The Mirage of the Metropolis

City imaging in the age of digital chorography

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Introduction: at the limits of imaging

More than half a century has elapsed since Kevin Lynch's classic work *The Image of the City* (1960) provided a framework for decoding how urban actors conceptualize, orient, and navigate their cities. While the relationship of the individual to the city had long been a central theme of urban sociology (see Simmel 1903), the accessibility of Lynch's classification of urban environments into five distinct elements endured and influenced several generations of designers and planners (Laurence 2006; Pearce and Fagence 1996).[1] Beyond these 'home' disciplines, Lynch's imaging framework and cognitive mapping methodology also impacted discourse in geography, anthropology, environmental psychology and cognitive psychology (see Milgram 1970). More recently, urban imaging has been actively applied to contexts as diverse as virtual environments (Morello and Ratti, 2009) and real-world tourism branding and marketing (Hospers 2010).

Lynch's urban imaging framework has also been subject to significant critique. From the perspective of urban semiotics, Raymond Ledrut (1973) criticized the psycho-biological undertones of Lynch's assumptions of image-based adaptation to the environment. Ledrut noted that far from simply reacting and adapting like goal-

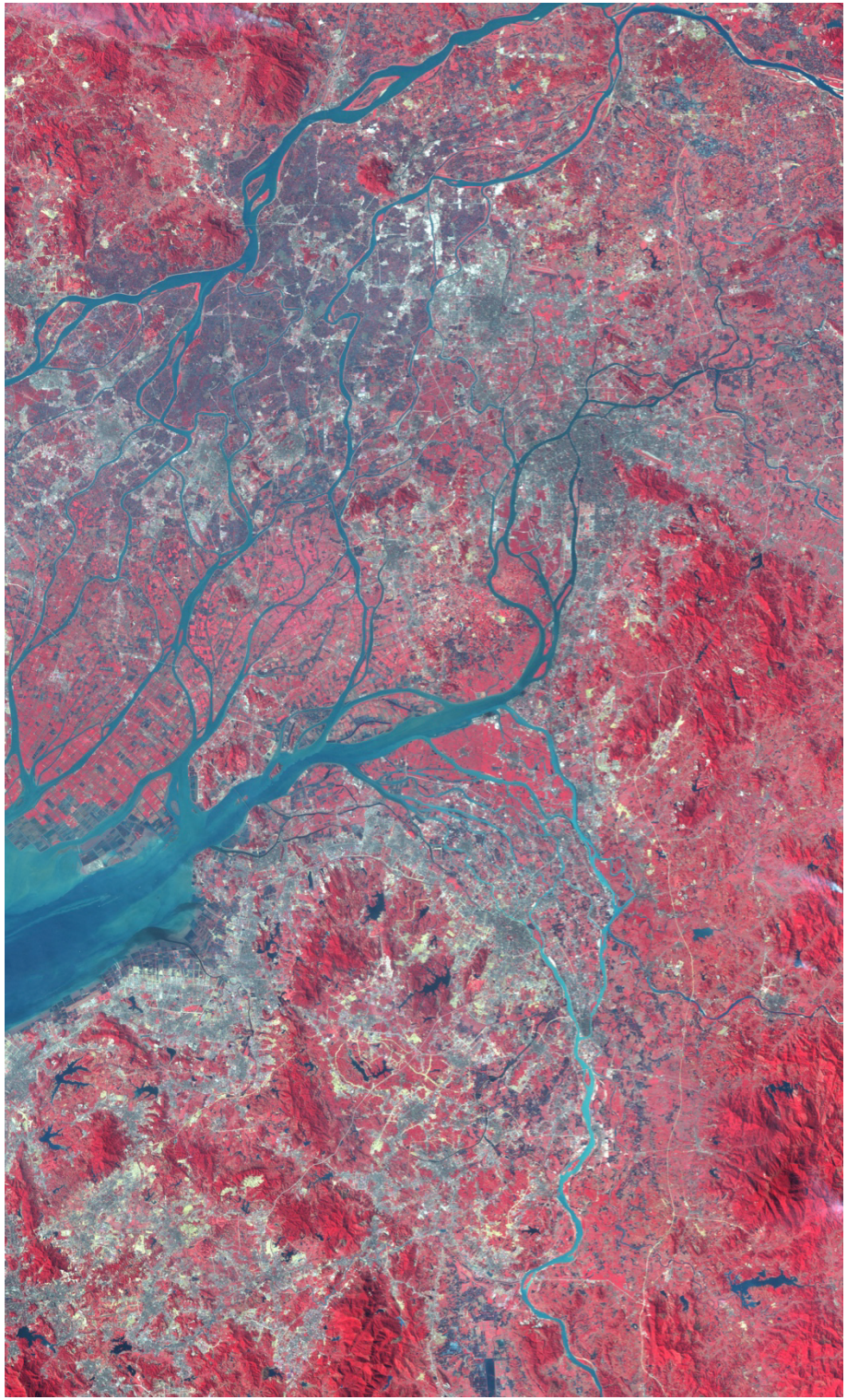

Figure 1. Satellite image of urbanization of the Pearl River Delta, China (© 2003 Landsat 7, NASA/GSFC,).

oriented laboratory rats caught in a maze, urban actors actively use and produce the urban milieu. Roland Barthes (1970) accepted classification into discreet units (paths, nodes, edges, landmarks, and districts) as semantically sound practice, but critiqued the disjunction between Lynch's pursuit of a reductive study technique whilst believing the human environment as a whole to be qualitatively greater than its parts.

Mark Gottdiener and Alexandros Lagopoulos (1986) posited that the use of cognitive mapping as an objective mechanism fails to acknowledge its ideological representation of signific and symbolic urban processes. Indeed, when reflecting on the original study a quarter of a century later, Lynch (1984A) himself acknowledged the limitations of having subjects use the difficult task of drawing maps to capture deeply lodged mental images. Fredric Jameson (1991) took this a step further, questioning whether the subject-centred travel itineraries that Lynch's subjects drew actually qualify as maps. More generally, Lynch's methodology has been critiqued for privileging vision, and in particular the abstract detachment of the planimetric view whilst ignoring the place-making influence of other senses such as smell (Landry 2006) and the corporeal act of walking (see De Certeau 1984). Lastly, urban imaging has been criticized for ignoring the role that media plays in constantly implanting dynamic mental images of cities, including zones that are yet to be physically visited (Warner and Vale 2001; Vale 1999).

Addressing some of these critiques and disregarding others, urban imaging continued to be applied, developed, and refined over time. Analysis of diverse physical environments and cultural contexts across the globe reinforced the apparent universal applicability of Lynch's framework (Kaplan and Kaplan 1981). While Lynch's original study sought to understand the problem of disorientation that he found so detrimental to effective urban life, designers and planners interpreted its apparent universality as a normative template for structuring well-ordered cities (Sternberg 2000; Debord 1994). Indeed, Lynch's later work on urban form also contributed to this interpretation (Lynch 1984B).[2] As a consequence, urban legibility emerged as a core objective for urbanism, both in the context of physical planning and through modes of representation of the city.

Given the urban transformations that have occurred since the mid twentieth century, it is remarkable just how intact Lynch's core premises have remained. To be certain, cities are still largely comprised of the same physical ingredients. For instance, the suburban template of car-oriented peripheral expansion (that continues to challenge urban designers) was well established by the late 1950s. As evidenced in Lynch's case study of Los Angeles, even the disorienting qualities of freeways had already significantly pervaded the post-WWII city. As Robert Venturi (1972) observed, whereas the crossroad once reconfirmed spatial orientation, enormous signs now direct drivers through freeway 'cloverleafs' at high speed, as they veer right in order to turn left. Moreover, the post-WWII motorists' experience follows the inherent disorientations of subterranean urban rail, which had existed in several major US cities since the turn of the century (see Maffi 2004).

However, while their fundamental physical ingredients may be similar, contemporary cities *have* changed manifestly from the ones Lynch studied. Today, the unbounded scale, speed and complexity that characterize urban milieus challenge traditional modes of imaging and mapping. At once both urban and landscape, planetary urbanization dissolves clear categories of city, periphery, and region (Dettmar and Weilacher 2003; Brenner 2014). This dispersed, undifferentiated, edgeless "post-urban condition" (Koolhaas 1997: 585) is more effectively described through remote satellite sensing and ecological metaphors, than through the traditional figure/ground plans that Lynch and several generations of urban designers used to describe urban form (see Waldheim 2011) (figure 1).

In this post-urban environment, the efforts of planners and designers to make cities more structurally legible and orienting generally met with limited success. Instead, as cities became increasingly complex and confounding, more sophisticated imaging techniques and way-finding navigation devices emerged to augment the cognitive maps of

urban actors. Initially constituted as vehicular satnav systems, specialist navigation apparatus became widely accessible through GPS-enabled smartphones. Consequently, urban imaging and navigation is no longer primarily constructed through bodily senses, dead reckoning and cognitive and physical maps. Urban actors heavily subsidize these tactics with an augmented landscape of location-specific information that substitutes traditional bricks-and-mortar landmarks with triangulation off invisible satellites and cell phone towers. In this milieu, the navigator becomes more immersed in the virtual space of the map than in the cues, features, and textures of the physical space that they are traversing (see Grabar 2014).

Aims and scope: re-mapping city imaging

These recent digital transformations of urban life challenge the continued relevance of established city-imaging paradigms (as originally codified by Lynch). Indeed, with technology readily at hand for extraction from any disorienting predicament, do urban actors still need to image urban environments? This paper is constructed on the assertion that imaging does remain essential for constructing a *sense of place*. That is, as a fundamental foundation of meaningful urban life, place making remains contingent on forming an environmental image that extends well beyond an actor's immediately perceivably location.

Situated in this context, the paper specifically explores the potential for innovation in modes of urban mapping and representation to adapt more traditional city representation techniques to the place making challenges of the contemporary metropolis. Towards this goal, the research draws on the established interdependencies between *cartographic representation* (maps created for a particular purpose), *cognitive mapping* (neurological representation of spatial information), *mental mapping* (physical maps constructed from memory), *city imaging* (individual and collective) and *urban structure* (both physical and cultural) (Golledge 1999). Methodologically, the research fits within an interpretive framework that places phenomena in context through an iterative mediation between theoretical understandings and empirical observations (Swaffield and Deming 2011).

The paper contributes to the wider adaptation of urban theory and design to digitally propelled shifts in contemporary urban life. In urban theory and design, urban delineation is indissolubly integral to processes of understanding and ultimately projecting visions for the city. And although the history of urban theory and design is characterized by the recurrent innovation and continual evolution of modes of urban mapping and representation, the field remains strongly grounded in established analogue traditions. While these traditions continue to serve the enduring nature of urban form, there is a growing necessity for alternative urban mapping techniques that more wholly assimilate the potential of digital methods into urban design within the challenging milieu of planetary urbanism.

New aesthetic of cognitive mapping

Three decades ago, Jameson identified the physical and existential loss of orientation as a key condition of postmodern urbanism. Jameson observed that the individual human body is losing the capacity "to locate itself, to organise its immediate surroundings perceptually" and to "cognitively map its position within a mappable external world" (Jameson 1984: 83). To engage this condition, Jameson called for the invention and projection of a new aesthetic of cognitive mapping to coordinate the existential subject within an abstract totality. In framing this challenge, Jameson leveraged the everyday role of cognitive mapping as enabling the "situational representation on the part of the individual subject to that vaster and properly unrepresentable totality". Jameson defined the "unrepresentable totality" as the "ensemble of society's structures as a whole" (Jameson 1991: 51).

Since *cognitive mapping* is defined as the internal neurological formation of spatial information (Golledge 1999), it is assumed here that Jameson uses the term more broadly to refer to *mapping of/for cognition*, thereby incorporating the agency of *cartographic representation*. With this caveat, Jameson's call fits within a long tradition of efforts to reveal cartographically society's structures at multiple scales within the city. In the mid eighteenth century, Giambattista Nolli's map of Rome revealed in great detail the

configuration of public and semi-public space across the streets, squares, colonnades and foyers of the metropolis. In the 1930s, Chicago School urban sociologists empirically mapped specific socio-spatial relationships, with Shaw and McKay's maps of juvenile delinquency, and Faris and Dunham's mental illness maps epitomizing this approach (Shaw and McKay 1942; Faris and Dunham 1939). Although some of the theoretical positions of Chicago School sociologists were later critiqued for oversimplifying and naturalizing social relations (Braun 2005; Vasishth and Sloane 2002), the potency of their maps endures. And from the 1970s, a new wave of urbanists and urban designers revisited the agency of urban social mapping, as evidenced in the observational cartographies of William H. Whyte and Jan Gehl (see Gehl 1979; Whyte 1980).

Set within this tradition and trajectory of urban delineation, Jameson's postmodern call for a new cognitive mapping aesthetic remains relevant to the contemporary post-urban condition. Responses to Jameson's challenge take a variety of forms, with some of the most persuasive emerging from the fields of urban data-visualization and counter mapping. Given that the complexity of information systems and urbanism are increasingly analogous, it follows that the spatialization of data becomes consonant with city mapping. Influenced by post-structuralist geographies such as Manuel DeLanda's (1997) re-conceptualization of urban history as the convergence of matter and energy, cities are re-visualized as matrices of flows, associations, and connections. Enabled by the increase in spatial data, these "shimmering" cartographies seek novel and enigmatic windows into the invisible city-structuring flows of information (Doel 1999; see Amoroso 2010) (figure 2).

By Illuminating hidden structures, urban-data mappings either explicitly or implicitly address half of Jameson's challenge to represent the "properly unrepresentable totality […] of society's structures as a whole" (Jameson 1991: 51). Similarly, some data-

Figure 2. Data mapping: flow map illustrating tourist hotspots of London generated by compiling publicly available geotagged photographs from flicker.com (© 2015 Eric Fisher/Mapbox).

maps might be argued to address the critique from urban semiotics: potentially resynthesizing the fragmentary nature of Lynch's methodology (as Barthes notes) or avoiding the subjective pitfalls of individual cognitive maps based on physical landmarks and movement. Moreover, augmenting visual information with rich flows of interactive non-visual data conceivably addresses the simple image-based adaptation that Ledrut found to be problematic with Lynch's methodology (see Russell 2004). However, although effective at illuminating informational convergences within the vaster totality, urban data-mapping projects generally apply a very abstract threshold to the 'situational representation' component of Jameson's new aesthetic of cognitive mapping.

In contrast to the structural or top-down scale that typifies urban-data mappings, *counter-mapping* approaches urban imaging from the ground up, or inside out. Counter-mapping draws on the postmodern dissolution of binaries such as object/subject, reader/author and within/without (Soja 1996: 116). Within this approach, the selectivity of mapped information, the privileged interpretive viewpoint of the 'skilled map reader', and the marginalizing human cost of the inaccuracies of representation are interrogated and deconstructed. This interrogation takes a variety of forms, including social mapping, everyday mapping, insurgent mapping, resistance mapping, map hackings and other personal, creative, and dissident projects (Crampton and Krygier 2006; Holmes 2006; Pinder 2007) (figure 3).[3] Across such a diverse range of approaches, counter-mappings prioritize the mapping of individual experience over accurate spatial surveying or efficient navigation (Casey 2007).

Overall, counter-cartographies dislodge the traditional position of placeless suspension above the field of survey in favour of a multiplicity of maps constructed from within. From this position, counter-mapping arguably addresses half of Jameson's challenge to enable the "situational representation on the part of the individual subject" (Jameson 1991: 51). The trade-off is that insider-mapping projects are typically too internally referent to fulfil the other

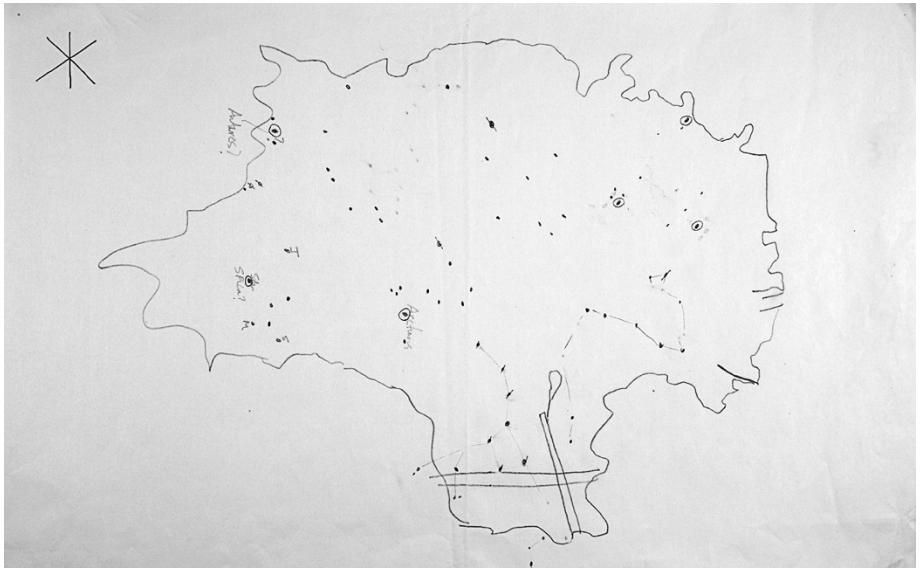

Figure 3. Counter mapping: "Night Sky" (© 2010 Denis Wood, reproduced with permission).

component of Jameson's challenge to represent the "totality of society's structures as a whole". When examined alongside one another, data-mappings and counter-mappings perpetuate the modern dichotomy between planimetric projections and ground-level points of view that persist in the analysis and representation of the urban landscape (Stevens 2006). That is, between the conventional Cartesian gaze that remains typical of data mapping, and the limited horizon of the immersive, localized, and individualized point of view that is typical of user-based counter mappings and projections.[4] Along with recent technological developments, it is this deficiency in radically novel modes of urban mapping that cultivates the parallel re-emergence of the anachronistic bird's-eye view.

Re-emergence of the bird's-eye view

Seeking an overview is a recurrent objective in the history of imaging and mapping urban environments. Beginning with oblique vantage points from hilltops and cathedral steeples, a century and a half of progressively higher and more systematized flight reinforced the vertically downward view. Passing from balloons, to kites, camera-

pigeons and planes, this progression reached its apotheosis in the 'whole-earth' images of the Apollo Moon missions (Cosgrove 1999). Retreating from this maximum distance, the eye-in the-sky settled into the low-Earth orbits that facilitate high-resolution satellite imagery.

Today, ubiquitous satellite imagery and mapping is habituated as an extension of the self in urban imaging and way finding (Kurgan 2013). However, the seductively systemic abstraction of satellite (and aerial) imagery also reveals the limitations of modern cartography's capacity to represent coherently the contemporary urbanized landscape and render legible the scale of everyday life. From orbit, an individual loses track of their place within urban agglomerations, which appear naturalized in their resemblance of bacterial blooms (Wang 1991). When zoomed right in (at ever-increasing resolutions), familiar features are registered in planimetric forms that often fail to resonate with an individual's established perception of their place in the world (Mitchell 1992).

The recent re-emergence of the anachronistic bird's-eye view in media and online map applications can be interpreted as a reaction to these limitations.[5] Angled obliquely down and across, the lower altitude vantage point of the bird's-eye view provides spatial qualities that more closely align with the scale of everyday life (figure 4). This in-between angle combines a structural view from above with the promise of walking and discovering the landscape at close range (Hunt 2000). Typically, the horizon adumbrates and calibrates this synthesis of the ground-aerial landscape (Casey 1993). Indeed, in the sense that one imagines the future as being dispensed from over the horizon, the bird's-eye view is inherently anticipatory. That this 'optimistic' angle remains popular indicates the fragility of two centuries of retraining our scopic regimes to conform to the planimetric Cartesian construction of the Earth (Pickles 2004). Amid the rapid adoption of cutting-edge automated consumer drone technologies that further promote and facilitate the low aerial bird's-eye view, this revival is likely to gain further momentum (Kullmann 2017).

Figure 4. Revived bird's-eye view: "New Presidio Parklands Project," San Francisco (by James Corner Field Operations 2014 for The Presidio Trust).

This raises the question of whether the innate characteristics of the anachronistic—but renascent—bird's-eye view might be harnessed to address the city imaging limitations of both conventional cartography and the new wave of user-based and data-mapping projects. While some of these mapping examples may lay justifiable claims to fulfilling parts of a new aesthetic for mapping the image of the city, it is difficult to argue that any fulfil the dual terms of Jameson's challenge for enabling the *situational representation* of the individual within the *vaster totality*. *Situational* is more comprehensively interpreted as representation that acknowledges its own selective and incomplete point of view and includes richness, diversity, and a degree of material immediacy (Söderström 1996). Now largely absent from modern cartographic conventions, these situational characteristics are reflected in the relegated mapping practice of *chorography*.

Chorography: first and second revivals

In Claudius Ptolemy's classical ternary representational hierarchy, chorography is the most grounded of the three modes of the natural order. Chorography is situated below the Euclidean projections of geography and the grand structure of the (geocentric) universe as established by cosmography. Revived following the fifteenth century Latin translation of Ptolemy's *Geographia*, the remit of chorography is the local region, where it registers features at the near scale in which human life takes place (Moll 1709; Cosgrove 2008). The Greek root chôra denotes *a definite piece of ground, a place* (Casey 2004; Olwig 2008).[6] Of the three representational orders, this root positions chorography closest to the modern usage of landscape, which traces Germanic etymology. Unlike geography—which eschews likeness for the abstraction and precise location of features—the near scale of chorography permits a qualitative and sensory approach to the representation of the particularities of the landscape (Cosgrove 2008).

Whereas quantitative geographical methods seek to eliminate the vagaries of interpretation, chorography admits the creative contribution of the individual surveyor (who was often depicted in the foreground of the representation in the third person) (figure 5). Nevertheless, Renaissance chorography remained more map than painting, with sixteenth and seventeenth century examples containing both quantitative and pictorial information about the land. Map space was scaled and proportioned according to a complex scaffolding of traverses and offsets or triangulations, whose constructions were often superimposed into the representation (Cosgrove 1999). However, unlike the cartographic pursuit of Euclidean consistency, chorographic constructions did not seek to depict all features equally. Despite this elasticity, chorography fulfilled the original sense of surveyable space, where the surveyor is situated within the same space that is being mapped (Casey 2002).

Although initially displayed alongside geographic projections, from the eighteenth-century chorography was usurped by the more spatially consistent military cavalier projections, and eventually by the

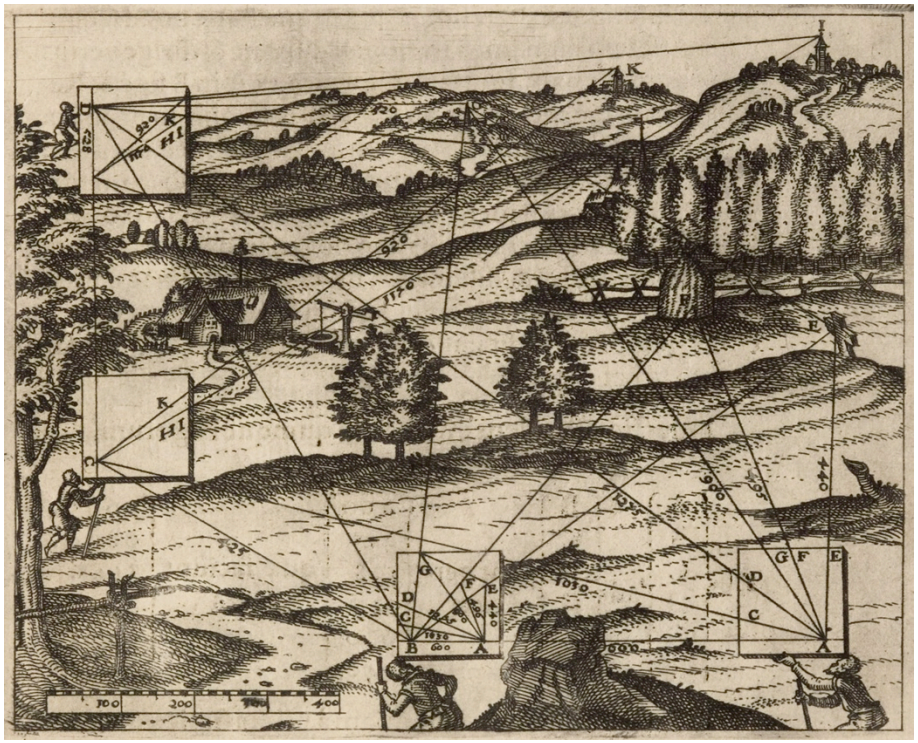

Figure 5. Renaissance chorographic survey of a region: Leonhard Zubler, 1607. "De Instrumenti uſu in deſcribenda totâ Regione, & Pagorum ejus / Instruments used in the description of the whole region and its districts." Fabrica et vsvs instrvmenti chorographici: qvo mira facilitate describuntur regiones & singulae partes earum, veluti Montes, Vrbes, Castella, Pagi, Propugnacula, & simila (Creative Commons License 2016, Max Planck Institute for the History of Science, Library).

plan (Bios 1981). As cities and landholdings extended well beyond the horizon—and could no longer be seen in their entirety from cathedral towers or hilltops—the problem of establishing both limits and continuity rendered the scope of chorography inadequate (Nuti 1999). Whereas chorographic maps reach their limits at a forest, ridge, or horizon, geographic (Cartesian) maps are circumscribed only by the immaterial map frame, which can be infinitely extended, rescaled and tessellated. Through this mathematical division of the Earth's surface from overhead, geography eventually assumed the role of urban delineation. Precision supplanted resemblance, as the planimetric view ascended over time to represent—and ultimately embody—the

rational order of modern city planning (Pickles 2004; Hinchcliffe and Deriu 2010).

In the nineteenth century, chorography underwent a minor second rehabilitation at the hands of the German geographer Ferdinand von Richthofen. Along with the related practice of chorology (the study of causal relations), Richthofen sought to standardize chorography as a specialization of geography focused on field observation of local attributes (Kasai 1975). With this distinction failing to gain wider traction, chorography continued to relinquish the duties of measurement and topographic representation to geography. Ultimately, the practice devolved into the scenic city-branding panoramas that were popular in the nineteenth century and still frequent tourist maps today.

Chorography: third revival?

Given their historical connection, the potency of the recently revived bird's-eye view suggests potential for probing deeper into the genealogy of chorography for characteristics relevant to the contemporary challenge of *situational/totality* urban representation (and by association, imaging). To be certain, Jameson clarifies that novel *situational/totality* mappings should avoid returning to the traditional machinery of a "reassuring *perspectival* or *mimetic* enclave." Cognizant of this caveat, the rationale for re-envisioning chorography is grounded in the potential for digital techniques to resolve historical deficiencies of the practice. Three key characteristics that traditionally curtailed chorography are digitally reinterpreted here as opportunities for city mapping and imaging.

First, although multiple viewpoints were traditionally combined into a single chorographic composition, the static nature of the medium necessitated that these angles be oriented in the same general cardinal direction. Consequently, viewing the map from alternative directions destabilized the overall composition (Nuti 1999). In digital form, a multitude of angles may be conveyed through subject-centred mapping to reconfigure dynamically a map representation to respond to the map-user's point of view (Hackenberry et al 2006). Granting the map-user active input potentially enhances the historical essence of chorography as analogous to a highly malleable lens that continuously changes viewpoints (Nuti 1999).

Second, in comparison with the uniformity of geographic projections, chorographic representations suffered from spatial inconsistencies. However, while problematic for translating mathematical distances between the map and the terrain, the spatial variability of chorography is suggestive of the elasticity that is integral to individual cognitive mapping and imaging (Golledge 1999). Whereas exaggeration in one part of the universal grid of Cartesian projections is necessarily offset by compression elsewhere, the customized constructions and limited extents of chorographic space are more able to absorb plasticity. Therefore, instead of removing chorographic distortion through geometric correction, distortion is potentially digitally amplified to record or invoke a range of more subjective spatial experiences.

Third, although individual choreographies provided useful representations of well-defined landscapes, assembling numerous overlapping, elastic, disjointed or distinctive maps into a coherent whole proved problematic. Digital stitching techniques for integrating large quantities of disparate imagery into coherent configurations suggest a technological solution to the historical problem of chorographic continuity. Calibrating digital stitching techniques to retain the integrity of the edge upholds the internal distinctiveness of each map. Given that the scope of chorography relates to the scale at which the landscape is perceived, this technique potentially delineates a local sense of place whilst simultaneously connecting the representation to the broader structure.

Digital choreographies: three motifs

Applying these digital characteristics to the challenge *of totality/*situational representation, the following section explores three motifs for re-envisioning a 'third chorography'.

Motif 1. Composited chorographies

The first level of chorographic integration of the *situational* and *totality* comprises compositing two or more distinct projections into a single map/representation. Numerous historical examples suggest precedents for this amalgamation. In the 17th century, the French landscape designer Andre Le Nôtre combined the ground plan and related perspectival projections into a "mixed perspective" drawing of Versailles (Weiss 1998: 49). In the 19th century, Peter Joseph Lenné combined plan and elevation in the masterplan for Berlin's Tiergarten. And in the 1960s and 1970s, the speculative architecture studios *Archigram* and *Superstudio* blurred the customary segregation of plan, section, and perspective in conceptual analogue collages. In these examples, elements of Donald Appleyard terms "multilevel comprehension" are evident, whereby multiple projections create associations between "simple abstractions" and the "complex texture of experience" (Appleyard 1977: 61). Nevertheless, the graphical assemblage of mixed projection remains tentative, with each example vulnerable to deconstruction to its constituent parts in the eyes of the viewer (see Kullmann 2014).

Two examples suggest more advanced compositing that instigate higher degrees of integration of the *situational* with the *totality* (and prefigure subsequent chorographic categories). First, Barbara Stauffacher Solomon's representation of the Palazzo Rossi combines three distinct projections into the single composition (figure 6). In the image, a low aerial constructed perspective of the palace and grounds folds up at almost 90 degrees to reveal the same setting in planimetric view. Behind this plan view, the projection appears to fold back down into a more traditional chorographic representation of an agrarian hinterland. Second, M. Razvan Voroneanu's representation of future Manhattan recomposes similar projective components to Palazzo Rossi, albeit in an alternative order (figure 7).

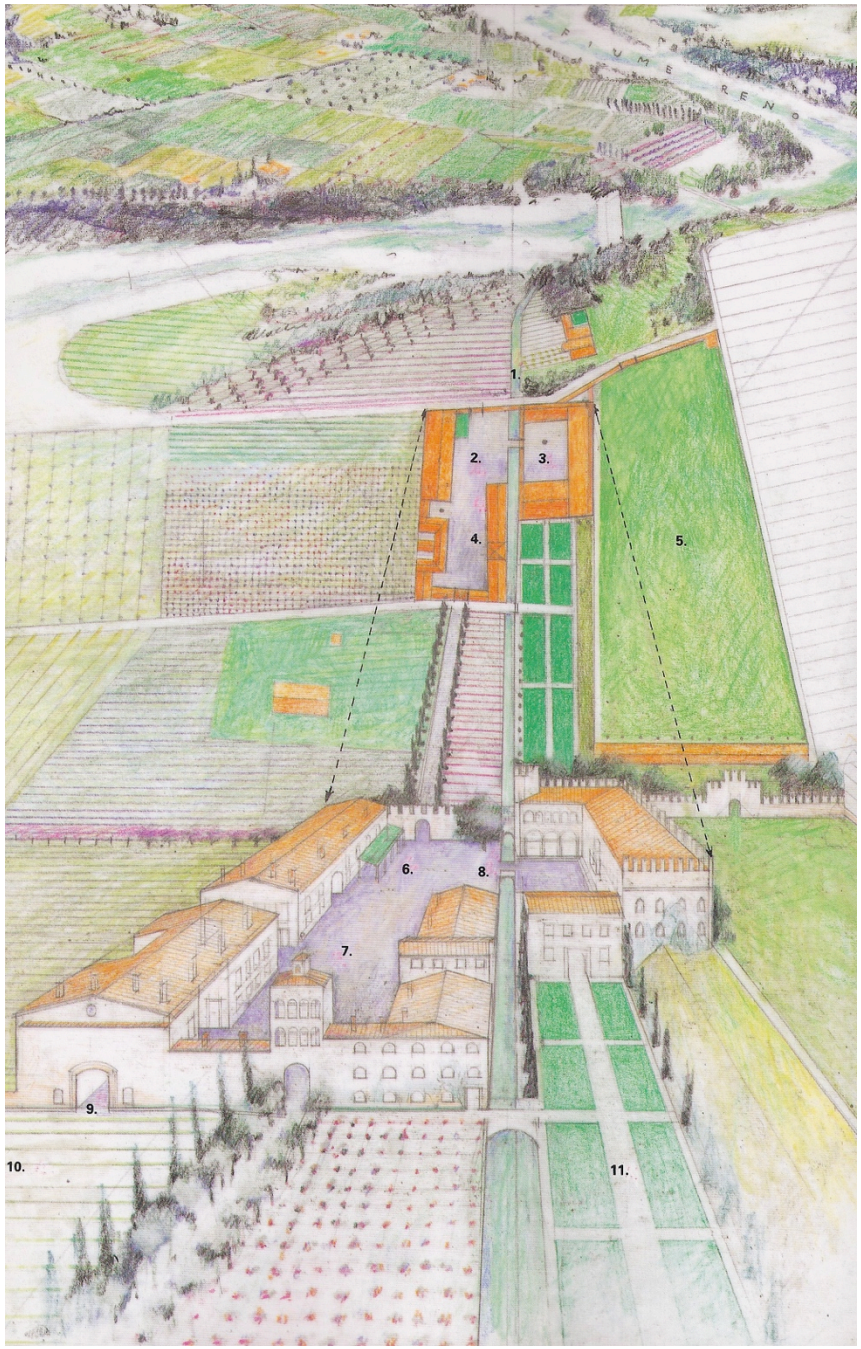

Figure 6. Composited chorography: "Palazzo Rossi" (© 1988 Barbara Stauffacher Solomon, reproduced with permission).

Figure 7. Composited chorography: "Of Urban Islands, Rhizomes, and Other Archaeologies" (© 2011 M. Razvan Voroneanu, reproduced with permission).

Dominating the centre of the image, a bird's-eye view of a portion of the city grid folds backwards towards the viewer, culminating in a perspectival plan view of a street (from directly overhead). In the distant background, at a location that just obscures the horizon of the bird's-eye view, the image folds up abruptly at 90 degrees to reveal the grid in full planimetric projection. Although presented as a static image with a self-consciously analogue patina, there is a dynamic aspect to the composition that appears poised to reconfigure to the motion or memory of the viewer.

Motif 2. Curved chorographies

Building on the above examples of chorography composited using seamless interfaces, the second level of chorographic integration more comprehensively blends distinct projections through bending and warping surfaces. This manoeuvre is memorably embodied in a scene of the Hollywood film *Inception* (2010), where the urban fabric of the 15th arrondissement in Paris bends upwards and almost back onto it itself (figure 8). As the streets and buildings curve upwards during the mind-bending dream-event, the structure of the surrounding city is revealed while the environment of the immediate streetscape remains stable and situated.

Inception's dream-altered Paris is reflected in the BERG Collective's contemporaneous Here & There map of Manhattan. Utilizing a similarly extreme curvature of the ground plane, this 'horizonless projection' fuses the representation of the viewer's immediate environment with a wider overview (figure 9). In explaining this dual experience that bridges the Cartesian and perspectival worlds, the creators of Here & There note that "the ability to be *in* a city and to see *through* it is a superpower, and it is how maps should work" (Jack Shulze 2009, added emphasis). Achieving this transparency—without revealing such a depth of visual information that the representation diffuses into incomprehensible noise—is an aspiration that is highly analogous to an urban actor's formation of an image of a city.

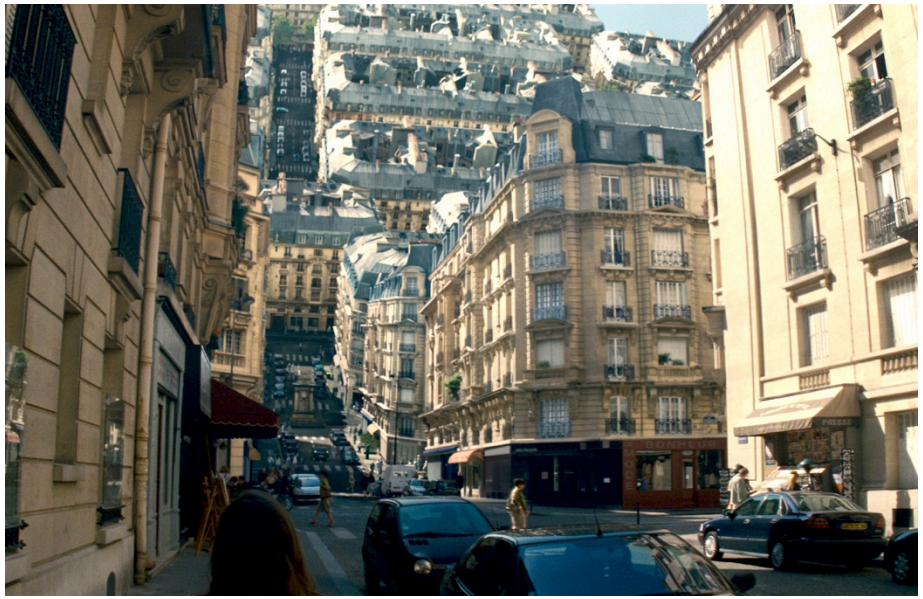

Figure 8. Bowed chorography: still from the film Inception (© 2010 Warner Bros and Legendary Pictures, reproduced under fair use for scholarly critique).

Just as the *Inception* example is literally a film still in a cinematic sequence, the "Here & There" curved chorography may be interpreted as a moment in a (yet to be developed) dynamically altering subject-centred map construction. Nevertheless, in practice, the explicit goal-orientation of subject-centred mapping constrains this dynamic interpretation. Although the destination-focus supplies the map user with abundant information about where they are headed, less serviced is information pertaining to where the subject has been, aspires to go, or will never go; all of which are critical in the formation of a meaningful image of a city. Placed within the tradition of bird's-eye views, this temporal aspect appears even more linear and predetermined, as urban actors react to a future that appears to be dispensed at them from over the forward horizon. In contrast, the horizonless projection of "Here & There" suggests an alternative, temporally relational state. Simultaneously immersed both within and above the map, and without a horizon to reference, time is construed neither as a goal to be reached nor as events to be reacted

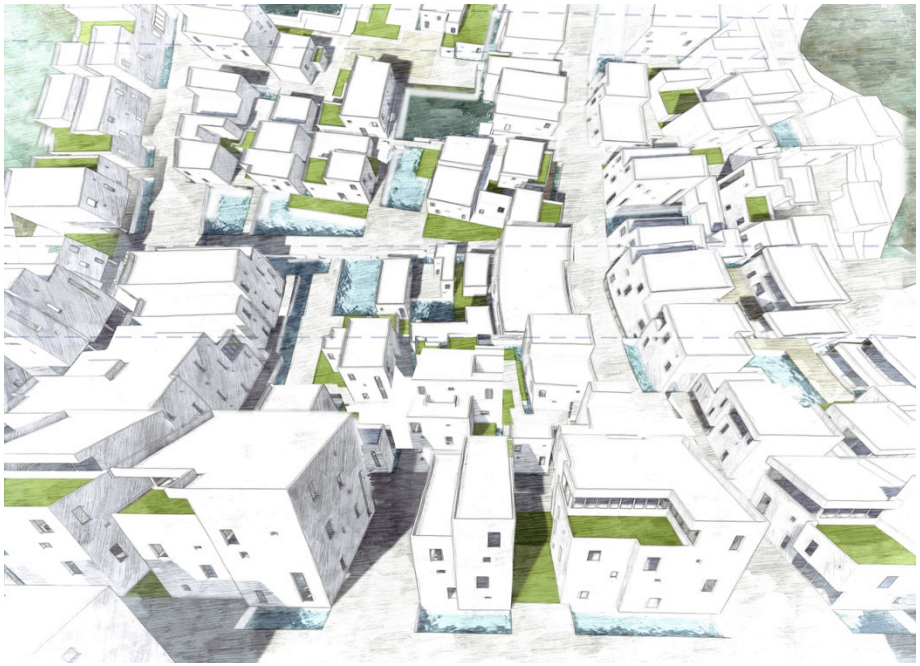

Figure 9. Bowed chorography: "Post-Industrial Fish Village Revitalization" (© 2013 Shi Chen, reproduced with permission). Reproduced here to illustrate the projection style of "Here and There: Horizonless Map of Manhattan" (2009 BERG).

to. Rather, map-space approximates the state of memory (the essence of city imaging) wherein time is fluid and explored in all directions (see Kullmann 2016; Cache 1995; Arakawa and Gins 1994).

Motif 3. Crumpled chorographies

Where *composited* and *curved* choreographies respectively *blend* and *bend* established projections, the third category stitches disparate chorographies into a patchwork. This approach leverages recent digital advances in drone-based photogrammetry and laser scanning. Topographic features of an environment (including buildings, infrastructure, and landscapes) are recorded in overlapping detail with camera or laser equipped drones and converted using stereophotogrammetry into orthorectified and georeferenced three-dimensional point cloud maps. Imagery captured and processed in this way provides an unparalleled overhead window onto the nuances

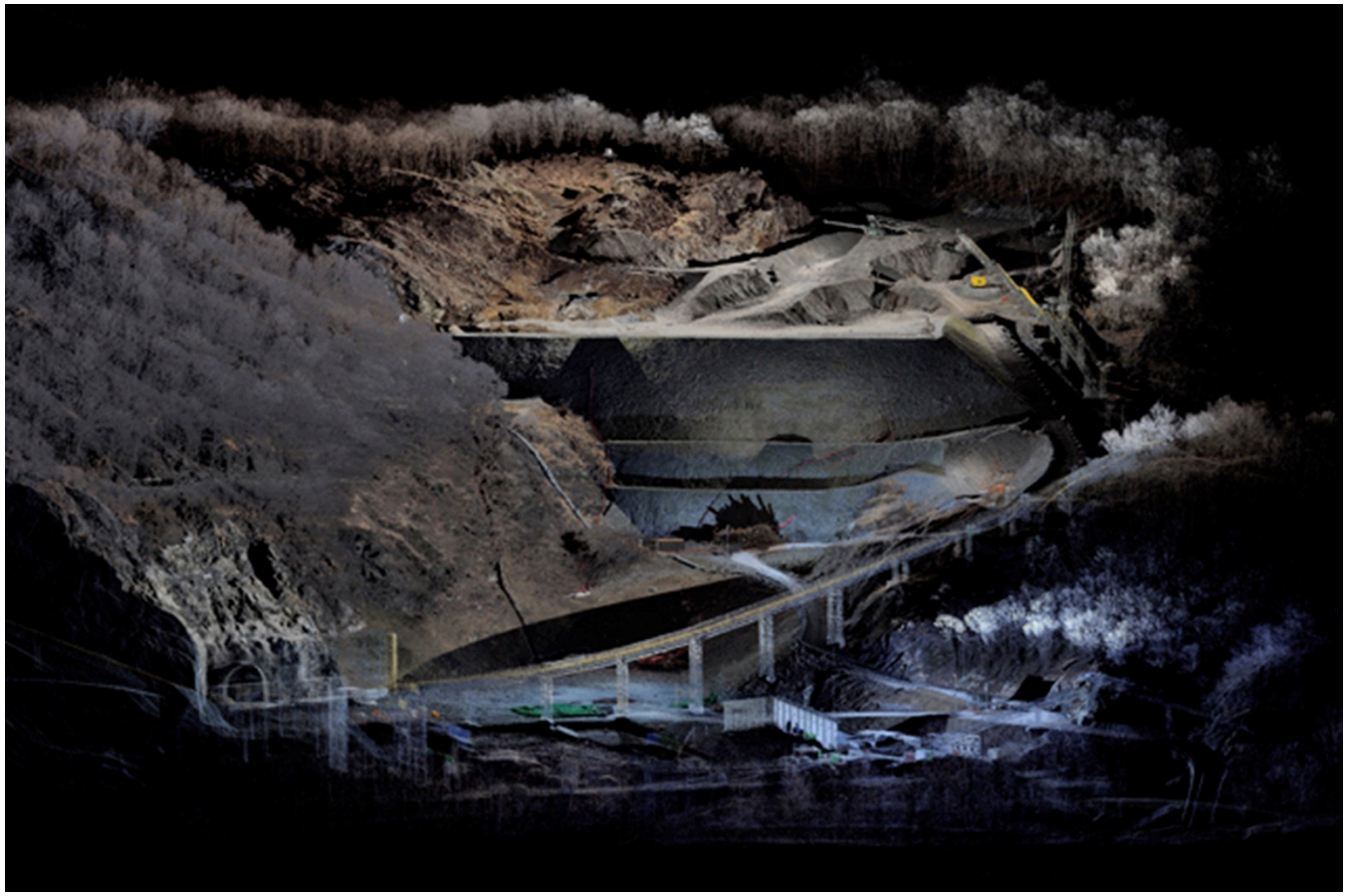

Figure 10. Crumpled chorography: point cloud representation of a hybrid landscape comprised of natural, infrastructural and industrial elements (© 2017 Landscape Modelling and Visualization Lab, Swiss Federal Institute of Technology, Zurich, reproduced with permission).

and details of the landscape that closely correlate with the clarity of the world as perceived from the ground (see Rekittke et al 2013).

The Landscape Modelling and Visualization Lab at the Swiss Federal Institute of Technology in Zurich applies this method to a multivalent natural, infrastructural, and industrial site (figure 10). Topographic features are rendered as a continuously crumpled quilt-like surface, irrespective of whether those features are constructed or grown, or whether they form intentional or circumstantial aspects of the represented landscape. This representational mechanism is appropriate to a relational rather than oppositional reading of contemporary urbanism, wherein the city is understood more as a continuous fabric than as a figure/ground collection of discrete buildings. As a by-product of the imaging process, the representation deteriorates at the edges as surfaces are omitted from the topographic mesh. Consequently, the representation is topographically delineated (as was characteristic of Renaissance chorography) rather than geometrically framed (as is characteristic of Cartesian maps). This use of topographic delineation potentially establishes differentiation within an edgeless, undifferentiated post-urban condition.

In contrast to the problem of limits that curtailed Renaissance chorography, the full potential of this approach is accessed through

the assemblage of multiple crumpled chorographies. In principle, digital stitching facilitates the accumulation of personal maps, which are captured through many uncoordinated individual drone excursions and amassed into a digital patchwork. Over time, the accrual of crumpled chorographies onto this thickened patchwork suggests an overlapping multilayering process that is analogous to accumulated leaf litter on a forest floor. In this metaphor, each crumpled leaf represents a physiognomic digital chorography of a particular terrain that is situated loosely amongst myriad other chorographic leaves. En masse, the leaves are not intrinsically fused into a single authoritative map; instead, the vestiges over, under and in between chorographies offer a multitude of overlapping images of places.

Conclusions: re-imaging the city

Although Lynch could never foresee a world in which nearly one third of the global population carries a device equipped with GPS and satellite maps, he did comment on the risk of relying on "orientation machines" such as the "directomats" installed in Manhattan in the 1950s (Lynch 1960: 11). While accepting their utility for targeted way finding, Lynch warned of the precariousness of relying on a device that could be lost or fail. For Lynch, myopically following simplified directions diminishes the construction of a reliable image of an urban environment and leaves no orienting strategy to fall back on. Half a century later, Lynch's apprehension resonates with cultural commentary debating the opportunities and obstacles of smartphone navigation (see Grabar 2014). Nonetheless, even as the cultural implications of these 'digital directomats' remain contested, they indisputably augment and amplify the virtual/real image of the city. Indeed, GPS equipped devices are merely the latest in a long succession of navigation and mapping technologies that facilitate novel cognitive relationships with the totality. From the compass to the sextant to the theodolite, each new technology captures the imagination of a society seeking to know its place (see Virilio 1995; Jameson 1991).

In this virtual/real urban milieu of delocalized and dematerialized flows, it has been argued that urban actors supplant fixed objects as the new landmarks (Fattahi and Kobayashi 2009A; 2009B). Here, establishing an image of the city through a sense of time becomes more relevant than establishing a sense of place in the traditional manner. In this setting, Jean Baudrillard's conjectured absence of a "sovereign difference" between the map and its ground appears increasingly apposite (Baudrillard 1994: 2). Nevertheless, (for the time being at least) people continue to inhabit the ground more so than they inhabit maps. Therefore, a corporeally founded sense of place remains broadly fundamental to the formation of meaningful urban life. Moreover, the act of place-making remains contingent on the formation of an environmental image that extends well beyond an actor's immediately perceivably location in both time and space.

In combination with memory, maps (both mental and representational) are a primary medium through which the wider image of place is formed and influenced. Ideally, representational maps also act in reverse, re-morphing in response to the subject's cognition of place. Fulfilling this facility requires dynamic mapping that is simultaneously structural and situational. Although data-mappings and counter-mappings typically achieve one or the other, few attain the dual terms of Jameson's challenge for the situational representation of the individual within the vaster totality. Taking an alternative position, a new aesthetic of cognitive mapping is potentially derived from re-envisioning the relegated mapping practice of chorography through advanced digital imaging technologies. This amalgamation leverages (1) the capacity of the chorographic to combine grounded and aerial angles at a scale and detail that is pertinent to place making, and (2) the capacity of the digital to coordinate and dynamically reconfigure multivalent representations of the urban landscape.

Recalibrating the image of the city through representational mechanisms—as opposed to reinventing city imaging itself—is appropriate to the layered and residual nature of urbanism. Cities simultaneously transform and stay the same; buildings are amongst the most transitory elements of the urban fabric, whereas other micro and macro features (such as property boundaries, trees, landform,

roads and even kerbs) typically endure over longer time frames (Cosgrove 2008). This thickened temporality substantially explains the tentative relationship between digital technologies and urban design in comparison with other design fields that embrace planned obsolescence. But rather than construing the digital as a navigational countermeasure to the tangible problem of endless undifferentiated planetary urbanism, the digital becomes integral to its representation. How the city is represented is in turn fundamental to how urban actors image it, act in it and create it through time.

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Notes

[1] Lynch is likely to have been influenced by Kenneth Boulding's (1956) account of experiential image formation.

[2] Lynch was actually distrustful of the nascent discipline of urban design, viewing it as a project-based architectural activity (Lynch 1984C).

[3] The actions and artworks of the avant-garde Situationist International movement epitomize this type of mapping (see Sadler 1998).

[4] This disjunction is memorably explored in Michel De Certeau's (1984) juxtaposition of the tactically immersed Manhattan pedestrian against the strategic "Concept-city" as witnessed from the 110th floor of Two Word Trade Center.

[5] Georeferenced orthorectified oblique aerial photography includes Bing Bird's Eye™ and Google Maps 45°™.

[6] Roughly equating to "place-mapping", chorography is often confused with the more common word choreography, which from the Greek root *choreia* roughly equates to "dance-mapping". The unintentional conflation of chorography and choreography is not without basis, since the two words are connected through the Greek root *chôros,* which refers to a "place of dance."

References

Amoroso, Nadia. 2010. *The Exposed City: Mapping the Urban Invisibles*. London: Routledge.

Appleyard, Donald. 1977. "Understanding Professional Media: Issues, Theory, and a Research Agenda." In *Human Behavior and Environment: Advances in Theory and Research*, edited by Irwin Altman and Joachim F. Wohlwill, 43–88. New York: Plenum Press.

Arakawa, Shusaku, and Madeline Gins. 1994. *Architecture: Sites of Reversible Destiny*. London: Academy Editions.

Barthes, Roland. 1970. "Sémiologie et urbanisme [Semiology and Town Planning]." *L'Architecture d'aujourd'hui* 53: 11–13.

Baudrillard, Jean. 1994. *Simulacra and Simulation*. Translated by Shiela F. Glaser. Ann Arbor MI: University of Michigan Press.

Bios, Yve-Alain. 1981. "Metamorphosis of Axonometry." *Daidalos* 1: 41–58.

Boulding, Kenneth E. 1956. *The Image*. Ann Arbor MI: University of Michigan Press.

Brenner, Neil, ed. 2014. *Implosions / Explosions: Towards a Study of Planetary Urbanization*. Berlin: Jovis Verlag.

Braun, Bruce. 2005. "Environmental Issues: Writing a More-than-Human Urban Geography." *Progress in Human Geography* 29 (5): 635–650.

Cache, Bernard. 1995. *Earth Moves*. Cambridge, MA: MIT Press.

Casey, Edward S. 2007. *Earth-Mapping: Artists Reshaping Landscape*. Minneapolis, MN: University of Minnesota Press.

Casey, Edward S. 2004. "Mapping the Earth in Works of Art." In *Rethinking Nature: Essays in Environmental Philosophy*, edited by Bruce Foltz and Robert Frodeman, 260–270. Bloomington, IN: Indiana University Press.

Casey, Edward S. 2002. *Representing Place: Landscape Painting and Maps*. Minneapolis, MN: University of Minnesota Press.

Casey, Edward S. 1993. *Getting Back into Place: Toward a Renewed Understanding of the Place-World*. Bloomington, IN: Indiana University Press.

De Certeau, Michel. 1984. *The Practice of Everyday Life*. Berkeley: University of California Press.

Cosgrove, Denis. 2008. *Geography and Vision: Seeing, Imagining and Representing the World*. London and New York: I.B. Taurus.

Cosgrove, Denis. 1999. "Liminal Geometry and Elemental Landscape: Construction and Representation." In *Recovering Landscape: Essays in Contemporary Landscape Architecture*, edited by James Corner, 201–119. New York: Princeton Architectural Press.

Crampton, Jeremy W., and John Krygier. 2006. “An Introduction to Critical Cartography.” *ACME: An International E-Journal for Critical Geographies* 4 (1): 11–33.

Debord, Guy. 1994. *The Society of Spectacle*. New York: Zone Books.

DeLanda, Manuel. 1997. *A Thousand Years of Nonlinear History*. New York: Zone Books.

Dettmar, Jörg, and Udo Weilacher. 2003. “Baukultur: Landschaft Als Prozess / Landscape as Process.” *Topos* 44: 76–81.

Doel, Marcus. 1999. *Poststructuralist Geographies: The Diabolical Art of Spatial Science*. Lantham MD: Rowman and Littlefield.

Faris, Robert E. L., and H. Warren Dunham. 1939. *Mental Disorders in Urban Areas: An Ecological Study of Schizophrenia and Other Psychoses*. Chicago IL: The University of Chicago Press.

Fattahi, Kaveh, and Hidetsugu Kobayashi. 2009a. “City Imaging after Kevin Lynch.” In *World Congress on Computer Science and Information Engineering*, edited by Mark Burgin, Masud H. Chowdhury, Chan H. Ham, Simone Ludwig, Weilian Su, and Sumanth Yenduri, 283–287. Los Angeles CA: IEEE.

Fattahi, Kaveh, and Hidetsugu Kobayashi. 2009b. “New Era, New Criteria for City Imaging.” *Theoretical and Empirical Research in Urban Management* 3 (12): 63–72.

Gehl, Jan. 1971. *Livet Mellem Husene: Udeaktiviteter Og Udemiljøer*. Denmark: Arkitektens Forlag. Published in English as: Jan Gehl (2011), Life Between Buildings: Using Public Space (Washington DC: Island Press).

Golledge, Reginald G. 1999. “Human Wayfinding and Cognitive Maps.” In *Wayfinding Behavior: Cognitive Mapping and Other Spatial Processes*, edited by Reginald G. Golledge, 5–45. Baltimore MD: The Johns Hopkins University Press.

Gottdiener, Mark, and Alexandros Lagopoulos. 1986. “Introduction.” In *The City and the Sign: An Introduction to Urban Semiotics*, edited by Mark Gottdiener and Alexandros Lagopoulos, 1–22. New York: Columbia University Press.

Grabar, Henry. 2014. “Navigation Apps Are Transforming the Way We Experience Urban Environments, for Better and for Worse.” http://www.citylab.com/tech/2014/09/smartphones-and-the-uncertain- future-of-spatial-thinking/379796/

Hackenberry, Mathew, Jeff Hoff, Rob Jens, and Ted Selker. 2006. “A Mindset for User-Centered Spatial Applications.” *Cognitive Processing* 7 (1): 49–51.

Hinchcliffe, Tanis, and Davide Deriu. 2010. “Eyes over London: Re-Imagining the Metropolis in the Age of Aerial Vision.” *The London Journal* 35 (3): 221–224.

Holmes, Brian. 2006. “Counter Cartographies.” In *Else/Where: Mapping — New Cartographies of Networks and Territories*, edited by Janet Abrams and Peter Hall, 20–25. Minneapolis, MN: University of Minnesota Design Institute.

Hospers, Gert-Jan. 2010. “Lynch’s the Image of the City after 50 Years: City Marketing Lessons from an Urban Planning Classic.” *European Planning Studies* 18 (12): 2073–2081.

Hunt, John Dixon. 2000. *Greater Perfections: The Practice of Garden Theory*. Philadelphia PA: University of Pennsylvania Press.

Jameson, Fredric. 1991. *Postmodernism, or, the Cultural Logic of Late Capitalism*. Durham: Duke University Press.

Jameson, Fredric. 1984. “Postmodernism, or, the Cultural Logic of Late Capital.” *New Left Review* 146: 53–92.

Kaplan, Stephen, and Rachel Kaplan. 1981. *Cognition and Environment*. New York: Praeger.

Kasai, Yamato. 1975. “Von Richthofen and Modern Geography: System and Unity of the Geographic Sciences.” *The Science Reports of the Tohoku University: 7th Series, Geography* 25 (1): 95–103.

Koolhaas, Rem. 1997. “Pearl River Delta: The City of Exacerbated Difference.” In *Poleitics: Documenta X*, edited by Catherine David and Jean-François Chevrier, 557–592. Cantz: Ostfildern-Ruit.

Kullmann, Karl. 2017. “The Drone’s Eye: Applications and Implications for Landscape Architecture.” *Landscape Research* 43 (7): 906–921.

Kullmann, Karl. 2014. “Hyper-Realism and Loose-Reality:The Limitations of Digital Realism and Alternative Principles in Landscape Design Visualization.” *Journal of Landscape Architecture* 9 (3): 20–31.

Kullmann, Karl. 2016. “Concave Worlds, Artificial Horizons: Reframing the Urban Public Garden.” *Studies in the History of Gardens and Designed Landscapes* 37 (1): 15–32.

Kurgan, Laura. 2013. *Close up at a Distance: Mapping, Technology, and Politics*. Cambridge MA: MIT Press. Landry, Charles. 2006. *The Art of City Making*. London: Earthscan.

Laurence, Peter L. 2006. “The Death and Life of Urban Design: Jane Jacobs, the Rockefeller Foundation and the New Research in Urbanism, 1955–1965.” *Journal of Urban Design* 11 (2): 145–172.

Ledrut, Raymond. 1973. “Parole Et Silence De La Ville [Speech and the Silence of the City].” *Espaces Et Sociétés* 9: 3–14.

Lynch, Kevin. 1984a. “Reconsidering the Image of the City.” In *Cities of the Mind*, edited by Lloyd Rodwin and Robert Hollister, 151–161. New York: Plenum.

Lynch, Kevin. 1984b. *Good City Form*. Cambridge, MA: MIT Press.

Lynch, Kevin. 1984c. “The Immature Arts of City Design.” *Places* 1 (3): 10–21. Lynch, Kevin. 1960. *The Image of the City*. Cambridge, MA: MIT Press.

Maffi, Mario. 2004. *New York City: An Outsider’s inside View*. Columbus, OH: Ohio State University Press. Milgram, Stanley. 1970. “The Experience of Living in Cities:

Adaptations to Urban Overload Create

Characteristic Qualities of City Life That Can Be Measured." *Science* 167: 1461–1468.

Mitchell, William. 1992. *The Reconfigured Eye: Visual Truth in the Post-Photographic Era*. Cambridge, MA: MIT Press.

Moll, Herman. 1709. *The Compleat Geographer: Or, the Chorography and Topography of All the Known Parts of the Earth*. London: Printed for Awnsham and John Churchill ... and Timothy Childe.

Morello, Eugenio, and Carlo Ratti. 2009. "A Digital Image of the City: 3D Isovists in Lynch's Urban Analysis." *Environment and Planning B: Planning and Design* 36 (5): 837–853.

Nuti, Lucia. 1999. "Mapping Places: Chorography and Vision in the Renaissance." In *Mappings*, edited by Denis Cosgrove, 90–108. London: Reaktion Books.

Olwig,Kenneth R. 2008. "Has 'Geography' Always Been Modern?: Choros, (Non)Representation, Performance, and the Landscape." *Environment and Planning A* 40: 1843–1861.

Pearce, Philip L., and Michael Fagence. 1996. "The Legacy of Kevin Lynch: Research Implications." *Annals of Tourism Research* 23 (3): 576–598.

Pickles, John. 2004. *A History of Spaces: Cartographic Reason, Mapping and the Geo-Coded World*. London and New York: Routledge.

Pinder, David. 2007. "Cartographies Unbound." *Cultural Geographies* 14 (3): 453–462.

Rekittke, Jörg, Philip Paar, Ervine Lin, and Yazid Ninsalam. 2013. "Digital Reconnaissance." *Journal of Landscape Architecture* 8 (1): 74–81.

Russell, Ben. 2004. *Headmap 3 Redux: Location Aware Devices / Know Your Place*. http://technoccult.net/wp-content/uploads/library/headmap-manifesto.pdf

Sadler, Simon. 1998. *The Situationist City*. Cambridge, MA: MIT Press. Schulze, Jack. 2009. http://berglondon.com/products/hat/

Shaw, Clifford R., and Henry D. McKay. 1942. *Juvenile Delinquency and Urban Areas: A Study of Rates of Delinquents in Relation to Differential Characteristics of Local Communities in American Cities*. Chicago IL: The University of Chicago Press.

Simmel, Georg. 1903. "The Metropolis and Mental Life." In *The Blackwell City Reader*, edited by Gary Bridge and Sophie Watson 2002, 103–110. Oxford and Malden, MA: Wiley-Blackwell. Söderström, Ola. 1996. "Paper Cities: Visual Thinking in Urban Planning." *Ecumene* 3 (3): 249–281.

Soja, Edward W. 1996. *Thirdspace: Journeys to Los Angeles and Other Real and Imagined Places*. Cambridge MA: Blackwell.

Sternberg, Ernest. 2000. "An Integrative Theory of Urban Design." *Journal of the American Planning Association* 66: 265–278.

Stevens, Quentin. 2006. "The Shape of Urban Experience: A Reevaluation of Lynch's Five Elements." *Environment and Planning B: Planning and Design* 33: 803–823.

Swaffield, Simon, and M. Elen Deming. 2011. "Research Strategies in Landscape Architecture." *Journal of Landscape Architecture* 6 (1): 34–45.

Vale, Lawrence J. 1999, April 10. "Imaging after Lynch." Imaging the City Symposium, Department of Urban Studies and Planning: MIT.

Vasishth, Ashwani, and David C. Sloane. 2002. Returning to Ecology: An Ecosystem Approach to Understanding the City. In *From Chicago to LA: Making Sense of Urban Theory*, edited by Michael J. Dear, 343–366. Thousand Oaks CA: Sage Publications.

Venturi, Robert, Denise Scott Brown, and Steven Izenour. 1972. *Learning from Las Vegas*. Cambridge, MA: MIT Press.

Virilio, Paul. 1995. *The Art of the Motor*. Minneapolis MN: University of Minnesota Press.

Waldheim, Charles. 2011 "Closing Plenary: Charles Waldheim and Andres Duany Discuss Landscape Urbanism." http://www.cnu.org/closecnu19

Wang, Wilfried. 1991. "On the Representation of Agglomerative Structures." *Daidalos* 61: 106–107. Warner Jr, Sam Bass, and Lawrence J. Vale. 2001. *Imaging the City: Continuing Struggles and New Directions*. New Brunswick: Center for Urban Policy Research.

Weiss, Allen S. 1998. *Unnatural Horizons*. New York: Princeton University Press.

Whyte, William H. 1980. *The Social Life of Small Urban Spaces*. Washington, DC: The Conservation Foundation.