

# Geography among the sciences

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Geography and the geographers who construct it enjoy distinctive opportunities and respond to distinctive challenges compared to those who profess and practice other disciplines. Geographers address an unusually wide variety of topics, and employ remarkably diverse methods in their attempts to solve problems and achieve understanding. Consequently, geography exhibits extensive internal specialization, which often engenders confusion on the part of colleagues in other disciplines about geography's intellectual core and substantive domain. To maintain its vital role among the sciences, geographers would be wise to articulate more clearly the ways they can contribute to the grand challenges facing contemporary science and humanity more generally, which in turn demands rethinking of traditional patterns of thought and practice.

## Geography's distinctive breadth

Not uniquely among the sciences, but distinctly and perhaps unmatched in degree, geographers seek to understand and explain phenomena across a wide spectrum of intellectual realms. Some ply the trade alongside botanists, atmospheric scientists, or earth scientists. Others engage primarily in social science pursuits by exploring the geometry and choreography of cultural, economic, political, social phenomena. Yet others view the world in humanistic terms, describing, interpreting, and explaining places and landscapes in ways that resonate with personal emotion and experience. Still others have found a behavioral viewpoint exciting and satisfying in their

work on navigation and way finding, and on how people perceive, respond to, and alter their surroundings. Supporting and intertwining with this rich substantive array are the geographers who create and refine the discipline's distinct techniques of mapmaking, remote sensing, and geographic information systems (GIS).

What lends coherence and unity to an intellectual enterprise with the audacity to assert dominion across the natural, social, and behavioral sciences as well as the humanities? A deep and abiding conviction that *location matters*. Whether they focus their analytical and explanatory skills on patterns of weather and climate, on the ways cities organize and reorganize their neighborhoods and hinterlands, on how immigrants try to reproduce the look and feel of their homelands in new settings, on the ways flood plain dwellers credit or discredit the threats posed by floods, or on how to make computerized maps easier to draw and interpret, geographers attend always to *where* things are, *why* they are there, and how they are *connected* to other things at other places. Meteorologists more likely than not attend primarily to the physics of atmospheric processes. A geographically trained climatologist will attend primarily to the ways atmospheric physics produces temporal patterns of weather extending over years and decades at specific places and in specific regions.

Every coherent, self-conscious intellectual enterprise (my definition of a discipline) has at its core one fundamental truth that can be elaborated indefinitely within its realm of applicability. Negate that basic proposition, and the enterprise necessarily collapses. Economics has arisen from

the undeniable existence of scarcity, and all of the grandeur and horror of the dismal science follow from the fact of scarcity. Were everything that human beings wanted ubiquitously abundant, economics would not-could not-exist as an intellectual enterprise. If natural and human systems did not exist in a temporal continuum with a past, present, and probable future, neither history nor cosmography would be viable or even thinkable concepts. Everything and everybody would just *be* rather than having been nascent, then being, and then have been.

Geography's intellectual superstructure is built on the friction of distance, which in turn arises from terrestrial space-an aspect of existence as fundamental as time. The undeniable existence of terrestrial space and the need to move individuals, commodities, goods, and services among places within terrestrial space is the foundation of geography's intellectual superstructure. Whether apparent or not, any movement of people, things, or even ideas among places entails costs. The costs may be monetary, political, social, or psychological, but nothing moves in the natural or human world without the expenditure of one of these forms of energy. The friction of distance is geography's *sine qua non*, in the same way that scarcity gives rise to economics and time gives rise to history. Eliminate the friction of distance, and geography becomes nonsensical. But because the friction of distance can never be eliminated at terrestrial scales, geography has always been, is, and will remain vital.

What we call geography then is the necessarily continuous teasing out of the nature and consequences of the costs of overcoming the friction of distance in human and natural systems. Individuals or groups of people who wish to exchange goods must find ways to move them about, and the constantly changing costs of moving them about shape not only the networks that carry the goods but in the long run, the fortunes of the places participating in the exchanges. Air and water and gravity combine to overcome the friction of distance for materials ranging from molecules to immense boulders, and sculpt the shape of the earth in doing so. Geographers profess and practice across many diverse substantive topics because they seek understanding of the ways the frictions of distance play out in specific subjects.

The distinctive methods geographers bring to bear on the problems and topics they pursue arise from geography's traditional focus on distance and

patterns (sets of distances) and they offer admirably affective ways of portraying and analyzing those dimensions of human experience and natural systems. Geographers and kindred spirits have been making maps for thousands of years. Computerization has greatly enhanced the power and utility of maps in recent years. Geographic information systems (GIS) are to geography what telescopes are to astronomy and microscopes are to biology – and more. Rendering maps into digital form has fostered the development of powerful new tools for analyzing patterns and processes that unfold simultaneously in space and time at terrestrial scales.

Equally important is the capability digital storage and manipulation of maps offers for *synthesis*, and especially for synthesizing different kinds of data such as the geographical relationships between natural and social phenomena. Comparing more than two or three paper maps to see how different features are geographically related to each other is difficult. Comparing five or six is almost impossible. When maps have been converted to digital form, however, they can readily be compared to each other with considerable rigor, engendering much improved understanding of the ways numerous features of the natural and social environment combine to produce individual places and regions.

## Consequences of geography's breadth and perspective

A discipline that spreads its attentions as widely as geography enjoys a constant tension between fission and cohesion. For better or for worse, geography has spawned what sometimes appears to be an embarrassment of specialized subgroups to provide local foci within its wide beam. The Association of American Geographers, for example, hosts 53 specialty groups with interests ranging from Africa to the World Wide Web, and three affinity groups for geographers employed by community colleges, those who are graduate students in geography, and those who are retired. Membership in the specialty groups ranges from more than 1,400 for the GIS specialty group, to fewer than 100 for several of the more specialized groups. The disparity evident in the existence of 53 specialty groups within geography versus the 24 sections in the American Association for the

Advancement of Science (AAAS), which represents all of science, has not gone unnoticed or unremarked by those concerned about geography's expansive purview. Internationally, similar internal specialization prevails. The International Geographical Union (IGU) boasts 22 commissions, ten study groups, and two task forces.

Maintaining cohesion within such topical diversity can be difficult, but to date it has been possible through occasional adjustments in the structure and operations of geography's scholarly societies. The AAG established specialty and affinity groups in response to the increasing size and diversity of its membership and its annual meetings. At its March 2001 annual meeting in New York City, for example, 4,750 participants attended more than 3,000 presentations organized into some 750 sessions. Specialty and affinity group organization and sponsorship of sessions at the annual meetings helps meeting participants find presentations and sessions of interest amidst an almost bewildering array of possibilities. Similarly, the 2000 segmenting of the *Annals of the Association of American Geographers* into four sections devoted respectively to Environmental Sciences; Methods, Models, and Geographical Information Sciences; Nature and Society; and People, Place, Region was instituted to highlight the four major intellectual realms in which geographers work.

Restructuring disciplinary meetings and publications helps maintain cohesion within geography but it does little to alleviate the second consequences of geography's diverse interests and applications – the confusion among colleagues in other disciplines about geography's goals. In many instances, geographers have failed to articulate adequately to non geographers the conceptual core that unifies their diverse substantive interests. In many instances, geographers have spread their expertise so thinly over so many regions or topics that they have failed to achieve the critical mass prerequisite to providing trenchant explanation or understanding. These shortcomings were cast into sharp relief at the opening session of the 2001 annual meeting of the Association of American Geographers. Keynote speaker John Noble Wilford, a seasoned science writer for the *New York Times* observed that while he as a non scientist could articulate clearly the overriding research agendas now being pursued by astronomers and archeologists (two of the other disciplines he covers in addition to geography), he

could not do so for geography. Wilford is a sympathetic friend of the discipline, a Councillor of the American Geographical Society and author of a number of books on topics related to geography, including *The Mapmakers* (Knopf 1981), and *The Mysterious History of Columbus* (Knopf 1991). Wilford recommended that geographers identify, and identify their individual work with, large scientific undertakings, the grand challenges that face humankind in general. It's possible that geography is congenitally incapable of consensus on such big questions, but I've always preferred to think there is a big picture in geography, basic themes that do unify its diverse manifestations, and that our difficulty has been in voicing it clearly and in linking it in productive ways to major problems. Accordingly, I will devote the concluding section of today's remarks to ways I think geographers can and should respond to the challenges posed generally by their own diversity of interests and more specifically to that posed by Wilford.

## Responses to the challenge of diversity

Certainly some of the grand challenges facing science today are suitable, worthy, and even noble causes in which geographers should enlist. More important, emerging efforts in earth systems science, sustainability science, and vulnerability science will be less than fully effective if geographers in large numbers do *not* participate in their formulation and elaboration. The explanation and understanding of nested and coupled natural and human systems sought by scholars in earth systems science are inherently geographical. Global changes are the summations of events that occur in localities. Any workable strategies for mitigating the causes of global change or for responding to its consequences will operate at locality scale. Modifying the forces that drive global change will require refined analysis of the ways local actions are linked to global processes, tempered by local knowledge of how decisions are made at locality scale. Geographers excel at producing those kinds of knowledge and understanding. Much the same is true with respect to the attempts to identify the limits on process that form the core of sustainability science and the efforts to map peoples and places at risk from anthropogenic and natural hazards in vulnerability science.

Meeting the grand challenges outside geography proper will require overcoming some obstacles to progress that have arisen inside the discipline because of its fragmented nature (Turner 2002). Foremost among these is the need to state clearly and forcefully, as I have tried to do today, the validity and value of the perspective that unifies the work geographers do. That location matters is an ineluctable reality of human existence and of most of humankind's intellectual constructs. Geographers would do well to clarify that message by providing examples of how their ways of thinking enhance the insights of the disciplines and specialties pursued by their non geographer colleagues. Meeting that challenge will in turn require attention to a linked series of subsidiary objectives: reducing somewhat geography's internal diversity by finding commonalities among its plethora of sub specialties; contributing more effectively to the formulation of the research agendas of science; building intellectual bridges to colleagues in other disciplines cognate with geography's major realms of research and application; strengthening the discipline's scholarly and professional societies; and a reduction in the proportion of the discipline's effort that is expended in pursuing isolated, diminutive projects.

That work has been undertaken in the United States with the formation of a new division within the Association of American Geographers. The goals of the AAG Research and Strategic Initiatives Division are to promote more effective links between the AAG and geographers in government agencies and private firms; enlarge AAG participation in government programs, foster research and teaching partnerships among the academic, government, and private sectors, collaborate more closely with cognate organizations, and take deliberate steps to secure appointments for geographers to positions of leadership in the broader scientific establishment of the United States and in international scientific organizations.

## Geography among the sciences in Finland

I apologize for presenting such a parochial view of geography among the sciences today. While I have greatly enjoyed and profited by the greater acquaintance with Finnish science and Finnish geography I have acquired during my few days

here under Markku Löytönen's expert guidance, my very limited prior knowledge of both forced me to rely largely on my own experience in my own country in preparing these remarks. There are many similarities in the practice of science and geography in Finland and the United States, and there are certainly no differences between the two countries in the theory and conceptual components of the enterprises, but important differences in the cultural and social contexts in which geography and science are conducted should not be forgotten.

Foremost among those differences is *scale*, a factor that is often overlooked by those not sensitive to it, and a dimension of process that can profoundly affect outcomes. Scale certainly affects the degree of division of labor and specialization of task that can be achieved. A small country such as Finland incurs all the fixed costs of maintaining a scientific infrastructure without being able to spread those costs over the larger corps of scientists that would exist in a larger country. That in turn results in multiple obligations for those who do choose science and geography as careers in Finland. I see your university faculty and students in geography playing substantially less specialized roles than their counterparts in the United States, where such tasks as teacher training or developing and maintaining links with geographers in government and the private sector are often performed by individuals who enjoy the luxury of specializing in those roles.

From what I have seen, however, generally and at the University of Helsinki, geography thrives here despite its small size, both as an individual enterprise and as a vital component of Finnish science. I spent most of my academic career at Penn State University where geography is a part of Penn State's College of Earth and Mineral Sciences. The Penn State Department of Geography was rated the best graduate program in geography in a 1995 National Academy of Sciences ranking of doctoral programs in the sciences. I believe that much of that accomplishment is attributable to the ways Penn State's geographers profited by their close association with the natural scientists – geologists, metallurgists, meteorologists, petroleum engineers, and others – who were their colleagues in that college. I see pleasant and promising parallels between geography's home among the university sciences at Penn State and geography's past and new home here at the University of Helsinki.

Personally and on behalf of the Association of American Geographers and the International Geographical Union, I offer warmest congratulations to you on the occasion of the dedication of the magnificent Physicum as a new home for geography and science at the University of Helsinki. You have our best wishes for continued and increased success in your teaching, research, and service to your country and to international science.

REFERENCES

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