INTRODUCTION

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OVER THE PAST ten years the spatial turn in the humanities in Scandinavia has resulted in a growing number of infrastructural projects aimed at facilitating interdisciplinary research into spatial aspects of a rich variety of materials, place-names, early modern inventories and cadastral maps, medieval literature and art, as well as Viking-Age and medieval runic inscriptions, to name just a few. This intensive development has brought about a number of challenges, as these projects differ with regard to their agendas, setups, and customized approaches to data, theories, and methods. A number of different solutions to common problems such as geocoding complex humanities data is of course inevitable, as different points of departure regarding the perceived needs of future users, research questions, and consequent priorities have shaped the projects' outputs. Nevertheless, for the development of the rapidly growing field of spatial research infrastructure studies in the humanities to be sustainable requires a conversation about the different ways we as a community understand, build, (re)use, maintain, and develop digital platforms and other types of infrastructure as well as the data they serve; another focal point of such a conversation would be the ongoing negotiation of best practices regarding spatial data management and the use of linked open data (LOD) in line with FAIR (findable, accessible, interoperable, reusable) principles. Consequently, the main aim of the current volume is to introduce the latest developments in the field, as well as to provide the possibility for such a dialogue in book format. The reader is served a smorgasbord of theoretical perspectives, methodological tools, and—most importantly—practical approaches to creating and talking about digital spatial research infrastructures (SRIs) in the humanities.

The volume introduces nine spatial infrastructure resources that are currently being developed: Norse World;[1] Mapping Saints;[2] the Icelandic Saga Map;[3] Nafnið.is;[4] TORA, a

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1 See www.uu.se/en/research/infrastructure/norseworld and https://norseworld.nordiska.uu.se (both accessed February 16, 2023).

2 See https://saints.dh.gu.se (accessed February 16, 2023).

3 See http://sagamap.hi.is/is (accessed February 16, 2023).

4 See https://nafnið.is and https://nafnid.is (both accessed February 16, 2023).

topographical register at the National Archives of Sweden;[5] the Swedish Digital Place-Name Register;[6] the Swedish Open Cultural Heritage;[7] and DigDag, a digital atlas of the historical and administrative geography of Denmark.[8] This infrastructural effort has not emerged in a vacuum but is a consequence and welcome result of the growth in the study of early modern and medieval geographic space, literary cartography, and spatial thinking at a time of rapid digitization.[9] The existing and emerging digital SRIs facilitate the rethinking of traditional lines of humanistic research on spatiality and worldviews, innovation in methodology, and critical discussion of digitization outcomes. This volume thus also provides the research community with an opportunity to revisit traditional research questions in the context of new infrastructural environments. Although primarily aimed at medievalists and scholars of the early modern period, the volume offers a broader spatial and temporal scope with a contribution from classical studies. The classics have in many ways pioneered the application of digital methods to narrative spatial analysis and developed strong collaborative engagement with infrastructure, producing Pelagios,[10] an ever-growing platform for a plethora of spatial databases and gazetteers, as well as Recogito,[11] a digital annotation tool. These two successful examples show a pressing need for community building around SRIs for early modern and medieval Scandinavia to ensure sustainable design, long-term preservation, and further collaborative development.

Place-names, the modelling of place-name data, and place-name databases constitute one of the focal points of the volume, as the majority of the chapters deal with names or named places in one way or another.[12] In general, the place-name perspective, including manual or automated collation and processing of name data from texts of any kinds, remains rather undefined, if not to say absent from the consciousness of spatial humanities. In the age of digital gazetteers with pre-defined standardized structures,[13] place-names are very often reduced to mere attributes and are almost never theorized or processed any further. This volume provides several examples of how this structure can be elaborated, adapted, and further developed in accordance with the project's ambitions and needs. Most importantly, however, the volume offers a completely new

5 See https://riksarkivet.se/tora-english (accessed February 16, 2023).

6 See https://ortnamnsregistret.isof.se (accessed February 16, 2023).

7 See http://kulturarvsdata.se (accessed February 16, 2023).

8 See www.digdag.dk (accessed February 16, 2023).

9 E.g. Tuan, *Space and Place*; Warf and Arias, *The Spatial Turn*; Westphal, *Geocriticism*; Tally Jr., *Geocritical Explorations*; *Literary Cartographies*; *Topophrenia*; Boulton, Hawkes, and Stoner, *Place and Space in the Medieval World*.

10 See https://pelagios.org (accessed February 16, 2023).

11 See https://recogito.pelagios.org (accessed February 16, 2023).

12 Or nameless places processed as if they were named: see Skovgaard Boeck, this volume.

13 Goodchild and Hill, "Introduction to Digital Gazetteer Research"; see also Gammeltoft, and Petrulevich, both this volume.

way of structuring place-name data.[14] These are innovative approaches to be considered by anyone interested in developing a spatial dataset from scratch and capturing the essence of place-names to produce as versatile a resource as possible. This focus on place-names also adds to the temporal complexities of the volume, as place-names coined hundreds or thousands of years ago are still in use today, not least in most of the geo-services we are constantly surrounded by.

The field of spatial humanities, centred on the question of location in space, has emerged to become a pioneering area of research that transcends traditional disciplinary boundaries and draws on geographic information system (GIS) technologies.[15] The multidisciplinary inquiry into spatiality across pre-modern materials requires adequate infrastructure resources that have not existed until very recently. For early modern and medieval Scandinavia, the work on building publicly available open-source SRIs is still under development.[16] There is an abundance of literature on spatial humanities and the use of GIS across humanities subjects, cross-interrogating the field on what it means to digitize a place as well as engaging in method development and critical discussion of GIS applications to born analogue data.[17] The challenges of designing, building, and sustaining long-term spatial infrastructures for humanistic research have so far not been addressed at length in a scholarly publication, however. Instead of following along a well-beaten path, the current volume thus breaks completely new ground.

Digital Spatial Research Infrastructures in the Humanities

What are research infrastructures (RIs) in the humanities? And what niche do digital SRIs occupy among them? There are plenty of definitions of the former by national and transnational policy-makers, funders, and interest organizations, such as national research councils, the European Commission, the European Science Foundation (ESF), and the Digital Research Infrastructure for the Arts and Humanities (DARIAH).[18] According to one of the broadest and most straightforward definitions, RIs are

14 See Gammeltoft, this volume.

15 Knowles and Hillier, *Placing History*; Bodenhamer, Corrigan, and Harris, *The Spatial Humanities*; Gregory and Geddes, *Toward Spatial Humanities*; Rossetto, "Theorizing Maps"; Cooper, Donaldson, and Murrieta-Flores, *Literary Mapping*; Murrieta-Flores and Howell, "Towards the Spatial Analysis"; Dunn, *A History of Place*.

16 Hafsal, Amundsen, and Gammeltoft, "Nytt digitalt liv"; Karsvall, "Historical Settlement Units"; Petrulevich, Backman, and Adams, "Medieval Macrospace through GIS"; Lethbridge, "Digital Mapping."

17 Travis, Ludlow, and Gyuris, *Historical Geography*; Dunn, *A History of Place*; Gregory and Geddes, *Toward Spatial Humanities*; Tally Jr., *Literary Cartographies*; von Lünen and Travis, *History and GIS*.

18 See Swedish Research Council, "The Swedish Research Council's Guide to Research Infrastructure 2018"; Research Council of Norway, "*Norwegian Roadmap for Research Infrastructure 2018*"; Danish Agency for Higher Education and Science, "Danish Roadmap for Research Infrastructure 2020"; European Commission, "European Research Infrastructures"; ESF, "Research Infrastructures in the Humanities"; DARIAH, "Mission and Vision."

"facilities, resources, and services that are used by the research communities to conduct research."[19] In the ESF's Science Policy Briefing 42 on RIs in the digital humanities from 2011, infrastructures in spatial humanities were the subject of one of the case studies; the sector-specific challenges were defined as needs for data resources, interdisciplinary collaboration, and methodological developments.[20] Drawing on these definitions and state-of-the-art analyses, an SRI can be very broadly defined as a digital resource used for research on location-based data in spatial humanities and other fields. Additionally, RIs in general and SRIs in particular can be seen as nodes of knowledge production and dissemination incorporating people, networks, tools, methodologies, and so on.[21] The present volume gives an insight into the ongoing dialogue and negotiation of what RIs and SRIs are and can be both in theory and practice.

This dialogue becomes apparent not least in the chapters' different ways of understanding and denoting the type of spatial infrastructure this volume is about. Two main terms are used throughout the book to talk about digital spatial infrastructures in the humanities: *spatial research infrastructures* (SRIs) and *spatial data infrastructures* (SDIs). These two terms are to a large extent synonymous and can often be used interchangeably. There are at least three points of difference, however. SRIs are somewhat tighter in focus compared to spatial data infrastructures, an umbrella concept that incorporates all types of digital infrastructures serving spatial data, SDIs used in business and government included. In this respect, the term "spatial research infrastructure" highlights the main attribute of openly released digital resources built and used for research and financed with research money, be it money from government, non-profit organizations, or independent foundations, namely their purpose: research. By choosing to talk about SRIs, we also want to emphasize that the processes of designing, building, and developing infrastructures are research practices in themselves. There are always research questions shaping SRIs even if these are implicit or, at times, "not allowed." Without research questions and researchers and other professionals processing raw data—such as objects, texts, linguistic items—describing them, and, most importantly, the relationships between them, the infrastructures produced are more or less useless. The final nuance of difference relates to SRIs being—at least seemingly—more inclusive with respect to the type of content that is relevant or central for infrastructures of the kind. This point depends entirely on what definition of spatial data is at play, however. As this book shows, digital spatial research infrastructures in the humanities are not necessarily about numerically representing objects in a geographic coordinate system; some of the location-based materials presented in the volume, most notably place-names, can partially or as a whole lack coordinates in related SRIs. Finally,

19 Science Europe, "Research Infrastructures."

20 ESF Standing Committee for the Humanities, "Research Infrastructures in the Digital Humanities," 30.

21 See PARTHENOS, "What Is Infrastructure?"

the term "spatial research infrastructure" is more in line with the terminology used by policy-makers and research funders; see the overview above.

Why is it important to talk about SRIs? The rapid development toward more sustainable infrastructure work and general awareness, if not yet implementation, of LOD to link available data implies that SRIs themselves are becoming important players in the current and future research landscape. As researchers making use of SRIs are dependent on the choices, priorities, theories, and methods the infrastructure project teams have made and opted for, spatial research infrastructures will have a deep and lasting impact on the type of research it is at all possible to conduct. For this reason, it is of major importance to have an ongoing conversation as to where the field of spatial research infrastructures in the humanities is heading as well as to continue collaboratively developing and linking the already existing infrastructures. Another important goal to work toward is to re-evaluate the status of SRIs—or, indeed, RIs of any kind—as scholarly output as well as the status of the research work invested in these resources.[22] Infrastructure projects in the humanities are often treated as something that is not as valuable as "real" question-driven research. Infrastructures take years of work to produce and require massive research efforts to catalogue, annotate, categorize, edit, comment, normalize, lemmatize, and so on. Considering the significance of (S)RIs for research communities, it is high time to equate infrastructure work with other types of scholarly labour.

The Structure of This Volume

A scientific collection of papers is seldom consumed as a novel from the beginning to the end. Naturally, the chapters included are all independent entities that can be read in their own right. There are multiple connections between the contributions with respect to common themes, however, not least the projects' spatial perspective, and common challenges, not least related to choices and applications of theories and methods. For instance, as mentioned earlier, place-names have become one of the leading components of the book. It is a challenging task to divide the chapters into larger entities with common denominators, as these can hardly summarize all the emerging patterns of affinity. In general, the chapters of the volume fall into three categories: presentations of digital SRI projects; wide-ranging discussions of methods and methodological choices, as well as practical approaches to building and sustaining SRIs; and case studies drawing on the material of the Norse Perception of the World project. For this reason, the core of the present volume consists of three parts: Part One, "Digital Spatial Infrastructures in the Humanities"; Part Two, "Building and Sustaining Digital Spatial Infrastructures: Challenges and Solutions"; and Part Three, "The Norse Perception of the World: Medieval Spatiality in the Digital Age." At the same time, the reader has to bear in mind that all the chapters deal with single or multiple projects in one way

22 The Agreement on Reforming Research Assessment, finalized in July 2022, is a very significant recent global initiative addressing this issue.

or another, and include highly relevant discussions of methods as well as empirical examples of their utilization. In other words, the chosen macrostructure is merely one possible compromise of many. As an addition to this macrostructure, cross-references constitute a highly relevant tool; by cross-referencing we hope to have brought to the fore the dialogue currently ongoing in the field as well as the many links—and, equally important, points of difference—between the contributions.

In the first part, five digital SRIs that are currently under development are presented. In Chapter 1, the editors walk the reader through how the digital gazetteer of East Norse medieval literature, Norse World, was designed, built, and further developed. The chapter offers practical advice for future spatial digitization projects with a focus on pre-modern literature, as well as suggesting possible uses of the web application and the project's data. In Chapter 2, Sara Ellis Nilsson, Terese Zachrisson, Anders Fröjmark, Lena Liepe, and Johan Åhlfeldt showcase the ways in which digital spatial methods can contribute to the understanding and interdisciplinary study of medieval "lived religion." The project "Mapping Lived Religion: the Medieval Cults of Saints in Sweden and Finland" carries out complex digitization and sustainability work digitizing and linking disparate materials from the Swedish National Historical Museums and the Swedish National Heritage Board. The chapter discusses the challenges associated with, for instance, mapping materials of different types, source preservation, and changing administrative borders, and it provides a number of solutions. Chapter 3, by Emily Lethbridge, describes two Icelandic SRIs: the Icelandic Saga Map and Nafnið.is. Both resources categorize and map Icelandic place-names; the first project deals with spatial information attested in the sagas of Icelanders, while the second is the result of an ambitious task to digitize the place-name archive held by the Árni Magnússon Institute for Icelandic Studies in Reykjavík. Lethbridge demonstrates convincingly how these two resources can complement each other and reveal connections between the medieval texts, the manuscripts they are attested in, and the place-names that are still preserved in the Icelandic cultural landscape. This and the two following contributions deal with the challenging task of turning originally analogue resources into powerful digital tools. Consequently, Chapter 4, by Olof Karsvall, discusses the methods applied, choices taken, and experiences learned from the Swedish LOD historical geographic register TORA, a topographical register at the National Archives of Sweden, wherein the sixteenth- and seventeenth-century source material—cadastral registers and large-scale maps—have been digitized and processed to produce an overview of over 25,000 geocoded historical settlements. Similarly, Björn Karlsson, Kristina Neumüller, and Elin Pihl (Chapter 5) summarize the ongoing work of making what is probably the world's largest place-name collection, held by the Institute for Language and Folklore (Isof) in Uppsala, Sweden, available to researchers and the general public in digital format. The chapter addresses the challenges of developing sustainable SRIs and the significance of long-term perspective at all stages of infrastructural work. The collection of approximately 3.7 million index cards of Swedish place-names was first digitized in the 1990s. Thirty years later the results of this early digitization still hamper the development of the new

incarnation of the Swedish digital place-name register; for this reason, the project team is forced to rethink database structures, methodologies, and design choices to produce as sustainable a resource as possible.

The second part of the volume focuses on the ongoing negotiations and implementations of best practices in the field with respect to building and sustaining SRIs. In Chapter 6, Peder Gammeltoft engages with the "spatio-temporal mess" of place-name databases, reconsidering the mainstream approach to handling place-name data in digital gazetteers. Place-names occur in etymologically and otherwise related clusters; moreover, one and the same locality can be associated with multiple names or name forms. Gammeltoft introduces the concept of a unique place-name identifier, and thus a novel approach to structuring place-name data in databases that would "enable coordination between multiple features with the same place-name origin, strengthen place-name standardization management and not least, more exactly represent place-name data across time, space, and domains of usage." The question of how to plan for (S)RI sustainability is the central element of Chapter 7. Agnieszka Backman and Marcus Smith address current best practices as well as what sustainability—with or without the implementation of LOD—can mean in different contexts, not least with respect to the scope of the infrastructure resource at hand. The chapter gives practical advice on how to achieve sustainable outputs in infrastructure projects. Additionally, Backman and Smith provide an insightful discussion of the diversity of outputs SRI projects deliver. The challenges of capturing datasets' spatial-temporal complexities in SRIs is further developed in Chapter 8, in which Peder Dam argues for integrating "time and space … into one dataset with time as an attribute parameter." In projects dealing with administrative divisions, this implies providing a border or an administrative polygon with start and end dates. The method has proved fruitful in DigDag, the digital atlas of the historical-administrative geography of Denmark, frequently used by its interdisciplinary audience. Yet another methodological approach to temporal and prosopographical data is actualized in Chapter 9, by Anna Foka, Elton Barker, Kyriaki Konstantinidou, Nasrin Mostofian, Brady Kiesling, Linda Talatas, O. Cenk Demiroglu, and Kajsa Palm. The authors reflect on the use of digital SRIs and annotation tools for mapping and analyses of Pausanias's *Periegesis Hellados* (*Description of Greece*), the focal point of the Digital Periegesis project. The chapter emphasizes the importance of collaborative approaches to SRIs, because multisectoral communities are absolutely necessary for infrastructures to stay relevant, be sustained, and be developed further in accordance with research needs.

The third part of the volume consists of three case studies all relating to Norse World, an interactive spatial-temporal resource for research into spatiality and worldviews in medieval literature from Sweden and Denmark. Norse World is the main output of the project "The Norse Perception of the World: A Mapping and Analysis of Foreign Place-Names in Medieval Swedish and Danish Texts," which has been central for current collaborative infrastructural development in the Nordic countries. In Chapter 10, Sofia Lodén discusses the role of travel in the Old Swedish translation of *Floire et Blancheflor*

in its European context—i.e., against the background of the other insular and continental versions, the French original included. Lodén focuses on the points of difference in descriptions of Floris/Floire's travel to Babylon in the texts and argues that the Nordic tradition prioritizes the external, "real" world motivation of the protagonist's actions compared to the continental interest in "the human mind and development." The Norse World resource is used for several case studies in philology and historical linguistics in the following chapter (Chapter 11). Alexandra Petrulevich shows that place-name variation data has much to offer in the study of textual criticism, genre, and language variation and change. Most importantly, however, the chapter reconsiders the current mainstream gazetteer structure and its approach to place-name materials, and offers both theory and methodology for dealing with place-names and place-name variants in SRIs in analytically meaningful way. In Chapter 12, Simon Skovgaard Boeck addresses the topical issue of extracting and processing relevant spatial references that do not bear names in some of the medieval source materials. This particular type of spatial references has caused much trouble for the Norse World project team. Although the spatial information is encoded in a non-prototypical way, it is still included in the resource because these spatial references are deemed crucial for interpretations and analyses of associated texts. The three chapters together can be seen as examples of cross-fertilization between SRIs and RI infrastructure studies as a field, on the one hand, and more traditional lines of humanistic research, on the other: the former facilitate the implementation of new methods in literary studies, to take just one example, while the methodology associated with the latter is still indispensable when processing raw material in the context of SRI development.

Finally, in the Concluding Remarks, Stuart Dunn summarizes and contextualizes the volume within the tradition of scholarship in spatial humanities and gives his perspectives on the book's contribution to the advancement of the field.

Final Remarks

This volume introduces a new, topical field of inquiry in spatial and digital humanities, digital spatial research infrastructure studies, and deepens the interdisciplinary scholarship on spatiality in pre-modern sources in the digital age. The reader is offered a comprehensive overview of currently developed SRIs with a focus on Scandinavia and beyond as well as critical perspectives on the outcomes of the ongoing rapid digitization in the Nordic countries. These resources provide the latest digital toolbox for customized qualitative and quantitative analyses of large amounts of geocoded humanities data, and thus further facilitate research in the digital age on spatiality in pre-modern narrative sources and societies. Most of the projects have a multidisciplinary background, engaging historians, art historians, linguists, philologists, onomasticians, literary scholars, geographers, research engineers, and specialists in digital humanities. Additionally, the current collection makes a solid contribution to the discussion of best practice solutions for collaborative engagement with digital SRIs for scholars and students across the humanities.

We have worked on this book with a heterogeneous interdisciplinary readership in mind. First, the chapters will be of importance for postgraduates, researchers, and academics interested in pursuing digital SRI projects. Second, the spatial and other data delivered by the databases, interactive platforms, and other web applications presented are valuable sources of primary material for student theses as well as research papers. The volume is therefore an ideal introduction to the methodologies and approaches to data, coding, and visualization behind downloaded datasets. Some of the chapters, especially those in Part 2 and Part 3, can also be used for teaching digital humanities and spatial humanities at upper undergraduate and postgraduate level. Third, as much of the material presented in the volume belongs to the cultural heritage sector, the book will be of great help to professionals working at GLAM institutions (galleries, libraries, archives, and museums) who are keen to work with academics in devising collaborative infrastructure projects. Furthermore, as the spatial turn in the humanities has reshaped course structures and curricula, we anticipate that the projects, theories, and methodologies presented in the volume will have a broader appeal in an academic teaching context. Digital spatial analysis, text annotation, ontologies, and LOD applications appear nowadays on traditional curricula in the fields of history, medieval studies, onomastics, philology, manuscript studies, literature and archaeology, among others.

As we have outlined above, the present volume complements the existing literature on spatial humanities and GIS applications in various fields of the humanities by elucidating the processes of understanding, building, linking, and sustaining digital SRIs in the humanities as a collaborative enterprise. By including a considerable number of cross-references throughout the collection, we hope we have achieved and made visible an interdisciplinary multisectoral dialogue between project teams, institutions, networks, and countries. One common denominator appearing in most chapters are place-names, linguistic units with complex transmission histories and essential attributes of any digital gazetteer. Place-names have rarely been theorized or modelled in order to capture the many functions they have with respect to spatial orientation, cognition, and linking landscape features in clusters based on common etymologies and other factors. This book is one of the first contributions published under the umbrella of spatial humanities that explicitly addresses these issues.

In more general terms, the volume seeks to reconsider the value of academic labour put into infrastructure projects and equate these efforts, including the projects' outputs to question-driven research published in article or monography format. Digital spatial research infrastructures in the humanities are becoming key interdisciplinary hubs facilitating and, most importantly, shaping innovative research. In addition to serving data to external users, the infrastructures disseminate ideas, theories, and methods, and thus leave a considerable footprint on any study drawing on these resources. It is hard to overestimate the significance and the impact of these infrastructures on traditional disciplinary research from a long-term perspective when LOD technologies have become mainstream. For this reason, it is important to foster world-class research infrastructures by giving practitioners the academic credit they deserve.

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