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## Geography: An Integrative Science

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### INTRODUCTION

What is Geography? Who are Geographers? What do Geographers do? I will not answer these questions immediately, but will attempt to develop answers in the course of the lecture. These answers will be put into the context of past, present and future nature of Geography, especially as practised at the University of Sydney. However, at this point I want to dismiss as irrelevant and trite the oft-quoted saying that "Geographers do what Geographers do". Such a definition helps no one, least of all those of us who claim to be geographers. We must be more responsible to our discipline, our students and might I say as well, the taxpayer, in providing a more rigorous statement of our aims, achievements and ambitions.

My own association with this University and the Department of Geography began in 1957 when I entered as an undergraduate. I had the good fortune of spending four years with the department as a student. After graduation, I was employed for a brief period as a Teaching Fellow before heading for the then perceived brighter lights of North America. After eight years abroad, I was lured to the somewhat more subdued but academically fascinating city of Canberra and, with the exception of a year as a lecturer at Sydney in 1976, I remained in Canberra until January this year. In my present capacity as Professor of Physical Geography, I feel honoured to be able to look back at developments in this discipline in the Science Faculty over the last century, but perhaps more importantly to be able to look forward to a vision of the subject that attempts to form a bridge between the natural and social sciences.

Without any doubt geography has been good to me, and might I be so bold as to say, to all my colleagues at this University. We can be professional travellers enjoying not only a worldwide comradeship with geographers elsewhere, but also being in a position to evaluate and enjoy all sorts of landscapes which fascinate us. Often friends in other disciplines and walks of life envy our lifestyle to the point of wishing to be reincarnated as geographers! I hope to be able to convey some of that feeling to you today, to attempt to provide you with a geographer's perspective of the earth as the home of man as seen by geographers over the years at this University.

In my introductory lecture to first year students this year, I emphasised the traditions which underlie the teaching and research programmes in Geography at this University. I stressed the need for them to have a 'feel' for the past, to recognise that their scholarly efforts are based to a

large extent on what has gone on before. Whilst the same can be said for most other disciplines at this University and elsewhere, I wanted my students to appreciate the somewhat special position they hold in Australian geography.

## FOUNDATIONS

The Department of Geography at the University of Sydney is by far the oldest in Australia. It was founded 64 years ago in 1921. Moreover, the first course in Geography taught in an Australian university was in Sir Edgeworth David's Geology Department in 1907. This was a course in "Commercial Geography" and it was taught by a young geologist just about to embark on one of the world's great exploratory efforts Scott's ill-fated expedition to Antarctica. I refer of course to Thomas Griffith Taylor, born in Essex in 1880, but educated at Kings School, Parramatta. Here he developed two pet hates – Latin and Sport (Taylor, 1958). He undertook university studies at Sydney as a student of David's and at Cambridge. Fortunately, he was not a member of the group that perished on the return from the dash to the pole. He conducted valuable studies of glacial geomorphology in Antarctica for which he was later awarded a DSc by this University in 1916. Before and after his excursion to Antarctica he worked as a "Physiographer" (although officially titled a Physicist) with the Australian Weather Service. Taylor was able to liberally interpret his position and realise the possibilities open to him. He wrote to David on 19 November, 1909:

*I am not quite clear as to the work to be done by the proposed Physicist to the Meteorological Bureau. If it consists in a careful and scientific study of the physical controls governing life and industry in Australia then there is hardly any position in the world I should better like to apply for.*

So in 1910 he began his geographical career in a meteorological agency linked in wartime with the Intelligence Branch, firstly writing on the physical setting and potential for settlement in Canberra, then contributing to monographs on climate and weather in Australia. However, as noted in the letter to David his prime concerns were not just physical geography, and in 1915 the famous government-sponsored report entitled "Climatic Control of Australian Production" was published. Griffith Taylor had now embarked on what was to become a collision course with officialdom.

Taylor became attached to David's department in 1917 and lectured on physiography – a subject which now embraces most of physical geography – and also on human settlement. His views on problems of settlement in the tropics did not go unchallenged and he even had a textbook banned by less than enlightened educational authorities in Western Australia. In 1921 he was appointed Associate Professor in charge of the newly founded Department of Geography at Sydney University – the department was off and running along a rather bumpy track!

Taylor's extensive travels and synthesizing skills were put to use in combating the national fevour in spreading more evenly the white population by utilizing the untapped empty spaces of the interior and north. A biographer has commented:

*During his brief but stormy career at Sydney University he took every opportunity to air his views on 'Environmental Control'. Taylor resolved to become an 'educator' in the broadest possible sense: although he never completely eschewed the mandatory purification rituals of the established professional journals he was not content to confine his important work in this way, travelling widely in 'Problem' areas, giving many public lectures, and contributing frequently to a wide variety of newspapers and magazines. In attempting therein to communicate some of the*

*basic approaches of his own subject to the clarification of contentious issues, Taylor could not resist the opportunity to ridicule every sacred cow: the White Australia Policy, tropical settlement, the extension of railways into the interior and the north (Powell, 1979, p.20).*

It is not difficult in today's climate of irrationality in response to Professor Geoffrey Blainey's views on immigration, to imagine the response of vast sections of the community to Professor Taylor's pronouncements on the ignorant exclusiveness of those supporting the White Australia Policy. He argued that the Chinese especially need not and should not be excluded.

As a result of these views, geography was news. The Sydney Morning Herald and other papers fanned the flames in a manner not unlike the criticism of Blainey. Taylor was attacked as a pessimist, for being unpatriotic, and by the likes of Daisy Bates as a slanderer of the spirit and talent of Australia's British pioneers. His reputation was challenged by eminent visiting geographers brought out to serve as a counter to this forceful academic. However, he counter-attacked with simple descriptions and maps which blasted away at the "Australia Unlimited" propaganda:

*The vital problem in Australia is to add suitable population with the least of public money. This is not the time to hinder settlement by wasting our wealth on a perfectly futile endeavour to settle arid Australia (Taylor, S.M.H., January 31, 1925). Where then will the future millions of Australians settle? Precisely where live the millions of today (Taylor, S.M.H., March 7, 1925).*

These statements were prophetic, but for Taylor in the 20s they were made in the context of bitter isolation. Denied promotion to full Professor at Sydney, he chose in 1928 to join Chicago's department and leave Australia for a continent where his research was more warmly received.

Griffith Taylor founded Geography at Sydney and in Australia. When he retired to Seaforth in 1952 he received a much warmer welcome home both scientifically and personally than he received a send-off some 24 years earlier. The University has honoured him by naming what was the former Geography Department building the Griffith Taylor Building.

There can be no doubting that his "high profile" image was both a blessing and a curse to the discipline. He swung a two-edged sword slicing away at those he perceived as ignorant and wasteful of our natural and human resources, but in return leaving an array of wounded who were not prepared to support the discipline for many years. Taylor did see man and land as two intimately linked entities. The physical environment determined man's settlement patterns and agricultural capacities. He belonged to a school of geography (environmental determinism) which although dying in the 30s and 40s nevertheless remains with us in a highly modified form.

## **THE MACDONALD HOLMES ERA**

Griffith Taylor's successor was a dour Scot, a product of the University of Glasgow. James Macdonald Holmes took up his position as Associate Professor and Head of Department in 1929. He became a full professor in 1945, the first to have this title in a Geography Department in Australia. To some extent he lived under Taylor's shadow and certainly as Taylor's enemy because one of his first acts was to arrange the dismissal of Taylor's sister, Dorothy, from the department. Holmes was tough-minded and authoritarian, and he relished in playing the role of "God Professor". He was also conscious of the role he could play in social and charitable affairs serving for many years with his wife as a promoter and fund-raiser for the Royal Flying Doctor

Service. He put into practical terms his concern for the hardships faced by those who lived in the “outback”.

Macdonald Holmes maintained and slowly developed the department through the depression years. Throughout the thirties his involvement in soil conservation and regional planning became more apparent. With more staff and students he developed his role as leader and co-ordinator of collective research on topics which he supported including pioneering research in climate and agriculture by some of his staff.

Let us look at some of his achievements. Unlike Taylor he courted politicians like Sir William McKell. He was not an environmental determinist, rather the opposite because he saw Australians adapting to the physical circumstances and developing a new culture which would cope with various problems like lack of water, salt in soil, floods, fire etc.

*Antipodean is not enough, for out of a new environment new ideas will arise* (Macdonald Holmes, 1963, p.xvi).

His views were sought by those in government particularly on the mapping systems and the regionalisation of administration.

*During the Second World War he was consulted on the determination of viable regions for civil defence and the pooling of machinery, a small but vital step towards the adoption of the regional idea throughout the country* (Powell, 1983, p.52).

He was a member of a government three-man Regional Planning Committee during the war, and partly through this committee he developed a reputation as an applied geographer involved in the production of regional atlases, descriptive resource inventories and land use surveys. What he saw very clearly was the need for local areas to assume “regional responsibility for the development of new wealth”. These ideas were well received especially following the publication of his book *The Geographical Basis of Government* in 1944.

His other major thrust was in soil conservation. He took an extremely practical approach, relying heavily on the technical ideas of others including farmers whom he deemed innovative and responsible. Macdonald Holmes saw little use for a knowledge of the physics of water flow in soil when it was time to plug up gullies, and spread the gospel of contour ploughing to inhibit sheet erosion.

One cannot overlook his contributions as an educator. He involved his senior students in original research which he closely co-ordinated and sponsored. Both his regional monographs *Murray Valley* and *Open North* involved extensive student input. These students had to do considerable field work.

*My purpose in forcing them into these contacts is to give them a training in adult practical work and to understudy, as it were, competent people at high levels doing their day's work* (cited by Powell, p. 53).

This tradition lives on within the department as we strive to inculcate into our honours class what he called “a respect for scientific approaches to multi-faceted, real-life situations” (Powell, 1983, p.53). Many senior geographers in Australia and overseas were enriched by this tradition stemming from Macdonald Holmes.

Both Holmes and Taylor addressed public issues in vastly different ways. One was locally successful, the other more internationally successful. They were very different yet both had a similar approach to the discipline. The common theme running through both their works was a concern for the interrelation of man and land.

*To be a geographer, therefore, is to be a student of community persistence on a background of accurately determined environmental knowledge, and geography is the study of land in relation to people – land as regions and as resources and people as groups with group aspirations and ambitions (Macdonald Holmes, 1961, p.xv).*

## **GROWTH AND SPECIALISATION**

The 1960s saw the course of Geography at Sydney University take a very different turn. Partly in tune with developments in the discipline in Britain and the U.S.A., the department took a more specialist thrust. The so-called “quantitative revolution” was underway – a paradigm shift of enormous proportions had occurred in the minds of some geographers who felt that:

*Geography ought to break decisively from its traditional preoccupation with the description of absolute spaces (regions), perhaps even to construct a ‘general theory of locational relativity’, and to concern itself with the rigorous analysis of distinctive geometrical forms with particular mathematical properties, whose unrestricted purchase would establish geography as a properly ‘nomothetic’ science (Billinge, Gregory and Martin, 1984, p.6).*

At Sydney, the revolution took the form of the new Professor in 1962 – George Dury. He may not have been the archtypal example of a “quantifer”, but he brought with him the spirit of change which was sweeping the campuses of the Northern Hemisphere. Gone was the over-riding concern for regions, for climate and man, for soil and man, and for integrated regional planning in relation to local welfare; in its place there was a drive for increased specialisation. I may be over-simplifying the nature of the change, but to me Dury symbolised the pursuit of excellence in a specialist branch of geography. He demanded quality of work which would be accepted in the best journals of allied disciplines such as geology.

Dury was seen as an anti-establishment rebel in the eyes of his former colleagues at the University of London. He took up the cudgel to beat the traditional concepts of geography in general and geomorphology in particular. By going to U.S.A. in the early 60s to work with the US Geological Survey he established a degree of independence and a reputation in a field quite separate from “mainstream” geography of the 1950s. He used quantitative techniques, he made detailed field measurements and he developed explanations in the process of testing hypotheses on river channel evolution (Dury, 1982). At Sydney, courses were changed to accommodate his interests including the introduction of what was a headache to many a geography student – statistics. He was an extremely busy researcher and prolific writer seeing in Australia unlimited field opportunities especially in the arid zone.

Colleagues in the department under Dury were stimulated to pursue their specialist interests. During the 1960s one can see the flowering of many specialist studies: fluvial geomorphology involving a spate of PhD theses, arid zone geomorphology, and agricultural and urban geography both with a strong economic bias. The surge of activity was seen in a marked increase in publications from an average of three per year between 1950 and 1960 rising steadily to 29 per year by the time Dury left in 1969 (Dury, 1970). This must be seen as a period of change from the general approach of the man/land theme in geography to a more specialist emphasis. Did our colleagues cease to be geographers at this time, or did they represent a change in the way

geographers saw their role, or more pointedly, how they saw their world? I don't think I am being unfair when I say that the specialisation trend represented by Dury and his associates in the 1960s was a natural reaction in a science where individuals failed to master all or even a major part of a growing body of knowledge. Freeman had in 1961 in his book *A Hundred Years of Geography* recognised this trend:

*... as the volume of research literature increased and the techniques of investigation demanded longer and more rigorous training so it became necessary for the individual to specialise, first as a geographer, and then within geography* (cited in Johnston, 1983a, p.39).

To maintain credibility with colleagues in allied disciplines there was a need to compete for funds, to publish in their journals, to attend their conferences and to participate with them in field studies. The new ball game required new players better equipped in methodological skills, more rigorous in scientific method and more willing to mix it with "young turks" in economics or geology or botany. Many of those who came through Dury's department in the 60s possessed the confidence to pursue research in highly specialised fields without being too worried about whether what they were doing was geography. Perhaps they preferred to be called geomorphologists, or land economists or spatial analysts. Who cares they would say, let's get on with the job of solving problems, of publishing and teaching and to hell with the philosophical morass in which traditional geography was buried.

## **PLURALISM, TENSIONS AND CHALLENGES OF MODERN GEOGRAPHY**

As we enter the last decade, and emerge from the Dury era, we see modern geography dominated by a high degree of plurality. We also see a discipline which possesses certain tensions as well as challenges with great opportunities. Firstly pluralism; this is represented not only by the various specialisms, but also by those who see the need to retain and even claim the man/land themes as the traditional mainstream of geography. At Sydney in the 70s the specialised thrust was symbolised by the establishment of two chairs, one in physical geography, the other in human geography. Each chair nominally had responsibility for sub-disciplines which fell within either physical or human geography. There was a determined push into coastal geomorphology on the physical side, a thrust which has achieved international recognition. However, the traditional perspective was not entirely neglected. The need to understand more about the various processes by which man and land have interacted over time in creating the rural landscape was pursued, for example in the study of irrigated farming and associated dry-land farms in southern N.S.W. by Professors Langford-Smith and Rutherford. All these studies have been conducted in an increasingly more sophisticated and rigorous way compared to the days of Taylor and Holmes with product of research often being acclaimed by colleagues in other disciplines as well as within geography. I must concur with Harold Brookfield of A.N.U. when he said last year:

*A quarter of century of change in geography has not yielded a consensus. It has, on the other hand, yielded a greater degree of pluralism, and for this much we must be thankful* (Brookfield, 1984, p.27).

What of the *tensions*? In the 70s, there emerged within geography the so-called "radical revolution". This aimed to throw the discipline wide open giving it a societal as well as a purely academic role. David Harvey said in 1973:

*It is our emerging objective social conditions and our patent inability to cope with them which essentially explains the necessity for a revolution in geographic thought (Harvey, 1973, p. 129) ... (The) immediate task is nothing more nor less than the self-conscious and aware construction of a new paradigm for social geographic thought through a deep and profound critique of our existing analytical constructs .... our task is to mobilize our power of thought, which we can apply to the task of bringing about a humanizing social change (ibid, p.144-5).*

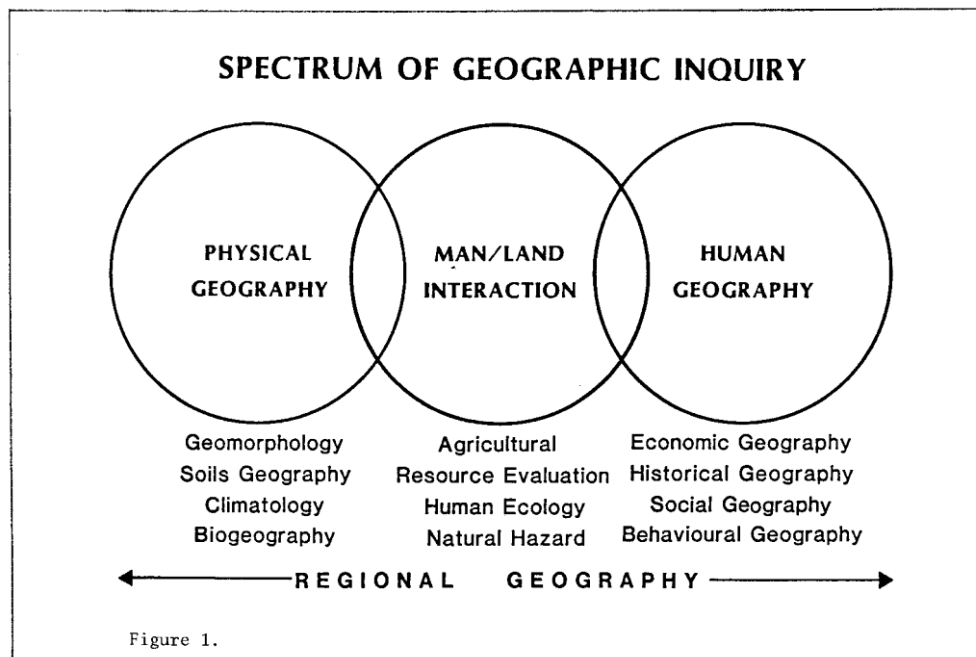
Such a theory should be built on a marxist base according to its proponents. Social reform will be achieved through education. Accordingly strong differences of style have characterised geography teaching in departments across the western world in the last decade. Sydney was not immune. Some students may have been confused, but at least they were made aware of different philosophies within the discipline (see Johnston, 1983b, for more elaborate discussion of these philosophies). Graffiti in the male toilets of the department epitomise the feelings of those who fought the intellectual battles between the traditionalists, the spatial analysts and the radicals. Thus modern human geography at Sydney could be seen as operating in and fiercely supporting three paradigms: The man-land (traditional); the quantitative-spatial (analytical) and the socially relevant (marxist or welfare).

To one side of all there were the “introspective” physical specialists, often oblivious to the concerns of human geographers; they were devoted to problem-solving and operated totally within the positivist sphere of the natural sciences (e.g. coastal geomorphologists like myself). Some of these physical geographers touched on various aspects of the new field of environmental sciences and even linked up with human geographers in studies of natural hazards and resource management.

The future should embrace these perspectives. The plurality and tensions to which I have referred will remain and so be the source of much stimulation to those of us who are privileged to occupy positions as staff or students in geography departments. But these are also challenges. In many ways these are similar to those which our forefathers encountered and so boldly took up. Taylor and Holmes both saw geography in the context of the Earth as the Home of Man. They both interested themselves in the affairs of man in relation to land. The past two decades have seen such specialisation within the discipline that concern for the interaction of man and land has been reduced to a lesser role within the subject.

## **THE PRESENT AND FUTURE**

At this point I want to summarise the state of present-day geography. Figure 1 shows how the “spectrum of geographic enquiry” may be sub-divided. Three main fields are represented by circles in this figure: Physical Geography, Man/Land Relations and Human Geography. Some of the sub-disciplines are also shown in Figure 1. In all branches, there is a common interest in spatial phenomena of some sort. Geographers, no matter what the breed, are concerned with phenomena on the surface of the earth.



Within the specialist framework shown in Figure 1 many approaches can be recognised, all of which are leading to the generation of, and revision of, models explaining earth-surface phenomena. These include:

- a. Recognition of patterns in the distribution of individual or collective phenomena (e.g. landforms, house types); this is the morphological approach.
- b. Study of changes in form properties and patterns of distribution over time representing the historical or evolutionary approach.
- c. Identification, measurement and evaluation of flows of energy, information, organisms, finance etc. which are responsible for the transformation of patterns from one state to another – the process or dynamic approach.
- d. The ecological approach which emphasises the interaction between organisms and their environment in different habitats; this approach embodies systems analysis and provides an inter-disciplinary focus on environmental structure and techniques (Bennett and Chorley, 1978, p.21).
- e. Analysis of human behaviour and actions from the point of view of determining spatial variations in the quality of life and thereby promulgating policies which are aimed at social change - the welfare approach.
- f. The *differentiation of the earth's surface* into areas which possess a degree of unity or homogeneity and thus constitute an identifiable land zone for purposes of education or planning - the chorological or regional approach.

A critical question confronting geographers in the future is how to undertake man/land studies. As an “integrative science” geography should have something to say on the harmonies and phenomena which interact on the earth’s surface.

The starting point for my perspective of an approach to man/land geography in the future is to appreciate that the surface of planet Earth is characterised by a mixture of interacting physical, chemical, biological and cultural phenomena represented to geographers as various spatial and temporal domains –



*the lithosphere – the crust, rocks, landforms*  
*the hydrosphere – oceans, rivers, lakes*  
*the atmosphere – weather, climate*  
*the biosphere – plants, animals, soils*  
*and the sociosphere – cultural and socioeconomic activities*

The real world consists of differences between places which are meaningful and understandable in terms of concepts designed to explain patterns and processes responsible for those patterns. Thus plants of a given type do grow in climates to which they are best adapted; man does achieve economic advantages in exploiting regional differences in productiveness of one soil-climate combination over another.

The holistic philosophy involving earth-surface phenomena seeks to focus on the interrelatedness of all phenomena within any given area, which at one extreme is represented by the planet as a whole. The reductionist philosophy concentrates on selected features or processes seeking to know more and more about less and less. Both philosophies must be accommodated within any discipline, especially one like geography which has pretensions of seeking synthesis and of identifying problems where knowledge of the whole is more important than the sum of the parts.

Capra in his recent overview of trends in science, notes the limitations of the reductionist approach in explaining biological phenomena:

*There is no unifying framework that would enable biologists to overcome the fragmentation of their science by evaluating the relative importance of research problems and recognising how they interrelate. The only framework used for such an evaluation is still the Cartesian, in which living organisms are seen as physical and biochemical machines, to be explained completely in terms of their molecular mechanisms (Capra, 1983, p.116).*

Likewise, geographers must seek a more unifying, systemic approach which enables the landscape “whole” to be analysed. I am not claiming all geographers should pursue the holistic integrative theme, but I am conscious of the need for someone to provide answers to questions which require an understanding of the ways natural and social forces differentially interact over the earth’s surface.

We live in a globally interconnected world, in which biological, environmental, and cultural phenomena are all interdependent. As scientific communication and technological capacities of man expand, the interconnections and interdependencies become more apparent. The nuclear threat and increased awareness of environmental degradation and exploitation make us more conscious of the fragility of life on earth.

Concepts such as the harmonious interrelatedness in nature and the unity of spatial phenomena have been part of geographical thought since early last century. It is ironic that geographers gave up their traditional holistic approach in the 50s to become more “scientific” that is to be more reductionistic. They adopted the classical Cartesian-Newtonian mechanistic approach to the phenomena they sought to study whilst physicists and others were adopting a different approach.

*The exploration of the atom has forced physicists to revive their basic concepts about the nature of physical reality in a radical way. The result of this revision is a coherent dynamic theory, quantum mechanics, which transcends the principal concepts of Cartesian-Newtonian science. In*

*biology, on the other hand, the exploration of the gene has not led to a comparable revision of basic concepts, nor has it resulted in a universal dynamic theory (Capra, 1983, p.116).*

Geography has been in more of a mess than biology because it was encountering the strong specialist tendencies of the natural sciences, and as well being subjected to whims, fads, conflicts and successes of diverse social sciences.

Today we begin to see natural and social spatial systems inextricably intertwined, and through feedback mechanisms seeking to adjust to a variety of forces capable of disturbing any harmony or equilibrium. Spatial variability gives the geographer his opportunity to say something meaningful about the operation of these forces at various scales. Rather than chasing that elusive goal of describing the unity of it all which so captivated 19th century geographers, and rather than seeking all powerful models which explain how man is controlled by his environment, or how the natural system is dominated by that intelligent creature called *Homo sapiens*, geographers are now capable of studying how phenomena interact to create spatial change.

The surface of the earth is undergoing continuous change by the operation of natural and human forces. The solar input is not constant, climates are subject to fluctuations, the soil is forever being modified, forests are being destroyed or planted, factories pour variable amounts of pollution into the air and waters, urban areas are both expanding and decaying, population grows in some areas but declines in others, capital is moved daily from one place to another creating new investment opportunities in some regions but less in others; all these constitute just a few examples of the changes which transform the face of the earth. The changes take place in different directions, at different rates and at various magnitudes and frequencies. This means we should be able to use our specialist skills (or work with those who can) to identify equilibrium tendencies. In other words, adjustments which are taking place in response to the forces operating differentially on the surface of the earth must be investigated. Forces upsetting equilibrium states may then be recognised and consequences of further change can be predicted. The example of drought in the lands south of the Sahara, the Sahel, is a case in point; this represents one of the great man/land dramas being played out on the face of the earth at the present time. In equilibrium, this man/land system would involve:

- a. plentiful summer rains;
- b. slow rate of population growth; and
- c. minimum interference to the traditional socio-economic pastoral life style which has developed a capacity to cope with perturbations in (a) and (b).

Disequilibrium resulting from changes to these forces (e.g. climatic change) has led to further instability through a positive feedback mechanism resulting in horrifying human consequences. What will happen in the future can be predicted for different parts of Sahel when we know more about the factors involved.

Another example which gravely affected the Australian landscape was the impact of the first wave of migrants to this island continent. They burnt at frequent intervals a fire-sensitive vegetation. This caused dramatic change in the flora producing a vegetation dominated by eucalypts – a new “balance” was then achieved. This was to be upset in many areas by another wave of immigrants, this time from Europe who brought an “if it grows cut it down, if it moves shoot it philosophy to the land they stole.

How can we pursue such studies and provide a much more holistic construction to the understanding of continuously changing, interrelated and interdependent earth-surface phenomena? Two assets are possessed by geographers:

- a. A powerful pedagogical concern to teach an awareness of man/land relations; this concern arises at Sydney because of the traditions of the discipline as developed by Griffith Taylor and Macdonald Holmes. Furthermore, the human and physical specialists living together create their own interactive social environment capable of generating ideas and field projects. In this setting many geographers are involved in management, planning, resource or historical studies which necessitates integrative thinking of natural and human phenomena.
- b. The second asset is the growing availability of multisource data. Here we have to thank the physicists, the electrical engineers and computer scientists. Tools of remote sensing, for instance, provide ways of mapping the earth's surface and accessing vast amounts of data at different resolutions. Modern and future computers will store these data as vast geographic information systems. What we have to do is find ways of making sense of all these data, to define the relationships which presumably exist between them using these sensing and computational tools.

Geographers mostly opted out of the man/land field during the period of growing concern about the viability of the environment. They opted out because they were undergoing their own internal revolutions in seeking specialist credibility, in quantification and in being socially relevant. The 60s and 70s, however, yielded a degree of professionalism which optimists like me believe now provide the backbone for future developments in the discipline. Our students acquire skills and concepts which should enable them to use their imagination to look at interacting phenomena at whatever spatial scale, over whatever time scale, they choose. Geography for them will not be seen as a natural science and not as a social science. It will be an "integrative science" built on the foundations of specialist knowledge and encompassing earth-surface phenomena which involves both man and land.

To paraphrase Professor Mabogunje, the Nigerian past President of the International Geographical Union, geography today finds itself concerned with describing and analysing physical and human activities and "with determining the extent to which environmental quality can be improved and how best to achieve such improvement" (1984, p.6). It has been a long and often tortuous haul from the days of Griffith Taylor and his concept of environmental determinism when the forces of man-land interaction were poorly understood. Even though "rif" could see the dangers, the threats and the consequences of misuse of a "hostile land", he was not the right man in the right era to have his ideas used by decision makers. Geographers today can play a role as a bridge between natural and social sciences thereby having an unequalled opportunity to use their rich pool of concepts and increasingly sophisticated analytical tools towards a much enhanced understanding of how to make the earth a better home for man.

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