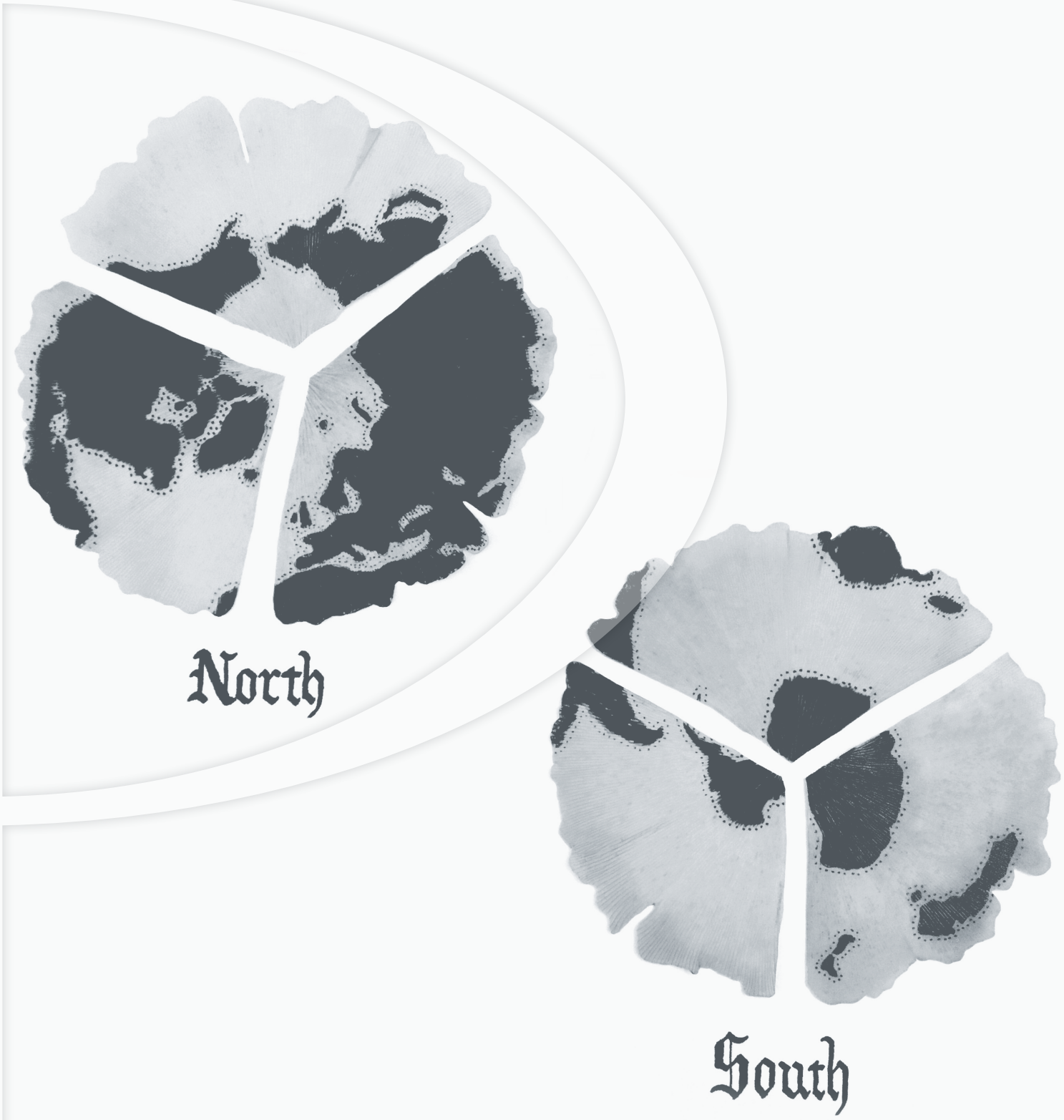
Cartographic Perspectives

The Journal of nacis

SPECIAL ISSUE ON ETHICS Number 105, 2025



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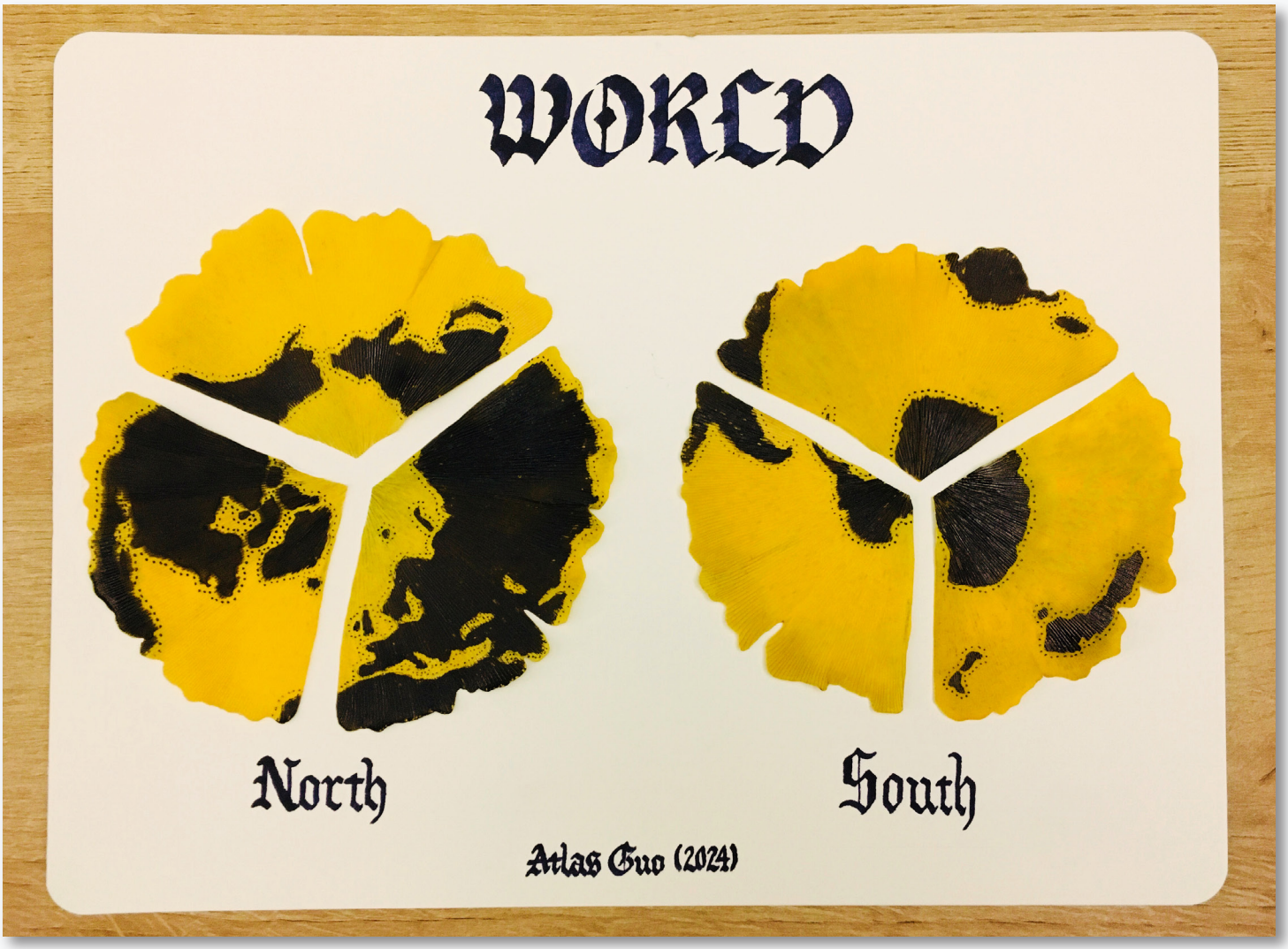

The cover of this issue of *CP* features an artistic map by Atlas Guo, transforming ginkgo leaves into abstract representations of the two hemispheres using an orthographic projection. The golden hue of the leaves is strikingly beautiful, while the natural texture of their venation is overlaid with black ink to depict continents. Learn more about Atlas's work at **CartoGuophy.com**.

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A Letter from the Guest Editors

INTRODUCTION TO ETHICS IN CARTOGRAPHY

This special issue of *Cartographic Perspectives (CP)* focuses on ethics in cartography—a theme that has found its way into this publication a number of times since the inception of *CP*. The first *CP* article on ethics appeared in the seventh issue, in 1990, when Patrick McHaffie and his colleagues shared a roundtable commentary on "Ethical Problems in Cartography" from the perspectives of cartographers in government, the private sector, and academia. In the tenth issue, in 1991, Mark Monmonier wrote about "Ethics and Map Design," and Brian Harley asked, "Can There be a Cartographic Ethics?" In 1999, Michael Peterson wrote about "The Web and Ethics in Cartography," and Matthew McGranaghan wrote "The Web, Cartography and Trust." In 2006, Tom Koch explored "Ethics and Mapping as a Profession," and in 2008, a dialog between Mark Denil ("Manifestos") and Steven Holloway ("Response to Mark Denil's 'Manifestos'") focused on **Steven's 2007 poster**, "Right MAP Making," which outlined five fundamental principles of ethical mapmaking. We now tackle the subject again, this time in a full issue dedicated to ethics in cartography.

In this introduction, before describing what you can look forward to in this issue, we cover some general concepts about cartographic ethics, including its definition, importance, key themes, and stakeholders.

DEFINITION

The Merriam-Webster **dictionary defines** *ethics* as "the principles of conduct governing an individual or a profession." David DiBiase, in his article in this special issue, offers us this definition of *geospatial ethics*:

> "Ethics" refers here to questions of right and wrong that arise in applications of geospatial technology, data, and methods. "Ethical" geospatial professionals and organizations know how to respond to such questions with insight, empathy, and integrity.

The International Cartographic Association (ICA) **defines *cartography*** as "the discipline dealing with the art, science and technology of making and using maps." Combining this definition of cartography with the previous definitions of ethics, we can describe cartographic ethics as principles of conduct governing our response to ethical and moral questions of right and wrong that relate to the nature, creation, and use of cartographic data, methods, technologies, and products.

However, perhaps the bounds of cartography are not so clear as the ICA's wording might make it seem. We see cartography as an integrative field—one that draws from other fields to, **in the words of** Merriam-Webster, "form, coordinate, or blend into a functioning or unified whole." Those elements which it draws upon include models of practice from the arts (like critique) and sciences (like evidence-based rigor), and a focus on taking advantage of rapidly evolving tools and technology that we see in many technical and craft fields. Cartography is also integrative because its *practitioners* come to mapmaking from a wide variety of disciplines and industries. In practice, cartography integrates the thinking and doing of mapmakers who are formally trained in the subject (often within the academic discipline of geography) with the thinking and doing of people with a wide variety of other backgrounds—graphic design, software development, journalism, business management, surveying, military operations, urban planning, environmental management, and more.

As an integrative field, ethical issues in cartography must also interact with ethics in the fields of art, science, and technology, as well as graphics, communication, and others. This places cartography in a unique position of sharing values with its complementary fields while grounding those values in the fundamental form of cartographic expression—a map. For example, values of accuracy, neutrality, and reduction of distortion, which are relevant in communication and science, are also important ethical considerations in cartography. Ethical values in graphic arts, such as respect for intellectual property and authenticity, also relate to cartography. Ethics issues related to technology, like privacy, data protection, and security, are also pertinent to cartography. Furthermore, ethics in cartography are applicable not only to trained professionals, but anyone creating, using, publishing, preserving, archiving, and developing methods and software for maps.

IMPORTANCE

The issue of ethics in cartography is crucial for several reasons. Maps have a profound impact on how we perceive and interact with the world, and they can shape our understanding of myriad facets of our environment, like territories, boundaries, and cultural landscapes. Cartography plays a vital role in decision-making processes—governments, organizations, and individuals rely on maps to make informed choices about resource allocation, urban planning, disaster management, and more. When maps are created with attention to ethical issues, based on reliable information, and made with analytical integrity, decision makers have better tools to help them understand issues and find solutions.

Additionally, maps—either deliberately or inadvertently—have social, political, and economic implications. They can perpetuate existing power dynamics, reinforce stereotypes, or marginalize certain communities. Ethical cartography aims to challenge these biases and promote inclusivity, fairness, and social justice in map representation. By considering the diverse perspectives and needs of different communities, we can create maps that more accurately reflect the world we live in. In summary, ethics in cartography encourages important topics such as accuracy, reliability, fairness, and inclusivity to be considered in map creation and use. Cartographic ethics are essential for maintaining the integrity of maps, and, by extension, supporting informed decision making that benefits society.

KEY TOPICS

There are a range of principles and factors that guide ethical practice in cartography. Here, we describe some key topics. ***Privacy and security*** considerations aim to reduce the risks of exposing confidential, personal, or sensitive information in the collection, storage, and sharing of geospatial data. Disclosure and attribution of ***data sources and provenance*** allows mapmakers and map users to evaluate the reliability and accuracy of map data. ***Analytical integrity*** with regard to data quality, statistical validity, transparency, and reproducibility enable assessment of the reliability and accuracy of data handling and analysis. ***Inaccuracy and misrepresentation*** through distorted or falsified visual representation can lead to misinformation. Adhering to ethical standards and guidelines in all stages of data collection, analysis, and graphic representation are essential for ethical mapmaking.

Maps are models of the world that people use to guide their actions. While models can be powerful tools for understanding and predicting complex systems, it is essential to be aware of their limitations. For example, maps have the potential to perpetuate ***bias and stereotypes*** by selectively including or excluding features or using biased labeling or symbols. By striving to present information in a fair and unbiased way, cartographers can enhance the quality, accuracy, and fairness of maps. ***Cultural sensitivity*** should be considered because maps should respect the cultural values and sensitivities of different communities. This consideration is especially important in order to avoid misrepresentation, for example, of Indigenous and culturally significant places, which could have detrimental ramifications such as misappropriation of resources. Maps can also have an ***environmental impact***, such as promoting sustainable or unsustainable development or contributing to habitat preservation or destruction, depending on how complex phenomena are simplified and abstracted in a mapped representation.

Awareness of ***law and policy*** helps cartographers to avoid legal issues and potential liabilities related to data privacy, intellectual property rights, access and use restrictions on data, and more. Attention to ***workplace ethics*** promotes an environment in which cartographic professionals can uphold integrity, trust, and accountability in their work by emphasizing professional conduct, respect for diversity, conflict resolution, professional development, and confidentiality.

Technological advancements have had a significant impact on cartographic ethics. The ease of creating and disseminating maps through digital platforms has increased the risk of ***misinformation and manipulation***. Cartographers should be cautious about the accuracy and reliability of their data sources and ensure that their maps are not used to mislead or misinform readers. Technology has the potential to improve map ***accessibility*** for individuals with disabilities so they can access and use maps effectively; however, it also raises challenges in terms of ensuring equal access to maps for all users, including removing barriers to access and bridging skills gaps. The use of artificial intelligence in cartography raises issues of ***bias and fairness*** because AI algorithms can inadvertently introduce biases based on their training data, leading to unfair or discriminatory outcomes. For example, a mapping algorithm that relies on historical data that does not reflect current demographics in a particular area can lead to biased outcomes. Cartographers need to be aware of these biases and strive for fairness and inclusivity in their use of AI for mapping. The use of Al and automation in cartography also raises questions about the role of ***human judgment and expertise***. While these tools can enhance efficiency, it is essential to strike a balance between automated

processes and human decision making to ensure the accuracy and appropriateness of maps. It is crucial for cartographers to stay informed about emerging technologies, engage in ongoing discussions, and propose ethical guidelines to navigate these challenges responsibly.

STAKEHOLDERS

Ethics in cartography should be a concern for a variety of stakeholders, including cartographers, geographers, researchers, policymakers, educators, and the general public. ***Cartographers*** create maps to facilitate understanding, support navigation, visualize data, tell stories, and play a crucial role in various forms of communication across different contexts and disciplines. Attention to ethical practices promotes the integrity and credibility of the cartographer's work to support these map uses. Because ***geographers and researchers*** rely on maps as a fundamental tool in their research and analysis, ethical cartography increases the probability that their maps provide reliable and trustworthy information. When ***policymakers*** use maps to inform decision-making processes, such as urban planning, resource allocation, and disaster management, the products of ethical cartography help them make better-informed choices for the benefit of society. For ***educators*** teaching about cartography, instilling an understanding of the importance of ethics in map creation and interpretation helps students critically evaluate maps and consider their social, cultural, and other implications. Maps for the ***general public*** shape our perception of the world and influence how we navigate and interact with our surroundings. Ethical cartography aims to ensure that maps are fair, inclusive, and free from biases, benefiting everyone who uses them.

THIS ISSUE OF CP

As mentioned in the beginning, cartographers are practitioners in an integrative field that draws ideas, techniques, and practitioners from many other fields, and those other fields often have their own ethical principles and guidelines. Additionally, cartographers support different kinds of clients and end users, including urban and regional planning, teaching and research, environmental and conservation efforts, technological services (for example, geospatial services and software development), natural resource management (in forestry, agriculture, water resources, oil and gas, and other areas), telecommunications and navigation, health and epidemiology, tourism and recreation, and security and defense. Each of these audiences may also have associated ethical principles and guidelines.

Although those ethical principles and guidelines are important, and it would be illuminating to see an accounting of them, that was not the focus of this special issue of *CP*. Instead, we wanted to get a better sense of the kinds of ethical issues that cartographers encounter in their work—and how they grapple with them. In one of our many conversations about this special issue, Nat noted, "It's not the framing *per se* but the *use* of that framing" in which we are interested. We wanted to learn about how cartographers "respond to questions of right and wrong … with insight, empathy, and integrity," to borrow from David's definition of geospatial ethics.

To that end, we issued this call for contributions:

> We are looking for short (1000–3000 word; shorter if need be) texts that address ethical dilemmas you have encountered in the map world, and how they were or were not resolved. We are looking for variety in every dimension we can think of—what

> sector of the map world you work in, what kind of issues you are dealing, and the cultures the conflict comes out of.
>
> What we want is less theory and more practice: it's the wrestling with ethical quandaries we are interested in. We are just fine with describing conflicts that aren't resolved. Not all ethical issues are neat and simple—this is part of the point of view we are working from.

We hoped to learn about issues that people felt were related to their conception of cartographic principles, and how those issues aligned, intersected, or conflicted with other ethical issues. For example, how might ethical principles related to science conflict with ethical principles in communication, or how might principles of transparency conflict with principles of data privacy. These insights are important because few cartographers are bound by a formal code of professional ethics; our actions and decisions are governed by suggestions, guidelines, principles, and codes from a variety of other sources. And the practical nature of our work forces the issues because, in the end, there is a product that reflects the choices we made which can be scrutinized and judged. Part of that judgement can be passed on us, as ethical actors, but also on our profession, as the stage we act upon.

In response to our solicitation, we received a number of manuscripts, which we call "case studies," that constitute the majority of this special issue. These contributions were submitted by colleagues in government, academia, and the private sector; by students, teachers, and seasoned practitioners; and by people from different cultures and with different backgrounds. Taken together, we believe this collection provides a broad, though not exhaustive, range of ethical concerns and challenges encountered by people undertaking cartographic work. The case studies illustrate diverse challenges faced by these cartographers—and diverse responses. Some (like **Seda Şalap-Ayça** and **Daniel P. Huffman**) focus on personal actions and conscience. Others (like **Leo Dillon** and **Daniel E. Coe**) describe ethical challenges within the context of institutional systems. Some (like Leo) address issues we recognize to be grounded in cartography, including place names and disputed boundaries, or related disciplines, like graphic communication (in the anonymous graphics reporter's case study). Still others struggle with ethical issues that arise from the integration of cartography with other fields (such as linguistics and Indigenous cultures in **Kim Shortreed**'s case study; and conservation and biological anthropology, among others, in the case study by **Laura C. Loyola** and her colleagues). Still others (like **Lily Houtman** and their colleagues, and **Aaron Adams** and his colleagues) illuminate the challenges of making maps in an environment that did not have codified ethics to apply to their situation.

The stories shared with us also range from the technical, like Daniel Coe's and Lily's approaches to ethical solutions through symbology, to socially-oriented responses to situations, like Daniel Huffman's and Kim's thoughtful changes in their dealings with other people. Some cartographers shared reflections of inadequacies—**Caglar Koylu** and **Alice Bee Kasakoff** describe confronting "the inherent complexities and biases in [their] historical data collection," and **Mairéad de Róiste** recounts the lack of "soft skills" that would have allowed her to question "a task that should have required a pause for at least some ethical consideration." Others confess to shortcomings, like Laura and her colleagues, who divulge that their solutions "do not address the underlying ethical issues of how power can be embodied in place names." Others admitted occasional defeat, like Leo, who noted in the summary of one of his three "episodes" that, "Established practice and rule-based order, it seemed, would take

a back seat to optics. As a civil servant whose career was guided by professional ethics, that was a hard reality to swallow."

Many of the cartographers willingly imparted words to the wise or calls to action. Mairéad's experience led her to "advocate here for the importance of practical ethics in geospatial education." Daniel Huffman crafted "a sort of poem, or perhaps series of aphorisms" for critiquing with empathy. Daniel Coe reminds us to be "cognizant of how [mapped] information could be used in detrimental ways." Kim's map "strives to champion Indigenous toponymic resurgence and awareness." Lily and their colleagues commend "the impact of collaboration" that "combined and collective knowledge" brings to inclusive map design. Caglar and Ann conclude, "it's about shaping a more equitable and comprehensive understanding of history that honors the diversity of all its participants." Aaron and his colleagues share with us this parting observation: "We must also ensure that we do not contribute to the infodemic through poor cartographic decisions, which can only be achieved by working ethical strategies into our workflows from the beginning of a project."

As **Nat Case**'s following letter in this special issue recounts, we struggled with a number of submissions that were less about ethical problem solving, which was our focus for this special issue, and more about the emotional load of ethical issues that the authors did not feel empowered to address. Although we ultimately decided to not include these pieces, they emphasized for us how important "power" is within ethical discussions and how much our personal ethical instincts start with *feelings* of right and wrong, rather than codified principles. This supports our definition of ethics as "principles of conduct governing our response to ethical and moral questions of right and wrong" that relate to cartography, but it points to the need to take into consideration the impetus for ethics, which may not be so clearly codifiable.

We also solicited two peer-reviewed articles to include in this special issue's discussion of ethical issues in cartography—not to provide a set of ethical principles, but to structure and give more precise language to that discussion. As the orchestrator of the roundtable discussion that first broached the subject of ethics in this publication in 1991, then-editor of *CP* **David DiBiase** is perfectly positioned to reflect on the evolution of primary ethical concerns in cartography. He also describes a case study approach to teach ethics in a college-level cartographic and GIScience curriculum, and he demonstrates how the "cases" in this special issue can be adapted to help "hone geospatial professionals' and organizations' ethical problem-solving abilities." **Nat Case**, **Timothy J. Prestby**, and **Georg Gartner**'s paper grew out of informal discussions at the International Cartographic Conference in Cape Town in August 2023, where multiple speakers referred to the idea that "people trust maps." Struck by how little foundational work had been done on trust in maps, they developed their article by drawing from trust studies in a variety of other fields to formulate a basic language for continued discussion of trust in maps within the field of cartography.

Thomas Pingel's submission was an anomaly, fitting neither the case study nor peer-reviewed article categories. We were enthusiastic to include his article because it directly targeted the issue of objectivity—a principal tenet in scientific ethics—and subjectivity—a counterpoint in critical cartography. Thomas concludes, "The challenge before us is not to choose between objectivity and subjectivity, but to thoughtfully integrate both approaches in service of deeper understanding. By doing so, we can create spatial narratives and visual

stories that are both compelling and comprehensive, that acknowledge our individual perspectives while still reaching for broader truths."

CONCLUSION

As David notes in his article, "ethics is a multifaceted concept that tends to reflect the point of view of the person or group that's thinking about it. We should expect that different individual practitioners and groups within cartography and GIS will have different perspectives on ethics. If true, then the more practitioners and groups that are invited to reflect on ethics in cartography, the more kaleidoscopic the view is likely to become." He goes on to suggest that there is the "possibility that consensus may recede, rather than emerge, from inclusive conversations about ethics." Our introduction to this special issue, and indeed the contents of this issue, may seem to support David's speculations. Nonetheless, it is also evident that there are some key topics that repeatedly come up (bias, transparency, privacy, cultural sensitivity), and it is likely that there are some core principles that cartographers would agree are integral to ethical cartography (honesty, accountability, integrity). It is also likely that the majority of cartographers would be interested in preserving trust in maps so that their credibility is not eroded, as has been the case for so many other forms of information communication in the digital age. Although this special issue offers significantly less than a set of guiding principles or a code of ethics for cartography, perhaps it will serve as an important step in that direction.

It is our hope that this *CP* special issue can help to elevate ethical awareness in the education, training, and professional practice of cartographers and mapmakers. We also hope it highlights the enthusiasm that cartographers have for sharing their thoughts about and experiences with ethical issues relating to our work.

ACKNOWLEDGEMENTS

We thank all the authors who contributed to this special issue, and the *CP* editors, Jim Thatcher and Daniel Huffman, for their tireless work in bringing this issue together. We recognize the accommodations the *CP* editors had to make for the case studies, which do not fit into one of the traditional section categories for this publication, and we appreciate the juggling they had to do to fit all this special issue's pieces into a single cohesive whole.

Aileen R. Buckley & Nat Case
Guest Editors

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A Letter from the Guest Editor

A FEELING ABOUT ETHICS

As you might expect, editing an issue like this has affected how my co-editor Aileen and I think about ethics itself. The collection of case studies in this issue was intended to focus on ethics as a *practice* rather than a theory. We ended up not including several contributions because they did not focus on that practice—on the agency of acting ethically. Instead, some of these contributions expressed a feeling of non-agency or being wronged, and described how their authors reacted to *that* experience.

In editing these papers, we came to understand an important thing about ethics: ethical lapses are *felt*. That is, when faced with wrongs, whether as victims or onlookers, we very often *feel* the wrongness of the situation in our bodies before we understand them intellectually in terms of rules or principles. In a sense, this feeling is why we often find ethics urgent. We want that visceral feeling of wrongness to be addressed, acknowledged, and righted (or at least prevented from happening in the future). It often isn't, but we still want resolution.

In particular, we want to acknowledge Vanessa Knoppke-Wetzel's unpublished submission, which used trauma as a framework to discuss her journey from what she experienced as an abusive work situation to one in which kindness and respect dominate. In a sense, this trauma framework centers the lack of agency many people feel in the wake of a breach of trust—we are physically shaken and some part of our body and mind may even stop working as we expect. Our bodies *are* involved, and our emotional lives are embedded in our physical bodies, and is something we often seem to try to ignore in formulating ethical structures. This disconnect recalled for us NACIS member Steven Holloway's long-standing calls for us to engage in embodied mapmaking work.

In emphasizing the *practice* of ethics, we center actions and agency. But in our professional lives, we are sometimes embedded in social structures based in dominance or hierarchy, where we feel ourselves relatively powerless. That feeling is also one we can feel in our bodies as fear and stress. The rational, analytical approach to ethics in many of the contributions to this issue is one mode of resolving these difficult felt experiences… but what if we do not find ourselves with the leverage to use this approach? Considering why and how power structures of various kinds affect our ability to behave ethically, and how power and ethics are co-constructed, seems to us to be a fruitful avenue for further exploration.

Nat Case
Guest Editor

DOI: 10.14714/CP105.1969

CASE STUDY

Regrets

Daniel P. Huffman (they/them or he/him)
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Creative fields such as ours thrive on critique. For many of us, being part of a network of cartographic professionals means exchanging advice and feedback with colleagues, including suggestions for improvement. It can also mean silently observing the maps of others and pondering, consciously or otherwise, how we might do things differently. This process of thinking critically about other people's maps, by and large, helps us all grow our skills. But, the reality of human nature means that the urge to critique can sometimes lead to toxic outcomes that harm our community. This I know from personal experience, for I was once a source of such negativity.

From 2009–2016, I ran a blog called *Cartastrophe*, in which I took other people's maps and pointed out their flaws. There was plenty of sarcasm. I'll spare you any direct quotes because I think you know how it goes; most all of us have seen a map (or another creative output) that we thought was poorly executed and made a crack about it, either aloud or in our mind.

This effort began when I was in graduate school. Many of my peers had blogs, and my advisor was nudging me toward establishing an online presence. This was during an era in which blogs were a big part of how many cartographers communicated online, before other forms of social media really took over the community. They were a way to get noticed and to network.

I did not start out intending to mock other people online. I originally wanted to write about my designs, and share my thoughts on various cartographic topics, as my peers did. But it quickly turned out that I didn't have a lot to say, so I instead shifted gears and launched *Cartastrophe* (the idea of simply not blogging did not occur to me, I suppose). Complaining about the work of other people was simply easier than coming up with more positive contributions. I think that I am far from alone in finding it much more challenging to describe the merits of a good idea than the perils of a poor one.

In my mind, I was doing a service to the community by providing educational content. I did try to make *Cartastrophe* more than a place for simply complaining that some mapper had done a bad job: I wanted to use these examples to **teach**. As with any good critique, I tried to explain my rationale: **why** I thought certain things should be changed, and what the author's "mistake" could teach us about design and human perception. I also required myself to say a minimum of one nice thing about each map, and I occasionally posted analysis and critique of maps that I really liked. Finally, I tried to show that I and others were not immune to mistakes: a few colleagues and I each posted critiques of our own work. In the end, though, most of the site was me posting what I thought were "bad maps," and telling people how I would have done better.

Whatever pedagogical value the site had is overshadowed, in my opinion, by the damage caused through its approach. I took people's maps, uninvited, and **publicly** stamped my thoughts on them. I did not ask the authors about their goals or process; I made assumptions, instead. I did not ask them if they were comfortable with a public critique. I did not ask them what they thought about the work—maybe they didn't even like it; I have made plenty of things for which I no longer wish to claim. I did not invite them to be a part of the process of improvement and learning. They never had a chance to explain themselves before I passed judgment.

This sort of public shaming does real damage to our community. I have heard several of my colleagues describe their hesitancy to publicly share work or ask for feedback specifically because they have seen how some maps are

mocked online (not necessarily by *Cartastrophe*; I am not the only one who has done harm here). One even commented that such practices made him hesitant to even *make* maps in the first place. Our friends and colleagues are denied the opportunity to grow in their skills and careers if they cannot safely share their work.

There is absolutely value in looking at other people's designs and learning what we might want to avoid. We shouldn't stop having, or sometimes sharing, negative thoughts about some of the maps that we see. But, it's all about the approach and context: my good and/or educational intentions were offset by the harm done through my mocking tone, and the fact that I rarely included the original map author as a consenting partner before dressing them down in front of my modest audience. The blog even described the map authors as "victims" of my commentary.

I don't mean to suggest that we always need the author's permission to share our opinions on a map; the context really matters here. Did this map come from a student, or a government organization? Are we warning the public about a dangerous error, or simply nitpicking label placements? What is the power differential between the critic and the author? Are we punching down or taking on the powerful? Any of these factors can change the ethical calculus. A seasoned professional holding a student's work up for ridicule to an audience of thousands is a very different situation than a presentation at a local GIS meetup that explores alternatives to a confusing color scheme used in a map published by a national newspaper.

I cannot hope to offer a formula leading to a perfect answer of when and how to offer unsolicited cartographic advice; perhaps there is an ethicist out there that can. But, privately weighing all these factors in my own case, I think that I did more harm than good in offering my opinions.

I ran *Cartastrophe* because it was an easy way to get attention when I was in graduate school—I *suspect* that witty mockery is more likely to garner a following than positive commentary. It was easier for me to point out flaws than cogently praise excellence, and it was easier to write quips about the failings of other people than to form coherent thoughts about my own cartographic practice. And it was easier to feel I was a good designer if I could break down ways that other people were not. That's the core of it.

I am certain I'm not the only one to offer a critique for such reasons, and I think there is an important lesson in that. When we feel an urge to offer our opinions, I believe it's worth asking: what's really driving this critique? We generally offer people advice because we want to help them, and because it's satisfying to see works improve and people grow, but more selfish motivations can infiltrate our intentions. Sometimes we might offer critique because we want to show off to people, to get them to praise us, or to entertain them. I believe that these motivations linger within each of us, whether or not we act upon them. I think that it's natural as a human being to feel the urge, from time to time, to make ourselves look better, or get attention from others, at the expense of somebody else. It feels good to be acknowledged as superior in some way. It's an easy trap to fall into: offering critique more for the needs of your own ego than for the benefit of the person who made the map, or for the people who might read your opinions. Avoiding this trap requires that we be vigilant and honest with ourselves about our motivations.

Cartastrophe is gone now. I mostly stopped posting to it by 2012, and finally took it down a few years ago. Unfortunately, the attitude that informed it persists elsewhere. For years, maps were brought up for public shaming on Twitter via the #cartofail hashtag, though I have observed this sort of practice less and less in recent years—maybe it just shifted to communities outside my notice. A couple of years ago I watched a shocking conference presentation in which the presenter spent their entire time ridiculing maps that they didn't like, and encouraging the audience to laugh along, without offering much practical commentary. The problem of ego-driven critique persists.

I doubt that any of us who have publicly shamed and mocked maps are unusually monstrous. We simply did not consider much beyond the benefits to ourselves, nor the fact that our actions might harm others. I believe that a greater emphasis on empathy can guide us toward a way of critique that both teaches an audience and respects the cartographer.

To that end, I have changed my approach to critique as I have gotten older and more experienced. While I cannot offer a comprehensive guide to offering critique ethically, I find that my thoughts on the subject are best summarized by a sort of poem, or perhaps series of aphorisms.

Critique with empathy.

Assume that the designer is, like you, a human being capable of both complex thought and honest mistakes.

Ask yourself how this competent and well-intentioned person could reasonably end up making decisions that you consider laughable, erroneous, or ill-conceived. That was unlikely their intent.

Consider the tools, privilege, and knowledge that this person did not have access to, and which you might.

Ask questions before offering assumptions.

Remember that the answer is always more complicated than "the designer is just stupid." You know that the real world is richer than that.

Reflect on the ways that you could have fallen into making that "design mistake." Perhaps you did once, in the past.

Don't mock your past self for the sin of combining honest effort with inexperience. Critique yourself with the same compassion that those around you deserve.

Accept that other designers' goals may differ from yours. Realize that the things that you want to change, may in fact be unimportant to what they are trying to do.

Remember that most of the design details that we teach and debate at conferences are usually unimportant in the big picture. This is liberating.

Admit your goal to yourself. If you offer a public opinion because you want attention, that is natural. It feels good to be acknowledged as an expert, or as entertaining. Own this honestly, and without shame.

Ask yourself how you can earn this good feeling without demeaning or otherwise harming someone else.

Remember that critique is always personal. There is no clean separation between the artist and the art that allows a wholly dispassionate discussion of someone's work.

Think about how you've been stung in the past by critiques, no matter how well-intentioned, or how much you agreed with them.

Be kind when wielding the benevolent scalpel.

Understand that it's OK for a designer, including you, to not want feedback. Sometimes it's fine to let a work be what it is, and move on to other things.

Enjoy the unintended laughter that you sometimes find in the works of others. Share that quietly among friends, not with the world.

Never feel bad for wanting to improve someone else's work, but accept that it is not always productive to share those ideas.

An empathetic approach such as this is valuable because it improves the odds that feedback is listened to. It can be frustrating for someone to hear that they need to make major changes to something they've worked hard on. It is natural for them to potentially feel defensive, or embarrassed, or maybe even shamed when hearing about things that they could have done better. Approaching with a positive, conciliatory attitude can put the author whose work you are analyzing at ease, helping them to set aside their own ego and engage in a discussion with you.

I think it's valuable to consider the author as your potential collaborator. They have a map, and you have suggestions: how can you both *work together* to improve the product? Imagine a team of colleagues working on an atlas, meeting regularly to provide suggestions that make their mutual project better. Their focus is not on who made a particular map, but on producing a work they'll all be proud to have their names on. They're all in it together, and their approach to feedback is collaborative. If the giver and recipient of feedback both set aside their egos, this can be the result.

But making real change often occurs out of the spotlight, and collaboration is frequently behind closed doors. Social media, blogs, and other public fora, on the other hand, tend to steer us toward garnering attention for our own needs.

I share these thoughts because they were words I could have stood to hear when I was younger, and because I think that our cartographic community still has work to do in order to overcome some of its gatekeeping behaviors. I am sorry for my part in having been one of those gatekeepers, and for the hurt that I likely caused through *Cartastrophe*. I will surely continue to make mistakes (hopefully different ones!), as will all of you. But, if we continue to mindfully place a strong emphasis on empathy and collaboration, I hope our future errors will do less harm.

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CASE STUDY

Ethical Dilemmas in Early Career: Reflections on a GIS Internship Experience and its Echo in Geospatial Teaching

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During an internship in an Irish local authority council, I was asked to complete an ethically questionable task. I completed the task without conscious consideration of its impacts. Although I gained valuable skills from the process, I failed to critically engage with the task and reflect on whether or not it should have been done, as well as my role in its completion. Based on my internship, other personal experiences, and conversations with colleagues, I now create space in my geospatial courses for practical conversation about ethics and argue the importance of critically considering and then reflecting on tasks. These conversations sit beside discussion of broader ethical issues, such as data availability and sovereignty.

I advocate here for the importance of practical *ethics in geospatial education—a focus on the small and the individual, as well as the wider ethical issues facing cartography and the broader geospatial industry. For professionals in the industry, I also believe it's essential to create space for open discussion and reflecting on our specific experiences can be beneficial in thinking about the broader role we play in the spatial profession.*

KEYWORDS: geospatial education; ethics; internship; practical ethics; geospatial teaching

In my early 20s, I interned at a city council in Ireland for two summers just before and during my postgraduate studies. This short-term GIS role was a valuable, first-hand insight into how the council functioned and the important place of spatial data and communication in the council's day-to-day business and its longer-term strategic goals. I gained HTML skills and designed an internal website to catalogue street furniture licenses (clearly before the availability of more plug-and-play GIS dashboards!). I created maps and cleaned data. I learned the importance of involving the user in designing tools so they would actually get used after being finished. I built my confidence in applying my academic knowledge to the real world, and learned about the expectations of a professional environment. I improved my communication and other soft skills and upgraded my CV. I ignited my passion for GIS—to the extent that I switched PhD topics to more deeply explore public data sharing processes. I had fun.

One of my first tasks was to remove elements from aerial imagery available internally in the council to staff and councillors. Nothing fancy, just removing the internal layout of prisons in the city. My manager explained that with the election of new councillors to the city council (in this case associated with a political party with ties to prisoners in those locations), accessing the layout of the prison via the council intranet might lead to misuse of these images. I spent a day or so manually editing the images to remove the prisons. I enjoyed the mechanical process and learned about image editing and data storage in the council, as well as where the backups were stored, in case I made a mistake.

While my involvement seemed routine and mundane, I later reflected on how I enabled and facilitated someone's bias (justified or not), and how easily I performed a task that should have required a pause for at least some ethical consideration. I merrily edited the images and enjoyed the learning process; it didn't occur to me to question my manager's request, and I'm convinced, looking back, that I didn't have the soft skills to know how to question it. Parts of this lack of critical thinking were due to our power imbalance and my desire to "do a good job." My manager simply expected that the image editing would be done and was passing on very procedural instructions. Another key part of my lack of introspection is that I didn't realise I

was an active agent in a wider process, rather than just "doing the job," and could influence how and whether certain tasks were performed. I didn't stop to think whether this was something I should have done or what my role in the process meant.

The real concern here is my lack of situational awareness, and how the professional environment may not allow time or space for ethical reflection in the moment. It seems easy then to argue for the importance of ethics as a topic in spatial courses at a university or in continued professional development. It is easy to point to examples of the misuse or poor design of spatial data and technology, from privacy breaches, individual surveillance (Hough 2009), to issues of data sovereignty. For example, Mark Monmonier's (2018) *How to Lie with Maps* remains an important insight into miscommunicating with spatial data. But often, such problems are seen as resulting from things that *other* people do, or from an active decision to be "bad," rather than the outcome of something seemingly mundane done by people like us.

It's a little too easy to focus on the technology and wider processes, rather than whether or not the map should be made or the task completed; or, indeed, how to raise ethical issues about the work. A code of ethics is embedded in a number of geospatial organisations, e.g., the American Association for Photogrammetry and Remote Sensing (ASPRS 2018) and the GIS Certification Institute (2023). These remain quite US-centric. In Aotearoa New Zealand, for example, the professional certification provided by the national spatial body (Survey and Spatial New Zealand) is limited to "Professional Engineering Surveyor" and "Professional Land Development Engineer" with few geospatial professionals seeking accreditation internationally. These codes can be slightly removed from day-to-day work life or often not detailed enough to provide guidance (Obermeyer 2021).

I argue here for a need to prepare professionals for practical ethical dilemmas at multiple scales, from the individual to the sector, as well as to make space for people to feel safe in raising ethical concerns. I also advocate for the need to self-reflect and learn from times where you got it wrong or not right enough.

After finishing my PhD, I moved to Aotearoa New Zealand in 2006 to take up a GIS academic role and then started teaching students about how to create, manipulate,

Image generated using Adobe Firefly AI and adapted manually to "remove" prison buildings

store, and communicate spatial data as part of an introductory GIS course, as well as how to work on applied projects in a follow-up course. The design of these courses gave me the space to consider the role of ethics in the learning of GIS, along with how and where to place the emphasis so that students can relate real ethical dilemmas to their own situations. I drew upon my experiences and those of generous professional colleagues who discussed these issues with me or shared their views in the literature. I am not the only academic (by far!) to grapple with the impacts of geospatial technology on society (e.g., Elwood and Wilson 2017; Scull et al. 2016; Davis 2014). The GIS&T Body of Knowledge (DiBiase et al. 2006; UCGIS 2016) argues for the inclusion of ethics in the teaching syllabus. Elwood and Wilson (2017) argue for the role of GIS pedagogy in developing appropriate curricula that identify and highlight ethical issues, as well as activities or assessments that help students gain awareness of the socio-technological impacts of GIS.

I've spoken to geospatial professionals who have faced similar ethical challenges in their roles, such as being asked to perform analysis to justify a decision after it had been made, when it received press coverage and associated public queries. They make for pertinent examples and have sparked provocative discussions in class. Some of these professionals have been kind enough to share those

examples with students through guest lectures or sharable resources.

Addressing personal ethical awareness in academic programmes for GIS is clearly important. It can be easy for an academic to recognise the importance of critiquing geospatial data, software, processes, and their wider societal impacts and it is important to do so. However, the softer skills of personal reflection and how to navigate stepping down from a project or raising concerns about it can be harder to teach, assimilate, and apply.

There's also a balance to be struck between highlighting the benefits and importance of spatial information and cartography, and critically engaging with that data or those maps. Some students new to the discipline can be quick to see things in black and white without realising the nuances in between. A lack of care in pointing out issues with the maps can mean the dissolution of all trust.

Education provides unique opportunities for future professionals to think through possible ethical scenarios before encountering them in the workplace, and provides a safer space with lower stakes to practice raising issues. Students can also learn from diverse perspectives as issues are discussed in class, broadening their viewpoint of where ethical issues may lie. By actively exploring practical examples, we are hopefully equipping students to recognise their ability to be active agents in the tasks they do, to broach ethical concerns effectively and respectfully, and to think about the wider potential impact of their work. Later, when these new professionals encounter ethical issues, they still may not act on their concerns or critically assess the request, but they will at least be better equipped to recognise, respond to, and ameliorate encountered issues. They should have a framework that supports their reflection, as well as their possible action in the moment.

I advocate here for the importance of practical ethics in geospatial education, with a focus on the small and individual, as well as the larger ethical issues facing the wider geospatial industry. Geospatial professionals need both an ethical framework to recognise and assess their own and their organisation's impact, as well as the soft skills to navigate these ethical situations as they arise.

Reflecting on my experience and through conversations with colleagues, I also ask you to think about creating and leaving space for conversation about ethics both in industry and education. Prepare yourself to analyse and then reflect on your tasks, provide a sounding board for peers and junior staff as well as create safe spaces for colleagues to raise issues, even when you'd just like them to complete the assigned task. Acknowledge that you won't always get it right, but that thinking and talking about ethics and specific examples can be beneficial in understanding our role in the broader context of the spatial profession.

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CASE STUDY

Interview with an Anonymous Graphics Reporter

Anonymous
A Graphics Reporter

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A conversation with a graphics reporter for a widely circulated American newspaper revealed the unique nature of the role, work, and ethics of graphics reporting. Operating under intense deadlines, graphics reporters must carefully balance the newsroom's need for speed and pressure for performance with the cartographer's meticulous attention to detail and iterative mapmaking process. Collaboration between the news reporter, graphics reporter, graphics editor, and, ultimately, the reader, can both facilitate and hinder the graphics report's work. Knowing that many people, some with the power to make decisions with serious consequences, will read their maps, graphics reporters operate under pressures that, while not unknown to other mapmakers, do not affect them as frequently. Guiding their decisions and actions in this high-stakes, high-pressure environment are the ethics of both journalism and cartography, which don't always converge.

KEYWORDS: graphics reporter; reporter; editor; newsroom; deadline; pressure

Newsrooms cartographers work in an environment with specific tensions that their colleagues outside of journalism rarely experience. Many of us work under the pressure of a deadline, but in a newsroom most deadlines are same-day, measured down to the minute, and have no flexibility. The newsroom cartographer's (or "graphics reporter's") attention to detail, careful handling of data, thoughtful development of design, and use of iteration to achieve higher quality constantly runs up against the newsroom's need for speed and pressure for performance. Add to this atmosphere a frequent lack of access to the reporters whose story is being illustrated; data that is potentially incomplete, questionable, or hard to understand (for example, in a different language); and demands from editors who are more concerned with story completion than the details of these hurdles, and you have an inkling of a graphic reporter's workday and work environment.

Graphics reporters overcome some of their handicaps by reusing previous map designs, making use of in-house databanks (and having a deep knowledge of pre-processed data available externally), developing collaborative relationships with colleagues, and undergoing review and oversight by their graphics editors. Despite these assistive resources, errors are bound to occur; however, the ramifications for errors on maps in the media are often far graver than for many other maps. Consider how many people see the maps (and may spot any inaccuracies), who may use the maps (like politicians and military officers), and how the maps may be used (for example, to make serious political or military decisions). All of these considerations place cartographers in the news industry in an unusual position, not just in their place of employment, but within the field of cartography. While other cartographers also work under tight deadlines, like those supporting military operations and emergency services, graphics reporters are also under pressure to create products for the general public—an audience composed of people widely varying expectations and expertise.

Above are some of the conclusions I drew after a lengthy, illuminating, and at times emotional conversation with a graphics reporter in a major American newsroom. That reporter wishes to remain anonymous, but their stories, thoughts, and concerns are summarized below. Quotes by the reporter are based on a transcript of our interview, lightly edited for clarity by the reporter, myself, and the *Cartographic Perspectives* editorial team.

The first question I asked was, "Are you ever faced with ethical issues in your job?" to which our graphics reporter immediately responded, "Absolutely, every day." To illustrate, they shared some of the issues they were facing at the time while making maps about the Gaza–Israel conflict:

How do you ethically portray zones of territorial control? How do you overlay infrastructure, that Hamas is alleged to have used, on the maps? If you map the zones of control and civilian infrastructure, could that imply a relationship between the infrastructure and a particular militant group? If you map the two things together, are you implying correlation or causation? For example, if you place a hospital on the map near a Hamas tunnel, you're implying that the two are connected. If there's a broader media narrative about Hamas using hospitals as covers for tunnel entrances and that's being used to justify the bombing of said hospitals, your map may have just played a part in the decision making that led to a bomb being dropped on a hospital.

I asked them about what one does in a situation like that:

There was one map where we had rather coarse data on tunnels in Gaza, and I was told to put hospitals on that map, which obviously implies a relationship, particularly because one hospital location happened to be very close to one end of one of those tunnel polylines. I said, "I'm not going to make this correlation because I don't know what that's going to imply. And I don't want to be held responsible for that." Even if the tunnel was actually next to the hospital, I don't know that there's a correlation. I don't want to make that statement unless I'm 110% sure. There's just no way to be that sure. Also, a lot of the data was coming from a source that I know has intentionally lied to or misled us multiple times in the past. So, I don't trust them as a data source. I don't want to make the map that way, because it could lead to bombs being dropped on people.

As they grapple with these ethical challenges, graphics reporters are still working under the pressure of the omnipotent "deadline." With the deadline in sight, speed and accuracy run a tight race for the lead:

What if you have a list of points, and you're not sure if they're valid or not, but the reporter's not responding to your emails and the map has to run? I can't double-check all these points, and I don't speak Arabic. I can try to fact-check them with tools like Google Translate and OSM, which are pretty good, but I can't meet the standards we put text to. I don't want to put twenty points of battle zones on a map if they're not actually there. And the reporter's still not answering any of my messages, and the map really has to run. Do I shut down the whole map, slow down the whole article, email ten different really high-level people, and say, "I'm sorry. I'm this random graphics person, but I'm going to put a stick in the works because I feel a little bit uncomfortable?" No one's going to say, "No," but every single force is saying, "Don't do that. Just don't say anything. Just keep your head down." Because what are the chances someone is going to say, "That's wrong"?

Even while producing a map under a tight deadline, our graphics reporter was still committed to "right map making," as **Steven Holloway** would say, with careful consideration of things like color connotations and bias:

How do you depict Israeli troop movements inside Gaza? Do you label them as blue? Do you label them as red? Because red looks more aggressive, red looks more like it's part of a war, red looks like they're the invading force. One time, I was making a Gaza map, and I borrowed from our existing symbology for military actions, which used red. We'd been using this symbology for some very early Israeli maps, so I put these polygons where the Israelis were clearing urban areas around Al-Shifa on the map. I showed the polygons as red, and I labeled them in red as Israeli urban cleared zones. I got a comment from an editor saying they wish they'd reviewed my map earlier because they would have asked that I changed the color, because red made it look like the Israelis were invading Gaza. To some people, that's a very clear example of putting bias on a map. Making the map one way would say, "They're invading Gaza," but making it another way would say, "They aren't invading Gaza."

Reporters and editors know that decision-makers read their work. Our graphics reporter took that knowledge to heart and sometimes found it a heavy burden to bear:

The newspaper is read by people high up in government, high up in the miliary, high up in the global economy. And if they see Israeli troops with red polygons, they're probably more inclined to think negatively of Israel than if it was blue. So, I'm making the decision when I'm sleep-deprived, stressed, tired, getting bombarded by emails. And I think to myself, "That's going to be in front of a senator within 48 hours." There's no room to think about those implications.

Because it's not technically wrong to symbolize something as blue versus red. But it still has a ripple effect.

On the other hand, the gravity of making a map that can have a lasting legacy also gives a sense of ethical agency to our graphics reporter:

Working in a major newsroom, it can feel like you're at the center of history. Modern history is written in the press—so much of it. If you're working on an important article for a major newsroom, that article is going to become the center of the developing historical narrative. I know that history is something that is written by people with agendas, with schedules. And being at the center of it and seeing it from around you, created by people you know, adds this immense weight to every little decision, because it feels like you're taking that decision and putting it in the giant catalog of human history. In some sense, it actually makes it easier to justify saying "no" because I feel like I'm answering to the long arc of history rather than just to my annual evaluation.

The constant interplay between the news reporter, the graphics reporter, the editor, and the readers underscores the collaborative nature of journalism. Each stakeholder plays a crucial role in shaping the narrative, visual appeal, and overall impact of the article. The reporter provides the content and story, the graphics reporter enhances it visually, the editor ensures coherence and accuracy, and the readers ultimately interpret and engage with the final product. This dynamic interaction highlights the multidimensional process of creating a compelling and informative newspaper graphic that resonates with its audience. Graphics reporters, and ideally their graphics editor, have the expertise and sensitivity to understand that both data errors and misleading graphic representations can distort interpretation in ways unique to non-text narratives:

The problem is that sometimes the reporters don't think visually whatsoever, sometimes they don't know what data is useful, and sometimes they just are not responsive. Sometimes reporters can be obstructive and can influence the process that way. Normally you want to defer to the reporter when it comes to information, because they're supposed to be the source of the information. The editor is the decision-maker when it comes to the graphic, how it's presented, where it's placed, but the reporter is the source of the information. In the end, editors can say, "Just do the first thing that I told you to do." Reporters don't have that kind of power.

But despite their authority, not all editors have the same cartographic training as their subordinates:

I once had to have a meeting to convince an editor that interpolating colors in a gradient for a raster was OK.

Mapmaking in a major newsroom does not always happen as a consistent procedural process. Sometimes the normally collaborative institutional structure provides enough gaps that more independent agendas can take hold:

There was one case where I had been working on a story for such a long time that I knew as much about it as the reporter did. And the reporter had a very different take on a piece of source testimony than I did. I thought their take was misleading, and they wanted the graphic to be changed to fit their view. They were so dead set on it at such a bad time that I deferred to them. In this situation, I decided the stakes weren't ridiculously high. But it's still the case that I let the map be made less accurate in my view, just to get the wheels moving again. Which, from an ethical point of view, feels compromised.

Even though the nature of journalism is collaborative, sometimes our graphics reporter finds themselves alone in making the kinds of qualitative and fact-checking judgments that, in theory, should be corroborated during editorial review. And the deadlines continue to loom:

It's never explicitly said, "Oh, thinking about this ethically takes too much time. Don't do it." No one's ever going to say that because people don't want to think of themselves as being against that ideal. But there's almost this atmosphere of pressure where you want to deliver a result, you want to get the map done, you want input from the reporters, you want to get it all tidied up. Those things can't all be accomplished if you're busy hemming and hawing over ethical concerns about the best way to display the data. You quickly find out that that behavior is not rewarded. Speed is rewarded, provided there aren't any first order errors, like you put a label in the wrong place, or you label the wrong city, or the number on the map is different from the number in the legend. Those are the errors that editors

care about. As long as you don't make any of those, you can basically waive anything else.

It's the second order errors—the ones that aren't so obviously on the surface and aren't so easily detected. Because maybe the people who know about them aren't going to be looking at the figure, or they're not the sorts of things that can be quickly parsed into an error. Those are the ones where the ethics become really muddy, and they're the ones that I'm trying to think about while I'm making the map. But there's no room to think about them, and there's no space given to thinking about them. And there are really no consequences you feel if you don't think about them.

Our graphics reporter also reflected on the tension between the written word and the graphic representation, as well as the newspaper article and its comprehension:

Knowing what that map is going to be used for and who is going to be seeing it, you obviously want to make the best case possible for accurately representing the science in a communicable way, but that may go against the overall bent of the article.

Taking climate change as an example, an improper framing is going to contribute to an improper understanding of climate science, which is going to, on a broader level, affect popular opinion about climate policy and the significance of climate change. And in that sense, you've kind of contributed to the problem, but in a way that's never going to directly come back negatively on you. And it's certainly not something that thinking about is going to reward you for in the newsroom. They just want a graphic.

But, what if the map gets out there and someone makes a comment? Or you see some way that the map's been misused? That's very different from a formal correction that will impact you at a career level. If you make a map and put a city label in the wrong place, that is going to become a correction. You're going to have to fill out a form, and the map's going to have to be edited. OK, great. Whatever. But if you make a climate map that doesn't accurately convey the scientific data, although not in a way that's necessarily an error but an improper framing of the issue? Very likely, you're never going to get an email about it.

So far, I've focused this summary of our conversation on the internal workings of the newsroom. But our graphics reporter also had something to say about reaching outside the newspaper enterprise—for data, ancillary information, and more:

When you work in a major newsroom, it can be this entity looming behind you. If you have that newspaper's name in your email handle, people will freak out and throw data at you. It's like a college trying to recruit you. They'll give you a giant baggie with a sweatshirt in it. Other groups, depending on their affiliation or origin, are going to look at you very suspiciously. Because they'll be thinking, "What's this corporate goon doing talking to us?" So, it's an added factor you have to think about. Sometimes it's very easy for me to get data, but then there are other times that I find it difficult to build up trust with groups because of my affiliation with my newspaper.

Our graphics reporter acknowledged that their position lies under the overarching umbrella of professional journalism, and that ethics in journalism also applies to graphics reporting. One of the four principles in the Society of Professional Journalists **code of ethics** is "Seek Truth and Report It," which, in part, admonishes journalists to, "Recognize a special obligation to serve as watchdogs over public affairs and government." Another principle is "Act Independently," which cautions against activities or situations that "may compromise integrity or impartiality or may damage credibility." During our conversation, our graphics reporter spoke to these ethical standards:

Our newsroom doesn't want to give anyone outside of the newsroom any control whatsoever, unless it's for legal reasons, over a story being published or not. So, one part of journalistic standards is, "It's OK to piss off a source once they've already given you information, and if they don't necessarily approve of the way it's being portrayed, tough shit." Which makes sense if it's a political story and a politician gives you a sound bite, and then that goes into an article showing that the politician's not so great, and the politician's upset about it. It's great that the politician doesn't have any power over whether the article goes out. So, this ethical standard makes sense.

Cartographers are often trained differently. In many cases, our desire for the map to be an authentic representation of

the story, theme, or situation drives us to seek verification and endorsement from authorities on the subject. The following story illustrates how our graphics reporter experiences a conflict between these motivations and journalistic ones:

> *We were working with the archaeologists talking about some archaeological data for a story, and I asked them how they would prefer the data be presented to properly keep the locations anonymous, because with archeological data that's obviously a very big deal. The archaeologist was appreciative and gave me some pointers that I could incorporate. But I got a talking-to from my editor, who said, "Don't do that. You never want to give a source any say over how the graphic is constructed. We're the ones who decide that, not them."*

For our graphics reporter, there was some comfort in partaking of the impartiality and objectivity that is, in part, related to ethical journalism, which (according to the Society of Professional Journalists) "should be accurate and fair":

This kind of conflict, between the ethics of the journalist and the ethics of the source, can take a toll on some members of a newsroom. Taking a step back can help avoid being overwhelmed:

> *For a lot of these issues, I have no personal relationship to them. I'm not going to likely be personally exhausted by having to work on any of these difficult topics on top of all the other forms of stress I've already have to deal with. That means that a lot of people who would actually be able to counteract the structural biases of a major newsroom that go into these problems don't make it because they just get completely burned out.*

As I suggested earlier, cartographers in the news industry are in a unique position. At this juncture, I would also propose that they are of a certain ilk. Not all cartographers could work under the conditions that graphics reporters do—I am pretty sure I couldn't. Nor do all cartographers have to grapple with such weighty ethical issues—or at least not as often. It seems it takes a certain breed of cartographer to survive and thrive in a major American newsroom—and likely many other newsrooms. After writing this summary, I have greater empathy for graphics reporters who are working under conditions that I personally would find oppressive, yet they still provide us with maps that help us better understand our world in significant and timely ways.

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CASE STUDY

The Harm Mapping Project: Navigating Ethics and Collaboration in Map Design

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1. INTRODUCTION

This article details the ethical challenges we encountered while designing maps for The Harm Mapping Project. Led by Dana Cuomo, Susan Hannan, and three undergraduate student research assistants (Madison Dennehy, Meredith Forman, and Abigail Zea), The Harm Mapping Project examines the geography of gender-based violence occurring at Lafayette College, a small (approx. 2,700 undergraduate students) residential liberal arts college in Easton, Pennsylvania. Data collection entailed a participatory mapping exercise in which individual students were instructed to use stickers to mark locations on a blank campus map where they had experienced gender-based violence. Different color stickers indicated different types of harm (e.g., sexual assault, verbal harassment, unwanted touching, stalking, physical abuse, and feeling vulnerable to experience gender-based violence). In addition to better understanding where on campus the student body has experienced gender-based violence, a secondary objective of the project includes providing recommendations to Lafayette College administrators regarding ways to modify the built environment to help prevent future harm from occurring. To support these objectives, the research team began working with Lily Houtman, a trained cartographer, to incorporate feminist design principles into the mapping of the project's data for public-facing audiences. Here, we describe our design process and share takeaways for cartographers working on similar projects.

2. ETHICAL CHALLENGES

Over the course of the project, we worked to achieve four key goals:

- **Collaboration:** Given that the maps represent the lived experiences of undergraduate students, it was essential to involve undergraduate research assistants throughout the process of creating the maps.
- **Anonymity in Data:** Due to the sensitive nature of the data, appropriate map type and thoughtful data aggregation was necessary.
- **Administrative Change:** Readability and clarity to advocate for change at the administrative level had to be balanced with other aspects of data representation.
- **Accessible Feminist Design:** The research topic and methodological design required that the map design avoid masculine top-down styles present in many traditional campus maps, and to incorporate a practice of self-reflexivity.

2.1. COLLABORATION

A key principle of feminist research design concerns centering lived experience as a basis of knowledge and expertise (Hesse-Biber 2014). This prioritizing of lived experience disrupts ideas of who represents an "expert," and often informs all stages of a research project, from project design to data collection and analysis. Here, the lived

experiences and insights of the undergraduate research assistants were an essential part of the map design process.

Early in the project, the research team identified their interest in creating maps to visualize the data, but no member had mapmaking experience, nor does Lafayette College have a geography department with cartography resources. Thus, the research team contacted Lily, a cartographer with scholarly interest in feminist and queer theory, to assist with designing and creating maps for the project. The resulting collaboration combined the strengths of three different groups: faculty PI from a small liberal arts college with training as a feminist geographer (Dana) and a clinical psychologist with trauma expertise (Susan); a graduate student cartographer from a large university with training in cartographic methods and design (Lily); and undergraduate research assistants with lived experience of the local campus (Madison, Meredith and Abigail).

What followed was an iterative process of collaboration in which the undergraduate research assistants played an essential role in designing the maps, despite having no cartographic training. While there were numerous examples in which collaboration with the undergraduate research assistants played a key role in influencing the ethical approach to the project, we emphasize here their part in the process of selecting a map type for visualizing the data, drawing from a related social justice-oriented cartographic project (see Bley et al. 2022).

During initial conversations, we did not feel there was an immediately obvious thematic map choice for this data. However, we did reflect on the particular tension with locations where only one person had experienced harm, as these were the personal experiences most likely to expose individuals. Subsequent conversations centered around visualizing the data by way of heat maps. Due to its continuous nature, the research team surmised that a heat map could help indicate that experiencing harm was possible across numerous locations on and adjacent to campus, even if there was no recorded data in a specific location (crowdsourcing information will always be incomplete). However, the undergraduate research assistants quickly noted that the small footprint of the college and heat map's lack of distinction concerning data points might inaccurately suggest that students were at risk for experiencing gender-based violence everywhere on campus. Importantly, we wanted the maps to be informative, but not to invoke gratuitous fear. The undergraduate research assistants also raised concern about the close associations between heat maps and "hotspot" mapping, noting the problematic use of "hotspot" mapping in predictive policing among law enforcement departments, resulting in racialized forms of policing (Jefferson 2018).

The research team also considered a dot density or dasymetric map, which would maintain a human element to the data by representing each participant with their own point, while also allowing for flexibility across a location. In this way, a point would not correspond exactly to the data provided by participants, and thus offer an added layer of anonymity to the data. However, through conversations with the research team, it became clear that a mismatch with the real data, while anonymous, would be a significant issue when transforming point data into a dot density map. For example, if there were four data points in "The Quad" on a dot density map, these points would be randomly distributed within "The Quad" with no tie to actual participant experiences. The undergraduate research assistants were concerned that the resulting map may do more harm than good if its random nature produced fake patterns. If Lafayette students interested in implementing personal safety plans consulted the map for information about locations to avoid, the random distribution of points across a location may be misleading.

2.2. ANONYMITY IN DATA

Following discussions about the ethical issues with various map types, the research team ultimately decided to create a series of proportional symbol maps, a map type familiar to general audiences, making the maps accessible for administration and students. The research team also decided that proportional symbol maps reflected the best option for protecting the sensitive nature of the project's data. Data could be aggregated by location and easily transferred to proportional symbols, demonstrating patterns and potential clusters in the data, while also benefiting from the anonymity of aggregation.

With the map type chosen, the research team considered anonymity in data at multiple stages of the design process. As noted above, data collection entailed participants voluntarily and anonymously placing stickers on a campus map to indicate locations where they experienced any of six types of gender-based violence, resulting in point data recording exact locations of harm. However, given the personal nature of this violence and the small campus size,

the research team discussed how data at this scale could be identifiable by individuals with specific knowledge of the recorded experiences, including perpetrators of the violence.

To support the research team's key ethical goal of preserving anonymity, the research team manually reviewed each participant's map (n=509) and coded each sticker to a location on campus or in the surrounding residential neighborhood. Data was aggregated to a total of 217 locations. By aggregating data to the nearest building, street or notable location, many individual experiences became less identifiable as part of a group. For example, while an individual may have experienced verbal harassment on the southeast side of the football stadium, collapsing together all occurrences at the football stadium helped to protect an individual participant's privacy. This choice is still imperfect, given that some audiences may want to see exact locations where harm was experienced in order to avoid them. However, compared to dot density maps, the data is intentionally represented as groups instead of single points, so audiences are less likely to attribute false levels of precision.

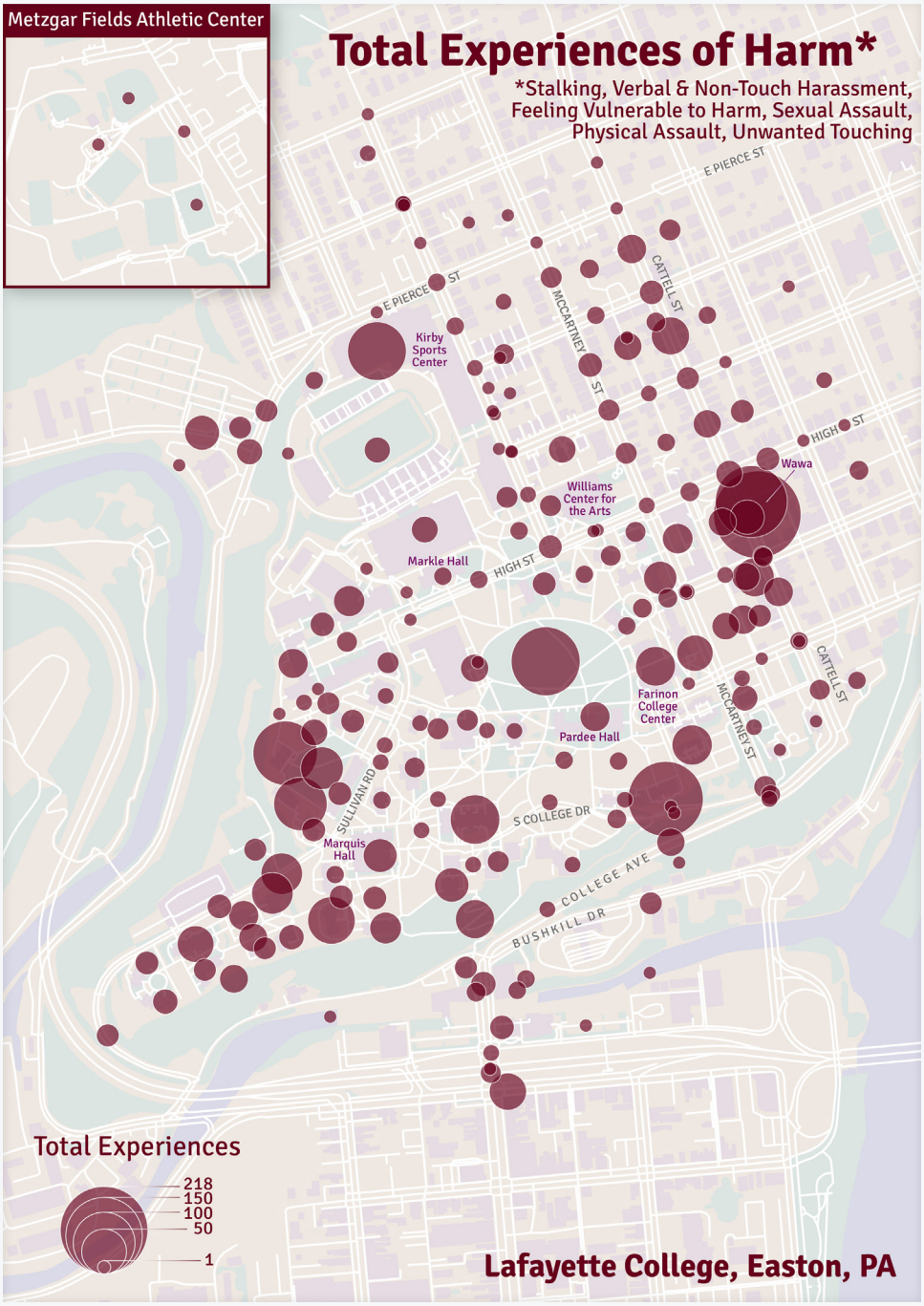

Figure 1. Map of total experiences of harm (six types)

However, frequency of experiences ranged significantly across locations. For example, while some locations had over 200 reported experiences, a large number of locations only had one reported experience of harm. The research team considered how to ensure that all data were represented on the maps so as not to "erase" a participant's experience of harm, while also protecting the anonymity of individual participants. One option was to create a graduated symbol map where data were grouped into classes, therefore hiding whether a location had one experience (compared to more than one experience). However, the range of the data complicated graduated symbols. For ease of reading, all data needed to be on the same scale to compare across seven maps (one with total number of experiences, and one for each of the six types of harm). However, the map of total types of harm had a maximum of 218 experiences (Figure 1), while the map of physical assault had a maximum of 5 experiences. Other types of harm, like unwanted touching, were in between these values, with a maximum of 74 experiences (Figure 2). Keeping a consistent scale across all seven maps while ensuring the maps

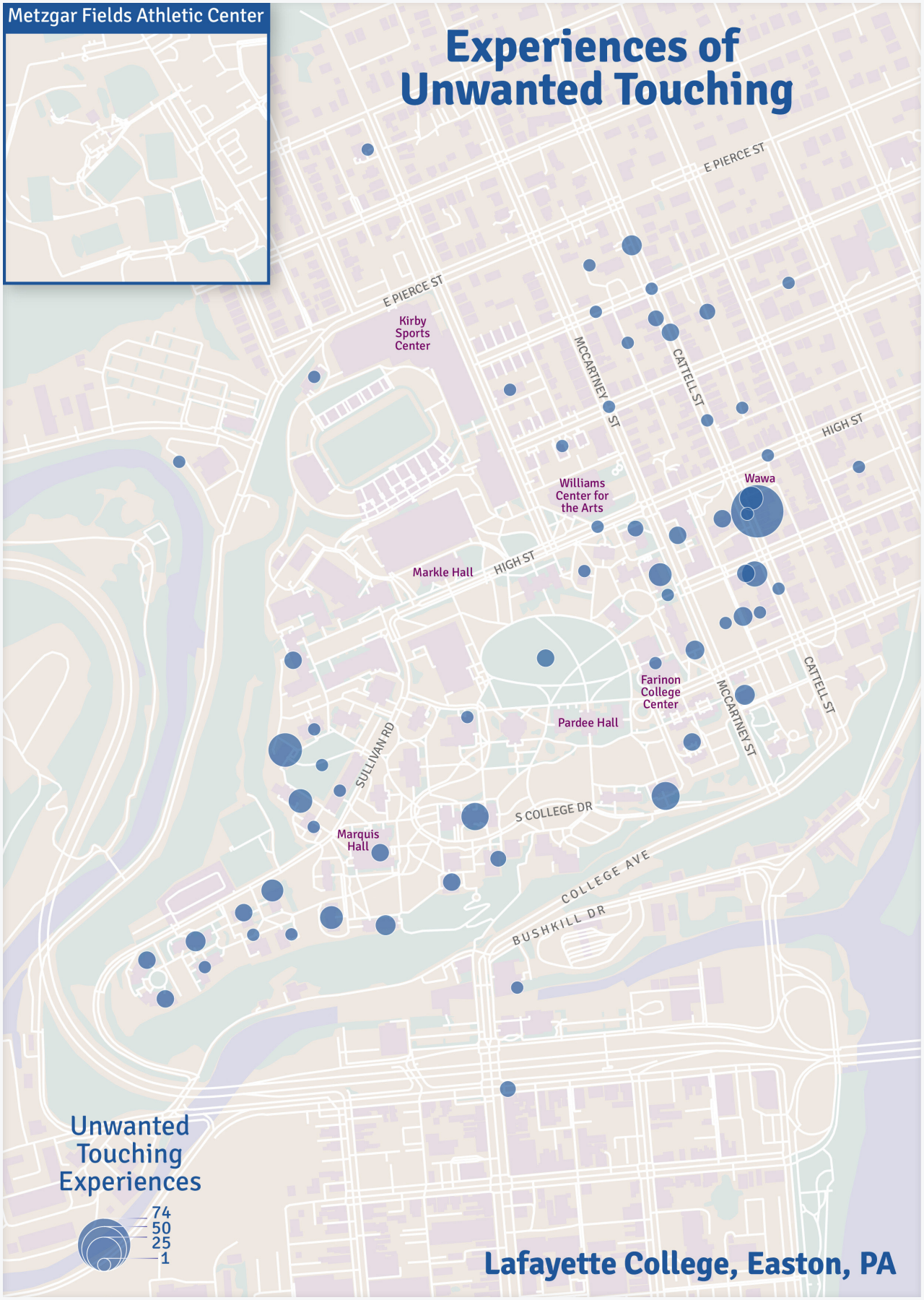

Figure 2. Individual map displaying one type of harm experience, unwanted touching

with the least amount of data remained meaningful was not possible with a graduated symbol map. For the proportional symbol map, we elected to set a limited amount of size variation across the symbols, making it slightly difficult to distinguish the difference between one experience and two or three experiences. Initially, this choice may seem similar to a graduated symbol map. However, a proportional symbol map with little variation allows a reader to see some level of variation and view which symbol is greater, even if they remain uncertain of exact values. In fact, being off by one or two counts helps to preserve anonymity.

2.3. ADMINISTRATIVE CHANGE

In addition to distributing findings to scholarly audiences, a second objective of The Harm Mapping Project included advocating to college administrators for modifications to the campus's built environment to prevent future experiences of gender-based violence. This objective impacted the research team's approach to the map design as we considered how to balance representing the geography and frequency of gender-based violence for two key audiences: administrators and students.

The timing of this project and the design of the maps coincided with a multi-year, college-wide Campus Master Planning process, in which many aspects of the built environment on campus were under review and open for alteration. At the time of this writing, we have already presented preliminary findings from The Harm Mapping Project—including the maps that are the focus of this article—to college administrators during the information gathering phase of the Master Planning process.

For administrators, the cartographic representation needed to protect the project's sensitive data, while simultaneously displaying the frequency of harm in a way that was both readable and impactful. When seeking to make change at an administrative level, clear data visualization that does not cause confusion is essential. This is one of the reasons we ultimately decided to use proportional symbol maps, which allowed us to represent the data on a clean basemap that did not require too many additional labels and locators that may be perceived as distracting. We were able to accomplish this goal in part because our local audience already had place-based knowledge of the campus. Administrators also featured in our conversations on data anonymity and protecting the privacy of individual participants. Notably, Lafayette College's **Policy on Equal Opportunity, Harassment and Non Discrimination** clarifies that faculty are not considered mandated reporters when student disclosures of gender-based violence occur within the context of research, yet we remained sensitive to concerns of anonymity and retaliation when designing the maps, as noted above.

While the upper echelons of the college administration ultimately decide what elements of the built environment to prioritize and modify, numerous groups hold sway in influencing those decisions. Students play a significant role in this process. For this reason, we also considered students as a key audience for the maps we designed. We anticipate disseminating findings from The Harm Mapping Project via presentation slides, in addition to printing large scale maps for display in the campus library as a public gallery. When necessary, we have made small modifications to the maps based on audience and venue, but aim for general consistency. We view these public presentations of the maps as essential for raising awareness of the geography of gender-based violence on campus among students, whom we then anticipate will also advocate for change to administrators for how to modify the built environment on campus to help reduce future harm.

2.4. ACCESSIBLE FEMINIST DESIGN

Throughout its design and execution, this research was conducted with the local campus community and feminist principles in mind (see Kelly 2016; D'Ignazio and Klein 2020). The data displayed on these maps were a community effort of crowdsourced information, distinct from campus-based reporting of experiences of gender-based violence. Because the maps represent sensitive information, an accessible feminist design, distinct from traditional masculine and authoritarian campus maps, was essential. This process included using open-source software when possible, involving undergraduate researchers in the design process, and engaging in a self-reflexive practice that considered how the research team's social backgrounds, positions of power, and personal biases influenced our approach to the map design process.

Almost all technology used in this research was free and open-source, making it accessible to all members of the research team (Gieseking 2018). However, we acknowledge there is still the possibly for issues with this technology, particularly in relation to profits and data security. Data

from the participatory mapping exercise was aggregated in Google Sheets, resulting in cleaner data for analysis. The initial maps were produced in QGIS with basemap data pulled from OpenStreetMap. While final touches to the maps were edited in Adobe Illustrator, a piece of paid software, all files could be opened in the free and open-source program Inkscape. Both fonts on the maps were selected from **Libre Fonts By Womxn**, which links to numerous free fonts of many styles. All cartographic design work was executed by one cartographer for this project (though with insight from the rest of the team). While we did not have time during this project to teach students to use GIS software, the use of open-source software keeps this option open, particularly regarding collaborations with smaller institutions without geography departments.

Early on, the research team decided that a custom base map (see Figures 1 and 2) would be the best way to incorporate a feminist design. To begin, the undergraduate research assistants shared images of graphics and map designs that they enjoyed and that fit with the goals of the project, relying on feelings more than logic. Once the cartographer designed an initial basemap, the undergraduate research assistants provided feedback on the choices, learning ways to talk about color in cartographic terms like hue, saturation, and value. The final basemap had a color scheme that was low in saturation and high in lightness, to feel softer than many harsh, bold campus maps. This light value also contrasted with the darker value chosen for the data. To maintain readability, the basemap included some conventions like blue for water and green for natural features. However, some hues were altered, including pink for buildings instead of a dull gray or yellow.

For the data itself, the team chose a color palette ranging from pink to bright blue for the six experiences of harm. These design choices prioritized pinks and purples, with a few nearby colors to aid in greater distinction between colors, to emphasize undervalued colors that are not always seen as authoritative because they have feminine associations. However, we were careful not to attach purples and blues, which could be associated with bruising, to certain types of physical harm and assault, to avoid any negative associations (Figure 2). For the map of total experiences of harm, Lafayette College's primary color, maroon, was used to emphasize the association of this harm with the institution and call on the administration to consider ways of changing the campus built environment to prevent future harm (Figure 1).

Drawing on our experiences, we encourage cartographers to incorporate a practice of self-reflexivity when engaging in similar projects involving sensitive data. At multiple stages of the design process, we discussed whether our data should be mapped at all, given its sensitive nature (Wilmott 2016; Kelly and Bosse 2022). We recommend other cartographers create similar space in the development phase for this kind of reflection, and return to that question throughout the map design process. We also encourage cartographers to examine what personal biases or motivations they may have when designing maps that involve sensitive data and how those biases influence design choices. To mitigate the impact of biases, curating a multidisciplinary team of collaborators that includes subject matter experts and/or those with situated knowledge and lived experience pertaining to the data has the potential to benefit other cartographic projects. As our experiences demonstrate, members without cartographic training can offer important insight for how to visualize data.

Self-reflexivity also entails acknowledging the emotions that emerge during the map design process. Our research team navigated a range of emotions, including worry that our maps would misrepresent or reduce the lived experiences of research participants who contributed data to this project, alongside feelings of hope that the maps could play a role in raising awareness and help address systemic violence. We made space within our meetings to discuss these feelings, which allowed for a more deliberate and thoughtful process as we made decisions regarding map type and other design choices. We encourage cartographers to make similar space for reflecting on such emotions, as these reflections raise new questions and can play an important role in ethical map design. Maps are imbued with power and always have the possibility to cause harm, but it is this same power that can lead to positive substantial change.

3. CONCLUSIONS

The Harm Mapping Project is ongoing, with distributions to the campus community, further presentations to college administrators, and a second phase of data collection still to come. We will continue

to embrace the same collaborative, feminist principles that prioritize ethics, anonymity and real-world change in future work that we have utilized thus far. Notably, the project's maps would not have been the same without collaboration, drawing on unique skills from multiple groups. In particular, the undergraduate research assistants were an essential part of designing the maps: they contributed lived experience as students on campus, and quickly became familiar with cartographic principles, despite no prior GIS training. The Harm Mapping Project illustrates the impact of collaboration across differently sized-institutions and team members with varying experiences, and the maps we produced were only possible because of this combined and collective knowledge.

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CASE STUDY

The "AfterMap" of the February 2023 Earthquakes in Türkiye

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In this first-person narrative, I explore the ethical challenges encountered while providing mapping support in the aftermath of the February 2023 earthquakes in Türkiye, a disaster that impacted 2.65 million people across several major cities. This crisis underscored the essential role of geospatial data in disaster response, while also exposing the disparities in data access and representation globally. Many vulnerable communities lack the resources needed to benefit equally from these efforts, leaving a critical gap often addressed by volunteer organizations.

Through our collaboration with the Humanitarian OpenStreetMap Team, my students and I engaged in digitizing essential map data, witnessing firsthand its transformative effect on disaster response. Despite the inherent challenges and uncertainties in volunteer mapping, each contribution plays a vital role in bridging spatial data gaps and enhancing resilience against natural disasters. This collective effort, following in the footprints of former collaborative mapping efforts, highlights the importance of collaborative action in crisis mapping.

By sharing this experience, I aim to shed light on the inequalities present in disaster situations and advocate for more equitable and inclusive approaches to disaster relief. Providing accurate information about unmapped areas and their needs can help pave the way for fairer distribution of aid. As environmental hazards grow more frequent and severe, the insights from this reflection on our mapping journey offer valuable perspectives on equity in digital cartography, with the potential for significant societal benefits.

KEYWORDS: disaster mapping; equity; GIS volunteers; disaster response; cartographic ethics

BACKGROUND

As a mapmaker and map user, I have always admired how technology enhances our ability to represent the world and support spatial decision-making. However, while geographers have historically focused on the spatial representations enabled by these technologies, it has not always been from a critical perspective (Roberts and Schein 1995). Similar to geographers, GIScientists and/or GIS practitioners do not always adopt a critical stance on the representation of space (and are perhaps rightfully being criticized for this). But there is nonetheless a substantial literature and research underscoring the importance of the subject.

Critical mapping and GIS have been a key area of research for more than a decade, extensively discussed and revisited by scholars such as Pickles (1995), O'Sullivan (2006), Crampton (2010), Denis Wood (1993), Michael Wood (2001), Thatcher et al. (2016), Harvey et al. (2005), and Edney (2015), with Blomley (2006) providing a comprehensive review of critical geography. In particular, Crampton (2010) notes that critical mapping examines the relationship between knowledge and power. The way we acquire and validate knowledge is deeply influenced by power dynamics, and certain ways of knowing are privileged or given more legitimacy because of the power structures that support them. This suggests that what we come to "know" is influenced by these power relationships, rather than being purely objective or universal.

While I acknowledge and appreciate these significant research efforts, my paper does not aim to review them but instead presents a personal case study that focuses

on power dynamics and inequalities in technology access during disaster response, and the ethical considerations that come from these inequalities.

These power dynamics were particularly evident on February 6th, 2023, when two devastating earthquakes struck Türkiye, severely affecting millions and exposing the disparities in disaster response, and in the knowledge that underpins it. On February 6, 2023, at 4:17 AM local time, a devastating magnitude 7.8 earthquake struck southern and central Türkiye, as well as northern and western Syria. Less than ten hours later, the impact of another powerful quake, with a magnitude of 7.7, added to the already ravaged geography (Meng et al. 2024). These numbers are among the few certainties regarding this catastrophic event. Numerous uncertainties persist to this day, particularly concerning the extent of human casualties and economic losses. These uncertainties are exacerbated by power differences that limit our knowledge.

In disaster mitigation, GIS is often used to map and assess risk areas, identify vulnerable populations, and plan emergency responses. Typically, urban areas are prioritized in these analyses due to their higher population density, infrastructure, and economic importance. While rural areas are often equally or even more vulnerable to certain disasters, such as earthquakes, wildfires, or floods, they frequently receive less attention in disaster mitigation efforts. GIS data in these regions may be sparse or outdated, and contain less information about the landscape, infrastructure, or local populations.

During a disaster, urban areas may have well-established evacuation plans and response teams, while rural communities might lack timely warnings or adequate evacuation routes. Besides an underinvestment in GIS data, rural communities may also have insufficiently trained personnel, and a lack of accessible emergency information, all of which compounds the disastrous effects of a catastrophe such as an earthquake.

This imbalance illustrates how power dynamics, reflected in the distribution of spatial data, can influence disaster preparedness and response across the urban-rural and developed-underdeveloped divide. When the earthquakes struck, I realized the critical role mapmaking could play in alleviating some of the inequalities I witnessed, particularly in filling the missing pieces in crowdsourced disaster mapping, which will be expanded later in the paper.

In an era when the spread of information is, surprisingly, **faster than the propagation of seismic vibrations**, can we expect a similar rapid dissemination of news about earthquake-affected communities? During the 2010 Haitian earthquake, the humanitarian field staff encountered significant difficulties due to unreliable information about health facilities, demographics, and infrastructure. The constantly shifting situation required ongoing processing of new data to grasp the evolving events which underlined the necessity of a system to gather all the information which is important for decision making (Harvard Humanitarian Initiative 2011). During this crisis, the **Ushahidi project** was deployed to give meaning to the information acquired by processing big data (in the form of SMS reports) coming through crowdsourcing (Mora 2011). While it wasn't exactly as fast as seismic waves, this crowdsourcing effort improved the spread of important information.

However, while technological advancements are universally influencing societies and pushing them toward similar outcomes, the speed at which different areas adapt and reach this technological "destination" varies, even though they are all moving in that direction (Wood 2001).

When the earthquakes struck eight major cities and provinces (Adana, Kahramanmaraş, Osmaniye, Hatay, Malatya, Adıyaman, Gaziantep, and Kilis) in southeastern Türkiye, more than 2.65 million people were living within a 50-kilometer radius of the first earthquake's epicenter. According to the Turkish Statistics Institute (Türkiye İstatistik Kurumu 2023), the proportion of households with high-speed internet access (e.g., through a digital subscriber line, cable, or fiber) for the Mediterranean Region (along the Mediterranean Sea in southern Türkiye where Adana, Kahramanmaraş, Osmaniye and Hatay are located) is 58%, and for the Southeast Anatolia Region (along the Syrian border where Malatya, Adıyaman, Gaziantep and Kilis are located) it is 43%. In the 2023 earthquakes, in which thousands of buildings collapsed and hundreds of thousands more were damaged, household fixed broadband access also collapsed. Mobile internet access (with 90% access for the Mediterranean Region and 92% for Southeast Anatolia) was also disrupted, as evidenced by the many complaints to the primary telephone service providers about disconnections (Sarp Nebil 2023). Additionally, social media users complained about internet disruptions, and officials announced that mobile bandwidth limitations were being applied in the regions affected by the earthquakes. All of these factors resulted

in a significant portion of the population having faulty or no internet access with which to announce their urgent needs, thus leading them to remain underrepresented and unseen. This situation underscores the glaring need for a more comprehensive data infrastructure (particularly locational), which, regrettably, remains absent in Türkiye and in many other parts of the world. Locational data and disaster maps play a pivotal role in disaster management and response, and it is imperative that they accurately and inclusively represent the individuals affected.

MY RESPONSE

As a Turkish citizen, I grappled with a range of unsettling emotions in response to the February 6 disaster. I knew that in times of crisis, like what had just happened, there is immense pressure to rapidly produce maps and allocate resources to aid relief efforts. How could I use my mapmaking skillset to aid those who were waiting for help? What was my responsibility as a person with experience working on this type of mapping for the past decade? How could I channel my own capacity, my network, and our resources to make a significant contribution in this time of need? These thoughts occupied my mind as I contemplated how to aid relief efforts from the safety of my home, thousands of miles away from the harsh realities faced by those in distress. In my emotional turmoil, I honestly wasn't sure where to start. The only thing I knew was that I wanted to help the relief effort.

Persisting through the failure of communication networks, people desperately sought help for themselves and their loved ones. Social media became inundated with pleas for assistance. Some of these posts included addresses and other locational information. My first approach was to scrape the social media data by writing a couple of scripts to get location information from the text and images that could then be used in rescue operations. Then I saw that a lot of other people had the same idea and were making their scripts available on GitHub. Despite the substantial effort put into this approach, I couldn't help but question how accessible the results of these efforts were to those attempting to provide aid and relief. I also wondered: Were we merely contributing to another layer of noise in the vast data landscape? What about the people with limited or even no access to the internet in the first place? My concerns were amplified by the fact that it wasn't possible to validate the data, and it was even more difficult to authenticate where and how it was produced. Locational data serves as the backbone of any disaster management effort, yet it paradoxically stands as one of the most unreliable and unavailable elements in this process.

I continued to question how equity could be ensured so that rescue maps could be created in ways that were fair and inclusive for all individuals. I felt unsettled in my efforts, until it dawned on me that perhaps I would have more impact in a collaborative effort rather than a solo one. As soon as I saw **the call made** by UN Mappers—a community of mappers collaborating to collect, validate, and disseminate geospatial open data to support United Nations field operations—for collaborative mapathon sessions to create maps to aid the disaster relief (Figure 1), I realized that the best possible way forward for me

Figure 1. Call for a mapathon to aid the HOT OSM earthquake disaster relief efforts in Türkiye.

was to go back to the simplest way to help: I joined the **Humanitarian OpenStreetMap Team** (HOT) effort. HOT is an international volunteer-based team that provides open and free map data for humanitarian aid and economic development. Individuals or organizations can create mapping projects for areas where map data is needed to help save or improve lives. Immediately after the February 2023 earthquakes, projects were set up to focus on affected regions where critical map data layers were not available.

Though I have taught about the accessible and collaborative nature of OpenStreetMap (OSM), and I have created OSM exercises for my students, I had never really rolled up my sleeves and contributed to it significantly. So, that is what I decided to do. Instead of doing it alone, I also recruited the students who were taking my WebGIS class during the spring term at the University of Massachusetts Amherst. I additionally reached out to former students who were members of my GISynchopation Slack channel. I posted and reposted as much as I could through social media about what we were doing to encourage others to also participate.

My current and former students and I dedicated hours to digitizing roads and buildings outlined in **HOT project #14226**: M7.8 Earthquake Türkiye – Gaziantep Response. We meticulously traced features from Mixar Premium satellite imagery or verified AI-assisted mappings generated by a tool known as **Rapid**. Making those small edits to polygons and lines for hours in front of a screen wasn't the most sophisticated work that I have done during my career, but it made me feel like I was at least helping. Then, when we witnessed the effect that our contributions had on damage assessment and relief planning, the gratification we felt made everything worth it.

For instance, in **a tweet by** Yer Çizenler, a Turkish non-government agency that supports the use of free and open geospatial data in humanitarian endeavors, our maps were shown in two images from the AKUT Search and Rescue Association (Figure 2). These photos illustrate how AKUT used our contributions for field coordination, to

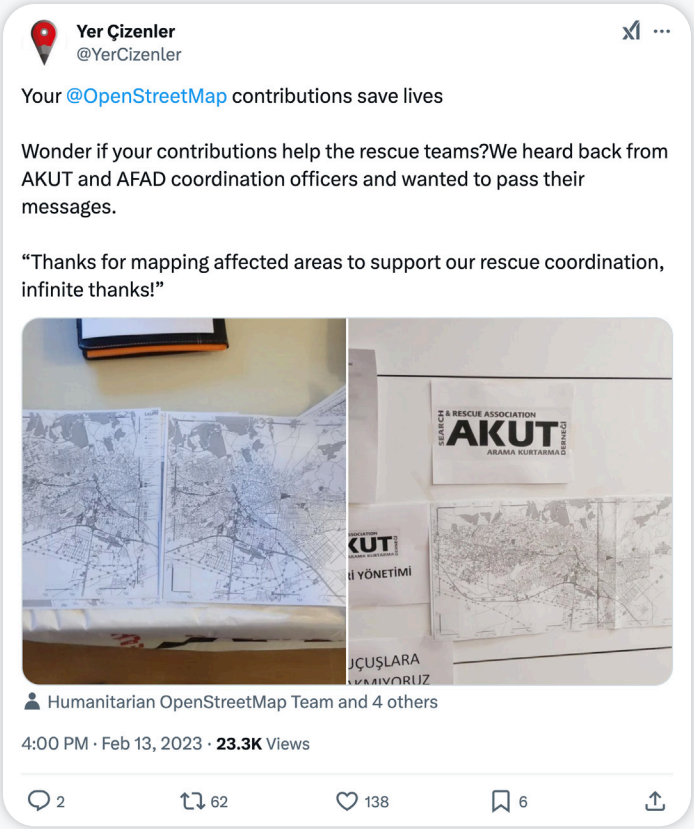

Figure 2. A tweet from Yer Çizenler shows two of our maps that were being used by AKUT.

reach damaged buildings, and to conduct needs assessments. In **an online article** about the mapping response to the Türkiye and Syria earthquake, HOT noted how many buildings had been mapped:

> Promptly after the earthquake hit, organizations like the International Federation of the Red Cross/Red Crescent (IFRC) requested building-level vector data for post-disaster damage assessments from Yer Çizenler, the coordinator of the response. Using government data, a Copernicus damage analysis, and pre-disaster OSM building footprints (more than 1.6 million have been mapped through today via the HOT Tasking Manager), IFRC performed a geospatial analysis to help them plan their aid in relief and recovery efforts by pinpointing the exact location of each destroyed building.

CONCLUSION

Understanding the tangible impact of our work has been pivotal for me. Even though I had used OSM previously, I have never really felt that my work had such a concrete impact. Did my efforts truly make the

unseen visible? Did I help to give a voice to the unheard? Was I able to add equity to the response efforts? While the answer may still be uncertain, these questions drive me to continue striving for a resounding "yes."

The volunteer GIS and crowdsourcing concepts have been around for very long time (Goodchild 2007), yet there is still much room for improvement in disaster response, and I harbor doubts that there would be any significant differences were a similar catastrophe of the same scale happen today in the same geography. However, as I reflect on the events surrounding the February 2023 earthquakes and their aftermath, I am reminded of the profound effect that volunteered geographic information can have on crisis response. This means we will repeat what has been pioneered in disaster response—including by **Ushahidi project**, in Russia during the wildfires in 2010, in the January 2010 Haiti and February 2010 Chile earthquakes, and many more—collaborative work to create the data and become the sensor of people who are invisible on the map.

The challenges faced in rapidly producing meaningful maps, coupled with disparities in broadband accessibility, underscore the critical need for a comprehensive and inclusive approach to disaster relief efforts. My experience with HOT reaffirmed the importance of community collaboration and the role of education in preparing individuals for such crises. I feel that we need to engage in more collaborative mapping efforts and perhaps not wait until a disaster hits. I advocate for sustained collaboration and proactive utilization of technology for societal good.

I have also learned that, as mapmakers, we bear a responsibility to advocate for those who might otherwise go unnoticed. In this case, they were the residents of rural parts of Türkiye who might have waited several days or even months for their locations to be mapped. As we continue to face the complex challenges of disaster response, I find solace in the collective power of communities volunteering their time and expertise, and the potential of technology to bridge gaps and bring about positive change.

The community's collectively created data on destroyed buildings is **available for download**.

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CASE STUDY

Ethical Reflections on Making the Untitled TETÁĆES Map

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TEMOSEN (Charles "Chazz" Elliott), a professional artist and carver working from a family studio in WJOŁEŁP (Tsartlip) First Nation, and Kim Shortreed, a settler immigrant artist and scholar, teamed up to challenge Western cartographic traditions through Untitled TETÁĆES, *the first prototype of a haptic map, an art/map concept created by Shortreed during his Ph.D. project. Having completed and shown the map at a local gallery, Kim now reflects on the ethics of creative and cultural ownership, toponymic justice, and cartographic colonization.*

KEYWORDS: art; British Columbia; ethics; Indigenous cartographies; mapping; Salish Sea; SENĆOŦEN; settler cartographies; toponyms; toponymic justice; WJOŁEŁP Tsartlip First Nation; WSÁNEĆ Peoples

INTRODUCTION

I conceived of the haptic map concept in 2023, as part of my Ph.D. project, "Contracolonial Practices in Salish Sea Namescapes," at the University of Victoria (UVic). The term haptic refers in its narrowest meaning to a sense of touch, but is also widely used to mean a sense of position and motion (proprioception). There is thus such a thing as haptic knowledge, and geographers have taken account of this in designing "tactile" maps for visually impaired users. Such maps have been supplemented with sound, producing a kind of "haptic" map (Rogers et al. 2013). Moreover, Tania Rossetto argues that "touch, as a proximal and non-representational way of knowing . . . is well suited for experimenting with non-representational approaches to maps," and that "tactile/haptic aspects of cartography" represent "a potential research area" in need of further development (2019, 85). The collaboratively built *Untitled TETÁĆES* the is the first complete prototype of my interpretation of a haptic approach to mapmaking (see Figure 1).

The primary goal of my haptic concept, and indeed the *Untitled TETÁĆES* art installation/map (map, hereafter), is to explore creative ways to consider maps less as abstract toponym-indexing machines and more as aesthetic relation al sites for human interactions, cultural exchange, and storytelling. My inspiration for this map concept is informed in part by cartographer and artist Margaret Pearce, who argues that cartography can be a "mode of creative expression" with the "potential to do more" than serve as a geospatial "inventory" tool, in the case of typical Western-style maps, for "the information extraction industry of colonial economies" (2021, 317). The *Untitled TETÁĆES* map combines aesthetics, language-learning, and interactivity in order to observe what these combined elements can teach about the ways in which maps construct a sense of place and perhaps spatial identity—it is an approach to haptic mapping that attempts to build a bridge between embodied learning on the land and the relatively abstract and visual-centric learning possible through typical Western two-dimensional paper or digital maps. As an art installation experience, *Untitled TETÁĆES* intends to get viewers thinking about the ways in which sensory understandings of spatiality and our emotional connections to personal geographies entwine to engender feelings of being "at home" in some places and not others.

My primary collaborator on this project was **TEMOSEN** (Charles "Chazz" Elliott), a professional artist and carver working outside the academy from a family studio in WJOŁEŁP (**Tsartlip**) First Nation.[1] Together, we

1. To learn more about TEMOSEN's work, family, and art, see the Salt Spring Arts webpage on **a 2022 show** called JSINSET—ŚWELOĶE (Family Growing Ourselves Up), a collaborative exhibit, curated by Rose Spahan, of works by TEMOSENŦET Charles Elliott, Myrna Crossley, TEMOSEN Chazz Elliott and Matthew Parlby-Elliott.

constructed the map over the course of roughly fifteen months. We constructed what is essentially a curved, narrow box, with three sheets of ⅛" thick Meranti plywood for the inner wall and seascape, and three sheets of ¼" flexible plywood sheets for the outer wall and the carvings. The structure was built using a stitch and glue technique with EcoPoxy as the main adhesive and filler. Overall, the map is a cylinder shape, roughly ten feet in diameter, with an entrance cut out; the entrance has a width of just over 36 inches and meets Canadian code for door width for wheelchair access. The interior map space is intended to allow three to four adults to move around comfortably. The Salish Sea seascape horizon scene on the map's interior was spray painted by artist **Jesse Campbell** (Michif [Métis]), who also specializes in large-scale murals. Each T̲ET̲ÁĆES (island) on the map can be moved anywhere along the seascape horizon. When lifted off the magnetized wall, a motion sensor in the island triggers an audio clip to play from a hidden speaker in the island, which speaks the island's name in both English and SENĆOŦEN, an Indigenous language spoken in W̲SÁNEĆ territories, including the lands known also as the Saanich Peninsula in British Columbia.[2] The map also has accompanying elements and resources: a field recording of **waves lapping a local seashore**, which is played on a loop from speakers within the central map space; an interactive, **virtual version** of the map, created by Legacy Gallery; and a **customized Google map** showing the written names for each island, in SENĆOŦEN and English, with some information about each island.

The *Untitled T̲ET̲ÁĆES* map is intended to be experienced in different ways. Viewers can enter the map space and listen to the sounds, arranging the islands as they wish. We placed a "Map Guide" near the entrance to the map, which provides among other things, some suggestions on ways to experience it:

> Each T̲ET̲ÁĆES, or island in SENĆOŦEN (a language spoken by W̲SÁNEĆ Peoples) in the map, is intended to be moved around so that you can hear both its SENĆOŦEN and English name. The islands' shapes are traced from the actual islands in the Salish Sea that they represent. Imagine yourself standing on a shoreline, looking out to the islands' silhouettes, or from on top of ŁÁU,WELN̲EW̲, the highest point on the Saanich peninsula and sacred to the W̲SÁNEĆ People. Do the islands look familiar to you? Feel yourself building an understanding of familiarity of place. Move the islands from memory, feel their shapes, listen to their names and try to say them. These islands are part of the living landscapes in W̲SÁNEĆ Territory and the Salish Sea.

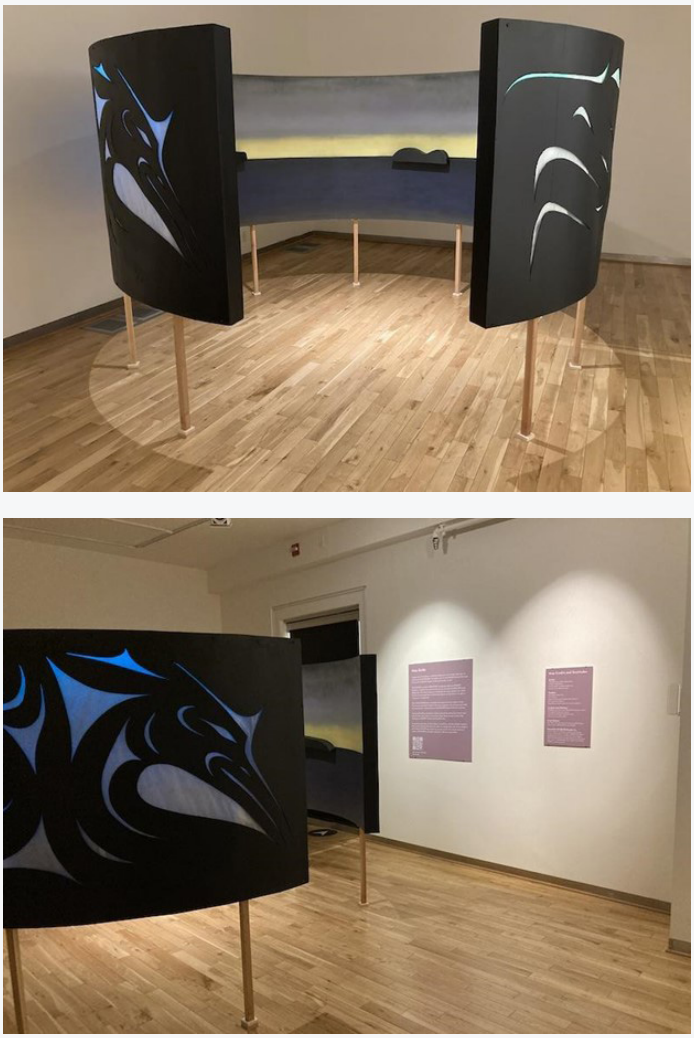

Figure 1. The *Untitled T̲ET̲ÁĆES* map, an early prototype to demonstrate our haptic map concept for SENĆOŦEN and English toponyms. This interactive map is a motion-activated art installation that speaks aloud place names in both languages. The above images show the map at Legacy Art Gallery in lək̓ʷəŋən (Lekwungen) territory/Victoria, BC, Canada, where it was shown from September 23–December 9, 2023 (photographs by the author, September 9, 2023).

There is a toponymic justice aspect to this map, which is to encourage viewers—especially settler viewers familiar primarily with English place names—to consider

2. See the W̲JOŁEŁP (Tsartlip) First Nation's **website** to learn more about W̲SÁNEĆ territories and histories.

SENĆOŦEN names as intrinsic to living W̱SÁNEĆ namescapes rooted in W̱SÁNEĆ narratives. This haptic map concept intentionally complicates how most W̱ENITEM—or "Anglo, white person" in SENĆOŦEN (Montler 2024)—are educated about what maps and toponyms are, or might be, as cartographic and cultural products.

Phillip Paul, in *The Care-Takers*, describes one counter to indexing-centric cartographies, and toponyms specifically, in W̱SÁNEĆ oral tradition, in which "a place name is tied irrevocably to either a teaching story or to a historical account" (1995, 1). All toponyms can of course be tied to varieties of meanings and narratives, which in themselves can vary in meaning and cultural significance, but the irrevocability in W̱SÁNEĆ toponymic practice is that teaching and narrative are epistemologically intrinsic to toponyms: to separate stories from places is to disrupt fundamentally their toponymic mores. Further, Paul relates that narrative accounts are embodied in people and the exchange between "the story teller" and "the listener" (1). The *Untitled ṮEṮÁĆES* map could never replace personal and cultural relational exchange—nor should it—but it can create conceptual spaces that gesture toward embodied and relational learning. While the artistic, representational landscape of the *Untitled ṮEṮÁĆES* map tells a visual story, it also tells a multi-sensory story of place intended through touch, by moving physical representations of islands, and hearing, by listening to a Salish Sea soundscape and recordings of spoken SENĆOŦEN and English toponyms. Placing Indigenous and non-Indigenous toponyms into relationship and conversation in new ways could encourage viewers to consider Indigenous/settler relationships to land differently and represent in a small way what artist TEMOSEṈŦET (Charles Elliot), TEMOSEṈ's late father, described as "a small bit of decolonization" (Dickson 2014).

TEMOSEṈ descends from the W̱SÁNEĆ and lək̓ʷəŋən (Lekwungen) Nations and I am a settler immigrant from the United Kingdom, and so we found ourselves discussing the ways in which our inherited cultural cartographic perspectives could be creatively paired through the *Untitled ṮEṮÁĆES* map, such that its design could promote broader conversations on reconciliation. Making and showing the *Untitled ṮEṮÁĆES* map invited us to explore some ethical territories particular to our collaborative journey—that of combining W̱SÁNEĆ and settler cartographic traditions, perspectives, and narratives in one map. I discuss these explorations here in order to invite reflection and to encourage dialogue for those working on similar cartographic projects in similar spaces. The first ethical conversation we had was about ownership of the map as a concept and object, and the second was about settler audience reactions to, and understandings of, the W̱SÁNEĆ/settler toponymic equity aims of the map and its representation of living landscapes. We are not celebrating or endorsing our approaches to these ethical conversations, nor do we intend to suggest universal solutions. Rather, we observe that maps that co-present Indigenous and settler cartographic perspectives will necessarily face ethical dialogues specific to their collaborations, institutions, and territories.

OWNERSHIP

The first ethical consideration we faced while making the *Untitled ṮEṮÁĆES* map was determining who would own it, both as an object and as an intellectual and cultural property. My haptic map concept developed in a settler academic institution, with its attendant systems, expectations, and ethical benchmarks. A year or so before we began the map construction, I presented a proposal on the *Untitled ṮEṮÁĆES* map to the UVic Human Research Ethics Board (HREB) and completed the **Human Research Ethics Standard Application**. As part of the ethics approval process, I also completed the Government of Canada's Tri-Council **Course on Research Ethics** (TCPS 2: CORE-2022). These ethics review processes took roughly five months to complete but they had nothing to do directly with ownership, so I needed to take UVic's ethics process further, especially since the map's construction involved Traditional Knowledge.

The *Untitled ṮEṮÁĆES* map is intended as a new way to understand namescapes, but TEMOSEṈ's design also conveys connections to and representations of W̱SÁNEĆ cultural memory, ontologies, and narratives of place.[3]

3. TEMOSEṈ designed and carved the outside panels with help from Matthew Parlby-Elliott. I built most of the map's structure (with help from TEMOSEṈ, Matt, and Ben Olsen) and the interactive islands. Mural artist Jesse Campbell painted the seascape horizon.

Therefore, early in our collaboration we determined it vital that TEMOSEN have complete ownership of the map and that he have final say on where the map could be exhibited. Our early discussions began with the understanding that the map might end up exhibited exclusively in Tsartlip, Tseycum, and Tsawout Nations' communities, and for their members alone. After TEMOSEN agreed verbally to work on the project, I secured several funding sources to pay for any work at the **wages recommended**, in 2023, for professional artists by a Canadian non-profit association called Canadian Artists' Representation. Of the funding received, roughly 90% went to TEMOSEN and roughly 10% toward materials.

As we began our design discussions and started to sketch out ideas and approaches to the design, I had to ensure that this and future creative outputs would belong to TEMOSEN and not UVic. Should the project cease midway, for whatever reason, TEMOSEN's work needed to be protected—an incomplete *Untitled TETÁĆES* map would still need to belong to TEMOSEN. To address ethics of who would own the map, both during its construction and in perpetuity, I drafted a "Haptic Map Agreement"—our version of an artist contract agreement—and reviewed it with TEMOSEN until we were both satisfied with its language and that TEMOSEN's ownership of the map was uncontestable. We both signed the agreement and I attached a digital copy to my UVic HREB application, which was accepted and approved as part of the broader ethics review application. Creating the agreement together was empowering for us both because we chose language and terms specific to our collaboration and to the creative and cultural practices that TEMOSEN brought to the map and its making. Our conversations about the ethical implications of the agreement were helpful, as they encouraged productive discourse on WSÁNEĆ and settler understandings of place and territorial presence, histories, and what it means to "own" land and its symbolic representation in cartographic form.

REPRESENTATION

The *Untitled TETÁĆES* map's design removes traditional Western cartographic elements, like written toponyms, border lines, and consistent scale, yet leaves enough elements in place to teach something about location and to encourage viewers to think about how they construct feelings of geospatial familiarity and belonging. This haptic map concept, as a cartographic/art and media project, raises considerations about Western cultural and institutional expectations and biases for what defines a "map." Are these *ethical* considerations? I argue that they are because the relationships established between a "map" and its viewers, as well as places it represents, have typically been informed by WENITEM hegemonic, cartographic, and epistemological norms, such as the assumptions that geocoordinates, cardinal directions, and distances on maps are culturally neutral or objective. JB Harley observes that maps can be "agents of change" and "they can equally become conservative documents. But in either case the map is never neutral" (1989, 14). Our working assumption was that by fundamentally questioning what we produce creatively and cartographically, we could learn new ways to question our inherited personal, cultural, and educational assumptions about what maps and toponyms can be. While building the *Untitled TETÁĆES* map, we came to understand our haptic map as much more than a theoretical cartographic concept: it is an ethical practice through which to learn about how better to undertake collaborative anticolonial work through interactive media. Moreover, we found that as our early, respective expectations about the installation's design and production as a "map" receded, the more clearly we were able to consider the installation as a sensory and phenomenological experience, a creative shift very much in keeping with Pearce's guiding principle to "work towards no predetermined outcome, but instead seek to learn what becomes possible" (2021, 334).

One of the ethical outcomes we did not predetermine was that presenting WSÁNEĆ (Indigenous) and English (settler) toponyms in symbolic harmony could potentially undermine the toponymic-justice intention of the *Untitled TETÁĆES* map, that is, to motivate real-world toponymic equity in British Columbia's official toponymic systems. As much as my haptic map concept strives to champion Indigenous toponymic resurgence and awareness, it also includes colonial and non-Indigenous toponyms, and this co-representation illuminates an ethical impasse. On the one hand, my haptic map concept presents a rebalancing of toponymic inequity—through the co-representations of Indigenous and English toponyms—on the other

hand, it presents a cartographic narrative of false equivalency in a settler-administered namescape of imbalance between Indigenous and settler toponyms. The *Untitled TE<u>T</u>ÁĆES* map, for example, represents the same number of SENĆOŦEN and English names; each of the four islands included in the *Untitled TE<u>T</u>ÁĆES* map has two audio clips: one in SENĆOŦEN and one in English. But, this toponymic balance is not reflected numerically in the official gazetteer of British Columbia. The British Columbia Geographical Names Office (BCGNO) **gazetteer** shows that English and non-Indigenous-language toponyms of "foreign imagination" far outnumber SENĆOŦEN and other Indigenous-language names (Noodin 2021, 27). It is also common in W̱SÁNEĆ territory to see English language versions of SENĆOŦEN names, for example, "Saanich" is an Anglicization of W̱SÁNEĆ. Viewers unfamiliar with the extent and degree of colonization's systematic and systemic erasure of Indigenous toponyms, through omission or Anglicization, might consider the *Untitled TE<u>T</u>ÁĆES* map to represent a toponymic harmony restored, rather contemplate its broader objective: to contribute to emerging, meaningful exchanges on how best to approach toponymic, cartographic, and ultimately land-ownership inequities between the colonial state and First Nations and Indigenous Peoples. My haptic map concept intends to contribute to "expanding dialogue[s]" on finding new ways for cartographies to serve as "potentially useful means of incorporating Indigenous and non-Indigenous conventions in the same map" (Pearce and Louis 2008, 107). However, settlers contemplating these conventions, which are themselves culturally and situationally specific, need to consider more fully the ethical complexities inherent in these new cartographies.

The ethical concern of overlooking toponymic injustice emerged during the artist panel discussion at Legacy Gallery, as part of *Untitled TE<u>T</u>ÁĆES*'s showing. During the question-and-answer session, I asked the audience of roughly fifty people to raise their hands if they had ever heard of the BCGNO and the overwhelming majority had not. This prompted a lively discussion about "official" vs. "unofficial" toponyms. Small as this sample size was, it nevertheless reveals a gap in general knowledge about the domination of specific settler institutions over our shared namescapes. Early in my haptic map concept's development, I grew increasingly concerned that I, as a settler immigrant, would—despite best intentions—reify what Margaret Noodin calls "cartographic colonization," a simultaneous erasure and colonial reframing of Indigenous naming histories and practices (2021, 16). Noodin observes that "as the narratives embedded in cartography show, colonization was a blunt process of forced forgetting and much was lost as names and identities were obliterated, merged or reshaped by foreign imagination" (27). Building on Noodin's observations, the *Untitled TE<u>T</u>ÁĆES* map could be rightly critiqued for transfiguring real-world toponymic inequity into a kind of toponymic chimera in which, at least in our abstract art/map space, SENĆOŦEN and English toponyms present as equals.

Among the narratives embedded in my haptic map concept, one is a falsehood that could undermine its ethical intention of encouraging official equity between Indigenous and settler toponyms in the BCGNO's gazetteer. Those unaware that toponymic inequity exists in our shared Indigenous and settler namescapes might experience the *Untitled TE<u>T</u>ÁĆES* map and assume, for example, that SENĆOŦEN and English placenames are relative equals, or that it is just a matter of time before these Indigenous and settler toponyms share cartographic space generally. However, official toponymic equity will take many years to achieve. In its present state, settler cartographies dominate Salish Sea landscapes from a place of seeming bureaucratic banality, in a toponymic status quo in which, from Indigenous perspectives, toponymic injustice is normalized. This banality acts as an ongoing tool of colonial effacement and dispossession, furthering a perpetual frontier narrative in which, as Razack contends, "European settlers" cast themselves "as bearers of civilization" (2002, 2). Lawrence Berg, building on Razack's contention, argues that in the settler state's toponymic banality "whites are able to safely ignore" Indigenous Peoples, and I would add their namescapes, by lending "a sense of the everyday" to systems that ultimately marginalize Indigenous Peoples and namescapes (2011, 20). For example, Trutch Street, named after a prominent British Columbian who "held repugnant personal views about First Nations," was only recently renamed to Su'it Street, which translates as *truth* in the lək̓ʷəŋən (Lekwungan) language (Depner 2022, 11). Prior to this name change, and its press coverage, Trutch was one name among the many that blended into the banal and unquestioned toponymic backdrop of other historical settler figures in the Salish Sea region. If toponymic equity were to happen at all, I maintain that a fundamental, systemic shift in thinking and practices around settler naming conventions is required. Presenting SENĆOŦEN and English toponyms as equals is a lie by

omission, unless viewers are aware already of just how rare this is in BC's conventional cartographic systems.

To the credit of the Legacy Gallery's staff involved in the *Untitled TEṮÁĆES* show, particularly Lorilee Wastasecoot (Ininew/Cree), Curator of Indigenous Art and Engagement, this group used the map's concepts as an opportunity to bring ethical conversations on space, place, and territory outside the map space and into other media. Legacy Gallery applied for and received funding from a local organization to create a "Digital Knowledge Mobilization Package," in the form of a website, video interviews, and exercises, in their words, "to give K-12 students, teachers, and community members an opportunity to further learn from and engage with the Untitled *TEṮÁĆES* art exhibition in their classrooms and at home" (2024). Legacy created a geospatial and territorial awareness education package intended, through its various exercises, to get students to learn about issues of space, place, and W̱SÁNEĆ and Indigenous toponymic awareness using the *Untitled TEṮÁĆES* map as metaphorical starting point. The first drafts of the educational modules were well intentioned and well designed. However, conspicuously absent in their content was any discussion of toponymic inequity. This fundamental ethical consideration was overlooked at first, and not intentionally. A few conversations and drafts later, we worked together to bring toponymic inequity considerations into the curriculum content. Now the lesson plan, located at the bottom of the "Video Interviews" page, asks teachers to "Ask students why they think it is important that people know SENĆOŦEN place names and why they might not be as well-known or as recognized as settler place names" (Legacy Art Galleries 2024). Neither TEMOSEṈ nor I see this education package as a complete solution to the ethical problems inherent in the map's co-presenting in harmony real-world toponymic disharmonies. However, we do consider this ancillary media helpful for settlers, particularly, to find ways into ethical discussions about shared Indigenous/settler namescapes. In addition to the education package, on a didactic panel presented as part of the Legacy show, we provided a QR-code link to the W̱SÁNEĆ Leadership Council's "**Resources for Settlers**" web page, which shows, among other information, a map of the hundreds of SENĆOŦEN toponyms in W̱SÁNEĆ territories. Our current thinking is that the *Untitled TEṮÁĆES* map may not be able to solve the co-representation ethical problem in the official sense, but we can at least provide resources for settlers to better understand the toponymic diversity around them.

For reasons of resources (both temporal and financial) and scope within my Ph.D. project, our *Untitled TEṮÁĆES* map—the first and hopefully not last example of our interpretation of a haptic map—was limited in scope and toponymic representation. At a **trial show** on SḴŦAḴ / Mayne Island, prior to the longer show at Legacy, several viewers commented encouragingly that they would have enjoyed interacting with and learning more about the many TEṮÁĆES/islands closer to their region of the Salish Sea. As more viewers interact with and respond to the *Untitled TEṮÁĆES* map, we will continue to learn more about which elements have predictable effects and which ones require more translation time, or a trip back to the metaphorical drawing board. Over time, we will continue to draw on Pearce's intentions to "learn to say with a map what we feel to be falling through the cracks between words, yet which we know must be said" (2021, 336) cartographically and ethically.

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CASE STUDY

A Discussion on the Ethics of Mapping Place Names for Riverine Forests in Tana River, Kenya

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We are an international group of researchers and conservationists with expertise in biological anthropology, environmental studies, international development, spatial sciences, and community-centered conservation. With over thirty years of combined research and lived experience in the Tana River region of Kenya, local place names for forests and woodlands have been shared with us through personal interactions, participatory mapping workshops, and other community workshops. We present an ongoing discussion about the ethics of publishing local names of sections of riverine forest patches and other locales, especially without inter- and intra-community agreement on these names. This conversation is especially critical for sustainable forest resource utilization, human-wildlife conflict, and biodiversity conservation. We present cartographic options and spatial analysis methods to reconcile the already-published names with the locally-named places and to preserve the privacy of villagers' activities. Also important are the implications for land ownership, rights, and control that claiming place names may have in this region at this time in history as land rights are presently being negotiated between different ethnic groups and clans. We explore a potential for harmonizing a naming system built upon consensus within the many invested Kenyan communities and anchored in their traditional way of naming places. We acknowledge that an ethical approach would be to publish names used by local people, but this is complicated by lack of local consensus.

KEYWORDS: place names; generalized point locations; cartographic solutions; ethical mapping; sustainable resource use

THE ISSUE

We are an international group of researchers and conservationists with expertise in biological anthropology, environmental studies, international development, spatial sciences, and community-centered conservation. One of the authors (Abae) on this paper is from the county of Tana River in Kenya, while the other (Kivai) is from the neighboring county of Makueni, both in the southeast of the country. Three of the US- and UK-based researchers (Loyola, Wieczkowski, and Allen) have spent months, even years, living in research camps in the Tana riverine forests or nearby villages. Two of the authors (Tang and Tran) are current undergraduate student researchers working with Loyola through the University of Southern California's Undergraduate Research Assistantship Program (URAP). The five senior researchers have knowledge of local names of sections of riverine forest patches and associated locales, acquired through lived experience, personal interactions, and numerous community workshops. However, we face an ethical conundrum on how to reconcile the published names of the riverine forests

(Andrews et al. 1975; Marsh 1976, 1986; Medley 1993; Butynski and Mwangi 1994; Decker 1994; Wieczkowski and Mbora 2000; Moinde-Fockler et al. 2007; Kivai et al. 2021; Kivai et al. 2023) with these local names. This deliberation is especially critical, given the implications for land rights that claiming place names may have in this area at this time in history, as land rights are presently being negotiated between different ethnic groups (mainly the Pokomo and Wardei, though there are others) and clans. Our question is whether it is ethical to publish local names.

The ethical issue that arises is whether it is acceptable to publish one set of names without a thorough discussion with all invested groups, particularly knowing that reaching a consensus may not be possible. In the Tana River region, as in many other locations, place names are often related to claims of ownership, rights to land use, ancestral attachment, and other aspects of land management (e.g., Boillat et al. 2013; Gray and Rück 2019; Hercus and Simpson 2002; Rose-Redwood 2021). Place names may also carry different meanings and information for different people and communities. These names may have been passed down through generations or they may have a more recent origin. In Tana River, the contentious nature of land ownership, rights, control, and naming surfaces even at the sub-forest spatial scale. It is also at this spatial scale that forest product utilization and conservation occur. It is therefore important to examine the ethics not only at the larger spatial scale recognized by international researchers, but also at the smaller spatial scale that the local people inhabit. The citing of more locally-recognized place names risks becoming a lightning rod for the above tensions because naming is claiming. Is it ethical for us to make a decision that exacerbates these tensions just by publishing one name (in one language or dialect or from one source) rather than another? In this paper, in order to discuss the question of naming within forests, we refer to these larger forests and woodlands as *forest patches*, and we refer to smaller areas within the forest patches as *forest sections*.

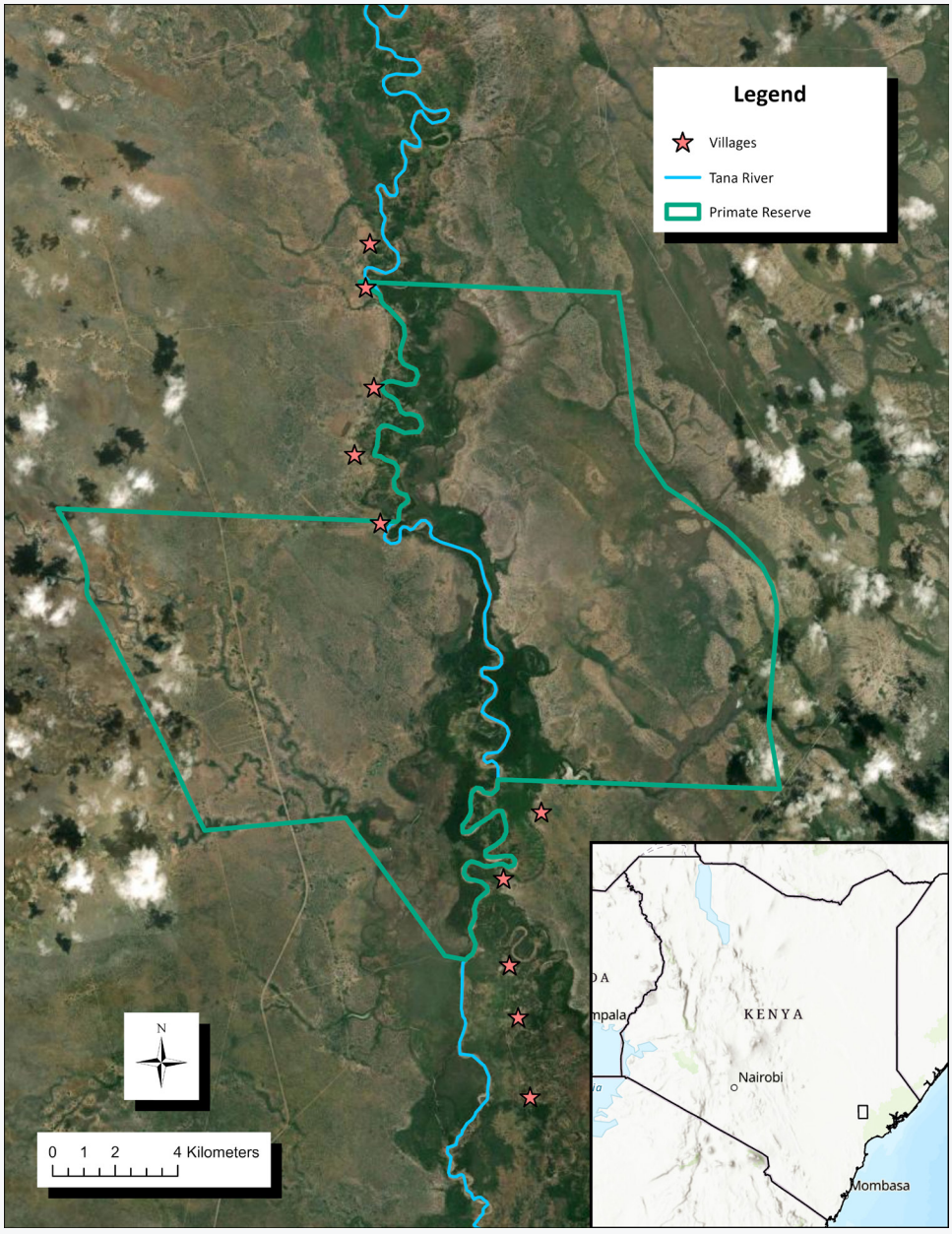

Figure 1. The area of interest is in the lower Tana River region, shown by the rectangle in the inset map. Selected village locations (shown with red stars), the Tana River Primate National Reserve (TRPNR) boundary (shown with a green line), and the Tana River (shown in blue) are depicted over recent satellite imagery. Map created by Susan Tang.

There are approximately 70 to 75 forest patches along the lower Tana River in southeastern Kenya (Figure 1). These forest patches grow and shrink over the decades, due to

both natural and anthropogenic factors. In addition, they are extremely heterogeneous in plant species composition (Hughes 1988, 1990). These forest patches are of international conservation concern and are part of the **Coastal Forests of Eastern Africa biodiversity hotspot**, a region of high species diversity with many endemic and endangered species (Myers et al. 2000). They are home to two endemic non-human primates: the **Tana River red colobus** (*Piliocolobus rufomitratus*) and the **Tana River mangabey** (*Cercocebus galeritus*). Both primates are classified as Critically Endangered. These forests are also classified as an **Important Bird Area** by BirdLife International. The primates are offered some protection in the Tana River Primate National Reserve, which is in the northern half of the species' ranges.

The first ecological survey of the lower Tana River was undertaken in 1972. In the published results (Andrews et al. 1975), the majority of the 26 forests and woodlands surveyed were named after the closest villages (e.g., Wema, Wenje, Mnazini). Subsequent surveys of the lower Tana River (Marsh 1976, 1986; Butynski and Mwangi 1994; Kivai et al. 2021; Kivai et al. 2023) continued the habit of naming the majority of forests after the nearest village. Naming systems included indicating the location of such forests relative to the river (such that the forests on the west and east banks closest to Mchelelo village were called Mchelelo West and Mchelelo East); their location relative to each other (e.g., Mnazini North and Mnazini South); or with numbers (e.g., Wenje 1 and Wenje 2). Subsequent researchers (Medley 1993; Decker 1994; Wieczkowski and Mbora 2000; Moinde-Fockler et al. 2007) continued to use these published names in their work.

The discrepancy between published names and local names came to light during participatory workshops that Allen, Loyola, Wieczkowski, and our colleague David Mbora ran in 2011 in every village immediately surrounding the Tana River Primate National Reserve (see Figure 1). One aim of these workshops was to gain a better understanding of how forest resources were utilized and conserved; another was to engage community members in participatory mapping sessions to visualize their villages and surrounding areas. We asked workshop participants to list forest products that they used and to identify the locations of harvesting. The place names used for these harvesting locations were new to us, largely because the workshop participants identified smaller, more specific sections within the larger forests patches that had been named in the literature by international researchers. A similar situation arose more recently with the 2021 community pre-census survey workshops conducted by Kivai and Abae (Kivai et al. 2021). When local community administrators along the lower Tana River were asked to list forest patches in their jurisdiction, names that were different from the published data again emerged. Additionally, pastoralists and agriculturalists who live in this region have cited different names (in their own languages and dialects) for the same forest sections during our interactions with them. These people have a unique connection to the area and land, and have lived adjacent to or in the conservation area in the Tana River floodplain for hundreds of years, depending on the river's flooding regimes and the resources that the riverine forests provide. To date, their knowledge has been transmitted largely through oral traditions; therefore, the depth and richness of this expertise is ignored, or even occluded, in the published record.

We have used the commonly published forest names in our previous manuscripts. However, these community workshops have made us realize that we would better understand the Tana River forests and the communities' interactions with the forests if we use local names to specify forest sections. Using more specific place names facilitates vegetation analysis (Valkó et al. 2023); biodiversity monitoring, mapping of resource use to determine sustainable practices, and conservation planning (Boillat et al. 2013; Gray and Rück, 2019); and prioritization of forest sections for research and conservation. Using local names also allows us to visualize the forest patches and sections as the local people do and to understand better how they interact with their environment. For example, places that are mentioned in reference to forest resource extraction, human-wildlife conflict, cultural utilization, or primary habitat for the two endemic and threatened primates are of great interest. These named sections could be located within forest patches, or they could be woodland/scrubland that is on the edge of the patches; this distinction may cause managers to take differing conservation/management actions.

We have recently identified the locations of smaller forest sections within a group of larger forest patches that have been referenced by local names by two (Pokomo and Wardei) of several ethnic groups in the region of the Tana River Primate National Reserve (see Table 1); these two ethnic groups are the ones with the most people living adjacent to the forests. With this knowledge, we hope to

Forest Patch Number	Forest Patch Name	Area* (Hectares)
1	Nkanjonja	187
2a	Wenje 1	220
2b	Wenje 2	258
3a	Kipendi 1	22
3b	Kipendi 2	8
4a	Maroni West 1	40
4b	Maroni West 2	9
5	Maroni East	156
6	Makere West	58
7	Kweche	36
8	Makere East	65
9	Guru East	33
10a	Guru North	9
10b	Guru South	95
11	Mchelelo West	16
12	Mchelelo East	13
13	Nkongolani Central	79
14	Nkongolani West	102
15	Unnamed Woodland 1	10
16	Sifa East	188
17	Sifa West	44
18	Maridadi	17
19	Hadiribu	8
20	Baomo East	49
21	Baomo North	30
22	Baomo South	215
23	Lemu	38
24	Kitere	17
25	Kombeni	22
26	Mnazini North	64
27	Mnazini South	60
28	Mnazini East	94
29	Unnamed Woodland 2	132
30	Matalani North	45
31	Munguvweni	14
32	Kinyadu West	65
33	Matalani South	226
36A	Bubesa West 1	24
36b	Bubesa West 2	66

Table 1. Selected forest patches and their published names. Forest patches are identified by their numbers and corresponding published names, as well as the forest area in hectares. The table is adapted from Figure 3 in Butynski and Mwangi (1994), and it references Figure 2 below. *Areas calculated using polygon geometry in GIS software.

gain a better understanding of where these areas are, how they are used by local people, and which conservation/sustainability issues relate to these forest sections. There is also the potential to harmonize the naming system, especially for those areas in conflict and those that can be utilized sustainably by local villagers while conserving wildlife habitats. However, we should bear in mind the natural floodplain ecology, the meandering nature of the river, and anthropogenic factors that affect the floodplain habitat (Loyola and Delgado 2014). Hydrologic changes affecting the meanders of the Tana River may "relocate" forests and even villages to the opposite side of the river, which may affect the system of naming forests after their nearest villages and the side of the river on which they are located. Additionally, with changing climatic conditions and a variety of anthropogenic influences (such as forest clearance for farmland, modification due to small-scale forest product use, and expansion from tree nursery plantings), new forests are developing through regeneration into adjoining forest patches, while others are disappearing (see Figure 2). Native vegetation is also being replaced by invasive species. The dynamic nature of the ecosystem

affects the names given to the riverine forests under the current naming conventions. Thus, if a harmonized system is established, the dynamic nature of the geographic area and its influence on place names must be considered. We would also have to incorporate a review period and produce updated visualizations from satellite imagery or ground-truthed locations as they are critical to updating the naming system.

Unlike some research collaborations in North America in which the goal was to shed light on and share the multitude of place names for specific locations (e.g., *Coming Home to Indigenous Place Names in Canada*), our work has not previously focused on this issue. Several ethnic groups live in the Tana River area, and there has been a long history of ethnic conflict, especially between the agriculturalists (Pokomo) and the pastoralists (Wardei, Somali, and Orma). As names can assert or infer a sense of ownership, we understand the potential conflict that may arise when assigning the name used by researchers, one ethnic group, or even just one clan within an ethnic group, to a location without consulting others in the vicinity/locality. Because there is no consensus on these names, publishing the names that we learned in our community workshops risks advantaging at least one group over another. However, understanding the smaller forest sections associated with

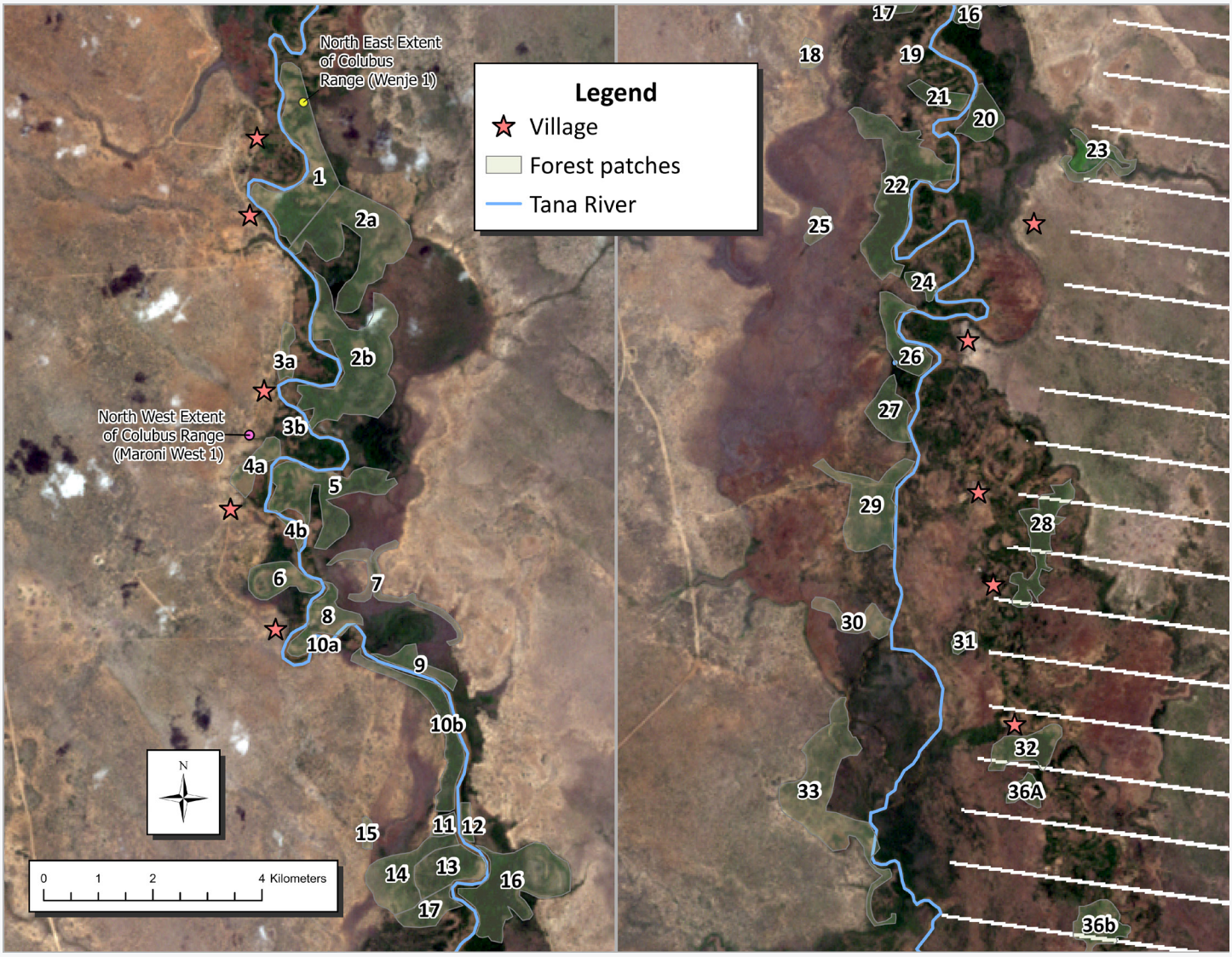

Figure 2. Selected forest patches were digitized from the original 77 forest and forest sections in Figure 4 in Butynski and Mwangi (1994). Patch numbers correlate with Table 1; 1–17 are the northern half of the range, 18–36b are in the southern half of the range. They are shown here over 2011 imagery to illustrate forest variations from the static maps published in 1994. The 1994 forest patches no longer correspond with the dark green forest areas seen in the 2011 imagery. The Tana River location was digitized from 2007 Google Earth Pro imagery. White diagonal lines are artifacts in the satellite imagery. Map created by Leyna Tran.

specific place names, as opposed to only the larger forest patches, may ultimately contribute to resolving potential human-wildlife conflict, responding quickly to emergencies, enhancing sustainable utilization of forest products, and increasing the understanding of forest and primate ecology. Therefore, we considered different options for resolving this conundrum.

POSSIBLE SOLUTIONS

One solution is to determine the exact location associated with each named place, utilize the locations for the spatial analysis, and then publicly reference specific locations using only already published forest names. However, this raises the question of who becomes the holder or keeper of the unpublished names, and at what point it is determined that the unpublished place name can or cannot be published. Alternatively, we could try to build consensus among the invested communities to establish agreed-upon place names, thereby harmonizing the naming system. These place names could then be shared with academic researchers and with the local community groups. Again, the process of sharing the place names with various types of local community groups that are not necessarily associated with clans or ethnic groups poses issues relating to the right to act as the naming adjudicator of these locales. Another option would be to locate the named places with our current knowledge and explicitly map their locations for analysis, then omit the place names from any maps or tables before publication. Depending on the research question (e.g., forest product use), we may even omit locations from publications. However, this option likely leaves future researchers and conservationists encountering the same challenges that we have.

We have discussed potential geographic and cartographic solutions that do not necessarily address the issue of place names, but that would allow us to produce maps of the results of our spatial analysis. Of the various geographic "masking techniques," the ones that we focus on are: (1) generalizing the point locations, (2) masking them using a randomized distance/direction offset, and (3) creating uniform buffers around point locations and dissolving them after the spatial analysis is completed. Generalizing point locations provides a general impression of where the place could be, maintains data anonymity, but does not preserve relative spatial accuracy of forest section size. This approach is commonly used to anonymize health, crime, or endangered species data (Zandbergen 2014; Seidl et al. 2018). For our research, it would provide the advantage of not revealing exact locations of resources and forest sections while (somewhat) clearly showing the locations of villages and forest patches relative to each other. However, the results of this approach may be too generalized to be useful because it does not show the variation in forest patch size.

The second option is an offset that shifts the feature in a specified or randomized direction and distance such that the actual location remains unknown. An advantage is that this approach preserves the privacy of the villagers' activities and allows for the same number of point observations to be analyzed. Another is that most masking algorithms allow for randomness in the shift of the data (Zandbergen 2014). A disadvantage is determining the best method for offsetting, including whether to select a random direction at (or within) a fixed or random distance.

Lastly, we could conduct the spatial analysis on the accurately geolocated forest sections and, upon completion, create graduated buffers and remove point locations. This provides a rough idea of where the place name relates to, but it does not reveal the exact location. An advantage is that buffers could show the relative sizes of forest patches. As a result, the general area in which human-wildlife interactions occur or where biodiversity hotspots are located can be visualized, thereby strengthening the outputs of our analysis. One challenge is finding the right buffer sizes to protect the locations of resources while remaining useful; another is the potential for the confusion that overlapping buffers may cause.

On one hand, there is a responsibility to engage in ethical cartography by avoiding the prioritization of one set of place names over another and publishing local names. On the other hand, there is an equally compelling rationale to publish accurate research results that support sustainable resource use and resolve human-wildlife conflict. These objectives are inherently contradictory, which emphasizes the complexity and difficulty of addressing this issue. The most transparent and ethical approach might be to acknowledge that there are multiple place names in

use and include a disclaimer in future publications and presentations stating that we recognize that for one place name there may be other names used by different groups, as mentioned above.

In this article, we suggested some cartographic solutions for publishing our research results; however, these solutions do not address the underlying ethical issues of how power can be embodied in place names, who holds these names, and when and how these names are shared. We are currently working on publishing results of our analysis from the data collected from our 2011 workshops, so we are also trying to accurately identify locally-named places through ground-truthing and subsequent interviews. At the same time, we are weighing our options to obtain the most accurate spatial analysis, while also producing cartographically ethical maps (i.e., considering the interests of the local people in our decision to name and/or map forest sections). However, we are still unresolved as to how to do this. The ideal resolution, as it would be based on participatory mapping and with the inclusion of multiple ethnic groups and clans, would be for local groups to agree on a harmonized naming system anchored in their traditional way of naming places. This solution would enact their right to designate the names and permit others to use them. This would, however, likely require multiple stakeholder meetings within and among the local community groups over an extended period of time, which would require funding and person-power resources. Not only is this beyond the scope of our current research, but it is also a process that arguably is outside the mandate of academic researchers, as it pertains to local politics. Nonetheless, we believe it is important, and we hope this process will be possible in the future.

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CASE STUDY

Ethical Challenges in Analyzing and Mapping Historical Demographic Changes and Migration Using Population-Scale Family Trees

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Despite the progress made toward generating and utilizing population-scale family trees to study historical population dynamics, little is known about their representativeness for the entire population. In this article, we confront the inherent complexities and biases in historical data collection and shed light on the extensive areas of history that remain unknown, unrecorded, or inaccurately portrayed. Although we do not provide definitive solutions for these data gaps, we aim to initiate a dialogue on these critical issues, contributing to the discourse on ethical data collection and representation in historical research. We first report on the preliminary results of a record linkage experiment between family tree records and a historical census, emphasizing the need for methods that integrate historical data from multiple sources to systematically evaluate representativeness. The experiment reveals significant underrepresentation of certain groups in the United States, notably Native American, Black, and Mexican persons, as well as those from eastern Europe, southern Europe, and Ireland. These findings underscore the ethical responsibilities that should guide historical research, including the need to address underrepresentation and improve methodologies to better reflect the diversity of population dynamics and migration patterns. To complement these efforts, we advocate for the use of interactive story maps to amplify the qualitative narratives of underrepresented populations and integrate them into the broader historical narrative. Our endeavor to map migration and demographic changes is not just about tracing the past; it's about shaping a more equitable and comprehensive understanding of history that honors the diversity of all its participants.

KEYWORDS: mapping historical migration; population-scale family trees; representativeness; bias in crowd-sourced data; bias in historical census data

INTRODUCTION

Population-scale kinship networks are large-scale social networks that describe kinship connections among a significant number of individuals within a given population. These networks offer insights into the complex network of relations established through biological ties, marriages, and extended kinship connections over many generations (Koylu and Kasakoff 2024). Constructing models of these networks, connecting individuals and families across geographic space and time, is enabled by family tree records generated by amateur and professional genealogists. These records offer a wealth of data including kinship ties (parents, children, spouses), names of individuals, and their dates and places of birth and death.

In our previous work, we cleaned, connected, and deduplicated crowd-sourced family tree data to generate the largest population-scale and longitudinal kinship network to date, containing about 40 million individuals in a single family tree spanning across centuries and continents (Koylu et al. 2021). Utilizing the child-ladder approach, which traces changes in birthplaces between consecutive siblings, we mapped interstate migration flows in the US between 1789 and 1924, uncovering the long-term changes in migration patterns in the US history (Koylu and Kasakoff 2022).

Despite the progress made toward generating and utilizing population-scale family trees to study historical

population dynamics, we struggle with a critical limitation: significant underrepresentation of certain groups in the United States, notably Native American, Black, and Mexican persons, as well as those from eastern Europe, southern Europe, and Ireland. This raises serious ethical concerns, highlighting our responsibilities as researchers to avoid perpetuating biases, to include marginalized groups in historical narratives, and to accurately interpret population dynamics without oversimplification.

These concerns challenge the reliability of our data and the validity of our findings, particularly when addressing questions about migration patterns, social mobility, and historical trends that may differ significantly across groups. Moreover, these challenges are also valid for other historical data, raising questions about their reliability for studying the social and demographic history of the entire population. Addressing these limitations requires not only methods to better evaluate the representativeness of population groups but also strategies to bridge data gaps by incorporating alternative historical sources and improving linkage techniques.

The discussion presented in this article aims to unpack these ethical challenges, explore the biases embedded in historical data collection, and examine the vast swathes of unknown, unrecorded, or misrepresented histories. While we do not offer a comprehensive solution to these issues, we seek to initiate a conversation and propose approaches for acknowledging and addressing these gaps in future research.

EMPIRICAL EVALUATION OF REPRESENTATIVENESS

Previous studies of population-scale family trees have consistently highlighted significant biases and limitations in representativeness. For instance, genealogical and genetic datasets have consistently shown a lack of African Americans and a skew toward the White population (Price et al. 2021; Erlich et al. 2018; Kaplanis et al. 2018). By comparing state-level statistics of individuals likely alive in 1880 with the 1880 United States Census, Koylu et al. (2021) revealed notable biases in family tree data, particularly favoring native-born White Americans and farmers while underrepresenting Black, Native American, and Mexican persons. They also found consistent biases toward men and older individuals across states. While these studies compared aggregate statistics from population-scale family trees with census data, a thorough comparison of representativeness requires linking individual records in family trees with those in historical census records.

We performed an empirical assessment of crowd-sourced family tree records compared to historical census records to evaluate the extent of their alignment, with the census data serving as a proxy for the actual population. We began by identifying potential connections between the family tree data—focusing on individuals likely alive in 1880 in the tree data—and those listed in the 1880 United States Census. For each record in the tree data, up to 100 potential census links were reviewed by trained research assistants who evaluated the correspondence of information between a single entry in the tree data and a possible census record for the same individual and decided whether a match could be made. Links made by the research assistants were reviewed for consistency, and instances where different research assistants selected different census records for the same tree record were flagged. The set of several hundred decisions about links and the characteristics of the tree and census records were used as training data for out-of-sample prediction of links between tree and census records. The training data were stratified by sex and marriage status to evaluate the potential ability of family trees to link women with maiden names. Utilizing the training data composed of manually linked records between family trees and the 1880 census, we developed a machine learning model (specifically, a probit regression model) to identify matches among millions of records from both the family tree and the 1880 census datasets. The initial linkage result showed an 18% linkage rate, corresponding to approximately 3% of the entire census. Our preliminary analysis of the census linkage indicates a significant representation of European-descended white populations across various sex and age groups, but a stark underrepresentation of critical demographic groups, including Black populations in the South, where they are scarcely represented in the family tree records, and Native Americans, who are mostly absent in family tree records. However, this underrepresentation is not limited to family tree data; historical census records themselves fail to accurately capture these groups due to systemic biases and

inconsistent documentation. We discuss historical biases in census-taking to explain the reasons for underrepresentation in the following section.

The major source of the problem in crowd-sourced family trees is the absence of records for historically underrepresented groups. This results largely from several ways these populations have been "discounted," making data for personal research harder to decode: inconsistent recording of names and lack of sources which included named individuals, lack of written records recording life events, passing (where individuals change their names and racial identities to gain social or economic benefits), and changing racial designations in historical sources. For some groups, common surnames within large cities made it difficult to disentangle different individuals with the same names. Moreover, the lack of crowd-sourced trees in certain populations also results from varying interest in genealogy by ancestry. For example, there is a notably low interest among individuals identified as Latino/a and a high interest among those identified as Black (Horowitz et al. 2019). This suggests that different racial or ethnic groups may have varying motivations or access to resources for exploring their genealogical backgrounds, potentially influenced by historical, cultural, or socioeconomic factors (Greely 2008; Roth et al. 2018).

All US datasets based upon crowd-sourced family trees, and many of those using DNA, have the same problem. Even those that link individuals between censuses have much less success linking together Black populations or recent immigrants, and they do not have any Native Americans (Helgertz et al. 2022). Records containing information on the slave trade including transatlantic ship records (Eltis 2020), slave biographies (Freedom Narratives 2024), runaway slave advertisements (Waldstreicher 1999), slave sales, and wills naming Black slaves bequeathed to others could be used to reconstruct Black trees and slave movement (Streets 2008). These records could also be linked with post-emancipation records such as censuses. However, generating such trees at a population scale would be a massive effort and may not yield a sample as representative as the one we have created for the European-descended white population. If generalized to the entire enslaved population, this technique might also lead to an overestimate of migration, as many of the potential datasets specifically focus on slaves known to have moved rather than a random sample of all slaves. Even if these holes in the crowd-sourced tree data were filled to better represent census population, most historical censuses fall short in accurately representing Black, Mexican, and Native American populations (Hochschild and Powell 2008). Compounding the problem, our analysis and mapping of migration over time is iterative and dependent on chains of data, so biases in population statistics propagate beyond their individual sources. Recognizing these biases is part of our ethical responsibility to ensure that our analyses do not inadvertently reinforce historical inaccuracies or exclude significant portions of the population.

REPRESENTATIVENESS IN HISTORICAL CENSUS

It is important to understand the complexities involved in census-taking, particularly concerning Native American populations. During the nineteenth century, Native Americans were often censused separately, especially those who were recognized as members of particular tribes that had signed treaties with the United States (Census Bureau 2024). These tribes were administered by the Department of Indian Affairs; tribal rolls were kept by Indian Agents, and did not always align directly with the general census process. Furthermore, the history of Native American censusing reveals that many Native American groups, especially those in the eastern portion of the United States, or those not recognized under treaties, may have been omitted or undercounted due to their unique socio-political status and the challenges of documenting populations that were, in some cases, actively hiding to avoid removal. The complexity of tribal recognition, eligibility for roll inclusion, and the impact of the Indian Reorganization Act of 1934 all further complicate how Native American populations were recorded.

Undercounting and inconsistent record-keeping of African-descended populations is also a major issue throughout the nineteenth century censuses, including the difficulties in documenting populations such as slaves, who lacked consistent naming conventions and whose records were not uniformly kept, and other marginalized groups whose presence in the census depended greatly on the fluctuating policies and practices of the time (Nix and Qian 2015). To uncover the ideological underpinnings

of racial categories, Lee (1993) provides a critical view of the methodologies employed in racial categorization, questioning the objective validity of these constructs and pointing towards a systemic reevaluation of racial data collection methods.

Similar problems of undercounting and inconsistent record-keeping also existed for Mexican populations (Parker et al. 2015). Between 1850 and 1920, the Census Bureau broadened its racial classification to include individuals of mixed race, identifying them under categories such as Mestizos and Mulattos. In this period, individuals of Mexican descent, including both Mexicans and Mexican Americans, were classified as "white" (Durand et al. 2001).

Even among the native-born white population, census records were far from complete, with notable variations across demographic groups and significant underenumeration in the nineteenth and early twentieth centuries. Hacker (2013) systematically examined this issue, utilizing back-projection methods, mortality estimates, and IPUMS samples to estimate age- and sex-specific underenumeration rates in the 1850–1930 censuses. His analysis showed that underenumeration rates ranged between 3.8 and 6.6 percent, with significant disparities across age and sex groups. Infants and older women were disproportionately undercounted. However, the undercounting of foreign-born populations is expected to be higher than the native-born persons. These findings highlight that while census data continue to be a reliable data source for historical research in the United States, it is our ethical responsibility to critically evaluate these data sources. This includes understanding their limitations, addressing underenumeration biases through appropriate corrections, and recognizing how these factors influence our interpretations.

REPRESENTATIVENESS OF MIGRATION PATTERNS FROM TREES

We use the child-ladder method to detect migration events from the tree data, dating these occurrences based on the midpoint of the birth years of two consecutive siblings born in different birthplaces. Given the relatively short intervals between the births of successive children—typically around two years within our study's timeframe of 1789 to 1924—this technique affords a more precise estimation of migration timing compared to broader decennial snapshots of household residences obtained from census data or parent-to-child or birth-to-death migration captured from birth and death events in family trees. However, the child-ladder method is inherently biased towards larger families and fails to capture the migration of single individuals or those with only one or no children. This approach also omits information on migration that may occur outside the childbearing period. Despite these limitations, the significance of this bias might be mitigated by the context of the US population during the study period, which was experiencing significant growth, with childless individuals constituting less than 10% of the population—a stark contrast to the higher proportions in the Northeast and Europe (Hacker 2016; Weir 1994). Therefore, while this method might not significantly underrepresent migration in a demographically expanding context like the US, especially at earlier dates, its effectiveness could diminish over time as the number of childless individuals increased. Nonetheless, the child-ladder method can detect multiple moves during the 10-year period between censuses.

Figure 1 illustrates a child-ladder migration flow map from 1850 to 1860 generated via **flowmapper.org** (Koylu et al. 2023). The curved flow lines illustrate the total number of families that moved between pairs of states; the point (node) symbols illustrate the gross volume of flows per state. Additionally, the choropleth base map represents migration efficiency, which is calculated by dividing the net flow of migration (the difference between the total inflow and outflow of migrants) by the sum of the total inflow and outflow. During this period, the child-ladder migration flows show a significant movement from east to west, with eastern states experiencing population declines and western states seeing increases. Major hubs of migration were identified in Ohio, Indiana, Illinois, Iowa, and Missouri.

To evaluate how closely the child-ladder migration from family trees reflects those from censused populations, we used the migration events derived from the IPUMS Multigenerational Longitudinal Panel (IPUMS-MLP) dataset (Helgertz et al. 2022) by leveraging changes in the state of residence for linked households across two consecutive censuses (i.e., 1850 to 1860). We should note that the MLP data set also introduces further bias into

the representation of population segments. For example, a comparative analysis with a sample from the 1910 census by Helgertz et al. (2022) revealed a significant overrepresentation of the linked individuals who were white, young males aged 7–20, predominantly from larger households living with their parents. Additionally, while overall coverage of women in the MLP dataset is less comprehensive than that of men, white women, those residing with family members, and individuals from larger households were notably overestimated compared to census figures. Regardless, the MLP change of residence migration dataset is probably the best proxy for representing the large-scale migration moves of the entire population between the states. We employed the cosine similarity metric to assess the similarity between state-to-state flow matrices derived from the child-ladder and the MLP change of household residence from 1850 to 1860, finding a high degree of similarity with a value of 0.91. This indicates a substantial commonality in migration patterns across the networks. Although we do not illustrate the MLP household migration flows in this article, the MLP map is very similar to the child-ladder migration (Figure 1), which is affirmed by the high cosine similarity score.

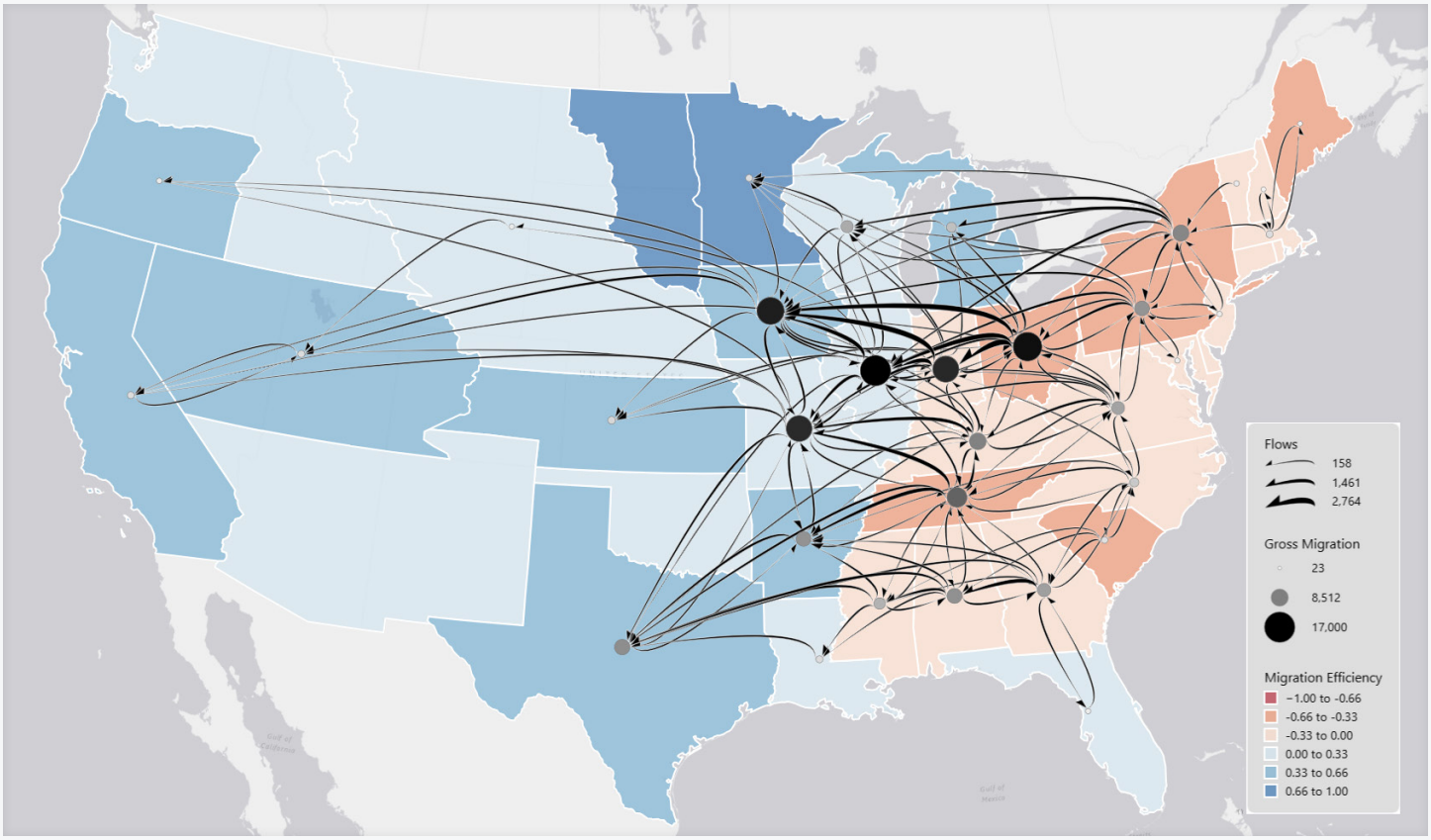

Figure 1. Family migration in 1850–1860 (child-ladder from family trees).

ROOTS & MIGRANTS

To tackle the issue of representativeness and shine a light on the stories of those neither fully captured in historical tree and census records, nor in our quantitative data and analyses, we have started a project called "Roots & Migrants." This project aims to further address the limitations of the data we have with detailed stories and provide a fuller picture of population and migration histories through the use of interactive story mapping. For example, it integrates the visualization of historical events such as the Indian Removal Act between 1830 and 1847 and its the consequences for the dislocation, dispersion, and disappearances of Native Americans (Sturtevant 1967) alongside the movement and expansion of migrants from family trees and historical census. Using story synthesis activities (Chen et al. 2018), the application will be accessible online to the general public and will enable people

with limited background in GIS to understand and communicate the challenges that westward migration posed to First Nations. It will also make the audience aware of how differences in documentation constrain the kinds of stories that can be told, further amplifying the differences between underrepresented populations.

A series of maps will combine what is known about Black, Native American, and Mexican populations with maps of the White population to visualize their different histories and the effect of White expansion on the other groups. Maps of the land that Native Americans occupied by treaty will be inserted onto the base map we use for making the flow maps of the White population. Officially recognized Native Americans were less able to move and mostly remained on their reservations in the nineteenth and early twentieth centuries. While the Mexicans living in the area ceded after the Mexican–American War became citizens and were censused as white, little is known about their migration and whether it can be reconstructed at the individual level. Many in the enslaved Black population were moved west by their masters to populate the New South. We will attempt to reconstruct that migration from census records even if we cannot study individuals. Meanwhile there was a growing population of Native Americans living away from reservations, some of whom were descended from mixed marriages or had never been listed on tribal rolls. There were also populations of free Black persons before the Civil War. These were relatively small in number, but it is important to study the paths people from these groups took to emphasize the diversity within these populations.

We plan to integrate Roots & Migrants into high school social studies curricula through collaborative workshops with high school teachers on the specific topic identified by Iowa Core Curriculum: "Analysis of human population movement and patterns" (Iowa Department of Education 2024). We held a workshop to guide the development of the application, involving seven high school teachers specializing in history, social studies, and geography, as well as three high school students. In this workshop we presented a prototype of the application to the users. The workshop involved focus group discussions and broader group feedback to refine the application's requirements, particularly around curriculum integration, student engagement, and the use of interactive tools. We plan to conduct a second workshop with high school teachers to develop lesson plans to support the Iowa Core Standards, emphasizing both historical content and thinking skills that prepare students to apply these skills in diverse historical contexts—essential for college, career, and democratic citizenship. Roots & Migrants seeks not only to address representational gaps but also to enhance public engagement and foster greater understanding of US historical population dynamics.

CONCLUSION

Our experience in mapping demographic changes and migration using family tree data has highlighted the ethical responsibilities we hold as researchers. Throughout our work, we recognized the imperative to address underrepresentation and bias in historical data actively. This journey compelled us to critically assess our methods and data sources, ensuring that we do not perpetuate inaccuracies or exclude marginalized groups from the historical narrative. By embracing these ethical obligations, we have taken significant steps toward creating a more inclusive and accurate portrayal of the nation's history. Our empirical assessment of representativeness, when compared with historical census records, underscores the persistent difficulties in fully capturing the diversity of the US population. This serves as a clear reminder of the ethical responsibilities that should steer our research and the critical need to constantly improve our methods to accurately reflect the population dynamics and migration patterns of all demographic groups.

In this article, we have confronted the inherent complexities and biases that exist in historical data collection and shed light on the extensive areas of history that remain unknown, unrecorded, or inaccurately portrayed. While we do not provide a comprehensive solution for these data gaps, our goal is to initiate a discussion on these critical issues. Moreover, by examining the underrepresentation of Native American, Black, and Mexican populations, and assessing migration patterns through the lens of family trees and historical censuses, we aim to contribute to the discourse on ethical practices in historical research.

As we move forward, our work continues to evolve, informed by the insights gained from these explorations. By

incorporating detailed narratives and qualitative insights through Roots & Migrants, we aim to bridge the gaps left by incomplete quantitative data, ensuring that the experiences of underrepresented populations are acknowledged and integrated into the broader historical narrative. By integrating stories of underrepresented groups and utilizing advanced analytical techniques, we aim to offer a richer, more inclusive view of American history. Our endeavor to map migration and demographic changes is not just about tracing the past; it's about shaping a more equitable and comprehensive understanding of history that honors the diversity of all its participants.

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CASE STUDY

Cartographic Considerations for Ethical Rockhounding

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When does location information on an interactive web map become too detailed and identifiable? In this case study, I discuss the issues that arose when the Washington Geological Survey converted a decades-old printed rockhounding location map into multiple interactive, variable-scale web maps. These issues include topics relating to privacy, land management, rock-collecting laws, and the ethical responsibility of a state agency to consider the many different ways that such maps could be used.

KEYWORDS: ethics; rockhounding; geology; rock collecting; land management; privacy; state agency; natural resources; state government

Rock and mineral collecting, also known as rockhounding, is an extremely popular recreational activity in the US state of Washington. The Washington State Mineral Council (WSMC) website lists over twenty rock, mineral, and gem clubs in the state, and there are several rock and fossil collecting sites that have been developed to support recreational activity, including the popular Stonerose site in northeastern Washington. However, issues arise when rockhounds seek to collect rocks, minerals, and fossils on lands where these activities are prohibited or only allowed under certain conditions. Therefore, groups and organizations that provide recommendations to rockhounds about locations to explore must keep these issues in mind.

Public requests for guidance about rock-collecting rules have consistently been among the Washington Geological Survey's (WGS) most requested types of information. WGS did not have much up-to-date, public information about rockhounding on their website until 2015, when a **rockhounding page** was added to provide rock-collecting information to site visitors. Then, in 2016, WGS published a rockhounding Esri StoryMap titled ***Minerals and Fossils in Washington***. The StoryMap provided an updated view of the information originally found in a 1985 Washington State Department of Natural Resources (WA DNR) rockhounding pamphlet and location map titled *Gems and Minerals of Washington* (Pattie 1985). The data from the print map (Figure 1) were presented in several variable-scale web maps in the StoryMap. Each online map

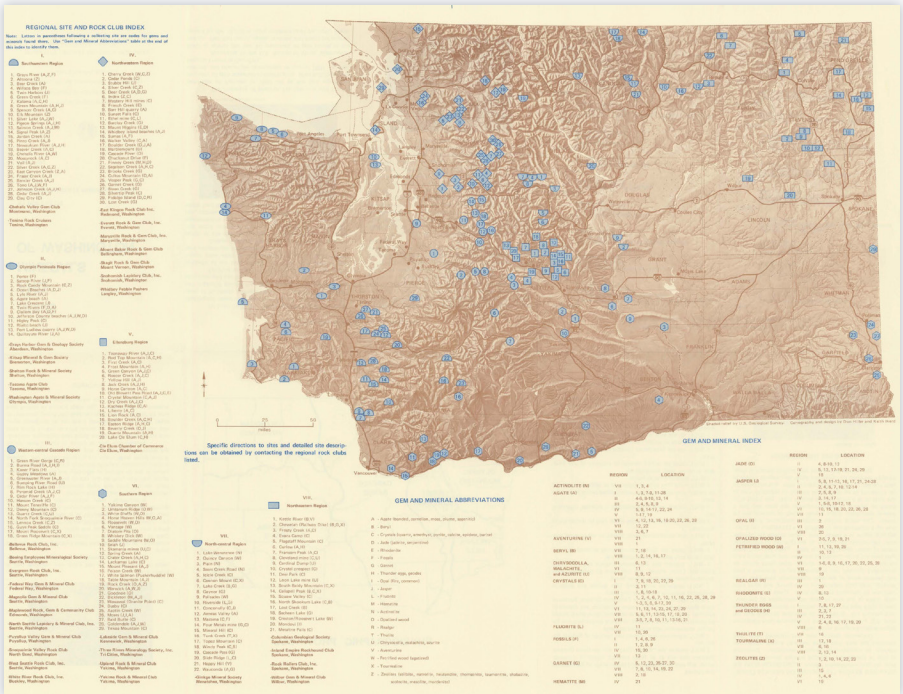

Figure 1. The 1985 WA DNR *Gems and Minerals of Washington* pamphlet by Bob Pattie. The point information on the map was used as the primary data set for the maps in the *Minerals and Fossils in Washington* StoryMap (Figure 2).

showed point locations for the different rock and fossil types on the original map (Figure 2). Additional geologic map unit data were added to several of the maps to provide extra context for where certain minerals and fossils were likely to be found.

Rock collecting is a complicated topic for many reasons, and there were many ethical considerations for WGS to consider when creating the updated maps, especially since WGS is part of an authoritative government agency—WA DNR. The following entry from the WGS Rockhounding webpage reflects some of these considerations:

> Before heading out on a rockhounding or fossil-hunting expedition, there are a few important things collectors need to consider:
>
> - Who owns the land you intend to visit?
> - What are the specific rules about collecting rocks or fossils on this land?
> - Are there special rules in regard to gold panning?
> - May I collect vertebrate fossils, meteorites, or archaeological artifacts?

These considerations mirror the first two entries in *A Rockhounder's Code of Ethics* from the original *Gems and Minerals of Washington* publication:

> - I will respect both private and public property and will do no collecting on privately-owned land without permission from the owner.
> - I will keep informed on all laws, regulations, and rules governing collecting on public lands and will observe them.

In the state of Washington, there are additional regulations and restrictions on gold panning due to the potential environmental impacts of this activity (Washington Department of Fish and Wildlife 2021). Likewise, the collection of vertebrate fossils, meteorites, or archaeological artifacts is also regulated due to their relative rarity, value to science, and cultural importance.

Perhaps of more relevance to the maps, however, is that Washington has a myriad of federal, state, and local land

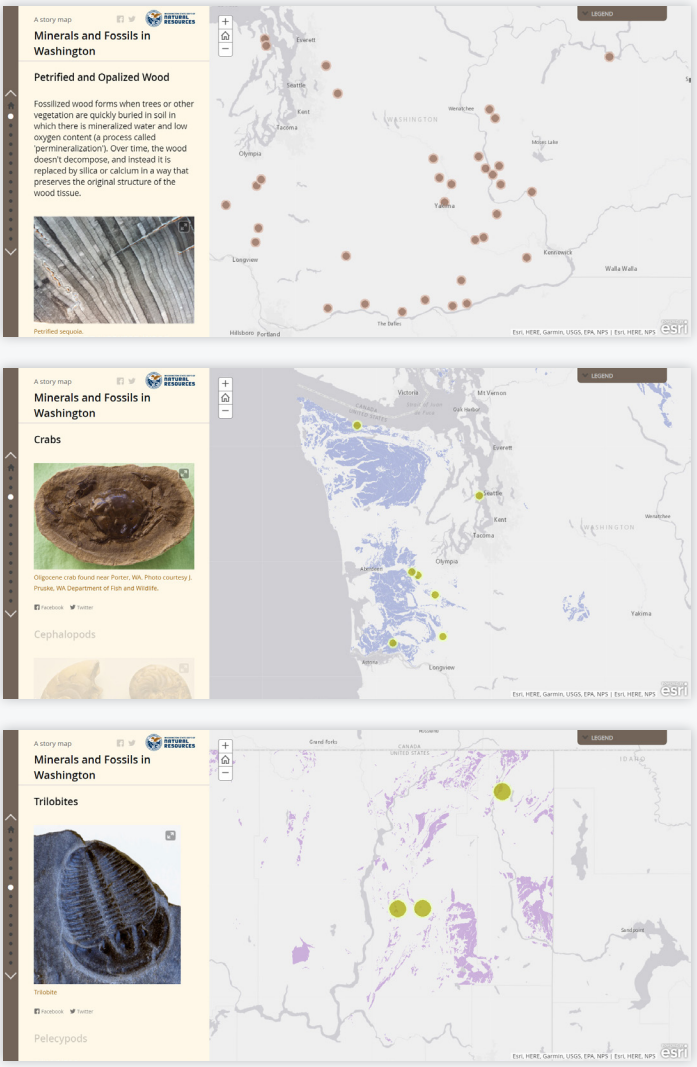

Figure 2. Selected maps in the 2016 WGS *Minerals and Fossils in Washington* StoryMap. The points on these maps were derived from the Gems and *Minerals of Washington* map (Figure 1).

management agencies, all with differing rules and regulations regarding rock collecting. WGS must be careful not to provide information about rockhounding regulations in places that are outside of its purview. If map users started showing up in specific locations provided by a state agency, on restricted federal land, for example, it would be very problematic for all involved. WGS Assistant State Geologist Jessica Czajkowski, who created the StoryMap, summed up how these considerations influenced the design of the maps:

> In doing the research to create our rockhounding webpage, we had to understand the rules and context around gold panning, prospecting, and rockhounding on different types of land in different settings. This information not only guided the

> context that we provided in the StoryMap but also how we approached it cartographically. (interview with author, January 9, 2024)

With this in mind, the updated maps included in the *Minerals and Fossils in Washington* StoryMap were designed to give users only a general idea of where certain types of geologic specimens could be found. Data on a variable-scale web map can be viewed at an extremely large scale, since the user can zoom in to locations of interest. This meant that the locations of the digitized points could potentially be identified with specific land parcels. This apparent precision was also problematic because the points on the original map were seemingly meant to be general locations for rockhounding, such as streams or mountains, rather than specific locations in or on those geographic features. The challenge, then, was to figure out how to use the valuable data from the original *Gems and Minerals of Washington* map while obscuring the individual point locations. This would allow WGS to provide useful guidance to people searching for general areas to go rockhounding, without creating the previously mentioned ethical problems relating to land ownership, land access, and collection restrictions.

Our solution to this problem was to convert the point locations to polygons at a statewide scale, so that when the user zoomed in to them, the "points" would cover larger, more general areas, rather than staying the same size when the map scale changed and allowing a more detailed location to be derived (Figure 3). The addition of associated 1:100,000-scale geologic unit polygons reinforced the idea of a more generalized, regional-level context for the rocks, minerals, and fossils that were being described.

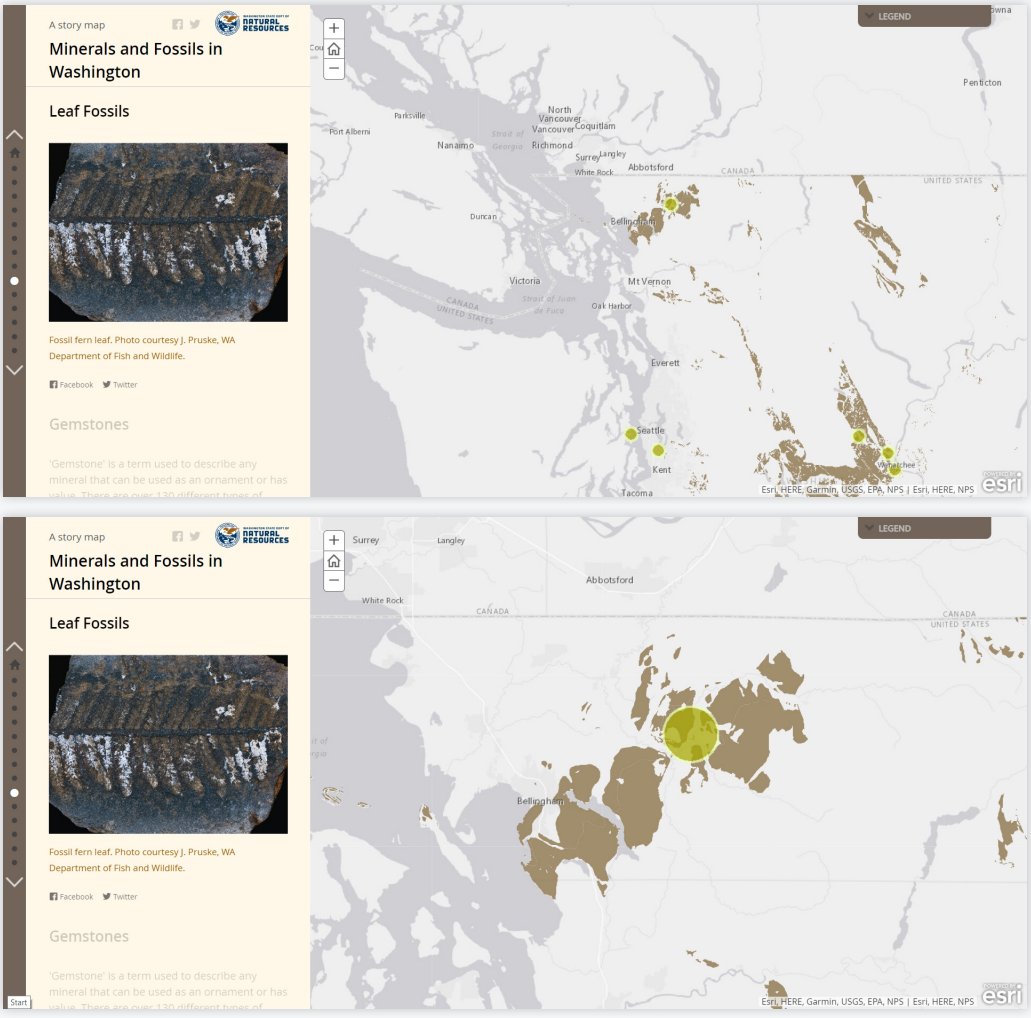

Figure 3. The image at the left shows a zoomed-out view of the map of leaf fossils from the *Minerals and Fossils in Washington* StoryMap. Note the yellow point in the Chuckanut Formation in northwestern Washington east of Bellingham. Because the point was converted to a polygon, it grows in size as the map is enlarged. This generalization of the data obscures the precise location of the original point data.

Seemingly minor cartographic decisions, such as the ones we made to show points as polygons and to add related areal contextual information, can play an important part in mitigating the potential for a map design to be misused and in protecting the integrity of the mapmaking organization. As a governmental entity, WGS must take extra care to meet high ethical standards, not only by providing the most accurate information possible, but also by being cognizant of how that information could be used in detrimental ways. This is an important principle for all the spatial data WGS produces, because users of these data may make important decisions based on what they see, and much of the work WGS produces is not intended for site-specific interpretation. In keeping with these ethical

considerations, WGS also must be careful to not provide inappropriate guidance for rockhounding sites that are outside of its jurisdiction. By giving users more general information, as well as links to other related rockhounding sources, mapmakers put the onus on the users to know the rules and regulations at their desired collecting site. The *Minerals and Fossils in Washington S*toryMap and the WGS rockhounding webpage continue to be two of WA DNR's most popular webpages, thus underscoring the importance of these mapmaking decisions.

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CASE STUDY

Mapping COVID-19: Applying Ethical Strategies in Web Mapping Decisions

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In December 2019, the world was introduced to a coronavirus, the likes of which have never been seen before, resulting in the COVID-19 pandemic. During the initial months of the pandemic, academics, government agencies, and concerned citizens, among others, raced to generate maps to help explain the geographic spread of the virus over space and time. Maps, however, can be intentionally or unintentionally misleading; we saw this play out during the pandemic as we rushed to make COVID-19 dashboards and online maps. While the Johns Hopkins University's COVID-19 dashboard served as the first authoritative resource on the pandemic, it lacked the spatial granularity required for smaller states, such as Connecticut. Realizing this limitation, a team of geography Ph.D. students and faculty came together to develop a dashboard better suited to serve the residents of the state and aid policymakers during a time when each decision could have vast consequences. This case study reflects on our team's strategies to address the ethical considerations to deliver high-quality maps and to promote healthy skepticism among users of the COVID-19 dashboard. We first provide a historical background of the discussion around ethics in cartography that we used to frame our arguments and strategies. Second, we summarize our deliverables, starting with an online interactive dashboard for 169 towns suitable for both mobile and desktop viewing. For the visualizations, we tried to balance the right amount of health information so that they were cartographically sound, easy to understand, and not misleading. As geographers, this is one of our responsibilities to our communities.

KEYWORDS: dashboards; ethics; map design; internet activists; Monmonier's six strategies; online maps

INTRODUCTION

Wake up, go downstairs to make coffee, boot up the work computer, open ArcGIS Pro, and start a geoprocessing function that will take a few minutes to run. While ArcGIS Pro runs, go online to look at social media for a few minutes while finishing your coffee. During the height of the COVID-19 pandemic in 2020, this routine became the new normal for many geographic information system (GIS) professionals, and that is where this case study in cartographic ethics begins. With algorithm-curated social media feeds and the widespread proliferation of open-source GIS software, COVID-19 web-based maps inevitably ended up in the social media feeds of cartographic professionals. To the chagrin of many, several of these maps did not follow even the most basic cartographic conventions based on decades of research, such as normalizing choropleth maps, use of appropriate enumeration units, and appropriate use of color (Adams et al. 2023).

Tremendous amounts of work have been done to properly implement GIS principles, including establishing consistent data standards, best practices for visualizations, the role of web maps in communication, and how to implement the technology (Jenks 1953; Peng and Tsou 2003; Zhang and Li 2005; DeMers 2009; Fu and Sun 2011; Zhang et al. 2015; Brewer 2016; Kuria et al. 2019). Today, in spite of this body of literature, anyone with a computer, access to the Internet, and publicly-available data can create a web-based map without properly adhering to the best practices of mapmaking. Since such maps can be distributed widely using social media, expanding the utility of GIS to more people (Plewe 1997; 2007; Trainor 2023) has created scenarios where maps can be misinterpreted or can spread misinformation.

Without any way to enforce the best practices established over decades of research, users are under no obligation to read instructions or follow tutorials (Peterson 2008). Thus, unfortunately, the best thought-out cartographic practices and theories often do not leave academia and are not implemented by GIS users. While holding all GIS users to professional standards is impossible, and we can forgive middle-school book reports and personal social media pages for cartographic errors, mapmaking and GIS lack occupational licensure in the United States, resulting in poorly made maps being published and distributed by federal and state governments (Adams et al. 2020; Monmonier 1985a). Poorly made maps can mislead the public, which is unethical, and they can lead to serious negative consequences when used to inform decisions related to public health crises, like the COVID-19 pandemic. The democratization of cartography, i.e., making maps easily available, while tremendously advantageous, has opened Pandora's box for an infodemic, spread by the share button through screens and smartphones. Academia and professionally trained cartographers were well aware of these plausible problems with cartography long before the COVID-19 pandemic (Harrison 1950; Jenks 1981; Monmonier 1985b; 2018; Clarke 1995; Monmonier 1985a; Jenks 1953).

In his 1991 paper titled "Ethics and Map Design: Six Strategies for Confronting the Traditional One-Map Solution," Mark Monmonier calls for "a conscious effort by map authors and cartographic educators to promote informed skepticism among map viewers." Physicists or statisticians, for example, exercise their disciplinary responsibility by informing the general population about the wrong applications of laws or statistical functions to minimize misinformation and potential harm to society. Cartographers and GIS users should not only promote ethics and best practices of mapmaking, but also critically review maps that did not follow any standards. Every time a poorly made map comes across our feed on social media, it is an opportunity to promote informed skepticism among map viewers, and it is our ethical responsibility as mapmakers to do so even though this may seem an exercise in futility. A well-thought-out comment is unlikely to gain the same attention as the map itself, and often, well-meaning criticisms are overwhelmed by others defending the original map. After attempting this a few times, one can start to feel that it is easier to keep scrolling. But then the problem persists. During the early stages of the COVID-19 pandemic, we witnessed a proliferation of web-based maps depicting many different aspects of the spread of the pandemic. In spite of cartographic educators promoting informed skepticism among map viewers, the usage of poorly made web-based maps and their dissemination via social media led to spread of misinformation on a novel virus. Some have argued that there was a corresponding infodemic, partially spread by bad maps (Mooney and Juhász 2020). Research has demonstrated that these maps influenced the public's perception of the pandemic, specifically causing rural individuals to falsely believe COVID-19 was mostly an urban problem (Engel et al. 2022). Misinformation leading individuals to underestimate their personal or community risk can have ramifications, and research suggests it may have contributed to political polarization on these issues (Engel et al. 2022).

The Johns Hopkins University dashboard served as the first authoritative online, continuously updated, map-based tool on the COVID-19 pandemic, but because it displayed county-level data for the US, it lacked the spatial granularity required for smaller US states, such as Connecticut (Dong et al. 2020; Everts 2020; Mooney and Juhász 2020). With only eight counties in a state of about 3.5 million people (Census 2020), any information represented at the county-level scale was not helpful when community-based organizations (CBOs) and administrative services made day-to-day decisions for their towns. Realizing this need, frustrated with rampant poor and unhelpful maps online, and attempting to fulfill our disciplinary and ethical duty to set an example and promote map literacy and skepticism, we created the University of Connecticut **Department of Geography's COVID-19 Mapping Project for Connecticut** for the state's 169

towns. Using towns, rather than counties like many other states, was particularly important in hindsight, as the state of Connecticut has now completely replaced counties with nine planning regions that do not correspond to the previous counties.

The project focused on creating various visualization approaches to explore and communicate COVID-19 data published in Connecticut. Among the outcomes of this project, our team members published papers calling attention to, and documenting, cartographic issues in official United States federal and state COVID-19 dashboards, such as the lack of proper normalization in choropleths (Adams et al. 2020; Adams et al. 2023). Other papers we published made use of the Connecticut COVID-19 datasets to model the disease using town-level data and assess the deployment of vaccines in the state among vulnerable populations (Chen et al. 2021; Wang et al. 2021). Collectively, we presented our work at local, regional, national, and international conferences, including the UConn Center for mHealth and Social Media conference focusing on COVID-19: Media, Misinformation, and Science Communication. We included discussion of our work in class material in our department, and we brought our work to the attention of medical professionals in presentations at Connecticut Children's Hospital. Several GIS professionals across the country took similar, or far greater, action to try and bring attention to the bad maps that appeared during the pandemic and set examples of how the maps should look, fulfilling the ethical responsibility of cartographers proposed by individuals like Mark Monmonier (1991) and Jeremey Crampton (1995).

CASE STUDY: UCONN DEPARTMENT OF GEOGRAPHY'S COVID-19 MAPPING PROJECT, MARCH 2020–APRIL 2023

This case study reflects on the work of our team to address our responsibility to deliver high-quality maps and information that would promote healthy skepticism among the users of the COVID-19 dashboard in Connecticut. Often, cartographic theory is not incorporated into practice by GIS users, so to avoid making ethical blunders, we tried to justify every cartographic decision we made with a citation. We were guided by the six strategies from Monmonier's 1991 paper, "Ethics and Map Design: Six Strategies for Confronting the Traditional One-Map Solution," and below we use them to describe selected ethical quandaries or dilemmas and our responses or workarounds. Monmonier's six strategies are: (1) dynamic sequencing of different cartographic views, (2) creating experiential maps, (3) abiding by professional standards, with a Code of Cartographic Ethics calling for presenting alternative views, (4) disclosing experiments, (5) promoting informed skepticism among map viewers, and (6) institutional structures (Monmonier 1991). During our project, these strategies served as a framework to help guide our decisions, workflows, and goals, while giving us a broader justification for what we were doing, including the use of an interactive dashboard over more traditional static cartography. These strategies served to help us avoid contributing to the spread of misinformation.

We addressed Monmonier's strategies #1 and #3 by implementing what Monmonier called "atlas touring" using a variety of spatial visualizations, graphs, and charts that we adapted throughout the pandemic (Monmonier 1991). These were divided into two products: an online COVID-19 dashboard and a policy-based visualization. Using an Esri dashboard app, with the Johns Hopkins dashboard as inspiration, we created a dashboard that was updated daily for the state of Connecticut. Throughout the pandemic, the topics of the web maps and visualizations hosted on our dashboard varied. We created and published choropleth maps, proportional symbol maps, dot density maps, pie chart maps, line graphs, bar charts, and raw number values. Many of the maps had dynamic scales (that is, they were zoomable) and pop-ups, allowing users to engage with the maps and see the raw data for themselves. Notably, we provided a town-level map of case rate (per 10,000 people) over the previous two weeks based on the (known) incubation period of the COVID-19 infection, which was unique and was not provided by any other COVID-19 tracking systems in the state. Later, when vaccination efforts were underway, we created a map (Figure 1) that showed the percentage of the population fully vaccinated by town and placed a star symbol on the centroid of towns that had reached 70% coverage for "herd immunity," based on the best information at the time (Plans-Rubió 2022). This was later replaced with an interactive web slider (Figure 2) embedded in the main dashboard that facilitated comparison of full vaccination and first dose percentages by town. To incorporate the time variable, we used two different animations: a dot density map showing total cases, and a pie chart depicting vaccination status by town. Later, we used

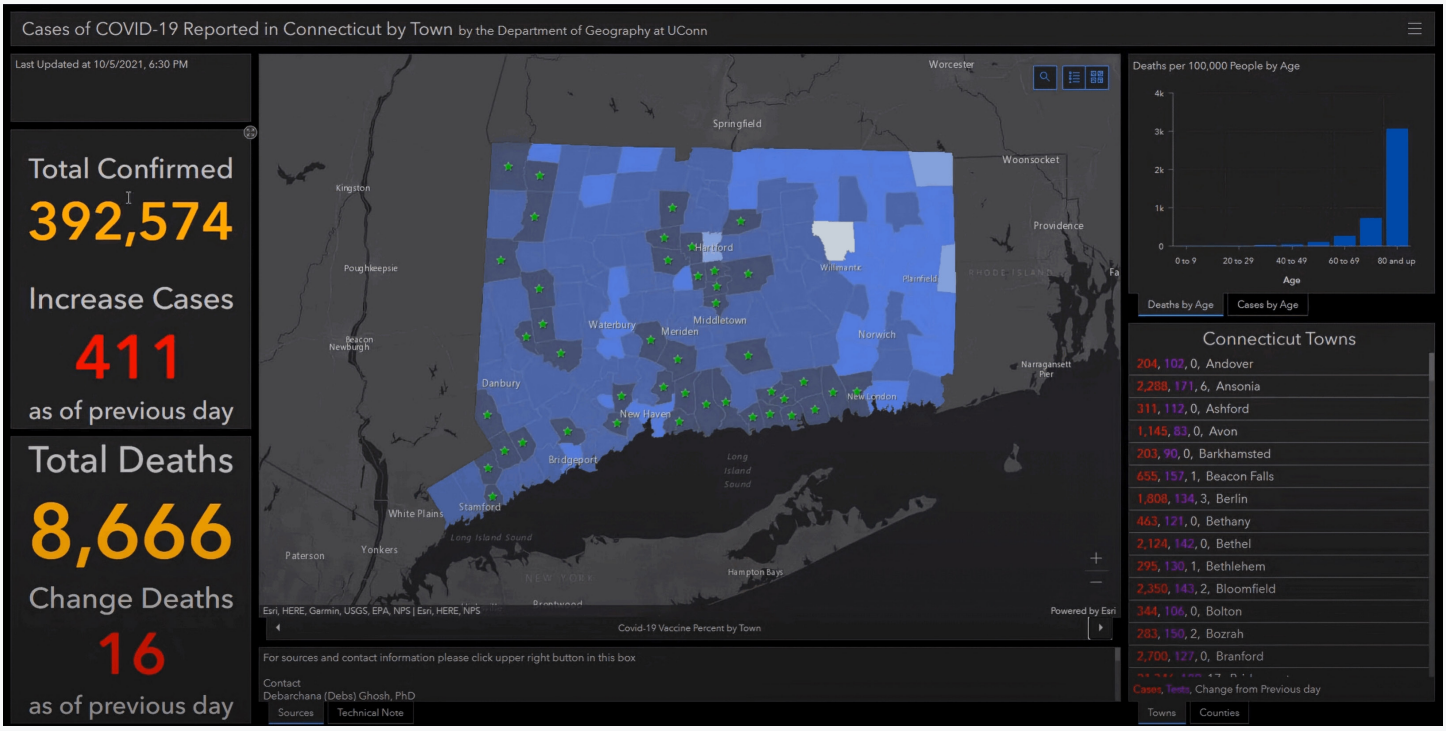

Figure 1. Percent of population fully vaccinated.

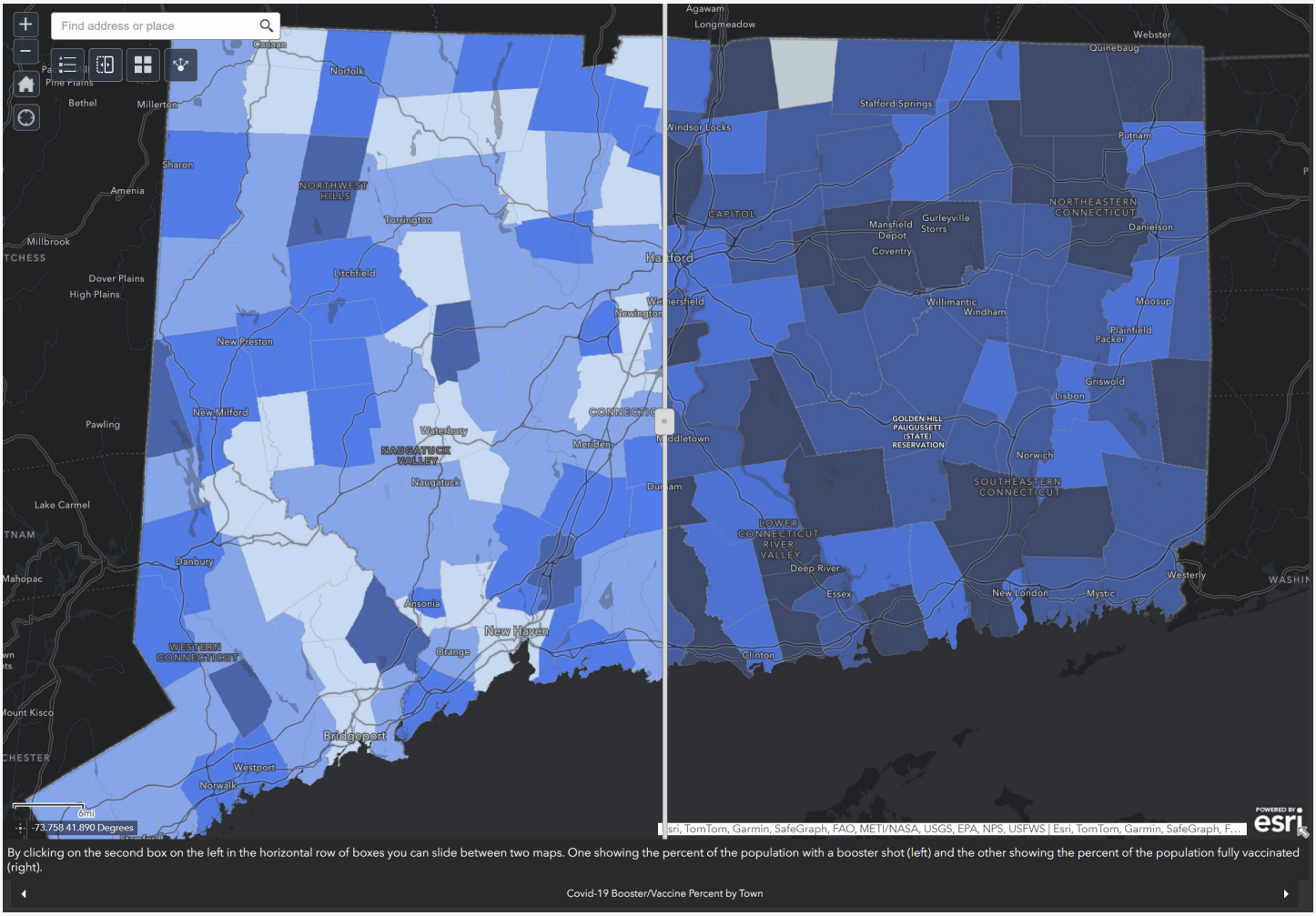

Figure 2. Percent of population fully vaccinated, with slider.

a swipe tool to compare variables related to COVID-19 vaccination side by side on the map.

Realizing the importance and the potential impact of the executive orders of Governor Ned Lamont, and other landmark intervention and mitigation efforts at the national level, such as the CDC's mask usage guidelines and the vaccine rollout, we developed our second product using open-source resources like Shiny in R and JavaScript. This was an interactive website, "Visualizing Associations between Policy Decision Timeline and COVID-19 Infection for Connecticut" (Figure 3). The timeline on the website showed the subsequent major COVID-19 related executive orders and mitigation measures, re-openings of schools, restaurants, and vaccination roll-out undertaken by the state of Connecticut after the first case appeared on March 6th, 2020, and the first executive order of "state emergency" was declared on March 10th, 2020.

Over time we adapted our dashboard items with "experiential maps," per Monmonier's strategy #2, to meet the changing conditions of the COVID-19 pandemic and its mitigation efforts. Early on in the pandemic, when testing was the number one priority, we made sure to include the location and associated information related to testing sites in Connecticut. When it was time to make decisions about returning to school in the fall of 2020, we incorporated the location of all state universities in Connecticut so that users could readily understand the COVID-19 conditions in the university towns. When the vaccine rollout started in February 2021, we added a pie chart showing weekly trends in the percentage of unvaccinated, first-dose, and fully-vaccinated people by town. In Figure 3, the timeline depicting the governor's executive orders and policies is interactive and allows users to click on various orders/policies to see what the situation was like on the date it was implemented. From a historical perspective, we hope that this can give insight to the impact of health policies/mitigation measures on the spread and transmission of COVID-19 cases. This could be useful for future infectious diseases outbreaks.

Our team attempted to proactively implement Monmonier's strategy #3, providing alternate views, during weekly discussions over Zoom, during which we discussed each visualization, proposed possible additional ones, and tried to be as careful as possible in our cartographic decision making. We also discussed issues related to COVID-19 health disparities, the lack of data by race/ethnicity and gender, and the incident of an **alleged whistleblower** who was a geographer and a GIS analyst at Florida's Department of Public Health regarding data aggregation and curation. These experiences and interactions, and our teamwork, led to the overall growth and maturity of the "cartographers" in us while we lived through a public health crisis.

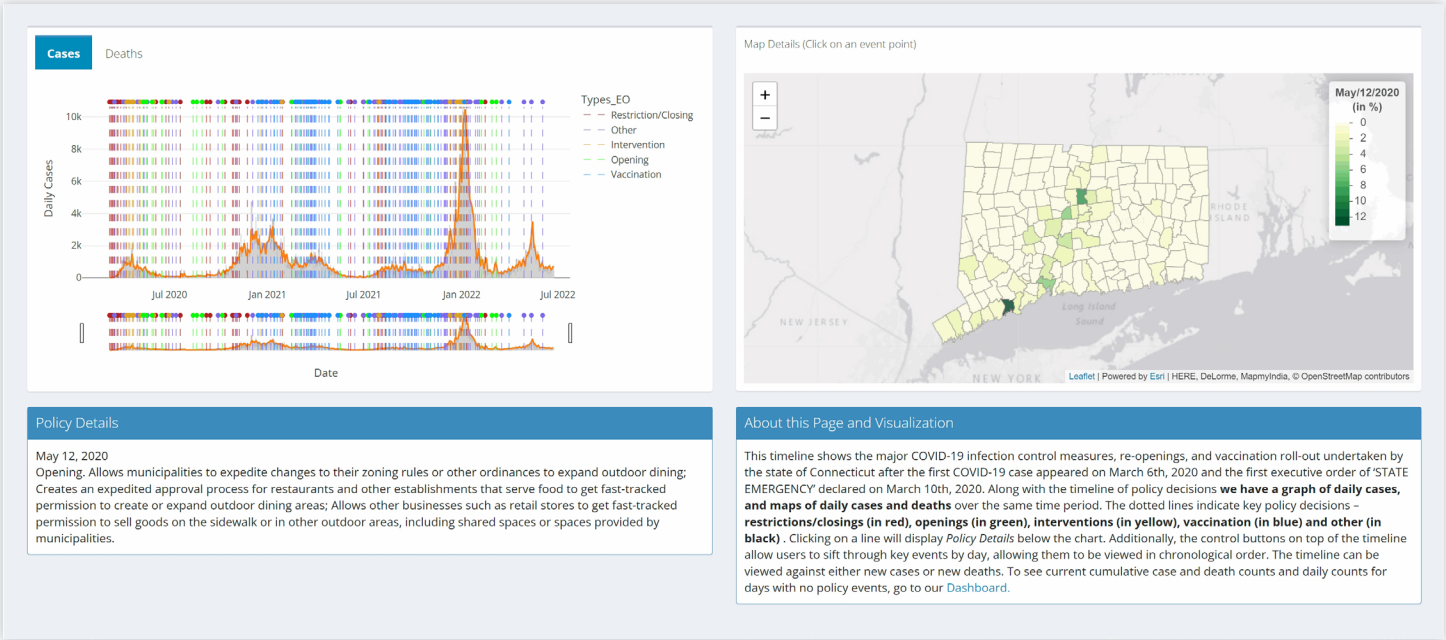

Figure 3. Visualizing associations between policy decisions and COVID-19 infection in Connecticut.

We tried to implement Monmonier's strategy #4, "disclosing experiments," in several ways. We documented our data processing decisions, and we have included a discussion of our mapmaking decisions in the methodology section of forthcoming papers. One example of the need to document data curation arose when the state of Connecticut shifted from publishing daily case counts for weekends, to publishing Saturday and Sunday added onto Monday's numbers. To continue logging daily counts and remedy this problem, we divided the Monday case count by three, and equally attributed it to Saturday, Sunday, and Monday. While this was not ideal, because we were forced to assume without evidence that the number of COVID-19 cases was same on all the three days, it was the only way to maintain daily case counts for analysis. To our surprise, another department at UConn noticed that Saturday, Sunday, and Monday were always equal, and contacted us with their concerns. This decision was documented, so that we could share these limitations with our users.

As another example, daily case counts for a town could be negative values because officials would periodically adjust the number of previously recorded cases, thus lowering the town's case count. In these instances, we resorted to changing the negative values to zeros for the daily visualizations to mitigate the confusion associated with a daily negative case count. However, these adjustments resulted in massive outliers in some instances, which we needed to either exclude from our analysis, or adjust for. These changes had to be documented very carefully to avoid misunderstandings or accusations that we were manipulating the data to suit a particular narrative. In hindsight, one strategy to maintain full disclosure would have been to capture a screenshot of the web map at regular intervals and include it in the documentation. Because web maps can be changed by the organization maintaining them—removing yesterday's mistakes and patterns that may have influenced policy being implemented today—and are also subject to link rot, this type of documentation could have captured the changes we made and provided more transparency.

We tried to implement Monmonier's strategy #5, "promoting informed skepticism among map viewers," in multiple ways. First, we published papers discussing problems with the official government dashboards, explicitly focusing on the normalization of choropleth maps and the colors and enumeration units used to make them. We presented papers and posters on these subjects at several academic conferences, workshops at the Connecticut Children's Hospital, and courses at University of Connecticut. Among these presentations was a YouTube video poster prepared for the "**COVID-19: Media, Misinformation, and Science Communication**" conference organized by the UConn Center for mHealth and Social Media. Many of these activities can also be seen as satisfying Monmonier's strategy #6, which calls for using "public forums, a journal of cartographic criticism, or courses promoting systematic critiques of maps, especially potentially persuasive maps" to get feedback on map design (Monmonier 1991). During the project, we reviewed other dashboards and web mapping projects, and we presented issues we found with those maps at conferences and as a write-up in the *Journal of Maps* (Adams et al. 2023). Members of our the project group were interviewed by NBC Connecticut, during which they discussed the potential for web maps on our dashboard to facilitate understanding of the COVID-19 case data (Jones 2020).

Figure 4 shows data and different frames from our dashboard to support our narrative of why and how we used Monmonier's strategies to help us avoid contributing to the spread of misinformation. This figure demonstrates the impact of symbolization (choropleth vs dot density), normalization (rate vs total cases), and the modifiable areal unit problem (MAUP) based on scales of geography (towns, counties, and planning regions) on the way spatial patterns appear on a map (Openshaw 1977; Fotheringham 1989).

DISCUSSION (AND A CALL TO ACTION)

The activities of the members of the COVID-19 Mapping Project for Connecticut, which is detailed in this case study, are just a tiny snapshot of the work carried out by geographers and cartographers across the country. During the COVID-19 pandemic, in spite of spread of information via poorly designed maps, the larger GIS community tried to demonstrate our technology's capabilities to study and map a pandemic in near real time to inform

policy (Dong et al. 2020; Delmelle et al. 2024). However, at the federal and state government levels, there were major failures to adhere to the most basic of cartographic standards, including failure to use appropriate symbolization or enumeration units (Adams et al. 2020; Adams et al. 2023). These failures can erode the trust that people place in maps, which can potentially cost lives when those maps are needed to coordinate the response to disasters. Ultimately, all society can do now is evaluate how GIS was used during the COVID-19 pandemic, assess the strengths and failures of those uses, and try to take an active role in ethically implementing the technology in the future. Moving forward, if nothing else, we can use the examples of misinformation spread by official government COVID-19 maps to underscore the importance of cartographic conventions.

Crampton (1998) calls for GIS professionals to be "Internet activists" in spreading good content online, and set the tone in regard to employing GIS and cartography online (Crampton 1998; McGranaghan 1999). Perhaps those of Mark Monmonier's "cartographic priesthood" must take this activism a step further and implement his strategies for ethics in map design by engaging with the comment section on social media as cartographic critics, insist on adherence to cartographic standards wherever possible, and patiently try to spread cartographic literacy and map skepticism to educate the public. We must also ensure that we do not contribute to the infodemic through poor cartographic decisions, which can only be achieved by working ethical strategies into our workflows from the beginning of a project.

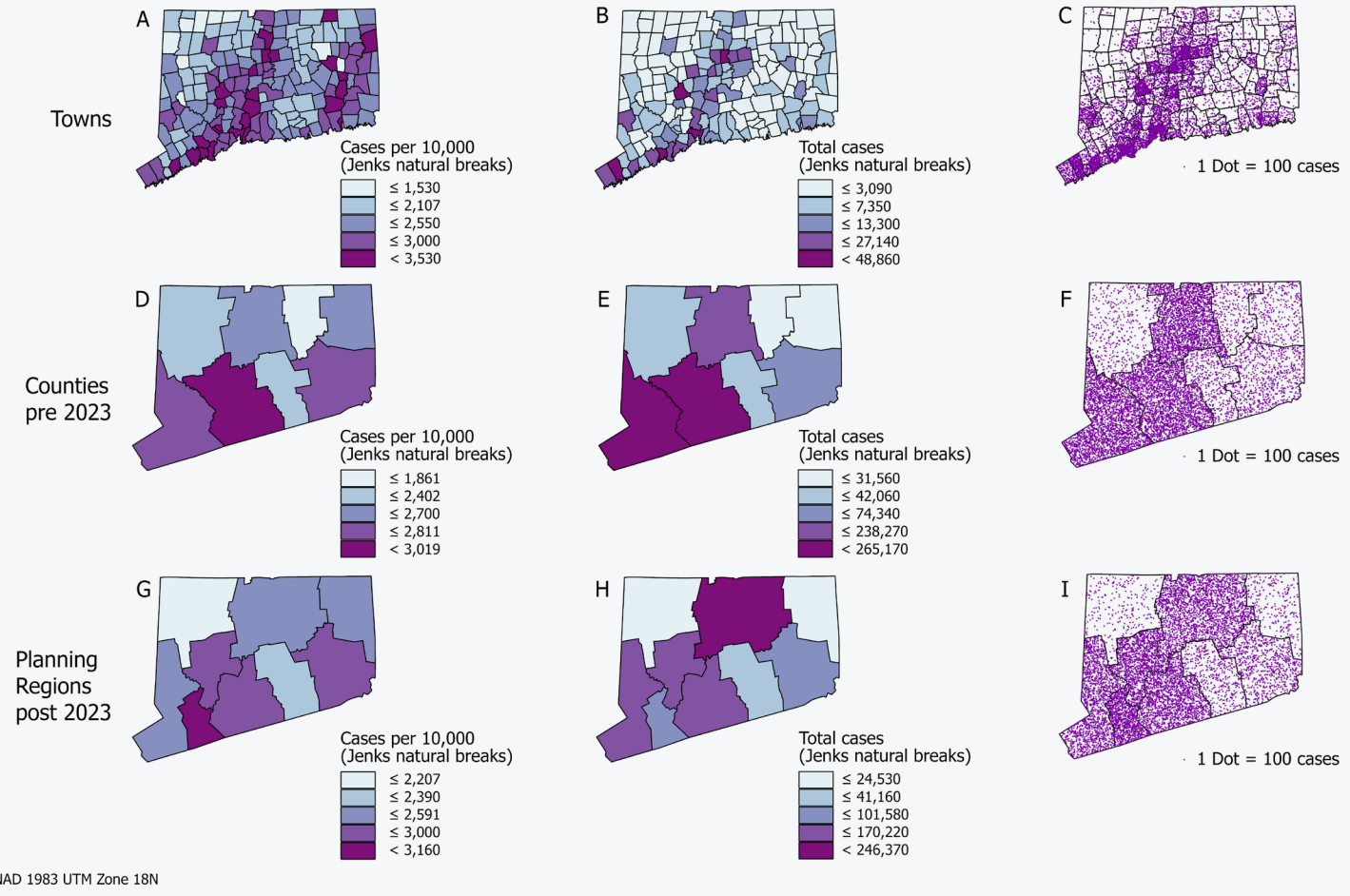

Figure 4. Prevalence of COVID-19 cases as of April 14, 2023, displayed with different symbolization methods and enumeration units.

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CASE STUDY

Better Than Good Enough for Government Work

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Three episodes in the 34-year career of a cartographer at the US State Department illustrate how ethics can inform, or intrude on, mapping for foreign policy. While US federal government cartography is guided by international law, political disputes and how they are handled put the cartographer in a position to inform and possibly influence an ethical policy. Or not. This article will explore instances in which mapping ethics get discussed, tested, and resolved in a foreign policy environment.

In the late 1980s, I was early in my career as a cartographer with the State Department ("the Department"). A Cold War mindset was strong within the United States government, and almost none of the best and brightest foreign policy experts would have predicted that the Soviet Union would very soon be gone from the map. During this period a map request from one of the Department's regional bureaus was assigned to me. I was given a list of hypothetical locations of Soviet missile systems along with their effective ranges, and another list of real American or allied targets that these theoretically placed weapons could hit. I was to make a map of these locations and ranges to support a briefing to a senior policymaker.

When I measured the range from one of the weapons systems, a missile launcher located conjecturally on the coast of a Soviet-allied country, it didn't reach the target of interest. This target, a major US military base, was the most impactful facility shown on the map, and was just outside the missile's maximum range. I told the regional bureau staffer who requested the map about this anomaly and was told, without regard to my concern, to leave the questionably located facility on the map.

Being a junior cartographer and uncertain of how far I could push back, I reached out to experts in my bureau whose job it was to know everything about these weapons. Looking at the map, they scoffed at the idea of placing this type of launcher at that location—a coastal mangrove forest with no nearby infrastructure to support its construction. To them, this was a non-threat. Together we went back to the requestor who said it was close enough and to leave it on the map.

This troubled us. The map would be shown to someone whose influence shaped foreign policy and the information on the map was at best misleading, but really just plain wrong. We took our concerns to the highest level available to us, our bureau's assistant secretary, who supported our analysis and conclusion. A call was made to the head of the policy bureau preparing the briefing and the dubious missile launcher was removed from the map.

In my 34-year career at the US Department of State's Office of the Geographer and Global Issues ("the Office"), that was likely the most unambiguous example of a positive ethical decision in foreign policy mapping: an undeniable fact backed by the objective judgment of geography and military subject matter experts. Truth to power, high-fives all around.

Ethics in foreign policy aren't always straightforward. Taking a position in a political dispute, or even remaining neutral, requires ethical judg ment and guarantees that at least one of the parties involved won't be satisfied. Throughout my career, I worked with smart, dedicated public servants whose commitment to ethics—at least within the parameters of policies they were required to follow—was guided by truth, objectivity, and even-handedness. It was rare to be asked to map something that gave me serious ethical qualms. I didn't always agree with policies I was asked to help implement (few civil servants with long careers ever do) but, other than the instance cited above, I was never asked to outright lie on a map. In the Office, if we felt that a truth was being stretched, we could voice our concerns and debate freely. I was, and remain, proud of my work.

Most people, I expect, view ethics in mapping through a thematic lens. It's what you put on top of a map's "base elements" that can be subjective or judgmental. But some of the base elements (including map projection) can promote bias, whether intentional or not. For foreign policy considerations, three main cartographic elements convey political information: boundaries, sovereignty portrayal, and geographic names. For all three, US Government (USG) cartographic policy is guided by a legal approach, which provides a useful ethical foundation.

A small but influential group, the Office coordinates policy on sovereignty and international boundary issues for the USG. I worked in the Office from 1986 through 2020, first as a cartographer and later as chief of the division handling cartography, international boundaries, sovereignty issues, and geographic names. The Office doesn't establish cartographic policy for the USG; rather, it works with policymakers within the Department and throughout government to craft and disseminate policy to USG cartography agencies.

Geographic names are one of the base elements of a map that are often overlooked from an ethical perspective, but a cartographer's choice of place names can be impactful. English conventional names, such as Moscow, Bangkok, and Cairo are usually preferable to their less familiar native names Moskva, Krung Thep Maha Nakhon, and Al Qāhirah. The US Board on Geographic Names (BGN) standardizes place names for USG use. The Office represents the Department on the BGN and is the Board's conduit for foreign policy concerns.

A good example of an ethical BGN decision was changing the spelling of Ukraine's capital from "Kiev" to "Kyiv." Kiev was the English conventional name for centuries, but that spelling is romanized from the Russian language version of the city's name and not the Ukrainian language one. In 2006, the Ukrainian government appealed to the Department to get the USG to change its spelling from Kiev to Kyiv. The BGN rejected that proposal, arguing that Kiev was as valid a conventional name as Moscow or Vienna. But for diplomatic reasons, the Department requested that USG cartographers use the native language-based spelling Kyiv while Kiev remained a conventional name in the official toponymic database.

In 2019, after five years of Russian occupation of Ukrainian territory in Crimea and the Donbas, the Ukrainian government appealed again to change the spelling. This time the BGN deemed it unethical to retain a name based on the language of an occupying aggressor, and voted to drop Kiev as a conventional name. This decision made headlines, unusual for a BGN action, and to my personal surprise the "new" name was quickly and almost universally adopted by most English language media sources. Five years on, English language use of Kiev is mostly limited to a popular chicken dish.

International boundaries are perhaps the most sensitive political information on a map and, fortunately, almost all the world's international boundaries are based on legal (de jure) treaties, agreed to by both sides (bilateral) and supported by documentary evidence.[1] To denote their legitimacy, de jure boundaries are shown on USG maps as solid lines. A fistful of the 320 or so international frontiers are not backed by bilateral political treaties. Many of these borders—notably around South Asia, the Levant, and the Korean Peninsula—are the result of a conflict, where militaries or an outside mediator brokered an armistice or ceasefire but the governments behind them made no formal agreements. In rare cases there is no legal bilateral agreement, and each government has competing ideas on where the boundary should be. These lines are dashed on USG maps to denote their extralegal status and, where scale allows, an explanatory label is included.

Official USG policies on boundaries can also change without the relevant parties themselves coming to any new agreements, though changes like this can lead to difficult cartographic decisions. In 2019, President Trump issued a proclamation recognizing Israeli sovereignty over the Golan Heights. This major policy change had a sizeable cartographic impact, and the Office began working with Department policy bureaus to issue guidance on how maps should be updated.

Until the proclamation, the USG recognized Syrian sovereignty over the Golan Heights. Israeli sovereignty was depicted up to the 1949 Armistice Line, symbolized as a dashed line, that existed before the Israeli conquest and subsequent annexation of the Golan Heights. Where scale permitted, the United Nations Disengagement Observer

1. The ethical merit of some de jure boundaries can be debated, such as in Africa where colonial powers determined the frontiers, or where stronger states imposed their will on weaker ones.

Force (UNDOF) Zone was shown and "Israeli-occupied" added to the label for Golan Heights (see Figure 1).

With the new policy, the Office recommended showing all boundaries defining the outer limits of the Golan Heights as dashed lines. To the north and south are boundaries established by countries other than Israel, and to the east is a cease-fire line established by the United Nations in 1974. Israel did not enter into a willing bilateral political agreement to any of these boundaries.

The Office felt we had solid justification for these recommendations. They followed long-established principles for depicting international boundaries. We presented a draft map with the recommendations to senior policymakers leading the effort to implement the new policy.

The response from a mid-level staffer was to "make the lines solid." The staffer, however professional and pleasant, was not part of the policy process. We explained the basis for our recommendation: solid lines on maps convey boundaries legally agreed to by governments of both sides of the line, which clearly didn't apply in this case. The staffer was noncommittal, saying only that this is what their boss wanted. We consulted with the Department's legal experts, who agreed with our logic, and tried again, this time with more robust reasoning. We asked if we could present our arguments directly to the policy team but were told that wasn't possible. The staffer would relay our written concerns to the policy team and get back to us.

This was unusual. The Department traditionally relies on its subject matter experts for guidance and almost always includes them in policy discussions. After a few days we heard back from the policymaker, through the staffer. They asked if there were any instances where international boundaries shown as solid lines were *not* the product of a bilateral agreement.

The answer was yes: one, but with a caveat. China's eastern boundary between India and Tibet, known as the McMahon Line, was negotiated between the British and Tibetan governments in 1914. Tibet at the time was considered by the British to be autonomous, but under Chinese suzerainty. The Chinese government initially participated in the McMahon Line agreement but ultimately did not approve it. In September 1962, China sent forces across this line into what they consider "South Tibet," temporarily occupying parts of what much of the world considered Indian territory. The US Ambassador to India successfully pleaded with the Kennedy administration to support India's claim to this territory by formally recognizing the McMahon Line as a fully de jure international boundary. From then on, the China-India boundary between Bhutan and Burma has been shown as a solid line on USG maps.

This, it seemed, was all the justification the senior policymaker needed. If one contested boundary could be recognized to support a policy decision, why not others? Like in my earlier example in the 1980s, the Office appealed to our bureau's assistant secretary in the hopes they could

Before the 2019 Golan Heights Proclamation

After the 2019 Golan Heights Proclamation

Figure 1. Excerpts of maps produced by the Office of the Geographer and Global Issues, US Department of State; modified by author.

convince the policymaker to at least discuss our rationale directly with them. The request was denied, and the Office was instructed to issue cartographic guidance showing the limits of the Golan Heights as solid lines (see Figure 1).

It was disheartening for me, and others in the Office, to see a key principle underpinning the USG's ethical treatment of international boundary representation disregarded. Showing dashed boundary lines around the Golan Heights would not alter the President's proclamation—Israeli sovereignty would still be depicted on the map—and it would adhere to the legal foundation that gave USG map depictions a sense of fair play. There was a sense that our top policymakers felt dashed lines "looked bad" by suggesting something other than complete support for the new policy. Established practice and rule-based order, it seemed, would take a back seat to optics. As a civil servant whose career was guided by professional ethics, that was a hard reality to swallow.

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Objectivity in Storytelling, Spatial Narratives, and Data Journalism

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A growing number of geographers, cartographers, and mapmakers are embracing visual storytelling, and integrating maps with diverse elements including text, images, graphs, and anecdotes to create rich and engaging spatial narratives (Caquard 2013; Caquard and Cartwright 2014; Denil 2016; Song et al. 2022). Roth (2021) summarized this movement and outlined four tenets of ethical visual storytelling: "show your work," "show yourself," "speak to power," and "speak to each other." These principles emphasize the importance of transparency about methodology and personal biases, while encouraging cartographers to engage critically with power structures and foster dialogue within their community. Buckley et al. (2022) observed a decline in public trust in news and other information sources, and in response authored "The Mapmaker's Mantra" to emphasize the importance of ethical practices in mapmaking, part of a long history of such considerations in the discipline (e.g., McHaffie et al. 1990; Harley 1991; Kent 2017). The Mantra addresses maps broadly, with its guiding principles—"be honest and accurate," "be transparent and accountable," "minimize harm and seek to provide value," and "be humble and courageous"—speaking to overarching ethical concerns in mapmaking. While both frameworks emphasize transparency and honesty, they diverge in their orientations, reflecting the distinct ethical priorities of mapmaking and storytelling. I'd like to further examine the ethical implications of an orientation toward story and narrative in the presentation of information, asking what this orientation entails, what it leaves behind, and what ethical dangers might be attached to a commitment to storytelling. Given the strong association between visual storytelling, spatial narratives, and data journalism, I will to a large extent connect my arguments to similar threads within journalism, where debates about narrative, objectivity, and ethical responsibility are central to the field.

The new interest in storytelling comes concomitant with a withdrawal of a commitment to objectivity. Objectivity became a guiding principle in journalism in the late nineteenth and early twentieth centuries as journalists reacted to the excesses of sensationalism and "yellow journalism" of that era (Jones 2009; Kovach and Rosenstiel 2021; Lippman 1922). Scientific objectivity became an explicit model for journalistic objectivity; under this framework, a careful attention to an accurate reporting of the verifiable facts became a primary concern, while opinion and activism—never wholly abandoned—became the province of the explicitly labelled opinion or editorial sections (Kovach and Rosenstiel 2021; Post 2014). Related concepts associated with this idea of objectivity include fairness, disinterestedness, neutrality, impartiality, and transparency (Curry and Stroud 2021; Kovach and Rosenstiel 2021; Schudson 2001). Philosopher Thomas Nagel coined the term "The View from Nowhere" in his 1986 examination of objectivity in which he acknowledged the clear limits of objectivity, but argued that as an ideal, objectivity allows us to partially and imperfectly transcend our own limited experience to connect what we know with what is known by others. Nagel thought of objectivity as a kind of detached method of understanding and a corresponding set of attitudes and beliefs rather than a clear end-state of absolute or perfect truth that mirrors the world as it is.

The rise and spread of postmodernism and critical theory from the 1960s to the 1990s started to undermine faith in objectivity in mapping and elsewhere (Crampton 2001; Crampton and Krygier 2005; Harley 1989), and by the early 2000s, "the view from nowhere" was invoked by many as a self-evident farce, impossible to achieve and foolish to pursue. It is in this vein that situatedness and perspective, especially among under-represented groups was seen as a key counterpoint to the dominant paradigm of objectivity

(Haraway 1988; Elwood and Leszczynski 2018), which was proffered as only a mask for a male, white, cis viewpoint. Proponents of subjectivity argue that objectivity, neutrality, and impartiality be replaced by ideals of transparency, accuracy, and honesty, and that stories become vehicles with which to effect change in the world. NYU Professor of Journalism Jay Rosen authored an influential early salvo within professional journalism against objectivity (2010) in which he argued that it is fundamentally in opposition to transparency in that the selection and editorial decisions that go into writing a piece must always and necessarily impart and often try to conceal a viewpoint. Better, from Rosen's standpoint, is to simply be honest and open about one's pre-existing beliefs, biases, perspectives, and assumptions that have fed into an analysis. The heavily partisan American political landscape brought new critics within professional journalism, including Lowery (2020), who voiced concerns that a commitment to objectivity is often reduced to an uncritical reporting of talking points or official government positions that hides behind neutrality to avoid a real engagement with the truth. Similarly, Sullivan (2023) argued that principles of neutrality and balance are at loggerheads with truth telling in that adherents uncourageously shrink from making a stand about what is and is not true. While the news media has as a whole moved toward perspective and activist journalism, there is a generational divide: older journalists are more likely to report values consistent with an attitude toward objectivity whereas younger journalists are more likely to report a friendliness toward biased viewpoint reporting (Bennet 2023; Forman-Katz and Jurkowitz 2022).

With these criticisms in hand, I would like to offer a defense in the service of the ideal of objectivity as an ethical principle, at least in part. First, let me say that the defense is a limited one: situated, non-objective stories absolutely have a place and I firmly resist the notion that a stance toward objectivity is an all-or-nothing, totalizing prospect. Not every story must be told in an objective way. What I argue is that the idea of "the view from nowhere" has utility, that whatever objectivity we imperfect humans can manage is worthwhile, and that the world is a better place if it is deployed in the service of analysis.

It may be that lazy objectivity does devolve into a form of milquetoast neutrality as in "he said / she said" or "horse race" style reporting, as Cunningham (2003), Rosen (2010) and Sullivan (2023) claim. But the principle of objectivity does not require "equal treatment" or "both-sidesism" to work. On the contrary, objectivity implies an external truth and its roots in science tie us to a belief that some claims to truth can be tested and verified. It may be the case that neutrality and nonpartisanship have been often associated with objectivity, but they aren't inherent to the concept. Objectivity is intrinsically interested in separating fact from fiction.

Objectivity *requires* that we see the world from multiple perspectives and to try to integrate those perspectives into a cohesive whole. In contrast, the principle of *accuracy* concerns only the matter of the truth of what has been said, but it says nothing about other truths that may be relevant and add important context (Williams 2002). The Pew Research Center has documented a wide variety of influences on the decline of trust in news and information sources (2022). One key finding is that many people have come to believe that *most* news they hear is in some way biased, and they feel they are getting only half the story from any one news source (Entman 2007; Nelson and Lewis 2023). What the objectivity-minded storyteller commits to is to tell the whole story, to not shy away from complications and nuance that add texture and their own kind of authenticity to a story. Maps and visual stories meant to persuade invariably run into concerns of the greater good, but when the public becomes aware of contextually relevant omissions, they grow mistrustful. Nelson and Lewis interviewed 60 participants about trust in media and found that they consistently reported a skepticism that any single news source was reporting all relevant information, and that they needed to assemble the truth in stories on their own from multiple sources—to "do journalists' jobs for them" (2023, 1535).

The problem with stories is that they don't exhort you to tell the *whole* truth. In the service of trying to make maps that matter, maps that persuade, or maps that will go viral, authors may "deselect" elements that complicate the narrative, effectively telling lies of omission. This is the crux of the ethical danger that storytellers face: to tell a good story, an exciting story, a compelling story, sometimes we are tempted to leave things out that don't fit. The framework of perspective-based storytelling effectively gives us permission to this; after all, we can tell *our* story, and others can tell theirs. Yet this compartmentalization of truth does a disservice to both our audience and our craft. While inconvenient truths may indeed complicate matters and muddy the waters, maintaining a commitment to telling the whole truth is what ultimately builds and retains

trust. Complex and ambiguous stories with no clear right and wrong can be good stories, too. Sometimes the most honest summary of a situation is, "it's complicated," and *moral clarity* (Lowery 2020) is hard to come by.

I'll close with several examples that I think center objectivity in visual storytelling and spatial narratives. First, objectivity (especially in journalism) is sometimes maligned as improperly *neutral*, and not able to take a stand against falsehoods. I find this criticism curious, as objectivity most certainly implies judgements about what is true and false. It is not objectivity that compels us to accept something as incredible as a contemporary theory of a flat earth, but rather the reverse! It is objectivity that asks us to transcend our own situated experiences and to conclude that the best explanation for what we *all* experience is that the Earth is round. The principle of objectivity exhorts us to view things from multiple perspectives and then synthesize them. Judges and juries are expected to be impartial and objective, but that doesn't mean they are agnostic about truth claims—their very *raison d'etre* is to sort truth from falsehood.

The idea of projection in cartography is a useful metaphor for understanding the value of objectivity. At a fundamental-level, one of the conceits of a map is that it is typically planimetric, effectively a simultaneous view from directly overhead at all points. This is a "view from nowhere" if ever there was one. And yet this view from nowhere, like objectivity, is a useful fiction that highlights other truths and lets us see outside our own experience in a common frame. By the same token, most map projections in common use warp space in ways that aren't grounded in an embodied perspective. Their value is in showing us things we can't ordinarily experience, thereby highlighting some things while distorting others. Projections are more *useful* in particular contexts than they are *true* or *false*. Objectivity can be seen in this way, as an attempt to see things from a point of view outside ourselves.

Some might argue that selection, simplification, displacement, smoothing, and enhancement—what Monmonier (1991) famously called the "little white lies" inherent in every map—mean that all maps inherently misrepresent reality (Harley 1991). This is true only in a trivial sense. In the short story *On Exactitude in Science,* Jorge Luis Borges (1999) relates an allegory of the Map of the Empire "whose size was that of the Empire," which pokes fun at the uselessness of models that leave nothing out. If we commit to a kind of nihilistic relativism by sticking to the notion that all storytelling is lying in degree, we lose our ability to arbitrate important truth claims at all. Telling the whole truth doesn't imply telling *everything*, Borges-like; it implies telling all the truths that matter to the story.

There is a quote attributed (apocryphally) to Einstein that says that "everything should be made as simple as possible, but no simpler." I charge that the call to storytelling often moves us to make things too simple, to leave out critical elements that complicate our stories. Accuracy, sincerity, verifiability, and transparency are excellent guideposts, but they only get us so far. What they leave behind is a commitment to the whole truth, the whole story. A commitment to telling the whole truth implies a commitment to the scholarship of the content of the stories you are telling. A mapmaker should not accept only the data, information, and analyses that are readily available, but should actively seek out relevant material that can round out or complete the tale. Just as mapmakers carefully consider the place and form of every map element, they need also commit to the scholarship of the content; they must be diligent and systematic in their investigation, evaluation, and synthesis of knowledge relevant to the subject matter being mapped. Epistemic responsibility (Code 2015; Corlett 2008) compels mapmakers to exercise due diligence in pursuing comprehensive, not merely accurate, knowledge of their subject matter. Any content-related item shouldn't be left out by chance any more than a map element should be haphazardly placed, sized, or stylized. If the decision is made to simplify the story, this should be a conscious, deliberate, and justifiable decision, not one made out of ignorance or negligence.

Finally, there's a more modern reason why single-viewpoint storytelling raises additional concerns. Telling single-perspective, situated stories in the service of advancing an argument or viewpoint involves the marshalling of evidence. But in an era of the Google Effect and Digital Amnesia in which people offload memory to the internet and a ready command of factual information is hard to come by, facts that might provide a constructive counterexample to a story don't as readily spring to a reader's mind (Robert et al. 2024; Sparrow et al. 2011). True, the critical reader can seek out alternative accounts from other sources, but we must also acknowledge that we are increasingly getting our stories from places that already fit what we think we know (Iyengar and Hahn 2009). In these cases, an edifice of internally consistent facts and points of view give the appearance of a complete picture, but the reality is that we tend to refuse to engage with alternative edifices

that don't align with our own *even when these are also largely built of truths* (Lord et al. 1979; Nguyen 2020). This phenomenon is closely tied to the idea of *framing*, where the presentation and emphasis of certain aspects within a narrative guide interpretation while sidelining other truths that might complicate or counter the preferred storyline (Entman 2007; Druckman 2001; Scheufele 1999). The telling of stories incentivizes us to create these internally consistent edifices that are yet riddled with of "spaces" of omission.

The causes for the erosion of trust in news and other information sources are manifold, but include a suspicion that our sources of information are too biased, not objective enough, and incomplete (Ksiazek et al. 2023). I argue that the principle of objectivity brings to the table the requirement to tell the truth, yes, but more importantly to tell the *whole* truth in a way that subjective, situated storytelling often does not. Yet objectivity and storytelling are not fundamentally opposed. For the better part of a hundred years, a bedrock principle of journalism has asked its practitioners to be objective in the way they create their stories. That this ideal is not perfectly attainable doesn't *prima facie* indicate we should abandon it. Nor does it require that all stories be objective. Stories absolutely can be told without objectivity and yet have truth value, utility, and epistemic responsibility (Code 2015). Further, if this notion of objectivity-as-aggregator of viewpoints is correct, we fundamentally need subjective stories as material from which to generalize and synthesize.

Stories represent one of humanity's most powerful tools for conveying meaning and understanding our world, but their power demands careful ethical consideration. While recent movements away from objectivity have rightly highlighted the importance of situated knowledge and diverse perspectives, we shouldn't entirely abandon the ideal of objectivity in our pursuit of compelling narratives. Instead, we should recognize that the strongest storytelling often emerges from a synthesis that embraces both subjective perspectives and objective analysis. When mapmakers and journalists commit to telling not just accurate stories, but *complete* ones—ones that acknowledge complexity, context, and competing truths—they help rebuild the trust that has been eroded by oversimplified narratives. The challenge before us is not to choose between objectivity and subjectivity, but to thoughtfully integrate both approaches in service of deeper understanding. By doing so, we can create spatial narratives and visual stories that are both compelling and comprehensive, that acknowledge our individual perspectives while still reaching for broader truths.

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PEER-REVIEWED ARTICLE

Practical Geospatial Ethics: Concerns, Codes, and Cases

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This paper is one of a diverse set of contributions to a special issue of Cartographic Perspectives *focused on cartographic ethics. Throughout it situates cartography within a broader geospatial context and discusses ethics in relation to professional practice in that field. First the paper considers the nature of ethical concerns expressed within the industry, government, and academic sectors of the geospatial enterprise, and speculates on how those concerns have evolved since* CP *first addressed ethics in the early 1990s. Second, it considers the roles of professional ethics codes and how relevant codes and rules relate to evolving ethical concerns. Thirdly, the paper highlights characteristics of ethics case studies, and the utility of formal case study analysis. It suggests how practitioners' stories about ethical challenges can be adapted to "actionable" case studies that can be used to hone geospatial professionals' and organizations' ethical problem-solving abilities. The paper concludes that case studies may be key to elevating ethics within cartography and geospatial curricula in higher education, as well as in training large language model AIs to provide reasonable ethical advice to human mapmakers and users.*

Michael Davis—the philosopher whose work guided my approach to practical ethics education—begins his book *Profession, Code, and Ethics* with a droll observation: "Just as nobody likes a wiseguy, nobody likes a definition" (Davis 2002, 1). Be that as it may, I begin by defining what I mean by "geospatial ethics":

> "Ethics" refers here to questions of right and wrong that arise in applications of geospatial technology, data, and methods. "Ethical" geospatial professionals and organizations know how to respond to such questions with insight, empathy, and integrity.

The term "geospatial" establishes the definition's context: the family of technological disciplines—including cartography, geographic information systems, remote sensing, and land surveying, among others—that specialize in geographic data and information. The phrase "geospatial professionals and organizations" establishes that the paper is concerned with the special moral obligations that those individuals and groups are obliged to uphold, above and beyond the ordinary moral traditions people learn as children. Responding to "questions of right and wrong" with "insight, empathy, and integrity" implies that ethical judgment requires (1) deep understanding of the facts and factors in question; (2) a sensitivity to stakeholders' concerns about the issues; and (3) honesty, transparency, and a strong sense of duty to the ethical principles that characterize one's profession.

The definition thus claims that practical ethics is not just a matter of following a code of ethics or a set of rules of conduct, though such resources do provide useful guidance. Instead, it claims that practical ethics requires setting aside one's gut feelings while applying judgment to identify and choose among multiple options—the best of which may not be immediately obvious.

In their respected primer *The Elements of Moral Philosophy*, James and Stuart Rachels (2023) posit a "Minimum Conception of Morality"—a "core that every moral theory should accept, at least as a starting point" (1):

> Morality is, at the very least, the effort to guide one's conduct by reason—that is, to do what there are the best reasons for doing—while giving weight to the interests of each individual affected by one's action (13).

Ethical judgment of this sort is not an innate ability. It is a habit of mind that can be strengthened with practice. In this paper I consider what sorts of ethical concerns geospatial professionals have, how those concerns may be evolving, and what sorts of resources are available to help strengthen their ability to resolve ethical challenges satisfactorily: with insight, empathy, and integrity.

> It would certainly help . . . to have more documented facts about ethical issues in cartography. What are the motives and personal engagements of cartographers with the maps they make?
>
> Brian Harley (1991)

A systematic accounting of ethical concerns and challenges faced by cartographers and other geospatial professionals would be a worthwhile project. In this section I'll try to provide a step in that direction. I'll review several sources with which I have personal experience: articles in *Cartographic Perspectives* focused on ethical issues—including some of the articles appearing in this special issue—as well as select publications beyond *CP*. I'll compare concerns found there with issues identified by current and aspiring professionals enrolled a graduate ethics workshop I have conducted regularly for The Pennsylvania State University (Penn State) since 2009. I hope this explorative review will at least provide a hypothesis about the diverse, context-specific, and dynamic ethical concerns in cartography and the broader geospatial enterprise. I'll work my way up to the hypothesis by the end of Part 1.

CARTOGRAPHIC PERSPECTIVES, *1990s–2000s*

To begin, I'll discuss the earliest ethics-focused articles published in *CP*. The very first was "Ethical Problems in Cartography: A Roundtable Commentary" (McHaffie et al. 1990), which appeared in issue #7. That paper, which I pitched to the authors as the fledgling editor of the new journal, was designed to span perspectives from cartographers working in the government, private, and academic sectors. I'll retain that tripartite structure throughout this section.

Industry Sector Concerns

In the commentary, Michael Dobson (then Chief Technologist and Chief Cartographer at Rand McNally, the venerable map and atlas publisher) stated that "in my opinion, the single greatest ethical problem in our industry is one in which large commercial cartographers are victims rather than perpetrators: copyright infringement" (5).

Government Sector Concerns

The two anonymous government employees involved in the roundtable described "an ethical crisis in government mapping" caused by product liability lawsuits, "budget cutbacks in the face of mounting pressures to produce more, or to produce the status quo with fewer resources," and "automation activities that are not technically or economically feasible at this time" (6).

Academic Sector Concerns

Sona Karentz Andrews highlighted what she believed were oft-overlooked ethical implications of map design: "The kinds of questions we should teach [students] to ask are 'what are the consequences of what I have mapped? How do the decisions I make influence the decisions made by others?'" (9).

Patrick McHaffie wrapped up the roundtable by observing that "the discussion illustrates the personal, individual nature of ethical questions, even within the three major sectors." Yet, he continued, "there are obviously common themes running through this group commentary," primary among which is "the nature and validity of cartography's claim to truth" (10).

Two more ethics articles appeared during my editorship in issue #10. One was Mark Monmonier's "Ethics and Map Design: Six Strategies for Confronting the Traditional One-Map Solution" (1991). For Mark, it is unethical for cartographers to risk misleading map users, or to stand by while others mislead intentionally, when cartographers know how to do better and have the necessary technology. His six strategies—including sequencing of alternative views, interactive maps, professional standards (including a code of ethics, disclosure of experiments, and institutional structures such as a journal of cartographic criticism) aimed to increase transparency and overcome biases in mapmaking.

The second article published in issue #10 was Brian Harley's "Can There Be a Cartographic Ethics?" (1991). Harley praised the roundtable article as "pioneering . . . the first of its kind," but argued that it was "based . . . on a fundamental fallacy . . . the 'cartographers know best' fallacy" (9–10). "Cartography," he warned, "will be unable to engage in an ethical debate while it continues to appeal only to its own internal standards yet is morally blind to issues in the world outside" (11). "If we are truly concerned with the social consequences of what happens when we make a map," he argued, ". . . the debate must move beyond a narrow internalist formulation of what is ethical

in cartography . . . cartography is too important to be left entirely to cartographers" (12).

I suppose I'm partly to blame for the "cartographers know best" fallacy, since I was responsible for framing the roundtable discussion. But a flawed idea can still be useful. The distinction between "internalist" and "externalist" perspectives on cartographic ethics that Harley, and later Jeremy Crampton, articulated from the broader perspective of Critical GIS (Crampton 1995) has informed debates about ethics in both fields ever since.

Harley provided more than just an externalist critique. He also addressed his own question, "Can there be an ethically informed cartography and what should be its agenda?" (13). He shared an important insight about the distinction between moral theory and practical and professional ethics: "What cartographers most earnestly seek is probably not so much a theoretical as a practical ethics, a set of principles that can be used to clarify moral disagreements or conflicts with the goal of resolving them" (14).

Several other ethics-focused articles by authors representing the academic cartography community appeared in later editions of *Cartographic Perspectives*, including Matthew McGranaghan's (1999) "The Web, Cartography and Trust," Michael Peterson's (1999) "Maps on Stone: The Web and Ethics in Cartography," Tom Koch's (2006) "'False Truths': Ethics and Mapping as a Profession," and the 2008 dialogue between Mark Denil ("Manifestos") and Steven Holloway ("Response to Mark Denil's 'Manifestos'"). I'll consider the "manifesto" that sparked that dialog later in this paper. At this point I wish to focus on Koch's "False Truths."

Drawing from Harley and Denis Wood (1992), Koch warns cartographers about complicity in spreading "false truths"— "lies wrapped in the guise of fact" (5). Among several examples he presents a thematic map of long-lived smokers, which suggests the false truth of "equivalence between longevity and tobacco use that is unsupportable" (5). Koch argues that "cartographers bear responsibility for the maps they make, for their effect on society" (7). Invoking Peter Singer's (1993) notion of an "impartial spectator or ideal observer," Koch argues that for the cartographer, "the trick therefore is to understand . . . that ideal observer's judgment of the maps they create" (4). In a sense, this virtue ethics approach is consonant with the "externalist" perspective Harley advocated.

SUBSEQUENT PERSPECTIVES, 2010s–2020s

Here, I'll compare those ethical concerns expressed in *Cartographic Perspectives* in the early 1990s and mid-2000s to more recent perspectives.

Industry Sector Concerns

In its "**Statement on Ethics for the Map Industry**," the International Map Industry Association does mention "proper treatment of intellectual property" under one of its four "essential priorities and practices." My sense, though, is that the issue has become less an ethical concern than a legal one. Proprietary map and remotely sensed image data certainly do exist, often for defensible business reasons. But for many geospatial people who have come of age during an era of open data initiatives, the very concept of proprietary data has become morally questionable.

Kevin Pomfret, a leading voice in geospatial law and policy, counts intellectual property among the field's enduring legal issues (Pomfret 2024). Privacy, national security, data quality, and liability are others. For years, Kevin has advocated greater awareness of legal and policy issues among geospatial professionals, including educators. He criticizes geospatial education for what he sees as an over-emphasis on ethics and neglect of law and policy. I agree with his critique and am convinced that my own teaching should explore more deeply the interrelationships of ethics, law, and policy. I'm also aware, however, that while philosophers like Davis (2014) encourage non-philosophers like me to teach professional ethics, the same might not be true of law school faculty.

Meanwhile, the ethics of proprietary geospatial software is a serious concern for some. So much so that **two scholars proposed** that the American Association of Geographers cancel Esri's Platinum-level sponsorship of the AAG's Annual Meeting. For its part, while Esri maintains a vigilant legal department, its public-facing employees seem focused on garnering trust and good will through an emphasis on customer success and best practices in mapping, including a commitment to geospatial ethics.

Government Sector Concerns

Two papers in this special issue of *CP* present concerns of mapmakers working in government. In relation to the 1990 roundtable commentary in *CP*, neither are concerned with product liability lawsuits, management pressures to

produce more with less, or immature mapping technologies. Some ethical concerns are ephemeral.

In "Better than Good Enough for Government Work," **Leo Dillon** recounts "three episodes in the 34-year career of a cartographer at the US State Department [that] illustrate how ethics can inform, or intrude on, mapping for foreign policy" (2025, 76). Problems of boundary representation, national sovereignty, and geographic names are particular concerns. He also presents a thought-provoking case study in which he was directed to "outright lie on a map" (76). I'll consider that case later in this paper, in the section dealing with the "case method."

Daniel Coe, Graphics Editor at the State of Washington Geological Survey, reflects on ethical challenges arising from the agency's conversion of a popular "rockhounding location map into multiple interactive, variable-scale web maps." Challenges include the duty to discourage "collecting on privately-owned land without permission" while honoring "laws, regulations, and rules governing collecting on public lands" (2025, 64).

Meanwhile, beyond *CP,* new concerns about government mapping have accompanied emerging information and communication technologies. One example is de Jong and colleagues' (2019) discussion of the ethical challenges posed by "movement mapping" using location-aware mobile phones to help identify disease transmission hotspots. More recently, the Federal Communications Commission's **$200 million fine** against four major wireless carriers for illegally sharing access to customers' location data demonstrates the US government's concerns about location privacy.

Academic Sector Concerns

Several other cases provide perspectives different in kind from the three early ethics pieces in *CP.* Some of these are not only "internalist," but introspective to a degree not found in more academically styled articles. For instance, in "The 'AfterMap' of the February 2023 Earthquakes in Turkey," Professor **Seda Şalap-Ayça** of Brown University recounts her struggle to contribute cartographically from afar to disaster relief efforts in her homeland. Despite her technological savvy and significant related experience, Şalap-Ayça worried that her efforts might be counter-productive by only adding "another layer of noise" to the "vast data landscape" on social media (2025, 36). She resolved that humbly joining forces with the Humanitarian OpenStreetMap Team was the most helpful thing she could do under the circumstances.

In their research on how interstate migration impacts family networks, Professor **Caglar Koylu** of the University of Iowa and Professor Emerita **Alice Bee Kasakoff** of the University of South Carolina (2025) wrestle with "serious ethical concerns" caused by biases in population statistics that result in "significant underrepresentation of certain groups in the United States, notably Native American, Black, and Mexican persons . . ." (56) Their case discusses how they have taken significant steps towards fulfilling their ethical responsibilities as cartographers and historians by working with high schools to highlight the issue of representativeness, augmenting family tree and census data with the narratives of underrepresented groups.

In her "Ethical Dilemmas in Early Career: Reflections on a GIS Internship Experience and its Echo in Geospatial Teaching," Professor **Mairéad de Róiste** of Victoria University of Wellington shares a regret about her response to an ethical challenge years before as a city council intern in Ireland, where she was directed to delete features in aerial photography. Her experience led her to advocate forcefully for "the importance of practical ethics in geospatial education" (2025, 18).

Entries by three thought leaders in geospatial ethics in the second (online) edition of the *GIS&T Body of Knowledge* summarize academic sector concerns and ways of thinking about the subject in the late 2010s to early 2020s. James Thatcher (2018) reconsiders Harley's theoretical approach to understanding the power of maps and discusses newer participatory and counter-mapping practices. Jeremy Crampton (2018) argues that the power of maps is a threshold concept capable of changing the way students and practitioners think about mapping, and that critical ethics is a useful way to understand the "data politics" within which GIS is embedded. Finally, Nancy Obermeyer (2021) compares ethical guidelines of the Geographic Information Systems Certification Institute (GISCI) and the American Society for Photogrammetry and Remote Sensing (ASPRS), suggesting that "virtue ethics and practical wisdom" are useful resources when guidelines fall short of addressing specific ethical challenges. (My own 2017 entry in the *GIS&T Body of Knowledge* is an earlier and lighter treatment of some of the thoughts discussed in this paper.)

A recent article in the *Proceedings of the National Academy of Sciences* crystalizes insights gleaned from ethics initiatives across the disciplines of geography, geosciences, and geographic information science in relation to the "3Es": ethics, empathy, and equity. These, the authors argue, "are emerging as new drivers of research and disrupting established practices" in science (Nelson et al. 2022). In the article, the authors

> discuss ethical issues arising from locational privacy and cartographic integrity, how our ability to build knowledge that will lead to empathy can be curbed by data that lack representativeness and by inadvertent inferential error, and how GIScientists can lead toward equity by supporting social justice efforts and democratizing access to spatial science and its tools.

Empathy is one of the themes in this special issue as well. Independent cartographer **Daniel P. Huffman** shares a poignant reflection on the map critiques he published in his former blog *Cartastrophe*. He concludes that "a greater emphasis on empathy can guide us toward a way of critique that both teaches an audience and respects the cartographer" (2025, 15).

Taken together, all these recent perspectives suggest that some ethical concerns have endured, and others are emerging. I'll summarize these at the end of Part 1.

CURRENT AND ASPIRING PROFESSIONALS 2010s–2020s

So far, we have considered the *CP* special issue case studies, along with related references beyond *CP,* in relation to the ethics articles published in *CP's* early years. In this section I'll add a perspective gained from discussions about ethical issues in a graduate workshop I lead at Penn State.

Since 2009, I've led an ethics workshop that's required for graduate students in Penn State's online Master of GIS degree program and, since 2021, the Master of Science in Spatial Data Science. The 12-hour workshop—which we call "Responsible Scholarship and Professional Practice"—combines Collaborative Institutions Training Initiative (CITI) online training in the Responsible Conduct of Research with our own instruction in geospatial professional ethics. By my count, as of December 2024, 779 graduate students have passed the workshop since 2009.

One of three workshop assignments asks our online students to read ***A GIS Code of Ethics*** published by the Urban and Regional Information Systems Association (URISA) and then post comments in response to one of a short list of topics. The most popular topic option is this: "Explain what you believe to be the most important ethical challenge in the geospatial field, or an ethical challenge you have confronted in your professional practice." Across the three workshop offerings I led in 2023, 70 graduate students addressed this prompt. The students' median age was 31 years (ranged 24–54). About half of the students were working with mapping technology professionally during their studies—nearly all in full-time jobs—and almost 20 percent more worked in related fields.

Although the students identified a variety of topics they considered "most important," the most frequently cited issues were related to the commodification of personally identifiable geographic information (PIGI): privacy, confidentiality, informed consent, location tracking, and data ownership, among others. Responses like the following two accounted for slightly more than 50 percent of students' posts:

> One of the most significant ethical challenges in the geospatial field is balancing the benefits of GIS technology with the potential risks to privacy and security. GIS technology provides a powerful means of analyzing and visualizing data, but it can also collect and process sensitive information about individuals, such as their location and movement patterns. Ensuring that this information is collected, used, and shared in a way that protects individual privacy and security is a critical ethical challenge for GIS professionals.

> One principle of both the URISA and GISCI code of ethics for GIS professionals includes striving to avoid harm to individuals in society. With an increase in sensors and geospatial tracking abilities, there is a vast increase in the amount of data available and at a more individual level than ever before, which presents one of the largest ethical challenges in the geospatial field today.

Why was PIGI the predominant issue cited by graduate students, when it is scarcely mentioned at all in the early ethics articles in *Cartographic Perspectives*, or in the current special issue case studies? The early *CP* articles harken

from a time when PIGI was less pervasive than it is today. For the students, who had just completed the required five-hour CITI training on the Responsible Conduct of Research, the issue was top-of-mind. Yet, as the quotes above suggest, their concern is not limited to research contexts—it is a pervasive worry in many students' everyday lives. Perhaps this concern doesn't surface so much in the cases in this special issue because those authors were more strongly encouraged to introspect.

Other concerns identified by three or more workshop students were: analytical integrity, accessibility (open data, barriers to entry; skills gap), accuracy, workplace ethics, public understanding of geospatial technologies and methods, and cartographic integrity. The following two quotes are among the more incisive comments:

> In my work in political science and public policy research, the principles outlined in the Obligations to Society sections of URISA and GISCI's code of ethics often come up, especially the importance of accurately and appropriately analyzing and presenting data. Because the findings of think tanks, research institutions, and government agencies often influence policy that directly impacts communities, misrepresenting or misinterpreting data can have serious, adverse effects.

> Something I have come to realize as I learn more about spatial analysis and statistics is how much is up to the discretion of the analyst . . . decisions of scope, model type, and data can be designed to represent reality that is not actual. I have become daunted by the understanding of how easy it is to manipulate results unknowingly [by] simply not taking everything into consideration, recognizing distortions of aggregated data, or creating models in a vacuum.

Obviously, many factors account for differences between the ethical concerns expressed in *Cartographic Perspectives* and other publications, and those of the current and aspiring professionals in my ethics workshops. My purpose here is not to enumerate the differences, but rather to suggest that differences are to be expected. Outside of specialist communities, ethics is a multifaceted concept that tends to reflect the point of view of the person or group that's thinking about it. We should expect that different individual practitioners and groups within cartography and GIS will have different perspectives on ethics. If true, then the more practitioners and groups that are invited to reflect on ethics in cartography, the more kaleidoscopic the view is likely to become. The possibility that consensus may recede, rather than emerge, from inclusive conversations about ethics is something that the cartography community should keep in mind as it considers what should be done about ethics. More about that in Part 2: Codes.

Despite the diversity of perspectives considered in this section, I do think it's reasonable to generalize the trends in ethical concerns expressed. Given that this effort has been explorative, I'll offer the generalization as a hypothesis, perhaps to be tested in a more rigorous future study. Broadly speaking, I'll suggest that the most pervasive ethical concerns are of two types:

1. **Enduring concerns** about the social consequences of mapping, including associated concerns about cartographic (re)presentation, which have persisted since at least the early 1990s; and

2. **Emerging concerns** about the personal consequences of pervasive collection, commodification, and exploitation of individual location data, arising more recently—perhaps since the proliferation of personal mobile devices in the later 2000s.

In the following section I'll consider how these enduring and emerging concerns are addressed in the ethics codes and rules that geospatial organizations provide to help guide their constituents toward doing the right thing.

PART 2: CODES

Given the diversity and dynamism of ethical concerns discussed above, we might expect that the codes of ethics adopted by major geospatial professional associations will vary accordingly, depending perhaps on organizational culture and world view.

Blakemore & Longhorn conducted such an assessment in 2004. In preparation for a workshop on GIS ethics for the Association for Geographic Information (AGI), they developed a matrix by which workshop participants were to identify "commonalities" among eleven organizations'

codes or rules of conduct. They invited participants to compare the codes and rules in relation to nine "general moral code issues" (e.g., "contribute to society and human well-being," "avoid harm to others," "respect privacy of others," and "honour confidentiality of information") and eight "professional code issues" (such as "maintain and update professional competence," "respect the work of colleagues and other professionals," and "uphold the reputation of the profession in your own conduct" (21). I failed to find any record of workshop outcomes, unfortunately.

Here I'll take on the more modest task of assessing several geospatial codes in relation to the hypothetical "enduring" and "emerging" ethical concerns suggested above. I looked for evidence of those concerns in the codes of ethics of **ASPRS**, the **British Cartographic Society** (BCS), and **URISA**, as well as the rules of conduct published by the **GISCI** and the ***Locus Charter*** proposed by initiatives of the American Geographical Society (EthicalGEO) and UK Ordnance Survey (Geovation). What emerges from my assessment is two kinds of geospatial codes.

Tom Koch (2006) describes the first kind: "Professional associations are typically developed to define a craft or profession, to delineate its standards of conduct, and to set ethical parameters for its members. . . . Most [associations] are careful to limit the parameters of their ethical guidance in a manner that does not restrict either the client base or the services that can be rendered to those clients" (12). Codes of this sort, including those of ASPRS, BCS, and GISCI, are limited to permissible professional conduct, especially by certified or licensed practitioners. These codes remind me that I myself once defined "ethics" as "principles of conduct guiding the practices of an individual or professional group" when I framed the "Ethical Problems in Cartography" paper for *CP* in 1990. I had a lot to learn.

Michael Davis (2002) suggests a second kind of code. For Davis, codes of ethics are defining characteristics of professions: "It is impossible," he writes, "to satisfy the definition of a profession without (something like) a code of ethics, . . . and indeed impossible to understand professions without understanding them as bound by such a code" (1). For Davis, members of a profession "serve a certain moral ideal" (3) that is expressed or implied in their code, and that distinguishes the profession from others and from laypersons. For the sake of discussion here, honoring the so-called enduring and emerging ethical concerns above may stand in for a moral ideal for geospatial professionals. However, a more idealistic assertion of the potential for geospatial professionals to contribute to a more just and sustainable future for life on Earth remains to be considered.

Grounded in the moral theory of deontology, URISA's ***A GIS Code of Ethics*** emphasizes treating people with respect, not just means to an end (Craig 1993; URISA 2003). It consists of 45 "guidelines" organized under four headings: "Obligations to Society," "Obligations to Employers and Funders," "Obligations to Colleagues and the Profession," and "Obligations to Individuals in Society." (GISCI endorsed URISA's Code and adopted the same structure for its ***Rules of Conduct for Certified GIS Professionals (GISPs)***, though the latter does not align as well with the enduring and emerging concerns. Where URISA's code provides guidance about what professionals should do, the GISCI rules focus on what they shouldn't.)

In relation to the enduring concerns, URISA's code explains that "the GIS professional recognizes the impact of his or her work on society as a whole, on subgroups . . . including geographic or demographic minorities, [and] on future generations. . ." (2). Although issues of cartographic (re)presentation are not specifically addressed, URISA's code does advocate objectivity, being "aware of consequences, good and bad," and striving for "broad citizen involvement in problem definition, data identification, analysis, and decision-making." Regarding the emerging personal concerns, URISA emphasizes protecting "individual privacy," including special care for "new information discovered about an individual through GIS-based manipulations (such as geocoding) or the combination of two or more databases." Further, it advises to "allow individuals to withhold consent from being added to a database, correct information about themselves in a database, and remove themselves from a database" (5).

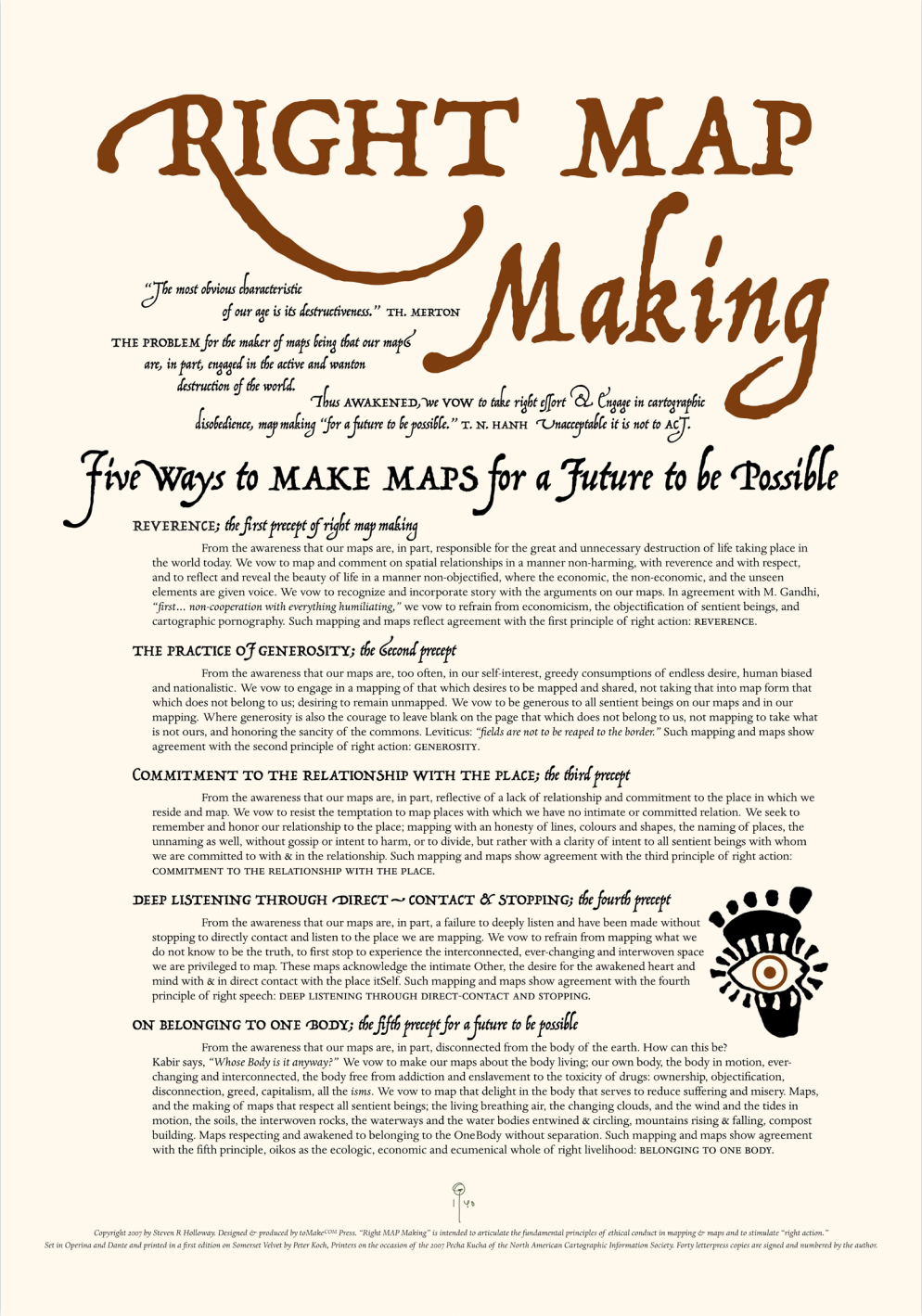
The *Locus Charter* (McKenzie and Hawes 2023) also aligns favorably with the enduring and emerging concerns, though it does so in less detail and specificity than URISA's code. It consists of ten founding principles, including

2. Understand Impacts: Users of location data have responsibility to understand the potential effects of their uses of data, including knowing who

(individuals and groups) and what could be affected, and how

5. Address Bias: Bias in the collection, use, and combination of location datasets can either remove affected groups from mapping that conveys rights or services, or amplify negative impacts of inclusion in a dataset

9. Prevent Identification of Individuals: As an individual's mobile location data is situated within more and more geospatial context data, [and] its anonymity erodes, measures should be put in place to prevent subsequent use of the data. . .



RIGHT MAP Making

"The most obvious characteristic of our age is its destructiveness." TH. MERTON

THE PROBLEM for the maker of maps being that our maps are, in part, engaged in the active and wanton destruction of the world.

Thus AWAKENED, we VOW to take right effort & Engage in cartographic disobedience, map making "for a future to be possible." T. N. HANH Unacceptable it is not to ACT.

Five Ways to MAKE MAPS for a Future to be Possible

REVERENCE; the first precept of right map making

From the awareness that our maps are, in part, responsible for the great and unnecessary destruction of life taking place in the world today. We vow to map and comment on spatial relationships in a manner non-harming, with reverence and with respect, and to reflect and reveal the beauty of life in a manner non-objectified, where the economic, the non-economic, and the unseen elements are given voice. We vow to recognize and incorporate story with the arguments on our maps. In agreement with M. Gandhi, *"first... non-cooperation with everything humiliating,"* we vow to refrain from economicism, the objectification of sentient beings, and cartographic pornography. Such mapping and maps reflect agreement with the first principle of right action: REVERENCE.

THE PRACTICE OF GENEROSITY; the second precept

From the awareness that our maps are, too often, in our self-interest, greedy consumptions of endless desire, human biased and nationalistic. We vow to engage in a mapping of that which desires to be mapped and shared, not taking that into map form that which does not belong to us; desiring to remain unmapped. We vow to be generous to all sentient beings on our maps and in our mapping. Where generosity is also the courage to leave blank on the page that which does not belong to us, not mapping to take what is not ours, and honoring the sancity of the commons. Leviticus: *"fields are not to be reaped to the border."* Such mapping and maps show agreement with the second principle of right action: GENEROSITY.

COMMITMENT TO THE RELATIONSHIP WITH THE PLACE; the third precept

From the awareness that our maps are, in part, reflective of a lack of relationship and commitment to the place in which we reside and map. We vow to resist the temptation to map places with which we have no intimate or committed relation. We seek to remember and honor our relationship to the place; mapping with an honesty of lines, colours and shapes, the naming of places, the unnaming as well, without gossip or intent to harm, or to divide, but rather with a clarity of intent to all sentient beings with whom we are committed to with & in the relationship. Such mapping and maps show agreement with the third principle of right action: COMMITMENT TO THE RELATIONSHIP WITH THE PLACE.

DEEP LISTENING THROUGH DIRECT ~ CONTACT & STOPPING; the fourth precept

From the awareness that our maps are, in part, a failure to deeply listen and have been made without stopping to directly contact and listen to the place we are mapping. We vow to refrain from mapping what we do not know to be the truth, to first stop to experience the interconnected, ever-changing and interwoven space we are privileged to map. These maps acknowledge the intimate Other, the desire for the awakened heart and mind with & in direct contact with the place itSelf. Such mapping and maps show agreement with the fourth principle of right speech: DEEP LISTENING THROUGH DIRECT-CONTACT AND STOPPING.

ON BELONGING TO ONE BODY; the fifth precept for a future to be possible

From the awareness that our maps are, in part, disconnected from the body of the earth. How can this be? Kabir says, *"Whose Body is it anyway?"* We vow to make our maps about the body living; our own body, the body in motion, ever-changing and interconnected, the body free from addiction and enslavement to the toxicity of drugs: ownership, objectification, disconnection, greed, capitalism, all the *isms*. We vow to map that delight in the body that serves to reduce suffering and misery. Maps, and the making of maps that respect all sentient beings; the living breathing air, the changing clouds, and the wind and the tides in motion, the soils, the interwoven rocks, the waterways and the water bodies entwined & circling, mountains rising & falling, compost building. Maps respecting and awakened to belonging to the OneBody without separation. Such mapping and maps show agreement with the fifth principle, oikos as the ecologic, economic and ecumenical whole of right livelihood: BELONGING TO ONE BODY.

Set in Operina and Dante and printed in a first edition on Somerset Velvet by Peter Koch, Printers on the occasion of the 2007 Pecha Kucha of the North American Cartographic Information Society. Forty letterpress copies are signed and numbered by the author.

Figure 1. A desiderata for mapmakers. Steven Holloway's 2007 broadside *Right MAP Making: Five Ways to Make Maps for a Future to be Possible*. Reproduced with author's permission.

Though there's apparently been much discussion within the North American Cartographic Information Society (NACIS) over the years, no consensus has crystalized around a code of cartographic ethics. Perhaps that's for the best. What's emerged instead resembles, to my mind, desiderata akin to Max Ehrmann's 1927 **prose poem** ("Go placidly amid the noise and the haste. . ."). In their 2022 post, "**The Mapmakers Mantra**," Aileen Buckley, Allen Carroll and Clint Brown propose four values to inspire cartographers to greater ethical behavior in mapping: "Be Honest and Accurate," "Be Transparent and Accountable," "Minimize Harm and Seek to Provide Value," and "Be Humble and Courageous." Steven Holloway's 2007 work *Right MAP Making: Five Ways to Make Maps for a Future to be Possible*, a "personal credo or set of principles addressing the intention of ethical conduct on the part of the mapmaker" (14), reads like—and in its striking visual presentation, looks like—a desideratum. I wonder if a heartfelt and artful statement along these lines might be more authentic and useful to the cartography community than a traditional code.

PART 3: CASES

> Codes of ethics and case studies need each other. . . . The best way to use these codes is to apply them to a variety of situations and see what results. It is from the back and forth evaluation of the codes and the cases that thoughtful moral judgments can best arise.

So wrote the Center for the Study of Ethics in the Professions at Illinois Institute of Technology **on its website** in 2012 (now archived). The Center was Michael Davis's academic home; he almost certainly authored the statement.

In this section I'll summarize Davis's definitive paper on the "case method" in ethics education. I'll review the characteristics of case studies in practical ethics, as well as a methodology for using cases, in conjunction with codes, to strengthen ethical judgment. I'll then consider how a couple of stories presented in this special ethics issue of *Cartographic Perspectives* can be transformed into actionable[1] case studies. Finally, I'll identify and comment upon several sources of case studies that may be useful to geospatial practitioners, educators, and students.

Davis's paper (1999) traces the origins of the case method to Harvard's law school in the 1870s—where "cases" were "published decisions of an appellate court" (143). Harvard's business school followed suit in 1908. Business cases, Davis reports, evolved from "a faculty member's war story, a company's annual report, . . . or even a wad of newspaper clippings" to "a specialty" involving "extensive research, often including on-site interview and detailed examination of public records" (145). Other Harvard programs soon adopted the method, and subsequent publication of "Harvard cases" influenced pedagogy at other universities.

Philosophers and theologians "seem to have developed their own 'case method' independently, as part of the fruitful exchange between philosophy and medicine that also produced the specialty we now know as 'medical ethics'" (Davis 1999, 145). Contrary to philosophers' long practice of using *examples* to illustrate or prove abstract points, the philosopher's *case* aimed "to provoke discussion

1. In common parlance, as used here, "actionable" means "able to be acted upon." For Natal (2022), actionable ethics refers to "techniques gleaned from neuroscience on how to make moral behavior habitual." For a critical perspective on "actionable" ethics in AI, see Gill (2022).

- **Long (and very long) vs. short (and very short)**: Davis considers a ten-page ethics case "quite long." "Mine," he writes, "are generally only a paragraph; few fill a single typewritten page."
- **Single perspective vs. several perspectives**: "Single perspective cases allow an instructor to go directly to the specific issues [they want] to discuss. A case with more than one perspective forces a preliminary discussion of what the problem might actually be. . ."
- **Narrative vs. dialogue**: "Dialogue is the easiest way to present a multiple-perspective case, each voice presenting its side. . . . Though narrative is a much more common case format than dialogue, many narratives might just as well have been dialogues."
- **Realistic (hypothetical) or real (actual):** "Cases . . . must be real or at least realistic. They must, that is, be enough like actual events to be treated as practical possibilities."
- **Stories vs. problems**: "A story has a beginning, a middle, and an end. . . . Problems may be thought of as stories that stop without ending. . . . Any story can be turned into a problem."
- **You (agent) vs. they (judge)**: "Cases . . . can be written with the reader [you] as a participant . . . or as an outside judge. . . .cases with the 'judge perspective' . . . allow students to treat ethics as, in effect, a spectator sport. . . . Second-guessing the actual decision maker is far easier than working out the details of a decision when it is your own. . ."
- **Would vs. should**: ". . . 'would' seems to ask for a prediction. Since I do not teach students how to predict their own behavior, but how to choose it," Davis writes, "I do not think it fair to ask them to make such predictions."
- **Top vs. bottom**: "Most cases in the news . . . involve decisions near the top of an organization. Our students will, however, graduate into jobs much closer to the bottom . . . First-job cases may . . . be better for enhancing judgment than top-level decisions. . .."
- **Single issue (poor) vs. multi-issue (rich):** "[Single issue] cases are better for a class where you want to focus on identifying, analyzing, and responding to a particular issue, not several."
- **Single stage vs. multi-stage**: "Multi-stage cases try to teach that, because no decision is necessarily 'final,' it pays to think about what new decisions this one might generate. . ."
- **Ordinary vs. technical language**: "The philosopher's case is . . . typically put in language allowing someone not trained in philosophy or any other particular discipline to reach the ethical issues. Cases can also be given the characteristic format of a particular discipline."

Table 1. Styles of practical ethics cases. Excerpted from Davis (1999, 149–158).

rather than to kill it. If a case had a right answer, it would not be immediately obvious or easy to demonstrate. Often there was (or at least seemed to be) no unique right answer, only several pretty good ones (and several pretty bad ones too)" (146).

Davis goes on to draw sixteen distinctions that illustrate the stylistic variety available to case study authors. A shortened list appears in Table 1.

Table 1 highlights the fact that there are many ways to write an ethics case study. It also provides a way of talking and thinking about cases. To ensure that a case study is as fruitful as possible as an exercise in moral reasoning, case study authors should be intentional about the stylistic decisions they make. In the following I'll use the distinctions to unpack some of the stylistic characteristics of effective ethics case studies.

The example shown in Figure 2 is a case from the collection at **GISEthics.org**. In relation to the sixteen distinctions outlined in Table 1, the "Low-level Radioactive Waste Siting Map" case is written as a "problem" rather than a "story." Its form is "short" and "narrative," and "realistic" in provenance (the ethical problem is based upon an actual low-level radioactive waste storage facility siting project in Pennsylvania). The protagonist is a low-level employee ("bottom" vs. "top") who must decide how to respond to a superior's directive that doesn't feel right. It is a "single issue," "single stage," "should"-style case that's written in slightly technical language familiar to geospatial professionals and students. The challenge it poses is fundamentally cartographic, but also raises questions of how to properly respond to a superior's directive. Several provisions of URISA's code of ethics (2003) are relevant, including:

- Practice integrity and not be unduly swayed by the demands of others (2);
- Provide full, clear, and accurate information (2);
- Identify risks and the potential means to reduce them (3);
- Define alternative strategies to reach employer/funder goals, if possible, and the implications of each (3);
- Accept decisions of employers and clients, unless they are illegal or unethical (3); and
- Strive to resolve differences (3).

THE CASE METHOD

To this point we've discussed characteristics of practical ethics cases in general and with an example. Next, let's consider Davis's (1999) advice about how cases can be used to strengthen ethical judgment in practice.

Practical ethics education takes various forms—as a formal course or seminar at a university, as a workshop offered at a professional meeting, as an informal training session conducted within a business or government agency, or even a competition among student teams (an "ethics bowl"). Whatever the setting, a "course" in professional ethics focuses on the particular moral obligations incumbent on members of a profession (often articulated in formal codes or rules) as opposed to the general morality people learn early in life. Such courses, Davis observes, can serve at least four purposes:

1. To enhance ethical *sensitivity*—the ability to recognize situations in which special professional standards may be relevant to a decision (164);

2. To increase ethical *knowledge*—to add to what students and practitioners know about the content, interpretation, and application of the special standards in question, as well the resources available to help them make decisions in practice (164);

3. To improve ethical *judgment*—the ability to recognize and choose wisely among multiple options to resolve a practical ethical challenge (164);

4. To enhance ethical *willpower*—the confidence and courage needed to do what one has reasons to believe is right (165).

In a special issue of the *URISA Journal* published over 20 years ago, former URISA presidents Bill Huxhold and Will Craig offered a rationale for relating URISA's newly proposed GIS code of ethics to the emergent GIS Certification Institute's procedures for certifying GIS professionals (Huxhold and Craig 2003). Near the conclusion of their article, they wrote:

> The last steps planned [by URISA's Certification Committee, the group that proposed GISCI] include adding resources to assist the GIS professional with ethical dilemmas. . . . The Committee

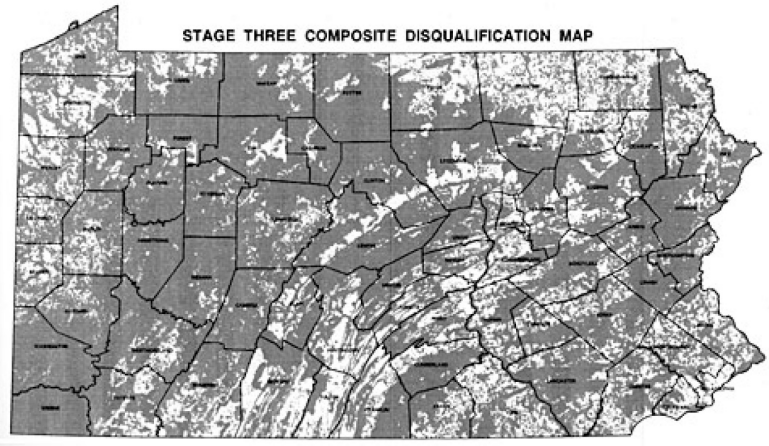
GIS Professional Ethics Project gisethics.org

Case study: Low-level Radioactive Waste Siting Map

The Pennsylvania Department of Environmental Protection (DEP) hires a contractor to identify potential sites for a 500-acre storage facility for low-level radioactive waste (LLRW). In collaboration with the DEP the contractor assembles a statewide GIS database that includes the geographic distributions of pertinent geological, hydrological and land use criteria. The contractor proposes to use overlay analysis to disqualify unsuitable areas. For example, areas characterized by any combination of permeable bedrock, excessive slope, or proximity to key water resources or protected lands (among other factors) will be deemed unsuitable.

The project involves three stages of screening for unsuitable areas: statewide, regional, and local. Each stage involves data fusion and analysis at larger map scales and greater detail. Public hearings are held at each stage to afford residents opportunities to ask questions about which areas have been disqualified, which are still in consideration, and why. The contractor produces reports for the hearings that explain the screening process and illustrate the geographic distributions of pertinent criteria and disqualified areas. By stage 3, three quarters of the state's land area are disqualified. The state agency hopes that communities in areas not yet disqualified will volunteer to host the facility in return for financial incentives. Most residents who attend the hearings, however, are determined to keep the proposed facilities as far as possible from their backyards.

A GIS analyst employed by the contractor is assigned by her supervisor to produce a statewide map showing areas disqualified after stage 3. A requirement is that the map be reproducible by black-and-white xerography (photocopy), and that it fit on a 11" x 17" page so that it can be folded into a page-size (8.5" x 11") report. The GIS analyst calculates that 1:1,500,000 is the maximum map scale at which the entire state can be shown on an 11" x 17" page. At this scale, some "islands" of potentially suitable areas surrounded by disqualified areas but large enough to contain a 500-acre facility will be too small to see. When the analyst explains this to her supervisor, he suggests that she include on the map a disclaimer stating that "it is possible that small areas of sufficient size for the LLRW disposal facility site may exist within regions that appear disqualified on the map. The detailed information for these small areas is retained within the GIS even though they are not visually illustrated." How should the analyst respond to this suggestion?



Areas (in gray) disqualified as potential sites for a low level radioactive waste storage facility. Disqualified areas depicted on a small scale map (original 1:1,500,000) mask small suitable areas large enough to contain the 500-acre facility (Chem-Nuclear Systems, Inc., 1994).

Figure 2. An example **case study** from GISEthics.org.

> plans to develop and link to a wide variety of case studies that present dilemmas faced by the GIS professional. Most ethicists agree that the best way to build ethical muscle is to take on tough problems, weigh them, and then see how others have responded (56).

A substantial, if incomplete collection of geospatial ethics case studies like what Huxhold and Craig (and others) envisioned exists today at **GISEthics.org**. What remains is a need for guidance on how practitioners and students should use the case studies to "build ethical muscle." Case studies that facilitate enhanced ethical sensitivity, knowledge, judgment, and willpower could be called "actionable" case studies, in the sense that they are "able to be acted upon" as discussed above.

Davis (1999) offers a methodology for acting upon case studies later in the case method chapter summarized above. In Table 2 is his "Seven-step Guide to Ethical Decision Making," a framework to help achieve the four purposes of practical ethics education by guiding analysis (and/or discussion) of problem-style cases in a methodical way.

A typical challenge arising from users' first attempts to apply the "Seven-step Guide" is an inadequate number and variety of options (Step 4). Those inclined to "go with their gut" may settle

1. **State problem** (e.g., "There's something about this decision that makes me uncomfortable" or "Do I have a conflict of interest?").
2. **Check facts** (many problems disappear upon closer examination of situation, while other change radically).
3. **Identify relevant factors** (e.g., persons involved, laws, professional code, other practical constraints).
4. **Develop list of** options (at least three; preferably four or more. Be imaginative, try to avoid simplistic "dilemmas"—not "yes" or "no" but who to go to, what to say).
5. **Test each option***
   a. **Harm test**: Does this option do less harm than alternatives?
   b. **Publicity test**: Would I want my choice of this option published in the newspaper?
   c. **Defensibility test**: Could I defend choice of option before Congressional committee or committee of peers?
   d. **Reversibility test**: Would I still think choice of this option good if I were adversely affected by it?
   e. **Colleague test**: What do my colleagues say when I describe my problem and suggest this option as my solution?
   f. **Professional test**: What might my profession's governing body or ethics committee say about this option?
   g. **Organization test**: What does the company's ethics officer or legal counsel say about this?
6. **Make a choice** based on steps 1–5.
7. **Review steps 1–6**: What could you do to make it less likely that you would have to make such a decision again? Any precautions [you can take as an individual] (announce your policy on question, change job, etc.)? Any way to have more support next time? Any way to change the organization (e.g., suggest policy change at next departmental meeting)?

* Step 4, "Test options," uses ideas from various moral theories (publicity, reversibility, and so on) to evaluate options. The tests are not necessarily decisive; they are supposed to call attention to relevant considerations. In this way, the core of most moral theories can be brought into decision-making in an uncontroversial form (that is, without the exclusiveness and technical paraphernalia of explicit moral theory)

Table 2. Seven-step Guide to Ethical Decision Making (Davis 1999, 166–167).

quickly on just two obvious options, thereby reducing the ethical challenge to a trivial dilemma. Students in Penn State's Geospatial Ethics Workshop are required to identify, and test, at least three options, and they are encouraged to consider even more. (A worked example of an exemplary case study analysis appears in DiBiase et al. 2012).

In relation to the case presented above, of the low-level radioactive waste (LLRW) siting map, students often identify "propose a larger map" and/or "go over the supervisor's head" as options. Others suggest replacing or supplementing the printed map with a multiscale web map—overlooking the fact that four percent of Pennsylvanians still lack adequate access to broadband internet, and that residents most vulnerable to LLRW facility sitings may be over-represented in that group. Students with a background in cartography are most likely to recognize that creative symbolization can serve map readers' interests while honoring the project scope. Specifically, eligible areas below a certain size threshold could be depicted as legible point symbols—even on a legal-size page—rather than true-to-scale areal symbols. This solution honors the URISA GIS code's principle of "defin[ing] alternative strategies to reach employer/funder goals. . ." (2003, 3).

TRANSFORMING "STORIES" ABOUT GEOSPATIAL ETHICS INTO "PROBLEMS"

As demonstrated in this special issue of *Cartographic Perspectives*, lots of practitioners have stories about ethical challenges they've encountered in their work. The corpus of actionable geospatial ethics case studies could be greatly expanded and diversified if stories could be transformed into problems in a straightforward way. This could help address the fact that existing geospatial ethics case study collections are inadequate in quantity and breadth—especially in relation to cartography.

On the right is an adaptation of a story included in Leo Dillon's article in this special issue, "Better than Good Enough for Government Work." The story involves an ethical challenge Dillon faced early in his career as a US State Department cartographer, when he was ordered to include a dubious, but potentially consequential, threat location on a map of US military targets. The adaptation omits the conclusion of Dillon's story and fictionalizes the bureau experts' accedence to the dubious request—leaving the junior cartographer alone to grapple with their misgivings. A problem with the adaptation is that the story is situated in a particular historical context, and younger readers may have trouble relating to it.

Like the LLRW disposal siting case in Figure 2, the "State Department Cartographer" case is written from the cartographer's single perspective. Rewriting it to include the perspective of the map requestor might make it more nuanced, and challenging.

A second example of a problem-style case adapted from a story is drawn from the "Interview with an Anonymous Graphics Reporter" in this special issue. The adaptation is again written from a single perspective, but in dialogue style rather than narrative.

The draft adaptation on the next page is a realistic derivative of an actual, non-trivial workplace challenge. My adaptation purposely conflates a couple of different cases discussed in the interview article. Some text is copied directly from the interview, some is edited, and some has been added to flesh out the scenario. Further fictionalization could add another layer of ethical complexity—X and Z might be ascribed Jewish and Arab-American ethnicities, for instance.

GEOSPATIAL CASE STUDY COLLECTIONS

Next, I'll consider some sources of ethics case studies in relation to the enduring and emerging ethical concerns of geospatial professionals. The curated collection at **GISEthics.org** is one, but it is not the only source of published ethics case studies that could be useful to cartographers and other geospatial practitioners.

As of this writing, 14 the 21 cases at GISEthics.org address one or another of the enduring and emerging concerns about geospatial ethics (Part 1 above). The relevant cases are described in Table 3.

CASE STUDY 1

STATE DEPARTMENT CARTOGRAPHER ORDERED TO MAP A DUBIOUS THREAT

Adapted from Leo Dillon (2024)

An early-career cartographer at the US Department of State faced an ethical challenge. It was the late 1980s. A Cold War mindset was strong within the US Government, and almost none of the best and brightest foreign policy experts could predict that the Soviet Union would soon disintegrate.

During this period, the cartographer receives a map request from one of the department's regional bureaus. The request includes a list of hypothetical locations of Soviet missile systems along with their effective ranges, and another list of real American or allied targets that these theoretically placed weapons could hit. The cartographer is assigned to make a map of these locations and ranges to support a briefing to a senior policymaker.

Upon measuring the range from one of the weapons systems—a missile launcher located conjecturally on the coast of a Soviet-allied country—the cartographer finds that it doesn't reach the target of interest. This target, a major US military base, is the most impactful facility shown on the map, and is located just outside the missile's maximum range. The cartographer reports the discrepancy to the staffer who requested the map and is told to leave the questionably located facility on the map.

Self-conscious about their junior status, the cartographer reaches out to experts in their bureau whose job is to know everything about these weapons. Looking at the map, they scoff at the idea of placing this type of launcher at that location, a coastal mangrove forest with no nearby infrastructure to support its construction. To them, it's a non-threat. The bureau experts meet with the requestor to vouch for the cartographer's concern, but they too are told it is close enough, and to leave it on the map. At this point, the bureau experts advise the cartographer to accede to the request and move on.

This is troubling. The map will be shown to someone whose influence shapes foreign policy. The information on the map is at best misleading, but really just plain wrong.

What are the cartographer's and the experts' ethical obligations at this point? What are the regional bureau staffer's motivations for insisting that the conjecturally-located missile launcher be included on the map? Should the cartographer trust the judgment of the senior decision maker to whom the map will be presented? What options are available address the cartographer's ethical concerns?

CASE STUDY 2

GRAPHICS REPORTER TROUBLED ABOUT UNVERIFIED BATTLE LOCATIONS.

Adapted from Anonymous (2024)

X and Y are both employed at a national newspaper in the US. X is a graphics reporter who specializes in cartography; Y is a news reporter. Both are junior employees, privately nervous about the ongoing contraction of the traditional newspaper industry.

X is working with Z, a more senior reporter, on an ongoing story about the war in Gaza. Z, who is on location in the Middle East, sends X a list of points to be mapped as battle zones. Z acquired the point data from a source known to have sometimes provided inaccurate information in the past; for this reason, X is worried that the purported battle zone locations may be misleading. X emails Z to express concerns, but Z doesn't reply. There's pressure to run the story with the map in tomorrow's paper, if possible.

X and Y meet for coffee. X shares their concerns. X confides, "I can't double check all these points. I don't speak Arabic. I can try to use Google Translate and OSM, which are pretty good, but I don't speak Arabic. I don't want to put twenty points of battle zones on a map if they're not actually there. But Z's not responding to any of my messages and the map has to run. Do I shut down the whole map, and slow down the whole article?'"

Y sympathizes. "What are you supposed to do, email ten different really high-level people and say, 'I'm sorry. I'm this random graphics reporter, this random twenty-something, and I'm going to put a stick in the works because I feel a little bit uncomfortable'? Don't do that. Don't say anything. Just keep your head down. Because what are the chances someone is going to say, 'That's wrong'?"

X replies, "You know, responsible behavior is not rewarded. Speed is rewarded, provided there aren't any first order screw-ups, like putting a label in the wrong place, or labeling the wrong city. Those are the errors that editors care about. It's the second order errors—the ones that are not so obvious—those are the ones where the ethics become really muddy, and they're the ones that I'm trying to think about."

Y: "But there's no time or space to think about them. And there's really no consequences unless someone notices and makes a comment. It's the same situation in prose reporting. The paper issues a correction when errors are discovered. That's true for maps too, right?"

X: "Yes, but we both know that a formal correction can impact your career."

Y: "Of course. But we also know that the newspaper is read by people high up in government, high up in the military, high up in the global economy. We're helping to write the first draft of history. Doesn't that knowledge make you feel responsible for drawing the line in situations like this?"

X: "I suppose it does, but I'm also aware that errors like the one I'm worried about may never be noticed."

Y: "So what are you going to do? And on what grounds are you going to justify it?"

Another source is the **EthicalGEO blog**. Posts include numerous stories that address contemporary issues related to geospatial ethics. Stories that seem ripe for adaptation to problem-style cases include:

- **Counter-Cartography: GIS and Anti-Eviction Resistance**
- **Water Management in Mexico City**: Ethics and Solutions to a Worsening Water Crisis
- **Geodata at the Intersection of Disease Control and Border Securitization**

Those whose interests include the intersection of geospatial practice with artificial intelligence and data science can find compelling case studies in the following collections, among others:

The Princeton Dialogues on AI and Ethics—"a research collaboration between Princeton's University Center for Human Values and the Center for Information Technology Policy," offers (as of this writing) a collection of six case studies designed as "intellectual reasoning tools to guide practitioners and policy makers, both current and future, in developing the ethical frameworks that will ultimately underpin their technical and legislative decisions." The Princeton cases are longer (5–10+ pages), realistic, story-style cases that include discussion questions and sidebars with explicit "ethical objections." The initiative's published case study methodology is based upon five "governing principles," including "Empirical foundations," "Broad accessibility," "Interactiveness," "Multiple viewpoints," and "Depth over brevity." One topic particularly germane to geospatial studies is "Public Sector Data Analysis," based loosely on the City of New Orleans' experience with predictive policing (Winston 2018).

ENDURING CONCERNS: SOCIAL CONSEQUENCES OF MAPPING, INCLUDING ASSOCIATED CONCERNS ABOUT CARTOGRAPHIC (RE)PRESENTATION

- **Caribou Migration Routes**—A GIS analyst is asked to exclude pertinent data from maps prepared for a public hearing.
- **Collateral Damage Mapping**—A geospatial intelligence analyst predicts the civilian casualties likely to be caused by a pre-emptive missile attack.
- **Cutting Corners on Redistricting**—Election mapping consultants propose to omit data from GIS analyses to cut costs and win a contract with a newly formed Independent Election Commission.
- **Energy Production and Protected Whales**—Should new lease blocks for oil and gas wells be established in a rare whale's habitat in the Gulf of Mexico?
- **Environmental Justice Web Map**—A GIS programmer ponders a contract for a web map that overlays toxic industrial sites and at-risk communities.
- **Government Employee and the Press**—A member of the press asks a government employee to leak the results of a GIS analysis about a controversial wild land fire.
- **Low-level Radioactive Waste Siting Map**—A map masks potentially suitable sites for low-level radioactive waste storage facility.
- **Proprietary Software in an Emergency**—Too few software licenses are available in the aftermath of a tsunami.
- **Tidal Wetland Mapping—**A scope of work statement and established mapping procedures prevent a GIS analyst from adding wetlands to a conservation database.

EMERGING CONCERNS: PERSONAL CONSEQUENCES OF PERVASIVE COLLECTION, COMMODIFICATION, AND EXPLOITATION OF INDIVIDUAL LOCATION DATA

- **Bear Baiting**—Should precise locations of controversial hunting stations be public information?
- **Mapping Muslim Neighborhoods**—A police department's plan to map potential terrorist enclaves brings charges of racial profiling.
- **Privacy and Planning**—A GIS professional considers filing an ethics complaint about lax protection of the confidentiality of a sensitive database.
- **Social Trails and Border Security**—A student intern has misgivings about sharing location data about trails used by illegal immigrants with US Border Patrol.
- **Tracking Mobile Phones in Mobility Research**—Researchers track mobile phone users' movements to derive predictive models of human mobility.

Table 3. Case Studies at GISEthics.org related to enduring and emerging ethical concerns.

The **Council for Big Data, Ethics, and Society** (2016) provides another small, but rich, **case study collection** related to data ethics. The three cases there are relatively lengthy (7– 23 pages) stories based on real scenarios. Though none of the three cases—"The Ethics of Using Hacked Data," "A YouTube Engineers Decision to Alter Data," and "Ethical Questions for Web-based Censorship Measurement"—foreground geospatial technologies and methods, all support in-depth discussion of ethical challenges associated with modern data analytics.

A third interesting source related to AI and data science is the collection of **six case studies** produced by the **Ada Lovelace Institute** and Alan Turing Institute for a workshop held as part of the research that culminated in the report *Looking Before We Leap*. The cases "represent hypothetical submissions to a Research Ethics Committee." One of the six cases—"Tattoo ID to map gangs"—is directly applicable to geospatial studies. Intended users—including "students, researchers, members of research ethics committees, funders and other actors in the research ecosystem"—are asked to "Keep the following questions in mind:"

1. What potential harms does this project pose, both to participants but also to members of society who may be impacted by this work?

2. What measures should be put in place to mitigate against these risks?

3. What additional information do I need, and who should I speak with to find it?

Users are also advised that "There is no 'right' answer to a case study—rather, this is an exercise to encourage reflection and discussion with your research group and peers."

From the related disciplinary perspective of the geosciences, ***Geoethics: Ethical Challenges and Case Studies in Earth Sciences*** (Wyss and Peppoloni 2015) provides several well-known story-style cases, including the alleged negligence of scientists responsible for assessing risk associated with the 2009 L'Aquila earthquake; concerns about large-scale regulation of water bodies arising from the Three Gorges Dam in China; and concerns about the environmental and health risks associated with fracking.

The summary of relevant ethics case study collections above is representative, not exhaustive. The fact remains, however, that openly available problem-style case studies that specifically address the enduring and emerging ethical concerns of the geospatial field in general, and cartography in particular, are in short supply. I believe that more case studies are needed—especially considering the rapid evolution of geospatial technologies and methods. How this increase may be effected—and more generally, how practical ethics may become more prominent and better supported in university curricula and professional associations' offerings—is a possibility we'll consider in the next (last) section.

PART 4: CODA

In this concluding section, I suggest a few ways forward for practical ethics in cartography, and in the broader geospatial domain of which it is a central part. One is an assessment of the prevalence of explicit ethics (and related legal) instruction in geospatial education. Another is the possibility of an ethics-across-the-(geospatial)-curriculum initiative in higher education. Finally, I touch upon the potential benefits of the case method in geospatial artificial intelligence (GeoAI)—the fusion of AI techniques with geospatial data analytics.

ETHICS IN CARTOGRAPHY EDUCATION

Earlier we read **Mairéad de Róiste**'s call to action for "practical ethics in geospatial education" (2024, 18). Her advocacy resonates with me, as I'm sure it does with many other readers. Unfortunately, we still have a long way to go.

In the 1990 roundtable commentary in *CP*, Sona Karentz Andrews observed candidly that "The majority of information we [cartography teachers in higher education] impart to students . . . has little to do with ethics" (8). Harley (1991) questioned her statement at the time, but not on the grounds that ethical issues were or were not discussed explicitly. Instead, his point was that many of the topics discussed in cartography classrooms have important social, political, and ethical implications, whether they are discussed explicitly or not.

I don't know if today's cartography educators (or geospatial educators, for that matter) discuss ethical issues explicitly any more than their predecessors did 35 years ago. Probably no one does know. A survey of geospatial educators would be a useful research project. As an example, Anthony Robinson and I **presented an assessment** of the ethics content of 13 "Spatial," "Geospatial," and "Geographic" Data Science master's degree programs at the 2022 AutoCarto conference.

We do know something about the prevalence of explicit ethics instruction within Penn State's Online Geospatial Education programs. As part of his master's thesis research, graduate student researcher Robert Myers (2025) performed textual analyses of the syllabi of all 32 online geospatial courses offered by Penn State (not including the ethics workshop or the graduate seminar GEOG 581: Spatial Data Science Ethics), as well as the open-access course texts available for a subset of 18 online courses. Myers wrote scripts to search the syllabi and texts for the keywords "dishonest," "dishonesty," "ethical," "ethics," "honestly," "honesty," "immoral," "immorality," "moral,"

"morality," "morally," and "unethical". He found that just twelve course syllabi and/or texts included one or more ethics keywords, and only five courses exhibited more than ten keywords. Notwithstanding the Penn State Online Geospatial Programs' claim at its **"Ethics Expectations" web page** that "our program promotes ethics across the curriculum," Myers concludes that there are gaps in the incorporation of ethics in Penn State's online geospatial curricula. Considering the preliminary assessment of 13 masters programs noted above, it seems likely that such gaps are common.

Beyond Penn State, I have some colloquial evidence that more than a few educators use the case studies collected at GISEthics.org. Google Analytics reports that the site received 3,528 page views by 1,924 users from October 1, 2022, through January 6, 2024. Viewers were concentrated in the US, which accounted for 3,045 views (86%) during that period. There were 103 views were associated with IP addresses in the UK; the remaining long tail of 380 views were from 56 other countries. Unfortunately, views of the cases themselves—which are PDF files linked from the main HTML page—were not counted.

From time to time, I receive inquiries from educators who request supplementary information about one or more of the cases at GISEthics.org. Some mention how they use the cases in their teaching. For example, a college educator in Wisconsin wrote, "I'm interested in using the Proprietary Software in an Emergency Case Study to walk my students through a conversation and exploration of GIS Ethics, and this particular case study ties in with what we were discussing last week." Another, in Virginia, said, "I will break them into small groups and have them work through a case study and as a group, decide what the appropriate resolution is and why. One week later, the groups will all present their case studies." And a master's candidate at the University of the Witwatersrand, South Africa, reported that "I am tutoring third year GIS and Remote Sensing students. . . . The students have an exercise on identifying the ethical problems and ways in which these can be addressed using the different South African GIS Professional legislation and acts."

GISEthics.org grew out of a National Science Foundation-funded project (Award # 0734903) called "Collaborative Research: Graduate Ethics Education for Future Geospatial Technology Professionals." Dawn Wright, Francis Harvey, and I were co-PIs. Three specialists in ethics education—philosopher Michael Davis (noted above), social psychologist Chuck Huff (St. Olaf College), and educational psychologist Matthew Keefer (University of Southern Illinois) served as collaborators. At its inception in 2007, the project aimed to produce "model curricula" for graduate ethics seminars at Penn State, Oregon State University, and the University of Minnesota. By its official conclusion in 2009 the main deliverable turned out to be problem-style case studies.

Graduate students in Penn State's required ethics workshop seem to agree that formal ethics instruction is a worthy component of their curricula. Of 42 students, 20 strongly agreed, 21 more agreed, and just 1 disagreed with the summative statement "This workshop was worthwhile" that I posed at the end of the three workshops conducted in 2023. I also asked students to explain their opinions. At the end of one of the 2023 workshops, one student wrote "The final ethics paper [the case study analysis exercise using Davis's Seven-step Guide] introduced me to a new way of thinking through ethical problems and gave a variety of scenarios to choose from. I will take what I learned in this workshop with me in future endeavors." Another observed, "Ethics is a complicated topic, and there might not always be a perfect answer, but background knowledge of ethical practices should be a must have." As if anticipating the conclusion of this article, a third student suggested "It would be interesting to integrate these ethical questions into other classes as well, and not just forget about them now that the workshop is over." The possibility of integrating ethical problems into other geospatial classes leads us to the "holy grail" of ethics education: ethics across the curriculum.

ETHICS ACROSS THE (CARTOGRAPHY) CURRICULUM

Michael Davis (2004) identifies five kinds of ethics across the curriculum: (1) *morality* across the curriculum; (2) *moral theory* across the curriculum; (3) *social ethics* across the curriculum; (4) ethics *from* across the curriculum; and (5) *professional* ethics across the curriculum. Here, and in my teaching, I focus on professional ethics. As discussed earlier, Davis defines professional ethics as the "special standards" that are incumbent upon members of a profession. (Whether cartography is or is not a profession is beside the point here. Cartography is at least an affinity group whose members certainly are concerned with standards of practice above and beyond what's expected of

non-cartographers—that's something all the contributions to this special issue have in common.) "Professional ethics across the cartography curriculum" means explicit attention to moral (and legal, ideally) implications of cartographic data, methods, technologies and products in every course that leads to an undergraduate or graduate degree in cartography or a cartography-related discipline. Or that every degree program includes an entire required course that focuses on ethical issues. Either way, that's a big ask.

Let's assume for the sake of discussion that every cartography educator is aware that ethical and legal issues are germane to their subject. Let's assume further that every cartography educator is willing, in principle, to include explicit consideration of relevant ethical issues in their courses. So, what's the hold up? Davis (2006, 717) observes that "the most common reason science and engineering faculty give for not including 'ethics' . . . in their technical classes is that 'there is no room.'" Davis developed a strategy he calls "micro-insertions" to address this concern. Micro-insertions "put ethics into technical courses without substantial change in the course and in a way students appreciate" (717). His 2006 article includes examples from thermodynamics and calculus, where Davis and colleagues at the Center for the Study of Ethics in the Professions consulted with educators in technical courses to integrate ethics into existing problems students encounter in the courses. Familiar examples of micro-insertions to which readers of this paper may relate include the geopolitical implications of Peters's equal-area map projection (within a discussion of projections), the potential for mixed messages in choropleth maps (in discussions of data classification and symbolization), and Donald Trump's infamous Sharpie intervention.

Whether used for guided discussion, individual analysis, or even student teams competing in "ethics bowls" that are popular in some disciplines, case studies are tailor-made for micro-insertions. As Davis (2006) writes, "Ethics need not be an add-on; it can work like an alloy, adding strength to the course without adding volume" (724). The story-style cases featured in this special issue, as well as the problem-style cases published at GISEthics.org, have the potential to sharpen and deepen discussions of ethics in cartography and other geospatial courses in higher education. Authoring more actionable case studies should therefore be a priority for ethics-across-the-cartography-curriculum advocates within and beyond academia. Other case study projects, notably "Ethics Unwrapped" at the University of Texas' McCombs School of Business, provide inspiring examples of how open educational resources can support ethics-across-the-curriculum initiatives in many disciplines.

Is there evidence that cartography educators, or geospatial educators more generally, are eager to infuse ethical implications into their teaching? Robert Myers (2025) explored this question by repeating his keyword search on the 244 entries that comprised the ***GIS&T Body of Knowledge*** at the time of his research. He found that only 15% (37 entries) included his ethics-related keywords. Five of those entries pertain to the "Cartography and Visualization" knowledge area (the "Big Data Visualization," "Cartography and Power," "Cartography and Science," "Collaborative Cartography," and "Statistical Mapping" entries). As of this writing, the "Cartography and Visualization" knowledge area currently includes 36 entries organized into six subtopics. Say what you will about the motives and legitimacy of the *Body of Knowledge* project; it remains the closest thing we have to a definitive, community-driven summation of the content of the geospatial domain. What does it say about cartography that, in this post-Harley age, only 5 of 36 Cartography and Visualization entries (14%) mention ethics-related keywords? Certainly, the count would be different if more search terms were included. "Privacy," for example, would surely produce more hits. Still, it's hard to escape the conclusion that ethics remains a peripheral issue for most of the cartography (and geospatial) educators and researchers who write entries for the *Body of Knowledge*. Sona Karentz Andrews's observation that "the majority of information we impart to [cartography] students . . . has little to do with ethics" (1990, 8) may be as accurate today as it was thirty-five years ago.

ENGAGEMENT WITH GEOAI ETHICS

If there was ever to be an issue that could bring ethics to the forefront of cartography education, it may be geospatial artificial intelligence.

Anthony Robinson and colleagues (2023) report that "Ethical Issues and Societal Implications" emerged as one of three research themes from discussions among thirty-five cartographers at an international workshop on Cartography and AI. In a separate content analysis and narrative synthesis of research studies integrating GeoAI and cartography, conducted in order to summarize current research and development trends, Kang, Gao and Roth

(2024) identify "five potential ethical challenges that need to be addressed in the integration of GeoAI for cartography: commodification, responsibility, privacy, bias, and (together) transparency, explainability, and provenance" (1).

In addition to research, related GeoAI development efforts are also underway. In 2023, the members of the GeoMachina project **announced on Twitter**:

> In a 2019 article, we speculated about a potential GeoAI moonshot to develop an autonomous GIS analyst that can perform simple spatial data science tasks entirely by itself . . . developing autonomous GI bots is not without risks, and the increasing tendency to connect ChatGPT-like systems to IoT devices is worrying. We believe the best next step for our spatial data science and GeoAI communities is to develop a benchmark and competition series that supports experiments and fruitful competition around developing autonomous GIS bots while at the same time being guided by strong ethical guidelines.

Following that announcement, GeoMachina collaborator Song Gao **invited chapter proposals** for a forthcoming open access book entitled *Geography According to ChatGPT*. The book's tentative subtitle speaks to the editors' aims: *Mutual Insights: Extracting Geographic Insights from Foundation Models while Refining their Representations of the World*. Pointing out that "biases in foundation models have a clear geo-spatial footprint (e.g., merely 3% of training data for images come from China and India combined)," the editors ask, "how can we learn from foundation models and what can we contribute in return to further improve these models"?[2]

Among the possible topics in consideration for *Geography According to ChatGPT* are "ethical concerns of using geographic foundation models," including biases, trust, philosophical foundations, and benchmarking. Mindful of the observation that "philosophical principles cannot be applied in any straightforward way to particular problems and policies" (Thompson 2007), I believe that practical ethics—specifically, a broad spectrum of ethics case studies and corresponding exemplary analyses of the problems they pose—must be included in the training sets employed for geographic foundation models. This need seems especially crucial for the models on which "autonomous GIS bots," such as those envisioned by the GeoMachina team, may be built.

To help build an ethical GeoAI, I believe a broad-based effort to assemble and publish actionable case studies that deal with ethical and associated legal and policy issues is needed. Such an effort should involve collaboration between educators and practitioners, as discussed in the section "Transforming 'Stories' about Geospatial Ethics into 'Problems'" above. AI itself may also help. In a 2024 instance of my seminar on Spatial Data Science Ethics, Penn State student Brian Eakin showed how ChatGPT can be trained to help generate new ethics case study scenarios. Problem-style cases, along with exemplary case analyses, seem likely to be effective vehicles to infuse ethical and legal reasoning in foundational model training sets. The same might be said for the education of current and aspiring geospatial professionals: their "training sets" should likewise include geospatial ethics, law and policy—a formidable challenge for educators to whom GeoAI may offer some help.

CLOSING

Is there a critical mass of concern that might justify the effort to realize the ideal of ethics across cartography (and broader geospatial) curricula? Despite the discouraging metrics discussed above, I remain hopeful. I know from long, firsthand experience that many students respond enthusiastically to ethics instruction (though some are skeptical at first). This special issue of *Cartographic Perspectives* demonstrates that practitioners in industry, government, and academia are eager to share their ethical concerns. And it's plain to see that GeoAI is amplifying concerns about social and personal impacts of geospatial technologies, data, and methods. If there was ever a time to prioritize ethics, it's now. So what can geospatial educators do to help humans—and perhaps AI models—learn to respond to ethical challenges with greater insight, empathy, and integrity? I close with few practical ideas in Table 4.

2. The White House's 2023 "Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence" (#14110) defines a foundation model as "an AI model that is trained on broad data; generally uses self-supervision; contains at least tens of billions of parameters; [and] is applicable across a wide range of contexts." ChatGPT is built upon several models, including the GPT-3.5 and GPT-4 families of foundation models.

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1. Survey ethical concerns of geospatial practitioners in industry, government, and academia.
2. Survey geospatial educators about the extent to which their students engage with ethical and legal topics and cases in their coursework, and their willingness to do more.
3. Identify and develop problem-based ethics case studies—perhaps in collaboration with large language models—that are relevant to the wide range of topics included in the *GIS&T Body of Knowledge*, or to particular curricula.
4. Assemble a corresponding collection of exemplary case study analyses (solutions).
5. Identify key topics in geospatial law and policy—and their relationships to ethical concerns—that should be included in geospatial education.
6. Organize teams to collaborate with GeoAI research and development initiatives.

Table 4. Some possibilities for advancing geospatial ethics.

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PEER-REVIEWED ARTICLE

Elements of Trust in Maps

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INTRODUCTION

The topic of trust in maps is increasingly relevant in a time where misinformation is abundant and scholarly critiques of maps' objectivity and truthfulness continue to evolve. This relevance is evidenced by a growing body of research evaluating methods that can be utilized to study trust in maps (e.g., Prestby 2024), and how different design factors interact with individuals' cultural and psychological factors to influence their trust in maps (e.g., Gartner et al. 2024; Christen et al. 2021; Ly 2024), While these studies are important, they fail to interrogate trust in maps at its most fundamental level. What separates trust in maps from trust in media, trust in people, etc.? What similarities does trust in maps have to trust in other objects? Are maps inherently trustworthy, and if so, what are the elements that make them so? These foundational questions are essential to guiding a more cohesive and robust research focus on trust in maps.

Despite the many claims that maps are an especially trustworthy information medium (e.g., Boggs 1947; Kent 2017; Flanagin and Metzger 2008), only a single empirical study has compared trust in maps with trust in other information mediums. Accordingly, Meier (2017) found that news stories featuring maps were perceived as more credible than those with other visualizations or only text, but these differences were not statistically significant. Other evidence suggests that visualizations are more trusted as a way of transmitting information than other means such as narrative text or photography (Tal and Wansink 2016). Still, research assessing people's trust in maps versus other mediums is limited. Moreover, it is not clear *how* trust varies across national and cultural lines in the global field of cartography.

We want to interrogate the claim that "people trust maps," or rather try to provide tools for that interrogation, in two dimensions. First, we want to break up the broad claim into pieces: What specifically do "people trust" about maps? Presumably it is not an absolute, un-nuanced trust. The literature on trust generally treats it in terms of overall quantity: in virtually every study we looked at, trust and trustworthiness in any given relationship is evaluated as a sum total, rather than as unevenly weighted depending on the aspect of the relationship being considered. Lewicki et al. (1998) identify this tendency in management studies and suggest it as a weakness, and O'Neill (2018) alludes to it but mostly focuses on "intelligent" application of differential trust. But when it comes to foundational studies in other trust fields (like psychology and sociology) the notion of partial or circumstantial trust does not seem to have been widely taken up or deeply analyzed. This is surprising because partiality seems to be a fundamental aspect of trust—we trust this person to repay a loan but not to be a good driver, or that person to take care of our kids but not to correctly diagnose the pain in our gut. An analogous example for maps would be trusting Google Maps to show us the quickest route but not necessarily the most scenic or enjoyable route to drive on. And so we will attempt to outline how this segregation or siloing of trust applies to how people trust maps.

Second, we want to examine the differences between trust and trustworthiness—between efforts to make a map or map producer more *trustworthy* on one hand and more *trusted* on the other. The implications of the difference between these two ideas reach into the ways trust is established and confirmed, and end up, we believe, uncovering some profound ways of addressing map quality and discussions about it. As a fact-grounded field, we tend to generally want trust on the basis of systematic, objectively judgeable criteria, the same sort of criteria that we center in assembling information on maps. Indeed, Fairbairn et

al. (2021) acknowledge that maps fulfill a variety of functions, the most important of which is communicating spatial information. Such information is based on symbolic relations and observable reality that can be perceived as facts. More heuristic judgment *is* also part of the mix, and we know this and "dress" our maps in "clothing"—both in terms of "mappy" style and including elements that indicate "real maps" to the general public—that will signal trustworthiness in a kind of shorthand to users. For example, the presence of a scale and north arrow may be an instant signal of a "good" map to some users (whether or not they are actually appropriate to the projection being used), but examination as to whether north orientation or scale are *accurate* takes more detailed systematic analysis. We think it is important to reconcile these two kinds of information that get included in maps, especially in a world where the construction of factuality has itself become a political subject up for debate.

It needs to be said up front: "trust" is an emotionally loaded term. It is a basis of every contract and treaty, every loving relationship, and practically every human drama ever written. Trust is arguably *the* human social linchpin, and as such, no paper should be trusted to be bias-free in discussing it, including this one.

It also should be noted that the underlying issues of what maps are and how they function in society are contested. The field of critical cartography has been wrestling with how to address the fundamental nature of maps for decades now. For the purposes of this paper, we wish to sidestep this discussion, and address the cognitive center of the field. Most maps in the public sphere (and thus the cartographers who make them) assert the idea that they represent factual and measurable phenomena in a geographic space (Fairbairn et al. 2021). Are there maps and discussions about maps that challenge this assertion? Yes. But we here assert that there remains a practical core that the broad statement "people trust maps" depends upon. We want to look at that core in itself, not to address its legitimacy, but to elucidate its structure. This is not meant to argue against that questioning of legitimacy, but to provide grounds for discussing the structure of map truth within the context of the idea of factuality.

Our research into trust has leaned heavily on studies in a variety of fields. Broad social science approaches (psychology and sociology) have helped us frame the discussion, but we have also been informed by the robust discourses within media and journalism studies, information sciences, organizational management, and marketing studies. As a strongly intersectional field, cartography can learn a lot by looking over the shoulder of near-neighbor fields that deal in communication, factuality of information, and data organization, and we use numerous examples from studies of trust in such fields in this paper.

We think that it is especially important to study trust in the field of cartography at the present time as the democratization of mapmaking (Sieber et al. 2016) and the new proliferation of generative artificial intelligence (Kang et al. 2023) have introduced community-, user-, and machine-generated content into the mix of maps that are consumed broadly. Consequently, neither we on the producer end nor those on the consumer end of the map world are entirely sure how to structure the basic trust we want to have in how we visualize geographic space. The social model of cartographic communication we have inherited, where much of that trust was grounded in persistent institutional sources of maps, is fragmenting, and we need a model that does not depend so much on those institutions.

The contributions of our paper are threefold. First, we link trust in maps to the rich discourse on trust in sibling social science disciplines. Cartography and geography are inherently interdisciplinary fields but they are also unique as they specialize in analyzing and generalizing spatial information. In carving out a research thrust on map trust, we expect that our ideas and findings will generate insights for related fields, and vice versa. Second, we outline ways that trust in maps is not binary, but rather fluid, with different elements playing a greater role depending on the situation. Third, we synthesize three key approaches for interrogating that trust: in terms of function, in terms of creator, and as a body of knowledge.

We organize the rest of the paper as follows: we begin by dissecting trust from the perspectives of related disciplines, paying particular attention to how trust has been conceptualized and its defining characteristics. Next, we explore three ways that trust in maps plays out. These include functional trust, trust in the mapmaker(s), and trust in the geographic body of knowledge. We then dive a bit deeper, bringing these perspectives together by interrogating trust in maps in terms of nuance and manipulation. We conclude by restating our contributions and offering avenues for future work.

THE IDEA OF TRUST AND ITS COMPONENTS

Trust is the subject of substantial subfields in sociology (Schilke et al. 2021), philosophy (McLeod 2023), economics (Glaeser et al. 2000), and psychology (Evans and Krueger 2009). Trust is also a central issue in more functionally organized fields like marketing (Raimondo 2000), media studies and journalism (Schudson 2022), political science (Levi and Stoker 2000), business management (Zenger and Folkman 2019), and education (Vodicka 2006). The literature is overwhelming enough that even broad studies in trust often end up only covering a subset of the overall discussion, but it is informative to dip one's toes in other fields' approaches, because the inherent biases and foci of each field tend to shape their discourse. For example, we found the **Trust Project** at Northwestern University's Kellogg School of Management a very approachable meeting place to explore a variety of views on the subject.

In the context of information science, a field adjacent to cartography, Kelton et al. (2008) propose a framework for discussing a variety of aspects of trust. Within "trustworthiness" they identify these further components, which we have chosen to use in this paper: competence, positive intentions, ethics, and predictability. That list has echoes in other literature: in the context of management, Zenger and Folkman (2019) identify positive relationships, good judgment/expertise, and consistency; and in educational leadership Vodicka (2006) identifies consistency, compassion, communication, and competency. In terms of e-commerce and financial services respectively, Gefen (2000) and Sekhon (2004) also conceptualize trustworthiness in terms of ability, benevolence, and integrity. The variety of terminology across areas of trust study can make precision difficult; we do what we can here, but we have needed to be flexible in considering parallel theoretical constructions.

Three of these components have clear analogues in how we think about cartography. Competence and expertise include skill with mapmaking tools, but also the ability to handle geodata with appropriate care for precision and accuracy, taking into account such issues as generalization, change over time, accuracy of positioning, and accurate place names. Consistency is also a basic quality, both within any given map and across sets of map products: consistent categorization and symbolization, and the assumption that any dataset will be as complete as possible within stated bounds (e.g., when showing US states, do not leave off Delaware) are so obvious that it is hard to find it named as an issue. And communication is so clearly what maps inherently *are* that it seems redundant to include them as a particular component of trust in maps.

Ethics is an area that has had less fundamental attention within cartography. This issue of *Cartographic Perspectives* and other work in professional forums is bringing fresh attention to it, but it has been taken for granted more than deemed irrelevant since it was first raised in the early 1990s, for example in the pages of this journal (McHaffie et al. 1990).

What Kelton et al. (2008) call "positive intentions" and Zenger and Folkman (2019) call "positive relationships"—referred to by others as "compassion" and "benevolence"—is harder to place in existing professional discourse. It does appear in literature about the complicity of maps in immoral or unethical systems (e.g., Kelso 1999) and approaches to mapping or not-mapping ethically (Holloway 2021), but in a sense ethics and intentions have become conflated in our discourse. That is to say, benevolence/malevolence has been conflated with how we conform to a moral code or system. But this conflation may be hard to avoid: In a summary of trust in philosophy, Goldberg (n.d.) says, "to trust someone to do something is to rely on them to do it and to do so out of a certain attitude towards the proposition that they will do it *for the right reasons* [emphasis added]."

Defining trust in the context of cartography is an entire paper in its own, but we can lean on a sibling discipline, media studies, to provide a definition of trust in maps. The explicit function of news is to selectively communicate information about the complex world, so readers can figure out where they stand in relation to others and adjust their perceptions of societal issues (Kohring and Matthes 2007). Cartography is not so different, as Usher argues: "Cartography, like journalism, is an exercise in the reduction of complexity and requires making choices about what matters and who counts" (2020, 251). Consequently, trust in maps and trust in news both entail relying on someone else to provide an accurate and truthful accounting of reality.

Kohring and Matthes (2007) define trust in news media as reliance on them to communicate information that will

guide actions and decisions in modern society. Hanitzsch et al. (2018) define trust as an individual's readiness to expose themselves to potential risks from news content, guided by the belief that the media will act in a competent and satisfactory way. These definitions parallel a definition of trust in maps that entails being willing to believe the information presented based on the expectation that the cartographer "has tried to communicate accurately and was capable of doing so to some adequate approximation" (McGranaghan 1999, 4).

ANTECEDENTS AND DIMENSIONS OF TRUST

In this section we review "antecedents": variables that precede and can be used to observe trust, and are also key dimensions of trust.

ANTECEDENTS

Trust has been broadly framed as generalized (e.g., "Are we a trusting society?") or particularized (e.g., "Do I trust you?"), notably by Putnam et al. (1993). More recently, Wollebæk et al. (2012) have added trust within smaller social groups in the middle of this framework. Considerable literature follows each of these. Kelton et al. (2008) propose a model of trust in digital information, arguing that the elements of competence, positive intentions, ethics, and predictability apply particularly to interpersonal trust—which in their usage means specifically directional trust (e.g., "I trust you") rather than mutual trust (e.g., "We trust each other"). For our discussion, generalized, group, and mutual trusts are not immediately relevant. We focus on the context of directional trust: what we are most concerned with is how much an individual "trusts maps."

Directional, interpersonal trust involves an individual called a "trustor" who willingly assumes vulnerability in depending on a "trustee" (something or someone else believed to act positively on behalf of the trustor; Gefen 2000; Kelton et al. 2008; Sekhon 2004). Trust is not just a proposition: in order to be *trust*, and not *trustworthiness*, it needs to be acted upon and future-oriented (Fawzi et al. 2021). A trustor's evaluation of trustworthiness precedes and informs the act of trust. For instance, if someone perceives a map to have a high level of trustworthiness, they are more likely to trust it. In other words, trustworthiness is one of the antecedents (predictors) to trust.

Another antecedent of trust is *credibility*. Credibility is often used interchangeably with trust in cartographic, information visualization, and media literature, but the two concepts are distinct. Credibility is akin to perceived believability whereas trust is akin to willing dependence. A key distinction between credibility and trust is that both are judgments, but credibility is evaluative in nature while trust is predictive (van Dalen 2019). Namely, trust is oriented to the future, as it hinges on expectations about future behaviors/outcomes. Credibility is narrower as it "concerns a specific evaluation of media content . . . at a given point in time" (Fawzi et al. 2021, 156). In sum, credibility is a facet of trust that is primarily concerned with believability (van Dalen 2019). Most researchers believe that credibility judgments likely precede trust and help a trustor determine how much to depend on a trustee.

DIMENSIONS OF TRUST

While definitions and conceptualizations of trust vary widely within and across disciplines, there is a growing consensus that trust in itself consists of three major dimensions: cognitive, affective, and behavioral (Lewis and Weigert 1985). Each of these dimensions interact with one another and together influence the degree of trust. Cognitive trust is inherently rational and evidence-based: trustworthiness in this dimension is determined based on prior knowledge and familiarity with the trustee. Put another way, cognitive trust boils down to whether we have good reasons to trust someone/something. At a certain point, though, people go beyond this knowledge-based, rational justification of trust and turn to affective (i.e., emotional) and behavioral dimensions (Lewis and Weigert 1985).

Affective trust concerns the emotional bonds formed between the trustor and the trustee (McAllister 1995). While originally conceptualized to characterize interpersonal relationships, affective trust has been remapped to capture the exchange between individuals and digital information (Huang et al. 2022; Kim and Sundar 2016; Soh et al. 2009). Accordingly, affective trust may be akin to likability and emotional security in terms of dependability and faith.

How much the basis of trust is weighted towards affective or cognitive dimensions may depend on the type of

information processing used. A much-used model posits that people process thought in two major ways. Chaiken (1980) describes information processing as "systematic" or "heuristic," echoing Wason and Evans (1974), and this has been in turn echoed by Stanovich and West's work (2000), often summed up as "slow and fast thinking." Systematic processing is effortful and cognitively demanding, whereas heuristic processing relies on simple decision rules (mental shortcuts) to quickly assess information. When something is being scrutinized systematically (as trust itself is in this paper), trust is more likely to be based on the cognitive dimension (Kim and Sundar 2016). Conversely, trust informed by heuristic processing is more likely to be affective in nature.

The final dimension of trust, behavioral, embodies this fundamental fact: trust carries inherent risk. Behavioral trust refers to the trustor accepting vulnerability to the trustee based on the expectation that the latter will act in the former's best interests (Lewis and Weigert 1985). Behavioral trust can both inform and be informed by cognitive and affective trust. Limited evidence suggests that behavioral trust is more linked to affective trust and is more a product of heuristic processing (Kim and Sundar 2016), which implies that most acts of trust must go through a heuristic phase—that we can't easily avoid the affective dimension.

So what do these dimensions tell us about maps? For one thing, trust is more irrational and emotional than not (McAllister 1995). So, an individual's personal beliefs about topics and sources, and their reactions to mapped content, may play a greater role than whether a map is accurate or transparent. Additionally, this research tells us that trust is multifaceted and that we need to consider it holistically when studying maps.

Trust is a pervasive feature of human relationships. It constitutes a social lubricant for all kinds of transactions. While it is ubiquitous, trust cannot be taken for granted: gaining, retaining, and losing trust are ongoing factors in any social relationship. Trustors inherently make themselves and their resources vulnerable to exploitation by trustees. The decision to trust others is typically conceptualized as an interplay of the institutional or social setting—capturing the incentives and constraints that individuals face—and individual factors such as prior beliefs and preferences. We reason here that individual trust behavior is embedded in a constant flux of social interactions that can lead to positive and negative experiences that affect trust in general and in particular. As emphasized in Akerlof (1983), such personal experiences are often powerful and particularly meaningful events to individuals, with the consequence that when "people go through experiences, frequently their loyalties, or their values, change" (Akerlof 1983, 54). Indeed, evidence presented by Alesina and La Ferrara (2002) suggests that prior (traumatic) experiences and belonging to groups that (historically) have been discriminated against are negatively associated with trust. So, an individual's trust in a particular map or type of map doesn't happen in a rational vacuum: it is likely to be based on former positive or negative experiences and understandings of their wider social context.

We also wonder about the relationship between information intended to be used in systematic evaluation (like scale, projection information, metadata, etc.) and how it itself can then be used as a heuristic marker rather than for actual systematic analysis. The same information can be (and presumably is) evaluated both ways: "A good map has a scale" triggers a fast heuristic evaluation as a marker, while "Does this map have a constant scale and is this scale actually accurate?" triggers a more involved systematic evaluation. How does that duality affect the status of that information, and how can awareness of it guide mapmaking?

To sum up, we can see antecedents to trust in trustworthiness and credibility, and dimensions in trust against which those antecedents are judged: they are evaluated in systematic, codifiable ways; through heuristic, less rational ways; and then in the act of trusting itself: we test our trust constantly as we see its results. It seems clear to us that behavioral trust is where nuance and variety in trust would develop, being iteratively shaped by our experience as we engage in trusting (or suspicious) behavior.

WHO/WHAT ARE WE TRUSTING?

Using these multiple ways of dividing up the antecedents to trust and its basic components, we now want to look specifically at how trust and trustworthiness play out in the mapping field. We see three ways of answering the question, "When someone trusts a map, what or whom exactly are they trusting?" Functional trust, trust

in the mapmaker, and trust in the body of knowledge that led to the map are how we frame these channels of trust. We remain focused on directional rather than mutual, group, or generalized trust, but while the model of a trustor remains constant, the nature of the trustee varies as we proceed.

TRUST IN MAP FUNCTION

Cartographic literature like that written by Robinson (1952) in the "positivist era" of cartographic discourse after World War II focused on task-based functionality: a "good" map is spatially accurate, clear and transparent in symbology, current, and properly generalized to the scale. In other words, the map is subject to systemic evaluation. Map function includes the obvious categories emphasized in that era, of navigation, territorial/property definition, and generally understanding the structure of geographic-scale phenomena. But function can also include intentionally affective results like pleasing décor, effective persuasion (changing minds) and reinforcement of established social order (cementing minds).

In this functional register, the judgment that leads to trust is based on the question, "Does this map do what it should?" As examples: "Does this map show currently open roads so I can get to my lunch appointment?" or "Will this map show me the best place to drill for oil" or "Does this map accurately show the floodplain so my house won't be washed downstream?" When we measure trust in this register, we are measuring people's actual and predicted experience with such function—map use, in other words—or reported experience of (trusted) others. We are measuring systematic and behavioral trust in tandem.

When we bring in the idea of aesthetic function, things become less clear. On one hand aesthetic design is the basis of the clarity component of trust, and design is a basic component of map quality (Wallace and Huffman 2012). A study by Lin and Thornton (2021) shows that when visualizations that included maps were perceived as more beautiful, they were also more trusted. Aesthetic quality was taken as a marker of the mapmaker's competence, and therefore greater trustworthiness. On the other hand, aesthetics are also the basis of décor, or a map's fit within the overall design of a publication. So, while aesthetic function includes support of systemically evaluated functionality, it also supports more heuristic judgments of taste and visual fit. This separability of appeal from function is, as we have discussed, one of the two main ways we come to trust something, but it is not necessarily only a "quick" decision: aesthetic appeal has a lot of depth and force to it. In other fields, for example music, where aesthetic taste is by far the largest judgment point, we can see how "authenticity" or "credibility" itself can become entirely separate from practical function and can become a point of style that's deeply embedded in musical identity (Barker and Taylor 2007). While the relation of a devoted fan to a particular artist can be seen as emotionally analogous to trust, we do not believe it is the same thing we are talking about in trust in maps. However, it is worth noting that aesthetic qualities do have a function—an operation—which can be as persuasive as systemically-evaluable qualities.

When we come to functions of persuasion and reinforcement, this basic user-centered judgment breaks down more completely: here the function—what the map is supposed to do—is not a matter of a user acting on the world, but of the map acting upon the user(s): if a map changes or reinforces minds, that will be as the *result* of users trust in the map, not the basis of it. Propaganda maps are most effective when their audience views them without the critical lens of who created them and why, while those that create them are more likely to spend time considering how to manipulate and selectively frame their data to make their point.

This is true even of benign communications: maps often have narrative directions that are simply part of storytelling, not an intent to subvert public opinion away from truth. As Harley (1989) and Wood and Fels (1992) point out, all maps have a point of view and an agenda, even those whose agenda is to keep hikers from falling off of cliffs. One of their points was to bring the question of benevolence back into the picture, to disrupt an assumption that maps as commodified containers of information are immune from questions of trust and ethics, and they did so in part by pointing out this fact: that maps are both operated by end users, and operate upon them.

TRUST IN THE MAP MAKER(S)

The last section demonstrated that "function" itself is not only about end-user (trustor) operability isolated from relationship to the map source, but also includes functions that necessarily include that source trustee. In these cases the success of the map is as much about "how can this map benefit the user?" as "how can this map intentionally

influence that end user?" Evaluating trustworthiness in this situation from an end-user perspective *does* include those dangling aspects of trust: ethics and benevolence.

"Intentional influence" is not necessarily as sinister as it may sound. Most things made for sale in the marketplace (or even freely offered in the "marketplace of ideas") will have an aspect of "appeal," whether solely on apparent merits or based on content designed to attract users' attention. Our main point here is that there is a social relationship that comes into play in evaluating trust, even when there is no direct apparent social connection between map user and mapmaker. Such relationships, especially in maps that are distributed through publication or broadcast to a mass audience, are likely to be signaled heuristically.

People are "cognitive misers" that prefer to take the path of least resistance when processing information (Chaiken 1980). Namely, people will decide whether to trust something based on whether the source is familiar, authoritative, and/or endorsed (Metzger and Flanagin 2013). Source has traditionally been the primary way that people assess the trustworthiness of information, broadly (Sundar and Shyam 2008), and specifically with maps (Flanagin and Metzger 2008). Indeed, a review of empirical research on trust in maps highlighted that people view a map's source as a key indicator of its trustworthiness (Prestby 2023). Source may play an even greater role in affecting trust in maps since most widely circulated maps have historically been produced by a handful of "expert" gatekeeping organizations who could (in theory) be trusted due to adherence to strict information quality standards (Flanagin and Metzger 2008).

The field of cartography tends towards a culture of relative individual anonymity and corporate authorship. By contrast, other content-production fields such as motion pictures commonly have "top billing" for directors and actors, and long credit rolls. Books tend to have strong authorship, but little credit for contributors like copy editors and book layout artists. In newspapers, reported stories with bylines are normal now but their presence has been variable. In the early twentieth century, *New York Times* publisher Adolph Ochs avoided bylines as a policy, saying, "the business of the paper must be absolutely impersonal" (Shafer 2012). And between these two models of centered and uncentered authorship, maps of the last century have tended towards uncentered authorship. Data sources for maps are often less transparent, though recent practices like Creative Commons licenses have nudged many of us towards greater data source transparency. The result of these common practices is that for end users, "trusting the source" is more about publishing institutions and other corporate groups than the voice of individual cartographers.

Complicating matters, source information or even indirect cues are not clear or may be entirely absent in much social media and user-generated content. For instance, maps shared on social media tend to be screenshots of maps made by other traditional sources (government, news organizations, etc.; Lisnic et al. 2023). Information about who made the map, where the data came from, etc. can be lost in this process. In other cases, there may be multiple source cues, so it is challenging to determine which is the true source. For example, a map created by a government agency may be reposted by a politician and then forwarded to you by a friend. In this case the true source is the agency, but people may perceive the friend as the source since it is the most surface-level entity (Henke et al. 2020).

So how then do people come to have a "relationship" with a map source they often cannot identify? We point to lessons from researchers studying trust in marketing, which as a field is in a sense about nothing *but* manipulation of trust—what most marketing boils down to is how to get consumers to trust your brand over other brands (Chaudhuri and Holbrook 2001). It is worth considering that it is actually most common for consumer products to operate without identifiable authorship. In many fields, to *have* such an authorship relationship is a mark of high-end "designer" or "artisanal" products. It is largely in content-based products that we take for granted the normality of authorship as part of marketing. However, when we look at branded *services* (as opposed to off-the-shelf products), positive branding is more about personal relationships and personal identity, including the sense of trust in reliability and quality (Hess and Story 2005). Consider the ubiquity of ads in the service sector saying, in essence, "we are here for you" or showing providers interacting with happy customers, as opposed to ads for products promoting how well the products function or how they will enhance the lives of users. It is worth noting that while maps themselves are mostly business-to-consumer products, many cartographers work in a business-to-business service model, within which relationship-based differentiation is the basis of their brand, so both kinds of relationship are prevalent in the field.

We identify maps *as products* then by their quality and consistency. And we identify *sources* of these maps in large part through their branding. How are maps "branded"? Explicit branding by publishers and online providers is one piece of the puzzle, but as Gartner et al. (2023) point out using national topographic map series as an example, the look and feel of non-commercial products can operate the same as named branding and can affect trust in maps. Look and feel can also become cultural norms for particular map use cases. Geological, air navigation, and orienteering maps each have a specific family of symbology: producer branding then is a subset of how we come to recognize a map we will provisionally (heuristically) trust as being the right sort of map for our purpose.

So it behooves us to consider the balance between trust based on evidence and sound social networks, and trust that is a matter of pose and social signaling. On its own, "mapicity," the qualities of maps that make them identifiable as such, per Denil (2011), is not that far from "truthiness," in that it is about form and style rather than substance. This is a disturbing idea for those of us who have devoted careers to substance, and clearly there is substance to the subject matter of most maps, but when we discuss *trust* in those maps, we may be talking about something that ends up being less about substance than we might like.

This sense of style is a central part of what artificial intelligence has been able to do to date: it knows what things should look like and read like, and it imitates styles convincingly, without intelligently doing the underlying rational thinking. That it works as well as it does at this early development stage, including in some aspects of map work—for example the machine-learning-based Eduard relief shading software (Jenny 2022)—points to some profound rethinking of what we think our work as cartographers is mostly made up of: how much of what we do is restyling and rearranging information so it looks how we want, and how much is the deeper analytic and systematic work much of our self-image is grounded in? As of this publication, artificial intelligence programs have not been developed that convincingly remove the "hallucinations" from generated maps that quickly signal their untrustworthiness, but this does not mean that the challenge will not be met (and soon; Robinson et al. 2023).

The question of source benevolence can mask something we think forms a third answer to "Who am I trusting if I trust this map?" Map sources do not usually decide how to draw boundaries or name places. That information comes out of a common body of knowledge that mapmakers and users alike mostly trust as the underlying facts of geography.

TRUST IN THE BODY OF KNOWLEDGE

There are aspects of information in most maps we just do not suspect of intentional falseness or untrustworthiness, and so questions of map source benevolence are irrelevant. It is well established, for example, what the shape of Iowa is, or what the elevations of many of the Himalayas are. Even when there are boundary disputes or disagreement on place names, arguments are generally between claimants of sovereignty, or legitimate naming authority, not on whether the surveyed line or name is *incorrectly* placed. There are of course maps where data is hidden or altered for secrecy purposes, but it is understood that to be meaningful as a map, enough of the map has to correspond to the world it depicts for these secrets to be exceptions. There is a huge body of geographic data that grows more and more sophisticated by the year, and any cartographer can see clearly when they ask themselves what the original source of ground-truthing the data on the map is, that that data, or some key aspects of it, simply do not bear argument. Significant parts of most maps are like many reference works: they are not works of original research, but compendia of existing knowledge. People trust maps, we argue, like they trust a dictionary, an almanac, or a directory: the information may be out of date, or there may be errors, but a body of knowledge that is held in common by society as a whole forms an underlying foundation. *That* is a lot of what people trust about maps, the underlying body of knowledge.

The idea of a "body of knowledge" is also used in efforts like the *GIS&T Body of Knowledge*, which seems to be more about deriving a common ontology for interoperability of systems such as the work of the **Open Geospatial Consortium**. And when we refer to trust in underlying data, we are not talking about specific trust in geodata, as for example Lush et al. (2018) discuss. What we are talking about here is more like the vocabulary that underlies a dictionary, or the "**compendium of knowledge**" included in Wikipedia. Getting a sense of what this body looks like is hard because it does not have a single, clear criterion; the line between established and propositional geographic knowledge depends in large part on the

consumer, both in terms of personal knowledge, and because no knowledge is 100% non-controversial. Viewing statements of Wikipedia's scope may help give some shape to the idea of a body of common geoknowledge, for example Wikipedia's **Five Pillars**, that "Wikipedia is an online encyclopedia; Wikipedia has a neutral point of view; Wikipedia is free content; Wikipedians should interact in a respectful and civil manner; and Wikipedia does not have firm rules."

Although we stated at the beginning of this paper that we were focused on directional, interpersonal trust, the idea of a body of knowledge implies trust relationships that are more mutual or group-oriented, which may mean we need to reconsider how trust in maps might also be a matter of social trust among group peers rather than just trustors trusting a trustee.

Geographic knowledge is, however, only partly contained in amorphously governed common sense. Government agencies remain the largest and most authoritative repositories of basic geodata and place names, and they have policies and processes that govern how information is presented (Flanagin and Metzger 2008), often including formal codes of ethics. The line between "authoritative" and "common" knowledge is often blurred, as the example of indigenous geographic knowledge (discussed below) demonstrates: one of the aspects of governmental power, at least in the modern world, is that government policy over place names often becomes "what the place is called."

This knowledge, the part that is trusted, is analogous to commodified products, where differentiation between brands is more a matter of things like cost and convenience than meaningful functional difference: any gallon of gasoline or sack of white flour will work more or less as well as the next, while we tend to make stronger distinctions and pay attention to reviews when choosing hotels or entertainment. At some point, certain information on maps—the basic shapes of countries, the names of major cities—is not special or uncommon knowledge, and just as we trust that a gallon of gasoline will do what it needs to do, we trust that basic knowledge to be accurate, unless someone has made a careless error, in which case it is clearly the fault of the mapmaker, not our collective knowledge.

This line of trust is not as monolithic as the word "body" might imply. Reference maps generally have a higher percentage of body-of-knowledge content than thematic maps, but in both types of maps there will be disputes over facts that appear clear and "commonplace" to others. Where there are conflicting national claims, and especially where countries dictate what can and cannot be shown on maps in that country (e.g., China, India, and Pakistan), markers of national affiliation may affect how readers gauge the reliability of the resulting maps. All of which is to say, "common" does not equate to "universal" but exists within broader groups than we discuss when we refer to trust in map source.

Disputes over this body of knowledge can go very deep indeed, as we can see in other knowledge fields today. In American and European media, questions of political orientation affect how viewers trust news and analysis stories. For example, Ad Fontes Media's "**Media Bias Chart**" measures this in the context of political and ideological affiliation in the United States. To the extent that a media source is seen as being part of a worldview the reader agrees or disagrees with, it seems logical that that reader will tend to view a map produced by that source with a similar trust or distrust. Indeed, Peck et al. (2019) found that political ideology was a key factor affecting trust in visualizations for rural Pennsylvania residents. Participants were first asked to rate how useful a series of visualizations (two of which were maps) were. No information about who created the visualizations was provided. Then, researchers revealed who made the visualization and asked participants if they wanted to change their ratings. Around half of participants altered their trust perceptions of a visualization depending on the organization that created it. Many of the participants who did change their ratings were motivated by their political identity. For instance, a very liberal participant trusted government agencies but not a conservative news outlet. Conversely, a conservative participant did not trust government agencies. These results highlight that people may choose to trust or not trust something solely based on whether the source of information coincides with their general worldview.

A deeper challenge to the basic idea of collective acceptance of map information comes out of post-colonial counter-cartography. For example, indigenous land-claim arguments posit that a map may be precise in its representations, but the institutions that produced it exist in part to support the (colonial) government that disowned the indigenous population, and some of that "trusted" information (non-indigenous place names and colonially-imposed boundaries) is far from accepted (Turnbull and Watson

1993; Fields 2021). In this type of situation, the body of knowledge is not disputed as a body, but its fundamental "rightness" is shown to be cultural rather than natural, and competing sets of knowledge are presented as equivalent in value.

The depth of this line of critique has no practical end. One can, for example, cite something along the lines of the classical Vedanta idea of *māyā*, the illusory nature of reality. Muehlenhaus (2023), for example, has critiqued our idea of geographical reality on this basis, drawing from quantum theories of the perceptible universe as being made of information. Our point here is not to say that this trust is an inherently good idea or not, or that models of reality cannot be challenged. This study exists within the context of a more or less cohesive culture of cartography whose existence we find self-evident, and "trust in maps" as a subject exists within and around that culture, regardless of the ontological justifiability of that culture's legitimacy in a universal sense.

THE SHAPE OF TRUST: MANIPULATION AND NUANCE

Thus far, we have tried to provide a broad schematic outline of trust in maps. We want to close the arguments of the paper with two areas where we feel trust studies can help make clearer what is actually happening on a functional level when it comes to map trust.

MANIPULATION OF TRUST

We have earlier touched on the issue of trust not just being earned but being strategically generated. We want to focus on this issue with the framework we have developed. Some discussions of trust in other fields are just as much about getting people to trust you as they are about actually being worthy of that trust. Many popular press articles we looked at were about how to generate trust, with the assumption that trustees are already trustworthy. However, the tools they suggest are just as applicable to trustees who want to generate unjustified trust in order to deceive trustors.

While we value honesty and trustworthiness, we are also often fine with deceiving our competitors, or more precisely maintaining an information advantage over them. For example, the justification for the original degraded accuracy of GPS signals was a matter of advantage for the American military that had put the satellites in place. The decision to remove that selective availability of more accurate positioning was a matter of **invoking public need** over security. Some other national mapping agencies have deliberately put incorrect information on maps for the same reason; do we regard this as inherently wrong or expected in a world of competing security? In the commercial sphere, examples of proprietary information such as mining companies keeping information about discoveries of underground deposits from competitors make sense to us, whether we are part of that company or not: is that withholding of information deceptive? In a sense, yes, but in a way we would expect from a commercial venture in competition with others. Another example is that we do not expect police to make information about the movements of criminals public in the course of an investigation, thus tipping their hand. As long as a deception does not endanger the public, we accept that public statements meant to catch criminals as in a "sting" operation are acceptable.

Monmonier (2018) lays out a variety of deceptions that occur in maps, some of them outright "lies" and others more subtle misdirection, and his main thesis is that we should not assume that all maps are provided to us with wholly benevolent intent. Our point here is that benevolence is relationship-specific: the functional operability of a map should in theory be the same for an ally or an enemy with similar ability to implement it. Systematic evaluation should return the same results of quality. But as we have shown, trustworthiness is not just about mechanical function, and trust evaluation will then necessarily include benevolence, and will tend to suspect deception if the source is seen as malevolent to the user.

If this sounds familiar to readers of the news, it should. Accusations of hidden agendas and hidden malevolence are not new. Indeed, the phrase "The Media" itself (as opposed to "The Press") was invented by Richard Nixon's advisors to broadly discredit journalism as biased against him in the wake of the 1960 election (Schudson 2022). Recent developments have shown that even in the 2020s, entire knowledge fields can be widely held up as sources of disinformation on the basis of personal loyalty rather than systematic analysis. Certainly, history shows that this

relationship between the power of knowledge and social/political power is an inherently wobbly one at best.

We also think that historical examples are a good way to envision the intersection of partisan interest, factual knowledge, and the manipulability of trust. Schudson (2022), for example, examined American news media since the 1940s. He found that on one hand partisanship in media went from high in the post-War era to low in the era of national TV news dominance. News media have returned to stronger partisanship in the internet era, but with a change in the role of investigative and analytical reporting as opposed to "a spokesperson said" reporting that began in the Vietnam era. These are speculatively tied to the documented overall decline in "trust in news media" since then.

It would be worthwhile, we think, to take a similar look back at the changing nature of what mapmakers have delivered and what map users have expected. Have there been similar cultural shifts over the last century? A review, for example, of Monmonier's (2015) summing-up of twentieth-century cartography, sees some discussion of the growth of critical cartography in the last decade or so of the century, but less re-setting of expectations between consumer and producer. That is, he sees that the focus on reproducible factuality at the heart of the field has not seriously moved. On the other hand, digital mapping technologies have changed the role of the end user in shaping their experience: interactivity can involve altering the map itself rather than imagining scenarios upon or sketch on top of a printed map. The ability to pan infinitely, scale easily, and change layers of foreground and background, have made using maps a matter of user interaction much more than was true a quarter century ago. How does this change in the "normal" stance on the part of the user affect the relationship between trustor and trustee in the map world? To us, this is unclear, because map providers are still largely responsible for providing the factual products being used. It seems potentially analogous to the ways that the greater ubiquity of roleplaying games may be changing how textual and filmed fiction are perceived by their audience: the functional relationship between author and audience may not be as solid as many of us who grew up in the age of print and broadcast assume.

In 2025, the world faces a global phenomenon of intentional disinformation (deceit) engineered to produce downstream misinformation (unintentional adoption of false information; Szalai 2023). In our eyes, a big part of the urgency of this subject in our profession is not just to protect the context of "good mapping," but also to lend perspective to the broader knowledge fields. Disinformation and misinformation are real dangers to the common knowledge base humanity has available to it and have the potential to greatly manipulate trust (Rainie 2022). We believe that being intentional, building on these tools to characterize general trust in maps and specifically our own trust in maps and cartography, can help strengthen cartographers' ability to be both truthful and trustworthy in the face of deliberate deception.

The "positive intentions" or "benevolence" aspect of trust that we noted above is the core issue here, we think. Deceptions in the name of "our team" are broadly accepted, but this comes into direct conflict with the idea of a body of knowledge. The knowledge in question cannot be withheld or distorted, as it is held and confirmed by so many competing hands. But the institutions that package and create new iterations of that knowledge *can* be considered benevolent or malevolent. It is here we find ourselves in the midst of broader cultural arguments about the need for expertise on the one hand (Nichols 2017), and unjustified gatekeeping on the other (DeIuliis 2015). In this landscape, as contemporary politics shows, discourse often simply devolves into arguments about relative benevolence and malevolence.

THE NUANCE OF REAL-WORLD TRUST

We began the paper by holding up the claim that "people trust maps." The authors certainly "trust maps." But we do not trust all maps in every circumstance in every aspect. All trust is partial. That is, we do not trust all maps to do all things well: an orienteering map will not tell us much about hospital beds per capita; a bedrock geology map will not tell us about road construction. More generally, we tend to segregate what we trust different people for, *including* elements of personal trust. That is, we know that our friends and colleagues have strengths and weaknesses, and we use that knowledge to build on trust in others' strengths. As we said earlier, there is curiously little literature on how this nuance to personal trust develops over time, but it seems obvious to us that it does.

Perhaps it has to do with the ways the three kinds of trustees we describe—maps, map sources, and the body of knowledge—overlap and interact. It may make sense to

think of them using a cartographic metaphor of map layers. In a literal sense, you may for example entirely trust the political boundaries of a choropleth map, but mistrust some aspect of the data presented, or the motives of the presenter. As another example, you may accept that the base map of a metro area is neutral in terms of its social affiliation, but that the locators of "twelve convenient locations" of a business on top of that base have an unambiguous agenda.

This kind of nuanced trust parallels the kind of nuance in the overall loss of trust in the media: people may "trust the media" less than they used to, but some portion of that is our applying critical filters to the news more than our grandparents did. Just as we can learn to get useful information out of a hard-sell salesperson, or make up our own minds somewhere in the middle from a political debate, a kind of brass-nails critical view of maps may be masked by overall trust in the form. That is, because we easily learn in a practical sense how to use an imperfect map to get the information we need, and thus "trust" that map even though its content may not be perfectly current or accurate, we also learn to take for granted that certain kinds of mapped information will be biased.

As we separate the layers of a map into their differentially trustable components, it is worth paying attention to the difference between "trusting maps" and "trusting *a particular source* of maps," which is analogous to "trusting the media" and "trusting *this* news source." Consumers are generally aware of the source through which they receive maps (even if that source is "my friend who posts memes"), and will differentially trust or distrust those sources through experience. People *do* make broad statements about trusting or not trusting "the government" or "the media" or "religion" or any other mass category, but often these broad statements hide a more subtle fact that we still want governance, information, and cosmic context, and do trust some aspects and providers more than others. So when we hear people speak of "trusting maps," it is worth considering how this statement likely breaks down by provider—some map providers are probably more or less trustworthy in the interested public's minds.

We contend that our evaluation of whether—and how much and in what ways—we should trust a map will probably not be thorough. Maps can contain a lot of information of a lot of different kinds, and we will draw our evaluation of function based on the aspects we care about for our purposes. Likewise, we argue that many people are willing to overlook affiliative differences in source if they see the information they are deriving as part of the body of knowledge. So while "neutrality" is an iffy word, in effect there are "our" maps, "their" maps, and maps where we decide affiliation is irrelevant: the affiliation is a neutral part in our view of "with" and "against" regardless of whether the map affects a "neutral" or "objective" point of view.

Moreover, our evaluation will be based on sampling, based on our particular experience and knowledge: we will notice if this particular shape is wrong, and thereby become suspicious about other shapes. We will notice a misspelling, and wonder about spellings we do not know to be correct or not. This is the way particularized social trust is tested too: we do not fact check everything everyone says, but if a source we are otherwise inclined to trust says something that we know to be clearly wrong (or against our subjective sense of what is right), we become more alert for other false information (Schilke 2021).

Finally, our evaluation within a social network will include information from directly trusted sources, somewhat less trusted second-hand sources, even-less-trusted friends of friends of friends, and so on. Networked trust degrades as degrees of separation from personal experience increases (Richters and Peixoto 2011).

There is also a clear and (to us) odd conclusion to this: that map *distrust* is a component of a healthy relationship to maps and to all information. The example of twentieth-century American journalism tells us that nuance is also a kind of tension between trust and distrust, and in keeping at least one eye open for deceit *and* one eye trusting the body of knowledge as a basis for action, we can keep that tension in balance.

CONCLUSION

In this paper we have examined the claim that "people trust maps" and have used that as a catalyst for a deeper cartographic perspective on trust. Specifically, we introduced three key dimensions within which to understand trust in maps. First, the functional avenue pertains to whether the map does what we expect it to do. Second,

the creator avenue emphasizes how source factors into trust. Third, the body of knowledge avenue considers how much of what is shown on maps is a compendium of sorts with established geographic "truths." We also have connected cartographic ideas with the rich discourse of trust in social science, to broadly identify areas of overlap and to make a case for trust in maps having its own special characteristics. In looking at trust in cartography we offered the hope that these findings are applicable and informative to the broader discourse of trust in social science and related fields. Finally, we demonstrated that trust in maps is not a binary concept, as it is variable, evolving, and nuanced.

These three dimensions are supported by an analysis of factors common to trust studies across disciplines, one that outlines several predictors of trust. Trustworthiness, a cumulative value of the trustee's ability to sustain the weight of trust, is one of the fundamental antecedents to trust. But the trustee is not the only factor, and we hope our analysis opens up an understanding of trust as not just dependent on the map or its maker, but also the wider context map use exists within.

We believe that the three dimensions discussed in this paper provide an overall contextual framework for researchers in cartography and GIScience to better understand trust in maps. Our work also highlights the need for a linking of theory and empirical work, and to look at connections between cartography and related disciplines. Several disciplines such as sociology, psychology, etc., have extensively studied trust, and that work can be usefully leveraged. Our hope is that cartography and GIScience researchers can contribute to advancing theory across disciplines. Overall, our work attempts to take a broader look at trust in maps, which we hope will complement recent empirical works that have evaluated narrow, specific questions pertaining to trust and map design, methods, etc. Establishing a foundation by exploring elements of trust in maps ensures that the broader context of trust in maps is examined. In doing so, it helps researchers approach research on trust in maps with a more nuanced understanding that acknowledges the many dynamics of the topic.

THE FUTURE OF TRUST IN MAPS

One of the underlying bases of the geographical body of knowledge is that measurements and drawings of many features of the earth have been made again and again, over time. This article is intended as an initial survey of a topic that, as we have shown, has sources and analogues in many different other fields of inquiry. Any sense of certainty we have shown in our findings is our own. The basis of a firmer and more nuanced sense of how trust in maps works, and how to work with that trust as individuals and as a cartographic community, will be based on this work being repeated, argued with, modified, and maybe eventually replaced. Our hope is that this paper provides a starting point for that discussion. As we work in one of the knowledge fields, cartographers need to keep this repeated inquiry in mind as foundational to what and who we are, lest the idea of that body of knowledge become siloed and institutionalized to such a degree that it is no longer "common." *That*, we think, is a long-term recipe for growing distrust in maps.

At the same time, trust in the body of knowledge is dependent on the overall quality of that body of knowledge, and its permeability by misinformation and disinformation. It is notable that recently, the **Overture Maps Foundation's** project has sought to integrate open source and other public data within a controlled integration environment, and Meta's **Daylight project** seeks to take open-source OpenStreetMap data and filter out disinformation and misinformation to create a public-access but still proprietarily controlled dataset.

We also encourage more work in describing the relationship between heuristic markers of "mapicity" and the underlying knowledge that maps contain. How can we describe this relationship more clearly and in a way that points towards best practices for mapmaking? We feel this question has implications for the wider information and knowledge fields and their public-facing arms: When and how do we "mark" our work as being part of the wider body of knowledge? How can we keep those markers closely related to the actual quality of knowledge? How can we make ourselves and users aware of ways in which those markers can be used to give a "stamp of approval" to misinformation, without tainting the solidly-backed body of knowledge? We do not make any specific suggestions here, but we hope our community and the knowledge fields in general will spend more time thinking about this.

It is equally important to think about trust from the perspective of a practicing cartographer. Some questions to ask yourself are: How do you approach others' trust in your own work? How do you balance encouraging people

to trust your maps, vs. the desire to encourage healthy critique of your maps and other maps? How much do you or your organization "own" your maps, so there is a clear line of responsibility for trustworthiness? How do you personally, and your organization(s) corporately, view trust of your maps—as a kind of "sacred trust," as a marketing opportunity, or more likely a combination of both? How does that balance work? And how does your map relate to the overall body of maps and geographic knowledge? Is that relationship clear to readers?

As we consider codes of conduct for trustworthy mapmaking and/or pursue other ways for ensuring trustworthiness such as providing maps with a seal of approval, we need to survey if our research and practice is actually fostering healthy trust in maps. Gartner (2023) outlines two initiatives for improving the trustworthiness in maps by striving for transparency in things like design decisions and advocating for contextualization (i.e., offering multiple representations for the same data). As these initiatives and others take root, we need to determine metrics and methods to assess whether they are working. Specifically, researchers need a way to measure one's trust in a map, and to identify the specific cartographic elements that have the greatest impact on trust. The rating scale developed by Prestby (2024) presents an initial tool for reliably measuring trust in maps. Determining which elements influence trust is crucial to both establishing guidelines for the creation of trustworthy maps and identifying elements that education campaigns can target to improve mapping literacy.

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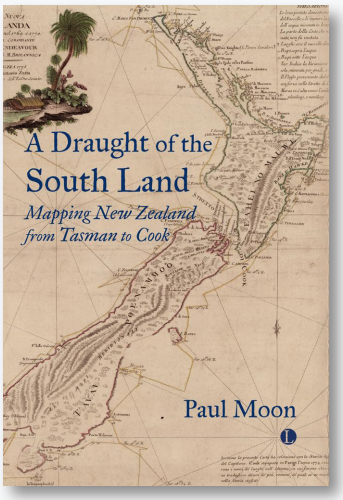

A DRAUGHT OF THE SOUTH LAND: MAPPING NEW ZEALAND FROM TASMAN TO COOK

By Paul Moon

The Lutterworth Press, 2023

200 pages, including maps and diagrams

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Review by: Brooks Groves (he/him)

In this insightful book, *A Draught of the South Land: Mapping New Zealand from Tasman to Cook*, historian Paul Moon meticulously uncovers the cartographic history that not only charted New Zealand but also shaped its encounter with European powers. Moon, a distinguished scholar of New Zealand's colonial and indigenous histories, crafts a narrative that extends far beyond maritime exploration, highlighting the strategic and often contentious role of cartography in imperial expansion, cultural encounter, and geopolitical strategies.

Moon begins by setting the stage within the Age of Discovery, a period roughly spanning the sixteenth and seventeenth centuries that is characterized by significant advancements in navigational technology and intense competition among European nations eager to expand their realms and control trade routes. Central to this was the Dutch East India Company (Vereenigde Oostindische Compagnie, or VOC), founded in 1602 as one of the first joint-stock trading companies—a pioneering innovation that distinguished it from previous trading entities, which were merely groups of individual traders. The joint-stock structure allowed the VOC to pool resources from multiple investors, spreading risk and enabling more substantial and sustained investment in trade and exploration.

The VOC epitomized the use of cartography as a strategic tool to assert and expand Dutch imperial interests, establishing a global trade network that connected Europe with Asia, Africa, and the Americas. Within this framework, Hessel Gerritsz emerged as a pivotal figure. As the first exclusive cartographer of the VOC and considered by some as the chief Dutch cartographer of the seventeenth century, Gerritsz's role was crucial. His detailed maps were not only practical tools for navigation and trade, but also potent symbols displayed in diplomatic courts to impress both domestic and foreign viewers, asserting Dutch maritime and commercial supremacy. Gerritsz's work exemplified the integration of cartographic skill with imperial strategy, reinforcing the VOC's position as a dominant force in global trade and exploration.

These maps—replete with strategic embellishments—exaggerated the size and potential wealth of Dutch claims to deter rivals and attract investment. Gerritsz's creations highlighted the newly "discovered" territories in relation to existing trade routes, aligning perfectly with the VOC's vision of economic dominance and diplomatic prowess. The maps were intricately woven into the fabric of Dutch imperial ambitions, functioning on multiple levels: as navigational aids, territorial markers, and artifacts of diplomacy.

Moon recounts the voyage Abel Tasman undertook in 1642, sailing his ships along the west coast of New Zealand. One of a series of exploratory endeavors sponsored by the VOC, it was not merely a voyage into uncharted waters, but a mission driven by the allure of wealth and strategic imperatives. The company's primary ambition was to expand their lucrative spice trade and to probe

rumored southern lands said to be rich in gold and other commodities. This journey—the first European encounter with New Zealand—also produced the first European maps of these large and diverse lands. Tasman's maps were not only instrumental in the VOC's expansionist strategy but were pivotal in integrating the region into the broader scope of European maritime ambitions, sparking interest in further exploration in the Pacific.

Paul Moon provides an intriguing examination of the extended lull between Abel Tasman's 1642 encounter with New Zealand and James Cook's more scientifically rigorous expeditions beginning in 1769. During this interim, lasting over a century, European cartographers, working half a world away, relied on hearsay and the often-sketchy charts of Tasman and others, resulting in maps that were more speculative than accurate. The VOC's Hessel Gerritsz contributed significantly to this period of speculative mapping. His maps, like those of many of his contemporaries, sometimes included fantastical elements—mythical creatures, speculative landmasses, and fictionalized depictions of the indigenous Māori—reflecting the European fantasies about distant lands.

These representations painted New Zealand as a place of wonder and mystery, and an alluring blank canvas for European aspirations and fears. The speculative nature of Gerritsz's maps, while not unique, highlights the era's blend of curiosity, ambition, and the limited availability of accurate information. Moon's analysis underscores how the conception of New Zealand took shape in the minds and maps of Europeans during this period, setting the stage for Cook's later, more empirical explorations.

Cook's voyages—which Moon contrasts sharply with the earlier era—were underpinned by Enlightenment values and equipped with advanced scientific instruments and were aimed at generating accurate knowledge and dispelling myths. These expeditions marked a turning point—a shift away from the realm of imagination to one of empirical inquiry and detailed, systematic cartography.

The earlier, speculative, maps, while inaccurate, were not merely errors in cartography; they reflected the European zeitgeist, a testament to the era's blend of curiosity, ambition, and ignorance. Moon's analysis of this period reveals how the conception of New Zealand took shape in the minds and maps of Europeans and showcases the profound impact these imaginings had on the eventual European engagement with the actual land and peoples of New Zealand. At the same time, however, significant cultural and intellectual transformations in Europe were changing and expanding the European worldview.

James Cook's voyages represent that fundamental shift in European exploration. The ostensive rationale for Cook's 1768 voyage was observation of the 1769 transit of Venus, but he was also secretly commissioned to seek out *Terra Australis*: the hypothesized southern continent. Thus, beginning with Cook's first Pacific expedition, commercial and imperial justifications began to be overlaid with, and joined onto, Enlightenment endeavors aimed at enhancing European knowledge and understanding of the world.

During his comprehensive exploration of New Zealand, Cook employed meticulous survey methods that resulted in significantly more accurate charts. Using new tools like the marine chronometer, which allowed for precise longitude measurements, Cook and his crew undertook a detailed coastal charting project; correcting the earlier, more primitive maps produced by Tasman and his contemporaries. Through these methodical surveys, Cook established that New Zealand consisted of two main islands—which he named the North and South Islands—thus dispelling earlier European beliefs that it might be part of a larger southern continent.

The level of detail in Cook's maps was unprecedented. For example, he charted the intricate inlets and harbors of New Zealand's coastlines, often navigating closer to the shore than previous explorers had dared. Cook's charts were so accurate that some were used well into the twentieth century, a testament to their precision and usefulness.

Cook's interactions with the indigenous Māori were significantly enhanced by the presence of Tupaia, a Polynesian priest and skilled navigator, who had joined Cook's expedition in Tahiti. Tupaia's ability to communicate with the Māori was invaluable, not only in facilitating immediate interactions but also in contributing to a deeper cultural exchange. He helped bridge the cultural gap between Europeans and the Māori, allowing for a more nuanced understanding of the social structures, customs, and languages of the Pacific peoples.

Tupaia's contributions went beyond mere translation; he provided Cook and his crew with insights into the Polynesian wayfinding techniques and local geographical

knowledge, which enriched the European maps with ethnographic details and helped Cook navigate other parts of the Pacific. Recognition of the pivotal importance of indigenous knowledge, such as that brought by Tupaia, challenges the standard narrative of heroic European exploration and solitary discovery, and instead highlights the collaborative nature of exploration.

Moon places emphasis on Tupaia's role not only to illustrate the collaborative nature of Cook's voyages but also to underscore what he sees as a critical shift in European exploration—from conquest to scientific inquiry and mutual exchange. This aspect of Cook's expeditions illustrates a broader Enlightenment-driven curiosity about the world, seeking to understand and document human diversity and the complexity of natural phenomena in a systematic and empirical way.

However, it is important to note that the integration of indigenous knowledge, and the recognition of figures like Tupaia, has only recently come to be acknowledged, much like the recent recognition of the role of Sacagawea in the success of the Lewis and Clark's expedition. Moon seems to suggest that this shift towards recognizing indigenous contributions was not fully realized or appreciated by the people of the eighteenth century. This perspective challenges the traditional narratives and highlights the often-overlooked contributions of indigenous peoples in these historic voyages.

Cook's voyages to New Zealand were instrumental in both refining the European maps and in transforming European cultural understanding of the Pacific. His integration of advanced cartographic techniques and genuine cultural exchange with indigenous peoples marked a new era in European exploration, characterized by greater accuracy, respect, and reciprocity.

In the final segment of Paul Moon's exploration, attention turns to the lasting impact of historical cartography on contemporary issues in New Zealand. Moon begins with the contributions of stay-at-home mapmakers like Gerritsz, whose meticulous work, driven by Dutch imperial ambitions, significantly shaped early European perceptions of New Zealand's geography. Despite their primitive, but detailed, nature by modern standards, Gerritsz's maps were instrumental in guiding exploration and colonization efforts, establishing a foundation for subsequent navigational endeavors.

Moon then highlights how maps crafted by explorers like Tasman and Cook, initially designed for navigation, evolved into essential tools for colonial administration. These maps are now frequently referenced in legal disputes, particularly those involving land claims by indigenous Māori communities, underscoring their enduring significance. Gerritsz, alongside Tasman and Cook, emerges as a central figure in shaping the cartographic legacy that continues to influence contemporary discussions on land rights and cultural heritage preservation in New Zealand. This legacy highlights the profound and lasting impact of these historical maps on modern legal and cultural landscapes.

Moon further explains how the precision and detail of Cook's maps have lent a degree of legitimacy to certain land claims, as these maps often serve as some of the earliest comprehensive records of the geography and human settlements in New Zealand. This not only underscores the legal and historical significance of these maps but also illuminates the complexities surrounding land rights issues, where colonial-era documents are used within modern judicial systems to resolve claims.

Moreover, Moon discusses the role of maps in cultural heritage preservation. The maps are more than just geographical representations; they are cultural artifacts that carry the imprints of cross-cultural encounters and the mingling of Western and indigenous knowledge systems. They help trace the lineage of historical interactions and serve as tools for cultural education and preservation, aiding efforts to revitalize and maintain indigenous languages, place names, and stories that are embedded in the landscape.

The evolution of cartography from traditional methods to modern satellite-based techniques also features prominently in Moon's analysis. This transition reflects significant technological advancements that have transformed how maps are created and used. Despite these changes, Moon argues that the fundamental role of maps as instruments of knowledge and power remains unchanged. Contemporary satellite maps continue to influence geopolitical strategies and cultural narratives much like their hand-drawn precursors, shaping perceptions and policies at both national and global levels.

Moon also reflects on how these historical cartographic efforts are not static relics of the past but dynamic tools that

continue to impact contemporary society. The legacy of these maps extends beyond their original purpose, influencing modern legal, political, and cultural landscapes in profound and lasting ways. This reflection offers a nuanced perspective on the power of maps, emphasizing their role as enduring links between history, knowledge, and power in shaping societies.

In *A Draught of the South Land*, Paul Moon offers an extensive exploration of the roles of cartography in empire-building and knowledge dissemination, marked by its engaging narrative and thorough research. However, while the book is commendable for its depth and breadth, it is not beyond criticism.

One point of critique is Moon's heavy reliance on European sources, which, while rich and informative, could be seen as presenting a somewhat Eurocentric view of history. Although Moon acknowledges the contributions of indigenous knowledge through figures like Tupaia, the primary perspective tends to favor the European narratives of discovery and exploration. This approach may leave readers yearning for a more balanced account that elevates non-European voices and perspectives, particularly those of the Māori, whose land and culture were significantly impacted by the events described.

Additionally, some readers might find Moon's detailed descriptions of cartographic techniques and historical map analysis somewhat esoteric. While these sections underscore the scientific advancements of the period, they can occasionally bog down the narrative, potentially alienating readers who are less familiar with geographic or cartographic jargon.

Despite these criticisms, *A Draught of the South Land* remains an indispensable resource. It provides a nuanced understanding of how exploration and cartography have shaped not only New Zealand but also the broader dynamics of global history. The book's exploration of the enduring impact of these maps on contemporary issues adds a layer of relevance, making it a valuable read for those interested in the intersections of history, geography, and politics. Moon's work is a critical addition to the field, offering insights into the transformative power of maps while highlighting areas where historical narratives can be expanded to incorporate a more inclusive range of perspectives.

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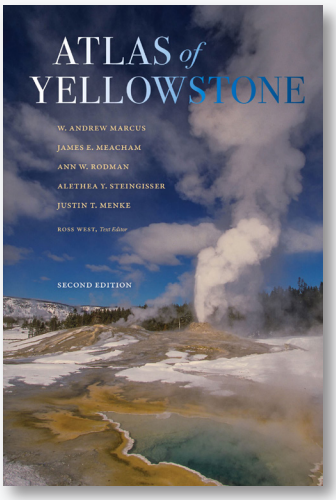


ATLAS OF YELLOWSTONE, SECOND EDITION

Edited by W. Andrew Marcus, James E. Meacham, Ann W. Rodman, Alethea Y. Steingisser, and Justin T. Menke

University of California Press, 2022

343 pages

Hardcover: $65.00, ISBN 978-0-520-37977-0

Review by: Eric D. M. Johnson, Virginia Commonwealth University

Yellowstone National Park has a strong claim to being the most-studied national park in the United States. In a recent comprehensive survey of park-related peer-reviewed research articles published since the 1970s, Jelena Vukomanovic and Joshua Randall (2021) found that Yellowstone National Park accounts for 36.2% of all such studies, with Everglades National Park coming in a distant second with 6.8%. This fact would surprise exactly zero readers of *Atlas of Yellowstone*, *Second Edition*, brought out in 2022 under the aegis of the University of Oregon's InfoGraphics Lab, given the breathtaking scope of topics so expertly compiled, interpreted, and mapped in this single gorgeous volume.

The first edition of the atlas was published in 2012, although the idea originated almost a decade earlier during planning for an Advanced Cartography course in the Department of Geography at the University of Oregon, led by two of the project's editors, W. Andrew Marcus and James Meacham. Having settled on Yellowstone as a central theme for the class, and "emboldened by several microbrews" (322), Marcus and Meacham thought they might as well take it a step further and go ahead and create an *Atlas of Yellowstone*, too. That decision launched the creation of a momentous, much-awarded publication that merely took "[a]lmost ten years, more than 100 expert contributors, many Yellowstone trips, dozens of cartographers (many of them students), and about 300 pages" (322).

As they recount in the Foreword to the second edition, the editors found that even before finishing the first edition they already wanted to make a second: "we realized we did not have the time or funding to tell all the Yellowstone stories we wanted to tell" (xx), noting in particular: the tales that GPS tracking might tell about animals' lives; the opportunities to further discuss Yellowstone's impacts on park architecture and culture; additional stories to tell of Native American history; and much more. "As a result," they wrote, "the *Second Edition* is 72 pages longer and contains 50 percent new, or extensively revisited, material" (xx). Another impetus to creation of the second edition in 2022 was that such an effort could coincide with the 150th anniversary of Yellowstone as the first national park in the world. (To the editors' credit, while the sesquicentennial is acknowledged a number of times in the text, the atlas never once feels like a gratuitous celebration of that fact.)

Upon first picking up the second edition, the reader is immediately struck by the very "Yellowstone-ness" of the cover image by Tom Murphy: Lion Geyser erupting in the mid-ground, the superheated steam lifting past snowbanks lining a brown thermal area and mixing with the white clouds in a deep blue sky, with equally deep blue Heart Spring in the foreground, the pool's geothermal processes encrusting its edges with white sinter (a solid chemical mass formed by pressure or heat without melting) and orange-brown algae. The atlas is a large, hardcover volume,

about 13½" tall by 9¾" wide. After perusing the front matter—a word or two about the many supporters of both editions, acknowledgments of the hundreds of individuals who contributed to the new volume, prefaces to both editions, and the editors' Foreword—the reader turns to the primary content.

The main body of the volume is divided into six principal sections, each introduced by a scholar's thought-provoking essay for context and consisting of a series of two-page spreads, termed by the editors *page pairs*—"each story *must* be told in two pages" (xx), they declared. The page pairs are the true heart of this work. Each page pair was prepared under the guidance of contributing topic experts—two or more experts per subject was typical, some 130 in all—and develops a specific story related to the section's theme. It is an atlas, after all, so maps are the chief means by which those stories are told, but they are not the only way. The maps are accompanied by informative background text and, in most of the spreads, graphs, charts, photographs, and/or illustrations in different combinations that best tell the story of their given topic.

The six sections cover many aspects of Yellowstone and Grand Teton National Parks and their surrounding areas. "Yellowstone National Park," with its six page pairs, situates the park broadly in its geographical and cultural contexts, and includes pages illustrating oblique bird's-eye views of the park and its surrounding lands, describing its legacy as the first national park, and examining the public lands that surround the park. "History" focuses on archaeology, Native American history, and early surveys and exploration, providing fourteen spreads on topics such as the flight of the Nez Perce tribe through the park, early maps of the park, and the history of scientific research in Yellowstone. The third section, "For the People," uses its fifteen page pairs to tell the story of the current park *as* a park, touching on the development of the built environment, park architecture, park visitation, and light pollution and the night sky. "Human Geography" tells of the development and impact of the human communities around the Yellowstone region: thirteen spreads cover topics such as land ownership, population, race and ethnicity, economic impact, and agriculture. "Physical Geography," the longest section with thirty-eight page pairs, focuses on the elements of the physical landscape, with spreads on topics such as landforms, geologic evolution, glaciers, geysers, precipitation, vegetation, and fire history. The final main section, "Wildlife," tells the stories of the park's fauna and the rich studies scientists have made in this domain. Its nineteen page pairs introduce the reader to Yellowstone's bison, elk, wolves—including the affecting individual story of Wolf 911M—birds, fish, and other creatures.

The final hundred pages of the volume comprise reference materials, including a series of beautiful reference maps of the region that the atlas terms the Greater Yellowstone Area (at 1:500,000 scale) and of Yellowstone and Grand Teton National Parks (at 1:100,000 scale). These maps are accompanied by a gazetteer to help readers find features and locales described throughout the text, an index to US Geological Survey maps of the area, a county map of the Greater Yellowstone Area, a wonderful guide to the origins of cultural and physical place names in the parks and their surrounding area, and a list of vertebrate species found in both parks. Finally, the Afterword (reprinted from the first edition) describes the process of creating *Atlas of Yellowstone*; a Sources section provides information on the experts, data sets, and sources used in each page pair, essay, and reference resource; and, thankfully, an index.

In the Afterword, the editors tell us that this atlas was always intended to be a synthesis, a work to "make scholarly materials accessible to the public and create new knowledge through such syntheses rather than primary data gathering" (323). "Our aspiration," they write, "was to create a comprehensive, state-of-the-art reference volume that centered on Yellowstone and Grand Teton National Parks. The target audience was to be visitors, educators, resource managers, and scholars—essentially anyone with a deep interest in Yellowstone" (323). In the Foreword they also indicate that they wanted to retain the four major themes introduced in the first edition: "that Yellowstone is connected to surrounding areas, that it is dynamic and ever-changing, that humans are as much a part of Yellowstone as the wildlife for which it is famous, and that Yellowstone is extraordinary" (xx). They also sought in this second edition to introduce a fifth theme in acknowledgment of the park's 150th anniversary, "to focus more on the park and its influence through a theme we called 'Yellowstone's reach'" (xx).

In all this, it must be said, the editors and their many contributors succeeded to great admiration. Firstly, in leafing through the volume, the reader cannot help but be struck at the sheer beauty and variety of the maps, graphs, illustrations, and photos in all their remarkable range of

size, color, scale, design, and emphasis. It is the rich cartography on which this work is based that stands as its greatest strength, and a special mention should be made of the many student cartographers who made such excellent contributions. Early on, the editors noted that "[t]he *Atlas of Yellowstone* tells many stories across many different scales. . . The spatial extent, time period covered, and scale of maps in this atlas are determined by the information necessary to tell a story and by available expertise and geographic data" (8). This was the right choice: virtually every page pair has its own unique map (or very effective sequence of maps) designed specifically to share information on that particular topic. While I cannot say so definitively, it appears that no basemap was repeated among topics, and this variety enhanced the quality of the volume as an aesthetic and communicative work.

The breadth of topics (some one hundred and five in all) made the parks, their surrounding landscape, physical features, and wildlife come to life; a reader cannot leave this atlas without feeling like Yellowstone is now a much more familiar friend. The atlas makes great use of map series and of small multiples in graphs, for instance in the "Traffic" page pair, which offers many graph comparisons as well as effective use of line widths to illustrate traffic flow (68–69). Similar effective combinations of maps and graphs appear in "City Population" (96–97) and "Religion and Politics" (102–103). The "Migratory Landscape"—a story now made possible by modern GPS tracking—is simply but very effectively told through a series of maps reflecting pronghorn, elk, and mule deer migration patterns in connection with subtly-depicted plant "green up" (the progression of spring and summer plant growth; 202–203). One might think "Park Visitation" would be a fairly static, straightforward story to tell, but it comes dynamically alive with effective use of line and bar graphs and proportional symbol maps (70–71). Scattered throughout the volume are individual maps that are utterly striking for their design—thanks in no small part to the rich, detailed data provided to the cartographers.

This is not to say, however, that *Atlas of Yellowstone*, *Second Edition* is entirely without flaw. The labels on some of the maps—particularly those emphasizing the topography of the park as on pages 6 through 9—are insufficiently contrasted with the base maps through halos or other techniques. A few of the information graphics are not quite what they might be: for instance, in the "Education" spread, 3D boxes are used to compare higher education institutional enrollment numbers (99), but the human eye is notoriously poor at making note of differences by volume so some other representation would likely have been more effective. While acknowledging that copyediting such a work with so many contributors is an enormous undertaking, there are a smattering of typographical and editorial errors scattered throughout: Obsidian Cliff was rendered in one place as "Obisdian" (22); Mammoth Hot Springs Historic District was written as "Mammoth Hots Springs" (62); and "pray" was used for prey (226). In the page pair on "Jackson and Moran," about the photographer and the painter who accompanied the 1871 Hayden survey, the text indicates that "Jackson captured the area's remarkable landscapes on film" (43)—only he captured images on glass plates, not on film. The definition of labor force participation in the spread on labor and employment is incorrect, saying that it is "the percentage of people who are employed or seeking employment divided by the non-institutional, civilian, working-age population" (106) when it is the *number* of people employed or seeking employment and not the *percentage*. A reference to western cutthroat trout appears on the "Fish" page pair when westslope cutthroat was probably intended (230). A handful of other typos and errors of these kinds also appeared elsewhere, standing out only because so much of the rest of the text had been so beautifully managed.

Another minor concern is the quality of the physical book. Having now gone through its pages a few, but not an unusual, number of times, it must be noted that the binding thread at the spine is starting to show more than I might expect for a new book, particularly in the innermost fold of each signature (bound section of folded sheets) and between pages within each signature. That may indicate a slightly weak binding that may worsen over time.

In terms of content, while the variety of maps was very welcome, some of the map apparatuses might have been standardized among maps, such as the way that detail maps were identified (sometimes they were numbered on the locator maps, sometimes not), and more consistency in graph designs would be beneficial (for instance, bison counts and removals were illustrated differently than elk counts and removals). The section on physical geography does outweigh any other section, and perhaps a third edition could see an additional expansion of the wildlife section, as more geospatial data is gathered through GPS and other studies; in particular it is notable that insects and birds, which are such a crucial part of the ecosystem, only

got one page spread each, while fish only received two. A separate full section on the trees and plants of the parks might also be a welcome addition. While it seems entirely greedy to ask for yet more, a few of the page pairs seemed like they missed an opportunity to be brought fully up-to-date in the second edition. The "Road History" topic, for instance, stopped in 1956 when no doubt there have been many newer road developments (54–55). Finally, though the Sources section was very helpful in identifying sources for the data presented throughout the atlas, at times I really wanted some additional bibliographic resources to turn to as a kind of "for further reading" connected with each topic. To be sure, it would probably be very hard to pull that together in any way that wouldn't simply overwhelm the editors or the references section, but if one were to dream of additional options, that would be a grand one.

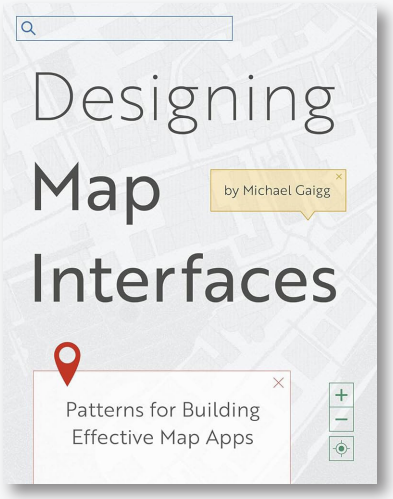
The true value of this stellar work is as an introduction to the breadth of knowledge that is being generated by researchers in many disciplines at Yellowstone and Grand Teton National Parks and their surrounding areas. It is outstanding as a work of cartography and would serve especially well to educate aspiring cartographers. Because the atlas tells the story of its own creation and offers such a variety of cartographic approaches, it could almost be a textbook—or better than a textbook, an exemplar of excellent cartographic practice. Scattered throughout the atlas are specific references that would aid in such an effort; the text introducing the two sets of reference maps (243, 256) explicitly spells out some of the cartographic choices that were made: why a given scale was chosen and even the definition of scale in the first place, why some streams were exaggerated and simplified while others were eliminated, why roads are selectively shown, and why the relief was shaded as it was.

As it is a reference work, it is may be unlikely that most people would read *Atlas of Yellowstone*, *Second Edition* straight through, but it absolutely rewards just such a reading. The reader gets such a rich sense of the place and its evolution, environments, people, and animal occupants. This is a work for anyone who loves Yellowstone, or who would like to love it more.

REFERENCE

Vukomanovic, Jelena, and Joshua Randall. 2021. "Research trends in U.S. national parks, the world's 'living laboratories.'" *Conservation Science and Practice* 3 (6): 1–15. **https://doi.org/10.1111/csp2.414**.

DOI: 10.14714/CP105.1963



DESIGNING MAP INTERFACES: PATTERNS FOR BUILDING EFFECTIVE MAP APPS

By Michael Gaigg

Esri Press, 2023

173 pages

Paperback: $44.99, ISBN 978-1-58948-725-3

Review by: Alex Shreffler, Andromeda Solutions

Designing Map Interfaces attempts to describe the basic tenants in map interface design, breaking down the design methodology into simple steps:

1. Selecting the right layout,
2. Interacting with the map,
3. Dealing with complex data,
4. Designing for mobile devices, and
5. Building single-purpose maps.

The first and last chapters also provide advice on getting started and avoiding common mistakes. All together, the book includes seven chapters of pragmatic consideration deservedly given to the creative map-app design process. The author proposes and affirms that the key to a great user interface (UI) is the marriage between the needs of the users and the requirements of the business, something they maintain can only be accomplished through the investigation of user/business needs, the identification of the design strategy, and the development of a visioned solution.

In the preface, the author gives specific instructions on how the reader should make use of the layout of the book, and primes them to look for colored highlights in the text that indicate references to a named UI pattern. While all of these patterns are listed on the author's ***Design Patterns For Effective Maps UX*** website, one advantage of buying the book is that the reader has access to its useful pre-chapter commentaries and illustrations. These include the discussion of user types and personas in Chapter 2 (27) which describes five user personas (Expert, Analyst, Executive, Public, and Mobile), each with different needs that are addressed through four characteristics: attention, focus, GIS literacy, and scale. This schema is then repeatedly applied in order to describe the appropriate application layout and UI patterns for each persona based on those characteristics. As suggested in the subtitle of the book, patterns play a key role in understanding user preference and are presented as basic design principles and best practices. Each chapter begins with a breakdown of challenges unique to different aspects of map-centric design before diving into the particular patterns relevant to the chapter topic. In addition to providing best practices throughout the book, the author succeeds in warning about issues to consider when designing the web map interface and suggests alternative designs that avoid potential mistakes.

Speaking of improvement, there are a few points at which the book could be strengthened. The author chose not to use in-text citations and preferred to list all their references in a quasi-Chicago style format at the end of each chapter. Chapter-end references are listed with no ties back to the text, and endnote numbers are not used. This method does not follow typical conventions, and this may be confusing when trying to find the reference clearly in the text—for example, when a book reference appears at the end of Chapter 5 (131) and never mentions the name

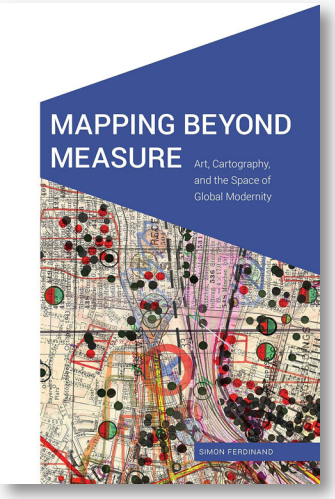
of the resource or its author anywhere in the rest of the chapter. As textbook or reference material, a more careful approach to citation and reference should be expected. It is also noticeable that the material promotes Esri products numerous times, but rarely even mentions any other platforms. Although the content does reference proprietary solutions more often than not, the advice is transferable to any mapping platform, whether provided out-of-the-box or built from complete scratch.

The physical experience of the book is as pleasant as you would expect from an author this meticulously aware of the user experience. The cover creatively presents the title, author, and subtitle in an immersive prop, which instantly communicates the expected content. The book design leaves no room for clutter; only essential information and useful visuals are included. I have noticed that when I bend the book slightly, the color printed on the fly edge of the pattern pages provides a visual chapter indicator on the page fore-edges, making it easy to find and reference a particular chapter in seconds. It may or may not be intentional, but it is a useful physical UX/UI affordance in a book about digital UX patterns.

This type of work contributes to the larger body of knowledge by fully describing the niche considerations for web map design that present challenges completely different than those usually encountered in either web design or traditional cartography. It will serve web-mapmakers, new and experienced alike, in its ease of reference, simple visual pattern illustrations, specific case-use examples, and clear "what-why-when-how" framework. Anyone who cares about the design of attractive and efficient web maps will appreciate *Designing Map Interfaces* as a timeless reference tool to keep on the shelf and share with others. It is worth keeping around just to flip through on occasion to refresh and inspire a creative, map-oriented mind.

Finding a specific discussion or pattern set is made easier by flexing the page stack.

DOI: 10.14714/CP105.1965



MAPPING BEYOND MEASURE: ART, CARTOGRAPHY, AND THE SPACE OF GLOBAL MODERNITY

By Simon Ferdinand

University of Nebraska Press, 2019

298 pages, 61 figures

Hardcover: $16.99, ISBN 978-1-4962-1211-5

Review by: Zach Thorpe, University of California, Berkeley

Simon Ferdinand, in *Mapping Beyond Measure*: *Art, Cartography and the Space of Global Modernity* (hereafter referred to as *Mapping*), argues that maps, geographies, and other expressions of spatial phenomena can challenge and excite our own understanding of space and place. He maintains that when we analyze the nature of this proposition we discover that maps are simply visual expressions of ideas, whose format is subject to the same critical analysis that is so often applied to visual art. The concept of a "map" itself can even be seen as subject matter that artists can include within their own work, helping to better communicate their messages to their audiences. Ferdinand further argues in favor of an innovative narrative of "map art" by placing this narrative within the context of how artworks can use cartography to examine, challenge, and disrupt the concept of "global modernity." This term, originally coined by Arif Dirlik (2007), stresses "important transformations in global relations" that posits the modern state of the world as "one and unequal" (8). Namely, that "capitalism's expansive tendency toward ever greater accumulation and the global articulation of markets" makes our world an integrated whole, while simultaneously being unequal, in that it is "riven with disjuncture, unevenness and diversions . . . [that] actively produces inequality and difference" (8).

Primarily theoretical in nature, *Mapping* examines a variety of artworks, maps, and other figures that reference an even broader range of artists, writers, and spatial theorists. The author's primary argument is "that map art is especially well placed to explore themes of global modernity because mapmaking itself has been inextricably bound up with the articulation of modern nation states, colonialism, and capitalism" (14). He divides his analysis of this assertion into six distinct parts, and devotes a single section of the book to uncovering the depths of each.

Previously, there have been other explorations into the intersection of visual art and cartography.[1] For example, books like Harriet Hawkins's *For Creative Geographies* (2014) provided an exploration into the relationship between geography and visual art, and laid out a broad argument about art's role in forming geographical knowledge in general. Similarly, Karen O'Rourke's work *Walking and Mapping*: *Artists as Cartographers* (2016) delved deeper into the ways some artists are harnessing technological advancements in GIS to aesthetically render the concept of "wandering." No one else, however, has taken on the task of investigating map art as it particularly applies to the theme of global modernity. Simon Ferdinand has devoted six years—both alone and in collaboration with colleagues—to putting this book together. He is currently a postdoctoral researcher at the University of Amsterdam, has lectured about art history and criticism, and has explored the relationships between art and geography through various articles and reviews since 2012—so he comes to the undertaking with some respectable credentials.

1. Editor's note: this includes **a special issue** (#53, 2006) of *Cartographic Perspectives* devoted to the subject.

The book's "Introduction"—subtitled "I Map Therefore I Am Modern"—outlines the content and premises of his arguments, along with some pertinent self-criticisms. Ferdinand's primary argument is that "map art" (explained as "the remarkably large and various field of artistic production concerned with mapping" [5–6]) is well situated to remark on global modernity because maps have, historically, been "the makers and markers of modernity" (7). He introduces some compelling original concepts that support this claim throughout the book, such as how cartography's "ontology of calculability" (17) reproduces our perception of the world as measurable, representable, and calculable. To Ferdinand, this inherently places cartography within a political view, a view that seeks to maintain global modernity's hegemonic control. The ability to create artistic mappings by using cartographic layers from temporally varying political perspectives over time is another of Ferdinand's original concepts, one he terms "polychronous cartography." These concepts are referenced many times by Ferdinand as he lays out the base arguments that are expanded in the first four chapters. In these chapters, the selected map artworks focus on themes that undermine cartography's façade of objectivity by reimagining and revealing perspectives of uneven spatial and temporal development in an increasingly globalized world.

Chapter 1 spotlights a painting entitled *The Old and the New. A Group Portrait* (1935) by Ukrainian artist Solomon Borisovich Nikritin. The subjects and composition of this work are analyzed to explore what Ferdinand calls the "phenomenologies of global mapping" (39)—another of his original concepts. A fitting work to begin the content of this book, Ferdinand explains how the four figures of the artwork represent global mapping's evolution from "Hellenistic cosmological predestination" to its current place of "calculative malleability." Ferdinand draws upon the form, emotions, genders, and gazes of the figures to argue that this work "focuses [on] a perpetual, constitutively modern impulse to map meaning and order onto a fortuitous world" (59). Referencing details like preparatory studies and other artworks by Nikritin, as well as the historical context of this artwork's creation in the shadow of the Soviet Union, Ferdinand melds art and geographic theory to lay out this initial argument of how projecting our own meanings onto the earth in the name of progress can consequently alienate us from it. He references consequences like "banal globalism," which creates "cosmopolitan consumer-citizens [that] are constructed through daily exposure to media motifs of global belonging" (59). This

Solomon Borisovich Nikritin. *The Old and the New. A Group Portrait.* 1935. Oil on canvas. State Museum of Arts of the Republic of Karakalpakstan, Uzbekistan.

asserts global modernity's calculability that yields "meaningless facticity across which global rhetorics play out" (65).

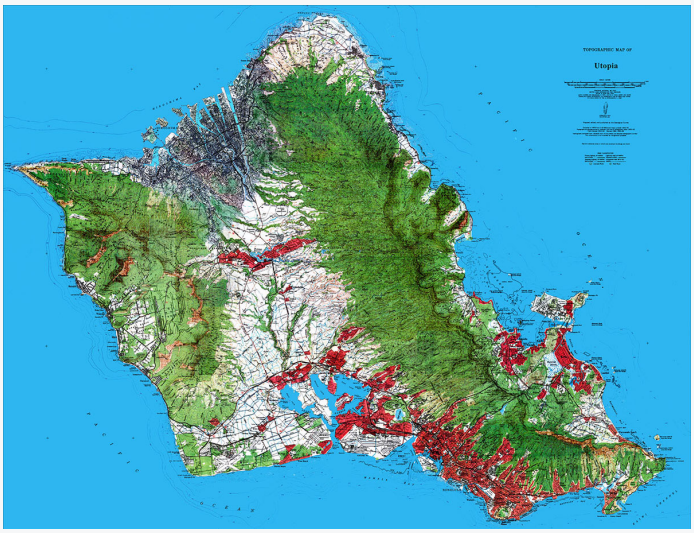
In Chapter 2, Ferdinand contrasts what he sees as modernity's urge for "monochronus mapping"—a mapping that temporally freezes space perception in the name of capitalist market globalization, state organization, and colonialism—with the idea of a "polychronous mapping" that critically reimagines the global temporalities that modern mapping constructs. He uses Alison Hildreth's piece *World Fort* (2007) to show how a visual combination of spatial temporalities can reveal historical and political tensions so often disguised by modernity's monochronus mapping tendencies. His analysis of the subject matter—war machines, insects, surveillance, and violence—associated with Hildreth's geographies-under-threat leads Ferdinand to conclude that the spatial-temporal frictions associated with Hildreth's work resolve to "modernity's ecological ruin following the triumphant resurgence of an avenging natural order" (93). The author links the themes of climate change and ecological crisis to the stark, gritty, melancholic aesthetics of the artist's temporal layers by noting that even ecological ruin will likely play out through a "combined and uneven apocalypse" (102), echoing global modernity's one and unequal evolution.

In Chapter 3, Ferdinand combines these two concepts and relates the amalgam to cartography's historical yet unfortunate connection to political and military conquest. Gert

Jan Kocken's work *Depictions of Munich* (1933–1945)—an incredibly detailed and dense work featuring various layers of state-planning maps, annotations, and datasets—speaks to the idea of how maps act as plans and, inversely, how plans of conflicting ideas of political utopias can turn into maps that depict "fascist, communist, and liberal-capitalist visions of modernity vying for hegemony" (119). Kocken purposefully chooses map layers that have political and temporal tensions to highlight these contrasts which speak to cartography's power to create different realities of state ordering. Using themes of warfare to highlight the differences of these visions, Kocken highlights both realized and failed cartographic plans in his work. These "aperspectival views" speak further of militarism's ability to violently shape our space perceptions and lived-realities through "epistemologies that purport to be immutable, contextless, and disinterested" (134), save for the purposes of state domination and control. In another stark take on our modern condition, Ferdinand's analysis of Kocken's work reveals a critique of the way modernity produces itself through "state gardening," a concept of continuous re-fabrication (and subsequent spatial ordering) to befit the winning ideology of the time, and urges us to remember that this is a process we continue to undergo.

While the first three chapters focus on works that outwardly challenge and criticize the effects of global modernity, Chapter 4's analysis of the Japanese artist Satomi Matoba's work is more complex and nuanced. Matoba's works digitally collage maps of different places into one fantastical region, under the guise of traditional cartographic representation standards. In the featured work, *Utopia* (1998), an island resembling the shape of Oahu contains Hiroshima in the north and Pearl Harbor in the south. This poignant symbolic connection opens a floodgate of observations upon which Ferdinand builds his arguments, saying that Matoba's technique of experimentally combining geographies both "naïvely [wishes] away the complexities of global modernity" and accentuates "the repressed transcultural hybridity that persists, unacknowledged, athwart national borders and inside national 'geobodies'" (144–145). Despite Matoba's express intention to imagine a possibility of unity within times of globalization, Ferdinand's uses these aspects to support his belief that Matoba's work perpetuates the theme of ontological calculability. He references the choice of an island as utopia as an "archetype of the emergent territorial nation-state" (151), an insular region that will eventually cause an "othering" of outsiders not within the region's clearly-defined borders. On the one hand, Ferdinand acknowledges that the values of intercultural cosmopolitanism and global flow suggested by Matoba's work challenges this insularity, but, nonetheless, he ultimately defines her work as one that inadvertently idealizes globalization through her aesthetically normative mapmaking choices.

The fifth chapter takes a look at contemporary mapping practices employing GIS and GPS, and how, by "undisciplining cartography" (34) and performing "art *as* mapping" (177), they challenge the modernist ontology of calculability. By taking mapping back from institutional control, Ferdinand argues, these cartographic practices come closer to properly challenging established ontological traditions in ways that many of the artworks discussed in this book struggle to fully achieve. Jeremy Wood's *My Ghost* (2009) is a mapping performance where Wood employs GPS to use himself as a "geodetic pencil" that, through traveling through London, accumulates records of his daily mobility. To Ferdinand, this concept of mapping on the street directly challenges the scientifically "elevated," aperspectival mapping that has dominated the cartographic control of urban space and infrastructure. Although Wood's personal cartographies empower pedestrianism and de-institutionalization by challenging the hierarchy of elevated street maps versus subordinate street-level mapping, Ferdinand recognizes that the hegemony of entrenched hierarchies is, at best, difficult to escape. As much as he respects the attempt, he cannot help but admit that Wood's work both directly challenges *and* inadvertently reinforces the ontology of calculability. Ferdinand explains that, in

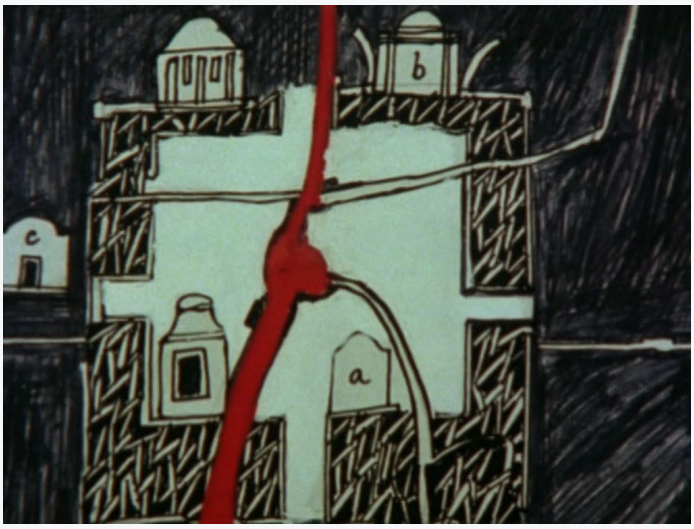


Satomi Matoba. *Utopia*. 1998. Digital collage.

harnessing GPS and GIS technology to create his work, the artist also adopts the values implicit in, and *controlled* by, the tech itself. This problematic ontology will always be perpetuated through the use of the tools that support it—unless artists can "counter this ontology with qualitatively different, experimental, and original visions of mapped space" (193). Ferdinand warns that, in the age of Google Maps and Apple Maps, the growing power of the socio-spatial field of "distributed digital mapping culture" (204) may further strengthen the very ontologies Wood's art-as-mappings projects seek to undo, due to unavoidable reinforcements given to calculated space.

In the final chapter, Ferdinand explores how map art can transcend cartography's historically persistent ontology of calculability through an examination of the 1978 film, ***A Walk Through H: The Reincarnation of an Ornithologist*** by Peter Greenaway. In it, an ornithologist retrospectively looks over his life and navigates a journey into the afterlife by voicing over a showcase of ninety-two maps that Greenaway produced himself, all widely varying in media, perspective, and chronology. The innovative way in which these imagined geographies are presented directly challenges the ontology of calculability through what Ferdinand offers as an imaginative ontology of *performativity*—saying that "the displacement of representational correspondence as cartography's essential function annuls the ontological basis upon which institutional cartography has claimed special authority in mapping" (210). Ferdinand further supports this markedly postmodernist take on a seemingly inescapable calculability in cartography by invoking the philosophical idea of *chorein*, defined as "an act of setting up space, which precedes place and grounds the capability-to-be-in-place" (221). This way of ontologically analyzing Greenaway's work is crucial for Ferdinand's argument because it supports the way Greenaway's work reconceptualizes ideas of space and place entirely, relinquishing any intentions of calculability. In fact, Ferdinand comes to the conclusion that Greenaway's works are entirely incalculable due to their increasingly irregular and bizarre abstractions of place. This development into a phenomenologically performative mapping divests from modernity because it reimagines the world not as something to be calculated and controlled, but to represent individual, lived experiences of spatial understanding.

Overall, *Mapping* is a fascinating exploration into the intersection of art, cartography, and philosophy. Ferdinand's core proposition is that the vast majority of map art



Peter Greenaway. *Antilipe*. Detail of *A Walk Through H: The Reincarnation of an Ornithologist*. 1978.

perpetuates calculative global modernity, despite each artist's individual attempt to comment on or directly challenge it, and each facet of this overarching argument is supported by his detailed analysis of works by a diverse array of artists from various backgrounds and time periods.

However, although the ideas and analyses presented in *Mapping* are compelling, Ferdinand offers few moments of respite from his take on map art's ability to successfully counteract, reimagine, and operate independently from, global modernity. Even his analysis of *A Walk Through H*, which provides a general resolution for his ominous argument of hopeless inescapability from modernity's grip, is left on a note of skepticism, saying that Greenaway's "impulse to found the world anew through mapping does not negate, but rather distills and radicalizes modernity" (241). Still, Ferdinand's arguments are worth consideration and provide a benchmark for future theorists and map artists to imagine cartographies that are inherently anti-modernity. Ferdinand admits in the introduction that his arguments are not "humanist," in that he is purposefully *not* seeing these map artworks as a universalizing "artistic expression and celebration of a shared human mapping impulse" (7). Quite to the contrary; his critical interpretation of map art, maps within art, and "art as mapping" sacrifices artistic intention to find fallibility under the crushing weight of modernity's influence. This represents a weakness in Ferdinand's thesis, as can be seen particularly in regard to his conclusions about Matoba's *Utopia* in Chapter 4, where he criticizes the artist's ultimate faltering turn to calculable perpetuation by the use of traditionally aesthetic

mapping practices. The book's non-humanist critique could use a breath of fresh, humanist air; for example, it could be argued that Matoba is purposefully leveraging traditionalist means to create non-traditionalist, imagined spaces rife with humanist tension that undermines, rather than reinforces, modernity's coldness.

Despite these few overlooked and/or potentially overworked points, Ferdinand's *Mapping* is a recommendable read to anyone with interests in cartography, visual art analysis, critiques on globalization and the modern condition, or broader spatial theory in general. The language Ferdinand uses suits *Mapping* to a more academic audience, creating passages and arguments that use thick (maybe even borderline pretentious) vocabulary. The firm stance taken in *Mapping Beyond Measure*: *Art, Cartography, and the Space of Global Modernity* can be credited to the sheer amount of effort Simon Ferdinand clearly put into this book's creation, and its forthright presentation will lend itself well to this book's becoming an important work that will support the burgeoning field of critical cartography and of map art in general.

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O'Rouke, Karen. 2016. *Walking and Mapping*: *Artists as Cartographers*. Cambridge, MA: MIT Press.

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Robinson, Arthur H., Joel L. Morrison, Phillip C. Muehrcke, A. Jon Kimerling, and Stephen C. Guptill. 1995. *Elements of Cartography, 6th Edition*. New York: John Wiley & Sons.

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Peterson, Michael. 2008. "Choropleth Google Maps." *Cartographic Perspectives* 60: 80–83. **http://doi.org/10.14714/CP60.237**.

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Danzer, Gerald. 1990. "Bird's-Eye Views of Towns and Cities." In *From Sea Charts to Satellite Images: Interpreting North American History through Maps*, edited by David Buisseret, 143–163. Chicago: University of Chicago Press.

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Cartography Associates. 2009. "David Rumsey Donates 150,000 Maps to Stanford University." *David Rumsey Map Collection*. Accessed January 3, 2011. **http://www.davidrumsey.com/blog/2009/8/29/david-rumsey-donates-150-000-maps-to-stanford**.

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