual opposition, or that only the humanists have the insight that intellectual disciplines create the objects of their inquiry. Any self-conscious historian of science or clinical researcher in the natural or social sciences insists the same is true for their work. Statisticians are extremely savvy about their artifices. Social scientists may divide between realist and constructivist foundations for their research, but none are naïve when it comes to the rhetorical character of statistics. The history of knowledge is the history of forms of expression of knowledge, and those forms change. What can be said, expressed, represented in any era is distinct from that of any other, with all the attendant caveats and reservations that attend to the study of the sequence of human intellectual events, keeping us from any assertion of progress while noting the facts of change and transformation. The historical, critical study of science is as full of discussions of this material as the humanities.

Thus the representation of knowledge is as crucial to its cultural force as any other facet of its production. The graphical forms of display that have come to the fore in digital humanities in the last decade are borrowed from a mechanistic approach to realism, and the common conception of data in those forms needs to be completely rethought for humanistic work. To reiterate what I said above, the sheer power of the graphical display of "information visualization" (and its novelty within a humanities community newly enthralled with the toys of data mining and display) seems to have produced a momentary blindness among practitioners who would never tolerate such literal assumptions in textual work.

The polemic I set forth here outlines several basic principles on which to proceed differently by suggesting that what is needed is not a set of applications to display humanities "data" but a new approach that uses humanities principles to constitute capta and its display. At stake, as I have said before and in many contexts, is the authority of humanistic knowledge in a culture increasingly beset by quantitative approaches that operate on claims of certainty. Bureaucracies process human activity through statistical means and when the methods grounded in empirical sciences are put at the service of the social sciences or humanities in a crudely reductive manner, basic principles of critical thought are violated, or at the very least, put too far to the side. To intervene in this ideological system, humanists, and the values they embrace and enact, must counter with conceptual tools that demonstrate humanities principles in their operation, execution, and display. The digital humanities can no longer afford to take its tools and methods from disciplines whose fundamental epistemological assumptions are at odds with humanistic method.

This paper is a call to imaginative action and intellectual engagement with the challenge of rethinking digital tools for visualization on basic principles of the humanities. I take these principles to be, first, that the humanities are committed to the concept of knowledge as interpretation, and, second, that the apprehension of the phenomena of
the physical, social, cultural world is through constructed and constitutive acts, not mechanistic or naturalistic realist representations of pre-existing or self-evident information. Nothing in intellectual life is self-evident or self-identical, nothing in cultural life is mere fact, and nothing in the phenomenal world gives rise to a record or representation except through constructed expressions. The rhetorical force of graphical display is too important a field for its design to be adopted without critical scrutiny and the full force of theoretical insight. Let me suggest what that means for the visualization of informational, temporal, and spatial phenomena.

**Data as capta: from information visualization to graphical expressions of interpretation**

If I set up a bar chart or graph, my first act is to draw a set of one or more axes and divide them into units. The conventional forms of the graphical display of information, "data", make use of a formal, unambiguous system of standard metrics. Charts use simple (if often misleading) geometric forms that lend themselves to legible comparison of values, proportions, or the exhibition of state changes across time. Lines, bars, columns, and pie charts are the common and familiar forms. They render quantitive relations with a transparency that seems natural, so that, for instance, if we look at the changes in population across a series of years for a particular location, we can simply accept that from one year to the next rises or drops occurred in the numbers of persons alive in X city in X country at X time. A pie chart showing percentage of resource allocation from national budgets seems completely transparent, self-evident even. A bar chart could compare daylight hours at different longitudes, or the average size of men and women in different countries, or the number of hospital beds in different institutions in a single geographical location and not raise a skeptical eyebrow, right? Yes, but the rendering of statistical information into graphical form gives it a simplicity and legibility that hides every aspect of the original interpretative framework on which the statistical data were constructed. The graphical force conceals what the statistician knows very well — that no "data" pre-exist their parameterization. *Data are capta*, taken not given, constructed as an interpretation of the phenomenal world, not inherent in it.

To expose the constructedness of data as capta a number of systematic changes have to be applied to the creation of graphical displays. That is the foundation and purpose of a *humanistic approach* to the qualitative display of graphical information. Read that last formulation carefully, *humanistic approach* means that the premises are rooted in the recognition of the interpretative nature of knowledge, that the display itself is conceived to *embody qualitative expressions*, and that the information is understood as *graphically constituted*. Each of these factors contains an explicit critique of assumptions in the conventional "visual display of quantitative information" that is the common currency.

Let me work through a specific case to show how each of these principles — humanistic approach, qualitative display, and graphical information — can be demonstrated. As an example, we can use that bar chart mentioned above, one that compares the percentage of men and women in various national populations at the present time.
Figure 1. A basic bar chart compares the number of men (top bar) and the number of women (bottom bar) in seven different nations, A through F, at the present time (2010). The assumptions are that quantities (number), entities (nations), identities (gender) and temporality (now) are all self-evident. Graphic credit Xárene Eskandar.

Certain issues immediately arise. A standard critique of data introduces reservations about the appearance of certainty such a chart presents. What counts as a nation? Are transient and immigrant populations documented? What kind of time span counts as "at the present time" within which these populations are counted? If the basic bar chart would have looked like a series of bands showing discrete categories of information in finite and certain numbers (all due statistical caveats noted), what are the problems? Gender definition assumes a simple binary distinction of men and women, an assumption much debated and highly problematic (gender can be understood as a factor of behavior, physiological changes, social expectations, dress, etc., and nation as a function of permeability of borders, citizenship patterns, naturalization rules, immigration regulations, quotas and border policies). So the bar chart reifies several categories, naturalizing them as discrete and fixed: national populations, time span, and gender defined as a simple binary. The representation can only be modified by changing the terms and premises on which it is constructed. What would a representation of gender by sliding scale look like? How would permeable boundaries to nations whose populations cross each others borders be shown? How would they dissolve the bar chart's basic structure? How would notions of the present be defined?
Figure 2. In this chart gendered identity is modified. In nation A, the top bar contains a changing gradient, indicating that “man” is a continuum from male enfant to adult, or in countries E and D, that gender ambiguity is a factor of genetic mutation or adaptation, thus showing that basis on which gendered individuals are identified and counted is complicated by many factors. In country F women only register as individuals after coming of reproductive age, thus showing that quantity is an effect of cultural conditions, not a self-evident fact. The movement of men back and forth across the border of nations B and C makes the "nations" unstable entities. Graphic credit Xarene Eskandar.

The point I’m making is that the basic categories of supposedly quantitative information, the fundamental parameters of chart production, are already interpreted expressions. But they do not present themselves as categories of interpretation, riven with ambiguity and uncertainty, because of the representational force of the visualization as a "picture" of "data". For instance, the assumption that gender is a binary category, stable across all cultural and national communities, is an assertion, an argument. Gendered identity defined in binary terms is not a self-evident fact, no matter how often Olympic committees come up against the need for a single rigid genital criterion on which to determine difference. By recognizing the always interpreted character of data we have shifted from data to capta, acknowledging the constructed-ness of the categories according to the uses and expectations for which they are put in service. Nations, genders, populations, and time spans are not self-evident, stable entities that exist a priori. They are each subject to qualifications and reservations that bear directly on and arise from the reality of lived experience. The presentation of the comparison in the original formulation grotesquely distorts the complexity — but also, the basic ambiguity — of the phenomenon under investigation (gender, nations, populations). If the challenge we are facing were merely to accommodate higher levels of complexity into a data representation model, that would require one set of considerations and modifications. But the more profound challenge we face is to accept the ambiguity of knowledge, the fundamentally interpreted condition on which data is constructed, in other words, the realization of my refrain—that all data is capta.

The humanistic aspect of this approach should be obvious — that knowledge created with the acknowledgement of the fundamentally constructed nature of its premises is not commensurate with principles of certainty guiding empirical or realist methods. Humanistic methods are counter to the idea of reliably repeatable experiments or standard metrics that assume observer independent phenomena. By definition, a humanistic approach is centered in the experiential, subjective conditions of interpretation. Phenomena and their observers are co-dependent, not necessarily in equal measure. A viewer gazing on a sublime landscape or recording migrations at a large scale may be more affected by the phenomena than the phenomena is by the observation. Theoretical physicist Werner
Heisenberg never suggested that the relation of intervening observer and effect on phenomena were symmetrical, merely that they were codependent, when he introduced the concept of uncertainty in the early 20th century.

Creating bar charts with ambiguity and degrees of uncertainty or other variables in them might cause champions of legibility and transparency some unease, but the shift away from standard metrics to metrics that express interpretation is an essential move for humanists and/or constructivists across disciplines. To emphasize the expressive quality of interpretation, I’m going to characterize constructed information as **subjective** – expressing the marks of its inflection in some formal way. The shift to expressive metrics and graphics is essential in changing from the ***expression of subjective information*** to the ***subjective expression of perceived phenomena***, but subjectivity and inflection are not the only features of interpretative approaches. Capta is not an expression of idiosyncracy, emotion, or individual quirks, but a systematic expression of information understood as constructed, as phenomena perceived according to principles of interpretation. To do this, we need to conceive of every metric "as a factor of X", where X is a point of view, agenda, assumption, presumption, or simply a convention. By qualifying any metric as a factor of some condition, the character of the "information" shifts from self-evident "fact" to constructed interpretation motivated by a human agenda.[3]

The standard elements of graphic display for statistical information are simple and limited: scale divisions, coordinate lines, scale figures, circles, rectangles, curves, bars (or columns or percentages of pie charts or other forms) and labels (numbers and terms), signs of movement, flow, or state change (arrows, vectors, paths). The ordering and arrangement of elements within a chart create another level of information, relational information. Relational information is graphically produced – the ordering of elements by size, by color, by alphabetical order, by texture, shape or other feature happens in graphical space. The resulting arrangement has a semantic value produced by features of proximity, grouping, orientation, apparent movement, and other graphical effects.

Now take these basic elements of graphical display and rethink them according to humanistic principles:

In conventional statistical graphics, the scale divisions are equal units. In humanistic, interpretative, graphics, they are not.

In statistical graphics the coordinate lines are always continuous and straight. In humanistic, interpretative, graphics, they might have breaks, repetitions, and curves or dips. Interpretation is stochastic and probabilistic, not mechanistic, and its uncertainties require the same mathematical and computational models as other complex systems.

The scale figures and labels in statistical graphics need to be clear and legible in all cases, and all the more so in humanistic, interpretative, graphics since they will need to do quite a bit of work.

Perhaps the most striking feature distinguishing humanistic, interpretative, and constructivist graphical expressions from realist statistical graphics is that the curves, bars, columns, percentage values would not always be represented as discrete bounded entities, but as conditional expressions of interpretative parameters—a kind of visual fuzzy logic or graphical complexity. Thus their edges might be permeable, lines dotted and broken, dots and points vary in size and scale or degree of ambiguity of placement, and so on. These graphical strategies express interpreted knowledge, situated and partial, rather than complete. They can be employed as systematically as other charting elements, though part of my intention is to disturb the grounds of certainty on which conventions of statistical legibility are based. Point of view systems introduced into graphs and charts will make evident a perspectival position with respect to their information, an inner standing point in the graphical rendering of space. This is true of all cartographic projections. Every map contains within its coordinate system for graphical expression, a set of assumptions about the place from which the map is drawn. Information spaces drawn from a point of view, rather than as if they were observer independent, reinsert the subjective standpoint of their creation into the graphical expression. Finally, any point or mark used as a specific node in a humanistic graph is assumed to have many dimensions to it – each of which complicates its identity by suggesting the embedded-ness of its existence in a system of co-dependent relations. Information entities, or units, are thus understood as fictional abstractions serving a purpose. But their potential to be read again in relation to any number of other equally significant relations
can be made evident. This approach destroys the ground on which standard metrics are used to abstract quantitative information from human circumstances. Humanistic premises replace notions of statistical concepts of self-identity with entangled co-dependence and contingencies.

All of this may sound unduly complicated to someone merely wanting to count the number of pupils enrolled in a group, calculate the number of pencils needed, or to show budgetary expenditures on a per capita basis in the classroom, for example. But this example — an instance of administrative and bureaucratic management — shows that such crudely conceived numeric statistics are useful only in the most reductive circumstances. They tell us nothing about whether the pencils can be used, whether the pupils are prepared or disposed to their work, or whether the budgets will have any effect on learning outcomes or any of the many other factors that come into play in assessments based on metrics extracted from lived experience. But each metric — number of X or Y — is actually a number as a factor of a particular intellectual assumption or decision: pupils as a factor of seats in a room, birthdates, population, illness, etc. pencils as a factor of resource allocation, and so on. All metrics are metrics about something for some purpose.

Any humanistic study based on statistical methods, even the simplest techniques of counting, has to address the assumption involved in the categories on which such techniques ("how many of X") are based. Take another example from work in data mining or "distant reading" as it is known in the digital humanities: counting the number of novels published in a given year. This involves an enormous number of interpretative decisions — each of which has more intellectual dimensions than any numeric assessment could.

![Figure 3. A chart shows the number of new novels put into print by a single publisher in the years 1855-1862.](image)
For instance, what is a novel, what does "published" mean in this context (date of appearance, editing, composition, acquisition, review, distribution), and how was the "year" determined. Statistical methods come into play after these decisions have been made, counting objects whose identity was established by interpretative decisions. Many aspects of constructed-ness are in play. But the graphical presentation of supposedly self-evident information (again, formulated in this example as "the number of novels published in a year") conceals these complexities, and the interpretative factors that bring the numerics into being, under a guise of graphical legibility. I cannot overstate the perniciousness of such techniques for the effect of passing construction off as real, and violating the very premises of humanistic inquiry.

The challenge is to design graphical expressions suited to the display of interpreted phenomena: information about subjective user-dependent metrics, subjective displays of information, and subjective methods of graphical expression. The term subjective is used as shorthand for interpretative construction, for the registration of point of view, position, the place from which and agenda according to which parameterization occurs. Subjectivity is not the same as individual inflection or mere idiosyncracy, but is meant to put codependent relations of observer and phenomena (in contrast to presumptions of objectivity, or observer-independent phenomena).

The display of information about inflection of affective experience can easily use standard metrics. For example, a chart that shows mood changes or degrees of attraction or any other information related to subjectivity can be created with standard metrics and visual conventions.
The next task is more complicated. Subjective information, that is information whose constitution exhibits its subjective character, deviates from the standard norms by using graphic variables such as intensity of tone, size, color, or other feature to embody its qualities. Subjective information can use graphical means to show its inflected character, demonstrating its deviation from standard norms in the way the display looks, or, in dynamic displays, the way it acts. One might imagine skittish points on an unstable grid to display the degrees of anxiety around a particular event or task, for instance, or points that glow hot or cold depending on the other elements that approach them. That would be a subjective — even affective — display of information.

Creating a display whose structure arises from subjective methods of graphical expression extends this last example to the design of the basic visual structure.

A subjective grid to show anxiety might have a widely varying set of spacings to show that the information on display is constituted as a variable of some other aspect of experience (number of family members present at an event, for instance). Recognizing that such subjective methods are anathema to the empirically minded makes me even more convinced that they are essential for the generation of graphical displays of interpretative and interpreted information.
The basic principle underlying such graphical displays is that capta marks its interpreted status. Interpreted knowledge is situated, observer co-dependent, and partial. Its variables are, in theory, infinite, but they are always present in some degree or measure by virtue of the performative and participatory character of interpretative information. Interpretation depends upon and is an expression of an individual reading in a particular set of circumstances and never presumes to completeness or observer independence. The requirements for legibility increase with these unfamiliar graphics, and they will need labeling to make explicit the justifications for their non-normative seeming appearance. I’m not advocating idiosyncracy, or intellectual solipsism, but a systematic approach to graphics that is appropriate to its principles.

These humanistic principles can be readily applied to the graphical display of temporal and spatial information. So I will turn my attention in these next two sections to some of the principles on which temporality and spatiality can also be given graphical expression through humanistic approaches.

**Time as Temporality**

Since antiquity, human conceptions of time have divided between those that consider time a given, an a priori existing container within which events occur, and those who consider time an effect of occurrences in temporal relation to each other. I take the latter view. The relational structure of temporality is always constituted according to inflections and variables. Not all days are equal. Or all minutes. Or all hours. Time understood as temporality can be succinctly stated as follows: Temporality = time as a factor of X where X is any variable (fear, speed, anxiety, foreshadowing, regret, reconsideration, narration, etc.).

Humanists deal with the representation of temporality of documents (when they were created), in documents (narrated, represented, depicted temporality), the construction of temporality across documents (the temporality of historical events), and also the shape of temporality that emerges from documentary evidence (the shape of an era, a season, a period or epoch). They need a way to graph and chart temporality in an approach that suits the basic principles of interpretative knowledge.

Conceptions of temporality in humanities documents do not conform to those used in the social and empirical sciences. In empirical sciences, time is understood as continuous, uni-directional, and homogenous. Its metrics are standardized, its direction is irreversible, and it has no breaks, folds, holes, wrinkles, or reworkings. But in the humanities time is frequently understood and represented as discontinuous, multi-directional, and variable. Temporal dimensions of humanities artifacts are often expressed in relational terms – before such and such happened, or after a significant event. Retrospection and anticipation factor heavily in humanistic works, and the models of temporality that arise from historical and literary documents include multiple viewpoints.

The temporal modeling project Bethany Nowviskie and I designed almost ten years ago made use of these basic insights in order to create a graphical application that was the working proof of a concept. We were intent on demonstrating that a graphical model could be created intuitively as an interpretation and then used to generate structured data as a result. Inverting the sequence of intellectual events was a radical move for digital humanities, especially at the time, suggesting that graphical knowledge could be primary, leading an interpretation, rather than always and only functioning to display what was already known (or assumed to be known). We wanted to demonstrate that visual spaces could be a primary site of intellectual work. Of course, that added yet another level of unfamiliarity to our already complex project – and many even in our immediate community were unsettled by elastic or stretchy timelines, multiple points of view from within the system, or other novel seeming conventions meant to serve for interpretation of literary and historical artifacts.

Briefly summarized, the original Temporal Modelling project aimed at creating a set of conceptual primitives for the modeling of temporal relations. These included graphical expressions meant to meet the needs of multiple points of view, reworking events according to a changed position within a temporal sequence, and a set of what we called inflections. Inflections, a kind of legend for marking points, intervals, or events (our basic units) with a quality or attribute, were divided into semantic and syntactic types. Semantic inflections were given their characteristics independently, as entities, and the vocabulary of attributes included degrees of intensity and other qualities.
Syntactic inflections were characterized as relational, marking the effect of one event, point, or interval or another.

Methods for graphing the elastic or "rubber-sheet" timelines meant to show the subjective variations in temporality can be derived from catastrophe theory, chaos diagrams, and the visualizations of stochastic and complex systems.

Figure 7. Models of events as temporal folds along a line of crisis. The first is a simple fold, showing an event as a combination of stresses warping a plane. An upper branch of consequences peels off towards an abrupt termination while the lower branch curve back to allow a retrospective view of the event’s unfolding back onto an earlier moment. Graphic credit Xárene Eskandar.

These visualizations express the topological and systemic complexity necessary to model the number of variables (of coordinates, forces, and the changing relations of variables) present in the experience of events, and/or analysis of their representation in humanistic documents (e.g. novels, films, letters, etc.). Some of the features of our earlier design, such as the dynamic behaviors of syntactic relations, could not be expressed in a standard Cartesian coordinate system (such as the one on which XML output is generated), even though dynamic and performative syntactic relations can be made operational by using vectors or forces.
But even standard coordinate systems, such as the conventions of perspectival drawing, allow for the interpretative quality temporal experience to be expressed more fully than is possible with standard timelines. A parallax view, in which prospective anticipation is gradually replaced with retrospective reassessment, can be generated with a slider that animates the dynamic transformation in the value, identity, and relation of temporal events. In such a view, temporal events expressed as a set of conditions, rather than givens. The slider indicates a point of view, a perspective from which the experience of temporality originates in an individual.

Figure 8. Two models of an event reaching a crisis with stress factors shown as vectors. The first shows the event as a fold, the second shows it as a vortex. Graphic credit Xàrene Eskandar.
Figure 9. A linear model of parallax showing anticipation and retrospective assessment of an event. The "event" is the combination of the moods of the "eye" individual, indicated by the anticipatory arrow and then the retrospective view (lower arrow) across the bar and star that mark a moment and a duration in the temporal span. The event is warped in the retrospective view. The metric might be altered as an effect, though it is not in this depiction. The "eye" is a now-slider, as per the old temporal modeling design, and its position on the bottom line indicates the position of the observer within the course of even. Graphic credit Xárene Eskandar.

By breaking the relentlessly regular grid, the potential for graphing temporal modeling as a complex system of events is greatly enhanced. The relational, and co-dependent quality of temporal events finds its expression in these more sophisticated models.

Several fundamental principles can now guide these designs. These principles of non-continuous, non-homogenous, and multi-directional temporality, as well as the point of view parallax, refine the reductive crudeness of models linked to standard a priori metrics of uni-directional, continuous, homogenous time. In this refinement temporality is conceived according to the basic formulation mentioned above: time as a function of x (temporality=time(x)). In these formulations, x is any of the (theoretically infinite) variables that inflect the model (mood, events, influences, events, constraints, etc.). Because temporality is an act of form-making (constructivist), not an act of expressing pre-existing or a priori phenomena (realism), the sequence of intellectual events in this formulation insists on temporality (and, likewise, spatiality as the result of constitutive relations among temporal and spatial phenomena. The full realization of this approach requires a multi-dimensional, complex, model of space and time and imaginative realizations as graphical expression.
Figure 10. In the first image, anxiety (measured subjectively but charted on a standard metric) is charted against time, also depicted with standard intervals. The change from one state to another (changes in degrees of anxiety) is shown in a continuous line. Graphic credit Xárene Eskandar.

Figure 11. The difference between one state and the next is used to generate a graphical form that expresses the changes from one moment to another. Graphic credit Xárene Eskandar.
Space as Spatiality

The discussion of space corresponds exactly to that of time, and the distinctions between the conception of space as an a priori given and that of space as relationally constituted marks the same philosophical division of approaches as those that are used in charting or understanding time and temporality. Likewise, spatiality is to be understood as space as a function of x  (spatiality= space (x)).[^4]
To give graphical expression to these ideas requires using non-standard metrics, intuitive and subjective principles of design. They are meant as provocations to the larger project of creating more systematic renderings of humanistic phenomena, introducing basic transformations of the graphical fields we created for time lines into mapping and GIS applications. Precedents for such renderings can be found—e.g. Francis Galton’s rendering of space as a function of travel time. Galton’s problem, formulated in the mid 19th century, takes into account that most statistical phenomena are observer-dependent and situated, and can’t be separated from the various dependencies that bear upon the creation of data. Galton, in other words, recognized that in many circumstances, data were capta. The statistical description of phenomena depend upon the observer’s circumstances. A more recent demonstration of these principles is a map designed by Tom Carden. His dynamic interface redraws the London Underground map as function of time of travel from any selected station to any other station.

Subjective parameters are even more difficult to inscribe, since they cannot, by definition, be based on simple consensual standards. We can easily understand these distortions—space as a result of travel time. But how could we visualize the spatial distortions introduced by variables such as fearfulness, anxiety, anticipation, distraction, or dalliance and thus render space as spatiality, space as a factor of x? Some variable is always in play in the experience of space as well as its representation, so space is also always constructed according to a specific agenda and a situated experience etc. While this is the common experience of the phenomenal world, representations of spatiality have lagged behind, dominated by the navigational or descriptive systems of standard mapping whose conventions are well known and recognized, and which partake of and impose the dominant realist model.

In proposing a new model for humanities’ work, I am suggesting that the subjective display of humanistic phenomena can be applied across the domains with which we are concerned at at least four basic levels of interpretation or knowledge production.

1. Modelling phenomenological experience in the making of humanities (data as capta, primary modeling, the representation of temporal and spatial experience);
2. Modeling relations among humanities documents i.e. discourse fields (a different metric is needed to understand dates on diplomatic documents in the spring of 1944 than one needed to constitute understanding of those dated to the same period of the spring of 1950 etc.);
3. Modeling the representations of temporality and spatiality that are in humanities documents (narrative is the most obvious);
4. Modeling the interpretation of any of the above (depicting or graphing the performative quality of interpretation).

Let me describe a concrete example and see how it can be understood across these four different models. Take the first instance, the modeling of a phenomenon. Three people are waiting for a bus, how long does it take? One is late for work and anxious, one is in desperate need of a bathroom, and the other does not want to go to the afterschool program. How can the variations in perception be expressed? Recent experiments on the way time is understood in relation to different circumstances and tasks have made this experiential variable apparent to psychologists. So, the initial graphical expression of the humanistic phenomenon requires a variable metric, an elastic timeline, even a field that might fold or break under extreme circumstances.

When we shift from modeling experience to find graphical expressions for the representation of experience, the complexity of the problem increases. The modeling of time in documents, in relation to the duration of the documents (time of telling) and the experiences they recount (the time of the told) as well as the relations among these and possible external temporal references, forms a subset of linguistic and narrative analyses. The graphical forms to represent these are generally inadequate to the complexity of the textual or visual (and/or filmic and audio) documents.

Modelling the temporal relations among documents about temporal experience (imagine letters, emails, text messages, or diary entries from these various bus riders, only some of which is date stamped), gives rise to yet
further ambiguities and complexities. A letter sent that was delayed, email re-routed, messages held in suspense on a server will change the temporal effect. For instance, letters or emails arranging family events and travels over the holidays contain many temporal values that are contingent on each other and often in constant flux as plans are being made. The temporal sequence and the date stamps are not one and the same, a temporal relation of the exchanges might include messages that cross in mid-stream, and whose temporal sequence does not match the simple alignment with dates on a line.

Plans change, travel times are altered, arrivals and departures re-arranged, moods shift, frustrations intensify, disappointments or unexpected surprises arise in relation to the sequence of events. An email recounting something that occurred "yesterday" in relation to a date stamp might also contain more vaguely identified "earlier" and "before" statements that put events into a relative sequence without explicitly identifying when these occurred. As the telling unfolds, these relations may change in the writer's expression and perception, so that the textual description of a recollected event continues to shift its place in the temporal order. Who was supposed to do what when and who was depending on which order of events? By the time holiday travels and expectations are sorted out, each family member has a very distinct view of what happened when and how the sequence of lived events occurred and where. Was the bus station large or small, far or near to any other spot in the itinerary, or located in a familiar landscape. How was the space experienced as a function of time spent in it? These constructions of temporality and spatiality from within documents, across documents or a discourse field, and of phenomena are all created with time/space as functions of interpretation. The act of interpreting a series of documents creates its own temporality, that of the production of a reading, that is not the same as the telling or the told within the documents, but an independent phenomenon. An interpretation has its own temporality ad spatiality.

We can construct a concrete example of spatiality that parallels this example of temporality, and also depends on temporal models. For instance, imagine an open stretch of beach, relatively unconstrained and unconstructed. When a sailing ship is washed up at a certain point on the beach, not only that point, but the space around it, becomes transformed. The presence of the wreck creates a huge impact, and the space almost palpably bends, compresses, expands, and warps around it, with waves of resonance rippling outward from that point.
Figure 14. In this example, a geographical space (a stretch of beach) is affected by a change in the state or circumstance. First we see the space mapped according to a regular Cartesian coordinate system. Then the grid is inflected by the arrival of a beached ship, around which the beach bends because the sense of each spot as relative equal is distorted by the attention that the ship commands. The space acquires one inflection after another as graffiti marks the ship, a chain link fence goes up with a police notice, footprints create a pattern in the sand, pathways for observation re-route pedestrian traffic etc. The "space" of the beach is transformed physically and in terms of attention getting and effect so that it is no longer a set of equal and neutral elements of a rational spatial system, but one that must be expressed with graphical distortions that show these inflections.

Graphic credit Xárene Eskandar.

Police barriers are set up and suddenly make that bit of beach into a highly charged site. Additional fences create zones of potential transgression and prohibition, lines in the literal sand that when crossed by graffiti artists and taggers, vandals and looters, introduce a whole set of spatial relations governed by different rules and expectations. The space of and around the shipwreck becomes a hot point, a zone, an arena of complex spatial negotiations and marked coordinates, each differently charged depending on the players and circumstances (law enforcement, owners, passersby, taggers at night, in early morning, broad daylight etc.). Even more than the open, indeterminate space of the beach, this spot becomes an area of shifting values and interpretation. Space, always marked, has become explicitly so, and the spatial relations demarcate regions of authority and behavior whose dimensions are not in strict correspondence to physical space. The same amount of physical space half a mile down the beach has none (or few) of these dimensions. Can we still locate the wreck on a Cartesian grid available through any GPS system? Of course, the two approaches, constructivist and realist, don't cancel each other out. But they are not equivalent. The GPS standards locate the spot within those coordinates, but say nothing about the constituted space as a phenomenon created by these many variables. We have many adequate models for the first mode of visualization, but very few for the constructivist approach grounded in an interpretative mode of experience.

Take another example, a map tracing a journey between London and Prague in the 1810s.[6]; How does the space change dimensions to reflect hazard, delays, dalliances, terrain changes, interruptions of war and political strife, danger, weather, or illness? A legend or set of labels or markings could indicate these inflections of the space simply by putting symbols on a map. That would be the registration of subjective data on a conventional map. But mapping conventions don't morph the landscape to accommodate the effects of fear, anger, or violence. Now change the map, distort its proportions so that it becomes a terrain shaped by fear, by obstacles, by disruptions and confusions.
That is a subjective expression. The two approaches are radically different. In the second instance, space is an effect of spatial relations, spatiality is expressed as a factor of disturbance, and it might be expressed as a factor of many variables occurring across a temporal extension (fear, anxiety, confusion, anger, disorientation).

The challenge of representing large corpora of texts and immense archives also requires attention, in part because the conventions of wayfinding and navigation that are part of print media and its institutional structures are not yet reworked in a digital environment meant to address the shifts in scale and experience brought on by new media. On top of the challenge of representing repositories and their use, we can point to another challenge –that of giving graphical expression to interpretations built on and out of documents, or collections of documents. These present different challenges than the humanistic interpretation of temporal, spatial, and informational phenomena, but depend upon the basic recognition that subjective and co-dependent principles must govern their design. The conventional graphical features of texts that inscribe interpretation include all of the features of layout and format, typography, and design that organize and structure its presentation on the page, screen, or other surface or medium. The features that inscribe interpretation in archives are those that embody or express the imprint of the point of view according to which the archive takes shape. These include classification systems, nomenclature, hierarchies and categories of organization and ordering, systems of search and access, information architecture, the format of storage and display, and any other feature of the archive that is intrinsic to the forms of its expression. While all of these are expressions of arguments, and thus interpretations, they do not show or model interpretation on the fly as a constitutive act of reading, relating, connecting, and sense making. In sum, these acts of interpretation make use of the format features of graphical presentation as well as responding to and thus producing the "content" of these artifacts. Some combination of user-centered but co-dependent systems analysis and critical
reading practices as performative acts would have to underpin such graphical visualizations. But that is also work for another time.

**Conclusion**

My argument is a polemical call to humanists to think differently about the graphical expressions in use in digital environments. A fundamental prejudice, I suggest, is introduced by conceiving of data within any humanistic interpretative frame on a conventional, uncritical, statistical basis. Few social scientists would proceed this way, and the abandonment of interpretation in favor of a naïve approach to statistical certainly skews the game from the outset in favor of a belief that data is intrinsically quantitative — self-evident, value neutral, and observer-independent. This belief excludes the possibilities of conceiving data as qualitative, co-dependently constituted — in other words, of recognizing that all data is capta.

Again, to reiterate, I am not suggesting that we simply introduce a quantitative analysis of qualitative experience into our data sets. I am suggesting that we rethink the foundation of the way data are conceived as capta by shifting its terms from certainty to ambiguity and find graphical means of expressing interpretative complexity. In some circumstances (the example of the bar chart given earlier that was displaying information about gender, nations, and populations) ambiguity merely requires a higher order level of complexity in the model, so that apparent "certainties" are qualified by variables and nuances that can be specified in mathematical terms. But the idea of capta as fundamentally co-dependent, constituted relationally, between observer and observed phenomena, is fundamentally different from the concept of data created as an observer-independent phenomena. That realization has to be at the heart of humanistic approaches to the graphical display of interpretative phenomena, of interpreted artifacts and the acts of interpretation themselves. Because interpretation is performative, bringing objects into view through a reading or other act of intervention, it forecloses the possibility that autonomous objects or phenomena exist within the horizon of human experience. Phenomena of human experience are constituted as interpretative acts.

The natural world and its cultural corollary exist, but the humanistic concept of knowledge depends upon the interplay between a situated and circumstantial viewer and the objects or experiences under examination and interpretation. That is the basic definition of humanistic knowledge, and its graphical display must be specific to this definition in its very foundational principles. The challenge is enormous, but essential, if the humanistic worldview, grounded in the recognition of the interpretative nature of knowledge, is to be part of the graphical expressions that come into play in the digital environment. If we don't engage with this challenge, we give the game away in advance, ceding the territory of interpretation to the ruling authority of certainty established on the false claims of observer-independent objectivity in the "visual display of quantitative information." [7]

I'll finish with one more concrete example of the shift from observer-independent realism to co-dependent constructivism. Snow's justly famous chart of deaths from cholera allowed city officials to track the source of the epidemic to a single water pump.
Figure 16. Dr. John Snow’s famous chart tracing the source of an epidemic using graphical methods that plotted frequency of outbreaks and geographical location. But each outbreak was an individual, and their degrees of vulnerability, impact of their illness, effect on the family and loved ones, was specific and particular in ways that a single dot cannot express. Seen from the point of view of an individual participant in these tragic events, some of these individuals loom much larger than others when depicted from within the gaze of someone actually seeing them occur. Graphic credit Xárene Eskandar.

The distribution of dots on the street map makes evident the role of the pump by the way they cluster. A useful map, crucial to analysis, its clarity and succinctness served an important purpose. It was sufficient to that purpose, adequate, but we could revisit that map and use it to express other factors. Who are those dots? Each individual had a profile, age, size, health, economic potential, family and social roles. In short, each dot represents a life, and none of these are identical. Many demographic features could be layered into this map to create a more complex statistical view of the epidemic. That is neither subjective data nor a subjective display. But what if we take the rate of deaths, their frequency, and chart that on a temporal axis inflected by increasing panic. Then give a graphical expression to the shape of the terrain, that urban streetscape, as it is redrawn to express the emotional landscape. Then imagine drawing this same streetscape from the point of view of a mother of six young children, a recent widow, a small child, or an elderly man whose son has just died.
These latter are all instances of the graphical expression of humanistic interpretation. They are as different from the visual display of quantitative information as a close reading of a poem is from the chart of an eye tracker following movements across a printed page. They are fundamentally different in character and in their basic assumptions about the role of graphical expression as an aspect of knowledge production. We have a very long way to go in creating graphical expressions that serve humanistic interpretation, but I hope I have suggested some of the premises on which this work might begin.

Notes


[2] [Griethe & Schumann 2006] [Jones et. al 2008] [MacEachren et. al 2005] [Shneiderman & Pang 2005] [Skeels et. al 2008] [Wells 2008]

[3] Subjective carries structuralist connotations, as position and enunciated identity; and is meant to suggest both the codependent conditions of construction and expressive graphical features.

[4] I first understood this notion when I read Sigfried Giedion's *Space Time and Architecture* about thirty years ago. His arguments about structure as space-making left a deep impression.

[5] See:[Carden]

[6] Alternate example was a street map of Tehran on which points are plotted to show a disturbance in progress. Let the points expand to register degrees of intensity of impact, disruption of normal function, fear and anger, violence. That would be the registration of subjective data on a conventional map. Now change the map, distort its proportions so that it becomes a terrain shaped by fear, by obstacles, by disruptions and confusions.

[7] This citation is of course the title of Edward Tufte’s first volume.

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Sand in the Mapmaking Machinery: The Role of Media Differences

In this 1766 book Laokoon, Gotthold Ephraim Lessing argued that painting should depict bodies in space, whereas poetry should present actions in time [1]. Few involved in the literature or art of our times would accept such a restrictive poetics. The idea that the sign systems we use to create our expressions should always have a comfortable relationship to their objects of reference feels quite foreign to us. We rather see the tension created by pushing at media borders as a fundamental part of how we express ourselves.

Yet Lessing was not only presenting a set of rules for artists and poets based on his own time and temperament. In his summary of Enlightenment ideas, in his conclusion of a discussion with its roots in antiquity, he also pinpointed distinctions which go far beyond the prescriptiveness of his argument. There are indeed differences between visual and verbal media. Different media can be mixed, and various forms of crossover and hybrid works push against and question media differences, but the borders are still there. They are strongly connected to the different sign systems used in visual and verbal expressions.

In this article, I will show how these differences play out for the relationship between texts and maps. I will apply some principles developed on two fiction texts, namely, Daniel Defoe’s Robinson Crusoe (1719) and Kazuo Ishiguro’s The Unconsoled (1995) [2].

The aim is to test the applicability of comparison to abstract maps as a way of understanding texts. I will then widen the scope somewhat by highlighting some results from a mapping seminar in June 2015, showing results from a number of mapping exercises based on different texts.

In the area of geographical information, there is a general view that maps are better than texts in storing and communicating information about geography. And this is true, in many cases. But in which cases? Are there cases in which the opposite is true? Lessing argued for the different qualities, the different areas where painting and poetry could work at their best. I make a similar argument for geographical maps and geographical texts. But what does it mean that a text is better than a map in certain ways?
This is not a study of mapping in practice, rather of how inherent media differences and differences in sign systems lead to problems in the mapping process. Some of these problems can be solved in a pragmatic way, whereas others signal fundamental differences between the two media: verbal texts and geographical maps. In any case the mapping exercise feeds back into the source text and changes our understanding of it. Because of their different sign systems and because they can present different if overlapping views of the world, seeing texts in the light of different map visualisations represents an interesting way to get a deeper understanding of geographical space and how it can be mediated.

Body and space
Humans are embodied creatures moving through external landscapes. We are also semiotic animals living in environments of signs [3]. In our interaction with texts, semiotics will often overshadow embodiment, but understanding textual descriptions of landscape is also always based on bodily experiences, even if it may be in very indirect ways. A reader of the novel Robinson Crusoe has an understanding of the island on which Cruse was shipwrecked for many years. That understanding is not based on first-hand experience—that would be impossible, as the island never existed as a physical place. Still, sitting in a chair with a book using hands, eyes, and other parts of the body in the reading process one can feel the heat, the humidity, and the sand. They are felt as bodily memories triggered by the text. The novel also feeds on bodily memories when it builds up the reader’s understanding of the descriptions and his or her desire for the plot. Without having experienced the island, one has other bodily experiences that make up important aspects of the understanding of the text.

What if one makes a map of Crusoe’s island? In the bodily act of making the map one also uses experiences gained as an embodied creature moving through landscapes. If I were to make such a map I would also use my experience as a map surveyor and drawer. Yet, when I show the map to somebody else the bodily memory of heat, humidity, and sand is called to attention in a different way from what would happen with the novel. Heat and humidity may not be experienced at all, and sand will be less important than travel distances, sight lines, and other spatial relationships between places. My previous research indicates strongly that these differences are systematic. External landscapes seem to be harder than experienced space; our location in space is fairly determinate. However, space is not as fixed as it may seem by looking at a map.

In my research I have used computer assisted conceptual modelling to investigate such differences in detail. What is the significance for personal and cultural memory of translation processes between digital textuality and digital cartography? In computer assisted modelling the algorithmic structures of the computer is forced on the complexity of human experience. The hard edges of a computer model are used to model the less determinate modes of human expressions. In this article computer based modelling is not used directly, but the interpretational system was developed though computer assisted conceptual modelling.

The spaces of Robinson Crusoe
As a starting point for this inquiry, was read and the descriptions in the text were classified according to a typology I have developed [4]. The typology groups text according to the degree to which its geographical information can be expressed on maps and includes the following categories:

1. **Fully specified textual descriptions.** Only one map can be drawn based on the description. If the text mentions something, it is fully specified geometrically.
2. **Underspecification.** Based on such a text, more than one map can be drawn, and at least two of these maps are significantly different.
3. **Disjunction.** The text includes expressions in the form ‘A or B is located at C’.
4. **Negation.** The text includes expressions in the form ‘There is no A in B’.
5. **Impossible figures.** The description of the geographical elements does not add up to a spatially coherent whole [5].

Although a modern reader meets the text of Robinson Crusoe with the expectation of a work of fiction, this is not the way the book was presented when first published. The title page of the first edition presents the text as an autobiography, a narrative of one person's experiences. The alleged truthfulness of the text is similar to any other autobiographical text. However, Defoe's text was criticised for being fantasy from the outset. Today the book is seen as fiction, with its paratextual and textual self-posing as a true narrative being part of the fiction.

The environment is brought into the narration at the different scales: larger and smaller areas as well as objects. There are few descriptions of larger areas. The island, and the location of it, is the largest area described. The vast majority of descriptions fall into the other two scales: small areas, such as Crusoe's house, his yard and the beach, and objects, such as boats, baskets and clothes. Descriptions of objects are bound to be important in the text, as the tools and other objects he is able to salvage from the ship are necessary for his subsistence on the island. One may say that it is not only him as a person with the skills he has, but equally much the quality of his European tools, which makes his work in cultivating the island successful. In this article the focus will be on the former two scales.

**Larger areas: place name dropping**

Referring to locations and showing routes is a different way of writing from describing landscape, although both are related to place and geography. Travel narratives and landscape descriptions tend to overlap, or at least be used in the same texts, but they are still different things. In the narration of most of Crusoe's longer travels, there are no descriptions at all [6]. Place names considered to be known are used without explanation or description. The same can be seen in his travel after he started his plantation [7]. The places are atoms between which one just moves and their whereabouts and the distances are, to the degree they are important, considered to be known to the reader [8]. For a reader without such basic knowledge the under-specification would be almost total, whereas reading with a map there is no under-specification on the grand scale, although some in the details, such as the exact whereabouts of his plantation in Brazil.

Larger areas than the island are never described, but their place names are mentioned and are expected to be known to the reader. One example of a journey that is rather easy to map is the voyage that was meant to be from Brazil to Africa, when he ended up shipwrecked [9]. There are realistic bearings under normal weather conditions. The positions and directions are indicated, making it easy to follow the route on a chart. Easy, that is, to know what the people on the ship knew. The perspective is always with the narrator or the group he was presented to be a part of. During the storms there are only guesses. It is quite obvious that this gives the narration a realistic touch, using the connection to the known world as an anchor for realism. The minimal departure is reduced to the minimum [10].

The descriptions of places of some size, mostly his island, are not connected to identifiable places, so that they cannot be tested against a real world map. In general, places and relations between them are not described if they can be easily located on maps. There are one or two exceptions to this; one is shown in the discussion of the events in the Yarmouth–Cromer area below. The location of the island is clearly identified, as being south east of Trinidad, north east of the eastern part of Venezuela, but any close identification is hard [11].

**Smaller (local) areas: geography building**

There are quite a few descriptions of smaller areas in the text. They are always connected to the narrative;
the descriptions are there because they are needed. The exploration of the island on pages is similar [12]. His travel route is described together with important places, but more emphasis is on the plants and animals. He does, however, use cardinal directions on a few occasions. These descriptions of smaller areas play an important role in the narrative. They establish a sort of place name system.

The place name system established by the text consists of what I will call a set of proto place names, and builds up the necessary local knowledge so that the reader can follow the narrative. Crusoe's possession of his land is established in the same process. These two types of results are fundamentally different, as the former one is text external, establishing an understanding in the mind of the book reader, whereas the latter is text internal, describing a process Robinson Crusoe, the character in the book, goes through. Our focus will be on the former of these processes, but it is meaningless to see the one isolated from the other.

A short comment on my use of the concept of place name is in order here. There are almost unlimited numbers of definitions of 'place name'. Many of these connect place names to a lack of semantic meaning of the expression making up the name, as the name is seen as referential only. While it is common to use place names where such meaning is not present, the opposite is also common in many languages. There is, as far as I am concerned, no reason to exclude such meanings in the definition. I will here use the definition of Magnus Olsen:

“A place-name, then, is a word, or word-complex, that within one particular community—no matter whether great or small, but of a certain stability—instantly evokes the idea of one particular place through an association of contiguity” [13].

The development of place names is part of building up knowledge of the general geography of the island, in order to let the narrative do with less and less geographical description as the story develops. We see this clearly in the attempt to sail around the island [14]. Once the understanding of the geography is firmly established, expressions functioning as place names are used to refer to parts of it, as where he uses expressions such as ‘our Dwelling’ and ‘our Creek’ [15]. Eventually, these expressions develop into almost iconic forms, which is further used when he is presented as a ruler of an organised society: ‘my Castle’ and ‘my Country Seat’ [16]. The place name dropping seen for larger, well known areas can now be applied at the island as well. One may speculate that if the narrative had indeed been a description of true events, some of these proto place names could eventually have developed into ordinary place names.

When the island is further developed in order to produce food for a larger population, the geography is no longer described; it is rather considered to be known to the reader [17]. After the island is left, however, new places visited by Crusoe are again described when necessary for the narrative, as we see in the wolf attack during their crossing into France from Spain [18]. In all these descriptions, as in many more in the novel, there are seemingly no attempts to describe landscape for its own sake. It gives us the impression of being there in order to make us understand the story. The main goal is to narrate a good story and, through that, present good Christian teachings. The landscape is only included to the degree it is necessary to reach these goals.

As for the mental image in the head of a reader, the text includes enough cues to build up a reasonable image. Still, one could assume that the under-specification would lead to very different images in different people's heads, to a large extent based on different bodily experiences. This is only a speculation, however, I have made no empirical studies into reader response. My image, for what it is worth, is not a topographical map, but rather what the landscape would look like if it had been seen from a high point on a nearby island, or from an airplane. When an initial image is established it is, however, hard to correct flaws in the fundamental spatial layout even if new information were added. Such flaws remain in my internal mental image.
Narrative, not mapping

Although travel routes are given by the use of place names from the outset of the text, the first real description of a landscape is connected to the first shipwrecking Crusoe lives through [19]. The landscape just out of Norwich, with the places Great Yarmouth, Winterton and Cromer, is still known today, and the places can all be found on a modern map. While the text is a true description of the landscape as it can be seen on a modern map, the reader may expect a more abrupt change in the direction of the shoreline around Winterton. If one would try to make a map based on the narrative alone, it is quite likely that this map does not have to look very much like the landscape based maps we have. I take it as granted that the shoreline has not changed significantly from the seventeenth century until today.

The Defoe text and a modern map express the landscape differently. We may say that one is true and the other one false. In contemporary culture we tend to believe in the map. A map has a rhetoric of perfection. It is not a perfect representation of the ground, as any cartographer could tell you; for just one thing, the distance between, e.g. a road and a river running next to each other is routinely overrated to improve readability. But the quest for perfection is seen in things like coastlines. They are based on techniques such as aerial photos and measurements, and the goal is a perfect match between any change of direction of a scale relevant for the map in the landscape and the map reproduction of it.

Is this to be true to nature? This difference in how the landscape is experienced is not necessarily between the text as fiction and the map as the conveyer of a one and only truth. If one went to the place, the landscape may look more similar to the text than to the map, especially seen from a situation similar to the one of the Crusoe character. Slopes tend to be overrated by our observations. Overrated, that is, if we accept the slope grade seen on a map as the true one. We tend to do so in the modern Western map-based society, but did they in England in the eighteenth century, or in other times and places?

Description outside the narrative

There are a few descriptions which are not directly connected to immediate action or events, as we see later when Crusoe mounts himself on a high place to get an overview of the island [20]. But they are more or less directly connected to future events in the novel. The descriptions of the planning and the building of his camp are very thorough, although it is only covering quite small areas [21]. It is the closest this text gets to a fully specified textual description.

Shortly afterwards, Defoe gives a general presentation, first of himself and then of the island and what he accomplished there [22]. This is the closest we get to a description not connected to action in the novel. It is a summing up of the first part of the book, and it feels as if the narrative takes a deep breath before the big change is introduced by the naked footstep on the shore. And, indeed, the description ends with the sentence “But now I come to a new Scene of my Life.” and the next paragraph opens with

It happened one day, about noon, going towards my boat, I was exceedingly surprised with the print of a man's naked foot on the shore, which was very plain to be seen on the sand [23].

His time in solitary peace was over, the rest of the stay on the island is under the threat of savages, and later, pirates.

One common characteristic in fiction is rule breaking. Lessing’s ‘rules’, to the degree they exist, are often broken. This is one of the ways literature creates its special effects. The borders between the types in the typology presented above are also areas where fiction may play. It is pretty clear that the relationship to place and space in Defoe is different from many real travel narratives. His goals could have been political, religious, economic, and the joy of telling a good story. The function based on this became a narrative with much reli-
gions reflection and an emphasis on practical work, a text which includes the landscape descriptions needed to do that, but no more.

**Media modalities**

In *Laokoon*, as in numerous other works following in this tradition, the existence of certain art forms has been taken as the starting point. In a recent paper, Elleström takes a different approach. Instead of starting from a set of different media or art forms, he takes a bottom-up approach, starting from a set of media modalities. His set includes four, namely, material, sensorial, spatiotemporal and semiotic modalities [24]. The differences I am discussing here, that is, between texts and maps, fall mainly in the latter two categories [25].

An important part of the process of reading and understanding texts is grasping the spatial organisation of a landscape. This spatiality is expressed in the text in the sequential form of the intended reading process. Even though texts as well as maps have space manifested in the material interface, the way a cognitive space is established differs. Because the spatiality of Defoe's text is not directly connected to the spatiality of the described landscape, the landscape spatiality established in the mind of the reader is a reconstructed virtual space. As for topographical maps, the space manifested in the material interface has a strong similarity to the landscape depicted. This similarity is visible for most modern readers, because the way maps refer to the landscape it depicts is deeply embedded into modern cultures. But again, this may have important culture-specific components.

This is also connected to a second point made by Lessing, namely that what is hidden is not seen. This is closely related to what Wellbery calls the syntax of the medium [26]. It cannot be divided from semiotics, which is the other of Elleström's modalities in which maps and texts show clear differences. Defoe's text and maps we draw based on it use signs differently, as will verbal texts and scaled geographical maps in general [27]. Scaled maps tend to be understandable to anyone with a basic reading ability of such graphical representation, an ability that seems to be either existing or quickly developed by people of all cultures. Numerous examples of this can be found in Woodward and Lewis [28]. It is usually easier to understand space by studying maps than by reading texts.

**Playing with Lessing's rules**

Lessing's rules did not exist for Defoe, in a very literal sense. Defoe died before *Laokoon* was published. Yet, although *Laokoon* can be read as a poetics, it is based on descriptions of pre-existing texts. Lessing's attacks on the use of French models for German drama, and the suggestion to use English models instead, because the German taste was closer to the English than to the French, is interesting in this context [29].

Now, the fact that a narrative text pauses to give a lengthy description outside the story as the very last thing before the major turning point is bound to have a special effect of meaning [30]. One such meaning may be to slow the narrative down in preparation for a big event. The book has no chapters or parts, which would be a more direct para-textual way to do it. Instead, the shift is made inside the text. This is seeing the description as a temporal feature. Another meaning may be to summarise the first part of the novel in order to get the reader ready for the second one.

However, it is peculiar to note that a print of a footprint in the sand, prepared by a geographical description of the island, is located in the spatial centre of the book. In the first edition the preface is on page 1 and the main text starts on page 3. The end of the description and the incident with the naked footprint in the sand is on page 153, and the end of the novel is on page 306. The centrality can also be seen in the number of words before and after the turning point.
Given that this is not a coincidence, does it mean that Defoe must have counted words? Not necessarily. Adjustments could have been made during typesetting, where the number of sheets before and after would be easy to see. People used to the handwriting of manuscripts for printing can also develop a pretty accurate feeling for how much is needed to fill a printed sheet. Using the typeset to do this is very much a spatial act. Given that this was the way it happened: not only did he put the turning point of the novel in the geographical centre of the book seen both as a graphical three dimensional set of pages [31] as well as seen as a one-dimensional string of words, he also did include just before this point the only geographical description in the novel which is not linked to action.

By refraining from all such descriptions in the rest of the text, Defoe signals to the reader that something is about to happen. Putting it in the middle of the novel balances it. So exactly in the middle that it looks like a puzzle. Is it the kind of a joke one would expect from a master of irony? Even if this is not intentional, the fact remains that this is a feature of the text, wherever it comes from. Can coincidence make art? Is it art if it is a result of a coincidence? Even if it is not a conscious part of the writing of the text, it has proved to be part of at least one reading of it. It is there in the text, in principle open for anyone to see.

Ishiguro's travel off the map

In Kazuo Ishiguro's 1995 novel The Unconsoled a surreal world is described. Not only space, but also time and personal relationships are presented in a dreamlike, unreal way. In this section I will make a short note on one chapter of the book, where one specific case of surreal landscape description will be discussed. This is a preliminary study into spatial movement in a surreal world as an attempt to see how the way of thinking shown for realist fiction above may also give insight into such a text. Through a study of the movements in chapter 10 of the book I will try to establish how the surreal effect is created and to what extent the unreal or impossible space described can be seen as a semantic or pragmatic phenomenon [32]. Is the space description really a claim for geometrical impossibility or is the experienced strangeness a signal to the reader to look for a real space beyond an envisaged impossibility?

The chapter describes how the protagonist is being taken by car from his hotel in the city to go to a dinner party. They travel through the city and then for a significant period of time out in the countryside until they reach a country house. Then the dinner party goes on for quite a few pages before the protagonist, upon wanting to retire to his room, realises that the dining room forms part of his hotel in the city.

How can we possibly interpret this description? One possibility is that they travelled in a circle. But the text clearly states that the travel went from the city centre and out into the countryside for a significant period of time at good speed, so coming back to the city would mean that the narrator is very unreliable, which does not fit the tone of the text. Another possibility would be that the protagonist and the people around him, that is, the whole dining hall, is transformed or moved from one place to another. But this does not fit well with the textual description. It is clearly stated that the narrator realised that the room was connected to the hotel [33]. There is no transfer or movement, rather the sudden realisation of a fact that has been true all along. So a better interpretation is that we have a non-geometrical, or non-real, space. Thus the dining hall is either in two different buildings far apart from each other at the same time, or the distances are incoherent. Simplified, we have a situation as in figure 1, where the distances between two points are not coherent: the distance from A to B is different from the distance from B to A.

![Figure 1. Unreal space.](image)
This situation can clearly be expressed in a text. Ishiguro’s book is an example of that, and far from the first example in the history of literature. Such situations are textually expressible but they cannot be conventionally mapped. The syntactics of the geometry based map medium prevents these types of statements from being made. So in trying to map expressions such as this one we not only have a situation of under-specification leading to the map being partly based on choice by the mapper, thus making the map one possible visualisation among others, but we see a situation where the sand in the machinery prevents the mapping exercise from being successful at all. This is a situation where differences in how the media modalities work prevent a media transformation from being possible [34].

**Other travels**

At the Digital Humanities Summer Institute (DHSI) in Victoria, Canada in June 2015 I taught a course in text mapping as modelling [35]. The students created mapping projects in order to understand better how one can map a text in many different ways, and thus, to what extent the map is based on the interpretation they did of the texts [36]. Groups of students created several maps based on the same text, documenting how different ways of visualising the text led to quite different understandings of the space expressed in the texts. None of the maps were unproblematic but they were all problematic in different ways. In some cases they were seen as useful to highlight certain aspects of the texts, in others the limitations of the maps showed important aspects of the texts, including different levels of specification, which opened up reflections on spaces untouched by the narrative as opposed to places mentioned in the text.

These specificities of the texts were seen in new ways by students who knew the texts well beforehand. And in one case, *Mapping Hemingway’s “The Killers [37]”*, the whole idea of creating maps based on the story was, after some attempts, seen as not very useful at all; other ways of re-working the text, including various ways of re-telling it, were seen as more illuminating. Different mapping approaches give different impressions, and even something as seemingly simple as trying to complement a quantitative mapping exercise with a qualitative one can open up a text to new readings. In this way maps can defamiliarise in a way comparable to texts, an effect very different from using a map to show ‘how it is’ often presented not only in political and historical discourse, but also in the mapping of fiction.

In some texts space is central, but difficult. In those cases it seems to be useful to use different types of maps to highlight different aspects of the text, even if none of the maps are seen as successful mappings. Each new visualisation method had a potential to enhance and manipulate our understanding of the text because different types of maps put different assumptions on the text. The map can indeed hide problems and inhibit discussion. Plotting points on a map makes all places equally accessible, which is quite different from the reading experience. However, a series of different mapping exercises has the potential to counter-work this foreclosure and indeed open up a text to new interpretations. In other cases the map may be easier to make but then it also is less interesting, and almost seen as a waste of time, except for the documentation of the shortcomings of text based mapping.

**Sand in the machinery**

“Sand in the machinery” is a traditional expression for sabotage. The common use today is as a metaphor based on the mechanical result of putting sand into lubricated metal such as crank wheels. It is comparable in effect to putting sugar in a tank of gasoline. Another similar, but stronger, expression, used in Norway in the 1910s and 20s is “Dynamite in the boreholes.” It was used as a threat to prevent strike-breakers from taking up the work of striking miners.

My aim is not to put sand in any machinery, and surely not to cause any explosions, not even metaphorical ones. My aim is rather to point to the fact that there is inherently some sand there, making digital maps
scream a bit in their joins. I hope the previous pages have shown where the sand comes from, what it is, and what the meaning of it may be. But what are the consequences we can draw and what should we do?

Lessing did not have a concept of rule breaking to produce an effect of meaning, but still, this is an important part of art. The rules vary, the level of breaking you need to do varies, but art pushes barriers. In order to be broken, the rule must be there, however. Time paradoxes are, given Lessing’s rules, more natural for verbal text than for images. One may easily get the impression that time paradox has been more an object of study for literary critics, and this makes sense, given Lessing’s rules. Paradoxicalities was not supported by Lessing, but based on his division of areas of interest for painting and poetry, spatial paradoxes should by analogy be reserved for the plastic arts, to the degree that paradoxes in plastic arts may be compared to paradoxes in literature at all, which is an open question. But it is interesting for space in this discussion, because one could easily think that spatial paradoxes should also be expressed as maps. The problem is that this is not possible, given that a paradox is in line with ambiguity, negation or indeed the impossible space we saw in Ishiguro’s novel. Or rather, the only possible way of expressing it on one single static map is as a text on the map.

So maybe text is not only the area of action, of ambiguity and of negation, but also the area of paradox. Maybe the concept of impossible figures should not be seen as a lack of possibilities, but rather a way of opening up language to paradoxical expressions. Such expressions are not available to the cartographer because he lacks the toolbox that the creator of verbal texts has access to.

Aesthetic rules are productive in the sense of producing meaning for effects. The same can be said about media differences. However, some attempts at media transformations create tension based on the different characteristics of the media modalities. One example is that maps are recursive and reflexive (the distance A to B is always identical to the distance B to A) whereas texts are not necessarily so. Other operations, such as negation, also work differently; they operate under different rule sets. It is important to remember that what we usually call the map of a text is not the map of the space of the textual document but rather a map of the reconstructed space established in the mind of an understanding reader of the texts.

Maps can be used for deforming texts [38]. By presenting different maps, different readings of a text can be presented and the understanding of the text by the reader can change. The landscape of a text is created by the reader based on cues in the text and seeing a map which was created based on the text will necessarily change this landscape in the mind of the reader. Different media can express fundamentally different images of the world. An expression based on another expression in another medium will always be an interpretation partly steered by the target medium.

In this article I have tried to discuss what we can say about what the text says, about what in the text is un-spoken, and about what the text cannot speak. This is done in parallel with looking into what the map says, about what of the map is un-spoken, and about what the map cannot speak. Using one medium as a measuring device for expressions in another medium, as I use maps for texts in this article, can give us further insights into the limits to our freedom of expression.

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[6] For example the one starting on Defoe p 264.


[16] Defoe, first used on pp 171 and 196 respectively.


[23] Defoe p 170..


[31] The book can be seen as three dimensional because each page has two dimensions, and the collection of pages making the book forms a third one.


[33] Ishiguro pp 147–8.


[36] The projects are documented at [http://textmappingasmodelling.wordpress.com/](http://textmappingasmodelling.wordpress.com/)
[37] https://textmappingasmodelling.wordpress.com/2015/06/12/mapping-hemingways-the-killers/