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Commentaries

Networks, flows, and fluids—reimagining spatial analysis?

> "In this chapter we argue that many current spatial metaphors, such as 'positionality', 'locality', 'grounding', 'displacement', 'territory', 'nomadism', and so forth require urgent critical scrutiny. The appeal of these spatial metaphors lies precisely in the new meaning they impart, but it is increasingly evident that these metaphors depend overwhelmingly on a very specific and contested conception of space and that they embody often unintended political conception."
>
> Smith and Katz (1993, page 68)

Ten years ago Neil Smith and Cindy Katz in their excellent article "Grounding metaphor: towards a spatialized politics" urged us to cautiousness as regards the (spatial) metaphors we use and the way in which we translate them into our analyses. We should be aware, they argued, of the meaning and politics that the metaphors import into the conceptions they construct. The main point of the argument was that metaphors do not travel empty-handed; in their case they were used to call attention to the naturalization of absolute space, with its ideas of fixity, inertness, and emptiness, involved in many of the above-mentioned metaphors. A lot of water has flowed under the bridge since then, and many new spatial concepts and metaphors might very well escape these problems. But the general request stands. Today, as then, it will make sense to subject dominant (spatial) concepts and metaphors to critical examination—to consider what kinds of ideas their application imports into our analyses. This short comment aims to be a modest contribution to that. I intend to use it to reflect on some of the contemporary catchwords in social, cultural, and urban thinking—in particular, those of networks, flows, and fluids—and to call attention to some problems that from my point of view appear in their application.

Sources of the concepts

In a very complex field spanning diverse subjects such as social theory, cultural studies, sociology, economics, geography, and planning, these spatial concepts—networks, flows, and fluids—are used as building blocks of a new orthodoxy of the theorization of social life; a theorization that is argued to favour a focus on process, connectivity, and mobility at the expense of an alleged former focus on boundedness, hierarchy, and form. In particular, the new concepts have been employed as organizational expressions of globalization, with Castells's (1996) argument for *the rise of the network society* as one of the key contributions. More generally, (at least) three strands of work (more or less interwoven) are contributing to this theoretical development. These are the identification and celebration of network organization as a superior form in several fields, the import of new sociotechnical hybrid ontologies, first and foremost from French poststructuralist philosophy, and the development of relational urban and global theories often incorporating elements from both of the other strands.

First, 'networking' is increasingly a topic in theories of industrial as well as political organization. Economic geography and business economics, for instance, have emphasized the network organization of production as one that secures efficiency, adaptability, and flexibility of production, as one that 'from below' favours self-organization and collaborative forms of action. It has been employed in a well-known discourse on local production systems and industrial clustering as best business practices (for example, Maskell et al, 1998). 'Scaling up' the idea, others

have focused on transnational corporations and firms as circulatory networks (for example, Amin and Thrift, 1992; Yeung, 2000), thus involving flows of people, information, and money within and across national borders. It is in this version that economic network theories have had the greatest influence on more general ideas of 'networking'.

Not surprisingly, another field in which network organization has taken centre stage is research on large technical systems (Graham and Marvin, 2001). It focuses on the way in which modern capitalist societies have come to rely on a whole interconnected web of infrastructure networks: gas and electricity systems, water, waste, and sewerage, the automobile transport system, railway and air transport, telecommunications, the Internet, and media networks. These networks, it is argued, tend to accrue in society on an incremental basis, creating ever denser and more elaborate systems, strung out over wider and wider distances. The point is that such 'infrastructures' are in a speedy transition from national, homogeneous structures to 'glocal scalar fixes', unbundled networks, hubs, and tunnel effects. In addition, independent of the specific field, technology plays a central part in all the theories in question here.

The second perspective, the hybrid 'nonessentialist' ontologies, stem from French thinkers such as Michel Serres, Bruno Latour, Gilles Deleuze, and Paul Virilio. Very briefly, they can be summarized around four issues. They seek to supersede all versions of a human–nature binary, that is, divides between the social and the natural or the social and the technical, in favour of a conception of the world as inhabited by 'hybrids' or 'quasi-objects' that are not quite natural and not quite social entities. In relation to that, they reject ideas that privilege humans as significant actors. Instead, they conceive of agency as a relational effect generated in networks by humans and nonhumans alike. Third, another 'great divide' is challenged, namely the one between the local and the global. These two extremes, as well as other spatial categorical distinctions, are considered less relevant than the intermediary arrangements of connectivity, marking lines of flow of varying length that transgress borders and categories. The final issue is the one of power. These ontologies look on power as a shared capacity, a relational achievement, involving myriad natural actants as much as social ones, which is totally decentred in different networks, flows, and foldings.

It is against this background that the spatial concepts of network (Latour) or flow (Deleuze) come into play. Latour (for example, 1993) and other proponents of actor-network theory (ANT) favour the *network* metaphor for conceptualizing the above-mentioned socionatural or sociotechnical imbrications. They emphasize how all sorts of bits and pieces (bodies, machines, and buildings, as well as documents, texts, and money) are associated together into actor-networks, configured across space and time. The central message is that "modern societies cannot be described without recognising them as having a fibrous, thread-like, wiry, stringy, ropy, capillary character that is never captured by the notions of levels, layers, territories, spheres, categories, structures, systems" (Latour, 1997, page 2). Others prefer the metaphor of *flows* in order simultaneously to signal the qualities of motion, materiality, and viscosity. Shields (1997) illustrates this by way of the example of 'ice flows', used by Virilio as well as by Deleuze and Guattari. The viscosity of ice, which becomes plastic under sufficient mass, has the qualities of intensity and motion that are searched through the use of the concept of flows. John Urry advances a similar idea when writing that "the development of a 'mobile sociology' demands metaphors that do view social and material life as being 'like the waves of a river' " (2003, page 59).

The third strand of work advancing the 'new' spatial concepts is to be found within contemporary relational urban (and global) theory. Now, relational urban theorists are a very diverse group that would be difficult to assign to one formula, and not all of them rely heavily on the concepts of networks and flows. Given the emphasis

of this comment, I shall concentrate on a few of those who do so. Probably the most prominent representative of these is Manuel Castells (1996) and his 'network society' thesis. To Castells, the extensive growth and development of information technologies and telecommunications are the major factors in what he sees as a shift towards an integrated, global 'network society'. The uneven structuring and 'variable geometry' of this society are necessarily connected to the application of these technologies and their effect of polarization and fragmentation on (urban) spaces all over the world. This is because all spaces are drawn into an integrated logic based on globalization, asymmetrical power, and highly differentiated influence on people and places from what he calls the 'space of flows'—the incessantly mobile, technologically mediated spatial form that dominates contemporary capitalist societies. Flows and networks—defined as 'sets of interconnected nodes'—are then conceived of as 'universal' organizational principles, be it of infrastructures, companies, finance, information, or media.

This thesis, and others close to it, with an emphasis on socially and geographically polarized connectedness or disconnectedness, have been extremely influential in urban writings, and many have moved on from them. Recently, for instance, Graham and Marvin in their *Splintering Urbanism* (2001) take off from it, in combination with, among other things, the ontologies of ANT, in an attempt to shift the study of networked urban infrastructures 'as a whole' to the centre of debates and analyses about cities and contemporary urban life (page 34). To them, then, technological networks become essential in contemporary theorization of space, place, and urban life. Others (for example, Amin and Thrift, 2002; Urry, 2003) are more radical in exploring possibilities of the application of new fluid ontologies, for instance, by practising an urban theory based on "the transhuman rather than the human, the distanciated rather than the proximate, the displaced rather than the placed, and the intransitive rather than the reflexive" (Amin and Thrift, 2002, page 5). The aim is to conceive of the world (and the city) through an ontology of 'process' and 'potential', through the work of networks of enrolment, fluid-like flows, and multiple encounters. Cities are seen as fields of movements and moments of encounter between spatially stretched and distant connections.

Gains and losses

No doubt should be cast on the fact that these discussions have added remarkably to the understanding of the contemporary (urban) world. Even though they have not been alone in doing that, they have pointed out the significance of process at the expense of structure, mobility at the expense of embeddedness, and connectivity at the expense of enclosure. They have drawn attention to the degree to which the growth of fast communication, global flows, and linkage into national and international institutional life has increased the city's connections and rendered necessary its theorization as a site of global–local connectivity, not only a place of meaningful proximate links. Even everyday life in the city needs to be understood through spatially stretched and distant connections.

From where I see it, however, the reverse of the coin is the degree to which the application of these concepts installs into the analysis an extensive *indifference* between the countless objects of the world (human and nonhuman), subsequently ending up portraying them as potentially all the same. I will take the liberty of using a few quotations to make my point:

> "The crisis in the conceptualisation of the dimension becomes the crisis of the whole. In other words, the substantial homogeneous space derived from classic Greek geometry gives way to an accidental, heterogeneous space in which sections and fractions become essential once more" (Virilio, 1997, page 389).

> "For Latour's 'skein of networks'... involves relational assemblies linking technological networks, spaces and places, and the space- and place-based users of such networks, in complex, folded geographies of exchange, connection and disconnection. The linkages between place and technologically mediating networks are so intimate and recombinatory that defining space and place separately from technological networks soon becomes as impossible as defining technological networks separately from space and place" (Graham and Marvin, 2001, page 216).

> "Networks are... an attempt to depart from Cartesian space and Aristotelian place. As Deleuze... puts it, 'I don't like points. *Faire le point* (to conclude) seems stupid to me. It is not the line that is between two points, but the point that is at the intersection of two lines.' And, lastly, networks are always more or less interwoven with other networks" (Amin and Thrift, 2002, page 29).

> "The town is the correlate of the road. The town exists only as a function of circulation and circuits; it is a singular point on the circuits which create it and which it creates. It is defined by entities and exits: something must enter it and exit from it. It imposes frequency. It effects a polarisation of matter, inert, living or human; it causes the *phylum*, the flow, to pass through specific places, along horizontal lines" (Deleuze and Guattari, 1997, page 196).

> "Flows are spatial, temporal—but above all material.... They have tempo and rhythm as well as direction. The significance of the material quality of flows is that they have content, beyond merely being process. They have the advantage of recasting the idealist notion of processual change into the changing material itself... flows signal pure movement, without suggesting a point of origin or destination.... Analytically, the differential of flow is a temporal, mathematical reduction. For example, a curve, mathematically differentiated yields the degree of change of direction" (Shields, 1997, pages 2 – 3).

One striking element to read from this (and other) formulations is the degree to which a language of *geometry*, directly or indirectly, infuses the discourse. This is not a classic geometry. As noted by many, space – time no longer corresponds to Euclidean space. Distance is no longer the privileged variable in assessing accessibility. Connectivity (being in relation) is added to, even imposed on, contiguity (being next to) as a principle by which the territory is structured (Offner, 2000), and space is considered more complex, fluid, and fragmented. Still, the language is loaded with terms such as 'varied geometries' and 'power geometries' and with reference to mathematical elements such as 'lines', 'points', and 'nodes'.

Now, the use of geometric concepts and metaphors is not a new phenomenon within geography and planning. It has been rather widespread, having a peak period in the 1960s within the so-called 'spatial analysis' or 'quantitative geography'. As already suggested, the kind of geometry put forward in the new metaphorization is very different from the one known from spatial analysis. It is much more unstable, messy, nonlinear, and open-ended in the way in which it is searching for the potential for emergent order in complex and unpredictable systems. It also often draws on different kinds of mathematics and sciences than did spatial analysis, including biological theories, chaos theory, fractal modelling, neural nets, and the like, sometimes combined in what has been called 'complexity theory' (for example, see Thrift, 1999; Urry, 2003). What both discourses have in common, however, is a universalization of spatial form (or movement) indifferent to the (human or nonhuman) entities they connect.

During the last thirty years, a discussion has been going on in geography and related disciplines around a social theorization of space. The starting point was to blow apart

the notion of a spatial world that was internally self-explanatory, and, regardless of disagreements, the general position became that the social and the spatial are inseparable. It is meaningless to talk about the spatial independently from the social processes and social practices of which it is a dimension. 'Social spatiality' is the term often used to underline that point. This is exactly the point that is endangered in the new conceptualizations. By putting spatial elements such as networks, flows, and fluids first and raising them to the status of 'ontology', 'paradigm', or characteristics of society, one tends to reimagine spatial form as self-referential and indifferent to social content. The unintended consequence of such a move might be a naturalization of 'spatial' process—a naturalization which is underlined by metaphorical associations with phenomena such as 'ice flows', 'waves of a river', and 'weather systems'. This, of course, is a political as well as a theoretical problem and, from my point of view, it renders open to scrutiny the whole range of 'new' spatial concepts and metaphors. Not in order to reject them, but to go beyond the moment of fascination, reflect on their theoretical and political implications, and reconsider the proper domain for their application.

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Databases and bodies: a cyborg update

The cyborg has been amongst us since at least 1983 when Donna Haraway wrote an early version of "The Cyborg Manifesto" (Haraway, 1991). The cyborg of the 20th century was an amalgamation of technology and humanity. Using a computer to write, having a locator chip installed in your dog's ear, or programming military – industrial applications all warranted the designation. Any confluence of silicon with animal or human behaviour and presto: a cyborg. Cyborgs of the 20th century had less to do with data than with silicon. The very fact that they incorporated computing was enough to earn the designation 'cyborg'. This was a wan depiction for, in the absence of data, cyborgs are generic. Rather they are the mere combination of a human being or animal and some electronic device, embedded or stand-alone. 'New' cyborgs are, however, more than metal and flesh; they come to life in the presence of data.

There has been a sea change over the last twenty years as cyborgs took on data as a third dimension. The expansion of large credit bureau databases may have been the frontrunner of this shift in what it means to be a cyborg (Poster, 1996). Having a skeletal—or well fleshed out—file with your credit history does not a cyborg make, but it does portend emergent forms of entities linked to computation. The combination of processing power and rich supplies of data permits the emergence, for example, of powerful computer-based *agents* who/which understand credit habits or, in another example, medical risk associated with insurance. Even the humble bibliographic database, EndNote, is transformed into a database of the mind when populated with sufficient relevant information based on a lifetime of note taking. The new cyborg is rich in data relevant only to a particular person.

This merger of databases and bodies in the new cyborg parallels other significant shifts. The renaming of the "S" in GIS from systems to science by Michael Goodchild in 1992 can be interpreted as a means of legitimating this once maligned subdiscipline in the hallowed halls of science (Taylor, 1990; Lake, 1993; Pickles, 1995). In retrospect, a less sinister interpretation emerges. Goodchild, Gerry Dobson (1993), and others argued at the time that the ability to accumulate, merge, and analyse huge, nay unimaginable, quantities of data is reshaping GIS to the extent that we can now ask (and answer) questions that were simply inconceivable two decades earlier. Global climate modeling and ontology-based universal classifications of ecological zones are each enabled by *data*. They are the new GIScience. Systems are incidental, taken for granted. The same is true for *individual* cyborgs.

The interaction between data and actions demonstrates the cyborg metal. A personal example may clarify my meaning. The 21st-century cyborg is shaped not by electronics (they are incidental) but data. As an athlete, for example, I subscribe to a training website (www.trainingbible.com) that generates workouts based on one's athletic profile and race goals. I input my specifications and annual goals and receive a training schedule that spans the year. A 25-year-old category-3 bicycle racer with fifteen available hours weekly to train will receive very different weekly workouts than a 40-year-old Olympic-distance triathlete with eight hours a week to train. For the sake of brevity, this is a very thin description of the extent of athlete profiles. Nor is the profile static; it grows from the initial cursory responses provided by an athlete who signs up—by virtue of ongoing data submission. Virtual Coach is based on the logging of daily data by the athlete to recalculate distances, hours allocated to training mode, etc.

Every day I wake up and take my heart rate. Anything over 52 beats per minute, and I am out of commission for anything but academic writing. Training is out of the question. A heart rate below 48 beats per minute conversely suggests that I am well and not overtrained. Such a reading generates an immediate buoyancy and thirst for what promises to be an excellent training session. It is impossible to really know how I feel without this metric. Every couple of weeks, I use the "fitness test" on the heart rate monitor (HRM). This generates an estimate of my current VO_2 Max as well as my predicted maximum heart rate. These data are duly entered into my daily log in Virtual Coach. They are later supplemented by the length of time that I swim, bike, or run. Distance and intensity are compulsory metrics associated with the daily training session. They are provided by the HRM which measures bike speed, distance, and cadence as well as time in each personalized heart rate zone. The HRM also measures temperature, calorie expenditure, altitude, ascent of climbs, and a myriad of metrics for both running and cycling. This is the new, improved HRM. My first, primitive HRM (it only measured heart rate) was relegated as a spare after the true extent of the available fields in Virtual Coach was appreciated. My new HRM knows me much better than my old one.

Entry of new data in Virtual Coach permits a more precise graphing of progress that, in turn, enables the individual athlete to modify his or her profile, which generates different workouts. This dynamic individual record is augmented by monthly time trials on the track and in the pool to illustrate increasing fitness levels or not! A decrease in base fitness is a powerful motivator to work harder (for some of us) just as an increase can buoy one's performance. This is surely a win – win situation. People who subscribe to Virtual Coach believe in the power of scientific training by tracking performance based on the accumulation of data over time. It provides the norms and the goals to become the perfect Foucauldian subject as well as a better athlete.

My partner recently described this scenario to a colleague who commented "you live with a nut." Part of the beauty of Virtual Coach is that there is a community of virtual nuts. We train and enter our performance data in relation to a universe of virtual others who are our peers. Peer status is established by common data-collection practices, shared goals, and a similar vocabulary. Daily workouts are generated using a distinct lexicon including terms such as muscular endurance (ME) workout or lactate threshold (LT). Of course, Virtual Coach is not the only such training site: they are pervasive for athletes of all stripes (for example, markallenonline.com; www.multisports.com). But once you are inculcated in the vocabulary of one, you are unlikely to want to learn a new language with its corresponding training philosophy. One chooses a particular source of cyberoptic bio-power and tends to become wed to it. One's training records are hosted on a particular website, cultivating loyalty; it would be painful to be separated from them. The central storage of personal data is a crowning touch that speaks to the disciplinary element of data—whether the discipline be internal or external. The cyborg of the 21st century is a data-hog.

As an extension of the user, this cyborg is a powerful extension of the self (for example, Virtual Coach). Numerous scenarios are possible, however. WalMart is a partner in the development of a technology called smartlabels or radio frequency identification tags (RFIT). These new merchandise tags contain inventory information so that large supermarkets can better control supplies; consumer returns can be tracked electronically en route; and consumers can trace production of each product by using a RFIT reader (*The Economist* 2003). Specific products can be linked to the customers who buy them, based on personal data associated with debit and credit cards (as well as loyalty cards). Smartlabels retain their intelligence, however, after they pass through the till. Products bought with smartlabels can be traced to individual households—a spatial form of consumer intelligence gathering. Their overt promise is that they can warn the consumer that they are going to run out of milk or fresh vegetables or that a product may contain allergens. Refrigerators will reputedly be affixed with RFIT readers to enhance smartlabel functionality. Smartlablels also permit precise record keeping of individual consumer behaviour that can be shared amongst multiple corporate partners. Early opposition to smartlabels has resulted in the development of a "kill" command which allows the customer to turn off the smartlabel at the till (*The Economist* 2003). This requires an informed consumer inherently skeptical of technological promise—one in control of their own cyborg composition.

Danny Dorling (2001) reminds us that "data are the plural of anecdote." We are increasingly subjects of a form of post-Foucauldian discipline based on the relations between metrics expressed as data and whatever forms of agency we possess. This *cyborg update* is a call to attention: for better or worse, it is all about you and the data.

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