

Contextualizing narratives of Geography's past, present, and future: Synthesis, difference, and cybernetic control

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Abstract

In this article, we seek to open up for critical debate disciplinary narratives that center the “synthesis” qualities of geographic thought. Proponents of Geography often emphasize its integrative, synthesis approach to human–environment relations to underline its value to interdisciplinary research initiatives addressing critical real-world issues such as climate change. But there are multiple styles of knowledge synthesis at work within academia and beyond, and they have contradictory ethical and epistemological effects. More specifically, synthesis is on the rise, but it is not Geography’s synthesis-as-understanding. Rather, an increasingly dominant cybernetic sociotechnical imaginary is installing a specific notion of synthesis—“synthesis-as-solution”—into universities, transforming both the production of knowledge *and* the institutional management and technological manifestation of that production. This cybernetic sociotechnical imaginary constrains research ethically and epistemologically to reduce knowledge to the synthesizable information flows and continuous innovation that characterize cybernetic control. In this context, non-conforming research—that is, research that disrupts or disdains such smooth synthesis—risks being labeled unprofessional, unimportant, and obsolescent and marginalized institutionally. Geographic disciplinary narratives that unreflexively celebrate synthesis thus risk producing a paradoxical future for Geography, one in which more space for different modes of knowledge production is created, but the type of difference recognized and affirmed is severely constrained. There is a pressing need for geographers to pay more attention to the practices and contexts in which we create disciplinary narratives because, like the content of our knowledge production, they can either challenge or reinforce a cybernetic sociotechnical imaginary.

Keywords

Synthesis, cybernetics, design, interdisciplinarity

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Introduction: Narrating Geography's past, present, and future in the Anthropocene

If, as one of this journal's editors reminds us, "narratives [of disciplinary identity] impose order on what was, is, and could (or should) be," then this special issue's theme of "Geographical research for the 21st century" provides a chance to revisit influential narratives that hold sway within the discipline (Castree, 2015a: 5). Over the past two decades, growing scholarly engagement with the Anthropocene has included narratives that variously position Geography in relation to the Anthropocene's challenge to conventional, modern scientific, and environmental management practices. One set of narratives centers the discipline's human–environment tradition, and its status as an "integrative," "synthesis" field, in order to make the case for the discipline's relevance for interdisciplinary research networks on grand challenges such as global climate change, biodiversity loss, energy transitions, urban sustainability, and disasters and resilience (to name a few—see Gober, 2000; Harden, 2012; Turner, 2002). Alternatively, more critical narratives emphasize the discipline's ability to hold together, in productive tension rather than neat unity, multiple forms of knowledge production that destabilize conventional ways of knowing and managing social and environmental relations, and thus hold open genuinely different options for the kinds of issues and responses interdisciplinary research might address (Castree, 2016). However, as social studies of science scholars emphasize, practices of science cannot be divorced from wider societal dynamics. While both narratives, in their own ways, attempt to give the discipline a foothold into wider interdisciplinary initiatives, our concern is that the institutional landscape in which these narratives are embedded is beginning to shift in subtle ways that may present profound challenges to the discipline over the coming decades. More specifically, we are concerned that the institutional landscape is encouraging smooth synthetic knowledge, not politically attuned, more unruly knowledge.

Consider, for example, the increasingly paradoxical situation facing many geographers, particularly in Anglo-American geography. On one hand, geography is enjoying a renewed relevance. As we write, the 2021 United Nations (UN) Climate Change Conference (COP26) is underway in Glasgow. Debates over possible climate change mitigation and adaptation action are playing out in the shadow of the Intergovernmental Panel on Climate Change's (IPCC) Sixth Assessment Report. Published 3 months ahead of the conference, and featuring contributions from numerous geographers, the report identifies many widespread, ongoing, and irreversible changes to Earth's climate and environmental systems. The discipline's longtime concern with integrating social and natural sciences has positioned geographers to contribute to, and in some cases lead, interdisciplinary research on grand challenges outlined above. While the scope and focus of such interdisciplinary work remains contentious, particularly around questions of how to engage social science (Castree, 2016; Castree et al., 2014; Klenk and Meehan, 2015), the growing involvement of geographers in these research networks is introducing greater appreciation for considerations of place, space, context, scale, and power to conventional scientific and environmental management approaches.

On the other hand, many geographers are confronting increasingly hostile higher education sectors. In the United Kingdom, there's impending industrial action, fighting against hollowed-out pension and pay and continued workforce casualization. In Australia, the national government has used the COVID-19 pandemic as an excuse to increase the cost of humanities and social science degrees relative to areas "where there's a job" (interpreted as technology, engineering, and applied sciences) in order to try to "incentivise students to make more job-relevant choices."¹ Similarly, the Australian Government is directing national research funding into manufacturing to help "secure our economic recovery."² Despite an angry response from the Academy of Social Sciences³ to this new strategy, the Government is increasingly overt in privileging applied science, technology, engineering, and math (STEM) fields that drive short-term economic growth. Then, in the United States, an announcement on the 2020 reorganization of the US National Science Foundation's (NSF) Geography and Spatial

Sciences directorate into the Human-Environment and Geographical Sciences (HEGS) directorate explicitly identified “research that is predominantly post-modern, post-structural, humanistic, etc.” as “not a good fit for NSF.”⁴ After a social media firestorm, the NSF clarified its changes, suggesting that geographers are “uniquely situated to participate” in “convergent programs across NSF directorates such as Dynamics of Integrated Socio-Environmental Systems (DISES), Coastlines and People (CoPe), Sustainable Regional Systems (SRS) and Navigating the New Arctic (NNA),” and that, in addition to supporting relevant interdisciplinary research and basic “geographic science,” “research projects submitted to the program must illustrate their relevance and importance to people and societies” (see Note 2). Of course, who’s included in this invocation of “people and societies,” what relevance and benefits they receive from interdisciplinary and basic geography research, and why these, rather than others, are important are long-standing contentious questions in their own right (Johnston, 1997). As one astute observer noted, these directorate changes are taking place at a moment when the discipline is extending long-overdue recognition to Black and Indigenous geographic scholarship, which often registers as little more than the “etc.” in dismissive depictions of “research that is predominantly post-modern, post-structural, humanistic, etc.”⁵

These developments extend beyond the familiar academic disputes over questions of ontology, epistemology, or methodology (One world or many worlds? Modeling or hermeneutic analysis?) that often typify debates over how geographers should conceptualize their discipline and engage scholars from other fields. Instead, they signal the concretization of harsher, more revanchist stances toward non-positivist academic pursuits, methods, and even entire disciplines, as the Australian example above suggests. Furthermore, these reactionary initiatives are often couched in hopeful and uplifting language celebrating expanded opportunities for interdisciplinary research and innovative solutions to contemporary grand challenges, as the NSF restructuring in the United States illustrates.

Our concern in this essay lies with this paradoxical mixture of hope and revanchist indifference (at best) or hostility (at worst) toward scholarly diversity that seems to increasingly characterize the contemporary “environment” in which long-running debates over the status and future of academic Geography play out. This creates a context in which, even as the crisis of the Anthropocene widens the scope for geographic contributions to interdisciplinary research on grand challenges, a number of reforms across the higher education sector are threatening to reduce the discipline’s scope and diversity—precisely at the moment when Geography’s diversity is more ethically and politically necessary than ever before (Ferretti, 2021; Oswin, 2019). In this short article, we seek to unpack this “environmental” condition and think through its implications for the geographic research in the 21st century.

Specifically, we argue that the growing influence of a *cybernetic sociotechnical imaginary* is threatening to exacerbate this paradoxical demand to both *embrace* and *repudiate* social and environmental difference in the Anthropocene. A threat to not only the *production and use* of knowledge, but also the institutional *management* of the production and use of knowledge, a cybernetic sociotechnical imaginary valorizes a geo-historically unique sense of synthesis, what we call here “designerly synthesis.” In contrast to more familiar styles of synthesis in Geography, designerly synthesis explicitly addresses problems of complexity, such as the grand challenges described above, through embracing contingent, partial, transdisciplinary knowledge and pragmatic solutions. Resonant with the neoliberalization and managerialism of higher education, the cybernetic sociotechnical imaginary tries to shape institutions around the imperative to produce “innovation” and enabling “innovation ecosystems.” Taken together, this imaginary strives to reconfigure the desires and goals that animate academic practice. Specifically, it introduces a libidinal investment in *in-formation*:⁶ the individual and collective *desire* to make the human and non-human in the Anthropocene commensurable by rendering reality as information, as functional abstractions that can be endlessly re/synthesized into innovative, pragmatic solutions. In this way, designerly synthesis becomes the “object” on which the insecurities of academic practice in the Anthropocene are becoming affixed: *hope* for solutions to

complex problems, *longing* for institutional recognition and affirmation from funding agencies and research councils, *attraction* to certain research methods and scientific techniques, *excitement* and *enthusiasm* for interdisciplinary collaboration, and *repulsion*, *indifference* and *disinterest* toward practices that do not share the same hopes, attractions, and excitement.

We see this in-formational desire as an increasingly consequential entrant in debates over the trajectory of geographic research. Notably, it carries with it an ethical and epistemological compulsion for *in-formational commensurability*: a demand for difference to make itself transparently legible in order to facilitate synthesis. Cybernetic practices of control operate through the progressive elimination of difference by actively incorporating difference as input into an emergent system (Tiqqun, 2020). “Non-conforming” difference disrupts synthesis and thus innovative solutions. From the perspective of a higher education sector recalibrating itself around designerly and cybernetic norms, practices, and desires, non-conforming academics and non-conforming disciplines are those whose knowledge production practices and outputs resist synthesis into widely interdisciplinary collaborations and pragmatic solutions and who, in turn, become marked as unprofessional, unserious, superfluous, expendable—and thus easy targets for budget cuts, reduced research support, casualization, and even departmental elimination (Harney and Moten, 2013). More problematically, as the case of the NSF restructuring shows, these punitive measures are often celebrated by proponents for enhancing their discipline’s apparent commitment to pragmatic, solutions-oriented interdisciplinary work.

As we see it, the danger confronting Geography is that academic practice organized around the ethical and epistemological demands of a cybernetic sociotechnical imaginary may compel proponents to wager disciplinary health on the autoimmune elimination of diversity within their discipline: the institutional elimination of non-conforming research programs, scholars, and departments becomes, in this view, a *necessary condition* for the discipline’s own persistence. As geographic research in the 21st century is increasingly subjected to these pressures, it is imperative that geographers strategically use the discipline’s growing relevance within interdisciplinary networks to actively transform research practices in ways that support and cultivate not only its own future, but diverse forms of knowledge within and beyond the academy.

Recognizing difference in synthesis

Key to Geography strategically engaging with the growing influence and effects of a cybernetic sociotechnical imaginary is recognition that there are two different forms of synthesis—a difference that the latter imaginary tries to neutralize by cannibalizing the other form.

Geographers working in multiple sub-fields emphasize how renewed interest in the discipline within interdisciplinary research networks reflects its status as a “synthetic” field of knowledge on human–environment relations (Turner, 2002). As Larsen and Harrington (2021: 736) explain, synthesis in Geography typically takes the form of scholarly bricolage, in which “geographers collect concepts, skills, and perspectives to help humans comprehend their relationship to the world.” This creates a “positive syncretism” (Castree, 2016), in which the practices of geographic synthesis do not take for granted pre-specified problems of inquiry—such as the need to develop pragmatic solutions to grand challenges—but rather hold together diverse analytical, methodological, and ontological approaches in a generative tension. Geographic synthesis directs our attention to multiple spatial and socio-natural practices that are irreducible to the figure of the utility-maximizing rational individual commonly assumed in fields such as environmental economics (see, for example, McKittrick, 2021; Wright, 2020; Wright and Tofa, 2021). As such, it can radically open up questions about what issues matter and what desirable responses to those issues look like, both in applied and critical research (Baptiste and Rhiney, 2016; Davis et al., 2019; Lane et al., 2011). As Castree (2015b, 2016) argues, this heterodox sensibility enables geographers in particular—but by no means exclusively—to

challenge and reframe interdisciplinary research agendas in ways that orient inquiry on contemporary social and environmental issues toward more progressive and emancipatory outcomes.

This vision of synthesis contrasts with that increasingly promoted in large-scale international programs. For example, in the International Science Council's 2018–2021 *Action Plan*, a data-driven interdisciplinary project is showcased under the heading of “making data work for cross-domain grand challenges.” The authors write

Many of the major contemporary problems faced by science and society are inherently complex. They concern the operation of systems that exhibit emergent behaviour as a consequence of interactions between their component parts. Some examples include the operation of cities, of the human brain, of the dynamics of infectious disease, of climate change and of pathways to sustainability. Researching these challenges almost invariably requires interdisciplinary collaboration. The tools of the digital revolution, now enhanced by the techniques of artificial intelligence, have created unprecedented opportunities to exploit such collaboration by integrating relevant data from disparate disciplinary sources.⁷

This synthetic “integrat[ion of] relevant data from disparate disciplinary sources” bears little resemblance to the “bricolage” Larsen and Harrington, Jr., describe. At least two differences stand out.

To begin, synthesis via bricolage is oriented toward producing knowledge that enables comprehension. Larsen and Harrington, Jr., leave open the question of whether comprehension derives from analytical (scientific/social scientific) or hermeneutic (arts/humanities) knowledge, leaving a large umbrella for both quantitative and qualitative geographic approaches. In contrast, synthesis of the sort envisaged by the International Science Council does not “researc[h] challenges” in order to develop analytical or hermeneutic understanding. Rather it addresses a specific class of problem: complex and indeterminate “wicked problems” that are irreducible to the scope of a single disciplinary field (Rittel and Weber, 1973; in geography, see Barnett, 2022; Collier and Gruendel, in press). Key to how wicked problems are understood here is that they often look different depending on the perspective from which they are viewed. Thus, disciplinary knowledge takes on a new role: it offers partial, “bounded” knowledge on wicked problems from a limited perspective. Consequently, it becomes useful only through a second-order process of synthesis that can yoke different forms of disciplinary knowledge into provisional courses of action through techniques of knowledge integration that reduce knowledge inputs to information, even data, often mathematics. Associated techniques such as design, modeling, and simulation, are now standard modes of knowledge production (unlike the exploratory play of geographic bricolage). Simulations of system dynamics, for instance, are celebrated for allowing scientists, policymakers, and other “stakeholders” to visualize and explore how a system might respond to disturbances and other interventions, and to design provisional, pragmatic solutions in the face of otherwise paralyzing complexity. This style of synthesis is characteristic of what Simon (1996) calls the artificial sciences, such as design, engineering, or medicine. Indeed, the field of design studies stakes its disciplinary identity on its claim to develop knowledge on the processes and practices of synthesis that characterizes design practice (Buchanan, 1992; Cross, 1982).⁸ Thus, we might clarify this first distinction: on one hand, synthesis-as-understanding, or geographic synthesis; and on the other, synthesis-as-solution, or designerly synthesis.

A second difference lies in the ethical orientation of each style of synthesis. While some geographers trace geographic understandings of synthesis to the Kantian distinction between systematic sciences, defined by their object of study, and synthesis sciences, defined by an integrative approach (Turner, 2002), the practice of geographic synthesis reflects a more general ethical and epistemological concern with understanding and engaging with difference to destabilize universal truth-claims. In contrast to this geographic heterodoxy (Castree, 2016), designerly synthesis has roots to the mid-20th-century emergence of cybernetics, which strongly influenced behavioral scientist Herbert Simon mentioned above. Cybernetics is commonly defined, after mathematician Wiener (1948), as “the

science of communication and control in the animal and machine.” In brief, cybernetics attempts to account for the totality of existence through an *in-formational* ontology, a vision of “what exists” as a *process* of constant emergence that is driven by information exchange within and across dynamic organic and mechanical systems. As a complex, “wicked” phenomenon, this process cannot be known with predictive certainty, and is thus not amenable to optimization through the instrumental application of basic analytical scientific knowledge. Instead, techniques of simulation, adaptive management, and algorithmic calculation can model, monitor, and modulate this process in ways that allow it to develop within an acceptable, if sub-optimal, and satisficing trajectory (Simon, 1996; see also Amoore, 2020; Dodge and Kitchin, 2005 for geographic critiques).

Our point is that there are two distinct styles of synthesis. First, a geographic synthesis that engages social, environmental, ontological, and epistemological difference to challenge universals and create further differentiation. This is a form of synthesis that strives to generate novel difference; we can represent it as: Difference → Synthesis → Differentiation. Second, a designerly synthesis that engages difference to create a provisional solution. This is a form of synthesis that strives to create a partial yet pragmatically actionable unity; we can represent it as: Difference → Synthesis → Unity. Crucially, the tension between the two is not just an academic debate; or it is an academic debate, but not only in terms of knowledge content. As we now discuss, there are signs that the second form of synthesis—designerly synthesis—is shaping the context of academic knowledge production, adding to the challenge for those within the system (such as ourselves) advocating for an alternative geographic approach.

A cybernetic sociotechnical imaginary

The emergence of a broader cybernetic sociotechnical imaginary in Anglo-American contexts is contributing to the increasing influence of designerly synthesis in the management as well as content of academic knowledge production.

By sociotechnical imaginary, we are referring to Jasanoff and Kim’s (2009) assertion that there are “collectively imagined forms of social life and social order reflected in the design and fulfillment of nation-specific scientific and/or technological projects” (p. 120). The ideas, beliefs, and visions that make up an imaginary are constantly evolving in both scope and reach, in ways that shape—including quite literally, through physical artifacts and infrastructure—how individuals and collectives can understand, approach, and respond to phenomena in question, such as smart city urban governance (Sadowski and Bendor, 2019) or energy policy innovation (Jasanoff and Kim, 2013).

The dominant sociotechnical imaginary in Anglo-American science has, historically, reflected a belief in the limitless benefits of technology with limited, manageable risks (Jasanoff and Kim, 2013). However, faith in the unbounded potential for applications of basic science to optimize human and natural outcomes wavered during and after the World Wars. Cybernetics helped restore faith in science to master uncertainty—but it did so by recalibrating what *mastery* meant and how it could be achieved (Tiqqun, 2020). Cybernetic control does not work via totalizing knowledge and prediction. While precise analytical and predictive knowledge of human and environmental conditions remains useful, it is reframed as insufficient for “mastery” of an emergent, complex environment. What is instead foregrounded as most important is the *process* of automated observation and adaptation, a process that creates emergent order that continually evolves *through* disorder and uncertainty.

Recent work in fields such as the history of science, science and technology studies, sociology and international relations has traced the influence of cybernetics on contemporary forms of thought and governance (e.g. Chandler, 2018; Dillon and Reid, 2009; Heyck, 2015), as well as on new capitalist accumulation strategies predicated on adaptively integrating diverse forms of knowledge from laborers and consumers in order to innovate production (Thrift, 2006; see also Boltanski and Chiapello, 2018; Tiqqun, 2020). In higher education, Cold War-era proponents of interdisciplinarity made the

cybernetic promise of mastery a feature of their efforts to construct a new model of science and repurpose World War–era research to civilian ends to help better ward off and manage the chaos that the wars had proved could exist. War-time research illustrates that interest in problem-oriented social science research already existed. Although in the early 20th century, US academia was generally focused on clarifying disciplinary boundaries and securing individual disciplines’ institutional standing, philanthropic organizations such as the Rockefeller Foundation dedicated considerable resources to support problem-oriented work. Although they incorporated the need for fundamental research, they framed their objectives in terms familiar to contemporary geographers. As Crowther-Heyck (2006) emphasizes, between the 1930s and 1960s, “they consistently defined their funding agendas around the *solution of real-world problems* that invariably cut across disciplinary lines, and they deliberately eschewed discipline-based funding structures” (p. 314, italics added).

This emergence of a cybernetic imaginary has breathed new life into this pre–World War II interest in a certain mode of interdisciplinarity (Heyck, 2015). Its promise of order within a context of crisis has especially provided proponents of problem-focused science with a new set of techniques and rationalities to further reconstruct and prosecute the vision of science as interdisciplinary and dedicated to identifying and addressing emergent social needs. In doing so, this imaginary has reconceptualized both “science” and “society.” First, a disciplinary model of science—even one that claimed to deliver social impact by simply *applying* its fundamental knowledge to real-world issues—has come into question. As indicated above, the wickedness of contemporary problems has cast rigid disciplinary boundaries as redundant and called into question the very logic of disciplines (Pickering, 2013). Concurrently, a cybernetic sensibility has transformed the idea of “the social” as a kind of sphere where impact is meant to be achieved. Rather than a unified, totalizing whole whose qualities and needs can be analytically determined, in a cybernetic lens, the social has come to mean an emergent collection of boundedly rational individuals pursuing limited and often conflicting satisficing goals in a complex environment. Social needs, in turn, are reimagined as emergent and subjective, appearing differently to individuals on account of their distinct forms of bounded knowledge on complex problems at a given moment.⁹ In these conditions, the ability of scientists or any other knowledge producers to address social needs becomes contingent on their willingness and ability to synthesize their own bounded (disciplinary) knowledge with other forms of equally bounded knowledge to continually re/define and address social needs, or what are framed, through the same lens, as wicked problems.

Becoming invested in cybernetic synthesis

An affective economy of excitement, hope, enthusiasm, and faith permeated early cybernetics research as much as contemporary interdisciplinary endeavors (Crowther-Heyck, 2005; Mirowski and Nik-Khah, 2011).¹⁰ Then and now, cybernetics has demanded a libidinal investment in its informational ontology, ethics, and epistemology—transforming the beliefs, ideas, visions, and practices that make up designerly synthesis into objects of desire through which individuals understand themselves and their place in the world.

A consequence of this affective economy is that it helps identify those who are, and are not, invested in the ideal of cybernetic control. Combined with the transformation of the social into a collection of individuals—a collection in which, as indicated above, academics are just one voice among many with no privileged claims on what is right or important—this means that if academics do not participate in synthetic knowledge production about the social, their absence is easily dismissed as a mere matter of personal choice. Elements of this are evident in the way that proponents of cybernetically inflected interdisciplinarity frequently highlight individual and collective attitudinal dispositions that foster synthesis. For example, in a prominent call to promote (designerly) synthesis in geography, President of the American Association of Geographers, Patricia Gober, stressed that “the path to synthesis will

involve a culture change for geography,” in which geographers “must learn to pass more easily and more often between reductionist analytical habits and more synthetic ones” (Gober, 2000: 9–10). Similarly, Rebekah Brown and colleagues, reflecting on interdisciplinary collaboration between the social and biophysical sciences, characterize interdisciplinary research as a “personal journey” in which scientists typically pass through three stages of development within interdisciplinary networks: first, a continued, vocal attachment to disciplinary identity and methods; second, a more passive acceptance of the importance of other disciplinary perspectives; and third, settling into a space of “constructive dialogue” (Brown et al., 2015: 317). For Gober, the capacity for such “constructive dialogue” reflects a scientist’s “ability to contribute *seamlessly* to a larger intellectual enterprise that is required to understand large, complex systems” (Gober, 2000: 9, emphasis added).

More broadly, interdisciplinarity generates a range of affective dispositions that color how academics come to understand their work. Our own experience within a variety of interdisciplinary research initiatives suggests that the practice of interdisciplinarity is a source of excitement for scholars invested in the hope that interdisciplinarity can provide solutions to grand challenges. Their enthusiastic faith in the transformative promise of their research animates the “dynamic relationships” (Brown et al., 2015: 317) that sustains networks across disciplinary divides. It contrasts especially strongly with the sometimes overbearing cynicism of critical social science research that uses the crutch of post-political analysis to dismiss out of hand any attempts to engage with contemporary problems (Wakefield, 2020; Wark, 2019).¹¹ Yet, as other critical scholars have cautioned, the demand for knowledge contributions that will integrate “seamlessly” with others dangerously reduces the space for agonistic debate and disagreement (Barry et al., 2008; Klenk and Meehan, 2015). It is thus of great concern that not only is designerly synthesis becoming the common sense approach, but that the related cybernetic sociotechnical imaginary is becoming installed into the institutional machinery of higher education.

University innovation as cybernetic synthesis

The compulsion for synthesis within a cybernetic sociotechnical imaginary carries an implicit demand for the commensurability of all knowledge, which is shaping research and universities at *multiple* levels. In addition to research projects, cybernetic ideas and applications are redefining the knowledge landscape of higher education. In particular, a three-part shift from research to innovation ecosystems is evident. First, the rise of innovation—defined in most basic terms as something both “new and useful”—has increasingly displaced the focus on research. As historian of innovation, Godin (2017) notes

Today, basic research is relatively absent from the vocabulary of governments and industry, compared to the 1960s-70s. [. . .] Departments or administrative units in charge of research policy now define their fields of responsibility as “research and innovation.” The EU commission, for example, has established a Directorate-General for Research and Innovation (formerly DG Research). EU member states have meanwhile adopted the label “research and innovation” for funding programs and directives. In the United Kingdom the government set up the UK-IRC recently, merging research and innovation in a single agency. In sum, research has disappeared as an autonomous object. Innovation is the keyword. (p. 1)

With research now framed as “not enough,” Godin argues that the key concepts in the innovation discourse include “need, coupling, process and system” (p. 1).

Unsurprisingly, then, the second shift is toward generating *innovation systems*. With innovation framed as a system output, “system” is defined in cybernetic terms as a set of arrangements enabling the “transformation of inputs into outputs through activities performed by agents or actors interacting with an environment” (Granstrand and Holgersson, 2020: 2). Since the 1980s, governments have been trying to orchestrate innovation systems at various scales (nation, region, city), partly to force

universities to more tightly couple to each other and industry (Godin, 2009). As geographers have helped document, these efforts to make university and other research more “interoperable” have had mixed success, triggering scrutiny of the idea that innovation can be driven by top-down, large-scale initiatives, and leading innovation discourse to focus more individualistically on value, dynamics, and the subject-specificity of “what is usable?”

As a result, a third shift has emerged: from innovation systems to *innovation ecosystems*. Here, the addition of “eco” has nothing to do with sustainability and everything to do with a more bottom-up, actor-specific (customer-specific) lens on innovation. First defined as “the collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution” (Adner, 2006)—a description that maps neatly onto the intent of many industry-facing interdisciplinary projects—innovation ecosystems take into account and selectively draw upon the diverse actors, relations, and information that potentially influence the generation of what a specified group (customer) believes to be innovative at a given point in time. A recent effort to *synthesize* over 100 definitions of “innovation ecosystem” into one better able to “facilitate operationalizations in economic terms” defines an innovation ecosystem as

the evolving set of actors, activities, and artifacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors. (Granstrand and Holgersson, 2020: 3)

Illustrating their definition with three examples of digital technologies including Apple iPhones, the authors do not mention natural ecologies, but do strongly emphasize the important role of artifacts which “include products and services, tangible and intangible resources, technological and non-technological resources, and other types of system inputs and outputs, *including innovations*” (p. 3, italics added). In other words, innovation is itself framed in cybernetic terms within innovation ecosystems as both output and input. In particular, technological systems of the sort that foster and bound interdisciplinary synthesis are recognized as not only innovations but—in keeping with the idea of a socio-technical imaginary—as influential components of the artifactual environment in which innovation is sought, and thus as active influences upon the capacity for and character of *further* innovation.

Each of these shifts has deepened the grip of a cybernetic sociotechnical imaginary and placed universities more and more on the back foot. The shift from research to the more-than-research and better-than-research idea of innovation arose as an explicit attempt to disrupt university’s discipline-based monopoly on new knowledge (Godin, 2017). The shift to innovation systems arose out of governments’ and businesses’ efforts to discipline universities and better harness their knowledge production to meet their needs (Godin, 2009). And the shift to individual-centered innovation ecosystems further displaces universities as privileged arbiters of knowledge, challenging not only their right to determine truth but the value of their institutional scale. In these ways, the Enlightenment ideal of universities and disciplines as collectives and structures based on the mission of progressing knowledge has been profoundly challenged. Universities, disciplines, research departments, research teams, and individual academics are all now viewed as commensurate to firms which need to innovate within the constraints of cybernetic synthesis or accept their own demise. If the *difference* of university-based knowledge—that is, the unique quality of academic scholarship—is found to be irreconcilable with, rather than useful to, the cybernetic machine that is now sensing and making the world, it risks being dismissed by the same logic as uncooperative, irrelevant, and having the wrong disposition.

Indeed, academic knowledge, and even research and education, is increasingly fading from view even within universities as the cybernetic mind-set of managerialism colonizes higher education. The ideology of managerialism sees universities as one organization among many and celebrates generic, transferable practices such as performance measurement as a way of trying to better balance universities’ inputs and outputs and make them more compatible with their (economic) environment (Davis

et al., 2016; Franklin, 2015). This effort to control universities includes turning them (i.e. their research and/or education and always brand) toward particular aspects of the external environment, such as industry demand for undistruptive input on managing systemic risks such as cyber-security or climate change. The goal here is for universities to be responsive and cooperative. In the process, truth is “eliminated from managerial equations,” critical knowledge is “marginalised” (Kilkauer, 2013: 153, 193), and “anything that cannot be included is denied functional existence” (Franklin, 2015: 94).

Implications for Geography

In this short article, we have briefly detailed how the wider institutional and affective atmospheres in which debates over the future of Geography will play out—particularly in Anglo-American corners of the discipline—are being increasingly saturated by a cybernetic sociotechnical imaginary. To return to our concerns at the start of the article, what implications for geographic research in the 21st century might follow from our efforts to differentiate geographic synthesis from designerly synthesis, and situate designerly synthesis within this wider cybernetic sociotechnical imaginary? At least three implications stand out.

First, differentiating and historicizing distinct styles of synthesis can help focus attention on the potential *complicity* of geographic research in ongoing transformations of the techniques and practices of contemporary rule. Since the discipline’s radical turn in the 1970s, geographers have drawn increasing attention to Geography’s historical roots in imperial rule and the ongoing colonial demand for totalizing knowledge and a “mechanistic” understanding of the dynamic, messy world (McKittrick, 2021; Ó Tuathail, 1996; Oswin, 2019), to say nothing of its complicity in the creation and maintenance of gender norms (Domosh, 1991) and the destructive enforcement of heteronormativity within the discipline (Mountz and Williams, 2017). If, as we saw above, the cybernetic demand to make social and environmental difference transparent, legible, and amenable to functional, designerly synthesis represents an intensification of the modernist effort to control and eliminate difference and strongly resonates with the ongoing neoliberalization and more specifically managerialism of higher education, then disciplinary narratives that celebrate synthesis without questioning what style of synthesis they are celebrating risk obscuring, at best, and advancing, at worst, Geography’s potential complicity in cybernetic forms of rule.

Second, along these lines, our arguments here also challenge geographers to explicitly account for *difference* within our disciplinary narratives. On one hand, this is commonsensical: Geography is marked by difference. It is characterized by its famed human and physical geography components, heterogeneous sub-disciplines, epistemologies, styles and agendas, and their synthesis-as-understanding. Although it is far less diverse than it ought to be, it is also far from seamless. The difference Geography makes is this attention to and libidinal investments in difference, not only in its subject matter, but also in the theory, methods, and everyday practices that make up the discipline (Castree, 2015a, 2016; Oswin, 2019). In these narratives, difference matters because it can unsettle universalizing claims and create alternative ways of thinking and acting that can, in turn, spur new kinds of questions, issues, and responses for research to examine.

On the other hand, in the 21st century, how we as geographers think about and approach difference can no longer be separated from the cybernetic compulsion to instrumentalize difference as input to management techniques that regulate emergent socio-ecological futures. In a cybernetic sociotechnical imaginary, difference is valued to the extent it can be harnessed for in-formational control and order (Tiqqun, 2020; Wark, 2019). This libidinal investment in difference is becoming increasingly influential within interdisciplinary research networks. It reflects a desire to reconstitute, in increasingly artificial form, the modernist compulsion to control and eliminate incommensurable difference. In the Anglo-American academy, it is increasingly realized through styles of interdisciplinarity that enact epistemological and ethical closure, valorize commensurability, and pathologize

non-conforming difference. What this means in a discipline as varied and diverse as Geography is that uncritically adopting narratives that center cybernetic demands for designerly styles of synthesis and interdisciplinarity runs the risk of devaluing and even eliminating the forms of difference that make Geography matter, even when such narratives are ironically adopted in an effort to underline Geography's uniqueness. At issue is not only the way that these demands mark certain intellectual traditions and even entire sub-disciplines superfluous and expendable. The problem is that narratives that celebrate the discipline's synthetic lineage without specifying what style of synthesis risk producing a paradoxical future for Geography in which more space for difference is created, but the type of difference recognized and affirmed is severely constrained. We need to ensure that any welcoming embrace that Geography receives in contemporary institutions does not only register certain styles of Geography as valid and worthy of support.

Finally, differentiating and historicizing distinct styles of synthesis can help qualify the *value* placed on synthesis within disciplinary narratives that celebrate Geography's contributions to interdisciplinary research on grand challenges. Geographers have long recognized how demands for commensurability within interdisciplinary research networks reduce the space for public discussion over genuine alternative social and environmental trajectories (Castree, 2015a, 2016; Klenk and Meehan, 2015). A cybernetic sociotechnical imaginary further forecloses the space for agonistic deliberation by instrumentalizing designerly styles of synthesis as ends in themselves. It valorizes synthesis not for its specific outputs but for the way it performatively enacts cybernetic practices that promise control and order in the face of mounting complexities and uncertainties. In contrast, the synthesis-as-understanding that geographers have historically tended to practice offers a different kind of value. Here, synthesis matters not because geographers' familiarity with synthesis thinking makes the discipline uniquely suited to join up with existing interdisciplinary research networks and initiatives to address grand challenges in innovative ways. Instead, geographic synthesis can radically reconceptualize what kinds of problems and demands geographic research should address in the 21st century. Rather than simply conjoining with existing cybernetically inflected research agendas, geographers are uniquely positioned to destabilize the underlying assumptions that interdisciplinary research should find "innovative" "solutions" in the first place (Castree, 2016). It challenges forms of thinking that encourage interdisciplinary research to approach contemporary injustices, vulnerabilities, and uncertainties as "grand challenges" that express the complexity of the world—rather than, for example, as conditions that exist because of historically specific and geographically intertwined power relations rooted in racialized and gendered violence and colonial domination and appropriation. Obviously, geographers are not alone in this endeavor (see Bonilla, 2020; Sheller, 2020). But geographers' practices of synthesis, and the discipline's general libidinal investment in difference for the sake of difference, allows geographic synthesis to open rather than foreclose the range of possible issues and responses interdisciplinary research on contemporary conditions might consider.

Geographic research in the 21st century thus has much to offer the pursuit of alternative forms of interdisciplinarity that do not conform to the integrative-synthesis ideal outlined here. For us, this is a key take-home point: for both scholars of interdisciplinarity and geographers in the field, *interdisciplinarity, like synthesis, is also polyvalent*.¹² Henry Buller, for example, suggests that interdisciplinarity is perhaps better understood as fundamentally explorative: "an emerging research praxis whose finality is more experimental, less absolute, less definitive and less objectifiably conclusive" than other forms of research (Buller, 2009: 402). Even when integration is the goal—as in much interdisciplinary climate change research—different approaches are possible (Bulkeley, 2019a, 2019b; Castree, 2019).¹³ Recent geographic research bears this out: geographers have creatively approached interdisciplinary research in ways that radically open up what kinds of problems interdisciplinary research can address, what kinds of data and styles of analysis can be utilized to study these problems, and who (and what) can be involved in the production of knowledge on these problems (see especially Lane et al., 2011; Tadaki and Sinner, 2014; Weir, 2009; Wright and Tofa, 2021 for reviews, see Castree, 2015a, 2016).

The discipline has made considerable headway in rejuvenating long-lost traditions of *radical science* in the Anthropocene (Castree, 2015b; see also Wark, 2016, 2019). Even if the adoption of more critical approaches to interdisciplinary research will necessarily be slow-moving in order to allow skeptics to accommodate themselves to new practices of science that blur facts and values (Tadaki et al., 2015), there is a pressing need for geographic research in the 21st century to continue this heterodox work of holding open possibilities for alternative styles of interdisciplinarity and synthesis so that the contributions we make to tackling urgent issues such as climate change are as effective as possible. To do this, geographers of all stripes need to pay attention to the detail—not only in the empirical world we proudly study, but in the knowledge production processes and institutional context we are enrolled in, and the way we build these processes into the narratives we construct on the discipline’s past, present, and future. Stiegler (2018: 237) argues that to help take care of the world, we need to “take care of knowledge” and take care of thinking. While this requires effort in all sorts of arenas, our hope is that this journal contributes to both.

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Notes

1. Australian Government Minister for Education, Dan Tehan, National Press Club Address, 19 June 2020: <https://ministers.dese.gov.au/tehan/minister-education-dan-tehan-national-press-club-address>
2. Australian Government Acting Minister for Education and Youth, Stuart Robert, Media Release, 14 December 2021: <https://ministers.dese.gov.au/robert/new-direction-australian-research-council-help-secure-australias-recovery>
3. <https://socialsciences.org.au/publications/academy-statement-on-the-proposed-changes-to-the-australian-research-council/>
4. <https://news.aag.org/2020/08/news-from-the-human-environment-and-geographical-sciences-hegs-program-at-the-national-science-foundation-nsf-september-2020/>
5. We are grateful to Kate Derickson for a twitter thread detailing how these developments are related
6. With the phrase in-formation, we seek to stress the open-ended and processual qualities of information, and in particular the way that cybernetic approaches to information seek to render singular conditions communicable across difference, and thus shape the possibilities for emergence within a complex environment.
7. <https://council.science/actionplan/making-data-work-for-grand-challenges/>
8. We would stress that the field of design studies is far from homogeneous. While cybernetic scientists’ efforts to systematize and optimize decision processes in complexity under the banner of “design” helped define the contemporary discipline (Simon, 1996), radical and humanist designers have critiqued those scientific approaches and call for ethically reflexive and politically charged work (e.g. Manzini, 2015). In this light, the disciplinary history of design mirrors to radical and humanist geographers’ critique of overly scientific slants on the discipline developed during the spatial-quantitative revolution of the 1950s–1960s (see Grove, 2018)
9. This cybernetic understanding of emergent social needs also drove neoliberal political theorists’ pragmatic reformulations of political economy (see, for example, Buchanan, 1959)—a phenomenon sociologists and anthropologists have described in terms of the dissolution of the social (Collier, 2011; Rose, 1996)

10. See also Anderson (2016) on related “neoliberal affects.”
11. As critical social scientists working in interdisciplinary departments and research networks, we find that we are often too “hopeful” for critical social scientists and too “cynical” for enthusiastic interdisciplinary researchers. The challenge of navigating affective tensions between the practice of critique and the practice of interdisciplinary synthesis is, in our view, a core problem for geographic research, a topic we return to in our discussion of unsettled geographies in our concluding section.
12. We would stress here as well that cybernetics is similarly polyvalent. It also has creative and progressive potential (Pickering, 2009), including its ability to help challenge the deeply problematic Western Cartesian dualisms of human—nature and subject—object. Cybernetics is politically polyvalent and many influential developments in critical theory have been shaped by cybernetic sensibilities—ones that attune analysts to a variety of forms of social and ecological difference without subsuming this difference under a deductive, pre-determined, and hierarchically structured explanatory model (August, 2021; Rindzeviciute, 2016; in geography, see Massey, 1999, 2005; Marston et al., 2005).
13. See also O’Brien and Leichenko (2019).

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