

Doing Critical GIS

Dillon Mahmoudi

University of Maryland, Baltimore County
dillonm@umbc.edu

Taylor Shelton

Georgia State University
jshelton19@gsu.edu

Abstract

This special issue emerges from a two-day workshop of the same name, held on April 1st and 2nd, 2019, in Baltimore, Maryland. Inspired by the continued growth and purchase of theories and practices of critical mapping, this workshop began from the provocation: “what should the doing of critical GIS look like?” Avoiding any single, universalizing answer to this question, the diversity of contributors to this special issue is mirrored in the diversity of their responses. Through examinations of Indigenous, queer, and feminist mapping practices, new theoretical framings for critical mapping and new technologies for producing non-Cartesian maps, and approaches to participatory data collection and mapping (and the limitations thereof), the collected papers each present their own partial perspective on expanding what doing critical GIS can, and ought to, look like. Despite the variety of approaches offered up by the special issue’s constituent papers, this introduction frames these contributions through a focus on two general themes that run throughout these papers: (1) the mapping of presences, absences, and relations, and (2) rethinking the processes of mapping. Or, put slightly differently, *what* we map and *how* we map. Ultimately, while the papers in this special issue offer a number of different paths forward, there are similarly many paths still untaken when it comes to doing GIS critically, which offer countless opportunities for continued growth in this work moving forward.

Keywords

Critical GIS, geographic thought and methodology, mapping



Introduction

Despite over three decades worth of writing on the intersection of GIS and critical social theory, many – both within and beyond the discipline of geography – continue to see the making of maps and the project of critical geography as fundamentally distinct and incommensurable. But if the turbulent decade of the 1990s gave geographers anything, it was the recognition that GIS and critical human geography need not be separate. Schuurman (2000) has identified this period as the “third wave” of GIS and society scholarship, focused on a synthetic intermixing of these two seemingly opposite poles.

And yet, there is perhaps a good reason that many continue to view the project of making maps and the project of social critique as largely distinct. Even though there have been significant currents of critical GIS scholarship that transform long-term ethnographic observations into creative cartographies (Kim 2015), use existing big data sets of social media and mobile phone data towards critical ends (Shelton et al. 2015; Xu 2022), repurpose conventional spatial analytical methods to critique forms of oppression and marginalization (Chambers 2020; Chambers et al. 2021) and collaborate with marginalized communities to use GIS towards their own ends (Bunge 1971; Boll-Bosse and Hankins 2018, Mahmoudi et al. 2020), the vast majority of critical GIS scholarship in recent years *hasn't* looked like this synthetic approach, where the epistemological and political concerns of critical human geography are integrated into and mobilized through GIS methodologies. Much critical GIS scholarship has instead taken up what's been called the “externalist” critique of GIS, pointing to the countless conceptual and practical shortcomings of this suite of technologies, using the concepts of critical social theory to challenge mapping's seemingly neutral, scientific and apolitical character. From the imbrication of GIS with projects of imperialist war-fighting and counterinsurgency (Smith 1992; Bryan and Wood 2015) to the ways that mapping helps to reify people and places as things to be managed through the powers of the technocratic and carceral state (Wilson 2011; Jefferson 2018) or reduces urban space to an abstract commodity to be consumed by the public (Leszczynski 2012; Payne and O'Sullivan 2020), the continued mobilization of geospatial technologies for less-than-savory ends has necessitated such a continued critique.

The relative prevalence of this approach to critical GIS is reflected in the opening chapter of Matt Wilson's 2017 book *New Lines*, which echoes the question often asked of those within the subfield: “but do you actually *do* GIS?” While Wilson argues that critical GIS represents “a tacking between the use of geographic technologies for projects of representation and the representation of geographic technologies themselves” (Wilson 2017: 3), it is largely the latter concern that tends to dominate the literature. Perhaps in part because despite multiple decades of critique of various GIS and cartographic practices, there remains no shortage of problematic implementations of mapping technologies that further white supremacist, patriarchal, capitalist, and imperialist goals. Perhaps it's because much of our *doing* of critical GIS as scholars and teachers occurs in contexts and situations where conventional publication of findings isn't well-suited or appropriate for the work at hand. Or maybe because it's easier to theorize than to build new software or create new kinds of visualizations.¹ But regardless of its causes, the relative dearth of work about actually *doing* GIS in a critical way leaves open significant opportunities to continue fleshing out what critical GIS is and should be.

It was with this in mind that we convened this special issue on “doing critical GIS,” and the namesake workshop from which it emerged back in 2019. While we, as the organizers and editors of this workshop and special issue, are in no way above having engaged in such an externalist critique of GIS (cf. Thatcher et al. 2016a; Shelton 2017) – and indeed, we want to emphasize that it remains an incredibly important endeavor – we wanted to open up a more explicit dialogue about what it means to

¹ We're especially thankful to John Krygier for this point.

put these critiques into practice as we work with GIS and use mapping as a means of advancing critical geographic theory. Rather than continually wringing our hands in response to the question Wilson poses, we thought it necessary and important to highlight the variety of ways that these tools are already being put to use in critical and creative ways, and how these approaches serve as models for the further development of a critical GIS praxis that unequivocally *does* GIS.

Doing the “Doing Critical GIS” Workshop

As mentioned above, this special issue emerges from a two-day workshop of the same name, held on April 1st and 2nd, 2019, in Baltimore, Maryland, at the worker-owned Red Emma’s Coffeehouse and Bookstore.² While the Annual Meeting of the American Association of Geographers being held in Washington, DC later that week served as a convenient excuse, convening the workshop in Baltimore was a deliberate choice. The city was an unlikely but central node in the emergence of radical geography in the 1970s and 80s (Sheppard and Barnes 2019). Indeed, David Harvey, who was perhaps *the* operative figure in this coincidence, has often credited the particularities of Baltimore’s landscape for providing the impetus for his development of a Marxist geographical analysis (Harvey 2022). Even further, it was from his early experiences in Baltimore that Harvey (1972) made his infamous observation (discussed in more detail in Shelton, this issue), that continually mapping more evidence of social inequality is, in fact, counter-revolutionary, in that it serves only to reiterate what we already know to be true and, in turn, distract from making tangible attempts to change that reality.

Inspired by the opportunity to offer a rejoinder to Harvey’s nearly half-century old critique of mapping from the same city where it originated, the workshop initially took shape as we invited a diverse group of twelve individuals to present short position papers responding to the question “what should the doing of critical GIS look like?” These position papers served as the backbone for the workshop and, subsequently, this special issue. But in addition, the workshop was interspersed with group and panel conversations that included six additional scholars, along with a short walking tour of the surrounding neighborhood led by local scholar-activist Dr. Lawrence Brown. Given that most workshop participants came to Baltimore from across the United States, the walking tour offered an opportunity to further ground the workshop in the city’s landscape, encouraging participants to reflect on the deeply rooted uneven geographies that have persisted from the time of Harvey’s radical turn to the present, along with increasingly complex understandings of the intersection of capitalism and racialization that imprint upon the geography of Baltimore (Brown 2021).

Though not all of the invited position paper presenters elected to participate in this special issue, the collective contributions from both the invited presenters and approximately fifty other workshop participants are reflected in the overall shape of the papers presented here and their provocations for how we can, and should, *do* critical GIS. Cumulatively, the composition of these workshop participants was deliberately oriented towards broadening the remit of critical GIS. While geography as a whole remains dominated by white men, the subfields of geographic information science broadly, and critical GIS in particular, have been less successful than the discipline as a whole in their attempts to diversify and become more representative of the larger population. Of the nearly thirty participants at a previous workshop devoted to “revisiting critical GIS” and subsequent publication (Thatcher et al. 2016a), only five were women and three people of color. At our workshop, the majority of invited speakers were women and nearly 40% were people of color, while the demographics of the other workshop participants were even more strongly tilted towards oft-marginalized voices, with roughly 60% of attendees choosing

² The workshop website is still available online at <https://doingcriticalgis.umbc.edu/>.

to self-identify as women and 60% as people of color, to say nothing of the countless other axes of identity.

This diversity of workshop participants was not accidental. In order to address these persistent issues with both the demographic diversity and definitional narrowing of the field, we employed a few key strategies throughout the process of organizing the workshop. First, we sought to challenge the obdurate perception of GIS as a solely computational, technical, and quantitative endeavor divorced from much of the rest of the discipline's concern with social and environmental injustice. We explicitly deprioritized these more technical aspects in our call for participation, instead emphasizing a broader concern for the multifaceted ways that GIS might be "done." Second, another closely related issue we sought to overcome in the organization of the workshop was that many of the most compelling practitioners of a critical GIS focused on actually *doing* GIS were not necessarily operating within the bounds of academic geography at all, or even if they were, perhaps didn't identify as scholars of critical GIS. And because so much of the conversation around critical GIS has been dominated by more theoretically-oriented externalist critiques, many of these more diverse voices have been excluded from conversations about critical GIS, even if not intentionally. Therefore, beyond those scholars firmly planted in the subfield of critical GIS who were invited to present position papers, we also invited individuals whose primary affiliations or commitments were not to academic disciplines or institutions, but to community organizations directly confronting injustice, for whom GIS might have only been a small part of their work.

Third, in addition to those individuals who were directly invited to present position papers at the workshop, we publicized an open call for participants. Though this call was still published through the usual disciplinary avenues like AAG's Knowledge Communities and other listservs, we also explicitly shared the call beyond the bounds of where one would generally expect to find self-identified members of the critical GIS community, including widespread social media broadcasts and direct outreach to individuals and departments. Fourth, and perhaps most importantly, beyond just actively recruiting a more diverse group of participants, we also sought to provide material, financial support to those who wanted to attend. Through funding secured as part of Mahmoudi's start-up package at UMBC, we were able to reduce the usual barriers to academic conference participation by providing *all* attendees with funding to support their costs for travel, lodging, and meals, while also offering on-site childcare for workshop participants. Combined with our other deliberate strategies for broadening participation in the workshop, we believe this helped to produce a more demographically and intellectually diverse space for engaging around different ways of doing critical GIS, which we hope can be replicated in future such gatherings.

This relative diversity of participants is further reflected in the papers presented as part of this special issue, which avoids pointing towards a single, unified conception of critical GIS that can be enacted in all possible moments or situations. Through examinations of Indigenous, queer, and feminist mapping practices, new theoretical framings for critical mapping and new technologies for producing non-Cartesian maps, and approaches to participatory data collection and mapping (and the limitations thereof), the collected papers present their own partial perspectives on expanding what doing critical GIS can, and ought to, look like. There is a recognition of the need to be flexible and adaptable about from where and who we draw our inspiration in order to make critical GIS more attentive to a variety of possible worlds. In part because the technology that we call "GIS" has advanced significantly and opened up many new possibilities – including in ways that the technologies' developers may never have envisioned – and in part because we live in an ever-changing set of social circumstances, doing critical GIS requires "letting 1,000 flowers bloom."

Despite these multiple vantage points, the papers presented here tend to share in their argument that "doing critical GIS" is simultaneously a question of data, of ontology and epistemology, and of the

social dimensions or applications of mapping. That is to say, doing critical GIS is a multi-pronged endeavor that requires taking account not only of the technical considerations of whether the right data exists (or if we are even equipped to collect and store that data) and whether one has the tools to analyze it, but also whether one is approaching the data – and the phenomena it represents – in the “right” way. As Catherine D’Ignazio and Lauren Klein write, taking account of only the technical considerations will inevitably lead one astray, as “you can only detect the pattern if you know the history, culture, and context that surrounds it” (D’Ignazio and Klein 2020: 65). It is in this complex interplay between the technical, the conceptual, and the social that critical GIS is actually “done.”

Beyond this shared grounding in the fundamental components of any critical GIS praxis, the collected papers also cohere around a set of key themes, which are helpful in identifying some of the different possible ways of doing critical GIS in countless different contexts and use cases. As described in the following sections, these themes include (1) the mapping of presences, absences, and relations, as well as a focus on (2) rethinking the processes of mapping. Or, put slightly differently, they focus on *what* we map and *how* we map. While each of the authors in the special issue draws on countless others for inspiration that we encourage any interested readers to explore in more depth, we focus in the following sections on summarizing and situating the key contributions of each of the collected papers and how they advance this expanded conception of what doing critical GIS can or ought to look like.

Presences, Absences, Relations

When making a map, arguably the most fundamental thing one is doing is marking the presence of a particular phenomenon at a particular place, perhaps at a particular time. In other words, our maps are often focused, at a very basic level, on asking “what is where?” But in some cases more than others, spatializing phenomena and visualizing them on a map is an explicitly political act, making visible and legible that which is all too often erased. These topics play central importance in an era of “big data” marked by an uneven and increasing data gap between phenomena for which we have an abundance of data and phenomena for which we not only do not have data, but for which the task of abstracting the phenomena to “data” may be too complex.

Work like that of Lucchesi (this issue) seeks to make these presences known, in her case with respect to missing and murdered Indigenous women and girls. Similarly, in their interview with Michael Brown, Larry Knopp, and Bo Zhao, Swab and Giesecking (this issue) discuss the salience of putting queer space *literally* on the map, working against the dominant tendency for queerness to remain closeted and hidden from view. In these cases and countless others, the presence of a given thing on the map works to name and claim space, to assert the belonging of a group, or the actual existence of harm that might otherwise be denied.

Understanding where certain things *are* is only part of the equation, however, as sometimes it’s just as instructive to understand where certain phenomena are *not*. As Brian Harley once wrote, “Silence can reveal as much as it conceals and from acting as independent and intentional statements, silences on maps may sometimes become the determinate part of the cartographic message. So, just as in verbal communication the silence is more than the mere correlate of what is sounded, in the case of a map the silence is not merely the opposite of what is depicted” (Harley 1988: 58). Whether because a given phenomenon doesn’t actually exist in a particular place or because the data hasn’t been collected (or cannot be abstracted and stored) to map in the first place, these absences are just as important to understand and highlight today as they were for the early modern maps Harley was talking about. In their piece, Mahmoudi et al. (this issue) focus on these absences from the map, especially in the case of citizen science data. As they show, even when the phenomena being studied are spatially diffuse and nearly universal, citizen science data and infrastructure remains conspicuously absent from many places, especially those that are predominantly Black and low-income. So even as citizen science aspires to a

more representative engagement with the process of collecting scientific data, some people and places remain left off the map, and their everyday realities remain invisible to conventional ways of seeing the world. Importantly, they show how absences on the map may relationally produce scientific knowledge for white and affluent communities.

Despite the straightforward salience of understanding where things are or are not, not everything of interest to us as geographers can be boiled down to a simple binary of “there” or “not there.” Sometimes things can be present in – and produced through the connections between – multiple places at the same time. In their pieces, both Lally (this issue) and Shelton (this issue) pick up on threads of earlier work examining how critical GIS can incorporate non-Cartesian spatialities to visualize these more socially and spatially complex relationships. For Shelton, mapping the relational geographies of property ownership and rent extraction from predominantly poor, Black neighborhoods represents an opportunity to bridge what he sees as two sometimes disparate poles within the practice of doing critical GIS: the tendency to focus primarily on leveraging the ostensible objectivity of mapping to advocate for social justice, and the tendency to look at ways of reworking the map to promote new spatial imaginaries. It is primarily this latter point that Lally explores in his intervention, where he argues for a more creative, experimental, speculative and artistic engagement with mapping that he’s previously discussed as “gis”, or “geographical *imagination* systems.” Such practices can not only help to bring GIS into closer alignment with traditions of spatial theory from critical human geography, but also build new ways of thinking about the world that can be generative of alternative social and technical practices.

Processes

And while each of the aforementioned papers from this special issue reflect on the various presences, absences and relations depicted in the map, some also join with the remaining papers in the collection to point to the insufficiency of such a focus for doing critical GIS. Indeed, these interventions open up the further question of whether it is the final map product that we pay attention to, or whether it is the *process* of mapping that is deserving of our focus when trying to map critically (Kitchin et al. 2013).

Not only do Swab and Gieseke discuss the numerous ethical and political quandaries of mapping queer space in their interview with Brown, Knopp and Zhao, they also touch on the fact that the project of a queer cartography isn’t simply to put queerness on the map itself, but to reorient the process of mapping to better represent the challenge of queer spaces and ways of being in space to conventional cartographic representations. It’s not just that the subject of the map should be broadened to include queer people and places, but that the entire process of mapping should be queered, as Brown and Knopp (2008) argued a decade and a half ago. Similarly, at the same time as Lucchesi touches on the importance of making violence against Indigenous women and girls visible, she also highlights how the usual processes of doing so actually reproduce the victimhood of these women and girls, and renders them vulnerable yet again. By individualizing these incidents of violence and stripping them of their social context, Lucchesi argues that conventional maps of violence against indigenous women tend to absolve structures of blame, a shortcoming that she argues can only be rectified by putting the data and mapping tools into the hands of indigenous women themselves.

Meanwhile, Erin McElroy (this issue) raises crucial questions about the provenance of the data and tools we use to do critical GIS. Reflecting on longstanding work with the Anti-Eviction Mapping Project, McElroy calls into question the reliance on both third-party data brokers and digital mapping platforms that not only don’t share the political goals of activist groups like the AEMP, but actively work at cross purposes, valorizing the commodification of both data and housing as property. Whether this be in the case of corporate or non-profit data brokers that act as gatekeepers for crucial data about housing inequalities across the United States, or Silicon Valley digital mapping startups that have helped to fuel

the gentrification of California's Bay Area that AEMP has been so focused on critiquing, the process of doing critical GIS requires a reflection on these entanglements, and how we might avoid or directly counter them.

Kelly and Bosse (this issue) pick up on similar themes regarding the necessity of recognizing one's positionality. But rather than simply calling on mapmakers to explicitly acknowledge their intersecting identities, Kelly and Bosse focus on the importance of "pressing pause" throughout the mapping process in order to reflect upon, and ultimately challenge, the multiple dimensions of power at work in any given mapping project. Their paper demonstrates how even the most seemingly minute and mundane design decisions have the potential for differential impacts on marginalized people, and how, through greater attention and care for these issues, critical GIS processes can better help to challenge existing power relations. Ultimately, they offer a toolkit for feminist reflexivity in the mapping process, disrupting conventional mapping workflows by integrating written, audio, and visual materials to document and reflect on the process of mapping, rather than being oriented towards only the final map product itself.

Pursuing the Paths Forward

The work of these papers cumulatively represents what Elwood (this issue) calls a new, fourth generation of critical GIS, "that advances an extraordinary politics of theory and grounded knowledge making that exceeds the limits and legibilities of white supremacy, settler coloniality, and cis-heteronormativity." In her closing piece to this special issue, Elwood reminds us that naming such a fourth wave of critical GIS scholarship is not meant to delegitimize that which has come before, as much of the work featured here is explicit in its engagement with historical lineages of earlier waves of critical GIS. Instead, it points towards the importance of the crucial, unresolved issues and questions with this latest generation of work, suggesting that it is a radically open project and one that necessitates continued expansion and pushing of boundaries to fully realize a vision of critical GIS that enacts such an extraordinary politics.

While the papers in this special issue offer a number of different paths forward, there are similarly many paths still untaken when it comes to *doing* GIS critically. For instance, while Elwood notes the broadened theoretical grounding of many of the papers in this collection and in the field more broadly, there remain opportunities to, for instance, integrate the growing body of work in Black geographies with GIS theories and methodologies (see Scott 2021 and Alderman et al. 2021 for some early investigations along these lines). Whatever the particulars of one's approach, we would implore those thinking about such issues to not only continue producing critiques of the way GIS is used by others, but to use these critiques as the building blocks for developing new ways of doing GIS critically, demonstrating the fundamentally productive tension between GIS and critical social theory that our subfield has engaged for the last two decades or more, but which still has a promising future ahead.

References

- Alderman, Derek H., Joshua F.J. Inwood, and Ethan Bottone. 2021. "The mapping behind the movement: On recovering the critical cartographies of the African American Freedom Struggle," *Geoforum* 120: 67-78.
- Boll-Bosse, Amber J., and Katherine B. Hankins. 2018. "'These Maps Talk for Us:' Participatory action mapping as civic engagement practice," *The Professional Geographer* 70 (2): 319-326.
- Brown, Lawrence T. 2021. *The Black Butterfly: The Harmful Politics of Race and Space in America*. Baltimore, MD: Johns Hopkins University Press.

- Brown, Michael, and Larry Knopp. 2008. "Queering the map: The productive tensions of colliding epistemologies," *Annals of the Association of American Geographers* 98 (1): 40-58.
- Bryan, Joe, and Denis Wood. 2015. *Weaponizing maps: Indigenous peoples and counterinsurgency in the Americas*. New York, NY: Guilford Publications.
- Bunge, William. 1971 [2011]. *Fitzgerald: Geography of a Revolution*. Athens, GA: University of Georgia Press.
- Chambers, Samuel Norton. 2020. "The spatiotemporal forming of a state of exception: repurposing hot-spot analysis to map bare-life in Southern Arizona's borderlands," *GeoJournal* 85 (5): 1373-1384.
- Chambers, Samuel Norton, Geoffrey Alan Boyce, Sarah Launius, and Alicia Dinsmore. 2021. "Mortality, surveillance and the tertiary 'funnel effect' on the US-Mexico border: a geospatial modeling of the geography of deterrence," *Journal of Borderlands Studies* 36 (3): 443-468.
- D'Ignazio, Catherine, and Lauren F. Klein. 2020. *Data Feminism*. Cambridge, MA: The MIT Press.
- Elwood, Sarah. 2022. "Toward a Fourth Generation Critical GIS: Extraordinary Politics," *ACME: An International Journal of Critical Geographies* 21 (4).
- Harley, J. Brian. 1988. "Silences and secrecy: the hidden agenda of cartography in early modern Europe," *Imago Mundi* 40 (1): 57-76.
- Harvey, David. 1972. "Revolutionary and Counter Revolutionary Theory in Geography and the Problem of Ghetto Formation," *Antipode* 4 (2): 110-125.
- Harvey, David. 2022. "Reflections on an academic life," *Human Geography* 15 (1): 14-24.
- Jefferson, Brian Jordan. 2018. "Predictable policing: Predictive crime mapping and geographies of policing and race," *Annals of the American Association of Geographers* 108 (1): 1-16.
- Kelly, Meghan, and Amber Bosse. 2022. "Pressing Pause, 'Doing' Feminist Mapping," *ACME: An International Journal of Critical Geographies* 21 (4).
- Kim, Annette Miae. 2015. *Sidewalk City: Remapping Public Space in Ho Chi Minh City*. Chicago, IL: University of Chicago Press.
- Kitchin, Rob, Justin Gleeson, and Martin Dodge. 2013. "Unfolding mapping practices: a new epistemology for cartography," *Transactions of the Institute of British Geographers* 38 (3): 480-496.
- Lally, Nick. 2022. "What can GIS do?" *ACME: An International Journal of Critical Geographies* 21 (4).
- Leszczynski, Agnieszka. 2012. "Situating the geoweb in political economy," *Progress in Human Geography* 36 (1): 72-89.
- Lucchesi, Annita Hetoevéhotohke'e. 2022. "Mapping violence against Indigenous women and girls: identifying and moving beyond colonizing data and mapping practices," *ACME: An International Journal of Critical Geographies* 21 (4).
- Mahmoudi, Dillon, Amy Lubitow, and Mackenzie A. Christensen. 2020. "Reproducing Spatial Inequality? The Sustainability Fix and Barriers to Urban Mobility in Portland, Oregon," *Urban Geography* 41 (6): 801-822.
- Mahmoudi, Dillon, Chris L. Hawn, Erica Henry, Deja Perkins, Caren B. Cooper, and Sacoby Wilson. 2022. "Mapping for whom? Communities of color and the citizen science gap," *ACME: An International Journal of Critical Geographies* 21 (4).

- McElroy, Erin M.B. 2022. "Digital Cartographies of Displacement: Data as Property and Property as Data," *ACME: An International Journal of Critical Geographies* 21 (4).
- Payne, Will B., and David O'Sullivan. 2020. "Exploding the phone book: Spatial data arbitrage in the 1990s internet boom," *Annals of the American Association of Geographers* 110 (2): 391-398.
- Schuurman, Nadine. 2000. "Trouble in the heartland: GIS and its critics in the 1990s," *Progress in Human Geography* 24 (4): 569-590.
- Scott, Darius. 2021. "Normalized Alterity: Visualizing Black Spatial Humanities," *GeoHumanities* 7 (2): 475-493.
- Shelton, Taylor. 2017. "The urban geographical imagination in the age of Big Data," *Big Data & Society* 4 (1): 1-14.
- Shelton, Taylor. 2022. "Situated mapping: visualizing urban inequality between the god trick and strategic positivism," *ACME: An International Journal of Critical Geographies* 21 (4).
- Shelton, Taylor, Ate Poorthuis, and Matthew Zook. 2015. "Social media and the city: Rethinking urban socio-spatial inequality using user-generated geographic information," *Landscape and Urban Planning* 142: 198-211.
- Sheppard, Eric, and Trevor J. Barnes. 2019. Baltimore as Truth Spot: David Harvey, Johns Hopkins, and Urban Activism. In *Spatial Histories of Radical Geography: North America and Beyond*, edited by Trevor J. Barnes and Eric Sheppard, 183-209. Hoboken, NJ: John Wiley & Sons.
- Smith, Neil. 1992. "History and philosophy of geography: real wars, theory wars," *Progress in Human Geography* 16 (2): 257-271.
- Swab, Jack, and Jack Giesecking. 2022. "Toward Queering the Map 2.0: A Conversation with Michael Brown, Larry Knopp, and Bo Zhao," *ACME: An International Journal of Critical Geographies* 21 (4).
- Thatcher, Jim, Luke Bergmann, Britta Ricker, Reuben Rose-Redwood, David O'Sullivan, Trevor J. Barnes, Luke R. Barnesmoore, Laura Beltz Imaoka, Ryan Burns, Jon Cinnamon, Craig M. Dalton, Clinton Davis, Stuart Dunn, Francis Harvey, Jin-Kyu Jung, Ellen Kersten, LaDona Knigge, Nick Lally, Wen Lin, Dillon Mahmoudi, Michael Martin, Will Payne, Amir Sheikh, Taylor Shelton, Eric Sheppard, Chris W. Strother, Alexander Tarr, Matthew W. Wilson and Jason C. Young. 2016a. "Revisiting critical GIS," *Environment and Planning A* 48 (5): 815-824.
- Thatcher, Jim, David O'Sullivan, and Dillon Mahmoudi. 2016b. "Data colonialism through accumulation by dispossession: New metaphors for daily data," *Environment and Planning D: Society and Space* 34 (6): 990-1006.
- Wilson, Matthew W. 2011. "Data matter (s): legitimacy, coding, and qualifications-of-life," *Environment and Planning D: Society and Space* 29 (5): 857-872.
- Wilson, Matthew W. 2017. *New Lines: Critical GIS and the Trouble of the Map*. Minneapolis, MN: University of Minnesota Press.
- Xu, Wenfei. 2022. "The contingency of neighbourhood diversity: Variation of social context using mobile phone application data," *Urban Studies* 59 (4): 851-869.