Theoretical framework and limitations of scientific urbanism

Introduction

The cities are ‘the greatest artworks of humanity’ (Mumford, 1938:5), artefacts that we inherit and inhabit, hate or cherish. They store, fossilize and convey wordless messages and stories, witnessing and withstanding the turbulences of many generations and societies. Within their monumentality, they safeguard the everydayness and the spectacle, the mundane and extraordinary of humanity. They inspire and depress, mystify and enlighten. Every city has ‘unique individuality, own life and physiognomy’ and it is a ‘complex individual’ (Reclus, 1905:385) entangling individuals, communities and neighbourhoods. There are many urban definitions and standpoints, ‘a plethora of fragmentary theoretical formulations’ (Harvey, 1973/2009:195).

Can science help in unveiling the unique individuality and complexity of cities, the urban mundane and extraordinary? Can it unravel and juxtapose the fragmentary definitions and conflicting ideological positions? Patrick Geddes (1915) suggested politology for science of cities, but the words city or polis (πολίς) and logos (λογος) were never fused in reality. The science of cities was never really established, but urbanism is regarded as ‘art and science’ (LeGates et al., 2009:767). Henri Lefebvre (2003:159) demystifies that by arguing that urbanism is nothing more than ideology that claims to be either art or technology or science depending on the context. In this essay I discuss the prospects and limitations of scientific urbanism via the dominant urban definitions and paradigms in urbanism. We are currently in the midst of a new wave of enthusiasm for scientific urbanism inspired by the digital revolution (LeGates et al., 2009). Scientific urbanism is a tendency or discourse of using scientific methods and inquiries in urbanism that historically quickly becomes fashionable and quickly disappears.

Science and urbanism

‘All knowledge about reality begins with experience and terminates in it’ (Einstein, 1934:164). Science is a body of objective knowledge (Rosenberg, 2005:18) as sets of facts, theories and laws supported by empirical evidence. It
seeks to ascertain what goes on in the world and to understand why (Hempel and Fetzer, 2001:329). It seeks truthfulness and validity, certainty or assurance. It seeks explanations (Rosenberg, 2005:33) in a traditional conception of truth as an agreement of the knowledge with its object (Heidegger, 1962:257-8). The truth, the agreement between the knowledge and its object, varies in different sciences. The truth in physics is absolute. Physical laws are valid anywhere and always. The physical world is ruled by a system of physical uniformities invariable through space and time (Popper, 1957/1986:5). Social relations may or may not produce regularities, and which can be explained independently of them (Sayer, 2010:3). In sociology and psychology the truth is not absolute. The theories and laws cannot be fully rejected or fully accepted. Sociological laws or the laws of social life, differ in different places and periods. They depend on a particular historical situation (Popper, 1957/1986:5).

The urban phenomenon has been ubiquitous research focus, especially attractive in sociology, architecture, geography, economy and psychology. The city is seen as physical space in architecture (3D), geography (2D and time) and economy (space and time), social space in sociology and geography and mental space (mental images) in psychology and architecture. But urbanism is both a research field and profession. It covers the study of urban phenomenon, urbanization and organization of cities, but also the profession of urban planning, design and even urban development. In some sense it even includes regional planning and regional science, since the cities exist today as agglomerations of urban areas in regions. Here I transplant the French meaning of urbanism that derives from Le Corbusier’s book ‘Urbanisme’ from 1925. Urbanism in English language revolves around the social. ‘Urbanism describes the distinctive features of the experience of everyday life in cities’ (Bridge, 2009:106). It is defined as a way of living in cities (Wirth, 1938; Gans, 1968; Gregory et al, 2009:791), sets of social relationships in cities (Harvey, 1973/2009) or studies of urban ways of living (Gregory et al, 2009:791). Its root is in Louis Wirth’s article ‘Urbanism as a way of life’ from 1938.

We are currently in the midst of a new wave of enthusiasm for scientific urbanism inspired by the digital revolution (LeGates et al., 2009). We experience accelerated digitalization of society and we see the dawn of the information society not out of the window, but in everyday life. Our urban everydayness is entangled with information, communication and sensing technology and our wired world generates incredible amount of digitized information, a phenomenon called big data. The big data includes information about individual behaviour and choices and the prospect of analyzing and utilizing big data in intelligent or smart cities, cities which sense and convey that
information back to the citizens is overwhelming. The big data ‘does not only
encapsulate routine and relatively stable behaviours but, within it over
sufficiently long periods of time, one can begin to extract changes to the
structure and form of the city and the way people behave’ (Batty, 2012:192).
The proponents of the new scientific urbanism are many research labs and
centres, notably CASA at UCL or SENSEable City Lab at MIT as well as IBM
though the initiative ‘Smarter planet’. Carlo Ratti, the director of the
SENSEable City Lab, sees the living in the smart city through a cycle of sensing
and actuating, of sensing information and responding to it. It is an ingenious
and appealing urban conceptualization of an individual in our world rich with
sensors and information, but it requires deeper scrutiny through a palette of
urban definitions.

Urban definitions
The knowledge about cities is voluminous and there are many definitions and
representations. David Harvey (1973/2009:195) argues that there is a plethora
of fragmentary theoretical formulations some of which are very particularistic,
while others are clearly mutually incompatible. Further on Harvey (2009:195-6)
argues that theories, like definitions, have their roots in ideology, and depend,
too, upon the objectives of the investigator and the characteristics of the
phenomena being investigated. There are many ideological positions to be
defended, many intriguing speculations to be followed up, many investigators
and many contexts in which urban phenomena may be encountered, for a
general theory of urbanism to emerge easily. I agree that there is friction
between urban theories, standpoints and representations, but I believe that
many theories are mutually compatible and completing each other, even more
they are often interwoven. They signify different aspects of cities and
prospectively ought to join in one composite definition and representation.

The city as artwork of a political struggle
Urbanization has always been a class phenomenon where the control typically
lies in a few hands (Harvey, 2009:316-7) and increasingly, we see the right to
the city falling into the hands of private or quasi-private interests (Harvey,
2009:329). The city ‘is the work of a history, that is, of clearly defined people
and groups who accomplish this artwork in historical conditions’ (Lefebvre,
1996:101). It is a product of political struggle, or the struggle of the control
over the right of the city (Soja, 1989:49). Today in part it reflects the prevailing
ideology of the ruling groups and institutions in society and in part the
dynamics of market forces and the capitalist economy (Harvey, 2009:310).
The city is a game or ‘a concert’ (Hall, 1980) where different actors, social groups and interests struggle for the right to develop the city. Peter Hall (1980) extracts bureaucrats, politicians and the community as main actors. Lefebvre (1996:83-85) writes about tendencies (scientist or technocrat, ‘people of good will’ and developer) of the actors rather that the actors themselves.

The city as mosaic of urban areas

The city is a ‘complex individual’ of diverse social groups, communities and neighbourhoods (Reclus, 1905:385). It is as ‘a mosaic of little worlds’ (Park, 1925:40) or as agglomeration of different urban areas (Burghess, 1925:56; Ahlmann at al., 1934:7). The geographers principally see the city as 2D mosaic and reduce the city on areas (paraphrased from Longley et al., 2005:67-70). For architects the city is a modifiable 3D mosaic, as an object in geometry, a continuous body indefinitely extended in length, breadth, and height or depth, which was divisible into various parts, could have different shapes and sizes and could be moved or transposed in any way (Descartes, 1627/1965:30).

The city as large and dense aggregate of individuals

Louis Wirth defines urban through three variables in interplay. The city is sizable and dense aggregate of heterogeneous individuals (Wirth, 1938) or ‘a permanent localization, relatively large and dense, of socially heterogeneous individuals’ (Castells, 1977:77). Wirth links size, density and heterogeneity with social interaction, individualization, alienation, anonymity, tolerance, stress through prepositions like anonymity increases with size or greater density produces greater tolerance for living closely with strangers, but also greater stress (see Gottdiener and Hutchison, 2000:115).

Wirth’s variables and agents dominate scientific urbanism as well as the urban research in geography, economy, transport engineering and information science. The conceptualization and reduction of the city to numbers or quantities, times, series and situations, systems, relations, objects and agents is fundamental in urban modelling and simulation. Törsten Hägerstrand (1962) developed representation of the individual’s path in a geographic space-time. A class of agent-based models emerged since the 1980s representing objects and populations at individualistic level and simulating their behaviours through space and time (Batty, 2009:51).

The ‘city of flows’ as ‘little worlds on the move’

Robert Park defines the city as ‘a mosaic of little worlds that touch, but do not interpenetrate’ (Park, 1925:40), where the simple means of communication
allows individuals to live simultaneously in many different worlds (Park, 1925:9). The cities are ‘extraordinary agglomerations of flows’ (Ash and Thrift (2002:42) or liquid mosaics and the argument is that geography cannot capture the urban mobility. Nigel Thrift transforms Melvyn Webber’s (1964) urban non-places into non-representation and he challenges the existing urban representation: Can we represent ‘cities of flows’? The economists however already represent the city through flows of capital, information, money and times, declaring even a ‘death of distance’ and death of geography.

The city as mental image and feeling
The city and its cityscapes are deeply engraved mental images in the human mind. The city is felt within and the feeling is enclosure or sanctuary. It traps and protects. 𒔖 (ur) means roof, to shut or protection in Sumerian and the stem ur has been found in a synonym of a city in almost all Indo-European languages. Some examples are 𒕏 (iri, eri, uru) for city in Sumerian and Akkadian (http://psd.museum.upenn.edu), पुरं (pur) in Sanskrit (http://www.sanskrit-lexicon.uni-koeln.de/), uru in Hittite, paru in Old Persian, urbs in Latin, baurs in Gothic, gradu in Old Slavonic. Roof is in the Chinese sign 市 (shi) for city. The city as mental image and feeling is represented through Kevin Lynch’s mental maps, Gordon Cullen’s urban sequences, Christian Norberg-Schulz’s genius loci or local spirit.

Urbanism as urban information and action
The city as an aggregate of individuals dominates the science discourse in urbanism. The individual receives information, interprets it and responds by actions. Carlo Ratti depicts the process as a cycle of sensing and actuating and he uses it as an analogy for practical urbanism (Figure 1, left). Patrick Geddes argued for surveying and planning as urbanism cycle in his book Evolution of cities a century ago. With sensing and actualizing Carlo Ratti revives, tunes and transliterates surveying and planning in the emerging information society. But the change in words is more refined. It is a change from plan to action, from planning to actuating and eventually living smart cities. To enrich Ratti’s actuating cycle and draw the limits of science in urbanism I overlaid it with a diagram drawn by John Turner showing scientific and political spheres of urban action (Figure 1, right). Turner (1976:159-60) argues that the action is generated by previous action and administration, information, theory and norms, either as laws or regulations. Information and theory belong to the scientific sphere in contrast to action and law which are of the political sphere.
The resultant of the overlay (Figure 2, left) is a cycle which includes the city and representation as intermediate steps in sensing and actuating cities. The representation, with analysis and theory as background, is within the scientific sphere. The representation defines sensing and information. The city is in the political sphere and its centre shifted from design to negotiation in today’s planning and development (Figure 2, right).

**Discussion**

**Science and urbanism**

There are many debates about urbanism as art or science or ideology, but it is often unclear in which context which methods can be used. John Turner’s spheres clarify the art of politics and the scientific analysis.
Scientific urbanism has limitations. There are two spheres and science must respect the political sphere of urbanism, even though there is always pretension of scientific analyze to link explanations with forecast and prescription even for political processes. Scientific urbanism must not only explain, but also warn of the possibilities of scientific prescription in political processes. Garreau (1992:464) writes: ‘No matter what you plan, the result will always be a surprise’. The costs of these surprises especially in the last century were very high. Slums, fragmentation, inequity, crime, environmental degradation, uniformity, greyness, sorrowfulness, sprawl, the Le Corbusian urbanism powered by scientific methods and universal prescriptions failed often and without recognizable pattern of success and failure. Thus sensing is the sole domain of scientific urbanism and even within sensing there are fundamental problems.

Descartes (1627/1965:30) argues that if we posit a triangle, it is necessary that all three angles be equal to two right angles; but he did not see anything in this which assured him that there was a single triangle in the world. Albert Einstein used to say: ‘As far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality’ (in Hempel, 1945). It is difficult to reduce truthful representation or formulations of the city and its physical, mental and social spaces, but we must mix and juxtapose standpoints and representation. Urbanism must be both about conceptualizing and scrutinizing theories. We must equally focus on theorizing and conceptualization or how we conceptualize objects, as well as on empirical research, causation and methods of explanations (from Sayer, 2010:2). It is also not about of one method, but many to.

**Urbanism as collage of urban definitions into collage representations**

The product of science is truth, system, organization, order, while the city is collage of situations, places, spaces, times, people, buildings, vehicles, trash cans, bicycles, dreams, fantasies, flowers, suicides, parks, traffic accidents, weddings, heart attacks, concerts. The city is a game of politics, an artefact, an agglomeration of individuals, flows and times through a static and mobile mosaic of spaces, and inclusive a feeling and mental image. The human beings are social species and we live in social groups. Sayer (2010:x-xi) argues that the people in sociology are seen as causal agents, who make things happen, and the other as ‘meaning makers’, who interpret the world in innumerate ways and as needy, desired beings dependent on others, having an orientation to the world of care and concern. The social coerces the individual in cities.
The urban representation is conceptualizing the physical, social and psychological aspects of the city. It is ultimately about objectifying social spaces and mental maps. Immanuel Kant in *Critique of pure reason* argues that space and time are forms of sensible intuition. With computers and information technology we managed to significantly define and manipulate the intuitive and visual element of space. In reality the space is transformation of images, touches or echoes. We locate and conceptualize spaces by triangulation of the images and ultimately by touching. We think in images or sequences of images that we wrap in spatial objects. The information technology today captures only sight, but our perception of space is predominantly photographic, or rather cinematographic. We cannot really make objects out of spaces if there are not enclosed. The empty space deludes us. Gordon Cullen in *The concise townscape* writes about urban sequences and describes exiting view and emerging view in places.

Figure 3: Within and top view and the collage of top-within view

There are two viewpoints on cities (broadened from Cecchini and Rizzi, 2001), within or inside (the perspective), or from the top (the plan) and they define two different representations (see Figure 3). I use them to make a collage representation of the city (plans in perspective). The place on the sketches is Stortorget in Stockholm. Each place has objects, the fountain on Stortorget for example. It has edges, where the place ends and exits or entrances to the place. In a place we make instantaneous relationships between the objects (over, under, beside, inside, outside, far, near), locate exits and impermeable edges. We remember the façades as images and also add attributes to the objects (for example immobile, predictably or autonomously mobile) and categorize them (for example benches, trees, garbage cans, bus stops, kiosks). In the end we add the place in the mental map of the city and connect it with exits to entrances to other places. We also join contiguous places in neighbourhoods. We conjoin images and differences between the images of the top-within view make differences between neighbourhoods. The neighbourhoods fuse the social and
physical, the group of people that temporarily or permanently inhabit certain urban form. All cities have many faces, in which each social class is found in distinct neighbourhood (Reclus, 1905:354).

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