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Geography in the United Kingdom 1996–2000

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Geography occupies an important place in the United Kingdom's system of Higher Education. In 1996-97, for example, the 103 Higher Education establishments that offered courses in Geography had 21 400 students registered in Honours programmes, a number which not only discounts the many students in other programmes taking courses in the subject but also ignores the sizeable and growing number of postgraduates well over 2500 (full-time and part-time) at the last count. British Geography is not just distinguished by its size, however. Increasingly it is also becoming a greater intellectual success. Physical geographers now publish more frequently in the top international scientific journals such as *Nature*, *Science*, the *Journal of Geophysical Research* and the *Philosophical Transactions of the Royal Society, Series A*, whilst human geographers have not only become adept in many of the major debates in the Social Sciences and Humanities but, in a few cases, are even leading them.

This report is intended to provide a map of British Geography's current state and recent achievements for readers from other countries, rather than a comprehensive summary of recent and current debates for a UK readership, a task that would be impossible in the space available. The report is optimistic but it is not triumphalist. British Geography is clearly gaining greater respect from other disciplines in Britain and it is making important interventions in various kinds of policy. Moreover, it now has an important and growing international dimension, as evidenced by indicators such as the award of the Vautrin Lud Prize to two British geographers in the period under review, and the significant number of invitations extended to British geographers by various Institutes of Advanced Study around the world. But it would be foolish to be sanguine. As we shall also show, there are still significant barriers to progress.

The report is in three main parts. The first part is concerned with British Geography's current institutional structure, covering topics as diverse as finance, audit and the state of the labour market. The second and third parts then report on the current state and recent achievements of physical and human geography respectively. There are clearly problems in deploying such a simple division – not least the growing attention being given to areas of study such as nature and the environment which have a foot in both camps and the tendency to overlook the attempts that have been made to bring the two camps together (e.g. Massey, 1999; Simmons, 1997) – but since the division is still widely accepted, we have used it.

The institutional environment of British Geography

The institutional environment of geography in the UK is characterized by five main phenomena. The first of these is money: there is simply not enough of it to support truly world-class research and teaching across the discipline. In order to make up the deficit, arising from the relative fall in income provided by the government for teaching and research, Geography – like other disciplines – has had to become learned in fund-raising. This has meant, to begin with, an accelerated rate of application to the chief relevant research councils and charitable bodies (the Natural Environment Research Council, the Economic and Social Research Council, the Engineering and Physical Sciences Research Council, the Arts and Humanities Research Board, the Leverhulme Trust, the Nuffield Foundation, the Wellcome Trust). It has also meant applying – with some success – to new funding competitions (the Joint Research Equipment Initiative, the Joint Infrastructure Fund). Then, there has been increased application to the European Union (although with its low overheads, this is a double-edged sword). Finally, industrial funding has been sought, often very successfully.

In general, then, Geography has been successful in the fund-raising drive compared with other disciplines. However, there are wide variations between Departments. For example, the highest ranking Departments have annual expenditures of £2 million or more, but some Departments are struggling on only £200 000 or £300 000.

The second phenomenon is audit: audit fever has gripped British Geography in its cold and unforgiving embrace. Apart from the numerous intra-university requirements, there are two chief national exercises. The Research Assessment Exercise (RAE), which takes places for the fifth time in 2001, is held in order to distribute government money, predominantly on the basis of the quality of research of each Department (as defined, most importantly of all, by

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the quality of the four examples of research output submitted by each member of staff in a Department, as well as by aggregate indicators such as numbers of postgraduates, certain kinds of research funding, and so on). Success in the RAE brings substantial financial rewards for a Department, as well as enhanced prestige, and it has, therefore, rapidly become pivotal to British university research culture. The 2001 RAE will, for the first time, contain a measure of verification by international assessors. The Teaching Quality Assessment Exercise (TQA) has now reached the end of its cycle and is to be replaced by new arrangements in 2000. The exercise was based on visits by assessors to those Departments claiming excellence (and a small sample of others) and a corresponding judgement awarded on the basis of documentation and actual classroom assessments. These two exercises have undoubtedly had some positive effects. For example, overall, they have probably generally pulled up the standard of research and teaching. But they have also had detrimental effects. For example, Departments and staff inevitably tend to act to indicators, an overheated transfer market of academics appears as the RAE reaches its climax, and, most detrimental of all, longer-term intellectual projects are threatened.

The third phenomenon is the growth of an uncertain labour market for academic geographers. In particular, a large informal labour force has grown up, intended to carry out research contracts and teaching on limited-time contracts, often on quite low pay. On one estimate, by 1998 over 41 per cent of UK academic staff were employed on fixed-term contracts and, of these, 36 000 were employed in contract research, an increase of 400 per cent in the last 20 years. (The increase in permanent/tenured contracts for academic staff in universities was only two per cent over the same time period.)

On the demand side, contract research and teaching has gained popularity with employers because it allows greater flexibility for the management of teaching and research activities. Contract researchers and teachers (CRTs) are known to be cheaper than permanent staff and can be hired and fired as the work, or as the research money, demands. Thus, CRTs experience a range of problems from the professional (loss of employment rights and lack of career development) to the personal (difficulties in securing loans/mortgages and in settling down in a particular area). On the supply side, the increase in CRTs may be the result of a general overproduction of postgraduates. For example, the former head of the Wellcome Institute, now the premier British research-funding institution, expressed her puzzlement at a state of affairs where too many postgraduates are produced for the limited number of available academic positions but then, later, not enough postdoctoral and similar positions are available to produce a proper career pyramid.

Paradoxically, as the demands for RAE-worthy talent have increased, and as the bulge of those appointed in the university expansion of the 1960s begins to retire, so it has become less difficult for established younger academics to obtain Professorships, to negotiate time off for research and to obtain one of the much-expanded number of Fellowships which are now available. To them who hath.... On the other hand, this emphasis on the value of research has had a very definite downside in the increasing difficulty of persuading staff to act collegially and in the undoubtedly higher levels of stress that now permeate the Higher Education system (Sidaway, 1997).

The fourth phenomenon is the growing influence of the Royal Geographical Society (with the Institute of British Geographers). After the merger of these two institutions in 1995, the RGS/IBG has become the chief representative of British Geography. In 1997 a major Strategic Review prepared the way for the real merger of activities and approaches. Since then, there has been a gradual evolution and re-balancing of the Society's activities, with support for research and education being promoted, in recognition of the need for a learned society and professional body to have strength in these areas. Key developments in research and education over the period 1996–2000 included:

- The appointment of a new Director, Rita Gardner, with a background in academic geography, in 1996.
- The establishment of the Research Division and the appointment of an Academic Officer, Lorraine Craig, in 1996.
- The refashioning of the committee structure following the strategic review in 1997, to create a separate Research Committee and an integrated Education Committee with a remit for Secondary (largely 14-19), Further and Higher Education, plus teacher training in June 1998.
- The creation of two new research groups, bringing the total to 22.
- Coordination and facilitation by the RGS-IBG of benchmarking at the request of the Quality Assurance Agency (QAA); and the formulation of an External Examiners' database for Geography HE funded by the QAA.
- Coordination by the RGS-IBG of an inclusive community-wide bid involving all three communities for the Subject Centre for Geography, Earth and Environmental Sciences, to be funded by the HEFCE. The Subject Centre aims to enhance the quality of teaching and learning in Higher Education.
- The appointment, in 1998, of a full-time Communications Officer with the brief to raise and strengthen the identity of Geography, of geographical research and education, and of the Society and its broader objectives.

- The appointment of an Education Officer in September 1999, with the remit to support 14–19 and Tertiary education.
- Closer liaison with the Geographical Association (GA) over Secondary education.

Whereas the old RGS was often perceived as being run by a small coterie of London-based or London-associated geographers, the new institution is clearly keen to promote much more democratic ways.

The Geographical Association continues to play a key role in representing the teaching of Geography in schools and it has been very active in support of the subject in primary schools throughout this difficult period. In the context of ongoing changes to Geography in the National Curriculum, the GA launched a Position Statement in Spring 1999 (Geographical Association, 1999). This explained the purpose of Geography in the school curriculum, identified the subject's distinctive and wider contribution, and set out a position regarding desirable time allocations and arrangements for Geography. The GA has also had a long tradition of pioneering visual approaches in school Geography and is extending this to embrace the potential of information and communications technology. Additionally, the GA has produced three major handbooks for teaching Geography at primary, secondary and post-16 levels (Bailey and Fox, 1997; Powell, 1997; Carter, 1998), whilst substantially improving the range and quality of its publications.

Other institutions have yet to prove anything like as influential in Geography. Human geography is becoming well-served. The prestigious British Academy, for example, has a growing geographic membership although it is hampered by its selection procedures. The new Academy of Learned Societies for the Social Sciences, which just started up, also has geographic membership. Physical geography is less well-served however. Geographers are hardly represented at all in the candidate books, yet alone the membership of the Royal Society. There is only one geographer elected to Fellowship of the Institution of Civil Engineers. This may well be symptomatic of one of the problems facing the discipline of Geography in Britain currently: the role of physical geography is not sufficiently acknowledged by the rest of the sciences. Many scientists still perceive it as a weak 'field' discipline. Its graduates are often perceived as lacking important technical skills. In general, it is, therefore, not seen as a good career choice for ambitious younger scientists. But this situation is now beginning to change. Departments with large numbers of options which have enabled students to evade the harder scientific subject matter are redesigning these courses to ensure proper training pathways. As we have noted already, physical geographers are publishing in the top scientific peer-reviewed journals. But it seems clear that institutions such as the RGS/IBG will have to do more in future to press the case for physical geography as a science, both within and without the discipline, whilst remembering its unique qualities.

The fifth phenomenon has been the greater attention being paid to teaching by the discipline. This attention has focussed on a number of important issues. The first has been the changes in the school curriculum and the likely effect on the supply of undergraduates. A significant development in the teaching of Geography at primary level occurred in 1998 when the Secretary of State for Education issued proposals to modify the Order for Geography and other foundation subjects. The effect of these proposals was to relax the requirement to follow the programme of study in these subjects until the introduction of new National Curriculum Orders in 2000. These proposals were designed to give primary schools the opportunity to place more emphasis on numeracy and literacy where necessary. In some schools this has resulted in less time than is appropriate being devoted to Geography. Proposals for the year 2000 revisions seek to increase flexibility further and reduce the prescribed subject content.

In the previous review, reference was made to the decision (Dearing, 1994) to remove Geography from the statutory requirements for (14–16 year olds), where initially it had been a compulsory subject for all students to the age of 16. The effects of this decision are now beginning to show. At GCSE, in 1998, the proportion of Geography candidates dropped by 8.5 per cent on the previous year. Geography also dropped by one place to become the seventh most popular subject at GCSE, with the six above all having some statutory protection within the National Curriculum. Indications are that Geography's decline is occurring not because it is less popular with students, but because statutory arrangements mean that schools provide less opportunity to freely choose it for GCSE. Many of these issues will be described in a further National Curriculum Review developed by the Qualifications and Curriculum Authority for implementation in 2000, which will affect pupils from five to 16 years.

The changes for 14–16 year olds have yet to affect numbers taking 'A' level Geography. The number of 'A' level Geography candidates increased throughout the period. With the 1998 figures maintaining Geography as the fourth most popular 'A' level subject. But the longer-term future of Geography at 'A' level will inevitably be affected by any continued decline in the number of successful candidates at GCSE, and also by proposed changes in the 16-19 curriculum being phased in from 1999 onwards which, in combination, seek to widen post-16 studies, provide more flexibility and choice, and create more breadth and learning without loss of depth.

Another issue has been concern over the recruitment, retention and training of teachers. Applications to Geography Post-Graduate Certificate of Education courses fell by over ten per cent

between 1997 and 1998, and many institutions were unable to fill their allocations of places for 1998–99, despite a vigorous advertising campaign by the Teacher Training Agency. In 1999 Geography was duly nominated as a 'shortage' subject.

Teaching has also become an issue in the university sector, influenced and motivated by changes which have reshaped and reconstituted the delivery of Higher Education within the UK. In general, geographical teaching is increasingly professional, in that teachers are now more reflective of their practice and are more willing to share ideas with others. Evidence for this statement can be found in the gradual evolution of a series of Geography university teaching initiatives.

The Geography Discipline Network (GDN), was funded on the basis of two one-year contracts by the DfEE between 1994 and 1996. In round one, the GDN set out to address the specific theme of individual, learner empowerment and disseminate good practice about those curriculum developments in Geography. Subsequently a new round of funding supported the continuation of this network. The principal aim of the refunded network was to enhance and diversify the work achieved to date by further extending participation, in order to move to a self-sustaining network of geographers in Higher Education concerned with developing and sharing good practice in preparing students for life beyond graduation (Jenkins, 1997; Matthews and Livingstone, 1996; Healey, 1998). The network recognized that there was still work to be done within the Higher Education sector with regard to three principal issues: identifying the core and disciplinary skills provided by a geography degree (Johnston, 1997; Unwin, 1997), incorporating the views of recent graduates in order to enhance skills delivery and to strengthen employer links (Clark and Higgitt, 1996; Gardiner 1998) and assisting the communication process about novel and/or worthwhile curriculum development strategies (Chalkley, 1997). A significant legacy of this phase of funding was the development of GeogNet, an e-mail teaching and learning discussion list (Livingstone, 1997). A second network, continued to work under the name of the GDN. The aim of this network was to identify good practice evident in the delivery and assessment strategies of UK Geography providers. New HEFCE funding brought with it a broader constituency in terms of membership and a growing sense of commitment amongst UK HEIs to the value of teaching and learning strategies (Healey, 1998; Healey and Gravestock, 1997; 1998, 1998a).

Further funding from the DfEE as part of the 'Key Skills Programme' (1998–2000) will provide an analysis of the skills which make up a Geography degree (Healey, 1998). Such information is all the more timely because Geography was one of the disciplines chosen by the QAA to undertake a subject 'benchmarking' exercise, an initiative aimed at setting national standards for geography degree programmes. Along with other initiatives such as the aforementioned Subject Centre for Geography, Earth and Environmental Sciences (which commences work in 2000) and the new National Institute for Teaching and Learning, this once again underlines the current importance being attached to university teaching.

Given the emphasis now being put on alternative modes of delivery of teaching, mention should also be made of the work of the Open University (OU). In the period under review, the OU launched two new geography courses, 'The Shape of the World' and 'Understanding Cities'. Geographers have also figured prominently in other high profile OU courses, such as the flagship 'Culture, Media and Identity' and 'Introduction to the Social Sciences' courses which are now being marketed world-wide.

The last element in the greater attention paid to teaching is postgraduate courses. These courses continue to proliferate at a remarkable rate, although the fact is that many – if not most – of these courses are running with less than ten students, which suggests that many courses are being run at a loss in the hope of attracting good doctoral students. A new feature of the teaching landscape is the rise of four-year MSci courses which are research-orientated undergraduate/postgraduate degrees in part brought in to allay concerns that current three-year undergraduate degrees are not teaching in enough depth compared with some European counterparts. At least three Departments currently offer these courses.

In the next two sections, we will move from teaching to research. In the space allotted, we can only provide an outline survey, but hopefully it will provide overseas readers with some sense of the current 'lie of the land'.

Physical geography

Any attempt to review progress and developments associated with research within the field of physical geography during the review period inevitably faces the problem of covering a vast range of activities involving in the order of 1000 active researchers. The subject area continues to embrace the traditional areas of geomorphology, hydrology, glaciology, biogeography, palaeoecology, climatology and meteorology, although activity in the latter two areas is arguably somewhat reduced compared to the past. The boundaries between the traditional subdivisions are also less well-defined than formerly, as links between the areas have strengthened and the development of important new tools, including modelling, GIS and remote sensing has created new foci. Rather than attempting to cover each of these areas in turn, this review will attempt to identify a number of important *trends*, which can be seen as characterizing the subject area more generally, and to report a selection of what are seen as significant *developments* and *achievements*.

Trends

An expanding international focus Within physical geography, a key feature of the review period has undoubtedly been the ongoing 'internationalization' of UK research activity. This trend is evident in several contexts, including the increasing importance of overseas study areas, the growth of collaborative involvement in European research consortia, and participation in international scientific programmes and associated scientific activities. UK physical geographers have traditionally indulged their interests well beyond the home country and they have, for example, made important contributions to research in tropical and desert regions, as well as in polar and high mountain areas. Equally, the Royal Geographical Society (with IBG) has a long tradition of promoting international field research programmes in more remote areas of the globe. However, there is evidence that such overseas study areas are assuming greater prominence. A survey of papers published by UK physical geographers during the review period indicates that, in of the order of 50 per cent of cases, the study areas were overseas. Drylands, in particular, continue to attract considerable interest (e.g. Allison and Higgitt, 1998; Bullard *et al.*, 1997; Clarke and Rendell, 1998; Chappell *et al.*, 1998; Cockburn *et al.*, 1999; Dutton *et al.*, 1998, El Hames and Richards, 1998; Goudie *et al.*, 1997; Harvey *et al.*, 1999; Parsons *et al.*, 1997; Reid *et al.*, 1998; Stokes *et al.*, 1997; Thomas *et al.*, 1997).

Royal Geographical Society (with IBG) international field research programmes have continued to provide a focus for overseas research during the review period and important work has been carried out on the 'Shoals of Capricorn' in the western Indian Ocean, the Jordanian Badia (Dutton *et al.*, 1998; Allison and Higgitt, 1998; Millington and Dutton, 1999), the Mkomazi Game Reserve in northern Tanzania (Coe *et al.*, 1999) and the Middle Hills of central and western Nepal. Geographers have also made an important contribution to the Royal Society's South-east Asian Rainforest Research Programme in Malaysia (Chappell *et al.*, 1998a; Brooks and Spencer, 1997; Douglas and Sinun, 1998) and the Lake Baikal Project supported from the UK by the Royal Society and the Natural Environment Research Council (NERC), (Mackay *et al.*, 1998). Much of the overseas work has, however, been founded on smaller projects supported by bodies such as the British Council, the Royal Society, the Department for International Development, the UK Darwin Initiative and the European Commission, or has formed part of larger global programmes. In addition to its primary role in providing major support for work in Europe, EC funding is currently supporting work in Bolivia, Peru and Argentina (Universities of Wales, Aberystwyth and Leeds), Belize (University of Exeter), and the Andes (University of Leicester) and the Darwin Initiative has supported work by Royal Holloway College on the *Melaleuca* Wetlands Project in Thailand and Vietnam (Maltby, 1997) and the University of Leicester on habitat mapping in Bolivian National Parks.

Research support from bodies such as the EC, which favour large projects involving many partners from different countries, has also promoted a culture of pan-European and wider international collaboration. The EC-funded MEDALUS project which was conceived by John Thornes at King's College, London and which is investigating problems relating to physical causes and consequences of desertification and land degradation in Mediterranean Europe, must be seen as a classic example of such pan-European collaboration, and this now involves 23 partners, including several UK teams. The ERMAS (European River Margins Study) project based at the University of Birmingham, the PROTOWET (Procedural Operationalisation of Techniques for the Functional Analysis of European Wetland Ecosystems) project led by Royal Holloway College, the PACE (Permafrost and Climate in Europe) study coordinated by Cardiff University, the INDFORSUS (Indicators of the Sustainability of Tropical Forest Exploitation Systems in South East Asia) project based at the University of Manchester and the 'Storminess and the Environmentally Sensitive Atlantic Coasts of the European Union' study led by the University of Coventry provide examples of other major UK-led European projects funded by DG XII and related directorates of the European Commission.

A selection of other EC-funded projects in which teams from UK Geography Departments have participated during the review period and which for convenience can be identified by their acronyms can be found in Table 1. Most UK Geography Departments have been involved in such EC-sponsored consortia in recent years. Provision for involving non-EU European partners in EC-funded projects has also promoted further expansion of pan-European collaboration. The INTAS programme has, for example, provided valuable opportunities for developing links with researchers in Russia and the New Independent States of the former Soviet Union. In addition to major collaborative projects, the EC also provides financial support for research networks and associated workshops and the success of the University of Oxford in establishing the EC COST 623 initiative for a research network in the field of soil erosion and global change provides a further example of this burgeoning of international collaboration. European Science Foundation activities in which there has been a significant UK involvement include the QUEEN (Quaternary Environments of the Eurasian North) programme (Svendsen *et al.*, 1999) and the UK-organized ESF Symposium on glacial-interglacial sea level changes held in Portugal in 1999. UK geographers have also provided a key input to the work of the European Space Agency in developing

Table 1. A selection of EC-funded projects in which UK Geography Departments have participated during the review period

Acronym	Topic
AASER	Arctic and alpine stream ecosystems
BINOCULARS	Biogeochemical cycling in large river systems
CHILL	Climate history deduced from Arctic and Alpine lakes
EDDI	European diatom database
EPPEC	European Palaeo-Environmental Climate and Circulation
EU-LIFE	Anglo-Danish river restoration demonstration project
MOLAR	Mountain lake research
MEDAFOR	Soil degradation and forestry activities in the N Mediterranean
NEWTECH	Modelling the impact of global change on landslide activity in Europe
NICHOLAS	Nitrate levels
PSELMA	Policies for sustaining environment and livelihood in mountain areas
SHELF	NW Europe continental shelf over the past 250 000 years
SPARTACUS	Post-fallout redistribution of Chernobyl radioactivity
TERON	Tillage erosion
TUNDRA	Tundra degradation in the Russian Arctic

research to support the sensors to be employed on the new Envisat polar platform, which is scheduled to be launched in 2001. The University of Southampton is, for example, heavily involved in the MERIS (Medium Resolution Imaging Spectrometer) component of Envisat (Verstraete *et al.*, 1999) and the University of Leicester has had significant input into ATSR2 (Along Track Scanning Radiometer of ERS2).

Looking beyond European collaboration, UK physical geographers have played an increasingly important role in a wide range of international organizations and in global research programmes promoted by bodies such as the IGBP, IGCP, INQUA, and the IGU. Frank Oldfield currently serves as Executive Director of the IGBP PAGES programme and has added an important geographical perspective to its work (e.g. Oldfield, 1997), and UK physical geographers are also heavily involved in the component activities of PAGES, including PEPIII (the 'Polar-Equator-Pole' transect spanning Europe and Africa, which is coordinated by University College, London), LUCIFS (Land Use and Climate Impacts on Fluvial Systems) and the promotion of a new initiative on human impacts on lake ecosystems (LIMPACS). They have also been active in other IGBP programmes, including LOICZ, BAHC, GCTE and LUCC and their work within the Land Degradation component of GCTE, where they have promoted work on the inter-comparison and validation of a range of current soil erosion models (Boardman and Favis-Mortlock, 1998), merits particular mention.

Within INQUA, UK physical geographers have played a very important role in promoting the activities of the GLOCOPH (Global Continental Palaeohydrology) Commission (Benito *et al.*, 1998). The UK has also been a major contributor to the INQUA NW Europe Shorelines Subcommission, to the INTIMATE (Integration of Ice-core, Marine and Terrestrial Records) core project of the INQUA Palaeoclimate Commission (Björck *et al.*, 1998) and to the work of the Holocene Commission (Roberts *et al.*, 1999). Another significant UK-led international initiative, which is closely related to both INQUA and PAGES and to the IGCP has been the establishment of FLAG (the Fluvial Archives Group) by the Quaternary Research Association. Within the Fifth Phase of the UNESCO International Hydrological Programme, UK physical geographers have made important contributions to components 2.1, 2.3 and 2.4 dealing with erosion and sedimentation and eco-hydrology.

Increasing interdisciplinary collaboration

The expansion of international cooperation and involvement highlighted above has also reflected a move towards increasing interdisciplinary collaboration, that continues a trend identified by Richards and Wrigley (1996) for the previous review period. Within the various IGBP programmes, for example, physical geographers are collaborating more closely with geologists, biologists, ecologists, limnologists, geochemists, climatologists, meteorologists, physicists and several other disciplines. A similar trend is also clearly evident at home. This in part reflects the formation of multidisciplinary Schools and Research Centres, Groups and Institutes in many universities, but it is also a response to a changing approach to research funding on the part of the Research Councils and more particularly NERC. Although the more traditional responsive mode, or non-thematic funding as it is now termed, continues, there is a growing emphasis on directed mode, or as it is now known, thematic funding. In this case, the Research Council identifies an area that it wishes to promote or develop and launches a thematic programme in that area. Such thematic programmes place emphasis on integrated multidisciplinary activities and the development of multidisciplinary research communities, such that interdisciplinary collaboration is fre-

quently a prerequisite for funding. This trend was initiated with major programmes such as the recently completed TIGER (Terrestrial Initiative in Global Environmental Research) and LOIS (Land-Ocean Interaction Study) investigations in which physical geographers were major participants. Within the latter phase of TIGER, physical geographers were important contributors to both the Water and Energy Exchanges (Lewis *et al.*, 1999) and the TIGGER (Geology in TIGER) (Holmes *et al.*, 1999; Barber *et al.*, 1999; Lowe *et al.*, 1999; Rose *et al.*, 1999) components. Within LOIS their contributions focused primarily on the River-Atmosphere-Coast Study (RACS) (Foster and Lees, 1999; Hardisty *et al.*, 1998; Lawler *et al.*, 1999; Phillips *et al.*,1999; Walling *et al.*, 1998; Webb *et al.*, 1997) and the LOEPS (Land-Ocean Evolution Perspective Study) (Macklin *et al.*,1997; Plater *et al.*, 1998; Rendell and Clarke, 1997; Shennan *et al.*, 1999; Wintle, 1997) components. This interdisciplinary involvement is being continued through contributions to new NERC thematic programme initiatives including, Environmental Diagnostics (ED), Urban Regeneration and the Environment (URGENT), Biological Diversity and Ecosystem Function (SOIL BIODIVERSITY), Arctic Ice and Environmental Variability (ARCICE) and the recently approved Lowland Catchment Research programme (LOCAR). Although some might argue that geographers have fared badly in securing research funding from NERC in recent years, they have made important contributions to both the steering committees and the scientific activities of these thematic programmes, thereby increasing their interdisciplinary links and arguably raising their profile within the broader scientific community. In looking more generally for areas of the subject where interdisciplinary collaboration has proved particularly effective and productive, the interface between hydrology and ecology (e.g. Petts *et al.*, 1999; Ward *et al.*, 1999) and the collaboration with geochemists and physicists which has resulted in the exploitation of new dating techniques based on cosmogenic isotopes (e.g. Stone *et al.*, 1998; Summerfield *et al.*, 1999) can be cited.

Although, as indicated above, there is increasing evidence of a growing involvement of physical geographers in interdisciplinary research activities, one inevitable corollary of this trend is the growth of interest of other disciplines in areas traditionally viewed as the preserve of the physical geographer. There is an important need to ensure that interest and involvement in these areas are maintained and that the importance of the geographical perspective is emphasized. In this context, it could be argued that, with some notable exceptions (e.g. Arnell, 1999; Battarbee, 2000; Oldfield, 1997; Jones, 1999; Parry *et al.*, 1998) physical geography has failed more generally to defend and exploit its traditional interest in the field of global change, which has attracted increased attention as a result of programmes such as the IGBP. Contributions from physical geographers have been conspicuously absent from recent UK reports on this theme (e.g. Inter-Agency Committee on Global Environmental Change, 1996) and there was a notable lack of physical geographers at the recent one-day meeting on the IGBP held at the Royal Society in June 1999.

Application, end-users and policy The move towards increasing interdisciplinarity outlined above can be seen to have been driven, at least in part, by external forces related to the current availability of research funding. Similar forces have acted to promote a growing emphasis on applied research and involvement with policy issues. This trend reflects both government concern to link research efforts to wealth creation, quality of life and related ideals and increasing emphasis on the end-user. The recently produced outline of the EU Fifth Framework Energy, Environment and Sustainable Development research programme, which must be seen as an important source of future research funding, has placed greater emphasis on supporting EU policy formulation and implementation. Similarly, several of the NERC thematic programmes cited previously, such as URGENT, ED and LOCAR have a strong applied base. The need to seek alternative sources of funding has also seen geographers looking increasingly to bodies such as MAFF, the Environment Agency, the Department of the Environment, Transport and Regions, English Nature, National Power and the Water Industry for support, with a corresponding emphasis on end-user applications. Examples of the growing portfolio of applied research includes work on catchment management (e.g. Burt, 1999; Newson and Sear, 1997; Petts *et al.*, 1999); river channel restoration and management; (e.g. Acornley and Sear, 1999; Downs and Thorne, 1998; Greenwood *et al.*, 1999; Gurnell and Sweet, 1998); the control of diffuse source pollution (e.g.Burt *et al.*, 1999; Heathwaite *et al.*, 1998; Johnes and Heathwaite, 1997; Russell *et al.*, 1998); environmental pollution and waste management (e.g. Brewer and Taylor, 1997; Dawson and Macklin, 1998; Hudson-Edwards *et al.*, 1999; Foster *et al.*, 1999); water quality modelling (e.g. Whitehead *et al.*, 1998); the environmental impact of acid deposition (e.g. Curtis *et al.*, 1999; Kernan *et al.*, 1998; Soulsby *et al.*, 1997); soil degradation (e.g. Quine *et al.*, 1999); wetland conservation (e.g Maltby and Lucas, 1997); designation of conservation sites (e.g. Gregory, 1998); bracken control (e.g. Taylor, 1999); landslide control (Collison *et al.*, 2000); coastal management (e.g. Bray and Hooke, 1997; Pethick, 1998); predicting the future impact of climate change on water resources (e.g. Arnell, 1999; Pilling *et al.*, 1998); and concern for the potential impact of biotechnology products (e.g. GMOs) on the environment (Mannion, 1998).

In many cases, involvement with practical applications must be seen as a two-way process, with the

potential contribution of physical geographers to contemporary applied issues being increasingly recognized and their input sought. This is particularly the case in the field of shoreline management and river management and restoration, where there is increasing recognition of the need to 'work with nature' and geographers are making an important contribution to both policy formulation and the development of investigation techniques and management strategies (Hooke, 2000; Pethick, 1998; Downs *et al.*, 1997; Thorne *et al.*, 1997; Gurnell *et al.*, 1998; Kronvang *et al.*, 1998; Newson *et al.*, 1998; Newson and Sear, 1997). Other examples of commissioned involvement with key environmental issues include the work of Wyer *et al.* (1998) and Kay *et al.* (1999) on the problem of faecal pollution of coastal bathing waters and failure to comply with the European Bathing Waters Directive. This work has also had direct links to policy formulation through provision of recommendations for coastal water quality standards. Similarly the work of Curtis *et al.*, (1999) in assessing the longer-term impact of acid deposition on upland environments in the UK has provided a key input to resolving conflicts regarding future policies for controlling such deposition.

The move towards policy issues and policy formulation has inevitably generated a need to develop the interface between the science underlying such issues and the related social constructs. There is a requirement to understand the cultural, economic, social and political factors which influence policy-making and the Environmental Research Group of the RGS-IBG is playing an important role in promoting this perspective (Trudgill *et al.*, 1999). The growing interest in environmental history, including the work of Grove (1997) on El Niño and of Mortimore (1998) on desertification must also be highlighted as a further integrative force linking science with society.

Developments and achievements

The trends identified above provide clear evidence of an active and evolving subject area that is responding to external pressures and opportunities. Looking in more detail at the research itself undertaken within the review period, particular developments and achievements can be identified in two main contexts. The first represents developments relating to the application of new tools or techniques, which have generated new opportunities or broken new ground, whereas the second relates to notable levels of activity and achievement in particular areas of the subject. In the first case, physical geographers have been quick to exploit the potential of new technology and new tools across a wide range of research. The availability of novel high-precision survey tools, including differential GPS, digital photogrammetry, ground penetrating radar and LIDAR has, for example, opened up many new opportunities (Butler *et al.*, 1998; Higgitt and Warburton, 1999; Twigg, 1998). Equally, the availability of acoustic doppler velocimetry and magnetic resonance imaging equipment has afforded important new potential for obtaining field information on flow patterns in river channels (Lane *et al.*, 1998) and in porous media (Amin *et al.*, 1997), respectively. This report will, however, highlight recent developments in the fields of numerical modelling, and multi-proxy environmental reconstruction and dating as key *developments*. In the second case, the areas of glaciology and remote sensing are identified as fields notable for high levels of activity and *achievement* during the review period.

Modelling Modelling continues to represent an important focus of activity across a wide range of physical geography, particularly in geomorphology. Significant developments during the review period include a shift in the focus away from practical predictions towards testing our understanding of processes and process-response feedbacks (Lane *et al.*, 1998a) and a growing emphasis on the use of sophisticated 'off the shelf' modelling software. In many respects this shift can be seen as building on the micro-scale process understanding achieved in the 1980s and early 1990s, by upscaling to larger-scale/longer-term systems and emphasizing non-equilibrium systems. Internal validation and sensitivity analysis are key requirements in such work and as a result modelling is now frequently undertaken as part of an integrated research strategy, combined with field and laboratory measurements and experiments designed to generate calibration/validation data. Recent work on the 1-D sediment routing of mixed size gravel along rivers, aimed at testing understanding of downstream fining through selective deposition, but opening up wider applications to transient river response to sediment imbalance (e.g. Hoey and Ferguson, 1997; Ferguson and Wathen, 1998) provides one example of such work. Examples of the application of 'off the shelf' modelling software are provided by the application of 2-D and 3-D computational fluid dynamics (CFD) techniques to model flow structures and sedimentation in river and floodplain systems (e,g, Bates *et al.*, 1997; Lane *et al.*, 1999; Stewart *et al.*, 1998) and the use of finite element techniques to analyse subsurface water movement in relation to landsliding (e.g. Thornes and Alcantara, 1998). In several of these modelling studies there is a clear synergy between modelling and the application of innovative field monitoring techniques, including acoustic Doppler velocimeters and the use of environmental radionuclides to estimate floodplain deposition rates, for model validation (e.g. Bradbrook *et al.*, 1998; Nicholas and McLelland, 1999; Siggers *et al.*, 1999). The work of Baird *et al.* (1998) on modelling groundwater behaviour in coastal beaches affords another useful example of a modelling study which has only recently proved possible owing to the availability of

sophisticated high-frequency logging devices for measuring waves and groundwater fluctuations in beaches.

Reference to other significant developments in modelling, many of which evidence a similar trend towards testing our understanding of processes and process-response feedbacks, can usefully include the ongoing development of multiscale soil erosion and land degradation models for assessing the impact of global change (e.g. Kirkby *et al.*, 1998), the incorporation of non-linear effects into models of phenomena such as rill and gully growth and interactions between erosion and vegetation cover (e.g. Favis-Mortlock *et al.*, 1998; Kirkby *et al.*, 1998), and the application of GIS, DTMs, cellular automaton and related spatial modelling techniques (e.g. Clark, 1998; Coulthard *et al.*, 1999; Peter and Stuart, 1998; Hardisty *et al.*, 1998, Hulton and Sugden, 1997; Willis *et al.*, 1998; Wise, 1998).

Palaeoclimatic reconstruction, dating, and long-term landscape evolution Research in the field of Quaternary geomorphology and palaeoenvironments relies heavily on the availability of techniques for palaeoclimatic and palaeoenvironmental reconstruction and dating, and the reporting period has seen important developments in the application of multi-proxy approaches to such reconstruction. The potential for using a wide range of physical, palaeontological and geochemical indicators to complement traditional palynological analysis is emphasized by Vandenberghe *et al.* (1998). As a result of the application of these multi-proxy approaches, major advances have been made in several areas of Quaternary palaeoclimatic reconstruction and stratigraphy during the review period. It has now proved possible to construct an effective biostratigraphy for much of the Pleistocene which emphasizes the almost total failure of traditional pollen assemblage-based palynostratigraphy. The EU-funded EPECC programme mentioned previously was conceived in order to apply a multi-proxy approach to generating palaeoclimatic parameters for the last interglacial in Western and Central Europe (Vandenberghe *et al.*, 1998). Its results have included reconstruction of regional palaeoclimate over the Devensian/Weichselian Lateglacial in Northern Europe, and this has provided critical new information regarding non-equivalence of the directions and magnitude of climate change (Coope *et al.*, 1998). The work of Lowe *et al.*, (1999) on the last glacial-Holocene transition within the TIGGER programme also represents an important milestone in introducing 'Event' stratigraphy to the British Quaternary. Looking beyond Europe, successful application of a multi-proxy approach to the Chinese loess to reconstruct climate changes over the past 75 000 years is reported by Chen *et al.* (1997). Equivalent multi-proxy approaches have been developed for reconstructing sea-level changes, where evidence from diatoms, ostracods, foraminifera, dinoflagellate cysts and a range of other indicators are now being used (Smith *et al.*, 1999; Dawson *et al.*, 1998).

Over more recent timescales, involving several millennia, parallel advances have been made in the application of a wide range of indicators to reconstruct proxy-climate records from peat bogs and lake deposits (e.g. Barber *et al.*, 1998, 1999). Work on developing new additions to the range of palaeoclimate indicators for use in multi-proxy approaches continues and recent work has, for example, demonstrated the potential of fossil testate amoeba (e.g. Woodland *et al.*, 1998) and stalagmite luminescence (e.g. Baker *et al.*, 1999) as palaeomoisture indicators. The application of multi-proxy approaches to palaeoenvironmental reconstruction has frequently been paralleled by improvements in temporal resolution, particularly when working with lake cores. This is well demonstrated by the work of Dearing and Zolitschka (1999) who have shown how fine-resolution laminations can provide valuable evidence for interpreting linear and non-linear dynamics in hydrological systems. Recent detailed examination of cores from Lake Baikal (Mackay *et al.* 1998) has also confounded existing views on its recent environmental history by highlighting the lack of evidence of recent contamination and degradation of this important lake ecosystem.

Dating techniques remain a key requirement in many palaeoenvironmental and geomorphological investigations and recent advances in the application of TL and OSL dating have afforded important new information for interpreting environmental change and landform development (Rendell and Clarke, 1997; Stokes *et al.*, 1997; Thomas *et al.*, 1997; Wintle, 1997). Over shorter timescales, the application of Cs-137 and Pb-210 measurements to document rates of overbank sedimentation on river floodplains has also provided new insights into the contemporary evolution of floodplain systems (Walling and He, 1999). Perhaps even more significant are the recent advances in the use of cosmogenic isotopes including Be-10, Al-26, Cl-36, and Ne-21 to estimate long-term denudation rates (Cockburn *et al.*, 1999; Fleming *et al.*, 1999; Summerfield *et al.*, 1999) and to reconstruct the thickness and extent of the last ice sheet in north-west Scotland and establish periglacial weathering limits in north-west Scotland (Ballantyne *et al.*, 1998; Stone *et al.*, 1998). Such work on estimating long-term denudation rates offers exciting potential for linking work on contemporary geomorphological processes to longer-term studies of landform evolution and thereby reducing the dichotomy between these two perspectives (Sugden *et al.*, 1997).

The growth of glaciology Glaciology is identified as one area that has experienced a substantial expansion of activity during the review period. The

strengthening of this field is evidenced by the establishment of the Centre for Glaciology within the Institute of Geography and Earth Sciences at the University of Wales Aberystwyth, in 1994, and of the Bristol Glaciology Centre in the School of Geographical Sciences at Bristol University in 1998, and by the flourishing of existing groups at Edinburgh, Cambridge, Southampton and elsewhere. As with other areas of physical geography, there has been a continuing shift towards multidisciplinary and multi-tool studies, involving field observations, satellite, airborne and shipborne remote sensing methods and numerical modelling. Technological advances which have generated important new information include techniques for monitoring englacial and subglacial drainage (Hubbard *et al.*, 1998), the use of digital terrain modelling techniques to calculate glacial flow rates and mass balances (Willis *et al.*, 1998), production of high accuracy digital elevation models of both the Antarctic and Greenland ice sheets using satellite radar altimetry (Bamber *et al.*,1998) and the use of synthetic aperture radar interferometric methods to generate synoptic velocity fields for large ice caps in Svalbard (Dowdeswell *et al.* 1999). Airborne radar and radio-echo sounding have also been used to determine basal ice conditions and to identify large lakes beneath the Antarctic ice sheet and to calculate the total volume of water stored in such lakes for the first time (e.g. Siegert and Ridley, 1998; Dowdeswell and Siegert, 1999a). The sediment dynamics and geochemistry of glacier meltwater systems have also continued to attract attention, with investigations of the latter now being extended from warm-based to cold- and polythermal-based glaciers. Such studies are providing valuable information on the locus and mechanisms of solute acquisition in glaciated catchments, meltwater flowpaths and chemical and physical denudation rates (Collins, 1998; Tranter *et al.*, 1997; Hodgkins *et al.*, 1998; Wadham *et al.*, 1998). Recent work has also demonstrated that microbes may mediate subglacial chemical weathering (Sharp *et al.*, 1999a).

These largely field-based activities have been paralleled by advances in ice sheet and glacier modelling which have included, for example, the use of a thermo-mechanical numerical modelling approach to understand and predict the development of fast-flowing ice streams in large ice masses and their variability through time (Payne and Dongelmans, 1997), prediction of changing rates of delivery of glacigenic sediments to the continental margins (Dowdeswell and Siegert, 1999b), and the application of a GIS approach to model the pattern of growth and decay of the Patagonian ice cap during an entire simulated glacial cycle (Hulton and Sugden, 1997).

Work on comparing contemporary and relict glacial landforms and on the implications of deforming beds continues (e.g. Bennett *et al.*, 1997; Hambrey *et al.*, 1997; Hart, 1998; Murray, 1997) and other examples of important new work with a broader geomorphological perspective include the use of new methods of exposure dating to demonstrate that the East Antarctic Ice Sheet has been stable over the last few millions of years (Sugden *et al.*, 1999) and studies of the relationship between ice-sheet growth and decay and sedimentation on high latitude continental margins. The Bear Island Fan, offshore of the Barents Sea, is, for example now known to be the same size as the Amazon and Mississippi fans, although the contributing area is an order of magnitude smaller (Dowdeswell *et al.*, 1998).

New opportunities in remote sensing The review period has been marked by two important developments, which have done much to stimulate work in this field. The first has been the flurry of activity related to the forthcoming launch of new Earth observation satellites that offer particular benefits for geographical research. UK researchers have been heavily involved in the development of strategies for using three sensors (Along Track Scanning Radiometer, ATSR; Advanced Synthetic Aperture Radar, ASAR; and the Medium Resolution Imaging Spectrometer, MERIS) on the European Space Agency (ESA) Envisat polar platform scheduled to be launched in 2000 (Verstraete *et al.*, 1999). The second reflects a recent shift in policy by NERC and other funding bodies towards the use, rather than the collection, of data, which is beginning to channel more funding towards the research undertaken by geographers. Key research achievements can be conveniently grouped into four areas, namely:

1 technological advances relating to an improved understanding of the interaction of radiation with the Earth's surface;
2 practical applications;
3 scientific applications; and
4 the coupling of remotely-sensed data with large scale ecosystem models.

The first can be exemplified by significant developments in understanding the effect of biochemical concentration on the spectral properties of vegetation canopies (e.g. Curran *et al.*, 1997; Dawson *et al.*, 1998) and the coupling of remote sensing and geostatistics to develop an improved understanding of the spatial properties of the Earth's surface (e.g. Curran and Atkinson, 1998; van Gardingen *et al.*, 1997). Examples of significant developments in practical applications include the use of remote sensing for investigating land cover change (Lucas *et al.*, 2000; Wellens, 1997), for mapping forest cover (e.g. Foody *et al.*, 1997) and for coastal management (e.g. Mumby *et al.*, 1999; Shanmugam and Barnsley, 1998; White and El Asmar, 1999). Work undertaken within the framework of the NERC TIGER programme aimed at estimating the size of the carbon

sink for Amazonia (Boyd and Curran, 1998) and the use of remote sensing in studying ice sheet dynamics (e.g. Bamber *et al.*, 1998; Clark, 1997; Siegert and Ridley, 1998) provide useful examples of new scientific applications. The potential for using remotely-sensed data to drive large-scale ecosystem models represents an important development which is well illustrated by the work of Lucas *et al.* (2000a).

Human geography

From the outside, British human geography looks like a major success story. First, it has begun to be taken seriously by the Social Sciences and Humanities as a subject worthy of note, on both theoretical and practical grounds. For example, it has begun to act not just as an importer of ideas from the rest of the Social Sciences and universities but also as an exporter. Second, it still shows all the signs of intellectual ferment. For example, new theoretical domains have been constantly produced. Third, it is intervening in numerous policy domains. Fourth, developments such as geocomputation mean that human geography continues to be at the technical cutting edge. Then, lastly, the institutional structure of human geography continues to build. For example, new British human geography journals have continued to come into existence at an almost bewildering rate.

There are a few dark clouds, of course. To begin with, the virtual demise of area studies in many Departments is a cause for real concern; for example, regional courses are now hardly taught at all in some Departments. Too often, the net result is a kind of pious Eurocentrism in which much is written in theory concerning the necessity to appreciate difference, but this is too rarely articulated in practice. That said, British human geographers have continued to produce important regional work of a kind which displays both knowledge in depth and commitment (e.g. Corbridge, 1997; Power, 1998; Radcliffe, 1999; Sidaway, 1998; Smith, 1999; Swyngedouw, 1997). Then, there is the issue of interdisciplinarity. Whilst British geography is now far more interdisciplinary than it was, much of that interdisciplinarity is still only skin-deep. In truth, only a very few human geographers have made the transition to a wider role in the Social Sciences and Humanities (Barnett, 1998).

Still, that British human geography is currently in a successful phase cannot be seriously in doubt. In order to span such a large and growing field, the authors have resorted to five different means of review. The first one is straightforward, based around a number of the extant sub-disciplines. The second considers the area where these sub-disciplines have overlapped, creating new and innovative areas of work which have no particular sub-disciplinary allegiances. The third means of review is a consideration of the pressing social problems to be found in the UK, and the attempts by British geographers to address them. The fourth means of review considers the growth of interest in methodologies. Finally, the last means of review considers the current theoretical debates in the discipline.

Sub-disciplines

Few would deny the current high visibility of social and cultural geography in British human geography. Certainly, many social and cultural geographers see themselves as in the van of the subject. Four aspects of social and cultural geography have been particularly important.

The oldest and seemingly most obviously 'geographic' area of social and cultural geography is the study of landscape (Daniels, 1999). But those working on landscape have made important strides of late in remapping what might be meant by landscape, especially by concentrating on the way in which modern seeing and knowing has been shaped by signs of the rural (Matless, 1999) or even the globe (Cosgrove, 2000), as well as by tourist and filmic repackaging (Clarke, 1998).

The second key area of social and cultural geography has been work on spaces of subjectivity, and most especially spaces of identity of various kinds – ethnic identity (e.g. Dwyer, 1999), national identity, sexual identities, identity based around age as in children (Mathews and Limb, 1999), identity based on disabilities (e.g. Imrie, 1996), and so on. In particular, geographers have tried to show how identity is anchored in particular constructive spaces of action and representation. Most recently, much of this work has been carried out under two signs, either that of 'governmentality', as a commitment to a Foucauldian or quasi-Foucauldian notion of the subject as the self-regulating object of regimes of government, or post-colonialism, as a commitment to a subaltern subject able to escape the numerous practices of enclosure that are scattered through the colonial present.

The third area has been work on the micro-spaces of the body and, more generally, embodiment. A better sense has been produced of the ways in which the body produces and is produced by social and cultural mores, of the ways in which each body is split into serial non-additive domains of action which can rely on quite different forms of social relation, and the ways in which the body drives and is driven by various regimes of discipline (Nast and Pile, 1998; Valentine, 1999). Most recently, there has been a particular turn to psychoanalysis as a model that might condense these concerns, and take them off into new domains. (Bondi, 1997; Pile, 1996).

The fourth and related area of work is concerned with the consideration of senses other than sight. In particular, much attention is being paid to the 'soundscapes' of music (Smith, 1997; Leyshon *et al*,

1997). And there is even some attention being paid to senses such as smell and touch.

These kinds of developments are not without their critics within social and cultural geography, however. A number of authors have argued that the subdiscipline, in its haste to think the unthinkable, is leaving behind the kind of basic equity issues signalled by words such as 'class' and 'gender'. Put brutally, social and cultural geography is, therefore, losing its radicalness (see Cook *et al.*, 2000). It is just not 'political' enough. Though there are obvious rejoinders – that the new developments are attempts to redefine what is radical, that they are not, in any case, incompatible with an emphasis on class and gender, that areas like post-colonialism emphasize social struggle – still many social and cultural geographers are uneasy. What can they say to the homeless they meet on the street each day?

In particular, they still often look guilty when the subject of 'the economic' is brought up. Work, corporations, money: these are issues which have been comparatively neglected by social and cultural geographers. Yet, this may not matter as much as it did. British Geography has produced a new generation of economic geographers willing to take on these issues, sometimes with a cultural bias (Lee and Wills, 1997; Clark, Gertler and Feldman, 2000). Thus, it is possible to note three main areas of work. There is the workplace and workplace struggles. Work on the geography of trades unions (Martin *et al.*, 1996; Wills, 1998), on workplace regulation (Peck, 1996), and the like has become important again. Another area of work is concerned with the firm, applying especially to notions like sunk costs as arbiters of firm decision-making. Then, there is work on money and finance which attempts to consider not just the powers of international finance (and especially the City of London) (Allen and Pryke, 1999; Clark, 1998; Martin, 1999) but also how these powers work out on the ground, often excluding substantial parts of the population from the retail financial system (Leyshon and Thrift, 1997).

These kinds of considerations have chiefly been brought together through an emphasis on the region. The region is no longer seen (if it ever was) as a simple collection of inputs and outputs (Allen *et al.*, 1998). Rather, much effort has been expended over the last few years in trying to understand the dynamic, endogenous determinants of successful regions, especially the learning capacity of the 'untraded interdependencies' engrained in their firms and workforces (Amin, 1999; Morgan, 1997) and the appropriate institutional mix that will produce these interdependencies. This effort has important policy consequences since if regional economies could be reconfigured as 'learning regions', perhaps they could carry on growing over long periods of time with constantly increasing returns, on the model of some Italian industrial districts. The problem is that we still know very little about what makes for successful institutional mixes. For example, why are some Chambers of Commerce more successful than others (Bennett, 1998; 1999)? Which programmes of help for small firms pay real dividends (Daniels, 1999)? What producer services are vital to boost competitive performance (O'Farrell *et al.*, 1996)? What venture capital arrangements are most likely to succeed (Harrison and Mason, 1996)? What arrangements of social capital might offer succour (Lee, 1996; Amin, Cameron and Hudson, 1999)? There is no simple answer. Indeed, because British regions are, generally speaking, such loose conglomerates, it may be that the problem is rather one of which bits of a region can grow and if the benefits of that growth can be more equally spread – so we come back to issues of equity again (Allen *et al.*, 1998; Amin *et al.*, 1999).

Further, this regional literature often ignores two important caveats. First, there is equal evidence of regions which over a long period have struggled or even declined. Second, all regions are now embedded in a global economy, so that very often the economic shots are being called at a distance (Dicken, 1997; Daniels and Lever, 1996).

The phenomenon of globalization is much remarked upon but, used carelessly, it can simply become a means of obfuscation. Anthropologists such as Arjun Appadurai and political geographers like Peter Taylor have argued that the Social Sciences should be refigured around a global agenda. In some senses this is, of course, an ironic call to arms for human geographers who have, rather more than many disciplines (with the exception of anthropology), been involved in constructing global knowledges for many centuries. In other ways of course, the call could not be more germane since, as Massey (1999) and Slater (1997) have shown, the sense of the global is currently built on an almost exclusively Anglo-American worldview; the global sense of place is not global.

Whatever the case, 'development' geographers have very clearly continued to cultivate a serious sense of the peoples and places outside the metropolitan core in ways which are absolutely vital to the practical and moral health of the discipline in Britain. Apart from important studies of particular places around the world, they also have devoted much time to 'rethinking', 'reassessing' and 'reconceptualizing' development, both as a process and as a policy, following the rejection of neatly economistic recipes for progress and in the light of the enormous repercussions arising from the Structural Adjustment Policies (SAP) being followed in so many developing countries.

Development geographers have also devoted much time to environmental sustainability in a wide set of different contexts. The fate of marginal areas subjected to environmentally damaging and ethically questionable forms of development has often overlapped with 'indigenous voices' hitherto ignored

or discounted, in spite of the recent interest in native species of plants by commercial research bodies. The role of the WTO in upholding the patenting of plants raises just the sort of ethical issues that cause researchers to reconsider the nature of their work. A second facet of sustainability concerns the 'resource curse', arising from the over-dependence of economies on oil or a mineral, and yet another focuses on the increasing volatility of global financial systems in association with SAP and most recently in connection with the recession experienced in Asia. In 2000, the Developing Areas Research Group will, therefore, focus on the Jubilee 2000 campaign to exonerate the poorest countries from debt as their contribution to millennium projects.

One result of the unsustainability of previous development models has been the widespread adoption of decentralization policies and the focus by international authorities, states and NGOs on the nature of governance. Research on marginal groups, defined by poverty, gender, ethnicity, religion or cast, whether in urban or rural settings, has been responsible for the current stress on 'empowerment' and its role in development. However, there is increasing scepticism as to its impact on grossly biased economic, political and social systems, especially given the stress on cost recovery by international institutions and SAP. Decentralization may be no more than a spatial fix by over-stretched regimes to shed local responsibilities for basic infrastructure, especially for poverty-stricken and discriminated groups.

The same ethical impulse enlivens other sub-disciplines. For example, work on gender and feminism is a potent example of a field where ethics are constantly debated and put into practice. It is no surprise, then, that much interest of late has concentrated on issues of gender inequality in the academy itself with respect to horizontal and vertical segregation, as well as experiences of harassment. This latter issue gained prominence through Gill Valentine's disclosure of her 'personal geography of harassment' (Valentine, 1998). More generally, changes in academic life have contributed to an erosion of employment security and an increase in long working hours which typically operates to the disadvantage of women (Reimer, 1998). As a positive response to these inequalities, the Women and Geography Study Group organized a very successful seminar 'Getting Funded' to elevate the research and publication profile of talented new women geographers. The sub-discipline also continues to emphasize the key contribution of gender and feminist research in education. For example, it has produced an undergraduate Geography text and has also become involved in issues of school education as in work on: curricula (Lee, 1996); teaching practice (Skelton, 1998; Valentine, 1997; student projects and fieldwork (Raghuram *et al.*, 1998; Maguire, 1998); providing a backdrop to wider issues of inequality in occupational and skills differentiation (Bondi, 1996; Webster, 1996) and 'doing feminist geography' more generally (McDowell, 1997; Bondi, 1997).

Research and publications on gender and feminism also reflect a growing interest in the way that experiences of (and access to) public and private spaces are shaped by gender (Bondi and Domosh, 1998; Bondi, 1998; Nash, 1998; Greed, 1996) and disability (Butler and Bowlby, 1997; Parr, 1997). Similarly, the household is becoming increasingly prominent as a key level of analysis – emphasizing the role of gender in sustaining informal networks of welfare in the household-locale nexus (Bowlby *et al.*, 1997; Holloway, 1998; 1998a; Jarvis, 1999; McVie *et al.*, 1996). This re-casting of orthodox debates on gender divisions gives greater prominence to issues of decision-making and power relations (Hardhill *et al.*, 1997; Monk and Garcia-Ramon, 1996) and recognition of changing trends of family and household structure, such as those of lone mother households (Duncan and Edwards, 1997) and lesbian and gay households (Oerton, 1997). In turn, these developments have increased the overlap, in terms of theory and empirical research, between literature on industrialized and less-developed economies, where the focus in both is turning towards household gender relations and strategies of survival (Pearson and Jackson, 1998; Laurie, 1997; Laurie *et al.*, 1999).

A continuing sphere of interest concerns the restructuring of labour and work-place gender relations. This has focused in particular on bodily performances (McDowell, 1997a) to highlight difference and diversity in gendered identities (Duncan, 1996; Lewis and Pile, 1996). Issues of gender and bodily performance also find particular resonance in patterns and processes of consumption (Glennie and Thrift, 1996). Moreover, a significant body of research and publications has grown up out of concern to explain difference in geographies of childhood (Valentine, 1996, 1996a) and youth cultures (Skelton and Valentine, 1998) through closer examination of gendered identities at work and at play (Cohen, 1997; Valentine and McKendrick, 1997; Valentine, 1997a).

Another example of the ethical impulse at work can be found in a political geography. The continuing renaissance of geopolitics (e.g. Atkinson and Dodds, 2000) can be read as an ethical integration of the construction and wielding of discursive power as can the increasing desire to write of entanglements of power rather than straightforward master-slave models in which power blocs transmit power downwards on to a supine populace (Sharp *et al.*, 1999). Similarly, that hoary chestnut of the 1980s, regulation theory, has started to mutate into something more interesting since it has taken up discursive motifs (Goodwin and Painter, 1996; Peck and

Tickell, 1996; Macleod and Goodwin, 1999). Other areas of political geography such as world systems theory (Taylor, 1999) and even more conventional work on boundaries and frontiers can be seen as interrogations of the geography of power in the large. Electoral geography, meanwhile, is enlivened by its commitment to the democratic imperatives which are promised but not always delivered by the multitude of electoral systems now in use (Johnston *et al.*, 1999; Rossiter *et al.*, 1999; Rossiter *et al.*, 1999a) and which have led to an increasing penchant for direct action (e.g. Routledge, 1997). For a time, indeed, British Geography had its own version of direct political action in the shape of the outcry against Shell's sponsorship of the Royal Geographical Society (with the Institute of British Geographers), given events in Nigeria such as the hanging of Ken Saro-Wiwa and the repressive actions in Ogoniland (Gilbert, 1999). The founding of the Critical Geography Forum in the wake of these events and the enthusiasm for the International Critical Geography Group suggest that the energies released by the Shell affair will not fade away.

Even those sub-disciplines which in the past might have been regarded as more traditional now embody all the themes so far mentioned – the emphasis on culture, the commitment to a global view and the ethical impulse. For example, historical geography continues to build on its long-standing traditions (Ogborn, 1997, 1999) of work on industrialization, rural land ownership, agriculture and agrarian change, migration and population patterns, urbanization, and transport networks. However, recent work is also moving in new directions. Now, many contemporary historical geographers, informed by feminism, post-structuralism, anti-racism and post-colonial perspectives, share concerns about questions of power and meaning with those from within the traditional sub-disciplines such as social and cultural, economic and political geography (Ogborn, 1998; Nash and Graham, 1999). The key themes evident in much recent work include a more overtly theorized exploration of the material, political and symbolic dimensions of travel and exploration, imperialism and colonialism, nationhood and state formation, and ideas of nature and environmental change (Phillips, 1997; Driver, 2000). In this, contemporary historical geography draws on the long-established tradition of considering the material and symbolic geographies of hierarchical social relations and extends its concern with questions of class and capital to other axes of domination and identity such as race and gender. Historical geographers share interests in the formal and informal knowledges, practices and forms of representation which have attempted to make sense of the world and our place within it, from systems of mapping and measurement to the classification of objects, animals and people. This entails both considering the historiography of Geography as a discipline itself as well as the popular representation and memorialization of the past through commemorative events and in museums, heritage sites or in film, performance or writing. Historical geographers have also extended what counts as source material to encompass objects, practices and discourses of popular culture in researching contemporary imaginative historical geographies, as well as the past itself.

These new departures reflect the fact that historical geography has always been in some respects an interdisciplinary endeavour, drawing on economic and social history, ecology and social theory, just as it draws on feminism, environmental history, post-colonialism and cultural history today. In 1997 Michael Heffernan, as the new Editor of the *Journal of Historical Geography*, reiterated Alan Baker's insistence that historical geography should be 'eclectic and liberal'. Contemporary historical geography is, by necessity

> a hybrid disciplinary arena in which spaces, places, environments and landscapes are considered and analysed historically, not as an exercise in antiquarianism, but as a commentary with direct bearing on the contemporary scene
>
> Heffernan, 1997: 2

Current influences on historical geography are producing exciting new research avenues that reflect this enduring tradition of interdisciplinarity. Contemporary historical geography has become more cultural', but without lessening its concerns with the material shaping of places, spaces, landscapes and lives. British historical geography in the year 2000 is, thus, concerned with the past *and* the present, the symbolic *and* the material world.

In a similar way, rural geography has also become a hybrid disciplinary arena, as rural geography has taken a cultural turn (Cloke, 1997; Phillips, 1998) which has led in two directions. First, there is much greater interest in the identification and analysis of 'others' in the countryside. Particular interest has been shown in the gendered use of space (Little and Austin, 1996; Woodward, 1998) and in groups of new age travellers (Halfacree, 1996; Cloke and Little, 1997; Milbourne, 1997). Also emerging is work on breaking down the dualism between society and nature (Murdoch, 1997), one manifestation of which is an attempt to 'bring animals back in' to analyses of rural space (Evans and Yarwood, 1995; Yarwood and Evans, 1998; Woods, 1998a).

Second, long-popular topics have been re-examined. For example, debates about the social class and lifestyles of rural residents, frequently defined along lines of 'newcomers' and 'locals' have developed (Boyle and Halfacree, 1998). Structuralist approaches have been leavened by the application of regulation theory and actor-network theory to issues of governance, politics and planning (as in the special edition of *Journal of Rural Studies* [1998] on governance or Woods [1998] on actor networks and hunting). New light has also been shed on topics

such as rural housing (Hoggart, 1997), education provision in rural localities (Ribchester and Edwards, 1999) and environmental planning (Ward *et al.*, 1995; Lowe *et al.*, 1997).

A discourse based upon political economy continues in rural geography. For its proponents this has become a period for assessing the contribution of this theoretical perspective, as commentaries by Whatmore *et al.* (1996), Short (1996) and Marsden *et al.* (1996) testify. In particular, political economy approaches continue to inform analyses of food, which for Marsden (1998) represents a 'reconnection' of people with the food they eat, its origin and transfer. As might be expected, following a series of recent scandals and food scares, concern for the regulation of food quality is emerging in the literature, especially where it is linked to locality (Morris and Young, 1998).

Major policy initiatives continue apace, providing a continuing challenge to more researchers. In particular, there is interest in the reform of the Common Agricultural Policy (CAP) within the EU through the Agenda 2000 proposals (Winter and Gaskell, 1998) and in the context of World Trade Organisation demands (Potter, 1998; Potter and Goodwin, 1998). Agricultural sustainability has been on the research agenda (Ilbery *et al.*, 1997), frequently evident empirically at the national scale through analysis of farmers' adoption of UK agri-environmental schemes. The latter has evolved into a substantial body of literature (Morris and Potter, 1995; Battershill and Gilg, 1996; Wilson, 1996; Winter, 1996; Clark *et al.*, 1997, to name but a few), far outweighing the actual significance of agri-environmental measures within the CAP. Even so, specific reports into the geographical impacts of such policy are more difficult to trace (Evans and Morris, 1996) and surprisingly little work has been conducted on state formulation of agri-environmental policy, implementation and mediation (Wilson, 1997).

New overlaps

New areas of work are now appearing which do not fit easily into any of the extant sub-disciplines, both because they cross the borders of so many existing geographical concerns and because they strike out so strongly into interdisciplinary territory. However, from the interest displayed in them, they very clearly strike a chord with many geographers. Four of these areas of overlap deserve mention.

The first is nature. Much work is now taking place on nature, but a nature which is no longer as understood as an entity which can be captured by opposition to categories such as culture, or as something that is simply socially constructed (Latour, 1993). This kind of viewpoint means reassessing the status of 'natural' objects – animals, plants, and so on. In particular, it allows these kind of objects agency by transposing them into hybrid networks which gain their power to have effects from the articulation of a host of different actors. Thus human geographers are no longer content with seeing nature as either the mirror of domesticity or the wild 'other'. Instead they strive to understand nature as co-existent but still 'other'. Thus animals, for example, have become a key area of interest for numerous human geographers (Philo, 1998; Whatmore and Thorne, 1998; Davis, 1999).

A second area is food. Not before time, food is again being seen as a crucial element of the geography of the human. Drawing on work in areas as diverse as the geography of agriculture, economic geography, feminist geography, and cultural geography, the new geography of food tries to outline the several circuits of the production and consumption of food. Work has covered the whole gamut of food and food-related topics from the 'food deserts' created in less well-off areas (Harrison *et al.*, 1997), through supermarket regulation, to food and sexuality (Bell and Valentine, 1997).

A third area is science Science is increasingly seen as a hybrid, made up of different projects, rather than as an inevitable and univocal progress towards infinite understanding. Seeing the enterprise of science in this way means that the practices of science, including Geography, are available to study in ways which might have been considered illegitimate before. Spurred on by the increasing centrality of the history and sociology of science in the Social Sciences and Humanities, geographers have become especially involved in tracing out the spaces of science, and in reflecting on particular practices of knowledge-construction, such as fieldwork (e.g. Livingstone and Withers, 1999; Withers, 1999; Thrift, 1999).

Finally, there is capitalism. Capitalism is now very much back on the research agenda, but considered in rather different ways (Castree, 1999). In particular, capitalism is now seen as a series of networks with different conventions and knowledges associated with them (Pinch and Henry, 1999; Leslie and Reimer, 1999). Such a view provides the space for new insights. For example, much work is currently taking place on culture and economy. In British Geography, work of particular note has taken place around retailing, consumption and place. British geographers have had a long tradition of work on retailing (e.g. Wrigley and Lowe, 1996; Wrigley, 1997), work which now looks even more prescient as real time retailing looks set to become one of the motors of the global economy. And it is no longer considered unusual to carry out ethnographies of shopping malls, car boot sales and other sites of consumption (Jackson, 1999; Miller, *et al.*, 1998; Crewe and Gregson, 1998).

Policy

Policy has been a central concern of British Geography, from the days of applied geography and

before and there are still, contrary to Martin (2000), many areas of public life in which geographers have had an important influence on policy. Here we will point to just three. The first is in the field of the urban. To an extent, urban geography has been in the doldrums with many of its key themes being addressed by other sub-disciplines and some of its chief lodes – such as gentrification and world cities – seemingly worked out (but see Lees, 1999). However, of late, urban geography has undergone something of a revival, for at least four reasons. First, there are the beginnings of a new theoretical agenda (e.g. Amin and Graham, 1997; Thrift, 1997a). Second, the interest that other sub-disciplines have taken in matters urban has, paradoxically, revived some areas of the discipline. Third, urban planning has found new energy through the adoption of new more community-orientated approaches to planning (Rydin, 1998). And fourth, the fact that the new Labour government is committed to reviving the major cities and urban life more generally has produced a policy agenda. Though much of this agenda looks distressingly familiar – estate renovation, community development, design-led rejuvenation, and so on – still it has understandably produced an impetus towards the urban which can only be welcomed and which has produced real effects, as evidenced by, for example, the Bristol Personal Finance Research Centre's ability to make financial exclusion into an area of major policy change. Yet, notwithstanding the spectacle of a millennium London, the few booming edge cities such as north Bristol and the dramatic areas of medium-sized urban employment growth such as Swindon and Cambridge, the fact remains that many major British cities are still haemorrhaging jobs and people, as geographers have documented at some length. And, in all the change, certain areas, and especially the suburbs, remain hardly studied.

One part of the reason for the increasing interest in cities is clearly also the fact that data have become much more freely available. Not only is the Census producing important information in consultation with geographers – but all manner of new data sources have come on line – longitudinal surveys, commercial databases, and so on – aided by GIS and other technologies. This increasing profusion of data has helped other areas, for example the geography of health.

In this regard, the rejection of the term 'medical geography' and its replacement by 'health geographies' is highly significant. The traditional division of medical geography on the basis of content (disease ecology or health care provision) sat uncomfortably with the mid-1990s concern to generate more theoretically aware geographical scholarship on health issues. The term medical geography (which is generally associated with spatial analysis) also failed to accommodate the growing body of research concerned with the convergence of place and health. This new tradition is itself highly diverse, encompassing work on local health experiences, local specificity in disease transmission, local organizational responses and local mobilization for health. The spatial-analytic tradition continues to be represented within the sub-discipline. Thus, spatial analyses such as diffusion studies (Smallman-Raynor and Cliff, 1998, 1998a; Cliff and Haggett, 1998) continue to be a strong feature of British health geography research (Smyth and Thomas, 1996) as do the investigation of the stability of epidemic modelling systems (Thomas, 1999) and the multi-level modelling of health-related behaviours and outcomes (Shouls *et al.*, 1996; Duncan *et al.*, 1996; Congdon *et al.*, 1997; Bullen *et al.*, 1997; Duncan *et al.*, 1998).

But spatial analysis is now just one of a wide range of approaches in the field. There are, for example, several regional specialists, focusing on health and/or health policy in specific regions (Smyth, 1998). Regional research in low-income or transitional societies is well represented (Asthana, 1996; Atkinson, 1997, 1999; Curtis *et al.*, 1997; Harpham and Boateng, 1997; Harpham and Werna, 1998; Royle and Cross, 1996; Royle, 1997; Werna *et al.*, 1998). There is also a wealth of research on health policy (current and historical) in the UK (Asthana *et al.*, 1999; Bartlett and Phillips 1996; Bullen *et al.*, 1996; Jones, 1999; Milligan, 1998, Mohan, 1996, 1997, 1998). Much of the research on health and place is explicitly guided by social theory, linking localized experiences with wider socio-spatial processes (Asthana, 1996a, 1998; Asthana and Oostvogels, 1996) or exploring the role of experience in the construction of place.

A concern with detecting patterns and measuring environmental effects can still be identified in British health geography research. Based on a range of techniques from simple ecological mapping to multilevel modelling, such studies have examined conditions as diverse as sudden infant death syndrome, malignant melanoma and Lymes disease (Aase and Bentham, 1996; McNally *et al.*, 1998; Mawby and Lovett, 1998).

But an overview of British research in the geography of health cannot overlook the substantial contribution made by geographers to research on health and inequalities (Curtis and Jones, 1998). Methodologically, health geographers have for some years been testing sources of information on socio-economic status with which to compare rates of health and illness between different social groups (Haynes *et al.*, 1996, 1997). Empirically, multi-level modelling research has been particularly valuable in focusing on the relative importance of compositional and contextual effects in determining health variations between different geographical areas (Langford and Bentham, 1997; Duncan *et al.*, 1996, 1998). Research undertaken by health geographers has also made a substantial contribution to the field (Shaw *et al.*, 1998; Dorling, 1998, 1998a; Shaw and Dorling, 1998; Brimblecombe *et al.*, 1999).

The other main area of policy influence is undoubtedly the environment. Environmental policy is clearly of interest to many British human geographers, not only because it encompasses major issues such as global environmental change and risk but also because there are clear links to policy (Munton, 1997). This interest can be seen in work on environmental knowledge and reflexivity, in the attempts to produce sustainable local institutions arising out of Agenda 21, in the greater and greater attention paid to issues like water quality and recycling and mineral extraction (Eden, 1999, Cowey and Owens, 1998), and in the increasing attention being given to corporate social responsibility (O'Riordan and Voisey 1998). A particular area of interest recently has been links to consumption. After all, it is clear that any major environmental initiative will involve promoting radical changes in the structure of consumer demand. In the wake of many highly publicized environmental disasters, and issues as diverse as road building and genetically-modified foods, another key area of interest has been environmental pressure groups, how they function and their ethical stances.

Increasingly, allied with the environmental literature is work on transport geography. Work in UK transport geography has been dominated by policy-related issues, especially those to do with personal mobility, sustainability, competition, and integration.

Transport and sustainability debates are dominated by the assumption that projected growth trends in personal mobility are not sustainable. The common thread in these debates is provided by the dual invocation of sustainability put forward in the 1992 *Rio Declaration*, which attempted to reconcile the needs, especially those of the world's poor, with protecting the environment's capacity to meet present and future needs. It is also emphasized that in addition to environmental carrying capacity, sustainability also invokes connotations of social needs and equity. The problem is that strategies of spatial planning aimed at achieving social equity also encourage mobility (*Journal of Transport Geography*, 1997). Sustainability issues shade into concerns with personal mobility and access to it. These studies do not simply address the perspective of the mobility-rich but also discuss the impacts of mobility impairment on access to goods, services and leisure activities for an extensive array of social groups defined by axes of differentiation such as age, gender and class (Hilling, 1997; Simon, 1996).

Much of the literature is concerned with the contradictions and tensions emanating from the interlocked nexus of deregulation, competition, privatization and globalization. Whichever the mode of transport, it is apparent that such policies, while they may produce more profitable and efficient transport industries, also invoke problems of unequal access to the benefits as well as exacerbating the extent of negative environmental externalities related to transport (*Journal of Transport Geography*, 1998).

Considerable attention has also been given to the role of transport in EU integration and the ways in which the development of high-speed train networks and airline liberalization are benefiting the already best-served regions and therefore undermining programmes aimed at cohesion and convergence (Graham, 1998).

Methodologies

Qualitative methodologies continue to grow in influence in British human geography; ethnography, extended interviews, focus groups – these are at the root of much current routine geographical work. Most Departments now teach qualitative methods, often extensively. And the practice of these root methods becomes increasingly sophisticated. For example, ethnographic software is now often used (Crang *et al.*, 1997; Hinchcliffe *et al.*, 1997). Again new methodologies are constantly being introduced. For example, visual methodologies are increasingly being experimented with, as are various 'performative' methodologies, derived from work in the performing arts, which both democratize the research process and make it more productive by inserting the researcher into the research process in richer but more ethical ways. Perhaps the only serious cloud on the horizon of qualitative methods is – with some noticeable exceptions – the general lack of quite simple forms of numerical rigour in surveys; for example, often quite basic sampling strategies and checks, are not being built into research projects. In other words, a whole set of survey skills which can be found in North American Social Science very rarely figure in British qualitative work.

Part of the reason for this comparative lack of rigour is that quantitative geography remains something of an island, a situation that has been both internally and externally generated. Quantitative geography has tended to continue on without much reference to or negotiation with wider changes in human geography, with the notable exception of the special issue of *Environment and Planning A* (1998) edited by Philo arising out of an RGS/IBG Annual Conference session which attempted to produce a kind of rapprochement with the rest of the discipline. In a number of ways this lack of reference or negotiation can be seen as a missed opportunity. To begin with, the quantitative grounding of the discipline is now lacking to a degree which is, in all probability, unhealthy – many human geography postgraduates and lecturers would not now know even some of the quite simple techniques which are generally regarded as helpful explanatory tools whilst the analysis of the important large and complex datasets which are now becoming available (such as the British Household Panel Survey, and the National Child Development Study) might well tax their pow-

ers. There is an irony to all this, in that quantitative geographers have been working with techniques which are becoming more and more attuned to Social Science problems. For example, multi-level modelling, a technique which became feasible in the mid-1980s with the development of efficient computational algorithms and associated software packages, offers important substantive and technical advantages over the single-level regression model, such as the ability to anticipate world-wide and ecological-level variables around precision-weighted estimates, to provide more efficient estimates of model parameters (Gould *et al.*, 1997; Jones *et al.*, 1998). Then, there is the increasing power of computers. This has allowed two developments to take place. One is the rise of developments in computers which have the potential for widespread application across geographic research (such as artificial intelligence, expert systems, research networks, fractals and chaos, quality control techniques for data and models, exploratory data analysis and data mining, super computers, cellular automata, process-based modelling, and fuzzy modelling) (Openshaw and Openshaw, 1998; Longley *et al.*, 1998). The other is the opportunities that computers present for visualization arising out of advances in computer graphics, multi-media, virtual reality and the increasing availability of spatial data. Across the social sciences and humanities, there is an increased interest in visualization. In quantitative geography this has chiefly manifested itself as the implementation of exploratory data analysis within a computing environment which allows dynamic interrogation of data, with multiple representations (maps, graphics, tables) and linked views, or as the opportunity for real time modelling, which is increasingly likely to take place in virtual environments like 'caves'. These kinds of techniques may well have as much purchase outside the quantitative arena as in it, as work by artists and those in disciplines such as performance studies and archaeology shows, yet remarkably few examples of this exciting kind of work exist in human geography, in part because of the false dichotomy still insisted upon by many human geographers between the qualitative and the quantitative, with the qualitative standing for imagination and the quantitative standing for the technical. Recent work in critical geography on information technologies and cyberspace (Crang *et al.*, 1999) and in quantitative geography on artificial intelligence, genetic algorithms, and the like (Batty, 1998), may at least begin to narrow the gap, as both practices learn something of the other.

Whatever the case, work on Geographical Information Systems continues apace, one of the chief applied bulwarks of British human geography. Much of GIS now exists outside the academic world, as a thriving commercial sector, but researchers in geography have still made major contributions (summarized in Longley *et al.*, 1999).

Theoretical debates

Theoretical debates concern a good part of British human geography. However, currently this concern is in a state of flux. The two 'posts' – poststructuralism and postcolonialism – are now very familiar beasts, although whether all their lessons have been learnt is a moot point (Doel, 1999). Certainly in the period under review, the work of poststructuralist and postcolonial writers like Foucault, Derrida, Said and Spivak has become part of normal human geographic currency (Crang and Thrift, 2000). But, at the same time, the problems of these approaches have become clearer as they have been deployed more and more routinely. Fuelled by developments in areas as diverse as new feminist theory and new thinking about materiality (as represented by, for example, Irigaray on Heidegger and Deleuze on Spinoza) the result has been a gradual distillation out of new concepts borne especially out of a discontent with banal versions of social constructionism. Three of these distillations seem particularly noteworthy.

To begin with, there has been much emphasis on the body, conceived not just as a surface on which cultural representations can be inscribed but as 'bare life' – embodied thought-in-practice. In particular, attempts are being made to understand the body as preternaturally spatial through the ways in which it forms place as a series of distributions and intensities. Second, there have been numerous attempts to consider the object-world as a force in its own right, rather than just a surface inscribed by humankind. In particular, human geographers have been in the forefront of work on actor-network theory, that body of work founded by Serres and Latour which is concerned with describing a world of quasi-objects, networks of actors which are concerned with producing spaces within which they can be effective (Thrift, 1996; Bingham, 1996; Hinchliffe, 2000; Hetherington and Law, 2000). Third, in order to better understand how people and things are combined forcefully so as to produce effects, human geographers have turned to the notion of performance – and to that enormous archive of work on performance – in order to understand qualities like intuition, improvization, and innovation (Thrift, 2000; Thrift and Rose, 2000).

Much of this non-representational work might seem as though it is only concerned with micro-orders. It is not. Rather it is a war on the notion of scale, and its replacement by a multiplying number of multiple geographies, geographies which can evolve and exhibit properties of emergence. Thus, a number of human geographers have taken up and developed ideas from fields such as complexity theory, the radical politics of Laclau and Mouffe, and work on hybrid subjectivities, to show up this process of multiplication (Massey, 1999). Put another way, human geographers are attempting to inject time into every nook and cranny of theoretical endeavour by concentrating on process

rather than product, formation rather than form, becoming rather than being. In turn, as they do so, so they are producing new accounts of a whole series of practices, accounts in which an ethic of 'relational responsibility' looms large.

Of course, we need to be careful not to exaggerate. Work in British human geography is still sometimes theoretically gestural. The empiricism which has lain at the heart of the subject since colonial times (and which, in part, gave rise to colonialism) persists and the result is that there are remarkably few British geographers who have tried to evolve a sustained theoretical project. Yet, at the same time, as the inclusion of the writings of key cultural theorists like, for example, Meaghan Morris, John Law, and Nikolas Rose in a flagship journal such as *Society and Space* shows, British human geography is no longer perceived as just a place where people do some 'quite interesting' things. It holds out at least the possibility of becoming a central place.

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