The Image of the (Smart) City, Redux: Re-examining Kevin Lynch's Models in a Big Data/VR World

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Extensive and growing informational infrastructures that inform the shaping of human settlements are engendering new design processes and practices. I speculate about the discursive contexts in which emergent roles for design professionals in designing "smarter" cities are forming. City design methods-in-development shaped by contemporary desires, concerns, and anxieties are compared and contrasted with normative theories of city image and "good" city form offered by planning theorist Kevin Lynch from the 1960s to the 1980s.

Kevin Lynch's books The Image of the City (1960) and Good City Form (1981) bracket a period infused with Cold War-era desires and anxieties: for national dominance, efficient organization, speed, modernization, and security from the threat of nuclear annihilation. Our milieu today is characterized by pervasive desires for ubiquitous interconnectivity and increased human agency, concerns involving adjudicating difference and belonging, and anxieties stemming from threats to personal privacy, and to our bodies via the violence of fundamentalist terrorism, both domestic and globalized. Recent texts from Verner Vinge, Benjamin H. Bratton, Anthony Townsend, and Adam Greenberg begin to outline steps towards ethical paths for designers to follow in this era of proliferating "smart city" models and schemes, in thrall to big data analytics and virtual reality (VR) interfaces. Can revisiting Lynch's writings provide useful insight to this discourse?

RE-READING

Upon re-reading Kevin Lynch's stalwart 1960 classic The Image of the City I am struck by the extent to which concepts his publications impressed into urban design and planning parlance have permeated professional urban design and planning discourse. *Imageability, urban legibility, wayfinding, landmarks, nodes, urban networks*, and *mental maps* have all become commonplace terms. The book now seems simplistic, almost. We all know that good signage supports wayfinding; that people carry around their own mental maps; that qualitative aspects of form, legible or otherwise, can be notated and mapped. Are not these things obvious, just good common design sense?
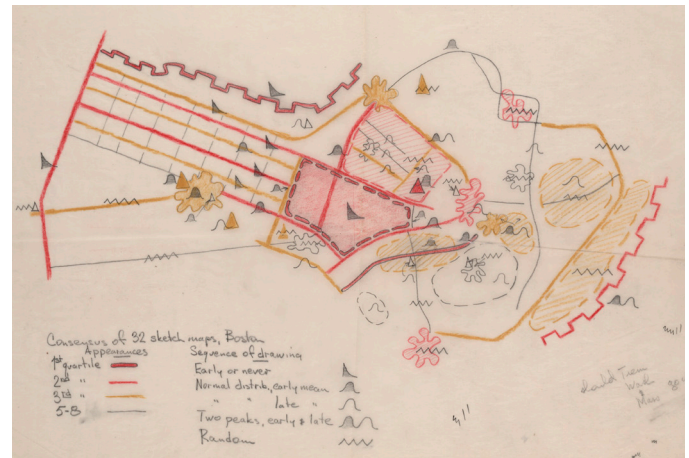

Figure 1: "Consensus of 32 Sketch Maps," a visual representation of appearances and sequence of drawings as noted in 32 sketches. From data collected for the Perceptual Form of the City. From Kevin Lynch's papers, 1959. (Source: MIT Libraries http://dome.mit.edu/handle/1721.3/36504)

In hindsight, the canniness of this earliest of Lynch's books becomes apparent. He labored to use the written language in a way that was clear and direct, devoid of jargon (excepting the new terms he introduced and carefully defined), and in a way that was memorable, such that the book is a model of its contents. The paragraphs, complemented by thumbnail hand sketches and diagrams in the wide margins, are in themselves an exemplification of the city form concepts of perceptual legibility that he is introducing to the city design professions. Some of the graphics—hand drawn and lettered, zipatoned for print publication—seem quaint but always clear. (Figure 1.) Lynch imprinted concepts and images in his readers' brains such that they might come away thinking they already knew about what had just been read. It seems so natural, so sensible.

Take, for example, this passage from the book's opening paragraphs:

... like a piece of architecture, the city is a construction in space, but one of vast scale, a thing perceived only in the course of long spans of time... On different occasions and for different people, the sequences are reversed, interrupted, abandoned, cut across... At every instant, there is more than the eye can see, more than the ear can hear, a setting or a view waiting to be explored. Nothing is experienced by itself, but always
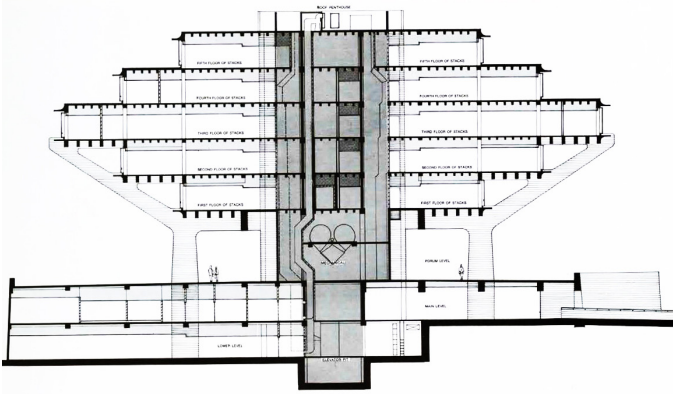
Figure 2: Building section the Geisel Library at UC San Diego, William L. Pereira & Associates, 1970. The programmatic organizational diagram and the concrete structural frames of the building both figure prominently in the plot of Victor Vinge's novel Rainbows End. (Source: www.archdaily.com).

in relation to its surroundings, the sequence of events leading up to it, the memory of past experiences.[1]

And:

… we must learn to see the hidden forms in the vast sprawl of our cities. We are not accustomed to organizing and imaging an artificial environment on such a large scale; yet our activities are pushing us toward that end.[2]

These passages set the stage for a consideration of the sensory reading of the visual quality of cities, informed by cinematics, as experienced by people moving through them.[3] Of particular interest is the emphasis on relational conditions, experienced both in space, at vast scale, and in time. In addition to the well-known methods he proposed for urban site documentation and analysis, embodied by the indelible five city image elements: paths, edges, nodes, districts, and landmarks, he also proposed a general method for actual planning based on the perceptual feedback of users and residents that proved very difficult to implement.

THE CITY IMAGE IN RAINBOWS END

The continuing currency of Lynch's "city image and its elements" is evident in Vernor Vinge's 2005 sci-fi novel *Rainbows End*.[4] Most of the novel's action is layered over Vinge's own rich cognitive map of San Diego and, more specifically, the UC San Diego campus, a clearly delineated "district," and the Geisel Library, its central "node," also a "landmark." Labyrinthine "path" networks of underground infrastructure tunnels lead the characters to neighboring laboratory complexes, while self-driving cars circumnavigate the circular drives above ground, limning the "edges" of the university campus.

Much is made of processes to "Dr. Suessify" the already imageable top-heavy structure with immersive VR "skins." These skins are 3d design overlays, like video game worlds; plugged in users see them as they move through places, both indoors and out, that without the skins appear skeletal, drab, and barren. In *Rainbows End*, the skins are described as mutable, and not entirely virtual, able to affect the underlying physical armature. When activated by library users, the skins twist

before their eyes, turning staircases and bookshelves into gravity-defying forms that can, nevertheless, be occupied. At one point, capitalizing on the imageability of the 1970 Brutalist library building by William L. Pereira & Associates, the angled cast-in-place concrete piers that support the library's cantilevered above-ground floors begin to "dance," swaying laterally in a manner that threatens the building's underlying structural integrity. (Figure 2.)

The characters in the novel toggle back and forth from real space to holographic projections into others' spaces, and from unmediated haptic experience in anodyne San Diego suburban landscapes to augmented virtual reality skin mode. The skins are laid over places that have been rebuilt, after some unspecified catastrophe, as bare-boned, unadorned shelters, like a new gloss on Robert Venturi and Denise Scott Brown's decorated sheds. "Oldsters," however, require remedial training to use the skin interface and are thrust back to vocational high school to get it. (I can relate. So very much has changed since my own architecture training a quarter century ago.)

Shifting the action north, to Los Angeles, we can compare the augmented worldscape of *Rainbows End* to software and computation design theorist Benjamin H. Bratton's "iPhone City," as first hypothesized in a 2009 article:

Computation evolves from a rare, expensive national asset to a cheap ubiquitous vapour. That stream's orifice is the handheld phone, PDA, homing beacon, Geiger counter, magic antenna, virtual goggles, scanning X-ray filter, field recording microphone and camera that makes hidden wisdom appear; the device becomes a window on to the hidden layers of data held in or about the user's immediate environment. Urban and network diagrams are images now animated in hand, transformed from maps into image-instruments with which to connect and control the immediate and remote environment. Both distance and nearness erode under the weight of the interface's imagery.[5]

One exciting application of immersive VR high design was displayed in Diller Scofidio + Renfro's virtuoso 2016-17 exhibition design for "Pierre Chareau: Modern Architecture and Design" at the Jewish Museum in New York. In one section, visitors circumambulate around an embedded room-sized black box, split into four corners; original furnishings are displayed against black interior walls and floor platforms. Visitors are invited to sit on one of four stools, don a VR headset, and gaze into light-filled immersive 3d evocations of the same furnishings set within iconic Chareau-designed domestic spaces. (Figures 3 & 4.) One can almost smell the wall of books in the Maison de Verre and hear the birds in Paris singing.

In his article, Bratton proposes that one half of all future architects should redirect their practices to designing virtual worlds and interfaces. This may be where we are headed, but what of the cognitive map, as held in the mind rather than on a device? Won't we still need our internal cognitive maps in order to navigate both real and virtual worlds, even with ubiquitous augmentation? It is interesting to reflect on how mental maps of real places are a necessary underlayment or frame for Vinge to graft the action of his novel, in order for it to make sense to a reader—one conjures up the places and spaces described in her mind's eye as one
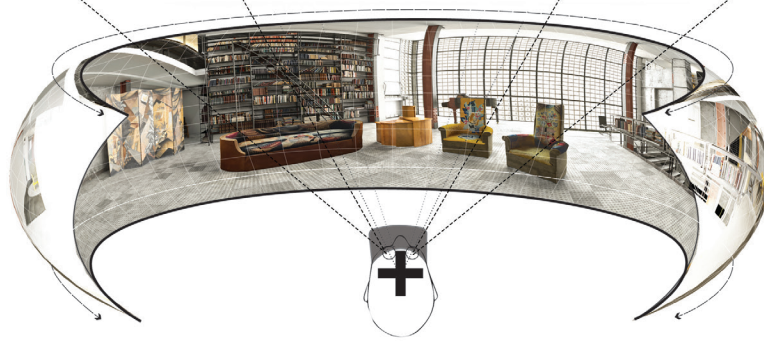
Figure 3 (top): Rendering of the grand salon of Maison de Verre, as seen through a virtual reality headset, with exhibited Chareau-designed furniture in virtual context. Image courtesy of Diller Scofidio + Renfro.

Figure 4 (bottom): Installation view of the exhibition Pierre Chareau: Modern Architecture and Design, November 4, 2016 – March 26, 2017, at The Jewish Museum, NY. Photo: Will Ragozzino/SocialShutterbug.com. Exhibition design by Diller Scofidio + Renfro.

reads. Personal mental maps, set in relation in our minds to virtual ones, are also necessary for navigating iPhone City, at least for now.

What are the risks to real bodily space and time of dispensing with these internal mental anchors? Both *Rainbows End* and "iPhone City" posit the potential for humans subjected to an overload of virtual stimulation and unrelenting waves of data to experience a psychotic break, as does one of the characters in Rainbows End. Another character switches into speaking Mandarin at random intervals, a negative side effect of enhanced military training in foreign languages. This concern about the risks of psychosis leads Bratton in later writing to ominous territory regarding the decidedly unprogressive compatibility of fundamentalist religions with already existing social networking and mapping platforms.[6] This is a dark side, which continues to mutate, finding new outlets for destabilizing democratic institutions and eroding standards of civility. On the side of liberation, however, smart phones and social media networks are tools or means mobilized effectively by the Occupy and Black Lives Matter socio-political movements. Both sets of phenomena reflect primary concerns and anxieties of our time: fears of bodily violence from extrastate terrorist networks, on the one hand, and on the other, desires for increased human agency and a more secure sense of belonging.

RAINBOWS AND REALITY

For both Vinge and Bratton, the rainbow, described as a distorted visual image, an effect of the sun, serves as a metaphor for distortions introduced when the virtual appears to be real, while also appearing in a different form to each individual viewer. In laying out caveats to his argument that architects should turn their attention to designing iPhone city, Bratton quotes Otto E. Rössler and Peter Weibel's 1992 media-futurist essay "Our Rainbow World":

It is said that at the end of the rainbow there is a pot of gold. Where that end is, however poses a problem, since it is different for every observer. The rainbow is actually a distorted virtual image of the sun. Nevertheless, it looks like a real object. Could it be that similar distortions apply to other 'real' objects?[7]

Vinge takes the metaphor further in his novel's title; the removal of the apostrophe is viewed ominously. What if instead of finding a pot of gold at the rainbow's end, we instead find an end to all rainbows? As one older, disabled character tells her granddaughter: "'Poor Miri. You don't understand. You live in a time that thinks it can ignore the human condition... You are surrounded by medical promises and halfway cures. It distracts you from the bedrock of reality."[8]

In order to tell his story, Vinge still needs references to actually existing places—known buildings and urban districts—and he needs the medium of the book, the written word. The books are housed, of course, in the library, and the library is where one goes to access the books (or, at least, to be around them). And, even when there are no longer books, we might still go to the library, a physical one. As I write this, I sit in a vast reading room of the New York Public Library. Everyone else is seated at the two-dozen large tables in the room is interfacing through a digital device—smart phone, laptop, or tablet—although a few also have books,

pens, and paper (I am one). The distractions "outside" are such that we take "inside" refuge here, in a library, to be alone in silence together.[9]

MORE ON LYNCH

Kevin Lynch (1918-1984) anticipated some of these contemporary discursive threads, although the contexts were quite different from then to now. His MIT faculty colleague, and mentor, in the Rockefeller Foundation-funded Perceptual Form of the City project that led to the publication of *The Image of the City* was György Kepes (1906-2001), protégé of Lazslo Moholy-Nagy, author of The *Language of Vision* (1944), and founder of MIT's Center for Advanced Visual Studies (CAVS).[10] Questions of vision and perception were central to the joint research studies of Kepes and Lynch, conducted over a five-year period (1954-59). The task of devising a common sense, easily understood graphical notational system to document and synthesize the findings from dozens of interviews, mapping exercises, and photodocumentation was also central to the project.

Kepes and Lynch were seeking not so much to document, map, and parse what exists in the geographic space of settlements and regions (physically, demographically, jurisdictionally), but rather to better understand and rationalize human beings as actors in urban places, as dynamic instigators of continuous change. They sought to understand processes of human perception and how these translate into people's sense of cities and their location and orientation within them, as human agents.[11] This was unlike the methodology for laminated site mapping developed by landscape architect Ian McHarg (1920-2001), a contemporary figure whose "layer cake" stacking became the basic conceptual foundation for Geographic Information Systems (GIS), with which we are increasingly familiar. The primary difference was the focus on human actors and their perceptions and points of view.

Reinhold Martin has described how the project was seated in the intellectual milieu of the Cold War period, noting: "Calls on the part of architects, designers, and their apologists for organic integration were thus evidence of a deep anxiety in the face of the formlessness, disintegration, and entropic overload that were the pathological constituents of an aesthetically and technologically produced normality."[12] On Kepes, Martin writes: "If the afterimages of the atomic blast register a world out of control, then the scientific images collected by Kepes are corrective patterns fed into the visual consciousness of architects (like those he taught at MIT), among others. They are, in that sense, an organizational software written in the patterned code of the images... art will integrate these organizational patterns into a new vision, a "pattern-seeking" that will set the guided missile of the organizational complex back on course." (Figure 5.) And, finally, regarding *The Image of the City*: "What was important for Lynch in his step-by-step account of the loss and potential restoration of the mobile spectator's orientation in a cityscape dominated by signs is what he calls the city's "imageability." In an echo of the "pattern-seeing" that Kepes sought to bring to the "new landscape" of a technologically mediated nature, Lynch proposed that this formulation would allow architects and urbanists to "learn to see the hidden forms in the vast sprawl of our cities...""[13]
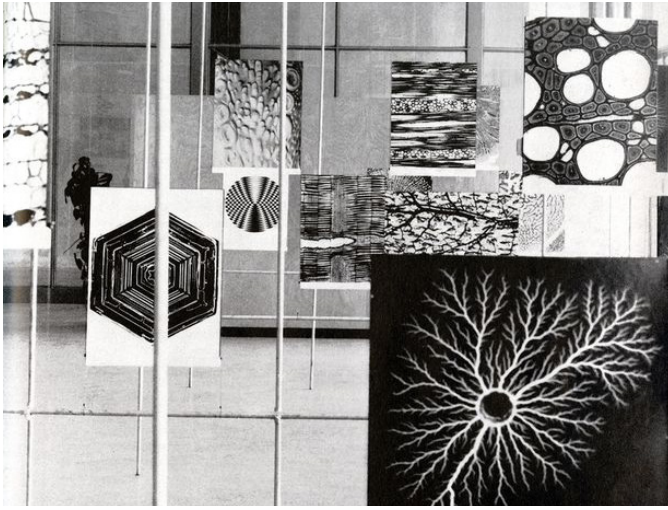
Figure 5: Installation view of The New Landscape Exhibition, MIT, 1951. Reproduced in Kepes, *The New Landscape in Art & Science* (Chicago: Paul Theobald and Co., 1956), p. 101.

A question that followed, especially for Lynch, was how these studies and the methodology might be made "useful." He suggested that design could provide a "sense of continuity." The context for this suggestion was the massive changes to cities already occuring through processes of urban modernization, incurring intense anxiety, such as the massive urban demolition and "renewal" programs and urban highway projects of the 1950s and 1960s.[14] In the years following publication, these programs and projects led to drastic reorganization of two of Lynch's test cities, Boston and downtown Los Angeles, and, to a lesser extent, the third test case of Jersey City. In Los Angeles, the Bunker Hill neighborhood was brutally scraped clean and rebuilt for arts and city government buildings on a literal new ground plane, over an undercarriage of tiered parking structures and tunnels. (Perhaps not incidentally, Bunker Hill formed the *tabula rasa* for Gehry's Disney Hall and DSR's Broad Museum.) In Boston, to make way for the Central Artery elevated highway, Government Center, and other megaprojects, the entire West End neighborhood was torn down, as was seedy, chaotic Scollay Square. In his role as a professional planner, Lynch was implicated in many of the Boston urban renewal projects, as both protagonist and antagonist.

It was in the context of significant schemes for the reorganization, reconceptualization, and—importantly—the decentralization of urban space that the material that became *The Image of the City* was conceived, researched, and prepared for publication. What are the parallel contexts for the current urban data management megaproject of reimagining and reorganizing cities as "smart"? One significant shift is the one towards planetary urbanization and, rhetorically at least, an embrace of higher urban densities.

In his late work *Good City Form* (1981), Lynch posited a schematic general normative theory for city design. He proposed that the elements of an urban settlement be seen as "connected through an immense and intricate network, which can be understood only as a series of overlapping local systems, never rigidly or instantaneously linked, and yet part of a fabric without edges."[15] This is an idea (or image, if you will) of the city as comprising flexible structure, something soft, yielding, and variable rather than rigid and hard. Lynch further posits the crucial role of humans as co-creators or agents of their own settlements, collectively responsible. In his theory, the components of "good" city form extend to five dimensions of performance: vitality, sense, fit, access, and control, and two "meta-criteria": efficiency and justice. The visual image of the city is encompassed by sense, just one of the seven.

FROM SMART HOUSE TO SMART CITY, 1996-PRESENT

The discursive frames of the disciplines of architecture and urban design may be somewhat ill equipped to address the challenge of defining contexts for current smart city projects, although Bratton has attempted to outline the scope of it with his model of "the stack." The datasets involved today are mind-bogglingly vast, and technological approaches to mining them are exceedingly complex, with many global players involved. It is not coincidental that the primary smart city booster companies—Cisco Systems, IBM, Siemens—look to hire data analysts with advanced science degrees. Computer scientists, statisticians, and astrophysicists are accustomed to managing algorithms and making seemingly convincing sense from enormous sets of nebulous digital data.

Predictable control and optimized efficiency seem to be dominant shared criteria steering these efforts. Urban planner Anthony M. Townsend suggests, "Behind the lens of that surveillance camera [on a traffic signal] lurks a ghost in the machine, an algorithm in the cloud analyzing its field of view for suspicious faces. But what you can see is just the tip of an iceberg. The world is being kitted out with gadgets like these, whose purpose is unclear to the untrained eye. With an unblinking stare, they sniff, scan, probe, and query."[16] Like Vinge and Bratton, Townsend conjures a potentially sinister regime in continuous operation behind the hype. But he is also sometimes hopeful: "The real magic of a fully networked and automated city won't be seen until designers start writing code to program truly novel behaviors for entire buildings and neighborhoods."[17]

How will we formulate the working models and design theories to guide this code? How will we evaluate whether the results are useful, good, and, importantly, just? In his quest to re-center the human within the design of technological systems, urbanist Adam Greenfield has proposed five general guidelines for the ethical development of ubiquitous computing. Ubiquitous information processing systems must 1) default to harmlessness, 2) be self-disclosing, 3) be conservative of face, 4) be conservative of time, and 5) be deniable.[18] Like Bratton, Greenfield has also written critically of the huge gaps between marketing and branding claims for new "smart cities" around the globe (Masdar, Songdo, PlanIT, Dholera, etc.) and what is actually being built in these glorified, privatized campus developments.[19] These commentators all preach vigilance in the face of urban operating systems that are increasingly non-legible and resistant to imageability.

A seesawing motion between hope and hype has been a constant through decades of techno-digital futurism. The first ACSA papers I wrote, twenty years ago, parsed proliferating urban "web" and "network" metaphors and probed the hype at that time about Smart House technologies.[20] (I noted that the term "Smart House" was copy-written in 1984 by the Home Builders National Research Center.) I opened one

paper with the tagline of an AT&T television advertisement: "Have you ever installed a phone on your wrist? —You will." This has now, of course, come to pass, first brought to mass market as the Apple Watch. The current Internet of Things (IoT), the selection of items available-in-stores here and now, includes a lot of other non-essentials, such as refrigerators with arrays of mini-cameras focused on the contents of every shelf that you can check whenever and wherever you do your shopping. The tip of an iceberg, indeed! But the tip of what, exactly: a chunk of wilted iceberg lettuce? These products seem an immense diminishment of the technologies' promises.

Do Lynch's performance dimensions and meta-criteria for good city form still make any "sense" to us today? I suggest that to some degree, they do. Bratton, Greenfield, Townsend, and even Vinge all echo in different ways Lynch's insistence that actual city form—of which the hyped projects of Songdo and the like are just pieces and parts—will and should result dynamically from the aggregated inputs and feedback generated by real people, not autonomous systems. However, the frame of the game has shifted, and multiplied, making increasingly difficult the already challenging task of tracking the performance of "squishy" qualitative dimensions like vitality and sense. Especially as populations seem to retreat from forming shared aspirations to shape inclusive public urban realms, preferring echo chambers in social media streams.

I am reminded of mysterious Mr. Rabbit, the ghost in the machine of Rainbows' End, who careens around at an increasingly rapid pace, seemingly ubiquitous and never seen in real space, destabilizing everything that is solid and wreaking general havoc. He represents a figure we must we wary of inadvertently creating in the zeal to implement and embrace new urban- and planetary-scale infrastructures of computation. And so, designers must embrace new tasks: to maintain a central role for mapping subjective sensory experiences in cities; to better visualize, clarify, and critique the output of big data sets; and to increase transparency and inclusive public engagement, while having fun with design. And what about the meta-criteria of justice? It is as crucial as it has ever been in this time of ever increasing inequality and slippery truth.

It will be incumbent upon all those who contribute to the design of human habitats to grapple with these ideas, regardless of whether we intend to participate directly in the creation of immersive VR environments and augmented worldscapes or will remain primarily builders of physically "real" urban settings, landscapes, and buildings. For better or for worse, the two are now intertwined.

ENDNOTES

1. Kevin Lynch, *The Image of the City* (Cambridge, Mass: MIT Press, 1960) p.1.

2. Ibid., p.12.

3. Lynch and collaborators had already begun research on what would become Donald Appleyard, Kevin Lynch, and John Randolph Myer, *The View from the Road* (Cambridge, Mass: MIT Press, 1964).

4. Verner Vinge, *Rainbows End* (New York: TOR Books, 2006). Pages quoted from paperback edition.

5. Benjamin H. Bratton, "iPhone City (v. 2008)," *Digital Cities AD: Architectural Design*, ed. Neal Leach, 79:4 (2009): 90–97. See also Benjamin H. Bratton and Natalie Jeremijenko, *Suspicious Images, Latent Interfaces* (Architectural League of New York, September 2008) and Benjamin H. Bratton, *The Stack: On Software and Sovereignty* (Cambridge, Mass: MIT Press, 2015).

6. See for example, Benjamin H. Bratton, "On Geoscapes and the Google Caliphate: Reflections on the Mumbai Attacks," *Theory, Culture & Society*, Vol. 26(7–8) (SAGE, Los Angeles, London, New Delhi, and Singapore, 2009): 329–342.

7. Otto E. Rössler and Peter Weibel, "Our Rainbow World" in Peter Weibel and Karl Gerbel (eds), *Ars Electronica: The World from Within – ENDO & NANO* (Linz: Veritas-Verlag, 1992) p. 13–21.

8. Vinge, *Rainbows End*, p. 142.

9. I am in the Edna Barnes Salomon Room at the New York Public Library, refurbished in 2009 as a WiFi reading room, and well used while the Main Reading Room in the 1911 Beaux Arts marble edifice by Carrère & Hastings was restored.

10. Gyorgy Kepes, *Language of Vision* (Chicago: P. Theobald, 1944).

11. Extensive materials are available in the MIT Institute Archives & Special Collections, "The Perceptual Form of the City: Boston featured in study directed by MIT Professors Kevin Lynch and Gyorgy Kepes, 1954-1959." Available at: https://libraries.mit.edu/archives/exhibits/kepes-lynch/; and http://dome.mit.edu/handle/1721.3/33656.

12. Reinhold Martin, *The Organizational Complex: Architecture, Media, and Corporate Space* (Cambridge, Mass: MIT Press, 2003) p.12.

13. Ibid., p.73-74.

14. Lynch, *Image of the City*, p.12.

15. Kevin Lynch, *Good City Form* (Cambridge, Mass: MIT Press, 1984) p.116-117. First published in 1981 as *A Theory of Good City Form*.

16. Anthony M. Townsend, *Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia* (New York: W.W. Norton & Company, 2014) p.6. For a discussion of distorting bias in big data algorithms, see Cathy O'Neil, *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy* (New York: Crown, 2016).

17. Ibid., p.35.

18. Adam Greenfield, "Some guidelines for the ethical development of ubiquitous computing," *Philosophical Transactions of the Royal Society A*, 366 (2008): 3823-3831.

19. Adam Greenfield, Against the Smart City: A Pamphlet (New York: Do projects, 2013). See also Adam Greenfield, "Zeroville-on-Khambhat, or: The clean slate's cost," *Dialogues in Human Geography*, 2015, Vol. 5(1): 40–44.

20. June Williamson, "The Digital Hall: A Search for Intelligent Space in the American Home," *Proceedings of the 1996 ACSA European Conference* (Washington, DC: ACSA Press, 1996): 353-355, and "Working the Urban Net Into a Safety Web," *Proceedings of the 85th ACSA Annual Meeting* (Washington, DC: ACSA Press, 1997): 355-360.