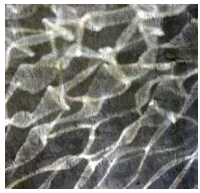

Enacting the social

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Abstract

This paper is concerned with the power of social science and its methods. We first argue that social inquiry and its methods are productive: they (help to) make social realities and social worlds. They do not simply describe the world as it is, but also enact it. Second, we suggest that, if social investigation makes worlds, then it can, in some measure, think about the worlds it wants to help to make. It gets involved in 'ontological politics'. We then go on to show that its methods – and its politics – are still stuck in, and tend to reproduce, nineteenth-century, nation-state-based politics.

How might we move social science from the enactment of nineteenth-century realities? We argue that social-and-physical changes in the world are – and need to be – paralleled by changes in the methods of social inquiry. The social sciences need to re-imagine themselves, their methods, and their 'worlds' if they are to work productively in the twenty-first century where social relations appear increasingly complex, elusive, ephemeral, and unpredictable. There are various possibilities: perhaps, for instance, there is need for 'messy' methods. But in the present paper we explore some implications of complexity theory to see whether and how this might provide productive metaphors and theories for enacting twenty-first-century realities.

What is the power of social science and its methods? We shall argue that social-and-physical changes in the world are – and need to be – paralleled by changes in the methods of social inquiry. The social sciences need to re-imagine themselves, their methods and, indeed, their 'worlds' if they are to work productively in the twenty-first century.

Our argument falls into three main parts. First, we argue that social inquiry and its methods are productive: they (help to) *make* social realities and social

worlds. They do not simply describe the world as it is, but also enact it. Second, we press some of the implications of this claim. In particular, we suggest that, if social investigation makes worlds, then it can, in some measure, think about the worlds it wants to *help* to make. It gets involved, in other words, in the business of 'ontological politics'. At the same time we argue that its methods – and its politics – are still stuck in, and tend to reproduce, nineteenth-century, nation state-based politics. So what does this imply? How might we move in social science from the enactment of nineteenth-century realities? There are many possibilities. For instance, we are committed to what we think of as a 'sociology of the elusive'. But in the third section of the paper we shall attend to one particular possibility: the potential of a social science of complexity.

Social science as enactment

Many parts of social science – and perhaps especially sociology – have often been treated as a joke, a more or less expensive way of discovering the obvious; or as an impenetrable thicket of jargon; or as congenitally indecisive ('on the one hand, on the other'). Many have imagined that, apart perhaps from economics, they are not serious: that, if they are not a joke or a set of neologisms, then they are the last redoubt of an outmoded radical politics.

Against this, social science has also been imaged as a source of special power. For instance, sociologists have sometimes imagined that they have the theoretical or methodological key to the universe: witness the more or less grand narratives of Parsons, critical theory, or Althusserian Marxism. Some on the political right have also attributed extraordinary subversive powers to the discipline. A generation ago Marxists were thought to represent a danger to the body politic. More recently sociology has got off more lightly, with venom directed more at the cognate disciplines of cultural studies, women's studies, or science studies. Thus, in the 'Sokal affair', science studies was accused of undermining the properly rational appreciation of the scientific basis of Western (and especially North American) technoscience, the public appreciation of the benefits of natural science, and (not altogether coincidentally) state funding for science.[1]

No doubt treatment of these disciplines as joke on the one hand or danger on the other are related. How to think of this strange enterprise that seeks to 'legislate' and 'interpret' the very nature of social life?[2] How, indeed, to think about 'the social' as a source of endless ambivalence and a repository of that which cannot be properly technicized? It is almost as if it (and therefore the disciplines which describe it) were the Other of scientific understanding.

Joke or danger? Neither response seems quite right. And, indeed, there has been substantial and more serious commentary over several decades arguing that the disciplines of the social are themselves social practices that simply form another part of the social world. In this view, the social sciences partake of the character of that social world – including all its virtues and vices. This means that, as the world changes, they too necessarily change. And, crucially for our

argument, it also suggests that the social sciences work upon, and within, the social world, helping in turn to make and to remake it.[3]

There is much anecdotal evidence of the interchange between the social sciences and 'the social'. The symbolic interactionist analysis of deviance is a classic example. 'Labelling', originally formulated by deviance theorists, rapidly became current and much more widely influential in political and social debate where for a time it had widespread consequences.[4] For instance, it contributed to attempts to avoid stigmatizing the powerless, to the critiques of total institutions, and the widespread policy of de-institutionalization.[5] But the traffic between society and the sciences of society has been two-way. A term such as 'heterogeneous engineering' (the idea that management of anything involves trying to order both people and objects) labels what many – for instance, managers, engineers, nurses, train-drivers – already 'know' perfectly well.[6] The argument made by Anthony Giddens (1990) and others is that the social sciences can be understood as an expression of – and a reflexive moment in – the continuing elaboration and enactment of social life. A part of the argument is that this has become more important in high modernity with its apparently increasing commitment to 'reflexive modernisation'.[7]

But the process is not new. The social sciences have always been embedded in, produced by, and productive of the social. If, for the purposes of convenience, we restrict our argument to sociology (though the same argument can be mounted for all the disciplines mentioned above) then the claims of the so-called 'founding fathers' make sense only if they are located in the contexts that produced them. This is most obvious for Marx, but applies just as much to Simmel, Weber, and Durkheim. Again, alongside the continental theorists, British sociology grew in part out of a tradition of ameliorist social reform that used increasingly sophisticated quantitative methods to study the misery of much of the British population at work and at home.[8] In this way, the social realities of economic inequality were identified, labelled, and brought into being alongside Marx's more radical vision of class. To use a feminist trope, such realities were 'given a voice'. Though, as (Thompson 1991) most famously shows, the working class was able to speak and organize 'for itself',[9] social scientists were important in the development of official discourses for monitoring, registering, and constructing such inequalities as those of 'social class'.[10]

So the social sciences, including sociology, are relational or interactive. They *participate in*, *reflect upon*, and *enact* the social in a wide range of locations including the state. Compared with sociologists, and even more so cultural studies, economists have often been more effective. Unemployment, production, productivity, terms of trade, balance of trade, GDP – such economic dimensions of the social are integral to state discourse and action.[11] But, if economic categories are performative, then so too are many quantitative and qualitative sociological categories.[12] And the boundary between 'the social' and 'the economic' is fuzzy, since to construct the economic is also to construct the social – and (often enough) *vice versa*.[13]

So what of research methods? Our argument is that these are *performative*. By

this we mean that they have effects; they make differences; they enact realities; and they can help to bring into being what they also discover.

That method has effects is uncontroversial. The classic study of the London cholera outbreak in 1854 is one of many examples. Where were the cases of cholera? The answer, it turned out when they were mapped, was that they were grouped around a single water pump in Broad Street. The effect of this discovery was a scandal for the state of the London water supplies, but also became part of science since it was difficult to deny that 'cholera' is carried in 'water'.[14] Durkheim's analysis of suicide rates – though growing out of a much larger tradition of argument in France about the social aetiology of suicide – also had its effects. It located suicide rates as an important issue in the French body politic. In an era of growing empiricism, as new disciplines were coming into being and struggling to claim exclusive rights over their particular 'reality', it was a manifesto that guaranteed sociology its own place in the scientific sun. The social, as is well known, could be distinguished from the individual and the psychological by distinct statistical measures.[15]

So method has effects, but what of the stronger suggestion that method helps to bring what it discovers into being? This is in part a philosophical argument. The predominant understanding of methodology is informed, often implicitly, by more or less empiricist version of realism. The assumption is that there is a real world with real attributes, and that it is the job of social science to discover those of social or political significance. Such was, for instance, Durkheim's position. This (more or less) empiricist realism builds upon several assumptions. One is that there is a definite social world that can be discovered. A second is that it is possible to distinguish between that world, on the one hand, and the knowledge that arises from its investigation, on the other. The implication is that, if we pose questions of the world, and then gather relevant data in an appropriately rigorous manner, then we will end with good knowledge of the social. But is the social world so easily distinguished from social science knowledge? The arguments sketched above about the two-way traffic between investigations of the social and the social itself suggest that, at least in a simple sense, this is not the case. The social knowledge of both 'lay' and 'professional' agents permeates the social world, making it and remaking it. The implication is that the instruments of investigation – for instance, the statistical data-gathering and analysis used by Durkheim – help to *create* a new reality of the suicide rates across different religions and cultures. And, as the ethnomethodological literature has shown, the imputation of 'suicide' to a death (the argument can be extended to death itself) is an elaborate social process that reflects, *inter alia*, the availability of the very notion of suicide that in turn depends upon varied religious, cultural, and legal practices.[16]

It is for such reasons that Osborne and Rose conclude that the social sciences 'have played a very significant role in making up our world, and the kinds of persons, phenomena and entities that inhabit it'.[17] Their particular case study is about the social production of what is now called 'public opinion'. In many ways public opinion did not really exist before the Second World War – and it was the

founding in 1937 of *Public Opinion Quarterly* that was the defining moment. It is now a major industry that has been produced through theory and research methods developed within the social sciences, including especially the initiation by Gallup of the representative sample (which became a form of 'science already-made'). Osborne and Rose suggest 'public opinion *existed*'[18] from that point on. A new sphere of reality was born, and a new kind of phenomenon, a public opinion 'out there', came into being, together with new and 'opinionated' selves. They add, however, that the whole process is difficult for its subjects to detect since social life and sociological work have become so intertwined that the productivity of social science has tended to disappear.

Perhaps this leaves one feeling a little queasy. If social reality is a relational effect produced in arrangements generated in social science, then where does this leave 'reality itself'? To think about this it is useful to turn to economics, which, as we have noted, has also helped to 'make up our world'. Michel Callon has argued at length that *theories* of markets have been crucial in helping to produce the realities that they purportedly describe.[19] And there have been recent moments when this was self-evident. For instance, Ken Binmore, an economist and game theorist at the London Business School, was retained by the UK government to devise a set of rules for the auction of the frequency spectrum for third-generation mobile phones. The object was to achieve three specific government objectives: to secure a new entrant in the market for mobile telephony; to maximize the returns for the government; and at the same time to ensure that those bidding would receive an adequate return for their investment.[20] In the auction (actually five simultaneous auctions) bids were submitted by fax machine in accordance with carefully designed rules, and the auction ran to 150 rounds, and lasted weeks. This application of auction theory raised £22bn for the government (instead of the £5bn originally estimated) though whether the last of the three objectives, the win-win outcome known in game theory as a Nash equilibrium, was achieved has been the subject of much subsequent controversy, with the bidders claiming that they were over-charged in what is known in auction theory as 'winner's curse'. But even here the issue at stake lies partly in the application of game theory. Perhaps the problem was that though they used it the bidders were not sufficiently proficient in applying auction theory. If this is so, then the outcome of the auction can be understood as the intersection of more proficient uses of gaming theory (by the Treasury) with less competent applications by some, at least, of the bidders. Either way, economic theory was being enacted into reality.

The 3G auction and a number of other less spectacularly successful auctions of scarce radio frequencies are dramatic instances in which the world was made up in the image of social science. And economics provides many other examples. For instance, Callon describes a small-scale case to do with buying and selling strawberries in a French rural area. This market, previously dominated by a small number of purchasers and distributors, was remoulded to secure economic subjectivities conforming with neo-classical theory. This was achieved by an ambitious young civil servant who had learned his neo-classical economics in the

Ecole Nationale d'Administration – though the effort needed to do this was not trivial (he was to learn that there is nothing 'natural' about neo-classical market behaviour). For instance, he elaborated a series of rules about the character of permitted bidding, the number of lots, the size of steps in the rounds of the auction, and extra-market sales (forbidden). He also organized a set of material arrangements that included an electronic display of prices, and an architectural arrangement of lines of sight that secured mutual invisibility between buyers and sellers. Many of these rules and arrangements were generated to produce (to simulate into reality) the market with the indefinite number of buyers and sellers that is required in neo-classical theory. Or, to put it a little differently, they were put into place to generate the subjectivities and market behaviour required in neo-classical theory among otherwise recalcitrant growers and purchasers.[21]

The argument, then, is that social science is performative. It *produces* realities. But what to do with this claim? There are various possibilities. One possible reading of the argument by Osborne and Rose is that there are no reliable social facts: that there are no realities in such forms as suicide rates or public opinion; that the 'truth' cannot be properly discovered; and instruments of measurement are not simply technically flawed and somewhat inadequate (a chronic condition holding out the promise of improvement which would excite little controversy) but that they are constitutively inappropriate. However, as the examples from economic action suggest, this gesture is both too romantic *and* too scientistic. It is too romantic because it implies that we can never know reality well at all.[22] And it is too scientistic because it imagines that there is an ultimate truth that is (it now appears) beyond reach in the methods of social science.

How to avoid this polarity? The answer, suggested by the examples of market behaviour, is to suggest that while the 'real' is indeed 'real, it is *also* made, and that it is made within relations. No doubt many, perhaps most, of those relations have little to do with social investigation or social theory. But at the same time many do. So our suggestion is that certain kinds of social realities are performed into being in social science, and *this does not make them any less real*. Comparative suicide rates became a fact in French society at the turn of the twentieth century. They were made into a reality, just as the processes of deviant labelling became a fact in 1970s Western societies. Attributes, such as delinquency, that previously were thought to belong to individuals, became social and political processes of attribution in the interaction between professional and lay discourses surrounding the 'deviant' and the 'criminal'.

The move here is to say that *reality is a relational effect*. It is produced and stabilized in interaction that is simultaneously material and social. Heisenberg wrote about a version of this problem in physics: 'What we observe is not nature itself, but nature exposed to our method of questioning.'[23] There is little difference between physics and social science here: theories and methods are protocols for modes of questioning or interacting which also *produce* realities as they interact with other kinds of interactions. This means that we are *not* saying is that reality is arbitrary. The argument is neither relativist nor realist.[24] Instead, it is that the real is produced in thoroughly non-arbitrary ways, in dense and

extended sets of relations.[25] It is produced with considerable effort, and it is much easier to produce some realities than others. In sum, we are saying that the world we know in social science is both real and it is produced.[26]

Sociology as enactment: implications

So the real is real enough. It is obdurate. It cannot be wished away. But it is also *made*. And in some measure that which is socially real is made by, and through, the instruments of social analysis. If this is right, then the political grammar of social investigation undergoes an interesting shift. The issue is not simply how what is out there can be uncovered and brought to light, though this remains an important issue. It is also about what might be made in the relations of investigation, what might be brought into being. And, indeed, it is about what should be brought into being. We want to insist that this is not a matter of wish fulfilment. The relations of the world will put up greater or lesser resistances to most of the realities that might be created. Even so, once we start to imagine methods in this way we enter the realm of an 'ontological politics'.[27] If methods help to make the realities they describe, then we are faced with the question: which realities might we try to enact? Neo-classical ones? Ameliorist agendas? Revolutionary realities? Anti-patriarchal or post-colonial worlds? Realities composed of post-structuralist partialities and shifting identities? Cyborg-like and materially heterogeneous worlds? These are just a few of the possibilities. And the issue of ontological politics, about what is or could be made more real, is all the more pointed since every time we make reality claims in social science we are helping to make some social reality or other more or less real. In a world where everything is performative, everything has consequences, there is, as Donna Haraway indicates, no innocence.[28] And if this is right then two questions arise: what realities do the current methods of social science help to enact or erode? And what realities might they help to bring into being or strengthen? There are no simple answers to these questions. Social science methods are diverse. But even so we want to make two suggestions: they tend to make a single world; and they tend to make a world that is Euclidean.

A single world?

Social investigators know perfectly well that different methods produce different and often inconsistent results. So how to explain this?

Perhaps there are three common responses. One is to say that some methods are better than others. Some see reality properly, whereas others do not. This is epistemology. The job of the methodologist becomes that of seeking the best possible methods. A second is to say that methods are tools, and different tools do different jobs. This is pragmatism, and it implies the need for greater flexibility: for instance, the use of quantitative methods here and qualitative

methods there. A third, not entirely unlike the second, is to say that different approaches imply different 'perspectives'. Marxist sociologies might have one set of perspectives, feminist sociologies another, and so on.

None of these suggestions is wrong, but all direct attention away from the *performativity* of method: the prospect that it helps to produce the realities that it describes. They also make it more difficult to imagine that different research practices might be *making multiple worlds*,[29] and that such worlds might be equally valid, equally true, but simply unlike one another. The hidden assumption is that, in any particular context, and at any particular time, there is a single reality out there, waiting to be discovered. The elephant feels different depending on where we touch it. But it is still an elephant. So the idea that there is a single reality is retained, and differences in accounts of that reality are explained as different perspectives upon that 'reality'.

However, if method is interactively performative, and helps to make realities, then the differences between research findings produced by different methods or in different research traditions have an alternative significance. No longer different *perspectives* on a single reality, they become instead the enactment of different *realities*. This is a strong claim, but very important. The shift is from epistemology (where what is known depends on perspective) to ontology (what is known is also being *made* differently). It is a shift that moves us from a single world to the idea that the world is multiply produced in diverse and contested social and material relations. The implication is that there is no single 'world'.[30]

Our suggestion, then, is if methods and practices are performative then worlds become multiple – though not necessarily entirely disconnected. This is because the extent to which they and the various methods that helped to produce them differ from one another is an empirical matter. In practice, no doubt methods and the practices in which they are carried overlap.[31] This means that the realities that they produce also overlap and interact with one another.[32] All of which has analytical and political implications of the kind we have already rehearsed. The question is: is it possible to imagine developing methods that strengthen particular realities while eroding others? Is it possible to imagine social science method as a *system of interference* (we draw the term from Donna Haraway) for working towards and making particular forms of the social real while eroding others?[33]

A Euclidean world?

Social investigators also tend to assume – and so to produce – social worlds composed of discrete entities standing in hierarchical or inclusive relations with one another. Often the larger entities subsume, explain, or create the conditions for the smaller, though the latter also carry or help to reproduce the larger. The forms of such hierarchical entities vary between theoretical and methodological traditions. Marxist theory mobilizes a range of metaphors, but a notion of 'levels' is carried in many of them – as in the distinction between the causal 'in the

last instance' infrastructure and the 'caused' superstructure. Other traditions, for instance those of structural functionalism, assume that the world is composed of containers (such as 'society' or 'culture') that are then subdivided into 'institutions', 'subcultures' located within, and perhaps contributing to the functioning of, the whole. The behaviour of 'individuals' (the atoms within the container) may be treated as an expression of cultural or structural location: individuals exist within the container of society (or its subdivisions). In this way method may create findings about individuals, which are either treated as expressions of location in and of themselves (as in ethnography) or (as in quantitative methods) are combined to display a feature of the larger collectivity (suicide rates, income distribution, domestic violence). And in other yet other versions of the social, as in rational choice approaches, there are attempts to reduce the larger societal scaffolding to the actions or beliefs of individuals.[34]

There is nothing intrinsically wrong with any of this, but what is interesting in the present context is its performativity. Thus it appears that much social science method is predicated on a set of more or less spatial metaphors to do with height, depth, levels, size, and proximity. Using metaphors that are more or less Euclidean this means that it tends to *enact* and produce a Euclidean reality of discrete entities of different sizes contained within discrete and very often homogeneous social spaces.[35]

Thus the modern notion of 'society' grew up within the sociologies which emerged in the era of European nationalism. The 'natural' unit for sociology was, indeed, 'society', and society itself 'naturally' mapped onto the bounded region of the nation state.[36] Society here meant that which was ordered through a nation-state, with clear territorial and citizenship boundaries and a system of governance over its particular citizens. There was a growing management of 'society' enhanced by the heightened constitution of a visible 'society' that was to be examined and monitored; Bentham talks of the development of a 'transparent society, visible and legible in each of its parts'.[377] Rose suggests that this increasingly visible society involved government from 'the social point of view'.[38] Such societal governmentality rested on many new forms of 'social' expertise, both generally, and within specific institutions. And this in turn was partly based upon sociology, the science of such societies and of the appropriate forms of social citizenship. Sociology has been the discipline that, according to Rose, 'ratified the existence of this [social] territory'.[39]

And it is no coincidence that network metaphors of connectivity, proximity, and distance, should now proliferate in social science at the moment that they are proliferating elsewhere in talk of global network societies, more or less technological, more or less loose.[40] Indeed, as Massey shows, to talk of 'the global' and 'globalization' is performative.[41] Franklin, Lury and Stacey bring out various ways in which the global is not so much a 'cause' of other effects but an effect in its own right. It is enacted, as aspiration rather than achievement, as effect rather than as condition, and as a project to be achieved rather than something that is pre-given.[42] The global comes to constitute its own domains; it is continuously reconstituted through material-semiotic processes. And to

enact the global means that many individuals and organizations come together to mobilize around phenomena that appear to possess and demonstrate a global character. This is what has happened, for instance, for a 'global nature'.[43] Its emergence has resulted from various social practices, including the social sciences of globalization, images of the earth from space, transport policies, deforestation, energy use, media images of iconic environments, 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, and global conferences such as Rio and Kyoto. Together these perform a 'global nature' that appears to be undergoing irreversible change. A new object ('global society') is thus being brought into being, an entity fit for analysis and understanding, an entity that did not exist until it was relationally constituted and performed. Such an entity 'contains' everything else, all the particular societies, cultures and networks that go to make it up. This is yet another Euclidean container, indeed the largest yet imaginable.[44]

New realities, new versions of social science

If social science helps to enact realities, then what should we make of this? One suggestion, with a long pedigree in critical social science, is that social science wrongly colludes in the enactment of dominant realities. However, another is that, paradoxically, it also responds uneasily to many of the realities now being produced within the social-material world. The realities of social science resonate problematically with many of those being enacted 'outside' the ivory tower. The Euclidean compartments and categories of social science, and perhaps especially sociological method, were more or less productive of nineteenth- and early twentieth-century realities. This was a world that performed itself into somewhat discrete nation-states containing market-oriented individuals, at least within 'Euro-America' (bearing in mind that most such nation-states 'owned' vast empires).[45] But these categories are less productive of 'global' (let alone post-colonial and civilizational) realities at the beginning of the twenty-first century, a world that enacts itself to produce unpredictable and non-linear flows and more mobile subjectivities.[46] So how might social science 'move on'?

There are various possibilities. It might be, for instance, that much of social life escapes our capacity to make models of it, not only in the technical sense that it is beyond the grasp of current research methods, but in the more profound sense that it is constitutively resistant to the process of being gathered together into a single account, description, or model. Such, at any rate, is one possible consequence of the suggestion that different methods or practices tend to produce different realities. In this way of thinking the move to ontology means that the world – and the objects, the institutions, and the people that make it up – is no longer a single thing. Instead of a 'universe' we are instead caught up in, and help to produce, a 'pluriverse'.[47]

Perhaps this sounds strange, but it is nevertheless implicit in a number of common approaches to social theory. For instance, it is a commonplace that the subject is decentred.[48] And it has also been suggested, as we have hinted above, that the object, too, may be multiple, more than one and less than many. Perhaps, then, we live in a world of decentred objects.[49] It is often suggested that institutions and organizations cannot be modelled in any single way, but subsist by shifting between different modalities.[50] On a larger scale, it has become common since the writing of Foucault to argue that different eras correspond to, or are constituted by, different epistemes.[51] But the implications of these kinds of arguments for social science are potentially profound. They imply the possible need to imagine a fluid and decentred social science, with fluid and decentred modes for knowing the world allegorically, indirectly, perhaps pictorially, sensuously, poetically, a social science of partial connections.[52] Whatever its form, this successor project would not look much like social science in its conventional representational forms.[53]

An alternative is to note that social science method has problems in understanding non-linear relationships and flows. Heisenberg wrote: 'The world . . . appears as a complicated tissue of events, in which connections of different kinds alternate or overlap or combine and thereby determine the texture of the whole'.[54] Tools for understanding such complex connections have been developed within the 'new physics' of chaos and complexity theory, but have been applied only falteringly within social science. Our sense, however, is that they are urgently required if we are to make better sense of global 'connections'.[55] This is the argument that we shall now develop.

Complexity

In the mid-1990s the Gulbenkian Commission on the Restructuring of the Social Sciences, chaired by world systems sociologist Immanuel Wallerstein and including non-linear scientist Ilya Prigogine, recommended that 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.[56] More generally it advocated breaking down the division between 'natural' and 'social' science. Both domains, it said, were characterized by 'complexity'. One should not be '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'.[57] This is a plea that has not been widely taken up within social science, and curiously it has not been applied to analysing global relationships.[58] So what are the implications of the Gulbenkian challenge?

Complexity entails a wide array of innovative notions that would take social investigation a long way from conventional linear analyses of structure or action/agency. It rejects the common-sense notion that large changes in causes

produce large changes in effects. Following a deterministic set of rules, unpredictable yet patterned results can be generated, with small causes on occasions producing large effects and *vice versa*.[59] Solutions to its equations are extremely sensitive to initial conditions. Relationships between variables can be non-linear with abrupt switches, so the same 'cause' can produce qualitatively different kinds of effect in specific circumstances.

Complexity theory investigates the physics of populations and their emergent and self-organizing systemic properties. Such systems are typically unstable. A particular agent never produces a single and confined effect; interventions or changes will always produce an array of possible effects across the system in question. Prigogine describes these system effects as 'a world of irregular, chaotic motions'.[60] Complexity thus makes three assumptions: that there is no necessary proportionality between 'causes' and 'effects'; that the individual and statistical levels of analysis are not equivalent; and that system effects do not result from the simple addition of individual components. A simple example: if we place an extra grain on top of a pile of sand, then the extra grain (the 'cause') may either stay there or it may cause a small avalanche. This is a 'system' that is self-organized but without a 'central governor', and one in which the effects of a particular local change vary enormously. It is impossible to know in advance what the consequences will be of particular local actions.

Complexity also explores how components of a system can, through dynamic interaction, 'spontaneously' develop collective properties or patterns, such as colour, that are not implicit in the same way within its components. The interest is in emergent properties, regularities of behaviour that 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. Space and time are not *containers* of bodies that move along various dimensions (Capra 1996). They are 'internal' to the processes by which the physical world operates, helping to constitute the very powers of objects. Hawking suggests that '[s]pace and time are now dynamic qualities: when a body moves, or a force acts, it affects the curvature of space and time – and in turn the structure of space-time affects the way in which bodies move and forces act'.[61] Thus there are multiple spaces and times, such spaces and times are internal to the powers of objects, and space and time can be curved, stretched and turn back onto themselves in non-Euclidean fashion.

Early cybernetic research under the auspices of the Macy Conferences just after World War II emphasized the importance of negative feedback. In systems of circular causality information was processed, and then it was used to re-establish equilibrium and stability. This negative feedback restored the homeostatic functioning of systems – an insight important in the models of the social developed in functionalist sociology. Later systems formulations moved on from the assumption of homeostasis. They have looked instead at the complexity of the non-linear and positive feedback loops. Unlike negative feedback, these

exacerbate initial stresses in the system, rendering it unable to absorb shocks and re-establish its original equilibrium.[62] There may be very strong interactions between the components in a system, with no central hierarchical structure able to 'govern' outcomes. So positive feedback occurs when a tendency to change is reinforced rather than dampened down. It increases the returns occurring across a network that generates the patterns of path dependence, so significant in the history of various socio-technical systems.[63]

The elements within any such system operate under conditions that are far from equilibrium, partly because each element responds only to 'local' sources of information. But multiple connections and mobile trajectories mean that elements at one location have significant time-space distanciated effects elsewhere. Such systems possess a history that irreversibly evolves and past events are never 'forgotten'. Points of bifurcation are reached when a system branches.

Applying such notions to the social, we would suggest that criss-crossing 'societies' may be seen as diverse systems in complex interconnections with their environments; that there are many chaotic effects distant in time and space from their location of origin; that there are positive feedback mechanisms that mean that order and chaos are always intertwined; that there are self-organizing global networks and global fluids moving systems far from equilibrium; and that a social order is never accounted for by purified social processes. Such complexity thinking transcends the division between determinism and free will, in particular because it sees material worlds as unpredictable, unstable, sensitive to initial conditions, irreversible, and rarely 'societally' organized. Complexity thus brings out the way in which 'liquid modernity' is unpredictable *and* irreversible, full of unexpected and irreversible time-space movements, often away from points of equilibrium.[64]

Moreover, in a complex world there are no innocent 'methods': all involve forms of social practice that in some way or another interfere with the patterns of the physical or the social. They are all part of that world. As we earlier noted, Heisenberg wrote that '[w]hat we observe is not nature itself, but nature exposed to our method of questioning'.[65] And the methods necessary to 'capture' complexity may well be unexpected and or counter-intuitive. If many social-land-material relations are unpredictable and yet irreversible then research that uses observations taken at a single point in time-space will be representationally inadequate.

Complexity theory *models* the emergent properties of non-linear systems, but it does not *predict* them. This means that the aspiration of nineteenth-century method is significantly modified. Moreover, we might see such complexity theories as particularly appropriate to contemporary globalization. There is an 'elective affinity'. With its many convergent, overlapping and irreversible interdependencies 'globalization' is remaking 'societies' but not in a linear, closed and finalized form. We might see the growth and spreading of theories of complexity as part of, and simultaneously helping to enact, the very processes of global change.[66]

Conclusion

Our argument has been that it is time for social science, which grew up in the nineteenth century, to review much of its methodological inheritance. That inheritance in considerable measure reflects nineteenth-century preoccupations: with fixing, with demarcating, with separating. More generally, it reflects a nineteenth-century imagination and metaphysics, which assumed that the world is out there, more or less given, and it is the job of the scientist (including the social scientist) to map reality within a four-dimensional space composed of three Euclidean dimensions together with the passage of time. Such were the concerns of European nation-states, and they were, in addition, in greater or lesser measure, the concerns of those who gave shape to social science and to sociology.[67]

But times have changed.[68] First, 'social reality' has altered. So-called 'globalization' means that the phenomena (including the horrors) of the social are less about territorial boundaries and states and more about connection and flow. Furthermore, though some traditions in social science have always celebrated the instability of social orders, it may also be the case that the character of those instabilities has also changed. Revolutions within nation-states, though not unknown, are complemented at the beginning of the twenty-first century by instabilities that flow down the global networks of finance, tourism, information, military power, and terrorism. The fleeting, the ephemeral, the geographically distributed, and the suddenly proximate are of increasing importance in current senses of the social.

Second, the understanding of the character of social investigation and its methods has also moved on. The sensibilities of the nineteenth-century inheritance, though still informing much social inquiry, are under pressure from an alternative, complex and performative sense of social inquiry. Our argument has been that methods are never innocent and that in some measure they enact whatever it is they describe *into* reality. Social science methods are no exception.

We have also argued that the standard social science methods are not particularly well adapted to the realities of global complexity. What worked well to enact nineteenth-century realities, works much less well at the beginning of the twenty-first century. Social science has yet to develop its own suite of methods for understanding – and helping to enact – twenty-first-century realities. Current methods do not resonate well with important reality enactments. They deal, for instance, poorly with the *fleeting* – that which is here today and gone tomorrow, only to reappear the day after tomorrow. They deal poorly with the *distributed* – that is to be found here and there but not in between – or that which slips and slides between one place and another. They deal poorly with the *multiple* – that which takes different shapes in different places. They deal poorly with the non-causal, the chaotic, the complex. And such methods have difficulty dealing with the *sensory* – that which is subject to vision, sound, taste, smell; with the *emotional* – time-space compressed outbursts of anger, pain, rage, pleasure, desire, or the spiritual; and the *kinaesthetic* – the pleasures and pains

that follow the movement and displacement of people, objects, information, and ideas.[69]

Why are these important? If methods also produce reality, then whatever we do, and whatever we tell, social science is in some measure involved in the creation of the real. There is no innocence. But to the extent social science conceals its performativity from itself it is pretending to an innocence that it cannot have. And to the extent that it enacts methods that look for or assume certain structural stabilities, it enacts those stabilities while interfering with other realities mentioned above. We have suggested that the issue is one of 'ontological politics'. If methods are not innocent then they are also political. They help to *make* realities. But the question is: which realities? Which do we want to help to make more real, and which less real? How do we want to interfere (because interfere we will, one way or another)?

Such is the larger purpose of our intervention. The globalizing world is complex, elusive, ephemeral, and unpredictable. It is enacted that way without our help. But, if social science is to interfere in the realities of that world, to make a difference, to engage in an ontological politics, and to help shape new realities, then it needs tools for understanding and practising the complex and the elusive. This will be uncomfortable. Novelty is always uncomfortable. We shall need to alter academic habits and develop sensibilities appropriate to a methodological decentring. Method needs to be sensitive to the complex and the elusive. It needs to be more mobile. It needs to find ways of knowing the slipperiness of 'units that are not' as they move in and beyond old categories.

Acknowledgements

We are grateful to Michel Callon, Kevin Hetherington, Scott Lash, Annemarie Mol, Ingunn Moser, Vicky Singleton, Nigel Thrift, Helen Verran, and Sylvia Walby for continued discussion about the complex and performative character of method. Naturally they are not responsible for the particular form that the arguments take here. We are also grateful to the anonymous *Economy and Society* reviewers of an earlier version of this paper.

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[1] See Sokal and Bricmont (1998).
[2] See Bauman (1987).
[3] See Giddens (1990, 1991), and Barnes (2000).
[4] See, for instance, Becker (1963), and Cohen (1973).
[5] See, for instance Goffman (1968a, 1968b).
[6] See Law (1987).
[7] See Beck *et al*. (1994).
[8] See Booth (1902–3), and Rowntree (1901). Marx famously relied on reports from theFactory Inspectors on mid-nineteenth-century work conditions in British factories.
[9] See E. P. Thompson's *The Making of the English Working Class* (1991).
[10] This argument has been developed by those working in the Foucauldian tradition. See, for instance, Rabinow (1989).
[11] This is well brought out in various articles in the journal *Economy and Society*.
[12] See, for instance, Hindess (1973).
[13] See, for instance, the papers collected in du Gay and Pryke (2002), and the arguments mounted in Callon (1998b).
[14] See Rosenberg (1962).
[15] See Durkheim (1951). See Goldthorpe (2000) on how Durkheim set back quantitative sociology because of his failure to understand probabilistic statistics.
[16] See, for instance, Atkinson (1978), and Douglas (1967). More generally on death, see Lock (2000), and Timmermans (1998).
[17] See Osborne and Rose (1999: 368).
[18] See Osborne and Rose (1999: 383).
[19] See Callon (1998b) and the papers collected in this volume.
[20] Details of this competition are available at the Radiocommunications Agency, third-generation spectrum auction website, at http://www.spectrumauctions.gov.uk/3gindex.htm
[21] This is discussed in Callon (1998a). The original is Garcia (1986).
[22] See the struggles with Romanticism in social thought described by Gouldner (1973).
[23] Quoted in Capra (1996: 40).
[24] Relativism is self-refuting. It is also an argument about knowledge, that is, it is epistemological. The argument we are making is about method-making-knowledge-andrealities; it is both epistemological *and* ontological.
[25] See, for instance, Latour (1993, 1999). Related arguments are developed in Law (2004). The notion of factish is explored in Nathan and Stengers (1995).
[26] See Law (2004), which builds in part on the classic Latour and Woolgar (1979).

[27] Perhaps the term belongs to Foucault, but it has been brought to prominence, discussed, and developed recently by Annemarie Mol (1999, 2002).

[28] An argument developed in a series of texts. See, for instance, Haraway (1992, 1997).

[29] The argument is developed in Law (2002), and in Mol (2002).

[30] Here it is helpful to distinguish between method in practice, on the one hand, and explicit debate in the philosophy of science and social science, on the other. Method in practice, whatever its formal theoretical stance, and whatever its particular research tools, typically tends to a kind of empiricist realism: the assumption that in any given context and given the purposes of the study there is a single reality, and that it is the job of the investigator to identify and describe this in the best possible way (possibly as a preliminary to intervention) For instance, methods texts offer advice about matters such as official statistics (May 2001: 71ff.), appropriate interview schedules (Gilbert 2001: 85ff., or ethnographic methods (Hine 2000). Empirical studies that work in other ways, and render explicit the performative character of their method, though becoming more common, are still unusual. An example would be Haraway's feminist cyborg-methodology of interference and diffraction (see Haraway 1991). The feminist cyborg is intended to interfere in the materiosemiotic networks of the world, rather than to describe or reflect them.

Philosophically, much work since the middle of the twentieth century can be seen as an attempt to argue around, or come to terms with, the limits of a straightforward realism. One influential reaction against a positivist version of this is to be found in the writing of Karl Popper (1959). Another is that of Thomas Kuhn (1970). More recently, writers such as Bruno Latour (1998) and Hans-Jorg Rheinberger (1997) have explored post-constructivism and the performativity of method. Yet another approach is the tradition of realism Baskhar (1979). For instance, contemporary critical realism (for convenient summaries, see Benton and Craib 2001; Sayer 2000), distinguishes between the real (roughly powers or capacities), the actual (aspects of those powers or capacities that are activated), and the empirical (that which is experienced). It also distinguishes between the intransitive (the objects of knowledge), and the transitive (theories or knowledge of those objects). Critical realism thus reflects the performativity of social science by noting that the social includes, and is at least partially constituted by, knowledge itself – it is simultaneously transitive and intransitive. How this relates to the claim from science studies (also outlined above), that the natural and the social are enacted together we leave on one side in the present paper since it is not crucial to our argument, though it seems likely that the versions of ontological multiplicity implied in the two traditions are different in important respects.

[31] The issue of incommensurability arises in the context of relativism. For a skillful but often misunderstood attempt to show difference without necessary incommensurability, see Kuhn (1970).

[32] For this argument developed at length, again see Mol (2002).

[33] See Haraway (1991).

[34] See Goldthorpe (2000).

[35] For discussion applied to the case of natural science, see Law (2001).

[36] Raymond Williams: 'Through many subsequent political changes this kind of distinction has persisted: society is that to which we all belong, even if it is also very general and impersonal; the *state* is the apparatus of power' (1988: 293). See Billig (1995), and Urry (2000).

[37] Cited in Cooper (1997: 34). And see Foucault (1970, 1976, 1979).

[38] See Rose (1996: 328).

[39] See Rose (1996: 328).

[40] Among the many references, the most obvious is perhaps Castells (1996). Indeed, even an a-sociological US President now talks of networks of international terrorism.

[41] See Massey (1999).
[42] Franklin *et al*. (2000: 1–17). Over one hundred books a year with global/globalization in the title are being published in English as we write this. This 'globalization' industry is a key component in the making of the global.
[43] See Wynne (1994).
[44] Franklin *et al*. (2000).
[45] This, though, requires qualification. The issue is: how did the compartments enact themselves? One answer is that they did this through building networks. These, however, can be read as implying an alternative non-Euclidean form of spatiality. The argument has been made in various idioms, in part by Marxist-inspired geographers (see Harvey 1989), and in part in versions of actor-network theory. For the latter see Mol and Law (1994), and Law and Mol (2001).
[46] See Urry (2003).
[47] This is a term that appears to have originated with William James.
[48] Notoriously, this argument is developed in the post-structuralist literature, but it has been picked up in many other locations. One of the more interesting manifestations appears in the feminist literature about cyborgs. See, for instance, Haraway (1991), which is then refracted into social anthropology by Strathern (see 1991).
[49] See Law (2002), and Mol (2002).
[50] See Morgan (1986), and Law (1994).
[51] See, for instance, Foucault (1976).
[52] The term 'partial connections' comes from Donna Haraway (1991), and has been explored further by Marilyn Strathern (1991, in an important study which foreshadows our argument here.
[53] There are a number of straws in the wind, though we shall not explore these further here. See, for instance, Mol (1998, 1999, 2002), Law and Singleton (2003), and Thrift (2000).
[54] Cited in Capra (1996: 30).
[55] As argued in Urry (2003).
[56] See Wallerstein (1996: 61, 63). For some introductions to complexity, see Capra (1996), Casti (1994), Nicolis (1995), Prigogine and Stengers (1984), and Waldrop (1994)
[57] See Wallerstein (1996: 61, 63).
[58] Some recent 'sociological' treatments of complexity include Baker (1993), Francis (1993), Luhmann (1990, 1995), Kiel and Elliott (1996), Eve *et al*. (1997), Byrne (1997), (1998), and Medd (2000). Urry (2003), is the only attempt that we know of to 'apply' some of the 'realities' of complexity to globalization.
[59] Casti (1994: 96).
[60] Prigogine (1997).
[61] Hawking (1988: 33).
[62] See Hayles (1999).
[63] Mahoney (2000).
[64] See Bauman (2000).
[65] Quoted in Capra (1996: 40).
[66] To that extent the talk of 'chaos theory' is misleading. The expectation is that chaos is not so 'chaotic' that it cannot be mathematically modelled.
[67] See Rose (1996).
[68] See Adam (1990), on the changing nature of 'science' and its view of time. And see Prigogine (1997).
[69] See Urry (2000: ch. 4), for a sociology of the senses.