GIS: Geographic Information Systems or Genuinely Incomplete Systems?
Indigenous Ways of Knowing Versus GIS Capabilities

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Maps are not simply diagrams of grids, pink blobs and blue expanses. They may be unassuming, printed onto beach balls or stuffed haphazardly into glove compartments, but they are powerful technologies in the Foucauldian sense, sites through which movements and relationships to the land are controlled and ordered, and where knowledge is not simply revealed but created (Kitchin and Dodge 2003:322). They may claim to be neutral, empirical representations of the physical landscape, but their irrefutable links to western scientific epistemology – of the right to know – suggest otherwise. The most recent reincarnation of the map is GIS, shorthand for Geographic Information System, a system that is used to capture, organize, analyze and represent the physical landscape. Increasingly accessible to the general population, GIS has received much press as a tool of empowerment, particularly for indigenous groups with an interest in defining their land. While it is true that indigenous groups stand to benefit from the use of GIS, as it produces maps accepted as evidence in the British Columbia treaty process, they also put themselves at a disadvantage by using a technology that has yet to prove its ability to accommodate the richness of their ways of knowing the land. What is lost in translating traditional relationships, stories, and myths into rasters, vectors and polygons?

There is no doubt that GIS is simultaneously powerful and accessible. Able to accommodate both spatial and non-spatial (called 'attribute') data, GIS can combine scientific and traditional knowledge within a single framework. The Nacho Nyak Dun First Nation in the Yukon, as outlined by Folliot, is just one example of many groups that have successfully used GIS to make digital maps to manage forest and wildlife resources; in calibrating the data along the proscribed lines of tradition, they created a map that helps them manage the land according to traditional cultural values (2005:12). GIS offers

indigenous groups a means of representing a space and hence, to some extent, controlling it; this control is rendered effective because it takes the form of the map, a common language conducive to discussion with cultural outsiders (ibid). Not only does it empower the indigenous group, but it also "enhances the ability and will of all parties to engage in sustainable resource management" (Stocks 2003:344). Further, because GIS is a participatory project, involving the input of many disparate data sources, it can promote community solidarity as well as new levels of cultural consciousness (Stocks 2003:352; Srinivasan 2006:500). The political ramifications of indigenous use of GIS seem uniformly positive at first glance: it constructs a product recognizable, even acceptable, to outsiders, while strengthening the internal community.

However, there are deeper issues at stake in using GIS. It may be a formidable political tool for First Nations groups, but it also potentially diminishes and devalues indigenous ways of knowing the landscape. The epistemological framework of the map is markedly different from the indigenous epistemology of relating to the land. Maps have been ideologically nurtured since the Enlightenment's bifurcation of nature and culture through the era of Fordist modernity, which depends on the availability of natural resources freed up by the individual's alienation from land, and beyond. As Larsen writes, modernity erases the past while transforming nature into profitable commodities (2006:311). Maps thus accomplish two key tasks: they freeze time, effectively negating the past, and they abstract space, undermining the attachments that people hold to certain places. These effects are incompatible with indigenous ways of knowing, which hold that time is not linear but cyclical, and that knowledge is embedded in the landscape. Connecting these two principles is the concept that memory is spatial, inscribed by

people in the landscape through a variety of means, ranging from toponyms evoking stories (Basso 1996) to different taxonomical relationships (Berlin et al 1968). Unfortunately, "through the lens of abstract space it's impossible to recognize, much less appreciate, the symbolic, emotive and economic values that First Nations attribute to traditional lands" (Larsen 2006:314). Maps flatten and freeze these complexities.

How can these 'attributional' understandings of space be accurately represented by a map? Proponents of GIS have heralded the way it, unlike a conventional map, can dynamically represent the physical landscape. Some, like Brodnig and Mayer-Schonberger, have even suggested that "in many ways, traditional environmental knowledge [TEK] is much closer to [GIS]'s structural features and functionalities than some of our Western methodologies" (2000:12). GIS, by virtue of its technological capabilities, claims to offer respite from the static qualities of the map by compiling many layers of data, each potentially conceptualized as a separate map, and then overlaying them. However, there are many flaws with this concept. Overlays depict quantitative data, gaining priority over attributional data, which is more qualitative. Much of TEK is considered qualitative data, gathered subjectively and encrypted in various genres. Because it is non-standardized, it cannot be conveyed on the GIS map; instead, it is linked from the map to a separate and subsidiary data chart (see Folliot 2005).

GIS, although it gives the impression of dynamism in the way it can constantly be augmented, nevertheless objectifies traditional knowledge of the land. Of central concern to TEK, as simultaneously process and product, are the techniques of developing and gathering knowledge. Cajete notes that "native science" is not concerned with "an objectified universe," but with "learning about and understanding relationships and

responsibilities" (in Shaw et al 2006:270). GIS cannot represent these gestures and accordingly reduces the complexity of this knowledge. By wresting this knowledge from its sources and compiling it in one database, it pushes "direct sensory experience[s] into the wings" (Ingold 2000:235). While this does make this knowledge available to treaty negotiations and able to be contrasted with other maps, it also leaves it vulnerable to commodification and exploitation (Turnbull 2007:141). Fitting TEK into a map, following techniques of coordination and commensuration that simultaneously "subsume different spatialities and temporalities into one abstract space," results in the omitting of "multiplicitous and interactive dimensions of the local and the practical, the stories and the journeys, the spiritual and the experiential" (ibid). Indeed, GIS has been likened to the "visual tip of a very large database iceberg," a jarring image that suggests the vast amounts of data that are not only hidden, but also utterly inaccessible (Duncan 2004:414). GIS can only offer the illusion of dynamism, by animating a series of objectified (and greatly reduced) data.

Just as GIS objectifies space and relationships to it, it compresses time. Though it is conceivable, given its capacity for spatial overlays, that GIS could accommodate temporal overlays, it currently "lacks the dimensionality and temporality" required to adequately convey notions of time that are not unilinear (Duncan 2004:413). Building on preexisting GIS models may be an "effective solution for temporal […] data when the temporal dimension is conceptually linear in form," but is "inflexible and inefficient" for more complex space-time data (Peuquet 2001:15). While it could perhaps represent shifting seasonal patterns quite effectively, it remains to be seen how GIS could

effectively convey the idea that the past continues to exist within the present, a central concept held by TEK.

So what could a culturally-sensitive GIS map look like? Turnbull outright rejects the culturally-sensitive map as a possibility, suggesting instead the need to create a new kind of map altogether, a "third space," in which individual trails and paths – ways of moving through and knowing the landscape – are both forged and recorded. In their interactions with others, animate and inanimate, an emergent "network of connections" is represented, one that can better depict the complex interdependencies between "widely variable components on different scales" (2007:147). These networks would not be mere overlays, subsidiary layers over an abstract, absolute topographical base, but the foundations of the map itself. This new kind of map would better suit indigenous concepts of the world as "suspended in movement" and "continually coming into being as we – through our own movements – contribute to its formation" (Ingold 2000:242).

GIS presents itself as an exercise in objectivity; it aims to consolidate knowledge from multiple sources to produce a positivistic, empirical representation of reality. TEK is inherently subjective, based on individual experiences and relationships, always incomplete and ever evolving. This is perhaps the crux of incommensurability between the two systems. Each operates under a separate paradigm and accordingly has different goals. While GIS may, technically speaking, have the capabilities to accommodate more complex non-spatial and temporal data, these changes cannot be made until the epistemology it represents can accommodate this data too. "Geography, as a discipline," in order to "advance politically," needs to acknowledge and "resign its role in the service of 'Western' imperialism," and accept other ways of knowing in both theory and practice

(Shaw et al 2006:273). In the meantime, GIS may be a double-edged sword for indigenous communities, aiding in the achievement of political goals while undercutting their distinctive epistemologies. Accordingly, as Johnson et al note, indigenous communities must develop a "two-pronged approach," achieving literacy in cartographic methods while developing "critical consciousness that attends to the dangers that accompany [their] use" (2006:83).

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