Steven M. Manson
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Building the Spatial University

Spatial Thinking, Learning, and Service Throughout the System

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ISBN 978-3-030-92846-9 ISBN 978-3-030-92847-6 (eBook)
https://doi.org/10.1007/978-3-030-92847-6

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This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

This volume summarizes a large body of knowledge and practice on how institutions can encourage spatial research, teaching, and service.

We developed this work in large part because the editors and others at the University of Minnesota were fielding an increasing number of inquiries about how we support spatial research, teaching, and service. By a stroke of good timing, Zachary Romano, then Associate Editor and now Senior Publishing Editor with the Earth Sciences, Geography, and Environment portfolio at Springer Science, approached Len Kne at the Esri User Conference a few years ago and asked whether he would put together a volume on U-Spatial, the University's spatial science infrastructure. Realizing that editing a volume can be both fun and frustrating, Len tapped Steven Manson, and they in turn, brought in Brittany Krzyzanowski and Jane Lindelof to share the joy and pain.

We thought this volume would be primarily about U-Spatial, which is the subject of Chap. 2 and woven throughout this volume. As we engaged with potential readers and authors, however, it became clear that we are really interested in the broader idea of the spatial university. This volume offers an expansive view on the power and possibility of spatial science for research, teaching, and outreach for scholars and institutions more broadly. The role of spatiality in almost all realms of higher learning became even more evident as the COVID-19 pandemic forced so many people to embrace technology as a way to navigate many facets of the crisis.

Given this broader focus on the spatial university, we originally envisioned two primary audiences for this book, and they remained front and center throughout. The first is spatial science practitioners and leaders who work within academic institutions. The second is a range of information technology, physical plant, facilities management, librarians, and research administrators in education, academia, and a host of other sectors who are looking for insight and direction on developing spatial science infrastructure.

In putting the volume together, it became clear that others could benefit from this volume. This work can be a resource for spatial researchers and practitioners interested in a broad view on spatial science as it applies to a range of domains. It can also aid graduate students in a range of fields who are grappling with developing or

working with spatial data and analysis in their research, including master's students in geographic information science (GISc), information science, or library science. In terms of domain-specific audiences, social scientists and humanities scholars have always had an interest in mapping and space, but the recent increased visibility and importance of spatial data and approaches has placed spatial science and infrastructure at the forefront of many fields.

We are also seeing an increase in the digital humanities and environmental humanities—areas with an interest in spatial science as both a methodological and technical approach, as well as a subject of critical study. Earth, planetary, ecological, and natural scientists have embraced the role of spatial science in the study of the earth as an integrated human–environment system. These researchers use spatial data and approaches to study ocean, land, and atmosphere processes. Finally, much spatial research is performed by information, data, and computer scientists and engineers. This volume gives these researchers an overview of the major challenges and opportunities in spatial science and infrastructure.

While we believe that many different groups of people will find value in this volume, our larger goal is to demonstrate the many ways in which spatial science and infrastructure are integral to many areas of research, teaching, and service. Given the breadth of the examples, however, the volume should speak to those in the private sector, non-profit organizations, and governmental organizations. We hope it will be useful and comprehensible across this range of inquire and practice for years to come.

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Foreword: Envisioning the Spatial University—An Origin Story

I'm grateful to the editors for inviting me to prepare this foreword to *Building the Spatial University*. I especially appreciate that Steve encouraged me to share my personal perspective on the genesis of the "spatial university" concept. Although the narrative roughly follows my haphazard career path, I trust readers will know that the point of the story is how the University of Minnesota's leading example inspired the spatial university vision.

As a graduate student in geography at the University of Wisconsin-Madison during the early 1980s, I worked in the UW Cartography Lab in Old Science Hall. Cartography then would be unrecognizable to cartographers today. We drafted maps and other information graphics with pen and ink, or etched them onto film, then combined hand-made layers into photographic negatives in darkrooms for printing. GIS software products were just beginning to become available on workstation computers, but their utility was limited for the old-school "photomechanical" mapmaking we practiced.

The most useful computer application for traditional cartographers was the DOS-based World Projections Package coded by University of Minnesota historian and information technology specialist Phillip Voxland. World allowed us to specify map projection parameters for many of the projections catalogued in John P. Snyder's *Map Projections: A Working Manual* and to plot the result to laser printers via the Postscript page description language. Using one of the massive process cameras in the Cart Lab darkroom, we converted plots to film layers that could be overlaid photographically with other map layers.

A couple of years later, a clever grad student at Temple University created a program that converted the printer Postscript produced by World into a format that we could open and edit in Adobe Illustrator, the new PC-based PostScript drawing package. That small innovation would hasten to the evolution of the illustrative cartography into a digital field of practice. Within a decade, that practice would merge with GIS.

As my studies at UW-Madison progressed, I began to think about how, and where, to begin building a career in cartography. At one point I visited our neighbor to the north—the University of Minnesota's Department of Geography—which

hosted a Cart Lab much like the one at UW. I recall asking Greg Chu, then-manager of the University of Minnesota Cart Lab, what the job prospects were for a young cartographer in Minneapolis. Greg made a lasting impression when he said that "there's only one good cartography job in the Twin Cities, and I have it!" Meanwhile, the University of Minnesota's Mark Lindberg was in the vanguard of computer cartographers who recognized the potential of PostScript. Within a few years, GIS and digital cartography displaced traditional methods. The University of Minnesota scrapped the Cart Lab's massive process camera—using a giant crane to haul it out of the fourth floor of Blegen Hall.

After graduating from UW-Madison with bachelor's and master's degrees in cartography, I took a job as a cartographer in Penn State's Department of Geography. Cart Lab director Alan MacEachren charged me to help shepherd Penn State through the transition from traditional to digital cartography. Later, I had the opportunity to develop and teach a new undergraduate course called Mapping Our Changing World, which I first taught in 1997. It was the first mapping course to be listed as a General Education course at Penn State—meaning that many students from across campus could count it toward their Social Science General Education breadth requirement.

Leading the way, the University of Minnesota's Phil Gersmehl and colleagues had pioneered a general studies course called The Language of Maps ten years earlier. That course subsequently evolved to an offering entitled "Mapping Our World." As such, it is—to the best of my knowledge—the first and longest-lasting university course to convince a faculty committee that mapping and spatial thinking are a valuable parts of every student's liberal education.

In the late 1990s, I had the unique opportunity to design and build a new Certificate Program in GIS that would be offered entirely online through Penn State's "World Campus." The venture was successful enough that I was invited to propose an online "Master of GIS" degree. Amidst fears about the "commodification of higher education," the notion of an online master's degree in GIS was controversial in those days. To reassure skeptical colleagues, we modeled the new program after the University of Minnesota's existing MGIS degree—even borrowing the same degree title. Although the University of Minnesota program was, and still is, offered on campus and not online, it was still encouraging to know that a respected peer institution saw fit to create a comparable degree. Both programs continue to thrive now, more than 20 years on. Paul Bolstad's *GIS Fundamentals* text is required reading for Penn State MGIS students.

One of the complaints about our MGIS degree program proposal was that it lacked attention to professional ethics, which seemed inconsistent with the fact that we pitched it as a "professional" program. A few years after launching the program, I joined with the University of Minnesota's Professor Francis Harvey, and Oregon State's Dawn Wright, to request funding for a GIS Professional Ethics project from the National Science Foundation. Francis had been active in earlier efforts to formalize an ethics of GIS, and the University of Minnesota's Will Craig was instrumental in publishing a GIS Code of Ethics in 1992. The National Science Foundation (NSF) funded our project, which eventually produced a collection of 16 GIS-related

case studies for ethics education. The University of Minnesota led by example yet again.

Will Craig played leading roles in our field as president of URISA—the Urban and Regional Information Systems Association—and of the University Consortium for Geographic Information Science (UCGIS). Bob McMaster also stepped up to co-organize UCGIS' *Research Agenda in GIScience* (2005). Both those leaders helped inspire me to organize the 1st Edition of UCGIS' *Geographic Information Science and Technology Body of Knowledge*, published by the Association of American Geographers in 2006. Bob especially impressed me as someone who could be counted on to finish what he started. Despite having been elevated to a vice provost position at the University of Minnesota, Bob still faithfully attends UCGIS Symposia and is a fellow of the organization.

In 2011, at a crossroads in my life and career, I welcomed Jack Dangermond's invitation to join Esri as "Director of Education." It was primarily a managerial job with frequent outreach appearances at professional meetings and university campuses. A few months after arriving Esri's headquarters in Redlands, California, I was surprised by an invitation to deliver that year's Borchert Lecture at the University of Minnesota. Jack is a distinguished University of Minnesota alumnus, a former student of Professor John Borchert, and was the inaugural Borchert Lecture Series speaker in 2008. "Jack," I announced proudly, "I've been invited to the Borchert Lecture!" "Great," he replied. "Who's speaking?"

I started that visit at the University of Minnesota Duluth, where I saw firsthand the great work that Stacey Stark was doing there; met with administrators, faculty, and students; and gave a talk at the GIS Day event. Later, at the Minneapolis campus, I met with Steve Manson, Will Craig, Bob and Susanna McMaster, Mark Lindberg, Ryan Mattke and colleagues at the Borchert Map Library, and Dan Sward—the GIS specialist in University Services. I was deeply impressed with the geospatial research and applications I saw at the Center for Urban and Regional Affairs, Minnesota Population Center, the Institute on the Environment, and the Polar Geospatial Center, among others. As described in this volume, the University of Minnesota's Office of the Vice President for Research helped establish U-Spatial in 2011. Even in those early days, U-Spatial's potential to foster campus-wide synergies in geospatial research, teaching, learning, and campus operations was plain to see.

I knew the lay of the land, then, when Jack invited me to accompany him to the University of Minnesota the following spring. Esri colleague (and University of Minnesota Geography alumna) Angela Lee joined us. Jack presented a lecture about the implications of "cloud" technology at the Humphrey Institute, and together we visited the College of Design with our host Tom Fisher. Later in the day, Jack and I had an audience with University President Eric Kaler. Jack had said that he wished to offer President Kaler a vision of the leading role that the University was poised to take. Jack seeks out leading organizations in each of Esri's business sectors and expects his industry managers to find ways (other than financial support) to boost their efforts and influence. His favorite metaphor for such organizations was "lighthouses." In the lead up to our visit I'd pondered what a "lighthouse" institution in

higher education would look like, and I was convinced that the University of Minnesota could be it. When Jack asked me to share my thoughts with President Kaler, I found myself describing the "spatial university" vision. After returning home to Southern California, I discussed the idea with Esri colleague Tom Baker, who co-authored the blog post that's referenced in this volume.

I promoted the spatial university concept thereafter in my travels to higher education institutions around the country and abroad. A special emphasis was on the select group of American and European universities represented in the Esri Development Center program (EDCs, now called Esri Innovation Centers). Prominent among those was—and still is—the University of Minnesota. Len Kne and Mark Lindberg participated faithfully in EDC annual meetings held in Palm Springs during Esri's Developers Summit. Esri founded the EDC program in 2008 to encourage higher education institutions to incorporate more coding, app building, and IT in their GIS education programs. The University of Minnesota was a role model for progressive education programs even before Eric Shook organized his Cyber Literacy for GIScience project, which provides a rationale and roadmap for modern GIS curricula. Its stature as a "lighthouse" university was affirmed in 2018, when Len Kne, Tom Fisher, Somayeh Dodge, and two students appeared on the "big stage" at the Esri User Conference—the first university to be so featured.

The spatial university concept seemed to evaporate at Esri soon after I retired in 2019. President Kaler was non-committal about it too, though the University's new leadership may yet embrace the vision. In any event, it's gratifying to see how the U-Spatial community continues to embrace—and embody—that vision 10 years on. There's no definitive list of "Spatial Universities," nor is there like to be (UCGIS considered formalizing the designation, but ultimately passed). However, from where I stand, it's true that the University of Minnesota's long and exemplary record of achievement in geospatial research, development, and applications, teaching and learning, and service inspired the concept in the first place.

August 2021 David DiBiase

Acknowledgments

We would like to express our gratitude to a number of people who offered advice and guidance on the text and apologize to anyone we missed!

- Jason Borah and David Peterson in Chap. 3 on the role of spatial technology in the U of M foundation.
- Madeleine Kerr for the development of text on nursing informatics in Chap. 5.
- Kaushi Kanankege in Chap. 5 on the role of spatial methods in veterinary sciences, and
- Paul Morin and Jonathan Pundsack for their work at the Polar Geospatial Center and conversations that informed parts of Chap. 5.
- Carissa Schively Slotterback for many early conversations on campus around GISc.
- Julie Santella did a very helpful editing pass-through.
- Institute on the Environment web team for their research page, which informed parts of Chap. 5.

We owe much to a number of leaders in various units across campus who have supported making the University of Minnesota the spatial university:

- The deans and associate deans in the founding of U-Spatial units noted in Chap. 2
- Claudia Neuhauser, Frances Lawrenz, Michael Oakes, Chris Cramer, and James Wilgenbusch in the Office of Vice President for Research for their vision and ongoing support in helping found and sustain U-Spatial and the larger research enterprise
- Jessica Hellmann and Jonathan Foley of the Institute on the Environment
- Brian Swanson, an early supporter for and proponent of shared spatial infrastructure

Thanks to the good folks at Esri who have worked with us over the years, including Angela Lee, Patricia Cummings, Tom Baker, and David Dibiase (who kindly wrote the Foreword). Thanks too to the Esri technical teams, who work with many people at the University of Minnesota on a regular basis.

And, of course, a huge thanks to Jack Dangermond, who has a long relationship with the University. We presented the core ideas of U-Spatial to Jack soon after being funded (more in Chap. 2) and he had a lot of good feedback and advice to offer.

Thanks to the Springer team to their patience as the pandemic put up roadblock after roadblock.

Finally, we also need to thank all our colleagues at U of M for their adoption and diverse use of GISc (whether they realize it or not). The first U-Spatial email list had 87 contacts; today that list is over 1500 people and continues to grow at a rapid pace. We wish we had the space in this book to share all of the stories about our colleague's research, teaching, and outreach. Check out thespatialuniversity.umn.edu, where we do our best to compile and showcase the great work happening across the U of M system.

Contents

The original version of this book was revised. The correction is available at https://doi.org/10.1007/978-3-030-92847-6_7