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'Societies' and the Global

Introducing the Global

It increasingly seems that we are living through some extraordinary times involving massive changes to the very fabric of normal economic, political and social life. Analogies have been drawn with a century or more ago, when a somewhat similar restructuring of the dimensions of time and space took place. New technological and organizational innovations 'compressed' the time taken to communicate and travel across large distances. Some of these momentous innovations that changed time-space a century ago included the telegram, the telephone, steamship travel, the bicycle, cars and lorries, skyscrapers, aircraft, the mass production factory, X-ray machines and Greenwich Mean Time (see Kern 1983). Together these technological and social innovations dramatically reorganized and compressed the very dimensions of time and space between people and places.

   Today some rather similar changes seem to be occurring. The 1990s saw the growth of the Internet with a take-up faster than any previous technology. There will soon be 1 billion users worldwide. The dealings of foreign exchange that occur each day are worth $1.4 trillion, which is sixty times greater than the amount of world trade. Communications 'on the move' are being transformed, with new mobile phones now more common in the world than conventional land-line phones. There are 700 million international journeys made each year, a figure predicted to pass 1

billion very soon. Microsoft pointedly asks: 'where do you want to go today?' and there are many ways of getting 'there'.

At the same time tens of millions of refugees and asylum-seekers roam the globe, with three billion people across the world receiving the same total income as the richest 300. Globally branded companies employing staff from scores of different countries have budgets that are greater than those of individual countries. Images of the blue earth from space or the golden arches of McDonald's are ubiquitous across the world and especially upon the billion or so TV sets. A huge array of public and private organizations has arisen seeking to produce, govern, surveil, terrorize and entertain this 'spaceship earth', including some 17,000 trans-border civic associations.

Thus new technologies are producing 'global times' in which the distances between places and peoples again seem to be dramatically reducing. Some writers even suggest that time and space are 'de-materializing', as people, machines, images, information, power, money, ideas and dangers are all, we might say, 'on the move', travelling at bewildering speed in unexpected directions from place to place, from time to time.

Various commentators have tried to understand these exceptional changes. Anthony Giddens (1990) has described modern social life as being like a massive out-of-control 'juggernaut' lurching onwards but with no driver at the wheel. The journalist Frances Cairncross (1995) describes in detail the 'death of distance' that these various technologies seem to produce. Zygmunt Bauman (2000) talks of the speeded-up 'liquid modernity' as opposed to the fixed and given shapes that the modern world had earlier taken. Manuel Castells (2001) has elaborated the growth of an 'Internet galaxy' that has ushered the world into a wholly different informational structure. Michael Hardt and Antonio Negri (2000) have provocatively suggested that notions of nation-state sovereignty have been replaced by a single system of power, what they call 'empire', while many writers, indeed more than 100 a year, have described and elaborated the so-called globalization of economic, social and political life.

In this book I show how various 'global' processes raise major implications for most of the categories by which sociology and the other social sciences have examined the character of social life.

'Globalization' debates transform many existing sociological controversies, such as the relative significance of social structure, on the one hand, and human agency, on the other. Investigating the global also dissolves strong dichotomies between human subjects and physical objects, as well as that between the physical sciences and the social sciences. The study of the global disrupts many conventional debates and should not be viewed as merely an extra level or domain that can be 'added' to existing sociological analyses that can carry on regardless. 'Sociology' will not be able to sustain itself as a specific and coherent discourse focused upon the study of given, bounded or 'organized' capitalist societies. It is irreversibly changed.

So far, however, globalization studies are at an early stage of recording, mapping, classifying and monitoring the 'global' and its effects (see Castells 1996, 1997, 1998; Held et al. 1999; Scholte 2000). A new social science paradigm, of globalization, is developing and extending worldwide, but so far it remains somewhat 'pre-scientific'. It concentrates upon the nature of the global 'region' that is seen as competing with, and dominating, the societal or nation-state 'region'. Globalization studies pose a kind of inter-regional competition between the global and each society, the global on such a view being regarded as an overwhelming, singular causal force.

Whether writers are critics of, or enthusiasts for, the global, globalization gets attributed exceptional power to determine a massive range of outcomes. Furthermore, 'globalization' is often taken to refer both to certain processes (from the verb, to globalize) and to certain outcomes (from the noun, the globe). Both get designated as globalization, as both 'cause' and 'effect' (Rosenberg 2000).

In order to develop the analysis here I suggest there are five major globalization debates and claims that should be clearly distinguished from each other. There is no single and agreed-upon globalization thesis. These five theories are based respectively upon the concepts of structure, flow, ideology, performance and complexity. Each recurs at different points in this book – but I especially develop the implications of the last. This book sets out and defends a complexity approach to globalization, an approach that elaborates the *systemic* and *dynamic* character of what I previously called 'disorganized' capitalism.

The structural notion of the global

Chase-Dunn, Kawano, and Brewer (2000: 78) maintain that globalization is defined as the increased density of international and global interactions, compared with such interactions at the local or national levels (see Castells 1996; Held et al. 1999; Scholte 2000). There has been an increase in structural globalization with the greatly heightened density of such global interactions, although this is not simply a new phenomenon. This increased density of interactions is seen to result from a number of causes. There is the liberalization of world trade and the internationalizing of the organization of much capitalist production. There is the globalizing of the consumption of many commodities and the declining costs of transportation and communications. Interregional organizations are more significant with the internationalizing of investment and the general development of a 'world system'.

These together produce a revised structural relationship between the heightened density of the global *and* the relatively less networked, less dense, local/national levels. Globalization is not the property of individual actors or territorial units. It is an emergent feature of the capitalist economy as a whole, developing from the interconnections between different agents, especially through new forms of time–space 'distanciation' across the globe *and* of the compression of time–space relations (Jessop 2000: 356). This produces the 'ecological dominance' of globalizing capitalism.

Relatedly it is argued that this dominance both stems from, and reflects, the growth of a 'transnational capitalist class' that is centred within transnational corporations that are 'more or less in control of the processes of globalization' (Sklair 2001: 5). US presidential candidate Ralph Nader summarized this thesis through the concept of 'corporate globalization'.

The global as flows and mobilities

These flows are seen as moving along various global 'scapes', including the system of transportation of people by air, sea, rail, motorways and other roads. There is the transportation of objects

via postal and other systems. Wire, coaxial and fibre-optic cables carry telephone messages, television pictures and computer information and images. There are microwave channels that are used for mobile phone communications. And there are satellites used for transmitting and receiving phone, radio and television signals (Appadurai 1990; Lash and Urry 1994; Castells 1996; Held et al. 1999). It is argued that, once such physical and organizational scape structures are established, then individuals, companies, places and even societies try to become nodes within such scapes.

Various potential flows occur along these scapes. Thus *people* travel along transportation scapes for work, education and holidays. *Objects* that are sent and received by companies and individuals move along postal and other freight systems. *Information, messages and images* flow along various cables and between satellites. *Messages* travel along microwave channels from one mobile phone to another.

These scapes and flows create new inequalities of access. What becomes significant is the 'relative', as opposed to the 'absolute', location of a particular social group or town or society in relationship to these multiple scapes. They pass by some areas while connecting others along information and transportation rich 'tunnels'. These can compress the distances of time and space between some places while enlarging those between others (Brunn and Leinbach 1991; Graham and Marvin 2001).

Globalization as ideology

This neo-liberal view is articulated by transnational corporations and their representatives and by various politicians and journalists (see Fukuyama 1992; Ohmae 1992). Such corporations operate on a worldwide basis and often lack any long-term commitment to particular places, labour forces or even societies. Thus those with economic interests in promoting capitalism across the globe maintain that globalization is both inevitable and natural *and* that national states or nationally organized trade unions should not regulate or direct the inevitable march of the global marketplace. What is viewed as crucial is 'shareholder value', so that labour markets should be made more flexible and capital should be able to invest or disinvest in industries or countries at will.

In this account, globalization is seen as forming a new epoch, a golden age of cosmopolitan 'borderlessness'. National states and societies are thought unable to control the global flows of information. Such a borderless world is seen as offering huge new opportunities to overcome the limitations and restrictions that societies and especially national states have historically exercised on the freedom of the 44,000 trans-border corporations to treat the world as 'their oyster'. There were incidentally only 7,000 such corporations in the 1960s (Scholte 2000: 86). The World Trade Organization both symbolizes this neo-liberal notion of globalization as ideology and represents such an interest, often spreading such notions through closed seminars for business leaders, academics and free-market politicians (see account and critique in Monbiot 2000).

Globalization as performance

Drawing on ideas about the analysis of gender as involving enactment, process and performance, Franklin et al. (2000: 1–17) argue that the global is not so much a 'cause' of other effects but an effect. It is enacted, as aspiration rather than achievement, as effect rather than condition, and as a project to be achieved rather than something that is pre-given. The global is seen as coming to constitute its own domains. It is continuously reconstituted through various material and semiotic processes. Law and Hetherington maintain that 'global space, is a material semiotic effect. It is something that is made' (1999).

And to perform the global implies that many individuals and organizations mobilize around and orchestrate phenomena that possess and demonstrate a global character. A good example of this involves how the idea of a separate and massively threatened 'global nature' has been produced and performed. What were once many apparently separate activities are now regarded as interconnected components of a single global crisis of the natural world (see Wynne 1994). This global nature has resulted from fusing various social practices that are remaking space. These include images of the earth from space and especially the Apollo 17 photograph of the 'whole earth' taken in 1972, transport policies, deforestation, energy use, media images of threatened iconic

environments which are often markers of global threats, dramatic
environmental protests, scientific papers on climate change, the
ending of the cold war, NGO campaigns, records of extreme
weather events, pronouncements by global public figures, global
conferences such as Rio and Kyoto, and so on. Together these prac-
tices are performing a 'global nature', a nature that appears to be
undergoing change that needs to be vigorously and systematically
resisted and indeed reversed.

Global complexity

This conception is nowhere developed in detail, but Rifkin (2000:
191–3) analyses the implications of what he calls the 'new physics'
for the study of property relations in the emerging capitalist world
(see also Capra 2002). Rifkin notes that contemporary 'science'
no longer sees anything 'as static, fixed and given'. The observer
changes that which is observed, apparent hard-and-fast entities are
always comprised of rapid movement, and there is no structure
that is separate from process. In particular, time and space are not
to be regarded as containers of phenomena, but rather all physi-
cal and social entities are constituted through time and through
space. These ideas from the 'new physics' will be elaborated below,
so as to explore better the extraordinary transformations of time–
space that 'globalization' debates both signify and enhance.

   Complexity does not, of course, solve all the problems of the
social sciences. Nor is globalization only and exhaustively com-
prehensible through complexity. And most of all I am not sug-
gesting that the 'social' implications of complexity are clear-cut.
But I do suggest that, since the systemic features of globalization
are not well understood, the complexity sciences may provide
concepts and methods that begin to illuminate the global as a
system or series of systems (for a similar formulation from within
'complexity', see Capra 2002).

   In coupling together the 'global' and 'complexity', the aim is to
show that the former comprises a set of emergent systems pos-
sessing properties and patterns that are often far from equilibrium.
Complexity emphasizes that there are diverse networked time–
space paths, that there are often massive disproportionalities
between causes and effects, and that unpredictable and yet

irreversible patterns seem to characterize all social and physical systems.

Some of this 'new physics' is also present in the so far most significant examination of the new global order, Manuel Castells's *The Information Age* (1996, 1997, 1998). His argument rests upon a 'complexity' conception of the global, although this is somewhat buried in the astonishing mass of material he presents. I now set out aspects of his argument, especially relating to the concept of 'network', before noting its 'complexity' components. His focus on networks will also be central to the analysis that follows below.

The Network Society

Castells (2000) argues that there are various technological paradigms, a cluster of interrelated technical, organizational and managerial innovations. Their advantages lie in their superior productivity in accomplishing assigned goals through synergy between their components. Each paradigm is constituted around a fundamental set of technologies, specific to the paradigm, and whose coming-together into a synergistic set establishes the paradigm.

Castells views information/communication technologies (including genetic engineering) as the basis of the new paradigm that developed within especially North America during the 1970s and 1980s. The main properties of this new informational paradigm are that the building blocks are bits of electronically transmitted information. Such technologies are pervasive, since information has become integral to almost all forms of human practice. Complex and temporally unpredictable patterns of informational development occur in a distributed fashion in very specific localities. Technologies are organized through loosely based and flexibly changing networks. These different technologies gradually converge into integrated informational systems, especially the once-separate biological and microelectronic technologies. Such systems permit organizations to work in real time 'on a planetary scale'. These instantaneous electronic impulses produce a 'timeless time' and provide material support for the

development of new scapes, with the instantaneous flows of information being the precondition for the growth of global relations.

This new informational paradigm is characterized by the network enterprise (see Castells 1996, 2000, 2001). This is a network made from either firms or segments of firms, and/or from internal segmentation of firms. Large corporations are internally decentralized as networks. Small and medium businesses are connected in networks. These networks connect among themselves on specific business projects, and switch to another network when the project is finished. Major corporations work in a strategy of changing alliances and partnerships, specific to a given product, process, time and space. Furthermore, these cooperations are increasingly based on the sharing of information. These are information networks, which, in the limit, link up suppliers and customers through one firm, with this firm being essentially an intermediary of supply and demand. The unit of this production process is the business project.

What are important, therefore, are not 'structures', which imply a centre, a concentration of power, vertical hierarchy and a formal or informal constitution. Rather, networks 'constitute the new social morphology of our societies, and the diffusion of networking logic substantially modifies the operation and outcomes in processes of production, experience, power and culture . . . the network society, characterized by the pre-eminence of social morphology over social action' (Castells 1996: 469). A network is a set of interconnected nodes, the distance between social positions being shorter where such positions constitute nodes *within* a network as opposed to those lying outside that particular network. Networks are dynamic open structures so long as they continue to effect communication with new nodes (Castells 1996: 470–1; see also Castells 2000). Networks decentre performance and share decision making. What is in the network is useful and necessary for its existence.

What is not in the network will be either ignored if it is not relevant to the network's task, or eliminated if it is competing in goals or in performance. If a node in the network ceases to perform a useful function, it is phased out from the network, and the network rearranges itself. Some nodes are more important than others, but they all need each other as long as they remain within

the network. Nodes increase their importance by absorbing more information and processing it more efficiently. If they decline in their performance, other nodes take over their tasks. Thus, the relevance and relative weight of nodes come not from their specific features, but from their ability to be trusted by the rest of the network. In this sense, the main nodes are not centres, but switchers that follow a networking logic rather than a command logic, in their function vis-à-vis the overall structure.

Networks generate complex and enduring connections stretching across time and space between peoples *and* things (Murdoch 1995: 745). Networks spread across time and space, which is advantageous, because 'left to their own devices *human actions and words do not spread very far at all*' (Law 1994: 24; see also Rycroft and Kash 1999). Different networks possess different abilities to bring home to certain nodes distant events, places or people, to overcome the friction of space within appropriate periods of time. According to Castells, there are now many very varied phenomena organized through networks, including network enterprises (such as the criminal economy), networked states (such as the European Union) and many networks within civil society (such as NGOs resisting globalization or international terrorists).

Castells's network analysis is of major importance, because it breaks with the idea that the global is a finished and completed totality. And he uses various ideas that prefigure a complexity approach to global phenomena (for a brief comment, see Castells 1996: 64–5). The analysis of networks emphasizes contingency, openness and unpredictability, suggesting analogies with how the 'web of life', according to Capra (1996: 35), consists of 'networks within networks'. Castells also emphasizes how networks of power produce networks of resistance. Many social practices are drawn to what could be called in complexity terms the 'power-resistance attractor' (Castells 1997: 362). He also argues that the strength of networks results from their self-organizing and often short-term character and not from centralized hierarchical direction, as with older style rational-legal bureaucracies of the sort famously examined by Weber (see Rycroft and Kash 1999; Rifkin 2000: 28). Specifically, Castells shows the 'chaotically' subversive effects of the development of the *personal* computer in the 1980s

upon the workings of the *state* bureaucracy in the Soviet Union. This Weberian bureaucracy had historically controlled all information flows, including even access to the humble photocopier. But it was completely outflanked by the informational effects of the unpredictable global spread of the PC (Castells 1996: 36–7; 1998: ch. 1).

Castells also notes how attempts to regulate the Internet seem doomed to failure, since, as three American judges have written: 'Just as the strength of the Internet is chaos, so the strength of our liberty depends upon the chaos and cacophony of the unfettered speech the First Amendment protects' (Castells 1997: 259). The weakness of hierarchical nation states can be seen in the growth of the 'global criminal economy' and the exceptional mobility of illegal money and its transmutation (money laundering) as it careers around global scapes, often evading detection (Castells 1998: 201–3; this money movement being partly created by different nation-state regimes). This global criminal economy, or indeed global terrorism, takes the global order far from equilibrium, as nation states respond to such mobilities with attacks on civil liberties especially of mobile immigrant groups, and as global crime corrupts democratic politics in many societies. Castells (1998: 162) also talks of the 'black holes' of informational capitalism, places of time–space warping where peoples and places are drawn into a downwards and irreversible spiral or vortex from which there is no escape. He argues, similarly, as we will see, to Prigogine, that the global world is characterized not by a single time but by what he calls multiple times. There is clock time of the mass production factory, the timeless time of the computer and the glacial time of the environment (Castells 1996: ch. 7; 1997: 125; Urry 2000b: ch. 5).

However, Castells's *magnum opus* lacks a set of interrelated concepts that would enable these very diverse phenomena to be *systematically* understood. The global remains rather taken for granted and there is not the range of theoretical terms necessary to analyse the emergent properties of the networked 'global' level. In particular, the term 'network' is expected to do too much theoretical work in the argument. Almost all phenomena are seen through the single and undifferentiated prism of 'network'. This concept glosses over very different networked phenomena. They

can range from hierarchical networks such as McDonald's to heterarchic extremely inchoate 'road protest movements', from spatially contiguous networks meeting every day to those organized around imagined 'cultures at a distance', from those based upon strong ties to those based on very important and extensive 'weak ties', and from those that are pretty well purely 'social' to those that are fundamentally 'materially' structured. These are all networks, but they are exceptionally different in their functioning one from the other.

Moreover, the concept of network does not bring out the enormously complex notions of power implicated in the diverse mobilities of global capitalism, such as those of the Internet (but see Castells 2001). Movement and power are now inextricably intertwined, and the concept of network minimizes the astonishing paradox, uncertainty and irreversibility of the patterns of global emergence. It is the materials, concepts and arguments within the science of complexity that remain undeveloped in Castells's otherwise brilliant examination of intersecting global networks.

The Challenge of Complexity

Thus, although hundreds of books and articles have been written on the 'global', it has been insufficiently theorized. In this book I turn to the complexity theory that is now emerging more generally as a potential new paradigm for the social sciences, having transformed much of the physical and biological sciences.

Thus 'non-linear' scientists working at one of the leading scientific complexity centres, the Santa Fe Institute in New Mexico, have developed some implications of complex adaptive systems for theorizing the nature of the global, especially the idea of global sustainability (Waldrop 1994: 348–53). Moreover, the US-based Gulbenkian Commission on the Restructuring of the Social Sciences, chaired by Immanuel Wallerstein and including non-linear scientist Ilya Prigogine, has advocated breaking down the division between 'natural' and 'social' science through seeing both domains as characterized by 'complexity' (Wallerstein 1996). Complexity, they say, involves not 'conceiving of humanity as mechanical, but

rather instead conceiving of nature as active and creative', to make 'the laws of nature compatible with the idea of events, of novelty, and of creativity' (Wallerstein 1996: 61, 63). The Commission recommends how scientific analysis 'based on the dynamics of non-equilibria, with its emphasis on multiple futures, bifurcation and choice, historical dependence, and . . . intrinsic and inherent uncertainty', should be the model for the social sciences and this would undermine clear-cut divisions between humans and nature, and between social and natural science. However, most surprisingly this Commission is silent on the study of globalization, although the global is surely characterized by emergent and irreversible complexity and by processes that are simultaneously social *and* natural.

I show in various chapters how concepts and theories in chaos and complexity theory bear directly upon the nature of the global. In particular, complexity examines how components of a system can through their dynamic interaction 'spontaneously' develop collective properties or patterns, such as colour, that do not seem implicit, or at least not implicit in the same way, within individual components. Complexity investigates emergent properties, certain regularities of behaviour that somehow transcend the ingredients that make them up. Complexity argues against reductionism, against reducing the whole to the parts. And in so doing it transforms scientific understanding of far-from-equilibrium structures, of irreversible times and of non-Euclidean mobile spaces. It emphasizes how positive feedback loops can exacerbate initial stresses in the system and render it unable to absorb shocks to re-establish the original equilibrium. Positive feedback occurs when a change tendency is reinforced rather than dampened down. Very strong interactions occur between the parts of such systems, with the absence of a central hierarchical structure that unambiguously 'governs' and produces outcomes. These outcomes are to be seen as both uncertain *and* irreversible.

Another way of expressing this is to argue that complexity can illumine how social life is always a significant mixture of achievement *and* failure. Much social science is premised upon the successful achievement of an agent's or system's goals and objectives. Sociology is 'imbued with a commitment to and confidence in the possibility of increased success in social life'; the social world to

which it directs our attention 'is one conceptualised, for the most part, in terms of practices, projects and processes that operate relatively unproblematically' (Malpas and Wickham 1995: 38). On this account, failure is 'an aberration, a temporary breakdown within the system', the exception rather than the rule (Malpas and Wickham 1995: 38). Thus there are the systems investigated by sociology (or the social sciences more generally) and there is failure or breakdown. There is thought to be either one or the other. It is a duality.

And yet, of course, social life is full of what we may term 'relative failure', both at the level of individual goals and especially at the level of social systems. Failure is a 'necessary consequence of incompleteness' and of the inability to establish and sustain complete control of the complex assemblages involved in any such system (Malpas and Wickham 1995: 39–40). This is well known but tends to be viewed in the social sciences through the concept of unintended consequences. What is intended is seen as having a range of unintended side effects that may take the system away from what seems to have been intended. However, this is a limited and often individualistic way of formulating relative failure that does not explicate just how these so-called side effects may be systemic features of the system in question. The use of complexity should enable us to break with such dualistic thinking, of system *and* its failures. Chaos and order are always interconnected within any such system.

It is in the light of these arguments that the emergent level of the global is examined below. Such a system clearly seems to combine in curious and unexpected ways, both chaos and order. It is not simply another region like that of society, nor is it the product of, or to be reduced to, a pre-existing difference or some governing element. Global systems can be viewed as interdependent, as self-organizing and as possessing emergent properties. I suggest that we can examine a range of non-linear, mobile and unpredictable 'global hybrids' always on the 'edge of chaos'. These should constitute the subject matter of sociology and of its 'theory' into the twenty-first century. Examples of such global hybrids include informational systems, automobility, global media, world money, the Internet, climate change, the oceans, health hazards, worldwide social protest and so on. Sociology has known

that it deals with an open system. But the proliferation of inter-
dependently fluid global hybrids operating at immensely varied
time–space scales produces a quantum leap in the openness and
complexity of the systems being analysed, systems always com-
bining success and failure that are on the edge of chaos.

Moreover, although contemporary social-physical phenomena
are undeniably networked, they should not be viewed merely as
networks. Castells's notion of 'network society' does not capture
the dynamic properties of global processes. 'Network' is too undif-
ferentiated a term here. We need a significant battery of other
terms to characterize the dynamic and emergent relationships
between such networks, to develop the intense relationality of
worldwide connections.

In particular, I examine how, given the range of possibilities that
a system may move within, the trajectories of many systems
are drawn over time to what complexity terms 'attractors'. The
strange attractor of 'glocalization' is developed below, an attractor
that involves parallel processes through which globalization-
deepens-localization-deepens-globalization and so on. Both the
global and the local are bound together through a dynamic,
irreversible relationship, as huge flows of resources are drawn into
and move backwards and forwards between the two. Neither the
global nor the local can exist without the other. Diverse social and
physical phenomena, including existing societies, are attracted
towards the 'glocal', which develops in a symbiotic, irreversible
and unstable set of relationships. I try to show that both the so-
called global and local levels get transformed through billions of
iterations that are irreversibly over time drawn towards, and are
remade through, this glocalizing attractor.

Conclusion

Thus it is argued in this book that an appropriate analysis of the
'global age' necessitates the examination of various notions that
are not reducible to, or explained through, single processes such
as network or empire or markets or disorganization (Rescher
1998). Rather, global ordering is so immensely complicated that
it cannot be 'known' through a single concept or set of processes.

Indeed, it is epistemologically and ontologically unknowable, with efforts at comprehension changing the very world that is being investigated. But, because of the power of metaphor in thinking, some notions from complexity will be interrogated in order to assess their fruitfulness in representing those processes implicated in such global ordering.

The book thus seeks to discuss how much complexity can illuminate an array of issues. First, are there *emergent* global systems? How is an emergent system of the 'global' developing that may be *self-producing* over time, such that its outputs provide inputs into a circular system of global objects, identities, institutions and social practices?

Second, what are the power and reach of such global systems? What is the impact of such systems upon the 'society system'?

Third, how are the properties of such systems reproduced through *iteration* over time involving 'inhuman' combinations of objects and social relations, or what I call 'material worlds'?

Fourth, how should we expect global 'systems' that are often far from equilibrium to develop and change irreversibly over time, especially in relationship to *small events* that can have big effects (and vice versa)?

Finally, what does 'global complexity' mean for the sociological problem of *social order* that has normally been seen as operating within and through individual 'societies'? How does a social ordering emerge through diverse and intersecting material worlds operating over varied times and moving across multiple spaces, where systems are always 'on the edge of chaos'? Can there any longer be societal ordering where cultures operate 'at a distance'?

This array of questions and issues provides the basis for what I have described and advocated elsewhere as 'mobile sociology' (Urry 2000a). The next chapter turns specifically to the challenge of a turn to complexity.