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Traditional, positivist approaches to map design usually yield a single map. These one-map solutions foster a highly selective, authored view reflecting consciously manipulative or ill-conceived design decisions about many factors, such as map scale, geographic scope, feature content, map title, classification of data, and the crispness or fuzziness of symbols representing uncertain features. As a result, the rightfully skeptical map viewer ought to question whether (a) an ulterior motive led to a biased view of reality favoring the author's philosophical or political biases or economic goals, or (b) a lazy map author failed to explore designs offering a more coherent or complete picture of reality. Technology has aggravated the problem of one-map solutions by placing powerful mapping software at the disposal of amateur cartographers who can generate convincing-looking graphics with little or no understanding of their data or the principles of mapping. And technology also allows devious map makers to perfect designs that support their points. But technology can also foster greater openness and more complete understanding of maps and their meaning, and thereby provide a more ethical approach to cartographic analysis and communication. After discussing the problem of single cartographic views, I present six strategies for a more open and overtly critical cartography in which one-map solutions are both rare and suspect.

This essay is about maps, technology, and ethics. I bring technology into the discussion because it is largely as a result of electronic technology that the map maker's capacity both to discover and to confuse the truth has changed.

Discussions of ethics not uncommonly attack something: a group, a principle, or a lack of principle. Well, here I attack what I call the one-map solution. Were it not so widely pervasive and so historically entrenched, I could perhaps call it the one-map paradigm.

I think you know what I mean. Our traditional, positivist approach to map design usually yields a single map. At least that's what we pretend to optimize, and that's what we give the viewer in almost all cases. These one-map solutions foster a highly selective, authored view perhaps reflecting consciously manipulative or ill-conceived design decisions about map scale, geographic scope, feature content, map title, classification of data, and the crispness or fuzziness of symbols representing uncertain features. But even if we are conscientious, even if we know our data inside and out, and even if we both know the creed of Bertin and Robinson and are aware of our own biases, the decision to present a single cartographic viewpoint can be a decision fraught with important ethical overtones.

Until recently, a variety of economic considerations justified the one-map solution. Maps were expensive to make and space for maps was scarce. We needed to generalize and summarize, to make hard choices about content and symbolization, and to be precise and parsimonious. And because space for words was also scarce, we told the reader little if anything about what how we arrived at these decisions.

The situation is different now, or quickly becoming so. By encouraging rapid interactive graphic displays, the compact storage of massive amounts of information, and new approaches to scholarly publication, electronic technology can easily change the ground rules of map authorship and the use of graphics in scholarly discourse. Although we still

Ethics and Map Design

Six Strategies for Confronting the Traditional One-Map Solution

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need parsimony and we still need to generalize and summarize, we will need to present our summaries as summaries of something, rather than as essential geographic truths or facts requiring no further exploration. In some cases, moreover, the cartographic summary might even be an index or menu designed to entice the viewer to a fuller understanding of the mapped phenomena.

Resolving the ethical problem of one-map solutions is not simple and calls for several remedies. Let's look at a few of them.

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My first strategy is to give the viewer a dynamic sequence of different maps presenting a range of both plausible and extreme cartographic views. Fraser Taylor (1982) first called our attention to the value of graphic sequences in an essay on choropleth maps revealed to the viewer in steps. This was a serendipitous way of using to advantage the slow reconstruction of a classed choropleth map transmitted through the Telidon videotex network. More recently, Terry Slocum and his colleagues (Slocum, Robeson, and Egbert 1990) have explored and refined Taylor's notion of the sequenced choropleth map.

My strategy for dynamic cartography goes a step beyond that of Taylor and Slocum, and I call it Atlas Touring (Monmonier 1989). Atlas Touring might involve not one but several types of map, and not just maps but statistical diagrams and text blocks. The central concepts are the graphic phrase and the graphic script. A *graphic phrase* is a computer-generated sequence of focused graphics tailored to the data and intended to explore a distribution, a spatial trend, a spatial-temporal series, or a bivariate relationship. A *graphic script* is a longer, more comprehensive graphic sequence and might include several graphic phrases.

Atlas Touring calls for a conceptual shift from single-map optimality to multiple-map complementarity. Because maps cannot tell the truth without some paradoxical lying, two or more complementary maps have the potential, at least, of lying less by telling more of the truth. And cartographic sequences have the added potential of placing the information in context and addressing its meaning.

However beneficial, powerful tools invite dangerous abuse. For instance, a computer-generated sequence of graphics can be a good way of selecting the one map that best proves the unscrupulous map author's point. And a carefully orchestrated sequence of persuasive graphics might easily assist cartographic propagandists seduce the uncritical minds of passive souls like Chauncey Gardiner, the simpleton hero who "liked to watch" in the classic Peter Sellers movie "Being There" (Kosinski 1971).

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A useful antidote then is a second, essentially complementary strategy, namely, *experiential maps* available on inexpensive graphics workstations that allow readers, users, or viewers to explore the data freely. After all, a revealing sequence of maps and related graphics should whet the viewer's intellectual appetite for a more involved exploration of the data. Indeed, a graphic script could be useful as an animated introduction to a cartographic database, and graphic phrases are natural elements in a so-called toolbox for exploratory cartographic analysis. Thus the potential of electronic technology to encourage experiential cartography might usefully counter the possibly mind-numbing effects of cartographic videos. Of course, citizen access to exploratory graphic analysis should be acknowledged in right-to-know and freedom-of-information legislation that includes electronic geographic databases.

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Third, cartography, geography, and other fields that employ maps might benefit from professional standards that call for providing alternative views and exploring the consequences of various design decisions. Although this recommendation might smack of self-serving professional-

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ism, a code of cartographic ethics should at least make map authors more mindful of responsibilities to careful scholarship.

A fourth need is for a fuller disclosure of experiments with trial designs, including cartographic views that deny or fail to support the map author's position. This information can provide a useful understanding of the map author's thoroughness and conscious avoidance of bias. Although the more popular media will continue to eschew such academic baggage, our scholarly geographic journals could set an example and encourage their writers to share their map-analysis strategies with readers. Even though centrally printed journals might remain the prime mode of scholarly communication, the map author's cartographic footnotes (or even a transcript of his or her exploratory graphic analysis) might be appraised by an editorial panel and deposited with an electronic file server for distribution on demand over an electronic-mail network such as Bitnet (Lewis 1989).

A fifth need is for a conscious effort by map authors and cartographic educators to promote informed skepticism among map viewers. Maps must lie, but they can lie in different ways (Monmonier 1991). Map viewers ought to condition themselves to questioning whether an ulterior motive might have led to a biased view of reality favoring the map author's philosophical, political or economic goals, or whether a lazy map author simply failed to explore designs offering a more coherent or complete picture of reality. Indeed, an interesting exercise in geography and cartography courses is to see how many ways a map might portray the same data, or to deconstruct a map by considering the data, biases, and constraints that influenced its design.

A sixth strategy is institutional structures such as public forums, a journal of cartographic criticism, or courses promoting systematic critiques of maps, especially potentially persuasive maps. Several years ago David Woodward suggested that scholars should examine the map as a graphic text and award it the scrutiny that literary critics give poems, plays, and narrative fiction. The insightful deconstruction of North Carolina's state highway map by Denis Wood and John Fels (1986) is a widely referenced cartographic variant of the critical literary essay, and David's own critique of typography selected by the U.S. Geological Survey for its 1:25,000 provisional and 1:100,000 topographic maps is another good illustration of what might be done (Woodward 1982). To be sure, reviews of atlases and mapping software do a little of this, but rarely with the thoroughness, say, of a literary critic dissecting Chaucer, Hemingway or John Irving. Reviews in cartographic journals tend to be back-of-the-book stuff. In five hundred words, for instance, a critic can scarcely describe a complex map's goal, much less examine motives and alternatives. And reviews seldom tackle the big fellas — Geological Survey topographic maps, the Rand McNally Road Atlas, or AAA Trip-Tiks, as examples. Yet literary critics have no such aversion to best sellers and acknowledged classics. David's right: there is a real need for a journal of cartographic criticism. Perhaps a special issue of one of our cartographic journals will serve as the vehicle for demonstrating and promoting the critical analysis of the map as a text.

A promising strategy for cartographic criticism would seem to lie in what philosophers call the *coherentist ontology of truth*, as developed by Foucault, Gadamer, and others (Alcoff 1988; Rescher 1979). This theory, which addresses being and meaning, rejects the notion of absolute truth. Rather, truth must refer to a specific system of knowledge or belief, and there can be different degrees or levels of truth.

Michel Foucault has had a major impact on literary criticism and

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historical interpretation (Shumway 1989). He demonstrated the need to treat literature, art, and other artifacts as text, that is, as rhetorical works with different levels or layers of interpretation and meaning (Foucault 1972). Foucault (1980, 1988) also noted that these various forms of discourse, including maps, can be used to obscure fact and exercise power over others. A good place to begin is with the perceptive writings of Brian Harley (1989, 1990) and Denis Wood (Wood and Fels 1986). Clearly the ethical map author must attempt to understand his or her sources, be they sixteenth century atlases or two-hour-old downloaded datasets.

Hans-Georg Gadamer, a German philosopher who examined ontological and methodological inquiry, supports a dialectic approach based on an interactive "questioning" between a text and the interpreter (DiCenso 1990). Among his contributions to hermeneutics, an approach to understanding literary and other texts, is the belief that truth is likely to emerge from "listening to" the text rather than by imposing a structure on it (Gadamer 1989). By extension, the modern geographer surely needs to "listen" to maps and other information by looking carefully at them from different viewpoints.

To conclude, technology is changing the nature of the map as well as how people use maps. Most significantly, a 'new cartography' based on dynamic displays and the experiential map is making the traditional one-map solution less and less defensible, and a theory of cartographic complementarity could evolve in the current decade. But because traditional channels for cartographic education cannot reach the expanding armada of neophyte cartographers newly enfranchised by mapping software and unprecedented in its ignorance of cartographic principles, new strategies are needed to help geographic educators and professional cartographers meet their ethical obligations. The six strategies suggested here should help theoreticians, designers, and educators meet the demands of the emerging multiple-view ethic. Φ

Six strategies for moving beyond one-map solutions

- 1 Dynamic sequence of different cartographic views
- 2 Experiential maps, based on
 - High-interaction computer graphics
 - Rich geographic databases
 - Intelligent databases
 - Helpful, disciplined software
- 3 Professional standards, with a Code of Cartographic Ethics calling for presenting alternative views
 - Exploring consequences of design decisions
- 4 Disclosure of experiments, including
 - Footnotes on trial designs
 - Transcript of exploratory graphic analysis
- 5 Promote informed skepticism among map viewers
- 6 Institutional structures
 - Forums, lectures, exhibits
 - Courses and workshops
 - Journal of cartographic criticism

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Eticos y el Diseño Cartográfico
Seis Estrategias para Confrontar
Las Tradiciones de Producir
Un Mapa

Extracto

Tradicionalmente, el curso inherente de un diseño cartográfico es la producción de un mapa. Esta tradición es creada por una perspectiva selectiva reflejando una manipulación consiente o la mal formulación de ideas y decisiones que afectan un diseño cartográfico como la escala, el objeto geográfico, el contenido de el mapa, el titulo, la clasificación de la data, y el nivel de detalle de esos símbolos que representan facciones que dirigen a una interpelación. Como resultado, el excéptico y recto veedor cartográfico debe poner en cuestión si (a.) el motivo ulterior talla a un aspecto que tuerce la realidad favoraciendo las opiniones filosóficas o politacas, o motivos económicos de el autor, o (b.) si un disidioso cartógrafo fallo de examinar diseños ofreciendos un retrato mas coherente o completo de la realidad. Hoy en dia la tecnología ha agravado el problema de delinear un mapa por que el cartógrafo aficionado, sin tener entendimiento de la data o de los fundamentos de cartografía, tiene a su desposición software que puede producir gráficos convincentes. La tecnología tambien permite que los cartógrafos errados perfecciónen sus diseños para atestiguar sus casos. Pero la tecnología tambien puede nutrir mas ingenuidad y mas comprensión completa de los mapas y sus intenciones, y por este medio proporcionar un acceso etico a la comunicación y el análisis cartográfico.

Despues de examinar el problema de un concepto cartográfico, este escrito presenta seis estrategias para críticamente examinar los fundamentos cartográficos donde los objetivos y las producciones de mapas que a la misma vez son cuestionable y poco común.

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