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# Engaging with “urban science”

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## Abstract

In this Intervention we discuss possible engagements between an inherently diverse urban geography and an emergent “urban science” dealing with information technology-driven, quantitative analysis of urban data. Although initial responses from some quarters of the urban geography community have been dismissive, we highlight three ways in which urban geography could positively engage with urban science: (1) by exhibiting greater ownership of our discipline’s past and the legacy of spatial science; (2) by resisting equating post-positivism with anti-positivism; and (3) by recognizing that the inherent ability of urban science to address post-truth thinking can be a useful building block in a pluralist approach to urban geography. We contend that (a) urban geographers need to be open to the use of new urban science methods to interrogate the pressing issues of our time and (b) where appropriate, inject cautionary tales of the dangers of a naive positivism in an uncritical urban science.

## MIT discovers a new kind of science

On 25 June 2018, Wired.com, a futurist megaphone about technological innovations affecting society, published “Cities are watching you – Urban Science graduates watch back” (Marshall, 2018). The article discusses a new undergraduate program at the Massachusetts Institute of Technology (MIT), and opens with the following statement: “It is not so often that a major university like the MIT discovers a new kind of science. But in the fall, the university will launch a novel sort of program, an undergraduate major called Urban Science.” MIT’s Urban Planning Twitter account relayed the message (MITdusp, 2018), with the quote highlighted, to its more than 30,000 followers. The exact delineation and subject matter of “urban science” remains implicit throughout, but based on the snippets in the Wired.com publication and the official announcement on the MIT news website it could be gathered that it deals with information-technology driven, quantitative analysis of the contemporary data abundance detailing “the elements that are converging to shape our places of living” (MIT News, 2018).

The MIT Urban Planning (MITUP) retweet went viral. It received many critical reactions from urban geographers, loosely defined here as the scientific community that would consider Urban Geography to be a natural home for its research. Many urban geographers felt their turf invaded by this new “urban science”, and took offense with its approach to studying “the urban”. Self-identifying as urban geographers, we share this discomfort with the hubristic arrival of this alliance of inter alia physicists, mathematicians,

computer scientists, engineers, and planners claiming to quickly solve the problems we have been struggling with for decades. But alongside the comic relief and irritation that marked most of the urban geography community's initial reactions to MIT's discovery, we believe we should also engage with rather than merely confront urban science. In this Intervention, we explore potential cornerstones of such an engagement. We start by elaborating MIT's discovery and its critical reception by many urban geographers. We subsequently situate the critical reaction to the discovery of urban science in a broader perspective of recurring tensions between geography and other/new disciplines, and geography's proven ability to positively engage with what may initially appear to be threats. These reflections from sister sub-disciplines allow us to formulate tactics that urban geographers might deploy to accommodate a critical but engaged dialogue with urban science.

## Urban geography: (not) discovered by MIT?

MITUP's retweet of the Wired.com article attracted different types of reactions. There was enthusiasm about how the program will deal with timely scientific and societal questions. But there was above all a great deal of ridicule and frustration. Many of these critical reactions came from within the urban geography community, painting an overall picture of wry despondence in the face of an urban science that could quickly become trending. In addition to taking issue with the self-righteous tone in much of the communication, most of these often sharply formulated critiques focused on the (1) alleged newness of urban science and (2) the definitions of "science" and "the urban".

First, although the more modestly phrased announcement on the MIT website acknowledged that urban science "draws on existing disciplines", the overall narrative is that of "a new discipline" covering "a unique area of knowledge" (MIT News, 2018). However, alongside the somewhat overstated technological edge, the program clearly speaks to longstanding research agendas, methods and approaches that are closely aligned with some approaches within urban geography. This shows from the most liked replies to MITUP's retweet, which invariably referred to urban science actually being (a specific strand of) urban geography. The Twitter account of Urban Geography presented one of the drier accounts of this by declaring that "We've been discovered by MIT!" (Urbgeog, 2018).

Second, according to Wired.com "urban science" is a science because it comes "with hypotheses that can be measured by data and evaluated with software engineering tools by smartypants computer scientists" (Marshall, 2018). Meanwhile, "the urban" stands for a vaguely defined territorial arena where a lot of technologically-measurable things happen per square mile. The article does mention that "the new program will also attempt to honor the actual fleshy people with hopes, fears, and questions about how the places where they make their homes might adapt to the future." However, in the remainder of the communication these "fleshy bits" are very much "Othered" thus at least implicitly suggesting that these are not really science.

Foregrounding technology over people also drew criticism from the urban geography community as we have long moved on from such limiting understandings of the urban and science alike. Perhaps the strongest rebuttal came from Ayona Datta, one of the editors of Urban Geography, who tweeted (AyonaDatta, 2018): "The 'urban' is not

'science'. It cannot be measured, replicated, and forecast like other sciences. The urban is an imaginary, a relationship between multiple spaces and scales from the personal to the global, a site of politics and governance. The urban is much more than 'science'".<sup>1</sup>

## Geography's ways of responding to things new

Geography has witnessed continuous and increasingly fast-paced changes with regards to its subject matter and how to study it. Although it is overly simplistic to characterize these changes as emanating from singularly outsider or insider challengers, for the sake of argumentation we will do so here. We briefly discuss one pertinent example of each, as it helps reflecting on how an evolving urban geography can deal with the challenges posed by urban science.

First, the external challengers. MIT's discovery and the urban geography community's dejected reactions are but another episode in ongoing tensions between geographers and researchers from other disciplines uncovering fields of enquiry that in the past were more or less exclusively "ours". Physicists stating that it is "time for a science of how city growth affects society and environment" (Bettencourt & West, 2010, p. 912; see O'Sullivan & Manson, 2015) and the seemingly ever-recurring discovery of environmental determinism (Fall, 2013) are well-known cases in point. One pertinent episode dates back to the 1990s, when economists started engaging with the "puzzling regularity of the urban hierarchy" (Krugman, 1996, p. 399; see Berry, 1999). The move was part of a broader discovery that was termed "new economic geography" to add insult to injury. This was met with angry reactions from "old economic geographers" (see Maki & Marchionni, 2011; Van Meeteren, 2016, pp. 12-13) as the new economic geography did not acknowledge the foundational contributions of geographers that had done this kind of research 40 years earlier (Berry, 1999). Moreover, many geographers had become dismissive of the positivist approach that characterized the new economic geography (Martin, 1999). Yet there is an interesting tension between both critiques. Because what was the real nature of the problem? That economists were reinventing the wheel, not acknowledging foundational works? Or rather that some scholars were using a previously discarded wheel as a way to move their vehicles? In other words: how reasonable was it for geographers to criticize economists for cultivating the lands they themselves had deliberately abandoned?<sup>2</sup> Irrespective, after initial resistance to the challenges posed by new economic geography, we have seen the emergence of different and more engaged interactions, epitomized by the foundation of *The Journal of Economic Geography*. Although these engagements are uneven, often difficult, and by no means add up to an improved and unified discipline where geographers and economists meet, today it nonetheless seems more apt to speak of a continuing, diverse, and critical dialogue

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<sup>1</sup> This tweet was subsequently turned into a meme by another academic journal, *The Sociological Review* (TheSocReview, 2018), garnering retweets on their behalf, showing that at least the marketing departments of urban studies journals have fully embraced the possibilities of the digital age.

<sup>2</sup> To be clear, they were not abandoned by everyone, but these approaches became decidedly out of fashion and relegated to the smaller rooms on major geographic conferences.

between various economic-geographical subdisciplines that has on balance between positive (see Barnes & Sheppard, 2010; Peck, 2012; Van Meeteren, 2018).

Second, there are the internal challengers. Ever since the quantitative revolution in the 1950s and 1960s, there have been successive waves of alleged paradigm shifts and turns in geography, often accompanied by an exclusionary discourse to mark the new from the old (Van Meeteren, 2016, pp. 9–11). A repeated rhetorical tactic used in these struggles is to either wear or categorically dismiss the crown of a paradigm being “scientific” (Sheppard, 1995; Smith, 1979). Each generation seems to repeat the internal discussions about whether human geography (Johnston, 1985, 1998), let alone geography as a whole, can (still) stake a claim to being a coherent discipline. Taylor (1985, p. 93) blames this disciplinary amnesia on geography’s “hidden self-contempt” where we are so ashamed of our own disciplinary past that we rather avoid talking about it altogether. A particularly relevant episode to revisit here are the internal debates about Geographical Information Systems (or Science) (GIS) as these were also concerned with the alleged potential offered by technological innovations and also invited analyses with a strong quantitative bent. What ought to be the position of GIS within geography was debated from the outset. Proponents argued that GIS could not only boost geography’s scientific standing, but also produce the kind of common ontological/epistemological basis worthy of a discipline. This rosy outlook was met with very critical responses, pointing to the many dark sides of the technology in which geography would become embroiled, as well as to the dangers of making an alleged theory-neutral toolkit analyzing “facts” the core of the discipline (Taylor & Johnston, 1995). Schuurman (2000) offers a cogent summary of these early debates, but of major relevance here is that initial, often very antagonistic arguments have made way for much more nuanced and varied discussions. One of the most interesting embodiments of this has been the emergence of Critical GIS. In a recent review, Thatcher et al. (2016) argue that although “‘critical’ and ‘GIS’ evolve in unresolved tension” so that Critical GIS is not “a historical body of scholarship but (. . .) a set of living, diverse, dynamic endeavors” (idem, p. 817), overall the term now stands for an extensive and diverse literature that “constructively engage(s) not only mainstream GIScience and the ever-proliferating intersections of computation with space and place but also critical human geography” (idem, p. 822, emphasis in original). The interaction between GIScience and Critical GIS allows for continuing debate questioning the neutrality of geospatial technologies (Leszczynski, 2013) and provides a discursive bridge to discuss critical theory where practitioners might only see these technologies as a practical and useful tool. Whether GIS ought to be a central pillar of disciplinary geography remains a heated debate in many places, but the technology has changed geographical practice in the world. Moreover, that actual engagements between critical human geography and GIS have delivered interesting insights and findings is beyond doubt.

## Arguing with urban science

We believe both examples are instructive, because today we see a similar ambivalence in the urban geography community’s initial responses to the discovery of urban science. This ambivalence is most clearly visible in the very different nature of the reactions from the Urban Geography twitter account and one of its editors (see above) – if urban science is just one of the emanations of urban geography, how come we feel it doesn’t even closely deal with what urban geography should be about? Part of the answer to this question is a concern over power structures in science. The proponents of urban science seem

influential enough to shift mainstream understandings of urban geography (compare Peck, 2012), not least because MIT's move is probably but the first in a series of similar initiatives by high-profile institutions. But although this is indeed a concern to be reckoned with, we still believe it is problematic to police a field of academic inquiry we are not willing to pursue ourselves. Thus, rather than simply embracing or rejecting urban science, we believe other forms of engagement from the urban geography community are needed. Informed by the earlier debates in Economic Geography and GIS, we discuss the contours of what we believe are three important and inter-related starting points for a more productive engagement with urban science.

The first point concerns coming to terms with the fact that our discovery has also been made possible by many urban geographers having knowingly and willingly left the urban science terrain. To be sure, new quantitative datasets and technological methods are still being developed to answer new and longstanding urban-geographical questions (Järv, Müürisepp, Ahas, Derudder, & Witlox, 2015; Poorthuis, 2017; Teixeira & Derudder, 2018; Van Meeteren & Poorthuis, 2018). Perhaps even more pertinent, self-declared urban geographers still pursue research that is literally named urban science – Michael Batty's (2013) *The New Science of Cities* is an obvious case in point. Yet it seems fair to state that this is no longer the mainstream of urban geography, which bears the marks of (human) geography's different philosophical turns. For many urban geographers, urban science-type research is probably a niche at best, and the very idea of the urban being measured and modeled a problem at worst. Meanwhile, those urban geographers who do pursue urban science-type work reorient towards other journals and communities that do not explicitly self-identify as urban geography. Although each of geography's philosophical turns had its own particular justification (Smith, 1979), the cynical responses to the discovery of a new science should take into account that this is in part due to our burying of the treasure in the first place. If we want to credibly lament that we are being ignored and have urban scientists taking urban geography and its legacy serious, we need to get over our hidden self-contempt and take ownership of our discipline's past even when acknowledging how and why it was flawed (cf. Barnes, 2013).

Importantly, this ownership needs to be a collective exercise surpassing one's own ontological and epistemological preferences. Rather than engaging in an exercise of finger-pointing to particular philosophical "isms" and turns within urban geography as alleged culprits, we propose to formulate this self-contempt in a "to whomever the shoe fits" fashion. This is not only because we believe conflict is often a waste of time and energy, but above all because many conflicts arise from unduly assigning strong opinions to broad and often vaguely defined ideological or philosophical currents (Van Meeteren, Derudder, & Bassens, 2016a, 2016b). Unfortunately, such theory wars are a contributing cause to geography's vulnerable and fragmented predicament. Echoing Johnston's (1998) cautionary remarks in this regard, we believe that a subdiscipline-defining institution such as Urban Geography ought to continue to reflect the research practice of all scholars that self-identify as urban geographers as long as it adheres to the (highest possible) accepted academic standards, which brings us to our second point.

This second point refers to urban science's stated outlook on the urban and on science, which rightly deserves a fair dose of suspicion. But, as the example of Critical GIS suggests, urban geographers doing things that resemble urban science does not perforce imply them sharing this outlook. Indeed, only the cliché of the staunch positivist with a

religious belief in “the” scientific method in the singular would endorse the urban science agenda on its own terms. Having pursued some work in the realm of urban science ourselves and having worked with many colleagues in this spirit, we really wonder whether such staunch positivists are still around in human geography; Sheppard (2014) even wonders whether they have ever existed! Nevertheless, and as Wyly (2014, p. 672) notices, this stereotypical positivist Other has become a key identity marker to rally against for many contemporary urban geographers. No wonder the Wired.com article was so effective in getting some urban geographers to bring out their pitchforks: urban science is something some love to loath. But this attitude is hardly representative of the diverse urban geography we know today, and certainly not the best basis for the engaged pluralist engagement the discipline in our view (continues to) need(s) (Brenner, 2018; Van Meeteren et al., 2016a). In our reading, a central issue that needs to be overcome to arrive at a critical dialogue with urban science is to resist equating post-positivism with anti-positivism (Smith, 1979). For us, a reflexive variety of positivism – akin to Wyly’s (2009) “strategic positivism” – that acknowledges that it is but one building block in our understanding of urban geographical questions is an important tool in geography’s toolbox. We do not have space here to disassemble the discourse of positivism and separately evaluate the more and less useful parts, but Chouinard, Fincher, and Webber (1984), Hay (1978), Lake (2013), and Sheppard (1995) provide useful starting points.

One further lesson in this regard from the Economic Geography and Critical GIS discussions is that in order to critically engage, we need to speak a common language (Hanson, 1983; Schuurman & Pratt, 2002). Holt-Jensen (2018, p. xiv) usefully reminds us that there is no single approach that has the best answer to every problem a geographer can encounter. The differences and debates in geography about the most suitable ontological, epistemological, or methodological approaches have therefore the potential to be a virtue rather than a problem. Consequently, there is neither an inherent need to passionately assert which approach is best, nor a need for attempts to try and reconcile this diversity as we ponder how to best approach a geographical question. However, there is a need to respect this diversity to its fullest. This may seem a trivial point as we suspect that most urban geographers would agree on the need for a diverse methodological toolkit, and many would probably see the virtues of an eclectic epistemology integrating knowledges created from integrating diverse perspectives. Yet, we believe actively embracing pluralism needs to go as far as respecting radically different ontological perspectives, as it is only through cross-ontological translation skills that we can capitalize on this diversity. For one thing, this most certainly means resisting the often-lazy, pre-emptive and ultimately self-defeating stance of declaring Other academic work incommensurable or outright useless (Van Meeteren, 2016, pp. 16–20). There likely exist contradictions and untranslatable features between ontological perspectives, but we believe that it is at these fissures where some of the most crucial overlooked research questions lie (Van Meeteren et al., 2016b, p. 299).

Given this situation, no matter how discomfoting this exercise might be to some, we need to accept that if we want to explain the limits of urban science, we have to preserve the terminological proficiency needed to engage with it. Therefore, we propose to critically retain the vocabulary associated with positivism in urban geography’s discourse. Neither as a package we necessarily agree with nor as a strawman, but as markers that ensure that we are talking about the same concepts and processes. Many contemporary urban geographers using methods, practices and ideas we associate with geography’s positivist

tradition have a tendency to downplay or even reject the positivist label (e.g. Kwan & Schwanen, 2009; O'Sullivan, Bergmann, & Thatcher, 2018). Everybody is of course free to choose their label, but we cannot help but wonder whether this relates to the stigma the term positivism has gotten in much geographical discourse. Regardless of the reason, the problem with this let-us-just-reject-the-positivism-label strategy is that geography's positivist history is curated by too few people. This makes it easier to collectively dismiss urban science as naïve positivism, but simultaneously renders it more difficult to dialogue as we preliminarily lose steam by actively avoiding the language that would be most suited for that dialogue.

Third, we contend that in an era of post-truth, a properly conducted, reflexive positivist analysis that draws on the technological tools and data used by urban science can easily qualify as critical theory in the spirit of the Frankfurter Schule (Horkheimer, 1937/2002). This is especially the case if the questions asked and the results provided challenge the interests of the powers that be and the knowledge that keeps them in place. There is no reason why a critical and progressive urban geography could not draw on urban science-type analyses of deep-seated socio-spatial inequalities (e.g. Dorling, 2014; Järv et al., 2015). It is perhaps useful to recall that the resurgence of positivism in the 1920s and 1930s, with its categorical rejection of metaphysical speculation, occurred in the context of the rise of fascist authoritarianism (Sigmund, 2017). When oppression, propaganda, fake news, and violence are real possibilities, the political stakes of whether a statement is true or false increase. Therefore, for us, discussions on validity and reliability of measurement, replicability of research, and verification and falsification of theory are potential cornerstones of critical discourse, ready to use to challenge those in power (cf. Wyly, 2009). When made aware of the issues with big data (Kitchin, 2013) and the importance of critically reflecting on who gets to ask what questions (Christopherson, 1989), the training of MITUP students can just as well inspire (some of) them to perform in the spirit of the Vienna Circle, whose philosophy helped resist fascist obscurantist propaganda (Faludi, 1989). Although we by no means want to downplay the relevance of post-positivist skepticism in urban geography, we believe that being able to reduce the amount of illusion in the world remains a virtue of any critical scientific project (Sayer, 2009). In general, but particularly in this post-truth era where "alternative facts" (according to US president Donald Trump's senior councilor) are a thing and "the truth sometimes not being the truth" (according to former mayor of New York and the US president's personal lawyer) are a justification for advancing deeply problematic political viewpoints.

O'Sullivan et al. (2018) make the case that quantitative methods need not be separated from, say, radical political economic and feminist thought. They suggest neglected methods to revisit, new alliances to be forged with critical human geography and cultural critique, and possible paths to enliven geographical imaginations (see also Kwan & Schwanen, 2009; Wyly, 2014). Similarly, there is an incredible amount of work to be done to understand contemporary global urban transformations, and as Acuto, Parnell, and Seto (2018) rightly point out the tools and methods of urban science are useful to guide this urbanization in such a way that it improves the human condition. For us the bottom line is that we would rather have the critical insights of urban geography on board for that task than leaving it solely to the technological optimists that populate the pages of Wired magazine.

## Coda: engaging with urban science

The contours of possible engagements with urban science obviously require more scrutiny and further specification. Yet, although dismay over urban geography's alleged discovery and counterstatements suggesting that the urban cannot be measured are understandable, we believe this will not suffice. Urban science is here to stay (at least for a while), so we do need to find other, and ideally productive, ways to deal with it. Knowing, appreciating, and inserting our disciplinary history, often elaborated in the pages of this very journal, is a first step towards engaging with urban science in a constructive way. There is plenty of irony that Urban Geography, under the longstanding leadership of former editors such as James Wheeler and Brian Berry, originated as natural outlet for contributions that would now probably qualify as urban science (Berry, 2002; Wheeler, 2002). Nevertheless, we would not consider it to be the task of the journal to be the urban science movement's mouthpiece, there are other specialized journals for that already.<sup>3</sup> However, we would contend that there needs to be space for urban science in contemporary urban geography. Not just for urban geographers to learn about and make use of its methods to interrogate the pressing issues of our time, but also to allow for urban geographers to inject cautionary tales of the dangers of too much of an overzealous positivism to aspiring cohorts of "smartypants computer scientists" enrolled in MIT's urban science program. We not only need to claim our place in the history books, but also our place at the contemporary scientific table. This will be a difficult and at times antagonistic task, but dismissing that possibility upfront would be anathema to the open and diverse urban geography we have become over the years.

## References

- Acuto, Michele, Parnell, Susan, & Seto, Karen. (2018). Building a global urban science. *Nature Sustainability*, 1(1), 2–4.
- AyonaDatta. (2018, July 3). The 'urban' is not 'science' [Tweet]. Retrieved from <https://twitter.com/AyonaDatta/status/1014186757187874817>
- Barnes, Trevor. (2013). Big data, little history. *Dialogues in Human Geography*, 3(3), 297–302.
- Barnes, Trevor, & Sheppard, Eric. (2010). "Nothing includes everything": Towards engaged pluralism in Anglophone economic geography. *Progress in Human Geography*, 34(2), 193–214.
- Batty, Michael. (2013). *The new science of cities*. Cambridge, MA: MIT Press.
- Berry, Brian. (1999). Déjà vu, mr. Krugman. *Urban Geography*, 20(1), 1–2.
- Berry, Brian. (2002). Big tents or firm foundations? *Urban Geography*, 23(6), 501–502.
- Bettencourt, Luis, & West, Geoffrey. (2010). A unified theory of urban living. *Nature*, 467(7318), 912–913.

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<sup>3</sup> Environment and Planning B, Computers, Environment and Urban Systems, and the International Journal for Urban Sciences come to mind.

- Brenner, Neil. (2018). Debating planetary urbanization: For an engaged pluralism. *Environment and Planning D: Society and Space*, 36(3), 570–590.
- Chouinard, Vera, Fincher, Ruth, & Webber, Michael. (1984). Empirical research in scientific human geography. *Progress in Human Geography*, 8(3), 347–380.
- Christopherson, Susan. (1989). On being outside “the project.” *Antipode*, 21(2), 83–89.
- Dorling, Danny. (2014). *Inequality and the 1%*. London and New York: Verso.
- Fall, Juliet. (2013). Review of ‘the revenge of geography’ by Robert Kaplan. *Society and Space Open Contribution*. Retrieved from <http://societyandspace.org/2013/06/27/revenge-of-geography-by-robert-kaplan-reviewed-by-juliet-fall/>
- Faludi, Andreas. (1989). Planning according to the “scientific conception of the world”: The work of Otto Neurath. *Environment and Planning D: Society and Space*, 7(4), 397–418.
- Hanson, Susan. (1983). The world is not a stone garden. *Geographical Analysis*, 15(1), 33–35.
- Hay, Alan M. (1978). Positivism in human geography: Response to critics. In D. T. Herbert & R. J. Johnston (Eds.), *Geography and the urban environment* (Vol. 2, pp. 1–27). Chichester: Wiley.
- Holt-Jensen, Arild. (2018). *Geography: History and concepts*. London: Sage.
- Horkheimer, Max. (1937/2002). Traditional and critical theory. In M. Horkheimer (Ed.), *Critical theory, selected essays of Max Horkheimer* (pp. 188–243). New York: Continuum.
- Järv, Olle, Müürisepp, Kerli, Ahas, Rein, Derudder, Ben, & Witlox, Frank. (2015). Ethnic differences in activity spaces as a characteristic of segregation: A study based on mobile phone usage in Tallinn, Estonia. *Urban Studies*, 52(14), 2680–2698.
- Johnston, Ron (Ed.). (1985). *The future of geography*. London: Methuen.
- Johnston, Ron. (1998). Fragmentation around a defended core: The territoriality of geography. *The Geographical Journal*, 164(2), 139–147.
- Kitchin, Rob. (2013). Big data and human geography: Opportunities, challenges and risks. *Dialogues in Human Geography*, 3(3), 262–267.
- Krugman, Paul. (1996). Confronting the mystery of urban hierarchy. *Journal of the Japanese and International Economies*, 10(4), 399–418.
- Kwan, Mei-Po, & Schwanen, Tim. (2009). Critical quantitative geographies. *Environment and Planning A*, 41(2), 261–264.
- Lake, Robert. (2013). Urban crisis redux. *Urban Geography*, 26(3), 266–270.
- Leszczynski, Agnieszka. (2013). On the neo in neogeography. *Annals of the Association of American Geographers*, 104(1), 60–79.

- Maki, Uskali, & Marchionni, Catarina. (2011). Is geographical economics imperializing economic geography? *Journal of Economic Geography*, 11(4), 645–665.
- Marshall, Aarian. (2018, June 25). Cities are watching you– Urban sciences graduates watch back.
- Wired.com. Retrieved from <https://www.wired.com/story/mit-urban-sciences-program/> Martin, Ron. (1999). Editorial: The “new economic geography”: Challenge or irrelevance? *Transactions of the Institute of British Geographers*, 24(4), 387–391.
- MIT News. (2018, June 5). MIT faculty approves new urban science major. Retrieved from <http://news.mit.edu/2018/mit-faculty-approves-new-urban-science-major-0605>
- MITdusp. (2018, June 25). It is not so often that a major university like the MIT discovers a new kind of science. [tweet]. Retrieved from <https://twitter.com/MITdusp/status/1011321765212164104>
- O’Sullivan, David, Bergmann, Luke, & Thatcher, Jim. (2018). Spatiality, maps, and mathematics in critical human geography: Toward a repetition with difference. *The Professional Geographer*, 70(1), 129–139.
- O’Sullivan, David, & Manson, Steven. (2015). Do physicists have geography envy? And what can geographers learn from it? *Annals of the Association of American Geographers*, 105(4), 704–722.
- Peck, Jamie. (2012). Economic geography: Island life. *Dialogues in Human Geography*, 2(2), 113–133.
- Poorthuis, A. (2017). How to draw a neighborhood? The potential of big data, regionalization, and community detection for understanding the heterogeneous nature of urban neighborhoods. *Geographical Analysis*, 35(2), 145–22.
- Sayer, Andrew. (2009). Who’s afraid of critical social science? *Current Sociology*, 57(6), 767–786.
- Schuurman, Nadine. (2000). Trouble in the heartland: GIS and its critics in the 1990s. *Progress in Human Geography*, 24(4), 569–590.
- Schuurman, Nadine, & Pratt, Geraldine. (2002). Care of the subject: Feminism and critiques of GIS. *Gender, Place and Culture*, 9(3), 291–299.
- Sheppard, Eric. (1995). Dissenting from spatial analysis. *Urban Geography*, 16(4), 283–303.
- Sheppard, Eric. (2014). We have never been positivist. *Urban Geography*, 35(5), 636–644.
- Sigmund, Karl. (2017). *Exact thinking in demented times: The Vienna circle and the epic quest for the foundations of science*. New York: Basic Books.
- Smith, Neil. (1979). Geography, science and post-positivist modes of explanation. *Progress in Human Geography*, 3(3), 356–383.
- Taylor, Peter. (1985). The value of a geographical perspective. In R.J. Johnston (Ed.), *The future of geography* (pp. 92–111). London: Methuen.

- Taylor, Peter J., & Johnston, Ron. (1995). GIS and geography. In J. Pickles (Ed.), *Ground truth: The social implications of geographic information systems* (pp. 51–67). New York: The Guilford Press.
- Teixeira, Filipe, & Derudder, Ben. (2018). Skynet – An R package for generating air passenger networks for urban studies. *Urban Studies*. doi:10.1177/0042098018803258
- Thatcher, Jim, et al. (2016). Revisiting critical GIS. *Environment and Planning A*, 48(5), 815–824.
- TheSocReview. (2018, July 14). The ‘urban’ is not ‘science’. [Tweet] Retrieved from <https://twitter.com/TheSocReview/status/1018022291186298880>
- Urbgeog. (2018, June 29). We’ve been discovered by MIT! [Tweet]. Retrieved from <https://twitter.com/urbgeog/status/1012614329454268416>
- Van Meeteren, Michiel. (2016). *From polycentricity to renovated urban systems theory: Explaining Belgian settlement geographies* (Doctoral dissertation). Ghent University, Ghent, Belgium.
- Van Meeteren, Michiel. (2018). On geography’s skewed transnationalization, anglophone hegemony, and qualified optimism toward an engaged pluralist future; A reply to Hassink, Gong and Marques. *International Journal of Urban Sciences*, DOI: 10.1080/12265934.2018.1467273
- Van Meeteren, Michiel, Bassens, David, & Derudder, Ben. (2016b). Doing global urban studies: On the need for engaged pluralism, frame switching, and methodological cross-fertilization. *Dialogues in Human Geography*, 6(3), 296–301.
- Van Meeteren, Michiel, Derudder, Ben, & Bassens, David. (2016a). Can the straw man speak? An engagement with postcolonial critiques of ‘global cities research’. *Dialogues in Human Geography*, 6(3), 247–267.
- Van Meeteren, Michiel, & Poorthuis, Ate. (2018). Christaller and “big data”: Recalibrating central place theory via the geoweb. *Urban Geography*, 39(1), 122–148.
- Wheeler, James O. (2002). From urban economic to social/cultural urban geography, 1980–2001. *Urban Geography*, 23(2), 97–102.
- Wyly, Elvin. (2009). Strategic positivism. *The Professional Geographer*, 61(3), 310–322.
- Wyly, Elvin. (2014). Automated (post) positivism. *Urban Geography*, 35(5), 669–690.