SPIRALS, BRIDGES AND TUNNELS: ENGAGING HUMAN–ENVIRONMENT PERSPECTIVES IN GEOGRAPHY

B. L. Turner II

The social sciences address the fundamental relationships of humankind with the mystical and religious, within itself, and with nature. Each relationship consists of a set of great questions that drive intellectual inquiry. These questions rise to our collective attention in particular forms, and accompanied by particular modes of analysis. Each such framing of the questions increases our range of insights as well as the base data or evidence for those insights, but also reveals limitations that lead to other framings and other questions. This process eventually returns us to the kinds of question and framing previously engaged but transformed by what was learned in the interim. This view of social-science research – which elsewhere I have likened to an upward spiral[1] – suggests that we do not solve the great questions of our research so much as change our understanding of them and, ultimately, of our fundamental relationships. Spiralling may serve the social sciences well over the long term. In the short run, however, the potential richness and increased pace of understanding is constrained by another attribute of the process – the 'sociology' of research: the different styles of research engagement. The impacts of this constraint are amplified for those addressing the human–environment relationship because historically this theme has not been central to the interest of the social sciences and its practitioners remain few compared to those engaging the other fundamental themes.

In the following, I elaborate the research spiral of the social sciences, focusing on the role of explanatory perspectives and, in particular, on the differing styles of intellectual engagement associated with them. These styles serve as significant impediments to fruitful engagement in the social sciences, diminishing contributions to the kinds of question posed by society and the research community at large.[2] Both the spiral and impacts of style are illustrated through a brief review of the recent history of geographical interests in human–environment relationships in the United States. Changes in the styles of engagement, it is suggested, will be necessary if the human–environment subfields within

0967-4608(97)EU111OA © 1997 *Arnold*

geography (and without) are to improve their contributions to the great question of 'our relationship with nature'.

Spirals of research cores

The spiral is framed by three axes – evidence and time, problem interests and perspectives of understanding (Figure 1) – and is composed of distinctive research cores.[3] These cores constitute large clusters of practitioners whose work broadly shares the qualities associated with those portions of the axes with which they align. For the social sciences the A-axis is pivotal becauase the location on it shapes the culture of the research cores, which in turn significantly influences inter-core dynamics and the upward progression of the spiral.[4]

Save perhaps in economics, the social sciences display little inclination to be wedded to a particular perspective or paradigm (Table 1). Rather, they continually reposition along the A-axis, creating new research cores. These cores rise and decline amid heated, if not formal, debate between the evangelical

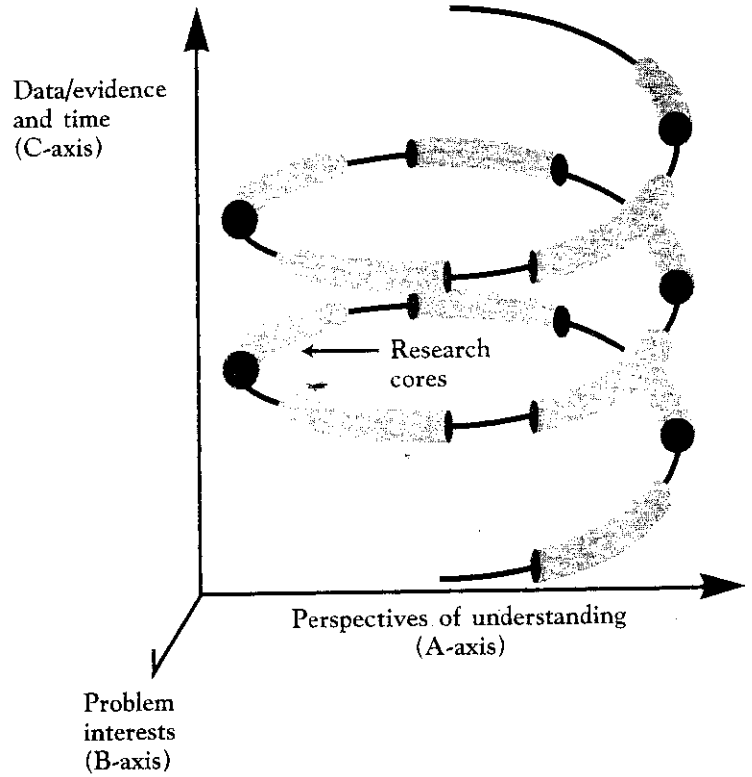

Figure 1 ~ The spiralling of research cores in the social sciences

Table 1 ~ Definitions and clarifications of terms

- *Paradigms or perspectives of understanding*
  Basic belief systems that guide disciplined inquiry; a paradigm may encompass more than one specific form of explanation.

- *Classifications of perspectives involve three fundamental qualities*
  Ontology: the nature of the knowable
  Epistemology: the relationship between the knower and the known
  Methodology: the prescribed way in which knowledge is accrued

Examples

Perspective	*Ontology*	*Epistemology*	*Methodology*
Postpositivism	Realism/ critical realism	Modified objectivism	Modified experimental
Critical theory	Critical realism	Subjectivism	Dialogic, transformative
Constructivism	Relativism	Subjectivism	Hermeneutic, dialectic

- *Modus operandi*
  The kind of contribution sought and the accepted means of achieving it, including the style of engagement.

- *Style of engagement*
  The dominant spirit, tone and argumentative character of engagement.

Definitions and labels, other than those for *modus operandi* and style of engagement, follow various contributions in Guba (n. 9).

proponents of the emerging cores and the defiant guardians of the older ones. This intellectual struggle does not proceed haphazardly, however chaotic the process may seem at times. Rather, it seems to follow a course that is registered as an oscillation across the A-axis – generating neither simple replacements of old cores nor truly novel and superior ones. Its history, as Smelser argues for sociology, is one of increasing 'numbers, complexity, and enrichment of more or less systematically expressed perspectives, frameworks, and theories'.[5] New research cores draw upon these developments, bearing the marks of subsequent intervening cores but invariably sharing similarities with older cores in reference to the broader qualities of the shared positions along the A-axis. This returning and reshaping justifies the spiral metaphor.

Spiralling never ceases, because the perspectives found within any research core are invariably limited in the kind of understanding that they generate and in their ability to engage the full range of problems that interest the social sciences at any one time. As these limitations are exposed or the problems themselves shift, new cores arise to meet them. Once entrenched in a research core, however, practitioners may be reluctant to abandon it. There are always key

issues for which their favoured perspectives add value. At any given time, therefore, multiple research cores exist within any of the social sciences. This circumstance offers the potential for intellectual 'hybrid vigour' as the cores engage by employing one another's evidence and insights to create richer understanding and, occasionally, to solve problems. Such cooperation I call 'bridging'.

This potential is seldom fulfilled. The sociology of research seems to favour a different form of engagement. As opposed to 'bridging' at the level of shared problem interests and data, cores tend to 'tunnel' into the underlying perspectives of the other cores in an attempt to collapse their foundations: emerging research cores justify themselves, in part, by demonstrating (at least to their adherents) the fundamental unsoundness of the other cores. In so doing, as Sheppard notes, there is 'a strong tendency to construct caricatures of the other [core] in order to reinforce the common identity of one's own'.[6] Contributions from older cores may be ignored or even lost to the new cores, and considerable intellectual energy is expended relearning what the older cores already knew. In return, the established cores may ignore the new ones or spend substantial energy contesting their usefulness – another form of tunnelling.[7]

The A-axis

Tunnelling may be a self-serving enterprise – protecting individual or core interests relative to job availability, research funding, editorial policies of journals or professional recognition.[8] Much of it, however, follows from the deeper qualities that define, and are associated with, the core's favoured explanatory forms or perspectives of understanding (see A-axis, Figure 1; Figure 2; Table 1). We may group these perspectives under the heading of paradigms or combinations of distinctive ontologies, epistemologies and, to a lesser extent, methodologies.[9] For the social sciences, paradigms range in the degree to which they share attributes with those of the natural sciences or the humanities.

Social science and philosophy literature is replete with definitions and descriptions of specific attributes of paradigms. I do not reiterate or interpret that literature here; to do so would deflect attention away from, and perhaps blur, the argument I seek to make (but see Table 1). It is sufficient to note that, as the natural science pole is approached, perspectives increasingly assume a postpositivist position that involves a belief in a world beyond the imagination, one of meaningful and detectable regularities and processes suitable for understanding reflexive agents, and in which the utility of theory construction, empirical referents and statistical associations is apparent. Approaching the humanities pole involves increasing belief in a world within the human imagination, one of complexities and contingencies that are best captured in the meanings of signs, symbols, icons and the languages of agents expressed in various narrative forms. Between these poles are many perspectives: for example, moving from left to right along the A-axis we encounter postpostivism, critical theory and constructivism (Figure 2).[10] Beyond either pole are perspectives that are neither well accepted nor well represented in the social sciences.

It is useful here to clarify postpostivism, a term that seems to be largely mis-

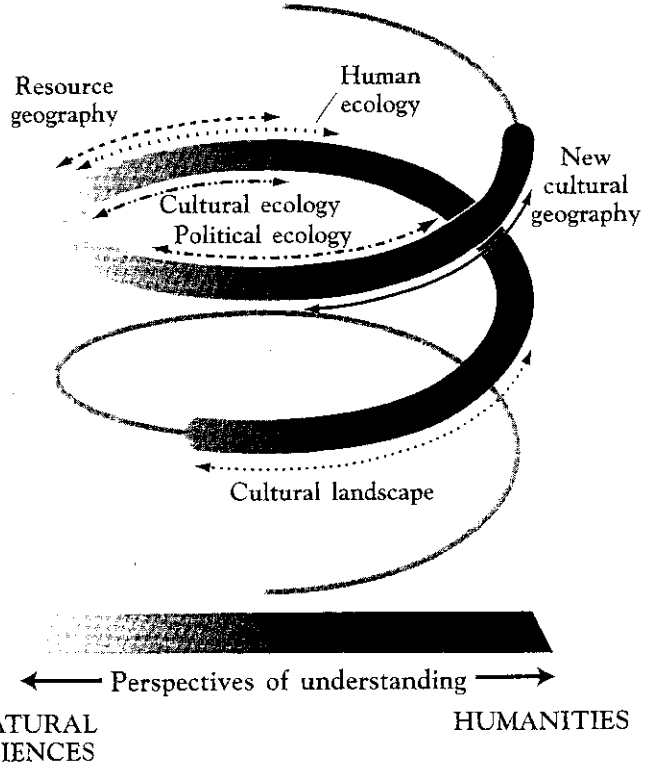

Figure 2 – The spiralling of the human–environment research cores in geography

understood in geography. The philosophy of science uses this term to refer to those perspectives emerging from the critique of postivism without rejecting all of its qualities. Perspectives which are given this label maintain realist to critical realist ontologies, objectivist epistemologies, and experimental methodologies.[11] Postpositivism is well represented throughout the social sciences, although critiques of such perspectives in geography are frequently but erroneously articulated in terms of logical postivism, a paradigm followed by few social scientists today.

No single paradigm or perspective currently dominates the social sciences, and no major shift to a dominant paradigm is apparently underway.[12] The social sciences, geography's domain included, seem to be mired in an extended phase of competing perspectives.[13] Merton recognized this condition of pluralism for sociology more than two decades ago, adding that its replacement by a dominant paradigm in the foreseeable future was not likely.[14] This condition can be an intellectually healthy one, given the increasing recognition that different perspectives are useful for illuminating different problems. This health, however, is

predicated on the effectiveness of the social sciences in bridge-building among its research cores, leading to the kind of collaboration that may enrich understanding. It is not clear, however, that this bridging is taking place in the social sciences in general or geography specifically, judging from the level of genuine appreciation and cooperation among the cores, including those of the human–environment domain.

To be sure, bridging is impeded by the profound differences among the perspectives which direct each core to discriminate differently among competing explanations or understandings. This quality is not the most significant impediment to bridging, however, and alone cannot adequately account for the prevalence of tunnelling. Equally important is the style through which the persepctive is articulated.[15] This style is codified into an accepted standard of operation or *modus operandi* – the kind of contribution that a core seeks to make and its means of achieving it. By style or style of engagement, I refer to the dominant or common spirit (cooperative to contentious), tone (respectful to condescending) and argument (empirical to polemical) through which the *modus operandi* is expressed. Among the elements that compose a *modus operandi*, perhaps none is a more important impediment to bridging than the way in which critique is valued and used, and especially the style employed in its presentation.

The natural-science pole emphasizes problem-solving over problem-framing. Problem definition tends to be anchored within the material world, and critique is largely aimed at the adequacy of the solution within the prescribed perspective. The humanities pole, by contrast, emphasizes problem-framing over attempts to solve. Problem definition and framing are inseparable, and critique focuses on the conceptual issues embedded in this nexus.

Seen from the natural-science pole, the distant perspectives towards the other pole are unwilling or unable to tackle 'real-world' problems in a useful way, and their interests in conceptual issues are mainly directed at other academics. The *modus operandi* of these perspectives is seen to reward skills of rhetoric, wit, even condescension, rather than advancement of knowledge.[16] The view from the humanist pole is equally unflattering. It sees the distant perspectives as uncritically following paradigms that are fundamentally inadequate for the study of humankind. Their *modus operandi*, with its set of 'rigorous' skills and quantitative biases, is seen to be deceptive, even dishonest. It directs understanding to a superficial (or proximate) level, offering momentary insights at best.

Whether these polar caricatures are real is not particularly important. That the research cores perceive them to be real is. Each research core views the other as lacking appreciation for its own contributions. In some cases this lack of appreciation is real and openly stated; in others it may be largely imaginary. The overall effect, however, is to stymie bridge-building and facilitate tunnelling.

Other geographers, of course, have recognized variants of my *modus operandi* argument. Gregory, for example, notes that individual geographers use their position along the A-axis (paradigmatic position) 'as a means of legislating for the proper conduct of geographical inquiry and of excluding work which lies beyond the competence of . . . [their respective positions]'.[17] My claims here differ in at least two ways: conduct reaches beyond the individual to research cores

as a whole, and our perceptions of the other cores' conduct helps to restrain us within our own. We may hide within our research cores for the reason Gregory notes, but we also are given minimal encouragement to venture beyond our cores, unless we seek the baptism of others.

Human–environment relationships in geography

Geography as a field appreciative of synthesis (meaning holism) might be expected to deal well with the range of perspectives operating among its research cores, with each core engaging the others in constructive ways that advance understanding and knowledge. This expectation also follows from geography's wide-ranging problem interests (B-axis, Figure 1), its tradition of problem-solving in context and its mode of training, which ideally emphasizes explorations across the A-axis.[18] Within the discipline, those cores dedicated to human–environment relationships should especially embrace the bridging goal, because by definition the relationships in question concern phenomena and processes whose origins and existence are both human and natural (no matter how humanly modified the natural may be).[19]

The existence of such a geographical utopia is problematic, at least as judged by the recent history of human–environment research cores in North America. Bridging is not evident among the cores at large, and tunnelling may be more common than ever. These dynamics partly stem from the cores' different but defining styles of engagement.[20]

As an illustration of these claims, I offer a cursory and highly interpretive review of the recent history of human–environment research in geography in the USA (Figures 3, 4). To do so, I take the considerable liberty of clustering the many human–environment subfields into research cores.[21] These cores represent broadly similar, shared problem interests, perspectives and *modus operandi* that are prevalent or were during various phases of the period in question. Three caveats are warranted, however. Individual practitioners may not share all the qualities of the research core with which they are identified, and they may undertake major shifts during their careers. Moreover, there are always practitioners who do not fit within any of the major cores, particularly within the simplified structure used here.[22] Finally, what constitutes 'recent' is in the eye of the beholder, and my lens is focused by my own entry into the discipline in the early 1970s.

Two major human–environment research cores existed at that time. The older and perhaps larger of the two is known by several names, but for simplicity, I label it 'cultural landscape', in reference to various uses of that term by Carl O. Sauer and many of his Berkeley cohorts. The other, 'human ecology', is largely associated with Gilbert F. White and his academic progeny at Chicago.[23]

It is well documented that the cultural-landscape core, while strongly grounded in the earth sciences and consistently inserting the 'natural' into its assessments, was resistant to positivist perspectives (at the time in question) for understanding culture or the cultural imprint on the landscape. The reach of the core, at least within Sauer's vision of historicism,[24] was towards history and the humanities, moral philosophy and alternatives to modernity.[25] The cultural

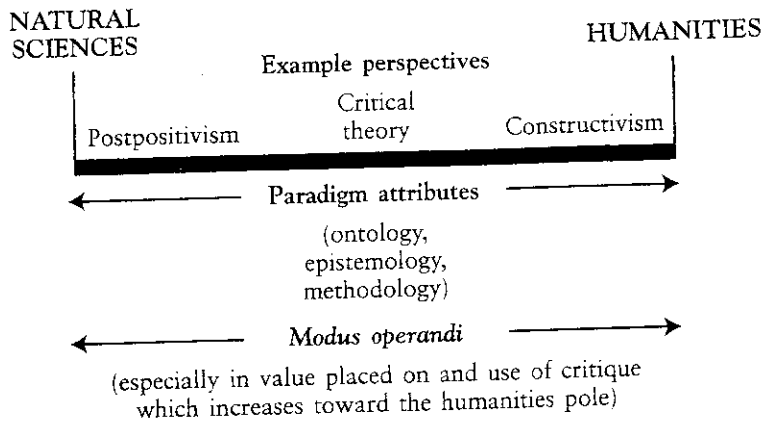

Figure 3 ~ The A-axis: perspectives of understanding

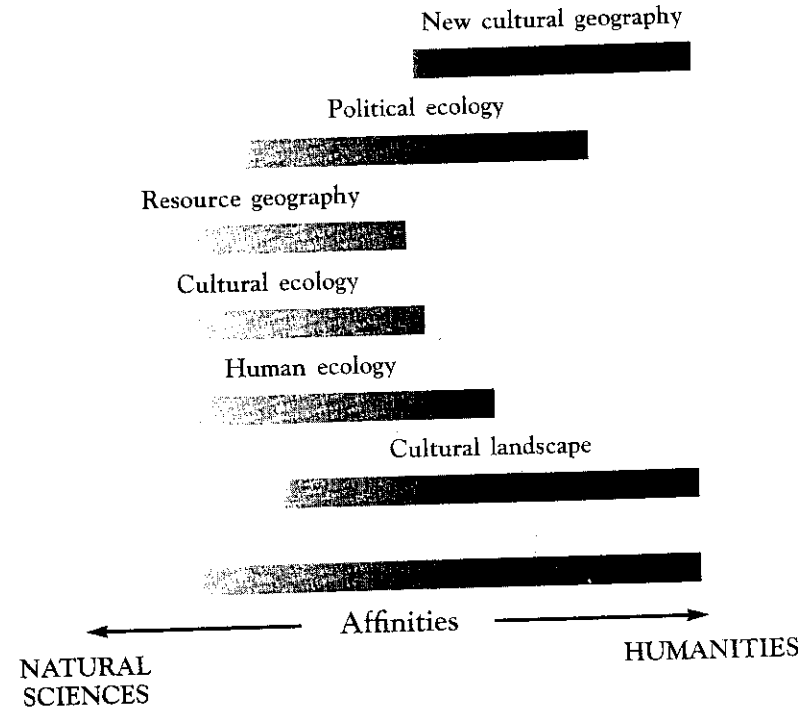

Figure 4 ~ Human–environment research cores on the A-axis

landscape core searched for understanding through a mode of observation bordering at times on the empathetic, and presented adequately in narrative.[26] The human-ecology core searched for central tendencies, general lessons and models. While embedded in 'bounded rationality' and largely avoiding formal constructions of behavioural theory,[27] it was nevertheless far closer to postpositivist perspectives and clearly adopted the associated *modus operandi*, as indicated in the work of its prominent risk-hazard subfield.[28]

Such differences provoked little tunnelling but also engendered minimal bridging, perhaps because each core considered itself under assault from 'spatial' geography. No significant collaborations were undertaken by the two cores; their influence on one another's published work is difficult to detect; and students in one core were rarely encouraged to engage the other.[29] Earth Day and the rise of environmental concerns to the highest level of social attention – ultimately leading to 'Rio' (UNCED–United Nations Conference on Environment and Development) and international programmes of research on global environmental change and sustainable development – found geography fragmented, unprepared and perhaps unwilling to take a leadership role.[30] Lacking the kind of inter-core cooperation needed, the discipline with the longest tradition of studying human–environment relationships has struggled ever since to regain its lost standing at the forefront of environmental research.

From this phase of the spiral onwards, human–environment geography becomes ever more fragmented into small subfields.[31] These subfields become increasingly difficult to associate with a single source, either an institution or a leading practitioner, and thus are more difficult to define.[32] This fragmentation notwithstanding, I collapse the human–environment subfields of the next phase into two research cores: resource geography and cultural ecology.[33] Like their predecessors, these two cores have not engaged in tunnelling *per se*, but operate in virtual isolation from one another, with no substantial bridging.[34]

Resource geography, in the sense used here, is an amalgamation of several subfields or parts of subfields: energy, water resources, environmental perception, risk and hazards research and land use.[35] These subfields, of course, include important practitioners representing different perspectives, but strong ties to human ecology, economic and spatial geography and physical geography dominate.[36] The social-science components of this core draw on underlying principles strongly aligned with behavioural and economic theory,[37] but employ a more expansive reach.[38]

A parallel movement towards the natural-science pole was also undertaken in regard to the cultural-landscape core.[39] Cultural ecology initially explored systems or system science[40] before inserting behavioural themes drawn first from ecological and adaptation theory[41] and later from behavioural and other economic theory.[42] It maintains clear if varied affinities with postpositivism, although many of its important leaders, such as Harold Brookfield, Karl Butzer and William Denevan, were never fully situated within that perspective.[43]

Tunnelling between the cores intensified subsequently, partly because, as the spiral would indicate, new research cores moved away from postpositivism and towards those perspectives with different styles of operation. Political ecology constitutes one such emergent core. Current use of that term in geography is generally traced to Blaikie and Brookfield,[44] whose work signifies the various perspectives that help to define this core. As judged by its practitioners, political ecology is not simply marxism inserted into environmental themes, but various mixtures of critical theory, new ecology and institutional and feminist interests, among others.[45] Political ecology, therefore, has become an umbrella for a variety of perspectives that hold in common a disenchantment with mainstream postpositivism, particularly its association, warranted or not, with so-called hegemonic discourse. This diversity makes difficult the demarcation between political ecology and research cores situated further towards the humanities pole.[46]

Nevertheless, political ecology as a core values critique as an essential tool, which it has aimed directly at resource geography, first to the risk-hazard subfield[47] and subsequently to other facets of that core.[48] A challenge, of course, need not constitute tunnelling, but can lead to useful engagement. In this case, however, the differing cultures clashed. The older core viewed the challenge largely as a polemic, with little likelihood of resolution and minimal real-world use. Their response was to ignore the challenge, which was in turn interpreted as a form of condescension. As political ecology matures, perhaps becoming the new status quo in human–environment research in geography according to some,[49] it increasingly emphasizes its own research outcomes rather than engaging in polemical challenges to others.[50]

This maturation, as the spiral suggests, has been accompanied by the emergence of yet another research core which challenges political ecology. This latest core brings us back full-circle to that position relative to the A-axis where we began: closer to the humanist pole and to the foundations of Ecumene.[51] Loosely affiliated with the label 'new cultural geography', this emerging core challenges all 'progressivist' and 'modernist' expressions encompassed in the other cores.[52] It seeks to re-insert humanist perspectives through the significance of human imagination,[53] to 'make, reshape, and communicate meaning with respect to physical environments, and the material and imaginative worlds'.[54] Its focus to date on the 'landscape as metaphor' redirects the kinds of human–environment inquiry dominant in the other cores towards 'the active social construction, representation and interpretation of ... cultural landscapes and their contested meanings'.[55] In so doing, it draws upon the poststructuralism and textualism of constructivist perspectives, calling for the kind of understanding gained from expressions that are more discursive, narrative and even rhetorical than those in which the other cores are grounded.[56] The new cultural geography values and uses critique similarly to political ecology, and thus has a similar *modus operandi*.

If precedents are followed, new cultural geography and political ecology will polemically engage one another, while cultural ecology and resource geography will largely ignore such engagement.[57] In either case, bridging of the kind I understand Ecumene calls for will probably not take place.

Where we stand and where we might go

The human–environment domain of geography has come full-spiral since my entry into it – from the humanist pole to the natural-science pole and back. Spiralling continues. Before the new cultural geography fully develops its human–environment dimension, other cores – perhaps some combination of the human dimensions of global change and geographical information systems-remote sensing – will appear on the horizon to pull the trajectory of the spiral back towards the natural-science pole. The pluralism of the modern social sciences, however, suggests that none of the current research cores, or its favoured perspective, is likely to dominate in the near future.[58] If this observation is true, we should ask ourselves what may be gained or lost by the choices human–environment research cores make to engage or ignore one another.

There are both pragmatic and intellectual reasons to aim for positive interactions in which the cores draw upon and recognize one another's strength and contributions, and undertake collaborative research efforts. Geography commands a minor position in American (and perhaps British) research and scholarship.[59] Its contributions to knowledge are not adequately understood; its talents are not sufficiently appreciated and are often attributed to other fields. The discipline has been and remains vulnerable. We make ourselves more vulnerable by fragmenting into small, dissociated and inward-looking research cores unwilling to appreciate one another's contributions and unable to join together in trans-core and trans-disciplinary efforts.[60] Nor do we strengthen geography's position by repeatedly investing our sparse resources in rediscovering and relearning what our predecessors already knew.[61] We may wish to deny that human–environment geography behaves in this manner, but I believe such entrenched narrow-mindedness is evident in almost every facet of our work, from seminar syllabuses to referencing in our research papers to participation in major interdisciplinary research programmes.[62]

There are, of course, legitimate intellectual differences among the human–environment research cores that are irreconcilable,[63] but this recognition does not preclude cross-core respect and cooperation. We would do well to look beyond geography to the developments emerging among those scholars and fields largely responsible for the study of paradigms in the social sciences. Here we find increasing attempts to enhance understanding through bridging, as attested by the 1989 Alternative Paradigms Conference in San Francisco. The volume based on this exchange concluded that there is a 'new spirit of ecumenicism and respect' among postpositivists *vis-à-vis* alternative expressions; that these alternatives, in turn, have begun to realize that 'continued polemic and hypercriticism are counterproductive'; and that 'it is now possible to open a dialog directed toward a reconstruction of existing paradigms, bringing them into a more ecumenical, if not consensual, posture'.[64]

Geography historically lags behind the waves or currents of intellectual ferment in academe or society at large.[65] The current waves require recognition of the decline of research-core hegemony as it may have existed in the past (if not because a single perspective is inadequate for all questions we address, then

because a single perspective will never suffice for the diversity and number of practitioners entering the human–environment subfields). It remains to be seen if we can move beyond this recognition towards a more collaborative interaction as promoted by the alternative paradigm symposium, espoused by Ecumene, and as suggested in the conclusion of the Price–Lewis and Cosgrove–Duncan–Jackson discourse. Such collaboration requires that we recognize the substantive and conceptual contributions of the many human–environment geographies, not just their limitations, and that we seek to build upon cross-core work in a more systematic manner than we have to date. This recognition and its implied engagements need not become 'a justification for naïve relativism', a position we should avoid, as Pickles and Watts argue in another vein.[66] But, as Sheppard has noted, much of the posturing over the differences among geography's spatial and urban-economic cores obscures their similarities, including those of explanatory perspective.[67] If we accept pluralism, there seems to be little reason in principle why the human–environment research cores cannot engage one another in a more productive way, potentially enhancing all the cores, geography and interdisciplinary work on human–environment relationships. The style and spirit of the engagement, it seems to me, may prove the determining factor in our success or failure to achieve a productive engagement.[68]

Human–environment geography is fortunate to have a base from which to build a positive engagement.[69] Many examples exist of bridging among individual researchers of adjacent cores;[70] and some researchers firmly anchored in one core consistently reach out to others.[71] And a few practitioners not only reach across the nearly full range of human–environment research cores but are extremely difficult to insert firmly into any one of them.[72] It is not clear to me, however, that such individuals – and their potential centrality to bridge building – are sufficiently appreciated. Their bridging behaviour is too often viewed as theoretically naïve or chaotic, especially by those anchored in the cores. Such views may be changing, however, especially among the newly certified researchers entering our ranks, who seem to be less wedded to purity of perspective and more appreciative of the strengths of the various cores. They are, as a group, more prone to follow such examples as Diana Liverman's attempts to make a bridge between risk-hazard research, as practised in human ecology and resource geography, and political ecology.[73]

Improved discourse among the research cores is a substantial start towards bridge-building. A more ambitious construction, however, awaits cooperative research programmes among the cores. The potential of human–environment geography to serve in this kind of bridging capacity is inherent, for example, in several of the international and interdisciplinary research efforts on global change (e.g. Intergovernmental Panel on Climate Change, International Geosphere–Biosphere Programme, and the International Human Dimensions Programme). And yet, our many human–environment research cores, and especially those practitioners whose outreach is primarily to the social sciences, consistently vote with their feet, failing to participate and thus ensuring that geography's potential role will not be fulfilled.

O'Riordan sees this response, and that of the social sciences in general, as embedded in the kinds of difference among the research cores outlined here.[74] We become so embroiled in the differences among our competing positions that we consistently fail to take advantage of the considerable opportunities offered to us. While the international donor community virtually pleads with the social sciences and geography to take the initiative in developing coherent, inter-core and interdisciplinary research strategies and programmes to address the human–environment condition – programmes so broadly interpreted that they encompass the full spectrum of interests among our research cores – we cannot agree on the kind of collaboration involved. Our standard notion of collaboration appears to be far more exclusive and intra-core oriented.[75] The newly emerging, AAG-sponsored programme on 'Global change, local places' may provide a measure of our real willingness to become more inclusive.

A final comment. The perspectives drawn upon by the research cores to address the fundamental theme of our relationship with nature have their origins almost exclusively in those sections of the social sciences that have paid minimal attention to this theme while emphasizing the other two. These origins privilege those other relationships as more fundamental in kind and/or envision the human–environment relationship as more synthetic. In either case, the assumption is that understanding of human–environment relationships can be adequately constructed from concepts and themes that have little, if any, foundations in those relationships. I remain unconvinced of the propriety of this assumption, although I practise it in my own research.

Our 'relationship with nature', however, is becoming increasingly important to the other social sciences and society in general.[76] This growth affords renewed opportunities for the human–environment cores of geography. Our potential to take advantage of these opportunities has much to do with our abilities to engage one another in new, productive ways. If we find those ways, our various collaborations may increase the pace of growth in the research spiral and improve the ability of the human–environment research cores to offer society a more informed understanding of the questions posed to us. Perhaps, too, they may lead to explanatory perspectives more profoundly immersed in the human–environment relationship.

Acknowledgements

The original version of this paper was delivered as the Ecumene Lecture to the Association of American Geographers, Charlotte, NC, 1996. I appreciate the opportunity to deliver the lecture afforded to me by the editors and editorial board of the journal. I thank various colleagues – Jody Emel, Dominic Golding, Susan Hanson, William Koelsch, William B. Meyer, Robert C. Mitchell, Richard Peet and Dianne Rocheleau – and the graduate students in my informal 'seminar', especially Patricia Benjamin, who offered comments on various drafts of this paper. Beyond Clark, I thank Neil Smelser, Robert Scott, Robert Sack, Eric Sheppard, Thomas Whitmore, Anthony Bebbington, Karl Butzer, William Denevan and James Parsons for their observations, and Matt W. Turner for his critical reading of the paper.

Clark University, USA

Notes

1 B. L. Turner II, 'Thoughts on linking the physical and human science in the study of global environmental change', *Research and Exploration* **7** (1991), pp. 133–5.

2 Social sciences refer to all disciplines and fields of study that engage human cognition, behaviour and structures beyond their biophysical elements alone, including portions of the humanities.

3 The A-axis is explained in the text. The B-axis, problem interests, involves the range of research topics engaged. On the C-axis, time is self-explanatory. Evidence refers to the accumulation of basic data generated over time, independent of the need to deconstruct and reinterpret that evidence.

4 Use of the spiral metaphor does not imply a teleological or goal-oriented system. The spiral moves upwards because base data or evidence accumulates through time and the amount of information generated at any moment increases, although these data may need to be reconstituted by changing perspective and questions. Spiralling, therefore, need not lead to better understanding, but it does provide the potential for richer understanding. This quality follows from the overall evidence upon which each new research core may draw as well as from the insights gained from preceding cores. This richness in understanding is only a potential inasmuch as research cores may choose to ignore the data and insights or be unable to reconstitute them within the new framing of the problems.

5 N. J. Smelser, *Sociology* (Oxford, Blackwell; Paris, UNESCO, 1994), p. 24, notes that a Kuhnian 'accumulation' model of science is not apparent in the history of sociology, and by implication the social sciences in general, because increased improvement in the validity of understanding is 'rendered invalid' by the next mode of understanding (perspectives or paradigms). The social sciences, implied in Smelser's argument, do not follow a Kuhnian pattern of paradigm advancement in the sense of improved explanations; rather, they change the fundamental structure of what constitutes explanations. Even if the accumulation model does not hold, the changing perspectives, if sufficiently appreciated, offer the potential for enriched understanding.

6 E. Sheppard, 'Dissenting from spatial analysis', *Urban Geography* **16** (1995), p. 297.

7 The impacts of this behaviour go beyond the practitioners. Their practice in seminars and elsewhere socializes their graduate students so that they learn to caricature other cores and individuals within them as well, often with minimal self-examination of the original literature.

8 See e.g. M. Komarovsky, 'Some persistent issues of sociological polemics', *Sociological Forum* **2** (1987), p. 562.

9 Some practitioners seek to define paradigms in terms of ideology. Philosophers and logicians, however, classify paradigms first on the qualities I use here (see Table 1). Ideology crosses paradigms, although it may be blurred with ontology and epistemology. See E. G. Guba, 'The alternative paradigm dialog', in Guba, ed., *The paradigm dialog* (Newbury Park, CA, Sage, 1990), pp. 17–27.

10 *Ibid.*

11 D. C. Phillips, 'Postpostivistic science: myths and realities', in Guba, *The paradigm dialog*, pp. 31–45; Guba, 'The alternative'.

[12] I recognize that this claim differs from assessments by other geographers, particularly those with postmodern orientations (e.g. Michael Dear, 'The postmodern challenge: reconstructing human geography', *Transactions of the Institute of British Geographers* **13** (1988), pp. 262–74). I support my claim by reference to the opinions of philosophers of science (e.g. Guba, 'The alternative') and major figures in those social sciences (e.g. R. K. Merton, 'Structural analysis in sociology', P. M. Blau, ed., *Approaches to the study of sociology structure* (Glencoe, IL, Free Press, 1975), pp. 21–52; Smelser, *Sociology*) from which geography typically borrows and with which geography is often out of temporal phase, as well as by an anecdote. Recently, a number of distinguished scholars were brought together at the Center for Advanced Studies in the Behavioral Sciences (CASBS, Palo Alto, CA) to discuss the state and direction of the social sciences, geography included, as preparatory work in a process undertaken by a major publisher to decide whether or not to produce a new encyclopedia of the social sciences. This group could not agree on the existence of a prevailing paradigm trajectory in the social sciences – an outcome that may appear contrary to a reading of the literature in human geography in which the sheer volume of (and reference to) works critical of postpositivism and supportive of various alternatives is striking (Sheppard, 'Dissenting', table 1, p. 288). Virtually every member of the CASBS group believed that postpositivistic views remained central to their disciplines – expressed by the majority of practitioners for some fields – and would likely remain so. Other geographers recognize the prevalence of pluralism, but they tend to neglect the role of postpositivism within mix of perspectives (e.g. E. Graham, 'Postmodernism and the possibility of a new human geography', *Scottish Geographical Magazine* **111** [1995], pp. 175–8.)

[13] Guba, 'The alternative'.

[14] Merton, 'Structural analysis'. See also M. Komarovsky, *Common frontiers of the social sciences* (Glencoe, IL, Free Press, 1957), and Smelser, 'The alternative'.

[15] K. Popper, *Conjectures and refutations* (New York, Harper & Row, 1968), p. 215.

[16] For a corresponding assessment of academic styles in general, see A. Sullivan, 'London diarist', *New Republic*, 20 Nov. 1995, p. 50.

[17] D. Gregory, 'Areal differentiation and post-modern human geography', in D. Gregory and R. Walford, eds, *Horizons in human geography* (Totowa, NJ: Barnes & Noble, 1989), pp. 67–9.

[18] Historically, geographical education has involved studies in natural science (physical geography), cognitive and behavioural sciences (human geography, cartography), and the humanities (historical and cultural geography), thus engaging a large range of perspectives of understanding. It is not clear that contemporary geographical education encourages exploration of the full range of the subfields of the discipline and hence of the perspectives associated with that range.

[19] Or, as W. Cronon ('Cutting loose or running aground?', *Journal of Historical Geography* **20** (1994), pp. 38–43) responds to D. Demeritt ('Ecology, objectivity and critique in writings on nature and human societies', *Journal of Historical Geography* **20** (1994), pp. 22–37), nature 'is not *entirely* our own invention'. Furthermore, I find some of the criticism of the human–nature dichotomy somewhat disingenuous for at least two reasons. The dichotomy has always been understood to reflect a nature perceived and often reconstituted by humankind. Its use has been a convenience denoting a reflexive agent within nature's complex. Furthermore, it is difficult to detect much difference in the actual outcomes between work overtly employing the dichotomy and work seeking to eliminate it. The possible exceptions are those extreme perspectives that would deny the existence of nature independent of the imagination – a view, it seems, that would deny the evolution of our species with its imagination.

[20] Different *modi operandi* are detectable in the way geography's subfields define and assess themselves; see G. L. Gaile and C. J. Willmott, eds, *Geography in America* (Columbus, OH, Merrill, 1989).

[21] I refer to the following subfield entries in *Geography in America*: energy geography, water resources, cultural ecology, cultural geography, environment perception and behavioural geography, contemporary agriculture and rural land use, hazards research, and geography from the left. I do not consider the recently developed 'human dimensions of global environmental change' subfield. Practitioners typically identified as 'physical geographers' are considered where their work involves a direct human component and is identified by one of the subfields noted as part of its research contributions.

[22] The contributions of Yi-Fu Tuan are a case in point. Subfields noting his influence in *Geography in America* are environmental perception, regional development and planning, hazards and regional synthesis – all subfields with strong postpositivist components. Most geographers think of Tuan as an intellectual leader in the development of humanistic geography, in opposition to postpositivism, and yet none of the subfields purporting to represent humanism in *Geography in America* makes reference to Tuan's work. See, however, the relevant sections of R. F. Abler, M. G. Marcus and J. M. Olson, eds, *Geography's inner worlds: pervasive themes in contemporary American geography* (New Brunswick, NJ, Rutgers University Press, 1992).

[23] As noted, I take considerable liberty in grouping diverse research interests into research cores. My cores will not suit those seeking more finely tuned categorization of the diverse interests found within any core, and the terms I use to identify a core will carry different meanings for different readers. For example, W. M. Denevan (pers. comm.) recognizes several subcores within Berkeley's cultural geography: cultural landscape, material culture, human impacts, origins and dispersals and human use of the earth. And L. Rowntree ('The culture landscape concept in human geography', in C. Earle, K. Mathewson, and M. S. Kenzer, eds, *Concepts in human geography* (Lanham, MD: Rowman & Littlefield, 1996), pp. 127–59) details the various meanings of cultural landscape within geography alone. I include all of Denevan's topics and approaches and those meanings identified with Sauerian traditions by Rowntree within my use of cultural landscape. My rationale for using the term is precisely that implied in Rowntree's essay – it is identified with the tradition in question, which possessed an acute interest in the 'lie of the land' as an outcome of human–environment interaction and pursued it within the broader perspective noted in the text. Even S. Paul (*Hewing to experience: essays and reviews on recent American poetry and poetics, nature and culture*, Iowa City, University of Iowa Press, p. 219), entering landscape studies from a different angle, identifies the 'Sauerian' landscape as one involving all the elements noted by Denevan above and more. Likewise, my human ecology research core encompasses various subjects that would lead to a number of subcores (and subfields), such as environmental perception and risk-hazard studies. This core, however, asked different kinds of question, took its leads from different perspectives, and reached out to different intellectual audiences from that of the cultural landscape core. I selected the term 'human ecology' because the core practitioners refer to it throughout portions of their work, if only retrospectively. Thus my human ecology core is not to be confused with other uses, such as that by K. S. Zimmerer ('Ecology as cornerstone and chimera in human ecology', in Earle *et al.*, *Concepts in human geography*, pp. 161–88), intended to capture the full corpus of human–environment research in geography.

[24] W. W. Speth, 'Historicism: the disciplinary world view of Carl O. Sauer', in M. S. Kenzer, ed., *Carl O. Sauer: a tribute* (Corvalis, Oregon State University Press, 1987), pp. 11–39.

[25] A. Bebbington and J. Carney, 'Geography in the international agricultural research centers: theoretical and practical concerns', *Annals of the Association of American Geographers (AAAG)* **80** (1990), pp. 34–48; J. N. Entrikin, 'Carl O. Sauer: philosopher in spite of himself. *Geographical Review* **74** (1984), pp. 387–408; J. Leighly, 'Ecology as metaphor: Carl Sauer and human ecology', *Professional Geographer* **39** (1987), pp. 405–12; K. Mathewson, 'Sauer south by southwest: antimodernist and the Austral impulse', in Kenzer, *Carl O. Sauer*, pp. 90–11; L. Rowntree, 'The culture landscape concept in human geography', in Earle *et al.*, *Concepts in human geography*, pp. 127–59.

[26] Two of Sauer's late career publications suggest the degree to which he moved towards the humanities in its classical traditions: *The early Spanish Main* (Berkeley, University of California Press, 1967) and *Northern mists* (Berkeley, University of California Press, 1967).

[27] M. Reuss, 1993, *Water resources people and issues: interview with Gilbert F. White* (Fort Belvoir, VA, US Army Corps of Engineers, 1993); J. L. Wescoat, Jr, 'The "practical range of choice" in water resource geography', *Progress in Human Geography* **11** (1987), pp. 41–59.

[28] See e.g. I. Burton, R. W. Kates and G. F. White, *The environment as hazard* (New York, Oxford University Press, 1978); J. K. Mitchell, 'Hazard research', in Gaile and Willmott, *Geography in America*, pp. 410–24. Human ecology questioned various facets of positivism, if only indirectly, through its emphasis on cognition and reflexivity. Critiques of human ecology, however, often imply that it was aligned completely with the logical positivist paradigm of its time.

[29] Geography at the University of Chicago was an exception. Faculty of both cores were present, as well as those that would help to direct the emergence of cultural ecology. A review of human–environment dissertations from Chicago indicates a greater appreciation of the various cores than I claim for geography in general.

[30] See R. W. Kates, 'The human environment: the road not taken, the road still beckoning', *AAAG* **77**(4), pp. 525–34. Missing in many assessments of geography's position in the rise of environmental studies in American universities is the overall weak role apparently played by physical geography *vis-à-vis* ecology and other natural sciences. I too omit it here, save that many physical geographers directly engage and influence certain human–environment cores.

[31] This fragmentation is difficult to attribute to the exceptional growth in the number of practitioners (see A. D. Hill and L. A. LaPrairie, 'Geography in American education', in Gaile and Willmott, *Geography in America*, pp. 1–26). It may reflect more the trend in science towards basing expertise on increasingly narrow subject domains. Regardless of the cause, fragmentation served as an impediment to the traditional, synthetic character of geographical contributions to research. Geographers began to mimic in their research the parallel speciality fields in other disciplines, and pay less attention to the more integrative perspective that is somewhat peculiar to the geographical tradition; they were increasingly thrust into a specialist-synthesis dilemma (B. L. Turner II, 'The specialist-synthesis approach to the revival of geography: the case of cultural ecology', *AAAG* **79** (1989), pp. 88–100).

[32] The Price–Lewis and Cosgrove–Duncan–Jackson debate in the 1993 issues of the *AAAG* illustrates this point. This debate focused on the distinctions between what I refer to here as the cores of cultural landscape and new cultural geography. See M. Price and M. Lewis, 'The reinvention of cultural geography', *AAAG* **83** (1993), pp. 1–17; 'Reply: on reading cultural geography', *AAAG* **83** (1993), pp. 520–2; D. Cosgrove, 'Commentary on the reinvention of cultural geography', *AAAG* **83** (1993), pp. 515–17; J. S. Duncan, 'Commentary on the reinvention of cultural geography', *AAAG* **83** (1993), pp. 517–18; P. Jackson, 'Berkeley and beyond: broadening the horizons of cultural geography', *AAAG* **83** (1993), pp. 519–20.

[33] These two cores differ more in their substantive interests and disciplinary outreach than in the broader perspectives taken. Resource geography is strongly 'western world'-oriented, with strong links to economics, political science and policy studies. Cultural ecology, in contrast, is strongly 'non-western world' in orientation, with strong affinities to anthropology, ecology and agricultural economics applied to smallholders.

[34] I recognize that a small set of influential practitioners existed at this time who do not fit into either of these two cores as I define them. I refer to those espousing more humanistic approaches to human–environment relationships, e.g. A. Buttimer and D. Seamons, eds, *The human experience of place and space* (London, Croom Helm, 1980); D. Lowenthal, 'The pioneer landscape: an American dream', *Great Plains Quarterly* **2** (1982), pp. 5–19; Y. F. Tuan, *Topophilia: a study of environmental perception, attitudes, and values* (New York, Pantheon, 1976). The subfield referencing them in *Geography in America* is environmental perception, to which these and other individuals sharing their vision contributed. And yet the trajectory of their work is against the postpositivism that dominates much of the two cores. I am reluctant to award these practitioners the status of a separate research core, if only because of their small numbers for the period in question. This problem illustrates an important point: my cores are aggregations and abstractions that mask the variability of perspectives held at any one time.

[35] Gaile and Willmott, *Geography in America*.

[36] S. L. Cutter, ed., *Living with risk* (London, Arnold 1993); W. I Graf, *Plutonium and the Rio Grande* (New York, Oxford University Press, 1994); J. D. Ives and B. Messerli, *The Himalayan dilemma: reconciling development and conservation* (New York, Routledge and United Nations University, 1989); T. R. Lakshmanan and P. Nijkamp, eds, *Systems and models for energy and environmental analysis* (Aldershot, UK, Gower, 1983).

[37] R. C. Mitchell and R. T. Carson, *Using surveys to value public goods: the contingent valuation method* (Washington, DC: Resources for the Future/Johns Hopkins University Press, 1989).

[38] R. W. Kates, C. Hohenemser and J. X. Kasperson, *Perilous progress: technology as hazard* (Boulder, CO, Westview, 1984); S. Krimsky and D. Golding, eds, *Social theories of risk*, (London, Praeger, 1992); T. J. Wilbanks, 'Sustainable development in geographic context', *AAAG* **84** (1994), pp. 541–57.

[39] Following P. L. Wagner and M. W. Mikesell, *Readings in cultural geography* (Chicago, University of Chicago Press, 1962) and perhaps implied in Price and Lewis ('The reinvention' and 'Reply'), cultural ecology in geography may be identified as a direct offshoot of the cultural landscape core as merged with cultural ecology in anthropology. As noted by J. Leighly ('Ecology as metaphor: Carl Sauer and human ecology', *Professional Geographer* **39** (1987), pp. 405–12), however, the Sauerian vision of this core, at least in its later stages of development, did not favour the more 'restrictive' view appended to cultural ecology, including its strong links to science (Price and Lewis, 'Reply', p. 521). Thus, while cultural ecology drew much of its subject interest from the cultural landscape core (and its anthropological counterpart), the basic approaches taken were different in their intent and were strongly influenced by practitioners of foreign training, specifically Harold Brookfield and Karl Butzer (K. W. Butzer, 'Cultural ecology', in Gaile and Willmott, *Geography in America*, pp. 192–208;

Turner, 'The specialist-synthesis') as well as by the sustained influences of Julian Steward, Robert Netting, and cultural ecologists in anthropology.

[40] K. W. Butzer, *Archaeology as human ecology: theory and method for a contextual approach* (Cambridge, Cambridge University Press, 1982); D. R. Stoddart, 'Geography and the ecological approach: the ecosystem as a geographical principle and method', *Geography* **50** (1965), pp. 242–51.

[41] W. M. Denevan, 'Adaptation, variation and cultural geography', *Professional Geographer* **35** (1983), pp. 399–407.

[42] R. C. Netting, *Smallholders, households: farm families and the ecology of intensive, sustainable agriculture* (Stanford, CA, Stanford University Press, 1993). See Zimmerer, 'Ecology' for a different interpretation of the various components of cultural and human ecology.

[43] It is important to note, however, that leading cultural ecologists strongly identify with 'culture' as a complex concept that cannot be adequately treated through the simplifications of generalizations and theory alone. Thus, while cultural ecology involved a move toward the natural science pole as framed here, its links with the humanities pole remained strong. See e.g. K. W. Butzer, 'Towards a cultural curriculum for the future', in K. E. Foote, P. J. Hugill, K. Mathewson and J. M. Smith, eds, *Re-reading cultural geography* (Austin, University of Texas Press, 1994), pp. 409–28.

[44] P. Blaikie and H. C. Brookfield, *Land degradation and society* (London, Methuen, 1987). I read this work as an attempt at bridging in the sense that I use that term here. Others have subsequently employed the term 'political ecology' with different meanings and possibly intent (e.g. R. Peet and M. Watts, 'Development theory and environment in an age of market triumphalism', *Economic Geography* **69** (1993), pp. 227–53). Thus not only is the practice of political ecology diverse, the *modus operandi* varies from bridging to tunnelling.

[45] D. Rocheleau, B. Thomas-Slayter, and E. Wangari, eds, *Feminist political ecology: global perspectives and local expressions* (New York, Routledge, 1996); M. J. Watts, *Silent violence: food, famine, and peasantry in northern Nigeria* (Berkeley, University of California Press, 1983); M. J. Watts, 'Powers of production: geographers among peasants', *Environment and Planning D* **5** (1987), pp. 215–30; Karl S. Zimmerer, 'Human geography and the "new ecology": the prospect and promise of integration', *AAAG* **84** (1994), pp. 108–25.

[46] See e.g. A. Sayer, 'Epistemology and conceptions of people and nature in geography', *Geoforum* **10** (1979), pp. 19–43.

[47] K. Hewitt, ed., *Interpretations of calamity* (Boston, Allen & Unwin, 1983).

[48] J. Emel and R. Peet, 'Natural resources and hazards', in N. Thrift and R. Peet, eds, *New models in geography* (London, Unwin, 1989), pp. 49–76.

[49] L. Rowntree, K. Foote and M. Domosh, 'Cultural geography', in Gaile and Willmott, *Geography in America*, p. 212.

[50] The history of articles in *Antipode* and *Environment and Planning D: Society and Space* maps this change in emphasis through time.

[51] Without restaging the Price–Lewis and Cosgrove–Duncan–Jackson debate, we must recognize that the new cultural geography and landscape history cores occupy similar positions relative to the A-axis and the other research cores. Many of the attributes ascribed to Sauerian historicism (cultural landscape or 'old cultural geography') seem present in the new cultural geography (Speth, 'Historicism', pp. 26–7). This observation does not, of course, deny the many differences between the two. If there were none, the metaphor of the spiral should be replaced by an ellipse.

[52] Sheppard ('Dissenting') makes a similar argument for a 'new social theory' core within spatial geography.

[53] D. Cosgrove and S. Daniels, eds, *The iconography of landscape: essays on the symbolic representation design, and use of past environments* (Cambridge, Cambridge University Press, 1988); D. Gregory, *Geographical imaginations* (Cambridge, MA, Blackwell, 1994).

[54] D. Cosgrove and J. Duncan, Editorial, *Ecumene* 1 (1994), p. 3. New cultural geography addresses many subjects other than human–environment relationships, and the component within it that does has focused on the built landscapes of urban environments (see D. Demeritt, 'The nature of metaphors in cultural geography and environmental history', *Progress in Human Geography* **18** (1994), pp. 163–85; Demeritt, 'Ecology'). *Ecumene* – serving as a major outlet for this research core among geographers – specifically calls for work that topically fits within the broader traditions of human–environment studies, however.

[55] Demeritt, 'The nature of metaphors' (p. 167) searches mightily to find a common ground between the reality of nature and human constructions of it. It is somewhat surprising in his 'Ecology', therefore, that he seems to move fully into the constructivist position, as noted in Cronon's ('Cutting loose') reply. Like Cronon, I concur with much of Demeritt's argument. His case, however, partially employs a 'straw person' logic to which I take exception. Thus we are informed, for example, that the work of A. W. Crosby (*The Columbian exchange: biological and cultural consequences of 1492* (Westport, CT, Greenwood, 1972); *Ecological imperialism: the biological expansion of Europe, 900–1900* (New York, Cambridge University Press, 1986)) borders on biological determinism because it fails to emphasize the social struggles embedded within the subjects. I find it difficult to accept this conclusion, simply because Crosby chooses to write on the biological impacts in question without entering into the complexities of accompanying social relationships. That Demeritt does so conclude may have much to do with his favoured perspective.

[56] Cosgrove and Duncan, Editorial, p. 3.

[57] One of the few rebuttals of postmodern and new cultural geography critiques by a geographer sympathetic to postpositivistic perspectives and our human–environment traditions is R. Symanski, 'Contested realities: feral horses in outback Australia', *AAAG* **84** (1994), pp. 251–69. I suspect that few others with such sympathies will engage in such public debate.

[58] Of course, other geographers recognize this condition, although most imply that this pluralism involves perspectives that fall along the middle and right portion of the A-axis (Fig. 2). See Graham, 'Postmodernism'.

[59] *Rediscovering geography*, the National Academy of Sciences' forthcoming assessment of geography's contribution to science and problem-solving, indicates a renewed interest in the discipline by those outside it. That the NAS speaks of a 'rediscovery' also indicates geography's low standing (see e.g. R. F. Abler, 'Desiderata for geography: an institutional view from the United States', in R. J. Johnston, ed., *The challenge for geography: a changing world, a changing discipline* (Cambridge, MA, Blackwell, 1993), pp. 1–23). We must also recognize that part of the rediscovery involves the significant impact of geographical information systems as an analytical tool beyond the confines of the discipline, providing a springboard for more spatially explicit approaches to problem-solving. Geography and its human–environment domain should use this opportunity to benefit the status of whole discipline.

[60] D. Gregory ('Areal differentiation and post-modern human geography', in Gregory and Walford, *Horizons in human geography*, pp. 67–9) and J. Pickles and M. J. Watts ('Paradigms for inquiry', in Abler, Marcus and Olson, *Geography's inner worlds*, pp. 301–26), describe fragmentation as a means by which research cores justify not dealing with one another, presumably in terms of substance as well as perspective. The

source of the fragmentation, therefore, is internal, involving insecurities or some other attributes of the cores. Undoubtedly, there is some validity in this view. On the other hand, the differing *modi operandi*, as I attempt to articulate them here, operate as external impediments to bridging, thus reinforcing the fragmentation.

[61] Abler, 'Desiderata', pp. 17–18.

[62] Unfortunately, I have no more than personal (participatory) observation to support my conclusion, and would welcome a more rigorous and thoughtful assessment. My observations suggest to me that on average all cores do not equally recognize the contributions of other cores. And various attempts by some cores and practitioners to engage the many in truly collaborative assessments and research have not been very successful.

[63] R. D. Sack, 'The realm of meaning: the inadequacy of human–nature theory and the view of mass consumption', in B. L. Turner II *et al.*, eds, *The earth as transformed by human action* (Cambridge, Cambridge University Press, 1990), pp. 659–72.

[64] E. G. Guba, 'Carrying on the dialog', in *The paradigm dialog*, pp. 368–78.

[65] Dear, 'The postmodern challenge'; R. W. Kates, 'The human environment: the road not taken, the road still beckoning', *AAAG* **77** (1987), pp. 525–34.

[66] Pickles and Watts, 'Paradigms', p. 303.

[67] Sheppard, 'Dissenting'.

[68] Other geographers have recognized the need to improve such engagement. Those calling for it, however, differ from my views in at least one of two ways. As noted previously, they confer the status of competing perspectives in the social sciences largely on those falling from the middle to right portion of the A-axis (e.g. Dear, 'The postmodern challenge'; Graham, 'Postmodernism'), by implication dismissing perspectives of a postpositivist kind. And/or they imply that the social sciences display a directionality along the A-axis of those perspectives that will dominate in the near future. As noted in Guba ('The alternative'), Merton ('Structural analysis'), and many others outside geography (see n. 12 above), competing perspectives extend along the full range of the A-axis. and the postpositivism dismissed by some geographers will remain a central component of the larger social sciences into the foreseeable future.

[69] Unfortunately, much of this bridging is accompanied by the apparent requirement to denounce 'straw person' logical positivism, as if the dead horse has to be beaten regularly lest it rise to run another race. This practice among geographers seems misguided to me for at least two reasons. First, as I have noted throughout, few, if any, logical positivists remain in human geography, and the many postpositivists that do cannot be equated or dismissed so simply. Second, a historical perspective surely suggests that the social-science research spiral will swing back towards the natural-science pole: The silks of the dead horse may race again, but on a new steed.

[70] Blaikie and Brookfield, *Land degradation.*

[71] J. Carney, 'Converting the wetlands, engendering the environment: the intersection of gender with agrarian change in the Gambia', *Economic Geography* **69** (1993), pp. 329–48; B. J. Cook, J. L. Emel, and R. E. Kasperson, 'Organizing and managing radioactive waste disposal as an experiment', *Journal of Policy Analysis and Management* **9** (1990), pp. 339–66; Jody Emel, 'Are you man enough, big and bad enough? Ecofeminism and wolf eradication', *Environment and Planning D: Society and Space* **13** (1995), pp. 707–34; J. L. Emel and R. Peet, 'Resource management and natural hazards', in Peet and N. Thrift, eds, *New models in geography* I (London, Unwin Hyman, 1989), pp. 49–76; D. M. Liverman, 'Drought impacts in Mexico: climate, agriculture, technology, and land tenure in Sonora and Puebla', *AAAG* **80** (1990), pp. 49–72; 'Evaluating global models', *Journal of Environmental Management* **29** (1989), pp. 215–35;

K. S. Zimmerer, 'Soil erosion and social discourses: perceiving the nature of environmental degradation', *Economic Geography* **69**(3), pp. 312–27; 'The origins of Andean irrigation', *Nature* **378** (1995), pp. 481–3.

[72] A. Bebbington, 'Modernization from below: an alternative indigenous development?', *Economic Geography* **69** (1993), pp. 274–92; Bebbington and Carney, 'Geography in the international agricultural research centers', *AAAG* **80**(1): pp. 34–48; A. Bebbington and G. Thiele, *Non-governmental organizations and the state in Latin America: rethinking roles in sustainable agricultural development* (New York, Routledge, 1993); J. L. Wescoat, Jr, 'The "practical range of choice" in water resource geography'; 'The "right of thirst" for animals in Islamic water law: a comparative approach', *Environment and Planning D: Society and Space* **13** (1995), pp. 637–54.

[73] D. M. Liverman, 'Vulnerability to global environmental change', in R. E. Kasperson, K. Dow, D. Golding and J. X. Kasperson, eds, *Understanding global environmental change: the contributions of risk analysis and management* (Worcester, MA: Graduate School of Geography and Center for Technology, Environment, and Development, 1990), pp. 27–44.

[74] T. O'Riordan, 'On integrating science for global environmental change', plenary address, Annual Meeting, Human Dimensions of Global Change (International Social Science Council), Geneva, 1995.

[75] I recognize, however, that the *modus operandi* has much to do with a core's view of how to go about inter-core collaboration. For some, this entails the announcement of a special edition of a journal or a compendium and requests for various core practitioners to participate. For others, it is the development and implementation of integrative projects or programmes, a far more difficult kind of collaboration.

[76] D. Stoddart ('To claim the high ground: geography for the end of the century', *Transactions of the Institute of British Geographers* n.s. **12** (1987), pp. 327–36) and D. Demeritt ('The nature of metaphors'; 'Ecology') have noted this point for historical geography and climate history. The implications for other areas of geography can be found in P. Stern, O. Young and D. Druckman, eds, *Global environmental change: understanding the human dimensions* (Washington, DC, National Academy Press, 1992).