

Helping Others To Be Geographers¹

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In recent days, I have had the privilege of making two, very different presentations. First, an opportunity to discuss some fairly technical matters on the frontiers of geographic modelling at the Department of Geography of the University of Barcelona.² Secondly, the rather rare opportunity and privilege to talk about geography to a wider public.³ These were both special and important occasions for me, but both are subordinate to the privilege of addressing a large and varied audience of one's professional colleagues. You do me a great honor with your invitation, and I thank you all from the bottom of my heart.

Freedom and Responsibility

But with this great sense of joy, there is also a small note of despair. We represent a marvellous, exciting, and intellectually challenging field of human inquiry, and while we recognize the dangers of eclecticism, and the possibility, I know that there is not one geographer among you who does not glory in the privilege of the intellectual freedom to move through a large 'problem space', to be unconfined by many of the usual partitions of formalized academic knowledge. In this age of increasing disciplinary specialization it is quite clear that spatial and geographic perspective is not simply becoming more important, but frequently and literally *vital*.

But with privilege comes responsibility and that responsibility includes not simply maintaining the very highest standards in our own research, inquiries and teaching, but reaching out beyond our own intellectual domain to help others to be geographers too. We must share the crucial sense of spatiality in our complex modern world, we must open up our geographic vision to others, not just our colleagues in the academic world, but also our fellow citizens in government, business, and all walks of life.

Sometimes, when I speak to groups of geographers, there seems to be a sense of disquiet about the relevance of the geographic perspective today. We sometimes appear intellectually defensive, but I do not think anxiety has ever been so misplaced. We stand today at the threshold of a time when the geographic wheel of fortune has come full circle. I believe, deeply, that geography, in all its aspects of teaching and research, has never been so important since the late 18th and early 19th centuries. But our relevance today is not the presence of Humboldt's *Kosmos*, or Reclus' *Géographie Universelle* in every educated home, but out there in a world increasingly aware that an understanding of the once neglected spatial and geographic dimensions of human existence is crucial for working towards, for enlarging the conditions of possibility, for more decent, more humane lives. These are exciting times, especially for geographers, full of possibilities, all capable of writing varied geographies from many perspectives on the face of the earth, and they demand our best efforts in teaching and research. And perhaps especially in transforming research into teaching, so that teaching geography becomes part of the explosive dynamic that constitutes geographic inquiry today. Let me explain what I mean in a sort of bricolage of geographic thinking that may capture some of the ferment of geographic concern today. I use the term 'bricolage' advisedly, because we are going to roam all over the intellectual map—which is exactly what geographers ought to do.

Stepping Back To Go Forward

Let us start by briefly stepping back. The geographic 'way of seeing' was there in our Western world long before the *geo-graphos* appeared in language—and therefore explicitly in human thought. The Italian geographer, Franco Farinelli,⁴ has pointed to those links of geographic 'first seeing' in the group of philosophers we call today the pre-Socratic, people with a sense of wonder about the richness of the world and the role of the human presence. In ways that still need to be carefully and extensively explicated, I believe those early thinkers shared what we call today the 'geographic perspective.' And when I use that rather strange phrase 'first seeing' I use it to remind us that our first task is one illumination. We are the makers of meaning, we are the torches thrust into the darkness of *phusis*,⁵ and we recall with Martin Heidegger that the Greek word for truth was *a-lethe-ia*, the 'a' negating the darkness of *lethe*, to make truth an unconcealing from the darkness.⁶

Well, that was a long step back, but not, I hope, an irrelevant reminder. For we can now take a big step forward to the time that we call the Enlightenment, a time of 'lighting up,' a time of great intellectual ferment out of which geography as a modern discipline was born. Despite earlier roots in the Renaissance, something extraordinarily mysterious happened in our Western world between the 16th and 18th centuries. As far as the formal structure of the university is concerned, theology, medicine and jurisprudence had already separated from the motherlode of philosophy. But then, in the 1600s, we see what we call today the physical sciences splitting off to become 'natural philosophy,' a fissioning process of intense specialization that continues to this day in all inquiries of the physical world. Then, in the 1700s, the formal disciplines of the living world, biology, botany, zoology, and so on, take off on their own, to be followed in the 1800s with the fields we recognize today as the human sciences. In one sense, the specialization and the concomitant intellectual isolation was inevitable, but I would maintain that all of us in the physical, biological and human sciences have paid a terrible price by disconnecting ourselves from that tradition of deepest reflection that we still name today as philosophy.

Origins and Developments

We trace our academic origins to the geographic lectures of Immanuel Kant at Königsburg, and the first chair at Berlin in 1825 held by Carl Ritter, at roughly the same time as our sister discipline, history, began to be formalized as a distinct academic field. But in a strange way, a way that I feel has yet to be properly explicated by intellectual historians, something happened in that fissioning process which is only now being recovered. I refer to the split between space and time, between geography and history, to the separation of the fundamental dimensions of human existence that in a deep sense makes a mockery of both history and geography. As Fernand Braudel knew so well,⁷ history without space and place is like a three-legged stool with one leg removed, and geography without time is like another amputated tripod. You can lean the two-legged stools against each other for awhile, hoping they will balance each other, but you will never recreate the solid spatio-temporal foundations of understanding that way.

The crisis came in the 1920s and 1930s, with that curious mixture of authoritarianism without authority, and the sort of distressing intellectual defensiveness that appears in Hartshorne's *Nature of Geography*.⁸ Fifty years ago, geography appears like a long covered wagon train of the Afrikaner moving through Zulu territory on the high veldt or an American pioneer covered wagon train moving into Comanche territory. At the first sight of danger the posture is a defensive circle, with geographers on the inside defending their little world, and having nothing to do with those on the outside. Fifty years later, the intellectual stance of a new generation is quite the opposite. There is an eagerness to reach out from the geographic realm to all relevant fields that can inform our inquires from the spatial perspective that we have taken. I recently completed a *pro bono* essay that was followed by a short literature review, little more than stitching together 20 titles in three pages to point out interesting geographic books to educated men and women both in and outside the academic world. Thirty years ago, it would have been almost impossible to find books that one could put in the hands of one's academic peers, saying «This is what geography is about». Today, one is faced with an embarrassment of riches, for as I looked over my shoulder towards my bookcase, I saw five meters of books, most of them published in the 1980s, many of which I would gladly have placed in the hands of any educated person with confidence and pride. This is what the intellectual explosion in geography has meant over the past 30 years. We have never been so richly endowed with good and perceptive people, we have never faced before as teachers the challenge of many students with fine intellects, intellects (if we are honest) far exceeding our own. I look at the qualifications of some of our students coming in for master's and doctoral work, and I know I have only a few years more to out-wit and to out-bluff them!

Some Quiet Revolutions

How has this dramatic intellectual change come about? The full story, like any account in intellectual history, must be written at a later time, when scholars can see or impose a firmer outline from a hermeneutic perspective that is still closed to us. But I have been a geographer long enough to know that interpretations placed upon a discipline's 'text' can also bear little resemblance, that is have little meaning in common, to the meaning given

by those who took part at the time. So let me place my own interpretation upon the text of the past 30 years, an interpretation out of the hermeneutic stance of one of the participants, a bit battered and bloody... but still unbowed!

There was, of course, the 'quantitative revolution,' a revolt of a generation against the intellectual banality and lack of challenge provided by the graduate schools of those days. I shall not dwell upon this, for it has long been absorbed into the mainstream of geographic education and research. Indeed, the Young Rebels of those days are now the Old Establishment of today. Only the tribal elders are called upon to address Geographical Congresses!

But since then, there have been other, quieter, but no less important revolutions. One, that has been quietly at work, like a rhizome working its way slowly underground to put up new and fresh shoots, has been the increasing and deep concern with what I would loosely call 'philosophical issues.' I believe there was a recognition that in splitting off from this old tradition of reflective concern, a tradition that truly gave birth to all that we call thinking today in our Western world, whether we label it humane or scientific, that in loosening our intellectual grip upon that tradition we lost for a while something very precious. This quieter revolution itself has many aspects, but perhaps we have space here to note three.

In the 1970s, we have what I believe are the first statements in our field that explicitly raise ethical problems in geographic inquiry.⁹ These statements are informed by the humane tradition of our field, and arrive in direct juxtaposition to the analytical pendulum that is swinging strongly towards the scientification of the human world. There is a growing expression of concern with what the Swedish geographer, Gunnar Olsson, has called the 'thingification,' the reification, of the human being.¹⁰ Put almost in the form of parody, we wonder what has happened to the individual person when thousands of human beings are treated like particles in an entropy maximization model.¹¹ It is a time when another Swedish geographer, Torsten Hägerstrand, will address the Regional Science Association with a paper entitled «What About People In Regional Science?»¹²

A second thread of the growing philosophical concern results in moves towards reconnecting with our sister social and behavior sciences—the human sciences—through a strong concern for social theory. But these intellectual efforts are more than just a one-way street: geographers are sharing, not borrowing, and they are concerned to infuse social theory with what the geographer Edward Soja has called the 'spatiality' of human life.¹³ Deeply as we may respect Marx as a social theorist, and share his moral outrage at the human condition of the 19th century, we have to admit that he was no geographer. That growing and shared concern to theorize the human world can be traced from Durkheim, Weber and Dilthey in the 19th century, to Habermas and Giddens in our own time, and it will result in a number of claims to fundamentalist positions. Such fundamentalist claims are difficult to sustain today, as they themselves come under the illuminating beam of critical thought that has always been the mark of the best philosophical reflection. As we shall see, these thrusts and counter-thrusts of geographic thinking are being played out all around us today.

The third thread is a quiet return to reflective thinking, to a genuine thinking, about *what* we are doing as human and physical geographers. These questions, if they can become meaningful to us, are as old as Aristotle. Indeed, his *Physics* and *Nicomachean Ethics* contain

questions about the physical and human worlds that are, and always will be, constantly renewed by the condition of possibility for new 'worlds' of meaning. It is no accident that ontological questions are being asked today, like the one posed to Dante, «Chi four li maggior tui?» translated very freely in its context as 'Out of what world did you arrive,?' or 'What is the nature of your journey across time?'¹⁴ And if these seem to you strange questions for a geographer to ask, then you are getting old! Ask your students what they mean: they will tell you.

Geography and Postmodernism

We are also in the midst of the second of these quieter revolutions, thinking that is labeled today as 'Postmodernist.' Whether Modernity has really moved into post-modernity, whether intellectual historians looking back a hundred years from now will really be able to discern a break, is something that we must leave for history. Each generation wishes to be seen as something new, and we would be disappointed if it did not, but what comes after post-post-modernism?

Nevertheless, what I shall call 'postmodernist thinking,' with its deep concern for language, and its claim that ultimately nothing can be grounded, is an intellectual movement of the first importance for our discipline of geography, and for the possibility it holds out to us for more thoughtful teaching and inquiry. If human language and thinking cannot be ultimately grounded, if at some point each of us must be a geographic Martin Luther with a «Here I stand... I can do no other,» then fundamentalist claims become enormously difficult to sustain, and there is a recognition that many different perspectives may have equal validity, or at least a validity judged upon their power to illuminate a problem from a particular perspective. At its worst, and in a thoroughly superficial way, such thinking can slip into a trivial relativism in which geographers and other scholars appear impotent to make any judgements of worth at all. But at its best, it results in a respect for a plurality of interpretative stances that provides the ontological condition of possibility for illuminating geographic questions from a variety of perspectives, perspectives that hold the promise of unconcealing a facet that was previously in darkness.

Geography as a Moral Discipline

Well, these are all rather abstract notions. So let me try to make these broad and somewhat abstract speculative outlines more concrete with some actual examples from contemporary geographic inquiry. It will be difficult to spin these examples into a single thread of narrative, because many of the things I want to talk about are inextricably connected in complex ways. But I regard this both as a challenge and as a good omen for geography. It means that many aspects of our broad and eclectic field are not only informing others, but also linking up and informing the various perspectives we take as geographers. Let me show you what I mean.

Those who are concerned to infuse social theory with spatiality are strongly informed by the Marxist perspective. Here the claims to fundamentalism are redolent of mechanism and a search for certainty typical of the 19th century.¹⁵ And I say this without any hint

of denigration: we are always children of our time. It is for this reason that a David Harvey *has* to challenge the postmodern perspective of hermeneutic plurality, for if you constantly make claims in your writing to 'the only perspective' you cannot, by definition, tolerate any others. His book **The Condition of Postmodernity** was precisely such an attempt to challenge, but like any other fundamentalist claim it has to fail in this postmodernist world. But do not misunderstand me: there are few people I respect more in the geographic profession than David, for his **Social Justice And The City**, his **The Urbanization of Capital and Consciousness And The Urban Experience**, and his extraordinary explication of Marx in his ambiguously titled **The Limits To Capital**, stand as benchmarks of careful scholarship in the human sciences. From the perspective he has chosen, he genuinely illuminates our human geographic world in both its contemporary and historical dimensions.

And those he has touched, directly as students, and indirectly through his writing have been touched, I suspect, by his essential moral concern. There are things in all our societies that we should be ashamed of, and through the informed democratic process we should work to put them right. Geographers have an enormous advantage here, precisely because they can help others achieve a sense of illumination, that 'phrase of understanding' people exclaim when they say «Oh, I see!» With our mental maps we can show the expanded white world of Los Angeles, and the highly constrained black world embedded in it, a world close in physical geographic space but in a human sense truly a 'world away'.¹⁶ We can help people to see how socio-economic decay forms in a part of New York City, how a reduction in basic social services results in burnt out housing, and how the 'hole in the donut' expands in a wave-like fashion. Riding on the back of the socio-economic wave of decay is heroin and crack addiction, and after it comes the HIV.¹⁷ The map is our tool above all things, and it helps people to visualize in a way that a simple, written text finds difficult to match. But I shall touch upon the question of scientific visualization again.

A Global Geography

Another mark of this morally informed, Marxist perspective is our heightened awareness of the global nature of our world and its social, economic and political systems. When a geographer like Michael Watts goes to the Gambia to examine the successive impact of 'development schemes' in an area of potential rice growing, he goes fully sensitive and aware he is seeing is a global economic system touching down at a specific place, rather like the funnel of a tornado sweeping across the plain.¹⁸ As that other larger world touches down in particular places, it affects a delicate and interconnected human web in intimate contact with its physical environment. The way the land is used changes, but this sets off a whole sequence of events —like touching the edge of a spider's web, and seeing the tremble of effects throughout the system. Old ways are challenged, relations between men and women are altered, and even language itself changes under the impact of these external forces. In May, I shall be leading a field trip to Jamaica, a regional focus of a graduate seminar throughout the spring semester. Already our students are intensely aware that Jamaica, as a specific place and culture, is embedded in a larger space and world.

But this is not the only hermeneutic stance that geographers take today.¹⁹ The humane fields of historical and cultural geography have also felt the postmodernist and hermeneutic winds of influence. Who, just 20 years ago, would have written a book entitled **The**

Iconography Of Landscape?²⁰ Where would you have seen an explicit recognition of landscape as *text*?²¹ Who would have written on the ‘deconstruction of the map’? This enlargement of the very idea of text increasingly permeates thinking, so we see geography as a succession of interpretive acts. Whether it is a numerical or algebraic text from a computer, or a graphic text in cartography, we are the ones who impose meaning, and then endeavor to persuade others through the rhetoric of our writing and stories. As all scientists do, we try to persuade, we try to help people to see.

The Visualization of Complexity

But our texts are increasingly complex. In our efforts to understand, to say those magical words «I see», we need to visualize what is happening. It is no accident that visualization is a major research thrust in the new Earth Systems Science Center of my college and university, a concern shared by colleagues in the Geosciences and Meteorology. We are beginning to realize that television and the computer expand the possibilities for cartographic presentation and the visualization of complexity.²² Only a few weeks ago, I saw a dramatic example of the way cartographic animation can help us see and speculate in ways we could not see before. And I use the word ‘speculate’ carefully here, reminding us that it comes from *speculum*, a watch tower from which we may see more distant horizons. We need *specula*, we need speculations to help us see farther than we do today. The particular example was created by the geographer Stanley Openshaw, a television tape animating the incidence of childhood leukemia in northern England over a number of years.²³ It was one of the most extraordinary geographic films I have ever seen, with great ‘volcanoes’ of childhood leukemia erupting and subsiding, and from time to time long arms of infection reaching out from these centers into the countryside, only to retreat back into the erupting volcanoes from which these ‘lava flows of infection’ seemed to have poured. Such a presentation forced you to think in different ways, and lent credence to the possibility that some forms of childhood leukemia may have an underlying viral agent.

AIDS as a Spatio-Temporal Process

But now I would like to show you how humanistic, moral and scientific concerns are virtually inseparable in geography today. In my department we have also been concerned with the spread of a disease, the HIV leading to AIDS. But let me note that this example is only one of many that could be used to illustrate a much deeper geographic concern, a concern to understand not simply temporal things, not simply spatial things, but spatio-temporal processes unfolding through time and space together. For thoroughly humane and ethical reasons, we want to understand those changing map sequences, and try to bring every modern analytical approach to bear upon finding pattern and structure in an attempt to forecast the consequences of what we see. We need to forecast, to the very best of our analytical abilities, what those next maps are going to look like down the time horizon.²⁴ Why? So we can incorporate these predicted maps into spectacular animated cartography for television to be used for educational intervention, educational efforts directed particularly to the late teenage and early adult years. We know that this disease makes tremendous demands upon health care delivery systems, upon hospitals and nursing homes, and we

must plan for an expansion of these facilities. In Puerto Rico, three people convert to AIDS every day, and eight more are infected with HIV. This requires us to forecast not simply *when*, the traditional epidemiological question, but *where*, the geographer's fundamental question. To locate new facilities, we have dozens of computer algorithms to solve the locational problem for all practical purposes. But whatever the analytical approach, it requires the forecasted spatial distribution of the people who will need them.²⁵

But right here, in this most geographic of spatio-temporal sequences, matters of ethics and power immediately intrude—as Michel Foucault and Peter Sloterdijk tell us.²⁶ Geographic research is embedded in the moral domain, and it is embedded in the political and bureaucratic domains of our modern world where power is exercised for good and for ill. For example, we have had tremendous difficulty obtaining the spatio-temporal data sets that would allow us to do this scientific and humane work. Part of the problem is the genuine and ethically responsible fear that as soon as any geographic specificity is attached to an individual case that somehow patient confidentiality will be broken. The real problem is that the medical and epidemiological professions never think in the geographic domain, and their thinking often appear closed to any other perspective than that in which they have been traditionally trained. The result is frequently a ludicrous and scientifically damaging policy, for you cannot model and forecast a spatio-temporal process without spatio-temporal data at an appropriate scale. In the United States, some states like Montana still only publish figures at the state level, others like Kentucky in groups of counties, others like Pennsylvania (and now many other states) at the county level, while the Los Angeles AIDS Surveillance Group, working in conjunction with geographers at Northridge, California, have maps at the census tract level.²⁷ No one looking at those reds, greens and blues, could identify anyone.

In examining such a spatio-temporal series, what is our fundamental aim? It is to find the structure and pattern within that cube of data that allows us to make some forecast of the future. Using a supercomputer, we have approached the problem with a technique called Spatial Adaptive Filtering, which like many scientific ideas is fundamentally very simple, although difficult to implement without very large and fast computing facilities. Without going into technical details here, we allow a little quadratic equation to wander over the map of Pennsylvania, rather like a bloodhound sniffing the ground for spatial structure. The parameters or coefficients of this little equation or filter are allowed to adapt to local spatial conditions on the map. We then ask if these coefficients show any regular trend through time, and find that they do display extraordinary regularity. This is intuitively obvious to any geographer, who immediately has a sense of extraordinary spatio-temporal regularity unfolding across the map, with the hierarchical and spatially contagious components of the diffusion process 'developing' like a photographic plate in the darkroom.

Let me ask you something: would such animated cartography, showing the epidemic unfolding in Spain, be useful for educational intervention on Spanish television and in high schools? In 1987, you had 508 reported cases. By the end of last year (1990), you had over 7,000. The most vulnerable part of your population is not the homosexual community, for they have long since changed their protective behavior after seeing many of their friends convert to AIDS and die. Your most vulnerable population, like ours, are the young heterosexual population in those years of early sexual experimentation. Without exaggeration, it is a matter of life and death. And geographers can make a tremendous contribution towards life.

Limits to Prediction

Predicting effects in both the physical and human world is always a difficult task and some would say, perhaps with some justification, that such attempts almost constitute *hubris*, or mortal pride, reminding us that we are finite human beings, not among the gods. Indeed, we are recognizing today that there are very severe limits on prediction, that our inability to specify initial conditions with sufficient precision puts finite limits on any computed forecast. Perhaps it is not surprising that what we call today 'chaos theory' first arose in our sister discipline of meteorology,²⁸ and that the great Russian mathematician, Kolmogorov, used the picture of two planets with identical atmospheric systems. You will remember that on one planet a butterfly flaps its wings, and this tiny perturbation is amplified through the system, so that after ten days the two atmospheric systems are totally different.

As geographers we know that many human systems unfold in space and time in unpredictable ways. The geographer Graham Chapman has devised the Green Revolution Game,²⁹ a game we often play with our students at Penn State, in which each person takes the role of an Indian villager trying to survive in the face of a severe environment. Based on intensive field work, packs of shuffled cards generate what the environment will bring during a particular year in terms of pests, new children, drought, and so on, but there are absolutely no rules to the game —except that bodily harm is forbidden! The 'Indian villagers' may form alliances, cooperatives, or anything else that they think will help them survive. Each time the game is played, over a period of six hours, it unfolds in totally unpredictable and different ways. It is difficult to find pattern and order, and so come across strategies which will work consistently in the face of a marginal environment.

Geography a Pattern Seeking

And yet this contradiction, this oxymoronic 'forecasting of the chaotic,' is where I would like to end my presentation today. The fundamental human task, the fundamental humane and scientific task of the geographer, is to find pattern and structure and give it coherent meaning that can be shared with others. Along with our companions in the sciences and humanities we must bring the very best of teaching and research to bear upon these fundamental tasks. This means we must reach out and share what we have, and examine closely the methodological approaches of others to see what is useful for our spatial and geographic perspective. For example, there is enormous interest today, across many fields, not the least philosophy itself, in the construction of neural nets for pattern seeking and pattern recognition.³⁰ There is not a geographer here today who does not recognize geography as a pattern-seeking discipline. With modern computing abilities, we can now construct neural nets to find pattern and structure in large and complex data sets, and use them as prosthetic devices to help us towards increased understanding, better forecasting, and the automation of pattern recognition that we must think about as streams of data threaten to drown us. My own university is closely related to the EOS, the Earth Observation System, program, involving satellites to be put into orbit in 1995-96, and sensing streams of information about our earth that will arrive in billions of bits. Only machines, machines trained to recognize pattern, machines capable of learning, can undertake these operations. Machines can search, find and recognize: the meaning is left to us.

Moreover, it turns out that virtually all conventional functional analysis in geography, from taxonomy and classification to the spatial adaptive filtering we have been doing, are all variations on a theme of neural nets. We must have young geographers out there on these new research frontiers. And while very large and fast computers may be necessary for some of these huge tasks of pattern recognition, the construction and use of neural nets in geographic research is not confined to those with access to supercomputers. Many personal computers and work stations have the speed and capacity of some of the most advanced computers 20 years ago, and there is no reason why you cannot leave a personal computer learning and training its neural net, searching for geographic pattern and structure, and come back a week from next Friday to see what it has found.

And at this point, where we see the oldest and most human characteristic of pattern seeking renewed in geographic inquiry with 21st century technology, I will have to leave you. Let us never forget that while we bring a unique geographic and spatial perspective to human inquiry, we also have an obligation to share that perspective with as many as are willing to think with us in our intellectual domain. That obligation extends from the small child in school learning about the wonders of our planetary home, to the most advanced research scientist in many of the fields around us. It is an exciting time to be a geographer, and I wish I had another whole professional life ahead of me!

Notes

- ¹ Originally given as an address to the Congress of the Catalan Geographical Society, March 15, 1991, in Barcelona
- ² The focus of the seminar was modelling the geographic diffusion of the AIDS epidemic, using expansion, transformation, spatial adaptive filtering and neural methods. The first three approaches are discussed in *Geo-Critica* 89 (Gould and Kabel, 1991).
- ³ A public lecture, «Thinking Like A Geographer: An Exploration Into Modern Geography,» sponsored by the Centre d'Art Santa Mònica, Generalitat de Catalunya, March 14, 1991 (Gould, 1991).
- ⁴ He would be the first to agree that much remains to be explicated in these early writings from the geographic perspective, but he is also the first (to the best of my knowledge) to point to their importance (Farinelli, 1990), although Glacken (1967) touches upon Hesiod and Parmenides somewhat nonphilosophically and obliquely.
- ⁵ These are difficult texts and ideas, and I have benefitted greatly over the past ten years from an almost continuous seminar —sometimes formal, sometimes informal— reading texts of Martin Heidegger with Professor Joseph Kockelmans. The fundamental thinking behind this sentence may be found in Heidegger's «Von Wesen und Begriff de $\Phi\beta\alpha\iota\varsigma$. Aristotle's *Physik* B, 1,» the text of his seminar held in the first trimester of 1940 in Freiburg. It is available in French, English and Italian translations (see References).
- ⁶ The etymological roots of *aletheia* are discussed in a number of Heidegger's writings, but notably in «Wissenschaft und Besinnung» in *Vorträge und Aufsätze*. It is available in English translation (see References).
- ⁷ From his fabulous *The Mediterranean In the Time of Philip The Second*, to his last work, *The Identity of France*, Braudel, as a founding member of the Annales 'School' exemplified the unity of what we might legitimately call the spatio-temporal perspective.
- ⁸ The 50th anniversary of *The Nature of Geography* was celebrated (?) in 1989 with a special issue of the *Annals of the Association of American Geographers* (1989). A number of the essays were anything but commendatory, and once commentary on the issue (Gould, 1991) pointed to the severe damage done to American geography by the strange mixture of intellectual arrogance and defensiveness to be found in the book. Thus we now have commentaries on those commenting on Hartshorne commenting on (mainly German) commentaries about geographic writing. Surely the days of medieval theology are not far away? How many geographers can dance on the head of a pin? Perhaps we should recall sympathetically Voltaire's exasperated Candide, when he said «That's all very well... but perhaps it is time to go out and dig the garden!»
- ⁹ I emphasize 'explicitly raise,' because I believe this was the time of the first published statement (Buttimer, 1974). This does not, of course, imply that much geographic research and teaching did not spring from the *ethos* of an inquiring tradition, a 'world' informing the moral stance of many geographers.

- ¹⁰ Frequently in his influential 'double book' *Birds in Egg/Eggs in Bird* (Olsson, 1980).
- ¹¹ As they must be if we are to describe geographic complexity for practical, applied purposes. Some level of spatial aggregation must be invoked on purely pragmatic grounds, even, perhaps especially, when the aim is a purely humane one of trying to plan for a more decent environment (Wilson, 1970).
- ¹² It is thought-provoking to reflect that the geographer who first used computer simulation and Monte Carlo methods before any other person in the human sciences, was also one of the first to raise truly informed questions about a mathematical tradition that he felt had got totally out of hand (Hägerstrand, 1970).
- ¹³ For example in his *Postmodern Geographies* (Soja, 1989)
- ¹⁴ In *Real Presences* (p. 165), a remarkable book by perhaps Europe's most prominent (and controversial?) literary critic. George Steiner, Professor of English and Comparative Literature at the University of Geneva, Extraordinary Fellow of Churchill College, Cambridge, with academic affiliations at the universities of Chicago, Harvard, Oxford, and the Institute of Advanced Study at Princeton, has demonstrated time and again an ability to illuminate something that others were unable to see. But no without causing some intellectual disruptions!
- ¹⁵ As I tried to elaborate slightly, and for a non-professional audience in *The Geographer At Work* (Gould, 1985).
- ¹⁶ These are republished in my *Mental Maps*, and in French translation as *Cartes Mentales*.
- ¹⁷ As explicated in a remarkable series of papers by Roderick Wallace (frequently with his wife Deborah), starting with an analysis of urban socio-economic decay (Wallace and Wallace, 1984), and continuing to the present (1990) with analyses of the drug and AIDS epidemics (Wallace and Fullerlove, 1991).
- ¹⁸ A summary of this perceptive and sensitive work is published as an essay (Golledge, Couclelis and Gould, 1988).
- ¹⁹ Perhaps it is worth noting that the first reading given to new graduate students at Penn State during the year-long introductory seminar is Hans-George Gadamer's (1976) essay on hermeneutics. Many students find it extremely difficult at the time, and wonder if they have strayed by accident into a philosophy department! But by the end of that first academic year they realize there was 'method in the madness.' Whether they are giving meaning to a written text, a numerical output from a computer, a map, an algebraic equation, or a landscape, they are *always* in that hermeneutic stance of interpretation. As we all and always are-as human beings.
- ²⁰ A book of highly perceptive essays edited by Denis Cosgrove and Stephen Daniels (1988), and published in the distinguished Cambridge Series in Historical Geography.
- ²¹ The cartographic essays of Brian Harley (1988, 1989) are increasingly influential, and provide an important 'counterbalancing force' to the increasing computerization and mechanistic thinking in contemporary cartography.
- ²² Something we have attempted to do to dramatize the AIDS epidemic for educational intervention purposes (Gould, DiBiase and Kabel, 1989).
- ²³ Presented at Penn State, when Openshaw was a Distinguished Visitor during the week of February 11-15, 1991.
- ²⁴ See the technical paper submitted to the IBM Supercomputer competition (Gould and Kabel, 1991), and the 'bridge essay' between the academic world and what is euphemistically called the 'real world' (Gould *et al.*, 1991).
- ²⁵ In the original address to the Congress, the geographic diffusion of the AIDS epidemic was shown as a series of slides, slides taken from a computer animated cartographic presentation originally made for television (Gould, DiBiase and Kabel, 1989). It was noted that the dynamic map did not have the usual lettered texts and names, since a voice 'overlay' was available to explain to a viewer. The maps are contained in *GeoCritica*, 89, 1991.
- ²⁶ Foucault's remarkable series of intellectual histories needs no comment, but Sloterdijk's (1987) works may be less well known, although he deals with a major theme of the 20th century, the bureaucratization of modern life. His arch-hero is Diogenes, and chapter titles such as *In Search of Lost Cheekiness*, and section headings such as *Pissing Against the Idealist Wind*, are required reading for our graduate students entering an inevitably bureaucratized life.
- ²⁷ William Bower (1990, 1991) has published a number of remarkable maps, made in conjunction with the Los Angeles AIDS Surveillance Unit, as a result of an undergraduate cartographic project to portray 'socially relevant' things. Detailed maps make it quite clear that individual confidentiality is *not* broken.
- ²⁸ Discovered quite by accident by the meteorologist Lorenz (1969) at MIT, when he left the computer running overnight and discovered a different result in the morning.
- ²⁹ Discussed in Chapter 22, *Playing Games Seriously*, in *The Geographer at Work*, or, in Italian, as *Il Mondo Nelle Tue Mani* (Gould, 1985, 1988).
- ³⁰ The best introduction by far is Wasserman (1989), whose book constitutes a model of pedagogic writing in a technical area. But see also Openshaw and Wymer (1990) for imaginative applications of neural net methodology in geographic research.

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