Chapter 9

Doing Giscience Doing Geography

If you have made it this far, you've earned some brief reflections on all that has gone before.

COMMON GROUND: A SPACE TO THINK

The principal conceit of this book is that geography and giscience share common ground in the shape of an array of big ideas (see also Thatcher et al., 2016). However differently these ideas have been taken up in giscience and in subfields of geography, because they are shared they create a space where conversations can take place and new ideas and understandings emerge. This is true even—perhaps especially—when it is clear that little beyond a word is actually shared, and the idea itself has been taken in dramatically different directions. I have explored some parts of this common ground—space, scale, place, borders and regions, relationality and networks, time, and process and pattern.

For the most part it is clear that the giscience takes on these are less rich than those in geographical thought. This is hardly surprising.

Human language with its fluid relations between words and meaning is a much more supple medium for exploring ideas in nuanced ways than is computer code. Further, once software is written, it is anything but soft. Systems are built on systems, and the engineering dictum "if it ain't broke, don't fix it" prevails. Belying the shiny newness of computers, there are parts of present-day GIS platforms whose original code was written in the 1970s.[1] So space is implemented as coordinates and Euclidean distances; scale as a representative fraction; place as the difficulty of associating a label with coordinates; territory as polygons; and so on. And once the associated tools exist, they are used, and if they are good enough for many purposes, then why change? "In short," as Eric Sheppard notes, "GIS as we know it is the end result of a particular evolutionary path that may or may not be the best possible path" (2001, p. 546). These effects are particularly powerful when they become sedimented into general purpose platforms in widespread use—as today's geospatial platforms did three or four decades ago, leading to highly routinized kinds of geographical computing. While the dominance of the classic desktop GIS has been eroded in the last decade or so by web mapping platforms, many elements of the underlying architecture, associated data structures, and assumptions remain.

I hope it is apparent that the common ground of shared ideas between geography and giscience is teeming with opportunities for developing and extending computational representations of geography. Some of those opportunities seem clear enough: Relational space and networks, and methods for visualizing approximations to their complex high-dimensional topologies, are well known. In fact, earlier quantitative geographers have been here before (Gatrell, 1983; Forer, 1978; Tobler, 1961). It mystifies me that such work has receded from the geographic mainstream, given its possibilities. I am not alone in thinking this: Miller and Wentz argued that

> [t]hrough the vehicle of GIS, many researchers are adopting the Euclidean model and its related analytical possibilities without realizing its assumptions or its alternatives (2003, p. 574).

[1] To be fair, the same is true of *all* sufficiently old computing platforms.

and that,

> [r]econsidering and expanding the geographic representation model underpinning both SA [spatial analysis] and GIS is an unexplored avenue for improving analytical capabilities of both (2003, p. 574).

Similar rich possibilities exist with respect to all the big ideas we have examined.

It is unlikely that such exploration will lead to a new, generalized geospatial platform, a so-called "GIS/2" (Sieber, 2004), or *really* geographical information system, but we already have a generalized geospatial platform, and don't really need another one.[2] It would be great to fold some new ideas into the general platforms where this can be easily done (non-Euclidean space seems very feasible; see Bergmann & O'Sullivan, 2017), but this need not be a priority. The more urgent priority is that having once made tools for working with computational representations that offer more to geographers than geodetic precision and simple location, then through collaborative exploration still richer possibilities might emerge.

Like others (see Cope & Elwood, 2009), Marianna Pavlovskaya emphasizes the importance of enhancing the capacity of platforms for handling qualitative relations for such developments,

> [t]he challenge is to open up GIS to qualitative research so that complex relationships, nonquantifiable properties, unprivileged ontologies, and fluid human worlds can be represented and better understood (2006, p. 2016).

I agree, but I also think that this position overemphasizes the qualitative versus quantitative dimension of the limitations of geospatial platforms (see also Sheppard, 2001; Plummer & Sheppard, 2001) over their more hidden, underlying inflexible geometric (cartographic) defaults. I am convinced that the task of "[r]eimagining and reconstructing GIS as a flexible tool for creating diverse human geographies" (Pavlovskaya,

[2] Digital humanities scholars lacking a standard platform have found this lack to be a spur to creativity (Drucker, 2009).

2006, p. 2016)—and not only human geographies—will depend on GISers taking geographical thought much more seriously than they have hitherto.

DOING GISCIENCE: REPRESENTATION AS PROCESS AND PRACTICE

A major stumbling block for many critics of giscience is its failure to take seriously the problematic nature of representation. Refuting the notion that maps are in any way simple, unproblematic representations of the world lies at the heart of critical cartography, and getting to grips with the nature of the representational acts involved in geographical computing should be similarly central to any would-be critical giscience. The critique of giscience most conveniently encapsulated in the collection *Ground Truth* (Pickles, 1995) and the associated debates around that time led to the emergence of *critical GIS* (Schuurman, 1999). As I argued in the opening chapter, critical GIS has led to many projects that have demonstrated the viability of GIS as a platform for diverse geographic research, but this has happened without changing the computational tools and representations central to doing GIS.

In Chapter 1, I tried to deflect or at least postpone this criticism by making clear first that there is no such thing as a perfect representation, and second that a better way of thinking about representations in giscience is as propositions (Krygier & Wood, 2009; Wood, 2010b). Alternatively (but relatedly) Kitchin and Dodge (2007) suggest that

> the important question is not what a map is (a spatial representation or performance), nor what a map does (communicates spatial information), but how the map emerges through contingent, relational, context-embedded practices (2007, p. 340).

Similarly, computational representations in geography—some of them maps, but many of them not—are constantly in a state of becoming, as practitioners grapple with how best to represent their ideas computationally.

A substantial technical literature has emerged around "how maps work" (MacEachren, 1995) as representations, even as critical cartography has questioned the status of maps as representations. If we accept that the important thing about maps is how they emerge though practices (of data collection and collation, design, production, and so on), then similar ideas surely apply to computational representations of geography. If cartographers can develop guidelines for what kinds of visual variables, or color schemes, or fonts (and so on) work well or badly for conveying various kinds of geographical information (Bertin, 1967), then it is surely long past time for giscience to move beyond the limitations of the raster–vector debate (Couclelis, 1992),[3] in reflecting on its representational practices.

Other representations are possible, and while some of them have even been implemented, still more possibilities remain to be invented. But beyond raster and vector, few have been mainstreamed, and the advent of desktop GIS has narrowed the scope for making different kinds of representation while doing giscience, even in the face of vastly increased computational capacities (Gahegan, 2018). Changing giscience surely requires making different kinds of GIS, such as "geographical imagination systems" (the "gis" of Bergmann & Lally, 2021), not only using the same old GIS to do different things.

There are few things more likely to date a book than setting out a research agenda, so I am wary of providing a list of desiderata for a more geographical giscience, nor is it my place to do so. Rather the collective efforts of geographers, GISers, and giscientists will determine what comes next. Even so, skimming over the preceding chapters, and without cross-referencing them directly, since they recur regularly in many places, some persistent themes emerge. We might start with one of the shibboleths of giscience, its First Law, that "everything is related to everything else, but near things are more related than distant things" (Tobler, 1970, p. 236). Instead of emphasizing the urge to simplify of

[3] The doggerel *Yes raster is faster / But raster is vaster / And vector… / Just seems more correcter* attributed to Dana Tomlin by Clarke (2011, p. 77) is not wrong, as far as it goes, but the discussion of data models in giscience sometimes seems like it doesn't get much further than this—at any rate, not in educational settings.

this dictum's original context, we might interrogate more closely possible meanings of "related," "near," and "distant." Relative/relational space dominates geographical thinking, and is essential to any serious consideration of place, boundaries, and processes, yet relational models remain second-order representations in giscience. Dropping the insistence in many geospatial platforms that particular geodetic coordinate reference systems be rigidly applied, and allowing instead for user-determined coordinates (and the projections they imply), could greatly expand the variety of visualizable and computable spaces. Finding ways to recognize the fuzziness, ambiguity, porosity, and uncertainty of boundaries, and explore the implications of the fiat/bona fide distinction in geographical entities, has potential to open up new and different ways of seeing geographies. Good starting points already exist for all of these. Taken together, they might also set the stage for ways that processes, events, and patterns can be explicitly represented and described, so that the familiar entities of giscience become emergent, not fixed and pre-given.

In sum, there is considerable scope for rethinking giscience as a kind of speculative geographical metaphysics. To repeat myself, many materials for enlivening the practice of computational representations of geographies already exist in the common ground between giscience and geography. There is plenty to work with in many corners of giscience as it already exists, albeit around the edges,[4] and not conveniently at hand in standard platforms. None of this is to deny the insight that GIS is much more than the computer on the desk. It is simply to say that ideas that are implemented and embedded in code have particular force when it comes to doing GIS. The countermappers' dilemma of only being able to operate in the terms that the system permits stands in the way of real alternatives. If platforms remain unchanged, then it will be hard to ask different questions.

[4] Corners are where edges meet, so this may be a tautology…

TOWARD DOING DIFFERENTLY

The phrase "doing GIS" appears no fewer than 22 times in a paper by Wright et al. (1997a) which, read alongside a negative commentary by John Pickles (1997) and a crestfallen response from the authors (Wright et al., 1997b), emphasizes the challenge of taking both giscience and geography seriously. The question of what constitutes doing GIS is revisited by Matt Wilson (2017), who rightly argues,

> [l]oaded in that question is a series of assumptions about what it means to practice, and I think we can do more to broaden our vision of that practice as both technical and critical. This, of course, necessitates a shift in undergraduate and graduate programming (2017, p. 2).

I hope I've shown that one way to develop that "technical and critical" vision is to take the *geographical* in giscience more seriously, *and* for geography to take giscience more seriously also. As Wilson suggests, and as my own educational experience confirms (see Chapter 1), this will require new approaches to teaching.[5]

Outside isolated pockets, we have been at an impasse over this for decades. Wilson (2017) goes on to quote Pickles, writing of the 1990s that

> GIS students were rarely introduced to the prevalent debates about philosophies of science, social theory, and cultural studies [...] In parallel, the technical possibilities for larger data-sharing and analysis were not taken up by most Marxist, feminist, and humanistic geographers (Pickles, 2006, p. 765).

Wilson wryly adds, "this reflection could be as easily made about our current moment" (Wilson, 2017, p. 8). Whatever is to blame for such "lines drawn, divisions articulated and reinforced" (2017, p. 8), Wilson's concern is well-founded. Unsurprisingly, little has changed in the short time since, so it is high time to approach teaching giscience *and* geography differently. The doing of giscience and the doing of geography will

[5] Perhaps even approaches that find this book useful!

not change if we continue to teach them as fields apart. This applies with particular urgency to giscience, which should *really* "never again be quite the comfortable retreat for the technically minded" (Goodchild, 2006, p. 687), which it remains, in spite of the best efforts of critical GIS scholars. As I have noted, the representational palette of existing platforms is narrow, and tends to force all projects down particular paths, regardless of original intentions. But broadening the palette of available representations to enable new kinds of projects will only make a difference if we also broaden the training, both technical and critical, of would-be giscientists, so that they don't (like me) have to write a book to get there! If the GISers, who become part of the overall GIS infrastructure of machines, ideas, practices, and modes of thought, remain unchanged, narrowly trained (as I was), it will not much matter how different the tools become.[6]

The narrowness of giscience has recently abated a little as libraries for handling the basics have developed in open computing environments—in "sandboxes" such as R, Python, and most obviously the web—enabling mixing, matching, remixing, and even "playful mapping" (Wilmott et al., 2016). These more open environments can foster more playful approaches to teaching giscience, perhaps even assisted by increasingly powerful coding agents. Purposeful play, exploring possibilities beyond the routinized geospatial requirements of states and corporations, requires engaging with ideas from across the whole gamut of geography, and expanding the kinds of questions we ask of students in their learning. Whether playful or serious (or both), it was just such explorations that led to community mapping by way of the Detroit Geographical Expedition and Institute (Warren et al., 2019) and feminist GIS (Timander & McLafferty, 1998; McLafferty, 2002) and its descendants, which remain the most sustained examples of doing GIS differently, along with closely related efforts in participatory GIS and countermapping. Again geographical thought can be a rich source of prompts to such creativity, alongside the increasingly fertile ground at the intersection of art, cartography, and visualization (Lally, 2022).

[6] Anyone who has taught GIS will be familiar with the genius of students for framing every question as an overlay problem. They have learned too well!

FINALLY...

Astute readers will realize that these three reflections are alternative takes on the same argument. Geography and giscience curricula at all levels should explore the common ground that they share. There is no reason why an introductory GIS class cannot also be a class that critically examines fundamental ideas in geography, doing so beyond focusing only on the technical issues that arise in working with existing representations. Such exploration can be deeper and more extended at more advanced levels, but should be included from the outset. Questioning and changing the default geographical representations of giscience should be core to education in giscience, critical GIS, and geography.

Ultimately, the goal should not be separate worlds of giscience, critical GIS, and geography but a giscience that is technical and critical, and above all, thoroughly geographical. Such a giscience would not need bridging to geography, it would be right there at the heart of it. At the end of the first chapter I suggested that geographical thought and giscience "can mutually inform one another to enliven a more thoroughly geographical computing." I am excited to see what we come up with, together.