# THE NODE KNOWS

THE COURT CARTOGRAPHER HAS BEEN RECALLED FROM DEFUNCT SURVEYS OF THE EMPIRE'S PHYSICAL TERRITORIES TO ADDRESS A MORE PRESSING TASK: STRUCTURING THE INFORMATION SPACES GENERATED BY CONTEMPORARY CAPITALISM. **J.J. KING** EXAMINES THE MAPPING AND COUNTER-MAPPING OF THE NETWORK SOCIETY.

## INTRODUCTION

From the Down Survey of 1650–59, which served as the basis of expropriation of lands belonging to Irish Catholic rebels, to the 1892 drawing of Africa that offered new frontiers instrumental to foreign nation states, or the mappings of London during the 1780 Gordon Riots and the 1926 General Strike, maps have always played a crucial role in determining territory and reallocating property. Scholars such as the late J. B. Harley (1932–1991) have worked hard to illuminate the political and cultural planes that lurk beneath the map's neutral surface, and to draw out the connections between mapping, knowledge and power.

Far from being passive objects, accounts such as Harley's insist, maps are instruments of social and political control. But what implications does this rather mundane insight have for one of the newest forms of cartography: representing knowledge and information? This article examines the social and political uses of knowledge maps and other representations of the contemporary, networked knowledge economy: a complex informational landscape for the contemporary mapmaker.

## KNOWLEDGE BEGETS KNOWLEDGE

The importance of knowledge and information to the economy has been long vaunted (see, for example, Bell's *The Coming of Post-Industrial Society*, 1976; Toffler's *The Third Wave*, 1991; Jameson's *Postmodernism, or The Cultural Logic of Late Capitalism*, 1991). For many commentators, we have entered an age of information in which knowledge, important to production across all historical epochs, has taken on a new commanding power. In the influential view of Manuel Castells, what is most distinctive about this phase is a de-coupling of the circuits of information and production. In the industrial mode, information organizes the mobilization of labor and production as well as the exploitation of energy; in the informational mode it chiefly mobilizes the generation of new knowledge. Consequently, an autonomous circuit of information-work is created that never directly contacts the production process: only its products impact the other elements of these processes and their interrelationships.[1] As Peter Drucker has argued:

> The traditional 'factors of production' do not disappear but rather become secondary. They can be obtained, and obtained easily, provided there is knowledge. And knowledge in this new sense means knowledge as a utility, knowledge as the means to obtain social and economic results...knowledge is now being applied to knowledge.[2]

A single sophisticated worker now commands, often completely unconsciously, entire chains of automated production, interlocked with unknown, outsourced human workforces and elements of fixed capital distributed across an archipelago of developing countries. "Creatives" who sell products, artist communities who aid in city regeneration, analysts who produce (rather than merely analyze) stock market value: all take part in the diffuse but articulated process of affective labour that has placed communication in the limelight of the capital cycle.

## THE SPACE OF FLOWS

Our society is constructed around flows of capital, flows of technology, flows of organizational interaction, flows of images, sounds and symbols. Flows are not just one element of the social organization; they are the expression of processes dominating our economic, political and symbolic life.[3]

1. Manuel Castells, *The Informational City: Information Technology, Economic Restructuring and the Urban-Regional Process*. Oxford: Blackwell, 1989, p. 10.

2. Peter Drucker, *Post-Capitalist Society*. New York: HarperBusiness, 1993, p. 42.

3. Manuel Castells, *The Rise of the Network Society*. Oxford: Blackwell, 1996, pp. 412–413.



Castells has coined a name for the quasi-autonomous place in which the primary communicative transactions of the post-industrial economy occur: the "Space of Flows." This spatial arrangement is, in Castells' terms, a "network of places... based on telecommunications and computer systems... connected around one common, simultaneous social practice." Castells inelegantly straddles the old informational metaphors (electronic circuit) and the new (network), but expresses well the sense of transition into a messy informational space generated by the increasing complexity of labor chains, production, distribution and consumption.

It is the project of representing this Space of Flows that is the focus of this article—rather than the topic that has so far proved more diverting for geographers, namely how the Space of Flows impacts traditional cartography. Information and knowledge have always figured and refigured how we experience space, but the stitch-and-suture recombinations that occur when physically-distant locations are networked is novel and noteworthy.

The traditional world-map needs to be re-interpreted. Waldo Tobler's First Law of Geography—*everything is related to everything else, but closer things are more closely related*—is fundamentally inverted under the regime of information.[4] Today, things that are symbolically related are brought into a network proximity that can mitigate or redeem physical distance. This doesn't mean the end of geography, but rather its re-emergence in a new form centered on the instructions, interactions and connections that order global capital across national boundaries—a world reformatted along the lines of financial flow. This is a sort of cartography after information, a necessary reappraisal of traditional geographies under the order of information, but it dovetails with a cartography of information: the task of representing the tremendously complex interactions that take place between knowledge workers and the objects, processes and bodies they administer.

The urge to represent these interactions comes from both sides of the line: those within the managerial elites who want to improve information flow within corporate environments and understand the knowledge resources held by their workers; and those, often styled anti-capitalist or anti-globalization, who oppose what they regard as the detrimental effects of the knowledge economy. In other words, mapping the messy Space of Flows is seen as necessary both by those wishing to critique contemporary capitalism and those seeking improved efficiency in information manipulation.

## TRACING THE KNOWLEDGE MAP

Although the first geographic map may have been carved on a mammoth bone 15,000 years ago, thematic maps associated with the handling of non-geographic information seem not to have evolved until the mid 17th Century. This, Edward Tufte argues in his book *Visual Explanations*, is because the move from "maps of existing scenery to graphs of newly measured and collated data was an enormous conceptual step." Tufte explains:

> Despite their quantifying scales and grids, maps resemble miniature pictorial representations of the physical world. To depict relations between any measured quantities, however, requires replacing the map's natural spatial scales with abstract scales of measurement not based on the geographic analogy.[5]

Edmond Halley, the English astronomer famous for his work on the orbits of comets, is often credited with the first thematic map; in a 1686 issue of *Philosophical Transactions*, he used small dashed lines on a world map to represent the location and direction of trade winds. The 18th Century saw the first maps of geology and medicine and the development of contours and isolines. But the real explosion in proficiency and creativity in relation to thematic maps took place the following century.[6] Charles J. Minard's 1861 map of Napoleon's 1812 March on Russia has become celebrated as the first example of information cartography, a flow map that provides an innovative depiction of flows of people and goods in space. Tufte, praising Minard's map, identifies the variables captured within it: the size of the French army depicted by the width of the bands; its location on a two-dimensional surface; the direction of the movement of the advance (upper band) and retreat (lower band); and the temperature on certain dates during the retreat.[7]



4. Waldo Tobler, "A Computer Movie Simulating Urban Growth in the Detroit Region." *Economic Geography*, 46:2, 1970, pp. 234–240.

5. Edward R. Tufte, *Visual Explanations: Images and Quantities, Evidence and Narrative*. Cheshire, CT: Graphics Press, 1997, pp. 14–15.

6. M. Friendly and D. J. Denis, *Milestones in the history of thematic cartography, statistical graphics and data visualization*. York University, 2003.

7. Edward R. Tufte, *The Visual Display of Quantitative Information*. Cheshire, CT: Graphics Press, 1983, pp. 40-41.

Minard's map, along with several dozen others published during his lifetime, is part of the general movement toward modern information cartography, whose conceptual basis is found in the work of Paul Otlet (1868–1944).[8] Otlet is regarded by many as the father of information science. In a substantial body of writing dating from 1893, Otlet argued the need for an international information handling system, a *Universal Network for Information and Documentation*, to be accessed through multimedia workstations that lay waiting to be invented just beyond the technological capacity of his time. Otlet was the precursor of Vannevar Bush, Doug Engelbart, and Ted Nelson. The latter, whose conceptual *Xanadu* project linked items of knowledge via informational trails, came up with the original idea of *hypertext*, an information technology for mapping the space of flows that had been anticipated by visionaries such as Otlet.

## CORPORATE CARTOGRAPHY

Nelson's vision of the "docuplex"—an abstract "evolutionary structure...a swirling complex of equi-accessible writing, a single great universal text and data grid"[9] remains, strictly speaking, unrealized. But its chief concepts (a space of data, and links between information elements within that space) loom large in the ongoing attempt to map capital's primary information resources: language and communication.

The idea of a corporate information cartography practice seems to have grown out of resource management initiatives in the corporate environment in the late 1970s and early 1980s. In her article "Information Mapping, Guiding Principles", Carol Hildebrand discusses ways to represent "the skills, expertise and information that make up their pool of knowledge" within an organization. As she explains,

> A knowledge map is an easy-to-use guide that shows knowledge workers the straightest path to pockets of expertise in a company... [M]aps can range from simple directories of names, titles and department affiliation to elaborate online search engines with hypertext links to databases of human expertise, research material and abstracts of published information.[10]

Hildebrand's argument that companies can yield big benefits by investing in a geographic representation of their informational resources seems to have been adopted most enthusiastically by those firms operating in a pure information space: consulting. Today, firms such as McKinsey, PriceWaterhouseCoopers and Andersen use sophisticated online tools to map their informational resources. But their first knowledge maps were resoundingly low-tech—as tentative as the first hand-drawn maps of traditional cartography. According to Cornelius Burk, co-author of *InfoMap, a Complete Guide to Discovering Corporate Information Resources*, American Express used a map of the United States and simply "pinpointed the location of different information resources within the company on it." Likewise, the knowledge maps of McKinsey and Co. Inc., in the early 1980s, were built purely on paper.[11]

Such efforts developed cheek by jowl with academic work toward more technologized representations of corporate data. The first use of topological visualization was SPIRE (Spatial Paradigm for Information Retrieval and Exploration) developed in 1995 by the Department of Energy's CIA-funded Pacific Northwest National Laboratory; *Cartia*, a spin-off from the PNNL, is now used for visualizing patent searches.

Today, a variety of projects offer to fulfill the needs of the corporate knowledge auditor. Projects such as *Thinkmap* and InXight's *Vizserver* "make sense of complex information in ways that traditional interfaces can't." According to proponents, by using such maps, "productivity increases as corporate knowledge is more accessible and the data is more accurate. Flexibility in time of delivery of knowledge is gained as information is always a click away."

Here the mapping of relational affect is seen as essential to a company's effective operation. Management consultant Valdis Krebs describes the evolution of approaches to capturing knowledge resources in a company. The most brutally exploitative approaches ("mine the knowledge from employees, codify it, and store it in knowledge database") tend to meet with little success. "People [are] not always willing to make public their best knowledge," Krebs explains, and codifying the tacit knowledge that resides with a corporation can be "like

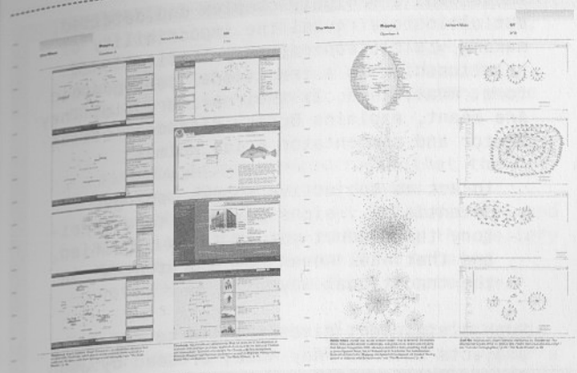
See "Conversations as Maps", pp. 70–79, 92–97.

8. Paul Otlet, "Something about Bibliography," in W. B. Rayward (trans./ed.), *International Organization and Dissemination of Knowledge: Selected Essays of Paul Otlet*. Amsterdam: Elsevier, 1990. W. B. Rayward, "Visions of Xanadu: Paul Otlet (1868–1944) and Hypertext," *Journal of the American Society for Information Science*, 45:4, 1994, pp. 235–250.

9. Ted Nelson, *Literary Machines*. Swarthmore, PA, 1981, p. 48.

10. Carol Hildebrand, "Information Mapping: Guiding Principles," *CIO Magazine*, July 1, 1995.





Network maps

**gazetteer A** 7–8/14 pp. 36–37

trying to nail jelly to the wall." For this analyst, the best use of available technology is "to keep a database of 'who knows what' and add a table of 'who knows who': in other words, store pointers to the knowledge, not the knowledge itself."[12]

Among these representations, it is possible to discern some consistent design principles and assumptions. Laura Garton, Caroline Haythornthwaite, and Barry Wellman define knowledge-mappers' key interests as 1) describing relations between elements in a corporate landscape, 2) tracing the flows of information passing between them, and 3) discovering the effects they have on people and organizations.[13] This usually results in a network structure, represented in a topology involving lines, stars, circles and meshes. Obviously, this is neither a necessary nor a sufficient architecture to contain the sorts of tacit information that researchers like Krebs are interested in studying, although enthusiastic claims continue to be made by advocates and practitioners. Jeffrey Heer, for example, in his recent project, *Exploring Enron*, claims his visualization of emails between Enron executives reveals Tim Belden's role as a mastermind of Enron's manipulation of California's markets. The visualization, seeming to master the febrile communications of the notorious multinational, has been very popular online—but like many knowledge maps, the value of its representation appears to rely on the quality of analysis brought to bear on it. One is left wondering whether the information map is a necessary middle term in the process of this analysis.

## THE OTHER SIDE OF THE TRACKS

The collapse of Enron—although it is really a collapse in reverse, a sort of materialization of prior absence—is an important nexus for information cartography. Enron demonstrated how what Castells sees as the autonomous quality of informational capital can also appear as a hollowness: a complex skein without substance. No doubt, the networked knowledge economy of developed Western economies creates a powerful urge to map, represent and understand, whether inside or outside the corporate context. This urge to represent emerges against a background of a general crisis for the representative mode: as object, in other words, the network at once inspires and thwarts the cartographer.

The leaders of the *Mapping Contemporary Capitalism* (MCC) project, created to develop tools for the "collaborative mapping of power relations," are well aware of the problematic nature of their undertaking; one of them, Simon Worthington, has described it as "like mapping the Bermuda Triangle in reverse."[14] The MCC's ambitious aim is to create software that will "enable groups to... plot the interconnections between organizations, political entities, corporations, and individuals that constitute society." Worthington admits to reservations about how "something as ungraspable as contemporary capitalism—so fast-moving and stealth-like—might be captured cartographically at all." It is unclear what stage MCC has reached in 2005.

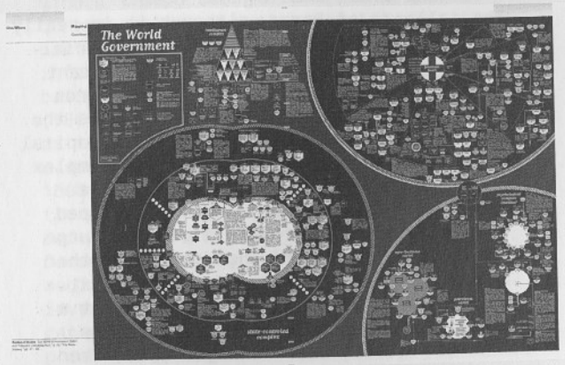
The MCC project dovetails and cooperates with that of Bureau d'études, a group that has also begun attempts to map networked capital by representing the links between, for example, financial funds, government agencies, banks and industrial firms. Bureau d'études' map *Refuse the Biopolice* focuses on contemporary control systems, and was distributed at the July 2002 *No Border Camp* in Strasbourg (a meeting of activists working on migration and border regimes). Its *European Norms of World-Production* examines the administrative structures around the bureaucratic European Commission, and was distributed at the European Social Forum in Florence in November 2002, Bureau d'études' *InfoWar* was distributed at *WSIS? WE SEIZE!*, a gathering of autonomous information activists that took place during the World Summit on Information Society in Geneva, 2003.

11. Cornelius Burk and Forest W. Horton, Jr., *InfoMap, a Complete Guide to Discovering Corporate Information Resources*. NJ: Prentice Hall, 1988.

12. Valdis Krebs, "Working in the Connected World: Managing Connected Assets," 1999. <http://www.knetmap.com/knowledge-flow.html>

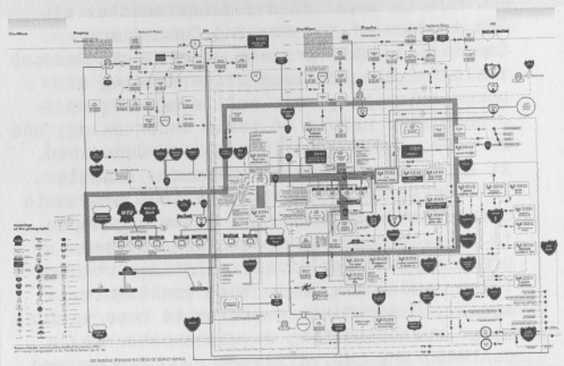
13. Laura Garton, Caroline Haythornthwaite and Barry Wellman, "Studying Online Social Networks," *Journal of Computer Mediated Communication*, 3:1, June 1997. <www.usc.edu/dept/annenberg/vol3/issue1/garton.html>

14. Simon Worthington, "The Bermuda Triangle in Reverse: Mapping



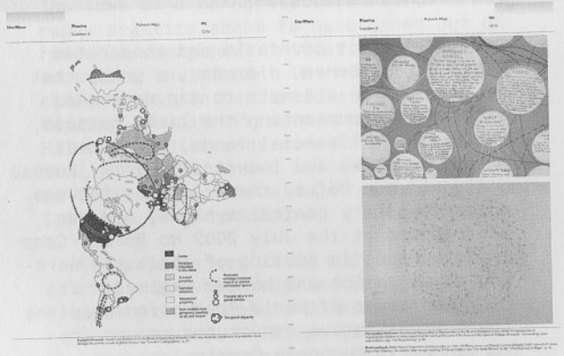

Network maps

**gazetteer A** 9–10/14 pp. 38–39



Network maps

**gazetteer A** 11–12/14 pp. 40–41



Network maps

**gazetteer A** 14/14 p. 43

These maps are highly complex and detailed, but ultimately reveal the impossibility of making visible contemporary institutional relationships in a traditional cartographic form. What, then, is their primary aim? They are meant, explains Bureau d'études' collaborator and commentator Brian Holmes:

> to act as subjective shocks, energy potentials... signs pointing to a territory that cannot yet be fully signified, and that will never be 'represented' in the traditional ways.[15]

Such a statement gives the lie to popular projects such as *They Rule*, created by Josh On and California-based Future Farmers, which graphically maps the links between board members of U.S. Fortune 100 companies, and provides multiple views of their interconnections. The project was featured in the *2002 Whitney Biennial* and awarded the Net Excellence at the 2002 *Ars Electronica* festival, but how much closer does it bring us to understanding the power structure of contemporary capitalism than the statement that a few men sit on many boards?

In London, The London Particular mapping collective has, since 2000, been developing a counter-regeneration map of a dense and proliferating network of agencies, quangos, (quasi-autonomous NGOs), arts bodies funding authorities, and tenant organizations in the east London area of Hackney. Beginning with an investigation of urban regeneration in a zone of artists, creative industries and long-standing working class and immigrant communities, the London Particular's map attempted to capture the shift from a Keynesian to a neo-liberal model of urban sovereignty with its devolved, decentralized and intensely complex networks. As The London Particular explain:

> The entities that constitute these networks administer and legitimate social and cultural projects through a pseudo-dialogic discourse of consultation and direct democracy ('grassroots', 'people power', 'bottom-up development').

Entitled—with a nod to artist Damien Hirst—*The Physical Impossibility of Regeneration in the Mind of Someone Living*, the project performs what The London Particular call "an ironic mimesis of the popular but hypo-critical 'socially engaged' mapping

Contemporary Capitalism," *TCM Reader*, 2004. <www.locative.net/tcmreader/index.php?endo;worthington>.

15. Brian Holmes, "Maps for the Outside," <http://twenteenthcentury.com/uo/index.php/BrianHolmesMapsfortheOutside>.



aesthetic." Hand drawn, complex to the point of illegibility, and obviously incomplete, the map (*pace* Holmes' comment) signals a deliberate refusal to exhaust or appear adequate to its subject. Its creators hope the project:

> simultaneously demonstrates that the cultural institutions, spaces and networks familiar to an art audience, and especially to those attending the gallery itself, are implicated in a broader network of gentrification strategies.[16]

Yet again, one wonders if the map does this better, *per se*, than The London Particular's written analyses. As with the *Mapping Contemporary Capitalism* project, the group is apparently finding it difficult to realize its stated cartographic ambitions.

THE NODE KNOWS

If information cartography is not yet up to the task of capturing the tacit, affective and transversal qualities of the knowledge economy, this may be because mapping's self-conception is inadequate. All the maps discussed in this essay have something in common: they map from the top down, attempting to understand the systems they represent from above, or from the outside.

Let me offer a highly constrained proposition: *when looked at from above, the network is illegible*. Jee Oh, a student in the Masters program in Digital Media at Ravensbourne College, London, is exploring what she terms "node analysis," in which the investigation of a particular network of social relations is approached from the point of view of each node within it.

In Oh's view, the node knows—that is, knows its own reasons for taking part in the network, with whom it interacts and why, and in what modality. Its motivations, aspirations, emotions, passions and ideas—which intimately affect how the network develops—are nonetheless non-representable by the cartographic tools currently used by knowledge mappers. Affective personal relations are not well understood by lines and meshes. Oh is developing a kind of node analysis that uses a much more nuanced tool: the written word. Her approach is part of a broader shift towards node-centric organization of information. *Folksonomy*, for example, is a practice of collaborative categorization using freely chosen keywords. In a tool like *del.icio.us*, created by Joshua Schachter (who previously created *GeoURL*, a location-to-URL reverse directory), the whole system of categorization—the entire set of possible key words and their intersections—will not ordinarily be known by a single user or set of users. Instead, they map the part of the system they use through their own ad-hoc categorizations.

A visual representation of a user's *del.icio.us* map is personal, particular and nuanced, and useful primarily to the person or group that created it, although radical visualizations have begun to develop, as projects like Kalle Kormann's and Michal Migurski's demonstrate.

I use *del.icio.us* every day that I'm connected to the network to map my own areas of interest, and examine other people's. So do hundreds of thousands of people. And that is more than can be said for the beautiful, highly designed, but ultimately limited-use productions of the first, and perhaps misguided, wave of network cartography.

16. David Panos and Benedict Seymour of The London Particular, email interview with the author, 2003.