The Geographies of Urban Density:

Topology, Politics and the City

Colin McFarlane

Geography, Durham University, DH13LE, UK

colin.mcfarlane@durham.ac.uk

Abstract

As the world increasingly urbanizes, the imaginaries, conceptions and politics of urban density will become increasingly urgent for research, policy, practice and activism. Density is a keyword in the history of how the city has been conceived and understood, and is firmly back on the global urban agenda. However, we lack sustained studies of how the geographies of density have been defined, lived, and contested. This paper develops a topological approach to urban density, considers key ways in which density has been politicized, and examines an emerging research area that understands the life and politics of density as 'intensive heterogeneities'.

Keywords: density, intensive heterogeneity, topography, topology, urban theory.

Introduction

The problem of the city has historically been a problem of density. Yet we lack systematic studies of the past, present and future geographies of urban density. Density tends to be understood as apolitical, topographical, and linked to city centres or residential locations. This chapter offers a different argument: that we need a new spatial and political understanding of density. Density, I will argue, needs to be understood as key not just to particular urban issues, but to urbanism in general. I will argue that a new research agenda around density as topological and constituted through intensive heterogeneities is an important step in addressing this.

Density has long been cast as a solution not just to urban problems – slums, suburbs, social mix, economic development, environmental sustainability - but to urbanism *per se*, and is back at the heart of global urban agendas. Whether the 'density fetishism' of planners and developers creating new elite and gentrified enclaves (Cohen, 2014), or efforts to foster density in the interests of lower-carbon urbanisms or affordable housing (Cohen and Gutman, 2007; Stein, 2014), or in calls to build density to promote and agglomerate post-recession job creation (Florida, 2014), or international organisations concerned with how low-density sprawl increasingly exceeds the governmental boundaries of municipalities (UN Habitat, 2013), density is continually positioned against an allegedly less environmentally smart and economically unproductive sprawl (Smit and Pieterse, 2014: 156-7).

Instinctively, for most urbanists, density is one of the concepts reached for when asked that ever-elusive question: *what makes a city?* The first cities - in Mesopotamia, Egypt, and the Indus Valley - were identified as such in large part because of their relative density as compared to villages. As the pioneering work of Archaeologists like V. Gordon Childe (1950) demonstrated, density has always been a relative calculation, and always more than a narrow quantity. Childe argued that density has a vital role in enabling new kinds of social

composition and function, including cultural roles or practices, combinations of crafts, systems of property and taxation, and associated systems of recording and monitoring. From our urban beginnings, density has never been simply number, and never neutral, but defined and connected to a shifting set of social, economic, political and ecological relations. Given that the concept is so freighted, so networked, it is not surprising to find that the history of urbanism is in significant part a history of a maelstrom of politicised densities: overcrowding, illness, pollution, congestion the familiar villains of the piece; planning, regulation, infrastructure, services, housing, decongestion incentives, and public space so often cast as the remedies.

Density is a political problem. It cannot be conceived or acted upon in and of itself, because it is always a relation to other issues, spaces and actors: to focus on demographics or employment quickly requires reckoning with infrastructure, services and housing, while prioritising attention on the merits of dense multiculture quickly pulls in questions of housing markets. For some urban thinkers, of course, one or more issues are especially important for understanding or addressing problems linked to density, but even then these key issues are thought as relational questions closely connected to other concerns. Lewis Mumford (1937), for example, saw transport as a central means to set limits on density, i.e. as a kind of threshold impacting on a whole set of other urban concerns: too many people and activities in one place would congest the roads, reduce economic opportunities, overbear social institutions, and so what was needed was a 'polynucleated city' that is well-planned, bounded and connected. This, anticipating the city-region, he imagined as a shift from 'massing' to a form of 'regional articulation', a form of thinking that some planners would recognise as tentpole density (Tonkiss, 2014: 42). And the networked nature of density is buffeted further still by the politics and economic imperatives of the day, and experienced and perceived in different ways by different people.

As we shall see, density has come a long way: now less vilified, in the West at least, and more a target for economic innovation, ecological sustainability, and social vitality (Tonkiss, 2014). The political, economic, and cultural understanding of density has been nothing short of transformed. If 19th century industrialisation required dense agglomerations of workers housed in cities, the geographies of density were radically recast in the 20th century. Densities that were once gained, celebrated, then derided or shrunk in some parts of the urban world have oftentimes been irretrievably lost in economic transformations, the rise of neoliberal states, and the emergence of new urban forms such as the city region – think for instance of the deindustrialised car economy of Detroit, or the once thriving mill economies of Manchester or Bombay. New patterns of settlement emerged driven by flexible accumulation and post-Fordist labour geographies, the rise of ideologies of suburban planning and living, out-of-town economies of different sorts, and transformations in transport technology (especially the growth in car ownership). And this is a global geographical story: the sociospatial densities of Western industrialisation did not disappear, but instead moved elsewhere.

It is vital to see these shifts in density not as objective facts that roll out onto urban spaces, but as political values assigned through the machinations of ideological vision, geographies of (dis)investment, and the near-pervasive dominance of the politics of growth and (sometimes managed) decline (Logan and Molotch, 1987). Economists have often argued for, and governments have often sought to foster, densities of innovation by agglomerating particular economic sectors and connections between them (e.g. see Glaeser *et al*, 2012; Jacobs, 1970). The urban growth machine has acted to manage densities by redistributing jobs through flexible accumulation in ways that effectively 'shuffles' urban densities regionally and globally, and people are required to move around in search of work and previously well-performing areas are left to shrink and struggle.

As a result, and despite the tendency to conflate density with centrality, density has no necessary pre-given geography, and processes of densification, decongestion and low-density planning turn out to be far more mobile than we often assume. Just as density can be part of an economic programme, it can also become at particular moments a political target, for example in the history of slum clearance programmes that take place in the name of 'public health' or the military targeting of civilian densities as part of 'anti-terrorist' campaigns from Baghdad and Kabul to Gaza and Karachi (Graham, 2012; Davis, 2006; Weizman, 2008; Appadurai, 2010).

It is for these and other reasons that density emerges not just as a topographical, linear or numerical problem, but as a *topological* problem connecting multiple concerns and spaces in ways that have consequences for other spaces, some planned and some unplanned. I will outline a research trajectory focussed on density as a political and lived set of *intensive heterogeneities*. This research agenda offers the possibility of new imaginaries, conceptions and practices of more socially just densities, of better ways of living together translocally. The issues discussed to illustrate these arguments are necessarily wide-ranging, and include the slum, the suburb, modernist skyscrapers, social mixture, urban activism, experiences of density 'on the move', and recent preoccupations with 'New Urbanism' and 'Smart Urbanism'.

Topological density

Topological thinking is becoming increasingly influential across the social sciences and humanities. A key concern in this work, across the different routes through which topology has gathered influence – mathematics, physics, biology, sociology, and so on – has been with how relations change while the terms remain the same, eg there may be continual change in relations despite the 'elements' remaining constant (Lury *et al*, 2012; Phillips, 2013; Martin

and Secor, 2014). Topology, argue Lury et al (2012: 8), "is the setting up of spaces of different kinds of order and continuity in such a way as to enable deformation or change, what Massumi (2002) calls the continuity of transformation". We might think here of the density of a city market or busy train or bus terminal or activist occupation, where the form of order that is put in place is there precisely to allow for change in relations (over a day or week or season).

In geography, topological thinking takes many forms: an actor-network theory influence that focuses on how a process or object takes on multiple spatial forms (e.g., as Martin and Secor, 2014, show, as topographical, networked, fluid, or even as 'fire', 'gel', or 'smoke' – Law and Mol, 2001; Moreira, 2004; Sheller, 2004); a related Deleuzian inspired set of debates around assemblage, where the focus is on how often contradictory and changing relations hold together and fall apart (e.g. Anderson and McFarlane, 2011; Braun, 2006; McFarlane, 2011); research on the multiple geographies of power (e.g. Allen, 2003); debates on the spatialities of the camp (e.g. Martin and Secor, 2014; Secor, 2013); and work on volume, spheres, and related debates on verticality (e.g. Sloterdijk, 2009, 2011; Elden, 2013; Harker, 2012; Graham and Hewitt, 2012; Graham, forthcoming).

The question of volume opens up a provocative spatial imaginary for thinking density not just as taking place on the *surface*, but through vertical arrangements of people and things in housing blocks, hotels, leisure complexes of different sorts, and further still densities both of the *air* in the form of increasing air traffic, drones, surveillance, or warfare, and of the *underground* world of mining, tunnels transporting people or materials, power, cables and other infrastructures that amass and bypass through complex spatialities to the overground (Adey, 2010; Bridge, 2009; Elden, 2013; Gregory, 2011; Sloterdijk, 2009). The term 'volumetric' is useful because it encompasses the topographical *and* the topological – as Stuart Elden (2013: 49) notes, the combination of the words 'volume' and 'metric' provides

both "the dimensionality implied by 'volume' and the calculability implied by 'metric'".

Indeed, a key issue that remains unresolved in debates on topology, and Martin and Secor (2014) identify this in geography as well as outside of the discipline, is the relation between topology and topography. The use of topology too often entails a "dichotomization of topographical versus topological space, wherein topography becomes an analog for fixity [or being] and topology for flow [or becoming]" (*ibid*. 422). Given that topology itself is given as much to fixity and hierarchy and separation as it is to movement and flow, this dichotomy is misleading. The topological and the topographical are not two distinct realms or processes acting on one another, but "two inseparable states of being" always immanent to one another (Martin and Secor, 2014: 433). A topological approach to density expands the notion of density beyond metrics of territorial distance and appropriate resources, but it cannot be opposed to topographical readings.

A topological approach entails two points of departure for understanding density. First, it focuses on the *relations that make and unmake density*, including how density: (a) holds together despite changing relations over time, (b) is reformed in light of political, economic, cultural and ecological change, and (c) falls apart. Density here emerges not just as a problematic of numbers of people and the necessary resources to service them on a map (the topographical focus), but as an assemblage of ideology, political economic restructuring and (dis)investment, plans and regulations, cultural politics of spatial valorisation, everyday lives, and the built environment. These work together to pattern who gets to live where and why in ways that are often closely linked to patterns of accumulation, planning fads, the operations of real estate markets, and relations of class, race and gender.

Second, a topological approach focuses on the *multiple spatialities of density*: *topographical* (numbers, distribution, movements and connections across Euclidean surface space), *relational* (in four ways - translocal, human and non-human, pulling in different

issues into its orbit, and connection physical and digital densities), *volumetric* (from vertical multi-story densities to dense underground networks), *experiential* (a non-singularity of urban textures, Rao, 2015), and *perceptual* (multiple angles of vision which exceed and can reshape absolute space).

A topological approach to urban density insists on density as a problem of urbanism *per se*, and especially of urban poitics and space-time, and opens out multiple spatial forms, experiences and perceptions of density. By taking a topological approach to density, the focus is less on density as a ratio and more on how density is differently produced, experienced, perceived, negotiated and contested as people live in and move through the city. In the next section, I examine some of the key ways in which the topographies of urban density have been topologically defined historically in urban debates, and here there is a key role for the slum and the suburb and the responses to them.

Bad densities? Urban slumming, suburbanisation and New Urbanism

Density substitutes for a wide variety of terms, many of which carry distinct spatial and political connotations: crowded, congested, centralised, concentration, agglomeration, over-populated, thickly populated, clustering, ghetto, and so on. Friedrich Engels (1844: 59) wrote of London as a "colossal centralization", a great "heaping together" of people, power and trade. As Engels' account of Manchester so vividly illustrated, the history of urban thought, politics and planning is a litany of revelatory descriptions and proclamations of 'good' and 'bad' densities. In some accounts, *density itself* is portrayed as the problem or the solution, while in others it is the *conditions that produce* a given geography of density that is the focus of analysis. As Tonkiss (2014, 38-39) puts it, while some have argued historically that "density is bad for poor people", others have argued, and more convincingly, that "it is poverty that is bad for poor people, and 'bad' densities tend to follow from that". Whichever

view is taken, a key site through which the problem of urban density has been historically understood is that of the 'slum'.

Engels' (1844) description of Manchester has had an enduring impact on urban thinking. In the mid-nineteenth century city – and not just in the West – density was linked to crowds, epidemics, illness and disease, and was almost exclusively seen as a problem. The concern was not, of course unfounded. Kingsley Davis (1965) noted that life expectancy in 1841 was 36 in London and 26 in Liverpool, but 41 on average for England. But unlike alarmist moralist accounts of the great mass of Victorian slums (Joyce, 2003), Engels did not see an undifferentiated mass of human density but instead produced a careful description and analysis of the geographies of density. Density, hidden from view from the middle and upper class to an extent that Engels had not seen anywhere else, was varied across poor neighbourhoods according to hierarchies of poverty. The density of mid-nineteenth century urbanism was a profoundly oppressive "world of atoms" (1844: 69), a "fierce whirlpool" (*ibid*. 70), where the only reciprocity was that of the exploitation by the ruling classes to whom the labour of the workers was so indelibly tied and regulated: density here was ordered through "reciprocal plundering under the protection of the law" (*ibid*. 69). The result was a turmoil of poverty and an almost complete absence of meaningful sociality.

Health was central to Engels' descriptions of the dense warren neighbourhoods of industrial Manchester, and sanitation loomed large. He described how what little public space existed was beset with stagnant pools of human waste, spilling from toilets without doors, and he continually referred to densities not just of people and housing, but of "refuse and filth" which continually appear in "heaps", "piles", "thick masses" and "streams" throughout the "narrow, filthy nooks and alleys", constituting no more than "cattle-sheds for human beings" (Engels, 1844: 90). This was density as a 'labyrinth' of dwellings and waste, densities that made it impossible for people to remain clean and live healthily, breathe clean

air, or enjoy anything of the urban atmosphere the city's aristocracy had carved out for itself. Density emerges here as the expression and experience of inequality *in extremis*, a relentless, active force set in train by capitalism that defines and curtails everyday life.

Engels here echoed contemporaneous accounts of an ever-deepening density of poverty that spread both in number and in extension, as Patrick Joyce (2003: 154) has put it: a "massive outgrowth of the city into unfinished streets and houses, new districts without seeming rhyme or reasons. Manchester was to them irrational, inhuman, brutish, the 'shock city' of the age". But this was not simply a topographical expansion. The density of the slum was a topological problem, and in two senses. First, it was a radically relational problem that enfolded key processes into one another: for Engels, and in the work of others including popular writers like Charles Dickens, the question of public health, sanitation, public space, equality and the very nature of capitalism itself was intimately tied to density. And second, it was a problem of volumetric space: of toxic air, gathering cesspools, and absent sewers and water pipes.

The century closed with Ebenezer Howard's (1898) profoundly influential *Garden Cities of Tomorrow*, a relational vision of the 'town-country' where decongestion gave way to bounded lower density green-belted cities. Howard's thinking has been and remains pivotal to the history of urban planning, and not just in Britain (Parsons and Schuyler, 2002). But density here was constituted as a quite distinct kind of problem from the political economic analysis offered by Engels: for Howard and like-minded thinkers like Patrick Geddes, the problem of the city was not so much capitalism but *overcrowding*, and the way forward was for "town and country" to be "married" (1898: 317). At the same time – and as was so often the case throughout the 19th century – de-densification was here linked not just to health improvements but to *moral improvements* (there are traces of this in Engels' account too). In these accounts it was as if density – especially in over-crowded urban spaces with

often insufficient (or only recently provided) sanitation – was *metabolised*, and that metabolisation corrupted the very morals of urban poor neighbourhoods. Howard, and many others, campaigned for a different metabolisation, one in which green space and clean air would bring health and moral improvement. The problematic of density was thus remade topologically as question of nature, morality and the urban ideal. This concern with 'nature' as an antidote to bad densities has had a long history, as Matthew Gandy (2003: 111) has argued: "Nature-based designs have been a defining element in virtually all conceptions of the urban ideal form the garden cities of Ebenezer Howard and Patrick Geddes to *La ville radieuse* of Le Corbusier and *The Disappearing City* of Frank Lloyd Wright".

The equation of bad densities with slum neighbourhoods and public health has remained, as has – to a lesser extent – the moral question, but its geographical locus has switched from the global North to the rapidly urbanising global South. A sense of burgeoning slums has led to scholastic and public accounts of cities as, in Seabrook's (1996: 5) words, uncontainable and inadequate: "The terms in which the cities are discussed – urban 'explosion', 'catastrophe' – tend to assimilate them to natural disasters; they are problems crying out first for relief, and then for solutions", echoing nineteenth century attitudes to the growth of large European cities (see, for example, Argaman, 2014, on recent debates on density in Cairo). For Mike Davis (2006), the problem is not density *per se*, but the pervasive and intensifying connections between rapid urbanisation, the concentration of rural land in powerful companies and landlords, and neoliberal policies. Slums here are cast here as 'warehouses' for the lumpen proletariat: this is Engels writ large. For Tom Agnotti (2006: 961), Davis is hyperbolic - Mexico City as a 'giant amoeba', Lagos is an exploding 'supernova', cities that threaten to devour the planet.

And yet Davis' book was and remains important: it helped place the experience and politics of slums as often profoundly challenging dense spaces at the heart of the urban

studies agenda, and analytically positioned slums in relation to shifting global political economies and cultural politics. Agnotti is right, however, to worry about what analytical space Davis leaves for the many ways in which residents and activists are forging new and better urbanisms, and not just in spite of these dense urban contexts but partly because of the social connections that close densities facilitate at community level.

Across the urban world the responses to slum density vary considerably, from supportive interventions of 'consolidation' evident in many South American cities to the nefarious demolition of slums so frequently carried out across parts of especially South Asia and Africa (Datta, 2012; Neuwirth, 2006; Saunders, 2011; Sassen, 2014). Residents manage density by building in largely incremental ways, enhancing precarious housing and infrastructure over time and learning how to negotiate multiple urban sites, actors and networks in often highly volatile urban assemblages both within and beyond the neighbourhood (e.g. Amin, forthcoming; Bayat, 2010; De Boek, 2012; Fabricius, 2003; McFarlane *et al*, 2014; McFarlane, 2011; Neuwirth, 2006; Pieterse, 2008; Satterthwaite and Mitlin, 2014; Simone, 2009, 2014). This is not to argue that there needs to be an uncritical shift from a view of slum densities of despair to densities of entrepreneurial celebration or potential – such a move is surely at work, for example, in state welfare removal or calls for marketisation and privatization of slum services, infrastructure and housing as a justification for creating 'self-reliant' communities, and this too can entrench hardship (De Soto, 2001; Gilbert, 2012; Roy, 2011; McFarlane, 2012). Instead, what these accounts present are stories of the positive possibilities that densities can help engender socially, physically, economically, and politically. These accounts centralise an alternative topology of the topographies of slum density by showing how creative energy, struggle, hope and their associated socialities and political forms reimagine both the space of the slum and the

possibility of the slum as an agent of local and global change, for example through translocal organisation (McFarlane, 2011).

By way of example, let's return to the question of density and human waste raised in the opening discussion from Engels. In 2013, residents in the informal settlement of Barcelona in Cape Town began protesting inadequate sanitation services (in terms of both the number and nature of provisions). In what became the 'poo protests', residents took old apartheid-era styled buckets (which they are expected to use as toilets an which at the time were not being maintained by the city council due to a salary dispute with maintenance workers), and emptied them across public spaces in the city, including the international airport, the steps of the state legislature, and on main roads in and out of the city. Here, the excess density of human waste was transformed from a topographical problem of too few services for numbers of people into a topological problem of urban critique. The political economy of the city - investing in elite (and hyper-sanitary) spaces like the airport over under-serviced neighbourhoods and further deepening what is a highly racialized geography 'post'-apartheid urban density – was called into question not so much through political debate or electoral choices, but through the realm of the senses, especially smell and visuality. Here, the insanitary slum densities bemoaned by Engels to Davis are turned in and against a particular imaginary of the city, and the topographical problem of slum density is brought into a topological realm that combines political economy, affect, shock, and the senses.

The topological politics of slum density, then, does not just connect density to a range of different issues, but in fact redefines the issues at stake and thereby the political field of density over time and space. Given that one in three urban residents now live in some form of informal settlement – from being squeezed into slithers of space in places like Mumbai or Manila, to lower-density neighbourhoods found in cities like Kampala or Sao Paulo – the

topological politics of slums are only going to become a more urgent field for research, policy and practice.

Suburbanisation and New Urbanism

If the garden city centrally shaped planning for density in the UK, in the US the response to inner city densities was much more about suburbanisation. The 'suburban ideal' in the US is a particular ideological topology of low-density urbanism, catalysed by the car and a utopian vision of American individualism: a plot of land, private property, the family, and car-oriented living. Frank Lloyd Wright (1935) was an influential voice here: the suburban form could rescue America from crowded decaying cities through more civilised suburban units (e.g. see his model of Broadacre City). But while suburbanisation has become synonymous with American cities, in practice cities in the US exhibit highly variable 'density gradients', from the steep gradients of New York and San Francisco which have very high central and relatively low fringe densities, to the dense sprawl of LA and the low density of Houston (Tonkiss, 2014). Los Angeles, is, of course, infamously a city of density *and* sprawl. There are density spikes – barrios "barricaded in poverty" and appearing as dense "wedges" in urban space, as Ed Soja (1989: 242) wrote - and areas where densities appear as "mounds" and "tented webs", sometimes of poverty and other times of higher-end land, housing and job densities. The suburban geographical picture, in short, is a variegated one, as Roger Keil (2011), Richard Harris (2011) and others (e.g. Ekers *et al*, 2012; Peck, 2011; Phelps and Wu, 2011) have argued in work charting and explaining differentiated processes of an ever-increasing and multi-faceted global suburbanisation.

As patterns of suburbanisation morphed over time and space, and new kinds of urbanism emerged, the topological interpretations of suburban topography have begun to shift. For example, Robert Fishman, in (1987) *Bourgeois Utopias: The Rise and Fall of*

14 of 40

Suburbia, argued that the growth not of the suburb but of the 'technoburb', especially in the USA – a mixed development characterised by industrial complexes, shopping malls, campuses and mixed housing, spread along highways - constituted less a new kind of suburbia and, more, a new kind of city. The growing dominance and variation in the suburban form, including edge cities, technoburbs and peripheral slums, has led some to argue that the suburb – or 'post-suburb' given the multiplicity in forms we are now witnessing – is now the dominant form of the urban age (Ekers *et al*, 2012; Phelps and Wu, 2011).

Other imaginaries with quite different urban ecological plans have taken on a global appeal, sometimes in relation suburban locations and at other times to central areas. For Le Corbusier's (1929), for example, density was to be managed both vertically in skyscrapers surrounded by large public spaces, and horizontally through a hierarchy of rapid moving road traffic. The mantra here was to both de-congest city centres of traffic and augment the density of urban space. Density was a problematic of verticalisation, distance reduction and speed of travel: "Density gives us our necessary shortening of distances and ensures rapid inter-communication" (cited in LeGates and Stout, 2007: 327). Corbusier's urbanism may appear topographic in that it measured space (vertically, across surfaces) and time (speed between points on a map), but this topography was also topological in that it expressed an integrative ideal of modernist living that understood the problem of density as one of volume as much as surface.

A cursory glance over the skylines of cities as different as Singapore, Istanbul, Shanghai, Sao Paulo, and Mumbai reveal that the appeal of the dense (and often suburban) high-rise tower is far from restricted to the spectacular urban worlding projects of developments like Dubai's Burj Khalifa (Roy and Ong, 2011). The high rise is alive and well (e.g see director Katerina Cizek's excellent work here: http://highrise.nfb.ca; Keil, 2014). That said, these models of managing density have, of course, been in some global regions

rejected as sterile, grey, and lacking a sense of the human scale - their topological experiences usually falling short of their topographical promises. There is a rich tradition of urban thinking that argues that such vertical skyscraper urbanism – and, for that matter, horizontal forms of sprawling suburbanism - can undermine or even destroy the potential of the social value of urban density in mixed, vibrant, publicly-oriented neighbourhoods and centres. This tradition extends from Mumford (1937) and Wirth (1938) through Jacobs (1961) and Sennett (1970), notwithstanding the reservations Wirth had about the 'quality' of social encounters that he saw as transitory, blasé, and 'elementary' (and see, for different interpretations of the socialities, politics, economies and democratic potential of urban encounters, Amin, 2012; Putnam, 1995; Valentine, 2014; Thrift, 2005; Alexiou, 2006; Caldeira, 2000; Zukin, 2010). In these debates, the topological politics of urban density rests on often heated debates about urban tolerance, difference and safety, as well as on the possibilities of urban community, gentrification, and isolation.

It is against this backdrop that we have seen the rise of 'New Urbanism'. Connected in particular to the work Andres Duany and Elizabeth Plater-Zyberk (1993), New Urbanism is a reaction to both modernist high-rise urbanism and surburbanisation, and seeks to pick up on the tradition of mixed urban social densities. Often linked to 'smart growth' thinking, which focusses on building broad city-based coalitions to address neglected city centres as well as other parts of the urban landscape (Gibbs *et al*, 2013; Flint, 2006), it seeks out a sense of holism and completeness: local, well-connected, integrated and mixed neighbourhoods that bring services together, reduce the need for cars, which are walkable, and replete with design spaces that are architecturally soothing and homely. Density returns as a social value derived from a mixture of people, income types, housing, work, shops, civic buildings, and parks in pedestrian-friendly neighbourhoods.

For Duany, New Urbanism articulates a new logic of density. He argues that in the US density is for most urban authorities narrowly linked to economic calculations, and especially to the car and to parking: "Density is parking, parking is density, parking is profits, parking is power: everything is controlled by parking" (cited in Fainstein and Campbell, 2002: 370) – and certainly parking constitutes a very large proportion of non-tax income for cities from Chicago to San Francisco and beyond. For Duany, this economic and ideological commitment needs to be replaced by improved public transport where the option of not having a car becomes a practical one for most people – density can then be potentially "unlimited" (*ibid*). For Duany, New Urbanism is both a critique of one ideological topology of density (car and parking models of sprawl) and an instalment of an alternative ideological topology based on public transport, higher density, and social mixture (Kelbaugh, 2002).

New Urbanim is certainly having material impacts. For example, Denver - "in recognition of the significant economic, social and environmental costs of sprawl" - has developed a suite of transit-oriented New Urbanist programmes which focus on higher-density and mixed-use urban centres (Goetz, 2013). Embodied most famously in Seaside, Florida, New Urbanism is characterised by a neo-Romantic architectural form that mimics small-town America and suburbia but which simultaneously densifies it and seeks to integrate multiple uses, social interactions and design forms. It has proven to have a global appeal, appearing in places as different as the new town of Lavasa, which has been controversially constructed near Mumbai, and in Tornagrain, near Inverness. In relation to the latter, Gordon MacLeod (2013) has shown how smart growth coalitions and New Urbanist principles have been combined in ways that can depoliticise urban and regional development. Gibbs *et al* (2013) argue that what is presented as a coming together of economic, social and environmental concerns to develop integrated urban areas, oftentimes emerges as aggressively market-led and socially elite urbanisms. In these accounts, New Urbanism is no

remedy to low (or high) topographical densities, but is instead the latest instalment of urban growth coalition to generate yet more gentrification whilst depoliticising civic participation.

Whether we have in mind slums, suburbs, modernist skyscrapers, or New Urbanism, density is never just a set of topographical calculations of people to urban form (housing, infrastructure, and services). Instead, densities topographies are always already interpreted as particular kinds of problems requiring particular kinds of solutions, and these interpretations have spatial imaginations and are often deeply ideological and contested. Recognising this means acknowledging that there is no such thing as optimal or ideal levels of urban density (cf. Kono *et al*, 2012), but instead only more or less socially just and environmentally sustainable forms of urban density. In this context, one important emerging research agenda is that focussing on density as a lived and variegated world of 'intensive heterogeneities'.

Intensive heterogeneity

Recent research has focussed on the topologies of density to make sense of how urban life is made and unmade for 'urban majorities' (Simone, 2014), especially but not exclusively in cities in the global South. This research combines work on dense urban slums and other neighbourhoods, markets, activism, and changing socialities – including work on digital technologies in sociality – and is focussed on the devices and sociomaterial infrastructures through which densities are produced, negotiated, lived, and contested. In particular this work examines, and has opened out a new research area on, the life of urban density in contexts of 'intensive heterogeneity' (Simone, 2014). Important here is the empirical shift away from equating density with central or residential spaces alone towards a more open agenda around where and when density is materialised, why it is materialised, how it is spatialised and experienced, what it might lead to, and how it is contested.

Topologically, intensive heterogeneities are constituted in part through topographical conditions, but as non-linear combinations of often different processes and things, given unity even while seemingly in contradiction and constituted by multiple space-times. These topologies are immanent and open, and push our spatial imaginaries to consider new forms of relational connection between people, things and processes (Secor, 2013). Tonkiss (2014: 49) describes some of the research challenges here: "If we want to think about this concept [density] in a more textured and more spatially complicated way, then this requires an understanding of densities that includes mobility as well as dwelling; non-economic uses as well as patterns of employment; spaces we pass through in less purposeful ways, as well as points A to B on the daily journey to work. These densities – or rather *intensities* – of city life are harder to map. They don't show up on demographic or employment census data. But these many transitory or incidental ways of making space in the city have much to do with the pleasures and the pains of urban life".

Tonkiss (2014) draws on Amos Rapoport's (1975) notion of 'affective density', which Rapoport viewed as rising with higher densities, and which we might broaden to consider how density changes as people move between the home, the neighbourhood, work, social sites, and across day and night when densities typically expand and contract in accordance with the multiple urban rhythms that compose cities. Density, Jacobs and Appleyard (1987: 114) argue, is lived not just as a mass of people and things, but through a range of less visible values, such as the "sights, sounds, feels and smells of the city, its materials and textures, floor surfaces, facades, style, signs, lights, seating, trees, sun, and shade". And of course these affective dimensions of intensive heterogeneity shift over time, as Tonkiss (2014: 47-48) argues: "Day and night-time densities can vary considerably for different urban areas – the City of London, the square mile that marks the capital's finance centre, has one of the thickest economic densities in the world given its office-hour productivity, but fewer than

10,000 residents (a third of whom, unsurprisingly, walk to work) and therefore one of the lowest population densities in the wider city and easily the lowest near the centre".

Of course, this is just one site, and if we look across London we see other rhythms of density that are equally strongly patterned by an uneven development that regulates density not just of people, things and atmosphere but of class, race, gender and other social vectors. In other words, the regulation of density through shifting growth coalitions and patterns of (de)industrialisation and gentrification mean that intensive *heterogeneities* are sometimes policed – at certain times and in certain places – as intensive *homogeneities*, with either explicit forms of exclusion through, for instance, dense gated apartment blocks or implicit exclusions through prohibitive costs of housing, shops, cafes, and the like[1].

A focus on intensity and heterogeneity matters to the project of theorising urban density because if the world is now urban, that urbanism, to borrow from AbdouMaliq Simone (2014), is not just a trajectory of expansion but a multiplicity of dense interactions that enable or disable, enhance, alienate, exploit or inspire different forms of urban life (see, for example, Bayat, 2010; Kitchen and Dodge, 2011; Crang and Graham, 2007; Thrift, 2014; Luque, *et al*, 2014; McFarlane, 2011; McFarlane *et al*, 2014; Pieterse, 2008; Rao, 2015; Simone 2014, 2013; Silver, 2014; Vasudevan, 2014a, 2014b). This disparate work examines the ways in which intensive heterogeneity is, first, differently produced through uneven urban development; second, spatialised, experienced, managed and contested in a variety or urban settings, from market places to informal settlements, infrastructure production to informal street trading and densities of digital data, and activist squatting to social movements; and, third, how those densities surface and dissipate as people and objects travel through space and time in the city across a day, season, year, and so on.

---

[1] I am grateful to Roger Keil for raising this point about homogeneity.

A useful example of a topological approach to intensive heterogeneity is Vyjayanthi Rao's (2015) study of mobility in Mumbai, in which she deploys density "not as a given attribute of urban space, a passive calculus that arises as a function of numbers and their normative environmental needs but as active spatio-temporal configurations that make visible styles of structural coupling, between human and non-human actors, and cultural-conceptual histories with the dispositions of non-human actants". For Rao, this approach to density reveals how the intensive and heterogeneous coexistence of people and things in small areas enable forms of experience and decision-making that emerge from multiple causes and relations, and engender speculations about how circumstances might be altered in the future. Writing about Mumbai, she shows how *density-in-motion*, for example on the city's infamous and frequently over-crowded rail network, can switch between an experience of cooperation as people adjust to make room for others to one of conflict as people seek to set limits or exclude: the point is that multiple expressions of density, of a seemingly 'amorphous mass', can and do occur each day across the city as people move through it. Here, 'adjusting' is what holds relations of difference topologically and topographically together. This differential experience of density – or 'textures of density', as she puts it – is mediated by relations of class, caste, religion, gender, ethnicity, and other social vectors that squeeze the majority into sometimes oppressive experiences of transport while allowing elites to escape in air conditioned cars, usually with drivers who negotiate the city's notorious traffic jams.

In a similar way, Simone examines 'bundles' of relations between people, ways of thinking and doing, and different networks and actors in the city (Simone, 2009: 157; 2014). These bundles or interactions are made of shifting and multiple preferences, trade-offs, speculations about the present and the future, tensions, and collaborations of different sorts. Through thick ethnographic description, Simone asks: what are the social and material platforms – forms of intersection that negotiate possibilities - through which density is

negotiated? How do different people withdraw from it or use it over time? What devices –
ways of knowing, doing and being in the city - appear when the more conventional devices
dissipate, and how are new devices developed? Simone experiments with conceptual
vocabularies for understanding the heterogeneous nature of urbanism in motion, focussing in
on forms of 'endurance', 'speculation', 'improvisation', 'intensity', 'resilience',
'incrementalism', and 'infrastructural collaboration' that people put to work. Governance and
citizenship, of course, matter, but oftentimes "securing the possibility of being able to make
urban life in ways that keep open a wide range of aspirations and potentials is located in the
density of heterogeneous public transactions that life in heterogeneous districts" offers, from
rumours on commodities, threats and opportunities to new ways to make a little extra money
or develop networks, and so on (Simone and Fauzan, 2012). To illustrate some of this, we
might turn again to where we started this history of density: with the slum.

Socio-volumetric technologies

Informal settlements represent a particular kind of urban marginality that dramatizes the
relation between marginality, density and heterogeneity. For example, accessing basic
services in Mumbai's informal settlements is a deeply variegated affair. In Khotwadi, a well-
established neighbourhood of mixed incomes in west Mumbai known for its textiles and
deep-seated links to the dominant political party - the ethno-chauvinist, regionalist and pro-
Hindu party, the Shiv Sena - party political patronage is key for accessing and maintaining
services, unless you happen to be a migrant in which case your access to this loose solidarity
is less assured, and perhaps violently so. The party maintains local toilet blocks and sanitation
related problems, such as drainage or water shortages, and in return ensures loyalty at
elections while entrenching its control over local activities. In other words, party political
patronage is the main route through which the intensities of urban density around scarce

resources are negotiated, and in a way that has a particular relation to the heterogeneity that it holds together: of solidarity amongst 'locals' set against disqualified 'outsiders'. Here, intensive heterogeneity is politically delimited around the ethnoreligious spatial imprinting of density.

However, if we switch context to Rafinagar, a so-called 'non-notified' or illegal informal neighbourhood in east Mumbai largely cut adrift from the Shiv Sena, we find that this patronage system is displaced by a different form of organisation: here, it is self-managed infrastructures and services that are more important for negotiating the intensities of infrastructural shortage. It's not that *all* services and infrastructures in Rafinagar are provided through self-management, or that those self-management strategies happen in the absence of state and civil society actors, but that this is the technique through which most people here will expect to use to negotiate intensive heterogeneities. Processes such as self-management – which we might call, adapting from Edgar Pieterse (2009), 'social technologies' aimed at organising urban life on the margins - shape the rhythm of everyday densities in different ways in this neighbourhood. They are also volumetric technologies: they exist not just above and below ground as toilets and pits, but at angles as pipes spaghetti around and below surfaces to maximise flow and pressure while allowing access for maintenance, and all of these materials are delivered through social and political labour that is ongoing and often unpredictable (on angles and volume, see Elden 2013).

These *socio-volumetric technologies* take the shape of local vernaculars that seek to hold relations together in ways that politically balance heterogeneity and homogeneity. They are distinct in form even between the two neighbourhoods in Mumbai, but they also resonate with ways of shaping everyday life that we see in accounts from Dhaka to Sao Paulo and Jakarta to Manila, cities often characterised by the challenge of learning in the context of intensive heterogeneity. They may also register as increasingly important parts of life on the

margins in Western cities - for instance in the improvised economies and housing left in the wake of austerity urbanism, or in the long histories of experimental urban squatting witnessed in Amsterdam, Berlin or Copenhagen (Vasudevan, 2014a, 2014b), or in the calculations that increasingly constitute the everyday lives of British families dependent on food banks – or indeed ways of organising more wealthy neighbourhoods in Mumbai and elsewhere, as Lisa Bjorkman's (forthcoming) work on Mumbai has suggested.

Urban density is partly organised through socio-volumetric technologies like patronage and self-management that emerge from the multiplicity of dense interactions to enable or disable, enhance or alienate, exploit or inspire different forms of urban life. An approach to density as a topology of intensive heterogeneities entails not predetermined definitions of density or elaborations of optimum densities, but instead seeks to conceptualise and research density as it is lived and contested through the "practical correlates" of the urban world (Thrift, 2014: 285). One key task here is to better understand the technologies that enable, delimit or contest urban life in contexts of intensive heterogeneity. As research in this emerging area has shown, the empirical terrain here is a very wide one: I focus in the rest of this section on activism and digital urbanism as two important areas of current debate on cities.

Activist densities: occupation

Urban density is, for example, a central feature of political protest and campaigns. Most obviously, people massing in city squares are key elements here, as we saw in the 'Arab spring', Occupy or Indagnacio movements of 2011, or in the protests over democracy in Hong Kong in 2014, or in the movement for Scottish Independence in the same year, or the protests against the World Cup in Brazil in 2013-14. Of course, it would be wrong to argue that it was the densities themselves that initiated these protests and campaigns. But these

densities are not only shaped in part by the manipulation of density by capital and politics, they posses a political force in and of themselves: as they stage a determined show of power, give rise to new ways of being together in which working with heterogeneity of people and views is a necessary part of the process, and work through forms of deliberative democracy.

These densities – part transitory moments of political emotion, part festivals of experimentation with new ways of thinking about or living the political - were enlivened or given new meanings through their entanglements with online densities, especially via Twitter and Facebook (e.g. Merrifield, 2012). Andy Merrifield (2012: 279) argues that the stakes for protests such as *Occupy* are not the city *per se*, but a "contemporary planetary urban society" that both enables these forms of protest through online and offline connections, and that orientates itself to the world by foregrounding a larger density of 'the 99%', as "citizens in front of the whole wide world". This commitment to the 99% is always what helped hold movements like Occupy topologically together, for a while at least, despite often changing and contradictory political positions within the movement. Understanding intensive heterogeneity here, then, offers clues to better ways of living densely together, where density is not just *here* in topgraphical spaces but *t(h)ere* in topological encounters.

The politics of the urban encounter debated in urban studies from Wirth and Mumford to Jacobs and Sennett is not just topographically *there* in the landscape, but is instead topologically made through combining physical proximate densities and spatially translocal e-densities. Indeed, this combination of digital and non-digital realms is increasingly vital to the experience, negotiation and contestation of urban density. A powerful trajectory here is the promise of 'smart urbanism', particularly as it is seductively marketed to urban authorities globally through the sleek visualisations of global corporations.

Connective densities: in real time

Central control rooms, such as IBM's Rio control room (Luque and Marvin, forthcoming), are imagined as constantly monitoring the distributed city, thereby remaking it as a manageable totality through real time data. Densities of people, traffic, goods, even weather – such as in flash flooding, in Rio's case – are managed here (so the claims go) through a new urban infomatics, increasingly premised on algorithms that articulate and represent large data sets, and which are inter-related through integrated governance based on new ways of seeing urban space. This is a promise of seeing and managing the intensive heterogeneities of urban life through data, and it has proven immensely successful as municipalities and governments across the world declare significant smart urban initiatives, whether in relation to particular sectors like energy or in relation to the city as a whole, from Glasgow, Bristol and Amsterdam to Boulder, Rio, Delhi, and Cape Town (e.g Dutta, forthcoming; Kitchen, forthcoming; Luque et al, 2014).

It is not, however, simply the seductive powers of IBM, Cisco, Siemens, and others that are at work here. Residents and activists too increasingly topologically negotiate or bypass the density of urbanism through the proliferation of new densities of digitalised data. In the increasingly pervasive digitalisation of the city, residents, via smart phones and near ubiquitous computing, are able to sift and sort through densities of data on seemingly every realm of urban life, from job opportunities, housing markets and travel timetables to reviews of nearby cafes or the latest information on film showings (and see Wilson, 2014, on 'continuous connectivity'). Residents and activists are also able to share and update that information for social, economic, environmental or political purposes, from Occupy or the Egyptian revolution to activist groups operating in real time like Power Cuts India (http://powercuts.in/) that monitor upcoming power outages or Map Kibera (http://mapkibera.org/) that produce digital community maps of Nairobi's largest informal settlement. This sentient urbanism and codification of urban space does not simply overlay

one form of urban density – topographical densities on urban land – with an electronic density of information: instead, these topographies and topologies increasingly co-produce one other as devices through which intensive heterogeneities are managed, got around, celebrated, made visible, brought together despite often stark differences in content or form, and in different ways rendered amenable for discussion and action in real-time (Kitchen and Dodge, 2011; Crang and Graham, 2007; Thrift, 2014).

With the increasing texturing of cities with digital technologies, density is located through a new volumetric capacity. Lury *et al's* (2012: 5) argument about the changing nature of culture in the West is useful here. They argue that culture is increasingly topological: based increasingly on a new kind of ordering, linked less to movement across fixed times and spaces and more to a different sort of movement, one based on practices of modelling, networking, mapping, sorting, naming, listing, comparing and calculating that establish movement as change and continuity (see Phillips, 2013, for a critique). Here, the "expanded role of indices, the formation of meta-models and the proliferation of networks in practices of auto-spatialization" of existing and potential connections – from financial derivatives or government databases of behaviour to algorithmic tools in Facebook or Google and the 'internet of things' - are especially important (*ibid*. 7; Amoore, 2013). A key question then becomes: "how are capacities for change being rendered legible, how are they being mobilized, and with what effects?" (Lury *et al*, 2012: 9).

Here, intensive heterogeneities are increasingly rendered visual, sifted through data and represented in all sorts of ways (maps, charts, rhythms, intensities, numbers, comments, etc). As Nigel Thrift (2014: 3) has argued, "the prevalence of data makes it much easier to compile lists of objects and to map them, to produce encyclopaedic renditions of things and to account and curate them, to map out space as a polytheistic pantheon of urban life, understood as a great 'meanwhile' (in the sense of 'meanwhile this was happening, and this

and this and…)". Urban planners, policy-makers, practitioners, corporations, residents and activists are increasingly inundated by and producing visualisations of a mobile urban world, often in real-time, from representations of global information of urban migration and energy infrastructure distribution, to global images of air pollution mapped on to densities produced by organisations like NASA (2014) to build inventories for air policies, to the increasing use of urban heat maps in economic calculations (e.g. EPA, 2014), to a whole variety of online real time data sources tracking different dimensions of urban social life such as health geographics in aquarium diagrams (e.g. Guagliardo, 2004), the proliferation of experiments mapping urban perception, such as MIT's Place Pulse which maps perception of safety amongst other things (http://pulse.media.mit.edu/), to the production of new e-social densities discussing preferences such as Foursquare (https://foursquare.com/), and groups analysing the resulting data from sites like Foursquare and Facebook to produce psycho-geographies of different cities, such as *We are here now* (http://weareherenow.org/). The integrated real time city is the new mantra for managing density and a dominant (if highly variegated) means through which density is today understood, problematized and contested.

Researching urban density as a set of lived and contested intensive heterogeneities opens a new research world. What are the social technologies through which intensive heterogeneities of people, things, information, and space-times are interpreted? How do those interpretations vary across different contexts and groups? What are limit points of 'heterogeneity' and how does homogeneity bite back? How are these relations contested? In what ways might they be understood and actioned in more socially just and environmentally sustainable ways mindful of densities that are not just *here*, but that stretch through translocal relations? How are intensive heterogeneities made and politicised in different contexts, from markets, slums and forms of mobility to political movements and saturations of e-data – and how are these co-constituted or pulled apart?

Conclusion

Density is less a particular urban issue and more a problematic of urbanism *per se*. It is a profoundly networked concept: it links and it morphs, and the ways in which that process occurs in different places is a product of dominant ideologies, uneven development, power relations and fashions in urban planning, architecture and design thinking, forms of contestation, and different experiences and perceptions. Density is at once a topographical problem of number and measurement *and* a problem of topological politics and space. If key sociospatial categories have been the foci of this politics – slum, suburb, skyscraper, city centre, the socially mixed city – new techniques and developments such as those around New Urbanism, digital urbanism, and activist occupation have both shifted how these are understood and forced new questions about the future of density in and between cities. And yet, the political conceptions and uses of density have often been in the background of urban analysis.

We need a new topological spatial and temporal imagination of density and its politics. A topological imagination focuses on the relations that make and unmake density over time, and on the multiple spatialities of density that are vital to that process (topographical, relational, volumetric, experiential, perceptual, etc). An important research trajectory here is the emergence of a new field examining urban density as topologies of intensive heterogeneity. Its challenge goes beyong research to present a vital challenge for the urban political Left: to better understand and support the social technologies through which urbanites produce, manage, alter and contest densities, and to force new imaginaries and practices of living together.

Density here has no pregiven geography. It does not belong to the city centre or to the residential but might be found anywhere, from busy streets and markets to trains stations and

airports to congested factories and Universities, to the ebb and flow of densities in motion across different surfaces as well as beneath and above them, or through forms of volumetric design or translocal exchange, and through entanglements off and online. Neither is this simply a question of densities of people, but of resources, data and ideas. Capital, for instance, has its own geographical densities, for example shifting through space at often tremendous rates in financial markets and creating huge imbalances of wealth and debt across the urban world, mediated in turn by densities of corporate structures, algorithmic patterning, and formal and informal networks (Mackenzie, 2008).

There is a lack of research examining the experience of different urban densities. How do residents or activists or practitioners or policy-makers – differentiated by class, gender, race, ethnicity, cast, age, etc – perceive, experience, live, intervene in, withdraw from, and contest intensive heterogeneities? How does that vary both over time – days or seasons, for instance – and within and across cities? There are a set of methodological challenges here too. How, for example, might we research the malleable, plastic nature of density both as a political tool and as a geographical imaginary and form? Discursive analysis of urban policy only takes us so far here, as do interviews with policy makers or planners. There is a challenge here in tracking through the different implicit and explicit ways in which density is mobilised as a political tool through urban growth coalitions, the media, cultural expectations of what density can and cannot do, and the ways in which spatiality is enrolled in these processes. Understanding the experiences, perceptions and practices of density, and its politics, further demands more ethnographic engagement with the life of densities in the urban world, a methodological challenge that is pushed further still by the growing role of digital data in the ways different groups manage densities and reshape or contest urbanism.

References

Adey, P. (2010). *Aerial life: Spaces, mobilities, affects.* Oxford: Wiley-Blackwell.

Alexiou, A.S. (2006) *Jane Jacobs: Urban Visionary*. New Brunswick: Rutgers University Press.

Allen, J. (2003) *Lost Geographies of Power.* Oxford: Blackwell.

Allen J (2011) 'Topological twists: Power's shifting geographies'. *Dialogues in Human Geography* 1(3): 283–298.

Amoore, L. (2013) *The Politics of Possibility: Risk and Security Beyond Probability*. Durham, NC: Duke University press

Amin, A. (2012) *Land of Strangers*. Cambridge: Polity.

Angotti T, (2006) 'Apocalyptic anti-urbanism: Mike Davis and his planet of slums' *International Journal of Urban and Regional Research* 30 961-967

Argaman, J. (2014) 'Cairo: the myth of a city on the verge of explosion'. *Jadaliyya* http://www.jadaliyya.com/pages/index/16399/cairo_the-myth-of-a-city-on-the-verge-of-explosion (last accessed August 10th, 2015).

Bayat, S. (2010) *Life as Politics: How Ordinary People Change the Middle East.* Amsterdam: Amsterdam University Press.

Bjorkman, L. (forthcoming) *Pipe Politics: Mumbai's Contested Waters*. Duke University Press.

Braun, B. (2006) 'Environmental issues: global natures in the space of assemblage'. *Progress in Human Geography*, 30, 5: 644–654

Bridge, G. (2009). 'The hole world: scales and spaces of extraction'. *New Geographies*, 2, 43-49.

Caldeira T (2000) *City of Walls: Crime, Segregation, and Citizenship in Sao Paulo*. Berkeley: University of California Press

Childe, V.G. (1950) 'The Urban Revolution'. *Town Planning Review*, 21: 3-17.

Cohen, M. and Gutman, M. (2007) 'Density: an overview essay'. *Built Environment*, 33:2, 140-144.

Cohen, D.A. (2014) 'Seize the Hamptons'. *Jacobin*, https://www.jacobinmag.com/2014/10/seize-the-hamptons/ (accessed March 28th 2015).

Crang, M and Graham, S (2007) 'Sentient Cities: Ambient intelligence and the politics of urban space', *Information, Communication & Society*, 10:6, 789 - 817

Davis M. (2006) *Planet of Slums*. Verso: New York (see relevant sections on slum sanitation)

Davis, K. (1965) 'The Urbanization of the Human Population'. *Scientific American*, September.

De Boek, F. (2012) 'Spectral Kinshasa: Building the City through an Architecture of Words'. In Edensor, T. and Jayne, M. (Eds) *Urban Theory Beyond the West: A World of Cities*. Routledge: London

De Soto, H. (2001) *The Mystery of Capital: why capitalism triumphs in the west and fails everywhere else.* New York: Basic Books.

Desai, R., McFarlane, C. & Graham, S. (2014) 'The politics of open defecation: informality, body and infrastructure'. *Antipode*, forthcoming.

Duany, A. (2003) 'Urban or Subrban'. Dialogue with Carol Burns, Robert Campbell, Andres Duany, Jerold Kayden, and Alex Krieger. In Fainstein, S. and Campbell, S. (2002) *Readings in Urban Theory*. Second Edition. Oxford: Blackwell, 362-385

Duany, A. and Plater-Zyberk, E. (1993) *The New Urbanism: Toward an Architecture of Community*. New York: McGraw-Hill.

Dutta, A. (2012) *The Illegal City: Space, Law and Gender in a Delhi Squatter Settlement*. Farnham: Ashgate.

Ekers, M., Hamel, P. & Keil, R. (2012) 'Governing Suburbia: Modalities and Mechanisms of Suburban Governance'. *Regional Studies*, 46(3), 405-422

Engels, F. (1844 [2009]) *The Condition of the English Working Class in England in 1844*. London: Penguin Books.

Elden, S. (2013) 'Secure the volume: Vertical geopolitics and the depth of power'. *Political Geography*, 34: 35-51.

EPA (2014) *Measuring Heat Islands*. United States Environmental Protection Agency: http://www.epa.gov/heatisland/about/measuring.htm (Accessed October 1st 2014).

Fabricius, D. (2003) 'Resisting Representation: The Informal Geographies of Rio de Janiero', *Harvard Design Magazine*, Spring/Summer 2008, 28

Fainstein, S.S. and Campbell, S. (2002) (Eds) *Readings in Urban Theory: Second Edition.* Oxford: Blackwell.

Fishman, R. (1987) *Bourgeois Utopias: The Rise and Fall of Suburbia.* New York: Basic Books.

Flint, A. (2006) *This Land: The Battle Over Sprawl and the Future of America*. Baltimore: Johns Hopkins University Press.

Florida, R. (2014) 'Large Metros Have Generated the Lion's Share of Employment Since the Great Recession'. *CityLab*, October 20th, http://www.citylab.com/work/2014/10/large-metros-have-generated-the-lions-share-of-employment-since-the-great-recession/381600/ (accessed March 20th, 2015).

Gandy, M. (2003) *Concrete and Clay: Reworking Nature in New York City*. Massachusetts Institute of Technology: MIT Press.

Gibbs, D., Krueger, R. and MacLeod, G. (2013) 'Grappling with Smart City Politics in an Era of Market Triumphalism'. *Urban Studies*, 50:11, 2151–2157

Gilbert, A. (2012) 'De Soto's *The Mystery of Capital*: Reflections on the Book's Public Impact. *International Development Planning Review*. Vol. 34, No. 3: v-xvii.

Glaeser, E. L., Kerr, S. P., and Kerr, W. R. (2012). 'Entrepreneurship and Urban Growth: An Empirical Assessment with Historical Mines'. Working chapter, http://www.hbs.edu/faculty/Pages/download.aspx?name=13-015.pdf

Gregory, D. (2011). From a view to a kill: drones and late modern war. Theory, Culture & Society, 28(7-8), 188-215.

Goetz, A. (2013) 'Suburban Sprawl or Urban Centres: Tensions and Contradictions of Smart Growth Approaches in Denver, Colorado'. *Urban Studies*, 50: 11, 2178-2195.

Graham, S. and McFarlane, C. (2015) (eds) *Infrastructural lives: urban infrastructure in context*. London: Routledge-Earthscan.

Graham, S. Desai, R., and McFarlane, C. (2013) 'Water wars in Mumbai'. *Public Culture*, 25: 115-141.

Guagliardo, M. (2004) 'Spatial accessibility of primary care: concepts, methods and challenges'. *International Journal of Health Geographics*. 3:3, http://www.ij-healthgeographics.com/content/3/1/3

Harris, R. (2010) 'Meaningful types in a world of suburbs', in Clapson, M. and Hutchinson, R. (Eds) *Suburbanisation in Global Society*. Research in Urban Sociology, 10, Emerald, Bingley

Howard, E. (1898 [2009]) *Garden Cities of To-morrow*. London: Dodo Press.

Jacobs, A. and Appleyard, D. (1987) 'Toward an urban design manifesto'. Journal of the American Planning Association, 53:1, 112-120.

Jacobs, J. (1961) *The Death and Life of Great American Cities*. Random House.

Jacobs, J. (1970). *The Economy of Cities.* New York: Vintage Books.

Joyce P (2003) *The rule of freedom: liberalism and the modern city* London: Verso

Keil, R. (2011) 'Global suburbanization: the challenge of researching cities in the 21st century', *Public* 43, 54–61.

Keil, R. (2014) 'Sub/urbanization and density: A few critical notes'. Global Suburbanisms: Governance, Land and Infrastructure in the 21st Century'.

http://suburbs.apps01.yorku.ca/2014/02/14/suburbanization-and-density-a-few-critical-notes/#sthash.X1wnr0QJ.dpuf (last accessed July 10th 2015).

Kelbaugh, D. (2002) *Repairing the American Metropolis: Common Place Revisited.* University of Washington Press.

Kitchen, R. and Dodge, M. (2011) *Code/Space: Software and Everyday Life*. MIT Press.

Kono, T., Joshi, K.K., Kato, T., Yokoi, T. (2012) 'Optimal regulation on building size and city boundary: An effective second-best remedy for traffic congestion externality'. *Regional Science and Urban Economics.* 42, 4: 619-630.

Law J and Mol A (2001) 'Situating technoscience: An inquiry into spatialities'. *Environment and Planning D: Society and Space* 19: 609–621.

Le Corbusier (1929) *The City of Tomorrow and its Planning.* MIT Press. In LeGates, R.T. and Stout, F. (2007) *The City Reader*. 4th Edition. London: Routledge, pp. 322-330.

Logan, J. and Molotch, H. (1987) *Urban Fortunes: The Political Economy of Place*. Berkeley, CA: University of California Press.

Lury, C., Parisi, L., Terranova, T. (2012) 'Introduction: The Becoming Topological of Culture'. *Theory, Culture and Society*, 29 (4/5) 3–35

Luque, A. and Marvin, S. (forthcoming) 'The maintenance of urban circulation: operationalisation of the city/civitas as a managerial entity'.

MacLeod, D.G. (2013) 'New Urbanism/Smart Growth in the Scottish Highlands: Mobile Policies and Post-politics in Local Development Planning'. *Urban Studies.* 50, 11: 2196-2221.

Massumi, B. (2002) *Parables for the Virtual: Movement, Affect, Sensation.* Durham: Duke University Press.

Martin, D. and Secor, A. (2014) 'Towards a post-mathematical topology'. *Progress in Human Geography*, 38(3) 420–438

MacKenzie, D. (2008) *Material Markets: How Economic Agents are Constucted.* Oxford: Oxford University Press.

McFarlane, C, Desai, R. & Graham, S. (2014) 'Informal urban sanitation: everyday life, comparison and poverty'. *Annals of the Association of American Geographers.* 104: 989-1011.

McFarlane, C. (2011) *Learning the city: knowledge and translocal assemblage*. Oxford: Wiley-Blackwell.

McFarlane, C. (2012) 'The entrepreneurial slum: civil society, mobility, and the co-production of urban development'. *Urban Studies*. 49: 2926-2947

Merrifield, A. (2012) 'The urban question under planetary urbanization'. *International Journal of Urban and Regional Research* 37:3.

Mitlin, D. and Satterthwaitte, D. (2014) *Urban Poverty in the Global South: Scale and Nature*. London: Routledge

Moreira T (2004) 'Surgical monads: A social topology of the operating room'. *Environment and Planning D: Society and Space* 22: 53–69

Mumford, L. (1937) 'What is a city?' *Architectural Record*, LXXXII, November.

NASA (2014) *Health and Air Quality*. National Aeronautics and Space Administration: http://www.nasa.gov/applied-sciences/health-air.html (Accessed October 1st 2014).

Neuwirth, R. (2006) *Shadow Cities: A Billion Squatters, A New Urban World*. Routledge: New York

Parsons, K. and Schuyler, D. (2002) (Eds) *From the Garden City to Green Cities: The Legacy of Ebenezer Howard.* Baltimore: John Hopkins University Press.

Peck, J. (2011) 'Neoliberal suburbanism. Frontier space', *Urban Geography* 32(6), 884–919

Phelps, N.A. and Wu, F. (2011) (eds) *International Perspectives on Suburbanization: A Post-Suburban World?* Palgrave

Phillips, J.W.P. (2013) 'On Topology'. *Theory, Culture and Society*, 30(5) 122–152

Pieterse, E. (2008) *City Futures: Confronting the Crisis of Urban Development*. Zed Books: London.

Pieterse, E. (2011) 'Rethinking African urbanism from the slum'. LSE Cities, http://lsecities.net/media/objects/articles/rethinking-african-urbanism-from-the-slum/en-gb/, accessed July 2014.

Putnam, R.D. (1995) 'Bowling Alone: America's Declining Social Capital'. *Journal of Democracy,* 6:1, 65-78.

Rao, V. (2015) 'Infra-City: Speculations on Flux and History in Infrastructure-Making'. In Graham, S. and McFarlane, C. (eds) *Infrastructural lives: urban infrastructure in context*. London: Routledge-Earthscan.

Rapoport, A. (1975) 'Toward a redefinition of density'. Environment and Behaviour, 7:2, 133-157.

Roy, A. (2011) 'Slumdog cities: rethinking subaltern urbanism.' *International Journal of Urban and Regional Research* 35:223- 238.

Roy, A. and Ong, A., (Eds) (2011) *Worlding Cities: Asian Experiments and the Art of Being Global*. Oxford: Blackwell.

Sassen, S. (2014) *Expulsions: Brutality and Complexity in the Global Economy*. Harvard University Press.

Saunders, D. (2011) *Arrival City: How the Largest Migration in History is Reshaping Our Urban World.* London: Windmill Books.

Sheller M (2004) 'Mobile publics: Beyond the network perspective'. *Environment and Planning D: Society and Space* 22(1): 39–52.

Schubert, D. (2014) (Ed) *Contemporary Perspectives on Jane Jacobs: Reassessing the Impact of an Urban Visionary.* Ashgate.

Scott, A.J. and Storper, M. (2014) In the Nature of Cities: The Scope and Limits of Urban Theory'. *International Journal of Urban and Regional Research* (forthcoming).

Seabrook, J. (1996) *In the Cities of the South: Scenes from a Developing World*. London: Verso.

Secor, A. (2013) '2012 Urban Geography Plenary Lecture Topological City', *Urban Geography*, 34:4, 430-444

Sennett, R. (1970) *The Uses of Disorder: Personal Identity and City Life*. University of Michigan.

Silver, J. (2014) 'Incremental infrastructures: material improvisation and social collaboration across post-colonial Accra', *Urban Geography*, 35:6, 788-804

Simone, A. (2009) *City Life from Jakarta to Dakar: Movements at the Crossroads*. Routledge: London

Simone, A. (2011) 'The surfacing of urban life'. *City*, 15, 3-4: 355-364.

Simone, A. (2013) 'Cities of Uncertainty: Jakarta, the Urban Majority, and Inventive Political Technologies'. *Theory, Culture & Society* 30: 243-263

Simone, A. (2014) *Jakarta, drawing the city near*. University of Minnesota Press.

Simone, A. and Fauzan, A.U. (2012) 'Making Security Work for the Majority: Reflections on Two Districts in Jakarta'. *City and Society*, 24: 2, 129–149

Sloterdijk, P. (2009). *Terror from the air (A. Patton, Trans).* New York: Semiotext(e).

Sloterdijk, P. (2011) Spheres.Volume 1, Bubbles: Microspherology. New York: Semiotext(e).

Smit, W. and Pieterse, E. (2014) 'Decentralisation and institutional reconfiguration in urban Africa'. In Parnell, S. and Pieterse, E. (Eds) *Africa's Urban Revolution*. London: Zed Books.

Soja, E. (1989) *Postmodern Geographies: The Reassertion of Space in Critical Social Theory*. London: Verso.

Stein, S. (2014) 'De Blasio's doomed housing plan'. *Jacobin*, https://www.jacobinmag.com/2014/10/de-blasios-doomed-housing-plan/ (accessed March 25th 2015)

Thrift, N. (2005) 'But malice afterthought: cities and the natural history of hatred'. *Transactions of the Institute of British Geographers*, 30: 133-150.

Thrift, N. (2014) 'The 'sentient' city and what it may portend'. *Big Data & Society*, 1:1.

Tonkiss, F. (2014) *Cities By Design: The Social Life of Urban Form*. Cambridge: Polity Press.

Valentine, G. (2014) 'Living with difference: reflections on the geographies of the encounter'. In Paddison, R. and McCann, E. (Eds) *Cities & Social Change: Encounters with Contemporary Urbanism*. London: Sage.

Vasudevan, A. (2014a) 'The makeshift city: Towards a global geography of squatting'. *Progress in Human Geography*, online early.

Vasudevan, A. (2014b) 'The autonomous city: Towards a critical geography of occupation'. *Progress in Human Geography*, online early.

Wilson M W (2014) "Continuous connectivity, handheld computers, and mobile spatial knowledge" *Environment and Planning D: Society and Space* 32(3) 535 – 555

Wirth, L. (1938) 'Urbanism as a way of life'. *American Journal of Sociology*, XLIV:1, July.

Wright, F.L. (1935) 'Broadacre City: A New Community Plan'. In LeGates, R.T. and Stout, F. (2007) *The City Reader.* 4th Edition. London: Routledge, pp. 331-336.

Zukin, S. (2010) *Naked city: The death and life of authentic urban places*. Oxford: Oxford University Press