ASSERTION AND AUTHORITY: THE SCIENCE OF USER-GENERATED GEOGRAPHIC CONTENT

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ABSTRACT

Neogeography has been defined as a blurring of the distinctions between producer, communicator, and consumer of geographic information. The relationship between professional and amateur varies across disciplines. The subject matter of geography is familiar to everyone, and the acquisition and compilation of geographic data has become vastly easier as technology has advanced. The authority of traditional mapping agencies can be attributed to their specifications, production mechanisms, and programs for quality control. Very different mechanisms work to ensure the quality of data volunteered by amateurs. Professional geographers are concerned with the extraction of knowledge from geographic data using a combination of analytic tools and accumulated theory. The definition of neogeography implies a misunderstanding of this role of the professional, but English lacks a basis for a better term.

1. INTRODUCTION

Wikipedia (www.wikipedia.org) defines neogeography as "the usage of geographical techniques and tools … for personal and community activities … by a non-expert group ...." This is rather different from the definition proposed by Rana and Joliveau (2007), who argue that the transition from academic or *paleo*geography to neogeography is characterized by a blurring of the traditional roles of subject, producer, communicator, and consumer of geographic information: "In other words, the old geography involves a prescribed role/interaction between the four main components, namely the audience, the information, the presenter and the subject, which are common to most standard practises of learning. In NeoGeography, there are however no such boundaries on roles, ownership, and interactions of these four components."

This separation between scientist and layperson, between expert and novice, is driven in many disciplines by the complexity of subject matter, by terminology that may be essential to precise communication within the discipline but inaccessible to the outsider, by the high cost of entry into the observational process, and by the complexity and abstraction of the discipline's main concepts. While the Ivory Tower is often characterized as impenetrable, academics sometimes go to great lengths to make their science accessible, and scientists such as Carl Sagan or Stephen Jay Gould have made a fine art of communicating difficult concepts to the general public. Nevertheless there is no doubt that concepts such as string theory will always remain largely incomprehensible outside their respective rarified communities. No one would suggest that a neophysics might emerge that blurred the boundaries around high-energy physics; or that brain surgery might be invaded by a generation of untrained neoneurosurgeons. The complex equipment necessary to engage in observation in many disciplines – electron microscopes, Earth-observing satellites, high-performance computers – creates a barrier to amateur engagement, as does the lengthy process of apprenticeship through advanced degrees that many disciplines require.

Then why neogeography? I argue in this paper that proximity to and familiarity with the subject matter of any science is a major factor in its public image and in the attitudes that form around it. In short, everyone feels himself or herself to be an expert in geography because geography is experienced by everyone. Moreover recent developments, such as GPS, the Web, and open-source GIS, have reduced the cost of entry into geographic science almost to zero, at least in the minds of neogeographers. Academic geographers will doubtless argue that the techniques of geographic research and the skills learned during extensive (and expensive) education are essential to ensuring the quality and originality of creative contributions to the discipline. But rather than circle the wagons or reinforce barriers to entry, I believe the discipline of geography has much to gain from neogeography, and from the collection of activities, tools, and energies that surround the concept. I focus specifically on the processes by which society acquires geographic data, in other words the processes by which it assembles and disseminates observations about the surface and near-surface of the Earth. In doing so

I address the traditional role of the citizen in the collection of scientific data, a role that virtually disappeared in the modern era but is now re-emerging in the world of Web 2.0. I discuss the potential for hybrid solutions, in which citizens and experts collaborate to combine their respective forms of expertise.

Central to the argument is the distinction between data, information, and knowledge. The term data is most often associated with observation, while the term information implies that data have been manipulated, filtered, and processed into a form that addresses some definite use. Knowledge includes the general principles that are abstracted from information: the theories, models, and procedures that have been tested and found to work, and are available for application.

2. Spaces of Familiarity

Johnston et al. (2000) define *activity space* as "the area within which the majority of an individual's day-to-day activities are carried out." It defines an area unique to each individual that encompasses home, place of work, and local areas used for recreation and other normal activities. It is related to the concept of neighborhood, though the latter conveys a stronger sense of community affinity and interaction, and may not include place of work. For the purposes of this discussion activity space will be taken as a surrogate for familiarity; that is, I will assume that an individual is by definition an expert in the geography of his or her activity space.

Of course a variety of specialized activities lead to the spatial extension of this expertise. Travel for business or pleasure, learning through formal and informal means, and exposure to the media all serve to extend an individual's area of familiarity over a larger geographic domain than is implied by his or her routine activity space. Moreover migration adds a temporal element to activity spaces, such that by the end of a lifetime an individual may have acquired some level of familiarity with widely scattered areas of the planet, at various points in time. In the past academic geographers have often prided themselves on the spatial extent of their expertise, have become experts in remote areas of the planet, and have developed courses and texts in regional geography. Much of this has disappeared recently, however, as geographers have argued that possession of geographic facts, and familiarity with exotic parts of the world, is of less importance than understanding of the processes that occur on and near the Earth's surface. This trend mirrors a larger one in which geographic ignorance is a well-documented feature of today's citizenry, despite a steady expansion and enrichment of the educational process; and contrasts sharply with recent increases in international tourism and what one might assume to be their benefit in increasing familiarity with distant places.

From this viewpoint academic geographers might be defined and distinguished by the unusually wide spatial extent of their familiarity and experience. Nevertheless Vermeer pictured his Geographer as confined to an office poring over maps that were likely made by others, and gazing somewhat wistfully into the real world outside his window (for a commentary along these lines see Downs 1997). In Saint-Exupéry's *The Little Prince* the geographer is someone who never travels, relying entirely on the reports of others and struggling with the assessment of their veracity (Saint-Exupéry 2000).

Geographic familiarity is subject to a form of spatial and temporal interpolation. Suppose, for example, that I visit a location $\mathbf{x}$ and a time t. My familiarity with that exact point at that exact time will be high; but I will also have acquired a degree of familiarity with nearby points $\mathbf{y}$ even though I have not precisely visited them; and my familiarity with a location at time t serves to provide a degree of familiarity with that location at other times u. In the spatial case one might expect familiarity to decline systematically with distance $||\mathbf{y}-\mathbf{x}||$ from each visited point, characterized by a length parameter λ. For example, λ might be defined as the distance over which familiarity halves, and might be defined at least in part by the limits to sensory perception. In the temporal case one might argue that interpolation is asymmetrical; that by visiting a location at time t one gains a greater sense of familiarity with its future than with its past. For example, having seen the Walt Disney Concert Hall in downtown Los Angeles I might feel more familiar with that area of the city five years from now, and less familiar with that area five years ago before the building was constructed. Thus decline in familiarity in time might be characterized by a forward parameter τ_f and a backward parameter τ_b, both expressed in temporal measure.

Consider Figure 1 as a map of geographic familiarity. It identifies all of the counties of the coterminous US that I have personally visited in the past 46 years (where *visited* is interpreted to mean entering the county on the ground). In this case there is no temporal decline (τ_f is infinite), and the spatial decline is reflected in the use of the county as the reporting zone, implying that visiting a single point within the county is sufficient to acquire familiarity with its entire area, but that familiarity falls to zero at the county's boundaries. This assumption is clearly more tenable for the smallest counties (the city-counties of Virginia) than for the largest (San Bernardino County in California).

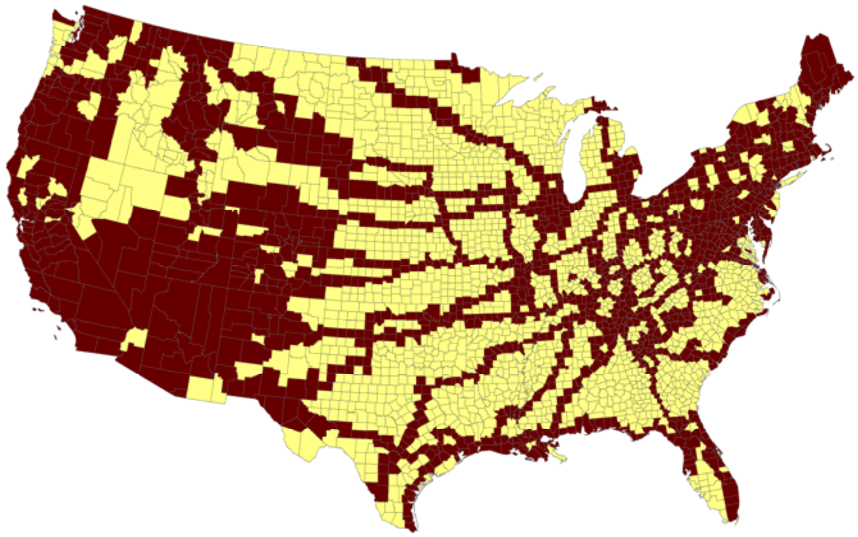

Figure 1. Map of the U.S. by county showing areas the author has visited in the past 46 years, where "visit" is defined as entering the county on the ground at any point.

If the subject matter of geography is the surface and near-surface of the Earth, then it is clear that every individual can claim familiarity with specific areas of that subject matter. In the past, of course, there were severe constraints on travel and the acquisition of geographic knowledge through the media and education. Europeans knew virtually nothing about the Americas until the late 15th century, and similarly the inhabitants of the Americas knew nothing about Europe. Even today certain areas of the planet, including caves, the highest mountains, and the polar regions, remain unfamiliar to all but small numbers of specialists. In these latter domains the expert retains a distinct role, as he or she does in high-energy physics. One would not expect to hear of a breaking down of the distinction between an expert on Antarctica and an audience for Antarctic knowledge, any more than one would expect an emergence of neophysics. On the other hand increasing travel, and the familiarity that individuals have with local geography, seems to be a major reason for the blurring of the distinction between expert and non-expert that is reflected in the rise of neogeography.

3. PRODUCTION OF GEOGRAPIC INFORMATION

Geographic information can be defined as information about the nature and locations of phenomena on or near the Earth's surface. More formally, all forms of geographic information can be conceptualized as composed of fundamental atomic tuples <**x**,**z**> where **x** is a location in space–time and **z** is one or more properties of that location (Goodchild, Yuan, and Cova 2007). Maps are rich compilations of such information, as are globes, geo-registered images, and even statements such as "It is cold today in Calgary" or "The elevation of Mt Everest is 8848m". Vast amounts of geographic data were collected by explorers such as Cook and von Humboldt, and subsequently compiled and published as maps, atlases, and books. The expertise of a Cook or a Scott, however, was largely in navigation, leadership, and endurance, all skills which are always in short supply. Today we associate no particularly advanced level of expertise with visiting such exotic areas as the Galapagos or Antarctica, and can imagine almost anyone with enough time, minimal sailing skills, and GPS creating a map of the east coast of Australia that is far more accurate than Cook's.

Until recently the process of map-making was long, complex, and
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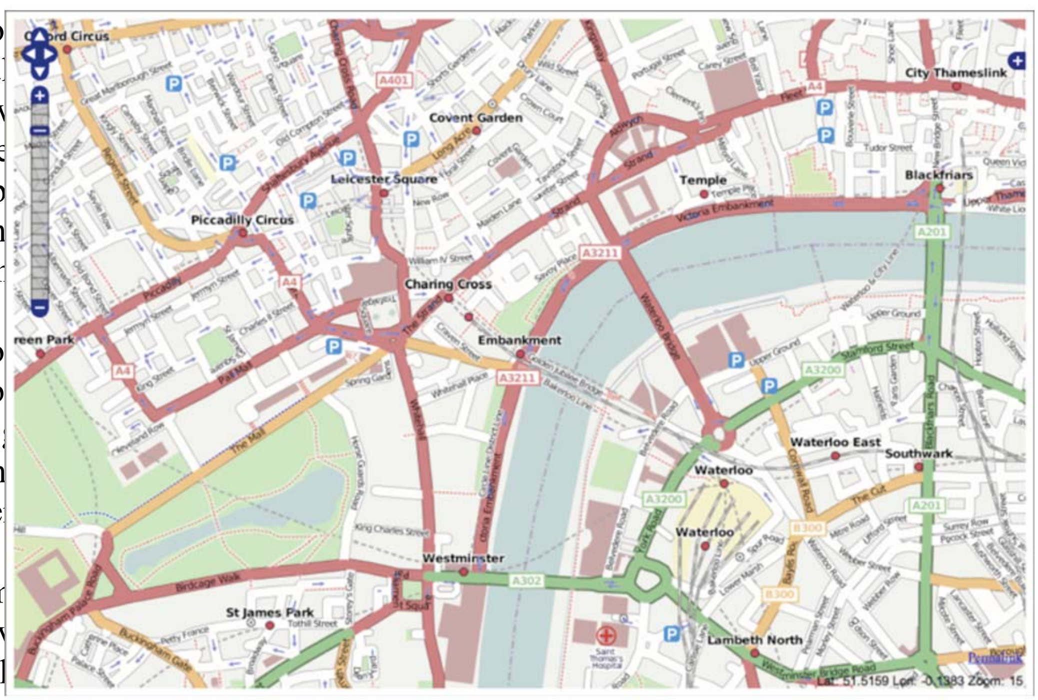

Mapping of streets and other well-defined features may require simple skills that almost anyone possesses: the ability to use GPS to determine location, and the ability to identify the names and other obvious characteristics of features. Similarly mapping of topography through the measurement of both location and elevation, together with the use of software to interpolate contours, is likely to open the field of topographic mapping to any suitably motivated amateur. In other areas, however, the levels of skill required for the production of geographic information are much more advanced, and the barriers to becoming a producer are substantial. To be a surveyor, for example, one has to undertake a lengthy process of training, and a complex set of legal and regulatory arrangements exist to ensure the quality of a surveyor's work.

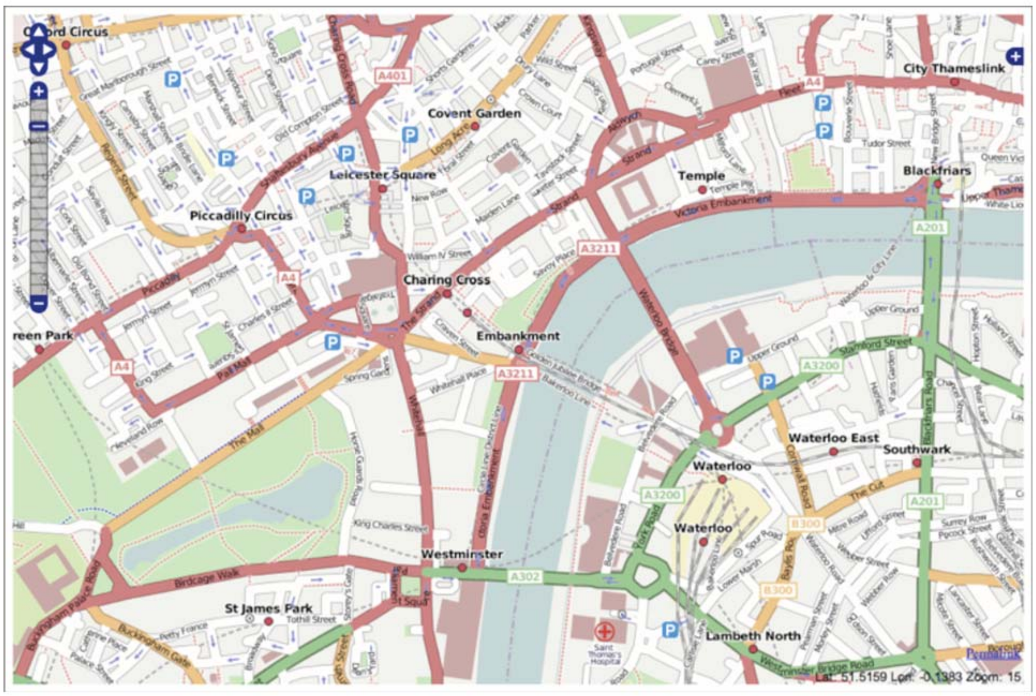

Figure 2. OpenStreetMap coverage of Central London, produced entirely by the efforts of volunteers.

Perhaps the following is the appropriate counter-argument. Soil scientists must make maps for as wide a set of applications as possible, in order to justify the high cost of observation, compilation, printing, and distribution. Although no one user is likely to need soil information for a wide area, soil mapping programs also emphasize broad spatial coverage, in order again to ensure the largest possible set of users. While amateur users may be familiar with such narrowly defined applications as horticulture, only soil scientists have sufficient expertise to understand and accommodate the much broader set of uses that soil maps must address if they are to justify their costs. However we noted earlier that the fixed costs of map production have fallen dramatically. Moreover modern technology is capable of organizing geographic information so that it can be used to respond to single queries such as "What is the soil type at **x**?" without delivering an entire tile of a map series. So this counter-argument seems to fail in the changed technological circumstances of the early 21st century, reinforcing the case for neogeography.

4. Quality and Authority

In the case of surveying and the creation of cadastral information, there is a longstanding tradition that the products of professional surveyors are of high quality. Terms such as *professional* convey an immediate sense of care, attention to detail, and adherence to rigorously applied standards, whereas the very term *amateur* suggests poor quality and is even used pejoratively. This same association of quality with authority holds for mapping agencies in general: information obtained from such agencies as the U.S. National Ocean Service or the U.S. Geological Survey (USGS) is immediately assumed to be of high quality. At the same time no geographic data can be perfect, since it is based on measurements and observations and subject to innumerable sources of uncertainty. So it is useful to ask why such agencies are associated with quality, and by what process the efforts of amateurs might acquire the same reputation.

Figure 3 shows a Google Earth mashup of the base imagery, the roads layer (supplied in this case by Navteq), and a piece of high-resolution imagery that has been carefully registered to better than 1m using several control points and GPS measurements. Note the approximately 15m shift between the high-resolution imagery and the Google base, and note also that the roads layer agrees much better with the high-resolution imagery than with the Google base. Navteq data is known to be positionally accurate to better than 10m, and in this case it appears that it is the Google base that is most substantially misregistered. However a 15m shift is quite acceptable for many of the purposes for which Google Earth was designed.

Figure 3. Google Earth mashup of a high-resolution image of part of the campus of the University of California, Santa Barbara, illustrating the inferred misregistration of the Google Earth base imagery.

The USGS operates in a very different environment from Google, and one in which quality is of major concern. One might expect, therefore, that problems such as these would not exist with the National Map, the USGS's main engine for dissemination of its vast resources of geographic information. Yet Figure 4 shows a very similar degree of misfit between its main imagery and streets layers. It is of course impossible to measure location perfectly, and unlike Google the positional accuracy of every USGS product is defined by the product's specifications and subject to frequent test. The USGS streets coverage has been obtained from 1:24,000 topographic mapping, with a published positional accuracy of about 12m, and the USGS digital orthoimagery has a published positional accuracy of about 6m. To the average user, however, who has not examined USGS specifications in detail and may lack the basic training needed to interpret them, both Google Earth and the National Map display similar levels of positional uncertainty. Yet given the choice, most users would instinctively trust the USGS more than Google; and would trust both over data produced by an amateur.

Figure 4. Misregistration of digital orthoimagery and roads in the US Geological Survey's National Map service.

Until recently national mapping agencies such as the USGS were the only extant source of geographic information. The processes they developed are well documented, and over time users came to trust their products. In part this may be because of the extensive *metadata* available for such products, in the form of documented specifications, test results, and mandates. By contrast no comparably extensive metadata exist for projects such as OpenStreetMap, for Google Earth, or for Navteq data. But in recent years the user base for such products has grown to include large numbers of individuals with little or no training in the geospatial sciences, little understanding of the details of the production process, and little interest in the published metadata. Instead data are taken at face value, particularly when they concern phenomena that are part of everyday experience. Nevertheless one way to establish authority would be for novel sources such as OpenStreetMap to publish extensive documentation of the procedures used and to initiate programs of quality testing.

A quite different argument is often used regarding the quality of sources such as Wikipedia, the on-line encyclopedia. Like

OpenStreetMap it is an effort by thousands of volunteers, and relies on the willingness of individuals both to contribute entries and to edit entries for errors. The *crowdsourcing* or *collective intelligence* argument suggests that entries created by large numbers of people are likely to be more accurate, or more likely to be accurate, than entries created by individuals. Wikipedia also maintains a hierarchy of volunteer editors with responsibility for checking and accepting entries and edits. Given the breadth of material, however, it is difficult to ensure that every entry is reviewed by an editor with a high level of familiarity with the subject. Nevertheless, the consensus appears to be that Wikipedia entries are of high quality, particularly the more important entries on topics for which substantial shared expertise exists.

If one were to extend this argument to the geographic case, it would suggest that local expertise can provide the basis of a powerful mechanism for quality control. A hierarchy of editors might be defined on a purely geographic basis; any new entry concerning a place would be referred to the first-level editor whose expertise covers that place; and entries would then move up the geographic hierarchy. It is interesting to compare this approach to the traditional one employed by national mapping agencies, which make very little use of local expertise in the mapping and editing process. Of course the organization of mapping at the national level was driven originally at least in part by the need for economies of scale in an enterprise with a very high cost of entry. But with the cost of entry now close to zero such economies of scale are no longer needed.

5. CITIZEN SCIENCE

The term *citizen science* is often used to describe the engagement of amateurs in the scientific process, particularly in the observational sciences. The Christmas Bird Count (http://www.audubon.org/bird/cbc/index.html), managed by the Audubon Society, is a major effort to engage amateur ornithologists (*birders*) in the collection of a comprehensive census of bird populations. Extensive protocols exist to ensure that the results are consistent through time and across space and scientifically useful as observations, and participants must possess a substantial level of skill in the identification of bird species. Project Globe (http://www.globe.gov/r) is managed by the University Consortium for Atmospheric Research as an international effort to engage schoolchildren in the observation of local environmental conditions, particularly weather. Data are uploaded from thousands of schools around the world, synthesized, and redistributed for use by their originators and by scientists. Again detailed protocols exist, and teachers are subjected to extensive training. Astronomy is another discipline with significant engagement with amateur observers, some of whom have made many significant discoveries in recent years.

These examples seem to focus on those sciences with substantial focus on observation. In each case the cost of entry is much lower than it is for professionals in the science, both in the training required of observers and in the cost of observational equipment. Nevertheless one would not expect the average participant in the Christmas Bird Count to be engaged in the development or empirical testing of sophisticated mathematical models of population ecology, or expect amateur astronomers to be making significant advances in theoretical cosmology. The amateur in both cases is limited to engagement in the process of raw observation, and to the inductive rather than deductive role of empiricism.

Yet this distinction between citizen and professional scientist is remarkably recent, and many of the great scientists of the past lacked all but the most basic training in observation. If one takes professional qualifications as the distinguishing characteristic of the professional, Darwin was by modern standards an amateur ornithologist, Banks was an amateur taxonomist, and Galileo an amateur astronomer. Their observational methods might even fail to meet the standards we require today of our students (Waller 2002). What in most cases distinguished the now-famous scientist from the amateur observer was not the observations per se, but the ability to draw inferences and to develop theory from those observations.

By extension, then, the flaw in the neogeography argument is not that geographic observation requires the skill of a professional, or even that professional expertise is needed to compile observations into maps. Instead, the professional geographer is distinguished by his or her ability to reason beyond observation – to develop new generalizations and theories, to test theories by comparing their predictions to observations, and to possess the sophisticated analytic tools needed to reveal insights that are not immediately apparent. In the widely accepted view Martin Waldseemüller and Vautrin Lud chose to name their new continent America after Amerigo Vespucci because they believed his claim to have been the first to recognize that the new lands discovered west of the Atlantic were a previously unknown continent (Fernández-Armesto 2007) – in other words, Vespucci's contribution was an inference from observation that Columbus had failed to make. Similarly the widespread recognition accorded such geographers as von Thünen, Christaller, Hagerstrand, Tobler, and Bunge stems from their contributions to general principles. While Tobler's observation that "nearby things are more similar than distant things" (Tobler 1970) may be blindingly obvious on reflection (and no more so than Newton's Laws of Motion), and while similar ideas have a long history in other disciplines, his statement was nevertheless a powerful advance in geographers' ability to generalize about the world around them.

However the popularity of neogeography suggests that unlike physicists and ecologists, geographers have generally failed to convince the average citizen that a substantial body of theory exists about the distribution of phenomena over the Earth's surface, or that analytic tools can greatly extend the value of raw observations. Too often, it seems that the task of the geographer has been perceived as no more than *geo graphics*, in other words the graphical portrayal of the Earth's surface in the form of maps. Services such as Google Earth reinforce this view, with their excellent capabilities for presenting the Earth in recognizable visual form but almost complete lack of the kinds of analytic capabilities that are abundant in a GIS. The neogeography definition suggests a perception that geography as a discipline is still largely descriptive, and still locked in the familiar "capes and bays" or "corn and hogs" parodies of geographic education.

6. WHAT PALEOGEOGRAPHERS KNOW

If the central notion of neogeography, the sweeping away of distinctions between professional and expert, is founded as I have argued on a misperception of what it is paleogeographers know and do, it might be worth elaborating a little on that theme before attempting a reconciliation. In essence the argument concerns tools that can reveal insights from the analysis of data, and theories that can account for and explain data. Collectively they constitute the means by which geographers extract higher-level knowledge from raw geographic data.

6.1 Analytic tools

Over the years statisticians, geographers, economists, and others have developed a host of techniques for the analysis of geographic data, all of them aimed in one way or another at the extraction of insights that are not otherwise apparent. When GIS appeared as a commercial product in the late 1970s it was immediately hailed as a powerful platform for analysis, and over the years numerous functions have been implemented. Today it is possible to assert that GIS is capable of virtually any conceivable operation on geographic data.

The analytic functions implemented in GIS go by various terms, including *spatial analysis*, *spatial data analysis*, *geographic analysis*, *geographic data analysis*, and *spatial data mining*, but all imply essentially the same thing: a collection of powerful tools for the precise analysis of geographic data. Some authors distinguish between those techniques used primarily for exploration and hypothesis generation and those used primarily for hypothesis testing and confirmation. De Smith, Goodchild, and Longley (2007) have recently published a comprehensive guide that includes pointers to the GIS products that implement each of the techniques.

Several efforts have been made to systematize what is otherwise a confusing mass of methods. Tomlin (1990) developed *Map Algebra*, which organizes all analytic functions into four categories but is only applicable to raster data. Longley et al. (2005) use six categories that are designed to organize techniques in ascending conceptual complexity. Most recently de Smith, Goodchild, and Longley (2007) have proposed an organization based on the fundamental spatial concepts explored by each technique. For example, there are many techniques designed to search for spatial clusters and to test the statistical significance of each, based on the notion that points in space often form clusters, either because conditions there are particularly favorable (*first-order* clustering) or because an initial infection spread through its immediate neighborhood (*second-order* clustering).

6.2 Spatial theory

A spatial theory can be defined as one in which spatial concepts such as location, distance, or adjacency appear as terms in the theory and share in its explanatory power. The argument that theories can exist in geography – in other words that there can be theories about the distribution of phenomena on the Earth's surface – has a long history in the discipline dating back at least as far as Varenius (Warntz 1989), and has often been the subject of extensive debate (Bunge 1966). Central Place Theory (Christaller 1966), which uses assumptions about the behavior of entrepreneurs and consumers to explain the locations of settlements in agricultural landscapes, is one of the best known. Spatial interaction theory (Fotheringham and O'Kelly 1989) addresses the systematic decline of human interaction with distance in such phenomena as migration, shopping behavior, and telephone traffic. Reference has already been made to Tobler's First Law of Geography (Tobler 1970), which is based on the observation that many phenomena vary smoothly over the Earth's surface, allowing locations to be aggregated into approximately homogenous regions, and allowing reliable estimates to be made of properties such as air temperature at locations where such properties have not been measured (*spatial interpolation*).

7. REINVENTING GEOGRAPHY

Like any empirical discipline, geography needs a reliable source of observations both as a source of insight and as a testbed for its theories. In the past geographers have relied on direct observation through field work, and on such secondary sources as the census and the products of mapping agencies. It has become increasingly apparent, however, that many of those secondary sources are drying up. Government is less and less willing to foot the bill for map-making efforts that serve the needs of small minorities of voters, while the costs of entering the mapping business have fallen almost to zero, allowing virtually anyone to make a map. This sea change is reflected in the emergence of the National Spatial Data Infrastructure (National Research Council 1993), a set of national policies based on the belief that map-making is becoming a community enterprise that must be supported by effective standards and access mechanisms.

In an earlier paper (Goodchild 2007) I proposed the term *volunteered geographic information* (VGI) to describe the actions of thousands of individuals who are now contributing user-generated geographic content to the Web. There are now literally hundreds of Web services that collect, compile, index, and distribute VGI content. Wikimapia encourages users to "describe the whole world"; OpenStreetMap is developing a free digital map of the world; and Flickr is compiling a vast resource of georeferenced photographs. But while the growth of VGI is clearly blurring the distinction between the traditional authoritative sources of geographic information and the assertions of amateurs, it falls far short of replacing the activities of professional geographers as outlined in the previous section.

Unfortunately we lack a word in English that would clearly distinguish the VGI enthusiast as an acquirer of geographic data from the role of the professional geographer. A *cartographer* is someone who studies the science of map-making, working to improve designs and to understand better how people use and react to maps; but while a VGI enthusiast might help to make a map, the cartographic designs of projects like OpenStreetMap are already locked into software. Moreover it would be a mistake to think of all VGI as being presented in map form since there are many types of geographic data for which the traditional map is not a feasible or practical display mechanism. The term *explorer* is often used to refer to collectors of geographic data, but it has gone out of use as the Earth's surface has become better known. Nevertheless *neo-explorer* might be a more accurate way of describing the contributor of VGI; although the areas being described are already well known, the great value of VGI is in making that familiarity vastly more useful and accessible through the mechanisms collectively known as Web 2.0. The role of contributors to OpenStreetMap is not to provide the kinds of new geographic knowledge that geographers might extract from data, but to provide an alternative to an older authoritative source of geographic data that has become too expensive for governments to maintain, and too expensive and difficult for the average person to use. That alternative is by its nature *asserted*, because it comes with none of the mechanisms for quality control favored by mapping agencies – but as we have seen other mechanisms associated with amateur efforts may well provide suitable assurances of quality.

Hybrid solutions to the production of geographic data may well represent the best of both worlds. There is clearly a role for central management and coordination, but the local expertise that VGI builds on is also very valuable. Increasingly we are seeing mapping agencies and private companies relying on networks of local volunteers and even paid part-time employees to acquire and maintain their geographic data resources. For example, the Ordnance Survey of Great Britain's Geograph project invites people to volunteer photographs of local areas to a communal Web site (http://www.geograph.org.uk/), providing a useful resource both for the agency and for the public at large. Local volunteers can provide early warning of changes in local geography as well as effective error correction.

To conclude, the world of authoritative geographic data is being rapidly augmented and to some extent replaced by a new world of asserted geographic data. The old distinction between amateur and professional is quickly blurring in this arena, since few if any of the arguments that built and sustained the traditional system of map production are now viable. But unfortunately English lacks an appropriate term for the producer of geographic data – geographer, cartographer, and explorer are all inappropriate. As Taylor argued (Taylor 1990), it is easy to confuse the process of collecting geographic facts with the process of geographic research. The definition of neogeography cited at the outset reflects a common misunderstanding of the work of geographers for which geographers themselves are most to blame. At the same time the changes that it echoes, in a growing willingness of amateurs to be involved in the mapping process, and a growing recognition that we are all experts in our own local communities, has much to offer to improving the relationship between humans and the world around them.

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