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# On Geography

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# The Human Environment: The Road Not Taken, The Road Still Beckoning

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**Abstract.** Repeated attempts to establish a monistic description of geography ignore the essential pluralism of our four traditions. From the 1960s on, the spatial tradition came to dominate the field. Thus following the environmental revolution in the late 1960s, the man-land or human environment tradition in geography was too small to provide the training and leadership for the increasingly professionalized movement despite high levels of scientific leadership and interdisciplinary competence evidenced by many individual geographers. The great enduring, scientific challenges of the human environment persist, and new opportunities are offered geographers to use their skills, knowledge, and values for human survival. These challenges include the Malthusian dilemma of population and resources, the nature and determinants of the human transformation of the earth, and the sustainable development of the biosphere. I describe a brief intellectual history of these problems, offer selective examples of work underway, and suggest opportunities for geographic participation.

**Key Words:** biosphere sustainability, earth transformation, environment, human environment, geography, geographic traditions, global change, intellectual history, population-resources.

Two roads diverged in a yellow wood,
And sorry I could not travel both
And be one traveler, long I stood
And looked down one as far as I could
To where it bent in the undergrowth;

Then took the other, as just as fair,
And having perhaps the better claim, . . .
R. Frost, "The Road Not Taken"
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Rinehart, and Winston)

I LOVE that poem. It resonates for me and perhaps for many of you. But not for us collectively, as a profession. Indeed, in the beginning—not the real beginning, not genesis, or Strabo, or Von Humboldt, but in my generation—there were four roads diverging: earth, place, space, environment. As Bill Pattison wrote, in the year after I received my Ph.D.,

> Every one of the well-known definitions of geography advanced since the founding of the A.A.G. has had its measure of success. Tending to displace one another by turns, each definition has said something true of geography. But from the vantage point of 1964 [actually 1963], one can see that each one has also failed. All of them adopted in one way or another a monistic view, a singleness of preference, certain to omit if not alienate numerous professionals who were in good conscience continuing to participate creatively in the broad geographic enterprise.
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> . . . [My] thesis . . . is that the work of American geographers, although not conforming to the restrictions implied by any one of these definitions, has exhibited a broad consistency, and that the essential unity has been attributable to a small number of distinct but affiliated traditions, operant as binders in the minds of members of the profession. These traditions are all of great age and have passed into American geography as parts of a general legacy of Western thought. They are shared today by geographers of other nations.
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> There are four traditions whose identification provides an alternative to the competing monistic definitions that have been the geographer's lot. . . . [They are]: (1) a spatial tradition, (2) an area studies tradi-

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tion, (3) a man-land tradition, and (4) an earth science tradition (Pattison 1964, 211).

The insistence on collapsing the four traditions into a single monistic whole continues today, fueled by the pressure to justify ourselves and our place in the university curriculum. What happens in the university carries over to the world of science. Our profession is only reluctantly included on committees of the social sciences. In face of the implicit suspicion that we are not really a social science, our representatives struggle to find a unique place among the sciences and continue to put forth monistic descriptions of the discipline (Ad Hoc Committee on Geography 1965; Taaffe 1970; Committee on Basic Research . . . , in press).

But it is not of clumsy convergence that I want to speak, but of divergence. During the 1960s, the practice of earth science (as opposed to its teaching) diminished greatly in our field. Area studies escaped from regional geography and, despite the welcome independent growth of such studies, were not to return to geography uniquely until a renewed humanistic interest in the sense of place developed. The competing roads that were left then, were the spatial tradition and the "man-land" tradition, or as I prefer, space and the human environment.

Embarrassed by the environmental determinism of an earlier time, rejecting the scholarly but atheoretical cultural geography that along with resource geography had carried forward the "man-land" tradition, and impelled by the quantitative revolution, space came to dominate our field. Our brightest and best basically described us as a spatial science. Our central question came to be, and for many is still, why is anything where it is?

Space became the high road of the profession, and the other traditions maintained themselves only by becoming even more interdisciplinary. We became geophysicists, or African, Asian, and Latin American scholars, or cultural ecologists, or psychogeographers, or environmental scientists. We published in nongeographical journals. For example, of the dozen or so geographers who have published in *Science* since 1980, almost all were affiliated with either the human environment or earth science tradition. This worked well for outstanding members of the profession, but poorly for the profession itself.

In what follows, I report on that portion of the human environment tradition that I know intimately. I beg the understanding of my fellow cultural ecologists as I emphasize the areas of our mutual field that I know best. In so doing, I omit their parallel and equally interesting intellectual evolution.

## The Road Not Taken

Drawing on elements of both the "man-land" and the earth science tradition, the human environment tradition flourished in important ways. It created a field of hazard studies and brought it together with resource analysis. It developed new methodologies of environmental perception, risk assessment, and climate impact assessment. Its leaders successfully bridged the natural and social sciences (Mabogunje 1984) in the departments, institutes, interdisciplinary studies, committees, boards, and panels that they organized and led. But what they did not do and could not do, was collectively to provide the disciplinary leadership for the environmental revolution.

The quantitative revolution was disciplinary (Burton 1963); the environmental revolution was social. Earth day 1970 burst forth, to surprise even those of us who were mindful of the recurrent swings of concern with resources and environment. No discipline was better situated than was geography to provide intellectual and scientific leadership. The natural science for the environmental revolution should have been the science of the human environment. It did not happen that way. Instead, intellectual leadership was split among biology, economics, and engineering, each of which transferred onto the human environmental realm their own theories of nature, of economy, or of technology, but none of these offered a truly integrated view (Burton, Kates, and Kirkby 1974). The theory of the human environment, then, was the theory of plant or animal ecosystems, or of pervasive externalities, or of technological and managerial fixes.

As all industrial societies came to spend between 1 and 2 percent of their GNP on environmental pollution, new jobs were created and new social roles were identified. There was and is a great need for geographers who can sit astride the natural and social science boundary to provide analysis, integration, and leadership. But they simply were not available. The departments that might have trained such geographers were few in number or were lacking the difficult and dual competences that were so vitally needed. There were and are ample opportunities to use these competences, but geographers who possess them employ

them for the most part within other disciplinary labels.

So much for the road not taken, what of the road still beckoning? The human environment tradition still poses great, enduring, intellectual, and scientific challenges, some of which are inexorably linked with the very survival of humankind. I turn now to three of these great questions: the Malthusian dilemma of population and resources, the human transformation of the earth, and the sustainable development of the biosphere. For each I shall describe a bit of history, pose some selective examples of interesting work under way, and suggest some new opportunities.

## The Malthusian Dilemma

For 189 years, Robert Malthus has cast his long shadow over the human environment. He is the grand theoretician that each generation rediscovers, redefines, and refutes anew (Wrigley and Souden 1986). The essential formula is a simple one. For Malthus there were the biological needs of sex and hunger. It was easier to satisfy the former than the latter. Thus there would be more rapid growth in people than in their means of subsistence, leading to positive checks on numbers, the four grim horsemen of the apocalypse. In later presentations of the theory, there were also preventive checks, mostly delayed marriage. But to borrow a phrase from another great theoretician of society—the history of all hitherto existing society is the history of population pressing the limits of the earth (Marx 1948).

It is convenient to think of Malthusian theory as a simple equation in which fundamental well-being is determined by a numerator of resources divided by the denominator of population. In the original formulation the numerator was food (or the agricultural land that produced it or to use Malthus's words the "limited territory that contained it") and the denominator was the population of that territory. His territories were surely limited, England and Wales, but in subsequent discussions, he included areas of Europe and North America.

And of course he was wrong. His homeland had doubled in population over the century before he wrote, but this population growth was unknown to the public until the census of 1801. It would double again, 2.5 more times, showing some signs of pressing against the margins of food subsistence but never checking its growth.

But such is the power of a good theory that practice seldom discourages it even when findings are to the contrary. Rather, each subsequent scholarly generation would redefine and expand the equation. By the 1850s, food requirements would include other energy and material resources (Jevons 1906). The limited territories of localized food production and trade would become national and, for imperial nations, would include their colonies. A century later, this view of resources would be broadened again to include amenity resources and the pollution-absorbing qualities of the environment. Then most recently resources would be generalized to the biosphere itself and to all living species. Similarly, in the denominator, the populations of nations were expanded to embrace the population of the world (Kates 1983).

The process of refutation continues as well. In my professional lifetime, I have been part of two major periods of rediscovery, revision, and refutation. In 1965, Ian Burton and I wrote that scientific and popular opinion seemed to range around two poles:

> In its extreme form, one pole is determinist in its view of nature, Malthusian in its concern with the adequacy of resources, and conservationist in its prescription for policy. The opposite pole is possibilist in its attitude towards nature, optimistic in its view of technological advance and the sufficiency of resources and generally concerned with technical and managerial problems of development (Burton and Kates 1965, 1, 2).

To document these poles, we listed some of the best-known neo-Mathusian works on the scarcity of resources and growing population, works by Vogt (1948) and Osborn (1953). In contrast, we cited the recent findings of three major studies prepared by Resources for the Future, which we reviewed under the title of "Slaying the Malthusian Dragon" (Burton and Kates 1964). These influential studies concluded that "technology can overcome increasing shortages of natural resources ad infinitum."

But as Potter and Christy (1962), Barnett and Morse (1963), Landsberg, Fischman, and Fisher (1963) were refuting the latest Mathusian fears of resource inadequacy, Rachel Carson (1962) was adding the songbirds of a silent spring to the equation. The two poles would reemerge in the limits of growth debates of the 1970s and 1980s (Meadows et al. 1972) with Boserup's (1965, 1981) careful theoretical and empirical studies writ large by Julian Simon (1981) and company, overturning the equation by making population the "ultimate resource."

Now we are in the midst of beginning still another round of rediscovery and revision, reexamining the limits of the earth by considering its transformation and global change. I will pass onto this theme in a moment, but before doing so, I want to illustrate the continuing opportunities for important work with two current directions for research, one empirical and one theoretical.

## Natural Experiments

Unplanned experiments, so-called "natural" experiments, are the essence of social science. Methodologically, the challenge is to take real world occurrences and to examine them in some comparative mode—before and after, with or without, case and control. Surprisingly, this is not often done and rarely is it done well. But when it is done, we geographers frequently do it.

Drawing upon my current work on hunger, I want to describe as examples, two natural experiments that can provide important substantive insight into understanding the Malthusian equation. They employ very different scales of analysis. The first relates to the four great problems that have dominated popular and scientific concern in the period following World War II: population, food, resources, and environment.

The recognition of each of these four great problems begins with a dire forecast or a sudden shock. Thus it was with food and population in the 1950s, with pollution of the environment in the 1960s, and with energy resources in the 1970s. Each offers in their resolution an opportunity for a natural experiment. Yet one looks in vain for comprehensive balanced syntheses of how food availability outdistanced population, how the rate of population growth turned downward, how it came to pass that 1–2 percent of national income now goes routinely into environmental protection, and how we coped with the energy crisis.

**Hunger.** A recent volume by the Sheffield geographer, David Grigg (1985), provides the first such synthesis, in which he attempts to explain what actually happened to reduce the fears of the late 1940s that in the face of growing population the world would run out of food. He presents a basic picture of food keeping up with population and even improving a bit in Latin America and Asia but not in Africa. In Asia, production has increased by intensification; in Latin America, by the expansion of cultivable land and the use of modern inputs; and in Africa, by some expansion of cultivable land, but primarily through the reduction of fallow. The green revolution has bypassed Africa, and per capita production has actually dropped over the past decade. Overall, as proportions of the world population, Grigg estimates that hunger was reduced from 34 to 17 percent, but the actual number of hungry people has increased. As critic or apologist, the glass of progress is half empty or half full. But in the richness of detail, in the emphasis on regional variation, in historical perspective, and in methodological thoughtfulness, Grigg does what we can do well.

**Africa.** The second example focuses on Africa, where counter to the worldwide trend, the rate of population growth is still climbing and demographers project that it will not turn down until early in the next century, leaving Africa with a prospect of a four- to fivefold increase in population, with Nigeria larger than the population of North America and with many calamitous forecasts of persistent hunger, environmental degradation, and ecomonic impoverishment.

But there is also convincing evidence that increasing population density may lead to agricultural intensification that would raise the capacity of Africans to feed themselves. In a study just under way, I am examining, with colleagues, a set of high-density regions in sub-Saharan Africa as natural experiments to identify the conditions under which agricultural intensification takes place and those in which greater densities seem to have little impact, or worse, lead to involution and environmental degradation. Fifty-five districts in nine countries have been identified as having densities over 200 persons/km$^2$, and field workers with a history of previous study in these areas are being sought to review what has happened as population density has risen. In turn, a sample of these districts will be matched with similar environmental but lower-density regions, if these can be found. This is of course an empirical test of Boserup's (1965, 1981) theory of population density and agricultural intensification, but it is also a practical attempt to learn how some Africans have been able to increase agricultural production dramatically in the face of an overall negative trend.

## The New Synthesis

At the theoretical end of the spectrum, a new synthesis is emerging at the nexus of anthropol-

ogy, demography, and geography, bringing together Boserup and Malthus and to some extent Marx and even Darwin. The synthesis is still emerging, but at its macro-level its aspirations are described by Lee:

> There are two grand themes in macro-demographic theory: the Malthusian one, that population equilibrates with resources at some level mediated by technology and a conventional standard of living and the Boserupian one, that technological change is itself spurred by increases in population. The striking association between levels and changes in technology and population over the past million years leaves no doubt in my mind that at least one of these views is correct. But it is also possible that both are, since the two theories are not contradictory, but rather complementary. They share the assumption of diminishing returns to labor for a fixed technological level. To this common ground, Malthus adds the assumption that population growth rates are endogenous, while Boserup adds the assumption that technological change is endogenous (Lee 1986, 96).

Using phase dynamics, Lee examines the behavior of a system governed by both mechanisms. Others also explore synthesis. In earlier work on cultural materialism, Harris (1979) had made a linkage between Malthus and Marx by relating social reproduction (Marx) to domestic reproduction (Malthus). This theme is taken up further by Hammel and Howell (1987), whose evolutionary framework on population and culture seems to embrace Boserup, Malthus, and Marx in a Darwinian perspective. Added to this heady brew of synthesis is some empirical flavoring, from the work of our millennial long waves group, whose reconstructions of long-term fluctuations in population seem to accord well with Lee's proposed dynamics. The important point of these efforts is that they redefine the nature of the argument from a simplistic choice of competing ideologies to a search for multicausal explanation.

## The Human Transformation of the Earth

These long-term fluctuations of population serve to remind us of the special moment in human history that we find ourselves in, midway in the course of a great transformation of the earth. The next doubling of global population will place the most intensive pressures yet known on the biosphere. This increase in numbers appears inevitable, but little else does. Humanity—both the scientific community and the public at large—has before it a series of fundamental questions regarding the future of our environment and its capacity to support and sustain life. To identify the dimensions and character of the sustainable development of the biosphere will require choices informed by the best of scientific and ethical insight.

Some consciousness, considerable satisfaction, and occasional concern with the power of humankind to transform the earth is recorded by Glacken (1967) from ancient times to the end of the eighteenth century, culminating in the work of Count Buffon. But systematic concern with the transformation of the environment can be traced back only slightly more than a century. *Man and Nature*, published in 1864 by the American scholar-diplomat George Perkins Marsh, was the pioneering attempt to take stock of such transformations and to awaken the public to the magnitude of human impact. For the first time, someone had described (in the title of its final revision) the earth as modified by human action.

Drawing on his extensive travels and reading, Marsh set out "to indicate the character and, approximately, the extent of the changes produced by human action in the physical conditions of the globe we inhabit" (p. iii). Successive chapters traced "the history of man's industry as exerted upon Animal and Vegetable Life, upon the Woods, upon the Waters, and upon the Sands" (pp. v,vi). These chapters serve as an initial stocktaking in the opening years of the industrial era.

By 1955, the population of Marsh's earth had doubled and the level of industrial activity had increased 20 fold. A major symposium, *Man's Role in Changing the Face of the Earth* (Thomas 1956), was organized by the Wenner-Gren Foundation at Princeton University. Drawing upon an extraordinary set of distinguished scholars and an intervening century of scholarship, the conference elaborated the themes of Marsh, describing the multiple impacts of human beings as agents of vast and often fearsome change in the world. But despite that century of scholarship, the essential organization of the Thomas volume is strikingly parallel to that of Marsh, a focus on the "faces" or landscapes of the earth: waters, soils, biotic communities, plus the addition of climate, cities, and a new landscape of waste.

Now, some 32 years after the Princeton symposium, there is a need to reexamine an earth no longer just modified but now transformed by human action. We might think of two windows in time having opened up. One is to the future; the end is in sight for global population growth. Almost all demographers agree that sometime in the

next century the world population will stabilize at about twice our present population—between 8 and 12 billion people. A large but finite number.

The second is to the past and present, a way of looking at the transformation to date. Within the scientific community, understanding of the quantitative dimensions of environmental change and of the processes involved has increased tremendously. We no longer focus on just the faces of the earth, or the states as the modelers would label them, but on the linkages between states, the essential flows of materials and energy, of the biogeochemicals, that support human life.

Simple equilibrium models and theories have been replaced by more sophisticated views of dynamic, multiple, or punctuated stable states. We have a better understanding of relationships among the various spatial and temporal scales of human activity and environmental processes. In particular we appreciate the incredible rates of transformation since Marsh's time and the expansion of scale from local to global. Above all, an interactive view of people-nature relationships has emerged that emphasizes the essential role of human behavior and adaptation in transformations of the earth.

Systematic measurement has replaced anecdotal survey in many fields of environmental science, and we are beginning to get estimates of the magnitude of transformation underway. For example, in a study that Gilbert White helped to organize for the United Nations Environmental Program, researchers estimated that: (1) the annual release of carbon dioxide to the atmosphere from the consumption of fossil fuels equals about 10 percent of that being used by plants for photosynthesis; (2) the formation of nitrogen oxides and nitrate in the course of fuel combustion and fertilizer manufacture equals about half of what the biosphere produces naturally; (3) the amount of sulphur oxides released to the atmosphere, primarily from fossil fuel burning, exceeds the natural flux from decaying organic matter (Holdgate, Kassas, and White 1982). And John Richards (1986), the environmental historian, has collected data indicating that about half of the world's arable land, an area the size of Brazil (852 million ha), was converted to cropland over the last century.

A major new stocktaking is well underway with a new international assessment of "The Earth as Transformed by Human Action." Scheduled to take place at Clark University in October 1987 as a celebration of Clark's 100th anniversary, the symposium is jointly organized by the Clark University Graduate School of Geography, the International Institute for Applied Systems Analysis, and the World Resources Institute. The opening section of the symposium places the 250-year period of rapid transformation into the context of the longer-term changes in environment and population and in the intellectual and sociopolitical history of human-induced transformations. Three major sets of papers follow. The first, continuing the tradition of Marsh and of Princeton Symposium, will examine, on the global scale, changes in the faces of the earth as caused by human activity. These include animal biota, atmosphere, forests, land use, the marine environment, population, soils, and water management. The second will focus on changes in the fundamental flows of the biosphere: carbon, earth materials, nitrogen-phosphorus-sulphur, trace pollutants, radiation, both solar and nuclear, and water.

This global stocktaking of the states and flows of the transformed earth, examined individually, is then integrated into a series of case studies of transformation in selected regions, including Africa (East Africa, Nigeria), North America (Hudson-Raritan Basin, Central Massachusetts, Basin of Mexico, Great Plains), South America (Amazonia), Asia (North China Plain, Ganges Basin, Maylaysia), and Europe (Russian Plain, Caucasia, Sweden, Swiss Alps). Underlying these documented transformations are various human processes. There is no general consensus as to what are the key prime movers for changing the face of the earth, but the symposium will examine five candidate processes: technological change, institutions and organizations, the concentration of human activity, the relationship between places of production and consumption, and social change.

## The Sustainable Development of the Biosphere

A concluding session of the symposium at Clark addresses the likely future trends of transformation, their implications for the sustainability of the biosphere, and the needed choices for action. Some elements of that future trend are already discernable. Over the next century, the population of the world, barring a major catastrophe such as nuclear war or a global pandemic, will level off somewhere between 8 and 12 billion people, between 1.6 and 2.4 times the current estimated population. An increase of this order will require a 3 to 4 times increase in agriculture to allow for meeting the dietary improvements for ending hunger, for

moving higher on the food chain, and for coping with the inevitable increase in the demand for specialty crops and organic industrial materials. In turn, the conventional wisdom holds that energy production will have to increase six- to eightfold to provide the inputs needed for such agricultural growth, for industrialization and urbanization, even at levels much below those of the industrialized nations today.

If the world is to be home to two to three times our current population, raising three to four times more food and fiber, and using six to eight times more energy, two things must happen. We need to understand the unprecedented burden placed upon the earth and we need to make the necessary adjustments that will enable us to sustain such a great level of human activity. Three broad, somewhat related, international efforts are underway or are being planned to provide scientific and policy guidance for coping with this future. All provide major opportunities for geographers' participation.

### Ecologically Sustainable Development of the Biosphere

This project is led by the International Institute for Applied Systems Analysis and is in its third year (Clark and Munn 1986). It seeks "to shape a strategic perspective on the interactions of development and environment that will help to define the terms of the debate, to order the knowns and unknowns, and to illuminate possible 'future histories' for the sustainable development of the biopshere" (IIASA 1986, 4).

To do this it has drawn together a broad set of research institutions and scientists from Eastern and Western Europe and from North America. To date, they have developed century-long scenarios of future socioeconomic development. These include both conventional surprise-free scenarios such as the ones I cited for population, agriculture, and energy, and surprise-rich ones, providing for both greater and lesser growth and for dramatic shifts in world power and influence (Svedin and Aniansson 1987). In turn, these scenarios are now being used to analyze environmental impacts and to assess social response, particularly in the form of major case studies. These include Europe as a region, the forest sector of the global economy, and the worldwide sustainability of agriculture. The findings from these activities will fuel a set of policy exercises designed to develop strategies to reduce the collision between human development and the natural environment.

### Global Change

In 1986, the International Council of Scientific Unions, the federation of the natural sciences, adopted "The International-Geosphere-Biosphere Program: A Study in Global Change." Its intention is:

> To describe and understand the interactive physical, chemical, and biological processes that regulate the total earth system, the unique environment it provides for life, the changes that are occurring in that system, and the manner by which these actions are influenced by human actions (International Council of Scientific Unions 1986).

Over a scale from the interior of the earth to the interior of the sun, the program hopes to identify and to understand the major processes of global change, integrating for the first time the physical and life sciences and requiring new concepts, models, and studies of process and new data sets and observations of past and present. Such an effort, beginning this year, will surely run through the end of this century (Malone 1986). Through the aegis of the International Geographical Union, there is some opportunity for our participation.

### Human Response to Global Change

The Global Change Project justifies its large and costly undertaking on both scientific and practical grounds. It aspires to provide the needed scientific knowledge for enabling society to manage its resources more rationally and to cope with the unwanted impacts of human-induced change. Yet in concentrating on the integration of the natural sciences, the sponsors of this project have consciously sought to exclude the formal participation of the social and behavioral sciences, except for the inadvertent participation of geographers and psychologists, who by virtue of their plural makeup are members of the ICSU family.

The International Federation of Institutes for Advanced Study therefore has proposed the organization of an international program of research on human response to global change, taking as its point of departure the changes to be identified, measured, and predicted through the IGBP. The overall objectives of the proposed program are (1) "to elucidate the basic interrelationships between

human activities and the changing natural environment that are of global and long-term importance"; (2) "to develop the information needed for formulation and evaluation of practical policy and management alternatives for dealing with change at international, national, and local levels"; and (3) "to increase awareness of the complex interrelationships between human actions and changes in the global environment" (International Federation of Institutes of Advanced Study 1987).

Last June, the first meeting of a group of international organizations took place in Toronto to begin planning the program. If successful, the program will become a direct descendant of the long list of "human response" studies encouraged by our tradition.

## The Road Still Beckoning

Are resources sufficient for our numbers? How are we transforming the earth? What is the sustainable development of the biosphere? These are great questions, derivative from the central question of the human environment tradition: what is and ought to be our relationship to the natural world?

These great questions of the human environment have at least three characteristics in common: they persist, they matter, they are not uniquely geographical. They persist because they are difficult. Each generation rediscovers, redefines, and answers them anew. They persist because they are important to people, to their understanding of their place in the cosmos, and to their survival. They are surely not uniquely geographical because all the great questions of the human environment are transdisciplinary.

Our claim that as geographers we can contribute to the great questions must rely on these characteristics, that we as a discipline understand the importance of the great questions and the broad spectrum of knowledge that is needed to cope with them. But then we also bring to their study some special although not unique disciplinary advantages.

We possess more than passing knowledge of both the natural and social sciences, often expressed as a focus on nature from a social perspective (but again not unique, and shared in particular with anthropologists). We have some useful tools of organizing data and information (also shared with all the observational sciences). We possess a strong tradition of empirical field research (again shared with ecology and anthropology). And perhaps most important we have and we teach a respect for other peoples' theories (perhaps having fewer of our own).

Our answer then, as to why geography—whether it is in the curriculum, the corporation, or government—is that we are needed and that we are useful. When they go forth, our students understand the nature of the great questions, have more than a passing knowledge of natural and social science, have been in the field, have collected and organized new data, and have placed these data into a theoretical perspective.

Thus instead of succumbing to the siren call of monism, either within our discipline or betwixt the disciplines, we should glory in our pluralism, flaunt it as a virtue, challenge others to emulate us. We should be proud of our hyphenated departments—Geography and. . . . We should celebrate our participation in interdisciplinary centers, programs, institutes, area studies, and consortia. And we should pepper our requirements for majors with the courses of others. We should strengthen our place in our institutions, not behind crumbling walls of uniqueness, but with a fine web of intellectually symbiotic relationships.

But there is a fine line between the celebration of pluralism and the view that almost anything goes. To help us move along that fine line, I offer two thoughts. The first relates to our discipline and the need for our academic departments to have greater focus. Not all of us should be doing everything, everywhere. Few geography departments can excel in all of our four traditions and none should try. But all should seek to excel in at least one.

The second is external to our discipline, an awareness of a wider crisis than that of geography. Things are falling apart; the disciplinary centers are not holding, not only in geography but everywhere in science and art. There are three roots to this epistemological crisis. The formal entrenched disciplines do not map well against the great questions of both scholarship and society. Inevitably, the frontiers of knowledge are on the peripheries of disciplines; the causes of the major problems of society are multiple; the meanings of the great works are many. Knowledge itself is in crisis; what constitutes knowing is in doubt. The strength of objective knowledge, of logical positivism, has been sapped by a generation of critical commentary designed to demonstrate the social construction of knowledge or the deconstruction of critical texts. To cope with this disciplinary inadequacy and to seek new epistemological and methodolog-

ical meaning, there is everywhere the proliferation of hyphenated departments, joint centers, multidisciplinary programs, and specialized institutes of problems or methods. But these do not mesh easily into an academia ordered by disciplines, and we are continually stressed by the conflicts between where we teach and where we learn, who pays us and who excites us, who gives us sustenance and who gives us tenure. Thus we must remember that much of our disciplinary behavior that many find troubling—our failure to have a monistic description and purpose for geography, our tendency to break into ever more narrow specialty groups, our interdisciplinary expansion on the periphery at the expense of the core—all of these are reflective of a great and sustained epistemological crisis.

Finally, we need to put our own house in order and to pursue some new initiatives. We in the human environment tradition would like to feel more comfortable within the house of geography. We do not always feel so now. We publish, for the most part, outside the field. When geography is described "officially," we often do not recognize it as ours. Our physical geography, an important part of our claim to knowledge of the human environment, is in shambles. It needs strengthening, attention, and self-revision. At a time when the physical and life sciences begin to work together, when they attend to the great biogeochemical flows of nature, too much of our knowledge of the earth begins and ends separately as geomorphology and climatology. We need more centers of excellence in the human environment tradition. Out of the graduate departments in the U.S. we have conscious specialization in the human environment in perhaps half a dozen, excellence in perhaps two or three. We need to develop with all those who share our interest, a more powerful, distinctive theory of the human environment, not merely a retread of existing ecological or economic theory. In the long run, our claim to understand the great questions will rest on the strength of our theory.

We need to extend ourselves to the other disciplines that study the environment, not merely as individuals, but formally as a profession. Thus within the social sciences, the time is ripe for us to call together the specialty groups within each of the social sciences that study the human environment, to organize an interchange of ideas, to undertake common activities. We must use our unique position within the ICSU family, to encourage the inclusion of human behavior in the study of global change, to serve as a window to the social and to the behavioral sciences, to act as a bridge in the study of the human environment.

But most of all we need to do good work on the great questions, to see that even the most local, most specific, and most practical of our endeavors relate to them, draw upon them, and contribute to them. Everywhere, we should bear witness to the transformation of the earth and to make its continuing assessment our task. For in the last analysis, we who have transformed our earth so greatly, must sustain it.

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