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DO WE HAVE TO STICK TO THE SCRIPT?...CITIES, SURVEYS AND DESCRIPTING

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INTRODUCTION

With increasing ubiquity and fidelity, our physical world is being recompiled in portable, transmissible ways not seen before. It's been some time that we could accept cities as things-in-themselves, and we can partly ascribe this to a major factor that defines the organization, scale and character of those cities: the patterning of the land that lies beneath them. The following explores the changing nature of land description goals and technologies, how such changes influence conceptualizations of our urban and ex-urban environments, and possible trajectories to yield new developments for the future of cities.

Metes and Metrics

In its long, global history, the division of land has been used to delimit agrarian or political boundaries, establish sovereignty, promote tax collection and define portions of land as real property. The demarcation of boundaries on the surface of the earth is commonplace, yet often hidden. As a formless regulating system that propagates – and allows us to comprehend – the orders underlying most of the world we've created, land surveying's logics and conventions are often unconsidered and certainly underreported.

Real (*res*, Latin for "thing") property is defined specifically by its tangibility and immovability. Because it can't be withdrawn like a portable object (as personal property can), understanding exactly how large, what shape, and in what orientation the real property exists is critical for its viability as a possession and a commodity. In the sixteenth-century manors of England coming to terms with the post-Enclosure laws, a surveyor was commonly engaged to oversee (*sur* + *voir*) the holdings of the estate. He would inspect and document the land and its boundaries, noting improvements, crops, livestock, etc., and preside over the "court of survey" where an inventory of the holdings would be reconciled and enumerated in the "court roll."[1] What was produced was information, not form: these reports were not graphic or pictorial but were an accounting, where land quantity, ownership and productivity were translated into lists and tabulations. As surveys increasingly became matters of course, the parameters that acted to define boundaries of land had clear repercussions for subsequent orders that emerged, most legibly in instances of civic form.

Numerography

As the duties of the land surveyor were progressively defined, their techniques were too. One of the conventional requirements to establish actual boundaries was entry onto the land to directly measure. Using both linear metrics and angular bearings to define extents, the surveyor worked in two dimensions, ranging over the landscape to plot courses and locate monuments. Surveyors traditionally thus had a more "intimate" and immersive relationship with the land than cartographers or painters, embodying a distinction in conception between an "outsider" who has a distanced, pictorial, morphological (and ultimately controlling) relationship to what he sees, and an "insider" who doesn't really see at all – he just does.[2] The surveyor is there to deal with the facts on the ground and not to interpret. In fact, he can leave the field with nothing more than a series of notes and numbers, and avoid the visual spatialization of a drawing entirely: no characterization, no representation.

The history of Spanish and Mexican land grants in California illustrates the disconnect between physical, material conditions and "mathematical" narrations. In the early occupation of the territory, application was made for a concession of land often using a pictorial sketch (a *diseño*) of natural features and boundaries. When California was ceded to the United States, holders of grants were required to prove their claim's validity, needing their parcels surveyed using metes-and-bounds techniques acceptable to American courts. The lack of verifiability and geometrical precision in the *diseños* fell victim to a very different paradigm for land description, where numerical, non-representational techniques ruled. This "arithmetization of geometry, essentially the digitization of shape"[3] has inexorably led to a new reality.

Historically, surveyors' lineal measurements were taken (and/or projected) with direct, continuous methods. From the Egyptians' use of knotted ropes, through the 66-foot long Gunter's chain (from about 1620) that became a standard due to its portability, durability and numeric flexibility,[4] to twentieth-century developments like low-thermal-expansion Invar measuring tapes, refinements in precision still left the mechanical, physically unbroken principle of measurement intact.

A new paradigm emerged in 1948 when the first Electronic Distance Measuring (EDM) device was introduced, where calculating the number of full and partial wavelengths of a beam of light bounced off a target (not unlike radar) could determine distance.[5] These and subsequent technologies employing non-visible portions of the electromagnetic spectrum all substitute pulses of energy, whose reflections are measured in time and converted to spatial units, for the direct techniques used previously.[6] Physically traversing the land using "inactive" instruments is replaced by "sedentary" positioning using active technologies, introducing a degree of remote sensing[7] that provides new opportunities for discovery but alters the previously intimate relationship surveyors had with the object of study. And the electronic method of data acquisition allows easy incorporation into the digital world, as has become standard.

The refinement of measuring technologies and techniques has ever-increasing fidelity and accuracy as goals, to be achieved through ever-increasing precision. As they attempt to correspond finer and finer measurements with the mutability of the things being measured, the impossibility to fully define singularities and rely instead on probabilities (especially when it comes to positioning) embodies a "statistical-mechanical" view of the world[8] where generalities provide more truthful results. A kind of uncertainty principle, we should acknowledge the limits of trying to identify an ideal condition where error, tolerance, and probability are more reliable guides.

Comprehensive Bounds

In the *Geography*, his work on surveying and mapping the known world, Ptolemy was clear to define the metric aspect of geography as the province of the mathematician, concerned with showing the world as a "single and continuous entity."[9] In an attempt to correspond to the continuity of the referenced topography, the "seamlessness" of land surveying tries to address all possible locations: ideally, no part of the globe is unconsecrated by this system. Even the "aberrations" of urban property development that triggered Matta-Clark's *Fake Estates* project were calculated, delineated and recorded: there is no longer any terra incognita, as it's all *accounted* for.

This seamlessness of intent is paradoxically implemented through seaming: a skein of geo-metrical lines enveloping the globe. Delimitation with "match lines," where all boundaries correspond to others, means there are no gaps or excesses in the object being surveyed. But by continuing to insist (by default) upon proximal adjacency and the smooth continuity of surfaces, are we masking other versions of the city? Acknowledging global and digital "non-physical interconnections" or studying the contemporary liquidity of real estate are perhaps more potent if we don't unintentionally prioritize the city's surface-based physicality. Saskia Sassen's call to reconceive borders as "borderlands" may be one way to subvert the limited connections the simple act of division suggests, as lines become thicker, less distinct and open to negotiation.[10]

Descriptive code

In her seminal book on Dutch artistic conceptions and representations, Svetlana Alpers noted that Ptolemy's use of the Greek *graphikōs* to define the work of the geographer could variously refer to picture-making, writing, or a field of study. The accurate portrayal of the earth and its localities could be accomplished through both maps and texts, as each is a kind of description.[11] That is what the *Geography* discloses: the possibility of encoding the physical, visual, tangible world in a series of words and numbers. Book Two is an extensive list of locations coupled with their longitudinal and latitudinal coordinates. Ptolemy's intention was for the tabular information to be used by anyone to plot on a blank map graticule one's own version of the ancient world.[12] The desire for reproducibility by encoding the graphic (a kind of proto-digitization) similarly led in Renaissance architecture to the rise of the construction drawing as a "notational mediator" through which one could script and communicate – using a pre-established code – form and intent.[13]

The function of a survey as a means of text-based *description*, not representation, is demonstrated in a common method of property documentation. In these instances, land records ("legal descriptions") are textual and numerical narrations ("recitals") that encode, in an un-graphic manner, the required references to real property. Sometimes even dimensions give way to the rest of the recital and become "more informational than factual."[14] Opting to use 1,000 words rather than a picture allows for greater precision, better transmissibility, and fewer claims than a solely pictorial approach: the abstraction of the symbolic code of language is both more durable and more portable than any representation.

In general, the techniques of land surveying all point in this direction: to create as accurate and comprehensive a version of the underlying territory as possible. As an inventory or organizational tool, empirical data is formulated to provide a verifiable, predictable and reliable option to the "real world" physicality it seeks to order. This push for quantifiability through pinpoint description set the base for future information-based versions of the city.

Tables to Models

Historically most surveys we encounter – plane surveys – have been conducted as intentional flattenings of the earth. While acknowledging its quasi-spherical geometry, the earth was typically conceived as a two-dimensional surface upon which things happen, as planar coordinate systems such as latitude and longitude attest. As scientific and political needs advanced, requiring larger scales and increased accuracy, surveying techniques that took the whole of the earth into consideration were developed. With geodesic models, a new means of assigning coordinates to any point on earth arose. Using the Cartesian system (with X and Y axes defining an equatorial plane and Z that of a reference meridian), an origin was created at the "center" of the earth. With the advent of non-terrestrial positioning techniques (like GPS), implementing a singular datum for specifying locations was now both conceptually and technically possible. Here, vectors from a single, stipulated center could be projected outward to define any point in space – whether on, below, or above the surface of the earth.[15]

With land description becoming truly "globalized" (even the term "surveying" is retiring in favor of "geomatics" and "geospatial engineering"[16]) we have moved our conception of territorial occupations from two dimensions to three: no longer confined to a surface on which to dispose objects – which has led to a tendency to perpendicularly extrude imprinted patterns as a means to understand the earth, a position maintained in the "layering" approach of many GIS formats – we are now part of a potentially universal, infinite spatial model. We are no longer on the earth, but in it.

And this yields potential new directions in the kinds of digital models created to organize the full "thickness" of the information collected. Rather than be concerned with flattenings, projections, and the fidelity of shape translations (an obsession from Ptolomy to Buckminster Fuller) we now stockpile multi- and non-dimensional information and visualize it with specific situational intent. Likewise, we have moved from three-dimensional "appearance" models based on the geometry and materialization of surfaces to "solid models" where pixels become voxels and interiors matter as much as what's on the outside.

Formless information

Given the softening of previous limitations on the collection of data, information continues to be digitized and correlated through various protocols (thus becoming seamless) and deposited in a potentially bottomless reservoir. Depending on needs, desires or accidents, parts of that insubstantial resource can achieve form, as the portability of the information renders it capable of easily shifting guises. This intricacy explains the picturesque seductiveness of GIS, where the inherent formlessness, recombinability and manipulability can bend the data to produce varied arrangements and visualizations. But it may be that the increased ability to accurately record the complexity of the environment, with the conceptual goal of 100% fidelity, is asymptotic and distracting.

What we've been producing is a "digital analogue" of our environment, a refraction of the "massive infrastructural deposit"[17] of the city. This kind of analogy is one not based on representation, meaning or memory as an alternative to the "real city" but which nonetheless acts as a "corrosive agent" that may be able to dissolve the ossifications of history.[18] Setting aside the ontological primacy of the material city as experienced, the alternatives for how we conceive our relationship are already present as options: based on imagination, symbolic codes, or systems and ambience, for instance.[19] In this way, the intensive description of the city to create invisible, analogous models is inherently social: not singular, individualized or representational, the information on which the models is based is open-source shareable, awaiting activation.

Descripting the City

Description for the surveyor is conventionally a project of singularity, verifiability and reproducibility, a linear process that results in the same (or at least approximately so) result every time. There is room for variance – with most processes redundancy is built in for error correction – but the usefulness of the outcome is predicated on predictability. This constrains the results of the survey to settle into "mere" context. It's not about separating signal from noise, as it all becomes the background for other events, like urban development patterns, to build upon.

To create the information used to describe the city, the surveyor is conventionally a collector: an instrument verifying and recording pre-existing conditions, empirically and neutrally. The technology of GPS is an apt metaphor in that in using it, one establishes points and relations in a wholly passive manner, and while I may not be a camera, I am a wavelength receiver. The net result of the fieldwork, now involving description, re-enters the world as a projective but prescriptive enterprise (to reinscribe territorial boundaries, for example). So what might be a possible "active" role for land description, in a way that leverages the advances in the field to construct fictive realities?

Rather than be limited to the singular framework of the script, contemporary interest in what is loosely confederated as "scripting" holds promise for alternative mediations of the city. Like surveying, scripting demands attention to detail in order to realize intention: in most instances its symbolic code – a text-based language used to translate conceived ideas into machine instructions – must be "precise and pedantic."[20] Scripting's potential lies mainly in its ability to interpret complex, non-linear situations where predictability can be a hindrance. As a generative process we can import recorded data sets, unleash the potential of computation to produce alternative results, and physicalize the consequences to produce new "real" cities that participate in a cycle of re-creation.

One approach would counter the dominance of the two-dimensional and monocular privileging of plan orientation in land description, a direction suggested by the "fullness" of the digital geospatial model. Conventionally, property lines extrude vertically from the described surface, rendering a continuous two-dimensional spatial arrangement even though projected in three. But what if there were more complex descriptions made possible by "misreading" information that allowed for alternative geometries, different kinds of surfaces, and mutability of control (though perhaps with a net conservation of assets)? Some of these directions have already been suggested by legal mechanisms like air rights and condominium associations, but can the three-dimensional, complex, resource-rich digital model of our cities produce adventuresome arrangements like topological property lines or places of "boundary relaxation?"[21]

An even more potent goal in going "off-script" is to reassert intimacy by being "inside" and guided through the data. Acquiring a massive amount of observed information may yield an authentic large-scale compilation, but its obduracy can overwhelm interpretation. By processing the remotely-sensed and the immaterial in ways that, due to their idiosyncrasies, produce individual "ownership" of the information, one may counter senses of distance and lack of connection to the city. This is not a call to produce fixed or solidified places, but deep knowledge of an environment to which one may nevertheless lack direct relation.

Ultimately, shifting the role of the survey from an empirical catalog to a generative script will also shift its effects out of the shadows and into the realm of actions that actively and instrumentally define the character of our cities. Recognizing the complexity of the contemporary condition where there are countless versions of the city being articulated, there are of course political responsibilities that must be accounted for: relationships to power, history, entrenched interests, technology, etc. As an activity that finds stability not in a single referent but in the aggregate of process outcomes, it can better address the long narrative of land occupation than closed-off descriptions that collapse from their own inflexibility. As a means to provoke more robust and productive models for urban organization, the future survey may have more to say than simply reminding everyone what the rules are.

References

1 A. W. Richeson, *English Land Measuring to 1800: Instruments and Practices* (Cambridge: M.I.T., 1966), 30-31.
2 Denis E. Cosgrove, *Social Formation and Symbolic Landscape* (Madison: University of Wisconsin, 1998), 18-19. Cosgrove refers to previous exploration by David Lowenthal, who wrote on William James' observations of varying attitudes towards a cleared area of forest (Lowenthal, "Not Every Prospect Pleases," *Landscape* 12:2 (1962-3), 19-23).
3 Lionel March, "Mathematics and Architecture since 1960," in *Nexus IV: Architecture and Mathematics*, ed. Kim Williams and Jose Francisco Rodrigues (Florence: Kim Williams Books, 2002), 30.
4 Andro Linklater, *Measuring America: How An Untamed Wilderness Shaped the United States and Fulfilled the Promise of Democracy* (New York: Walker and Co., 2002), 15-18.
5 Paul R. Wolf and Charles D. Ghilani, *Elementary Surveying: An Introduction to Geomatics* (Upper Saddle River: Prentice Hall, 2008), 145.
6 Mike Silver, "Subsurface Visualization," in *Mapping in the Age of Digital Media: The Yale Symposium*, ed. Mike Silver et al. (Chichester: Wiley, 2003), 101, 105.
7 Denis E. Cosgrove and William L. Fox, *Photography and Flight* (London: Reaktion, 2010), 71. Evelyn Pruitt of the U.S. Office of Naval Research coined the term to apply to truly "remote" satellite-based reconnaissance techniques and not systems like aerial photography, although it is now used for any long-distance recording technique.

8 John May, “Sensing: Preliminary Notes on the Emergence of Statistical-Mechanical Geographic Vision,” *Perspecta* 40 (2008): 43.
9 Ptolemy, J. Lennart Berggren, and Alexander Jones, *Ptolemy's Geography: An Annotated Translation of the Theoretical Chapters* (Princeton: Princeton University, 2000), 57.
10 Saskia Sassen, “Unsettling Topographic Representation,” in *Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space*, ed. Mark Shepard (Cambridge: M.I.T., 2011), 184-185.
11 Svetlana Alpers, *The Art of Describing: Dutch Art in the Seventeenth Century* (Chicago: University of Chicago, 1983), 135-136. ***Graphikōs*** from ***graphō*** (write, draw, record) was commonly translated into Latin as *pictor* (maker of pictures) but usually also with reference to *descriptio*, rooted in *scribo*, to write.
12 Ptolemy, *Geography*, 81-83. Ptolemy’s locations include “the more noteworthy cities, rivers, bays, mountains, and other things that ought to be in a map.” These could be plotted either on a spherical globe or a two-dimensional surface, for which he gives extensive instructions about projection techniques to minimize distortion.
13 Mario Carpo, *The Alphabet and the Algorithm* (Cambridge: M.I.T. Press, 2011), 32.
14 William C. Wattles, *Land Survey Descriptions* (Los Angeles: Title Insurance and Trust Co., 1956), 6.
15 Jan Van Sickle, *GPS for Land Surveyors* (New York: Taylor and Francis, 2001), 126. The U.S. Department of Defense desired a passive and global orienting system such that locations in the field would not be disclosed by a transmitted signal and coordinates around the world could be uniformly referenced. Work on NAVSTAR GPS (Navigation System with Timing and Ranging, Global Positioning System) began in 1973 with the first implementing satellite launch in 1978. A “constellation” of satellites in six orbital planes ensures “visibility” and ranging by the required minimum of four transmitters at any time. The positions of the constantly-moving satellites must also be known at the precise instant the range signals are received, so time coordinates are as critical to this system as spatial ones. While averaging multiple readings produces ever-greater accuracies in positioning, the quest for a single definitive answer is counterproductive (Van Sickle, 68-76).
16 Wolf and Ghilani, *Elementary Surveying*, 3.
17 Reyner Banham, “The Great Gizmo,” *Industrial Design* 12 (9:1965): 56.
18 Peter Eisenman, “The Houses of Memory: The Texts of Analogy,” in *The Architecture of the City*, by Aldo Rossi (Cambridge: M.I.T., 1982), 8-9. To Eisenman, Rossi’s Analogous City is a subversion of the “real city” and runs contrary to its “skeleton” of history. Digital versioning of the city might produce multiple skeletons.
19 K. Michael Hays, “Architecture and its Own” (lecture delivered at the University of Michigan Taubman College of Architecture + Urban Planning, Ann Arbor, Michigan, October 22, 2012), accessed June 2, 2014, http://vimeo.com/52156254. Hays uses the term “virtual city” to describe the ontological condition, which is registered and understood only in its actualized affects, or “ontic” presence.
20 Mark Burry, *Scripting Cultures: Architectural Design and Programming* (Chichester: Wiley, 2011), 59.
21 R.E. Somol, “Shape and the City,” *Architectural Design* 82.5 (2012): 111.

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We have nothing in common with them as a class but sometimes we need to talk to our bosses. When we confront our bosses, for instance, we need to talk to them.Â Here are some ways the boss might respond: justify the decision ("we had more work, someone had to do it"), bring up some other issue ("well, you all are out of uniform"), try to guilt you in some way ("you do this after I got you that nice coffee maker for the break. room?"), bring up the way you raised the issue ("you shouldn't bring this up in a group"), point you to someone else or somewhere else ("you should bring this up at our team meeting," "you really should go through Human Resources"), or question your right to bring i