Selected Papers of #AoIR2023:
The 24th Annual Conference of the
Association of Internet Researchers
Philadelphia, PA, USA / 18-21 Oct 2023

A RIVER OF DATA RUNS THROUGH IT: EXAMINING URBAN CIRCULATIONS IN THE DIGITAL AGE

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Introduction: Urbanizing Internet Studies

In the age of "smart cities", urban data centers, and agglomerated technology sector capital in cities, we contend that there is a deepening need for dialogue between (digital) urbanists and Internet Studies scholarship. Specifically, we want to open space to think about flows, circulations, and movement within urban contexts. Contemporary cities are marked by concentrated natural, human, and digital resources that have preoccupied scholarship of the Anthropocene, urban political ecology, smart cities, and digital labor. However, the means by which these resources accumulate, organize, and flow in and through cities remains underexplored in Internet Studies research, a point recently made about the adjacent field Science & Technology Studies (STS) by Coutard and Florentin (2022) and by Smith and Martin (2021). As data, infrastructures, apps, capital, and natural phenomena concentrate in cities, and are instantiated to create and constrain flows and circulations, we contend that Internet Studies can play a key role in analyzing and understanding these new socio-technical entanglements.

Here, we want to bring urban political ecology (UPE) to bear upon Internet Studies, to elaborate on these mutual imbrications. In short, UPE asks how society and nature are co-produced, and it does so through an analysis of the distribution of resources, and an attention to power balance in urban environments (Heynen et al 2005; Keil 2003). Importantly, UPE conceives of the city not as unnatural or artificial, but as the construction of particular forms of natures and environmental relations. Drawing on Nost & Goldstein's (2022) notion of *data infrastructures* and Halpern & Mitchell's (2023) concept of *surplus data*, we unpack how data shape urban-environmental governance and ultimately transform people and nature. Digital urban infrastructure, understood broadly, has long been conceptualized as a vessel that enables and (re)directs flows of capital, matter, energy, or living organisms like humans and vegetation (Amin & Thrift

Suggested Citation (APA): Burns, R., Mouton, M. (2023, October). *A River Of Data Runs Through It: Examining Urban Circulations In The Digital Age*. Paper presented at AoIR2023: The 24th Annual Conference of the Association of Internet Researchers. Philadelphia, PA, USA: AoIR. Retrieved from http://spir.aoir.org.

2002; Bowker & Star 2000; Brown 2010; Hughes 1983). Here, we bridge these two areas to derive deeper insights into how digital infrastructures create and control flows in cities. Among our objectives is to hint at what an *urbanized* Internet Studies could look like.

Materialism in Digital Urban Natures

This reflection on the inscription of digital technologies in urban environments builds upon Internet studies' acknowledgement of the *materiality* of data (Nost & Goldstein, 2022), as exemplified by the extraction of minerals required to build digital devices or in the siting of data centers (Arboleda, 2020; Graham, 2016). Urban scholars have followed suit and extended these discussions, as they examined the material infrastructure that subtends the circulation of data, and questioned the conditions for its in/visibility (Furlong, 2021). They also have paid particular attention to the socio-environmental context from which these infrastructures arise, and highlighted the political tensions that they generate locally (Diguet and Lopez, 2020).

There is a second side to the materiality of data, however: instead of considering their "footprint," one can also focus on their consequences for the socio-material (re)organization of the environment. Datafication of urban life and urban phenomena is indeed profoundly impacting the organization, exploitation, and circulation of natural, social, economic, and political resources. It becomes a rationale and logic guiding urbanization and new forms of data colonialism (Clark, 2020; Dowling et al, 2021; Mouton and Burns, 2021), and emerges as a unique driver for an array of circulations, movement, flows, and streams. More specifically, streams of data make the circulations visible and governable (Moere and Hill, 2012; van Dijk, 2014). By way of example, the datafication of urban services (e.g., energy, transportation, water, and waste) allows for real-time, fine-grained identification, quantification, and spatialization of all sorts of flows running across urban space (Kitchin, 2014), a key idea behind smart city discourses that promise more control over urban space, urban metabolism, and streams of privately-held revenue. As many have noted, the "optimized" flows of urban phenomena is richly interwoven with politics, values, and epistemologies (Powell 2021; Sadowski 2020). In other words, digital technologies underwrite the urban, and the urban underwrites digital technologies. Overall, we argue that reframing urban circulations in the digital age can help us rethink ways to "urbanize" Internet Studies and related fields as we explore how data transform urban materialities.

Methodological Considerations

As we focus on how digital technologies transform the coproduction of society and the environment, we follow a "poststructuralist turn" that UPE has taken over the past few years (Cornea, Zimmer & Véron, 2017a; Lawhon, Ernstson, & Silver, 2014). In this, we are not only concerned with macro analyses of how major actors (e.g., platforms) intervene in the reshaping of urban environments, but we also draw attention to more diffuse practices of everyday city-making. Practically, this approach entails considering the transformation and circulation of resources — data being a prime object of interest here — and retracing their "metabolic pathways" (Desvaux, forthcoming) to understand how they change urban natures. In short, we advocate for a closer examination of the

micropolitics at work in city-making, which invites new sets of methodological tools to be developed, that are ethnographic in nature (Cornea, Zimmer & Véron, 2017b).

Against this backdrop, UPE can benefit from better methodological integration with Internet Studies. In particular, digital ethnography can offer invaluable insights, as we consider different aspects of data infrastructure, from databases (Burns & Wark, 2019) to algorithms (Seaver, 2017) and virtual spaces (Hine, 2017), and as we analyze how this infrastructure is established, operated and maintained (Castagnino, 2016; Denis, 2018; Hogan 2015). By turning our attention to these digital artifacts, we can get a better understanding of the social reality they are embedded in, and of the social meaning they produce. As each of the elements composing data infrastructure is examined, the processes underlying the creation, curation and circulation of data can be explored and analyzed — and, ultimately, repoliticized.

Conclusion

In conclusion, we advocate for further "urbanizing" Internet Studies. While the dialogue between related fields like STS and urban studies is small but growing (Coutard and Guy, 2007; Hommels, 2020; Karvonen, 2020), scholars have pointed out the need for a better frame for thinking about the urban, and this conversation has not developed to the same degree in Internet Studies. Here, we have advanced this goal by focusing in particular on ecological and environmental dimensions that tie digital technologies to urban spaces. Along the same lines, here we attend to the ontological "nature" of digital technologies by focusing on *streams* of data, and *flows* of matter, energy, and capital. In so doing, we draw attention to the materiality of digital technologies and their tendency to move, concentrate, frame, and generate resources.

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