1. Introduction

The prospect of rapid climate change has generated many possible global responses. Such responses might entail attempts to adapt to the effects of climate change. Or they might entail actions which will minimize climate change, provided of course that this is anthropogenic in origin, and thus susceptible to human control.

Since the mid-1980s efforts have been made to mitigate or combat global warming by reducing the emission of greenhouse gases (GHGs), particularly carbon dioxide (CO₂) generated by the combustion of fossil fuels, in particular coal and oil. The international legal context for these efforts is provided by the Framework Convention on Climate Change (FCCC, 1992) and its Kyoto Protocol (KP, 1997). Negotiations, after stalling in late 2000, have finally succeeded, at least partially, with the ‘mini-Kyoto’ protocol agreed (without the USA) in Bonn in July 2001 and later that year in Marrakesh. An intergovernmental agreement to go forward has indeed been reached, but in much watered-down form and with many important decisions again deferred. The refusal of the political leaders of the USA, the largest emitter of GHGs, to join is seen in America as a principled stand against UN dominated globalization and has been justified with reference to economic unfairness and scientific uncertainty. In contrast, the European Union and the United Kingdom have been whole-hearted supporters of the Kyoto process which is supported by a ‘scientific consensus’. What is going on scientifically and politically? Why has the Kyoto Protocol, designed ostensibly to prevent dangerous anthropogenic planetary heating, been embraced by so many governments, industrialists, scientists and environmentalists in Europe and even, more cautiously, by governments in most developing countries – while being rejected by the USA and regarded with caution by other countries such as Japan, Canada and Australia?

For climate change, states formed into negotiating blocs and agreed in Kyoto to a number of differentiated reduction targets for industrialized nations which amounted to a 5.2 per cent reduction over 1990 emission levels of greenhouse gases. But many details were left to be finalized, and in subsequent rounds of negotiation the collective 5.2 per cent cut was reduced to an effective reduction in emissions of about 2 per cent at the sixth meeting of the Conference of the Parties to the FCCC (COP-6), which broke down without agreement in The Hague in late 2000 but was concluded eight months later in July 2001 in Bonn.
Both mitigation, which has dominated the debate so far, and adaptation, which is now creeping into it, raise issues which are central to politics, in part because anthropogenic (or human-induced) climate change, if serious as well as real, raises questions about the distribution of liability, of costs and benefits, and hence of global competitiveness and political stability. Even adaptation responses raise questions about who should research solutions and who should pay for them. Questions just as difficult arise if naturally occurring climate change were to take place at a rate which makes gradual adaptation — that is change without drastic intervention — difficult or prohibitively costly. We live in an interdependent world and therefore should aid neighbours who are unable to cope when catastrophe befalls them. But if such disasters have human origins, then the claim by the victims on those who cause the problems is stronger. Attribution of causality is therefore the essence of any attempt to impose legally binding obligations.

But, although devising and implementing policies and determining the allocation, first, of blame and then, in particular, of costs, are all fundamental political activities usually undertaken through the agency of government, government is absent at the global level. Here, governance without a single government is required (see Rosenau, 1995). How then should courses of action be devised and chosen, and costs and benefits be allocated: for example, in the case allegedly as ‘global’ and ‘dangerous’ as global warming? International relations theory suggests some insights, stressing the value of shared norms and understandings of science, of cause and effect, to help bring disparate parties together. Yet, as we will show, strong normative and causal discourses were insufficient with Kyoto, which came down to a negotiation of interests. In order to get a deal that had some prospect of Kyoto receiving sufficient ratifications to enter into force, the EU and G-77 and China had to concede so much ground to Russia, Japan, Canada and Australia that the gross reductions in CO₂ emissions required were close to zero, with sinks and trading of ‘hot air’ resulting from Russia’s post-communist economic collapse serving to meet targets.

In the absence of government as a single sovereign actor, global governance cannot rely upon the imposition of coercion which is fundamental to government at the level of the nation-state, although some nations are subject to coercion by others. The international system cannot readily even rely upon majority voting — even by substantial majorities — since those not in agreement are sovereign states. Faced with the classic options of ‘exit, voice or loyalty’ (Hirschman, 1970), states might simply choose to exit from the deliberative process by which a scheme of governance is to be devised. Should one nation choose exit over voicing disagreement or adhering to the dominant view, the whole scheme is threatened. This is especially so if the party departing is a significant player, but any departure risks being copied by others.
Regardless of whether international treaties make provision for voting, actual voting is the exception: one which is actively avoided. The threat to call a vote becomes in itself an important bargaining device, used not just by those who might win the vote, but also as a disruptive threat by the likely losers, because voting is likely to shatter the consensus which lies at the heart of international agreements, including those on environmental problems, usually referred to as multilateral environmental agreements (or MEAs). Consensus is difficult to achieve, especially among the over 180 diverse members of the United Nations. For this reason, the negotiation processes have been described as analogous to a convoy of ships, which can move only at the speed of the slowest boat (Sand, 1990). Not only is the speed of the negotiation process limited in this way to ensure that all parties are ‘brought along’ together, but there is a qualitative corollary to the ‘slowest boat problem’: what can be agreed often reflects the ‘lowest common denominator’. The negotiations themselves put a premium on certainty (about damage and costs) and the reduction of complex issues to simple visions, thus creating a difficult environment for scientific advice to flourish, but encouraging verbal ambiguity and legal flexibility.

The challenge in developing responses to climate change and other global environmental problems is thus one involving pace of progress, quality of outcomes and coping with uncertainty: of achieving a degree of cohesion among disparate actors which will produce worthwhile agreements on a reasonable timetable. The challenge is often described in terms of interdependency norms prevailing over sovereignty norms: the realization by states’ parties to negotiations that, for whatever reason, it is more important that they cooperate than defend their independence and the interests of those within their borders. But will this strategy work when it remains uncertain whether the resulting agreement has any real effect on the environment? The outcome must remain problematic as, especially if practical implementation takes place over time spans that may be very long indeed, human behaviour and technologies are by no means fully under the control of even the most powerful government. Many governments may also lack the capacity for implementation.

Brenton (1994, 252–9) identifies four forces encouraging international cohesion in international environmental politics: the use of ‘toe in the door’ negotiating processes; reliance upon science and epistemic communities; the influence of environment non-governmental organizations (NGOs); and what he terms ‘environmental altruism’, or responding to rhetorical justifications which are difficult to resist. Brenton extends Lumsdaine’s (1993) insights about the force of moral suasion in the aid arena to suggest that governments may find it difficult to resist rhetorical injunctions to ‘save the planet’. The rhetoric alone ‘tends to make politicians and negotiators ready to look for common ground than they would be in other sorts of international negotiation.’ (Brenton, 1994, 259). Brenton admits to having had personal feelings of this kind in
climate change negotiations, and similar feelings were reported by the chief US negotiator on the ozone issue (Benedick, 1991). But moral injunctions that are difficult to resist are not necessarily a sound foundation upon which to base an international regulatory regime. Certainly, Nadelmann (1990) suggests that prohibition regimes are more successful when they reflect, rather than impose, strong moral positions, and it seems reasonable to suppose the same applies with any strong regulatory regime.

‘Toe in the door’ negotiating processes are not unique to international environmental politics, and are indeed an example of a fundamental political strategy of the ‘thin end of the wedge’ – of achieving acceptance of a small, innocuous measure and then expanding it. It forms the basis of Lindblom’s (1959, 1979) claim that incremental change can produce rapid progress by dealing with political realities and of Wildavsky’s (1984) similar notion in the politics of the budgetary process. In the international context this has been referred to as ‘iterative functionalism’ (Feldman, 1995), and has been formalized in the model of the development of ‘framework’ conventions, such as the FCCC. These have little binding content but establish an institutional setting that facilitates the development of shared norms and understandings which later make possible the development of more explicit binding commitments under a protocol to the framework convention. This has been the case with regimes dealing with problems such as acid rain or ozone depletion.

The nature of the negotiating process is thus the adoption of initial agreements whose substantive content is low, but which gave rise to a subsequent series of meetings which are used ‘as an opportunity by those countries with environment- mentally more advanced positions to place pressure on others, both directly and via environmental NGOs, to shift in their direction’ (Brenton, 1994, 252). This depends upon the globalization of the news and the uniquely open and public style of international environmental negotiation developed at the 1972 UN Conference on the Human Environment at Stockholm ‘which means that NGOs and others can apply their pressure on the right issues at the right time’ (Brenton, 1994, 253).

Brenton (1994, 255) also notes that the use of science – sometimes distorted for effect – is important; that and ‘the power of a united scientific view to push even unwilling governments into action is now one of the key mechanisms of international environmental cooperation’. Most notably, Peter Haas (1990) has emphasized the importance of epistemic consensus evolving among communities of scientists in the development of a broader political consensus. The emergence of a scientific consensus is seen by Peter Haas as a necessary rather than a sufficient condition for international agreement, although Ernst Haas (1990) is of the view that changing knowledge can lead to a redefinition of interests. Once agreement has been reached and policy commitments have been made, there is a need for science to support it, and this can add to the factors
which might have a corrupting influence on science, as the scientific consensus can become a tool for securing additional research funding for scientists. Boehmer-Christiansen (1994a, 1994b), however, has questioned the scientific nature of such consensus if research science is under pressure to deliver in order to justify a policy direction already defined by interests that may be considered precautionary.

The absence of a scientific consensus is seen as more significant than consensus, because scientific disagreements are regarded as likely to be sufficient to limit the prospects for agreement. This in turn tends to lead to pressure on science, or to the selection of ‘relevant’ or ‘sound’ science by governments seeking agreement; and the process whereby the Kyoto Protocol to the Framework Convention on Climate Change was developed, we suggest here, is an example of this.

The emergence of a scientific consensus was certainly important in the development of an international response to the problem of ozone-depleting chemicals. From the publication of the first paper suggesting that CFCs might be responsible for depleting the ozone layer, it took little more than a decade for the Montreal Protocol to be concluded, during which time further research had built support for a particular understanding of the problem. The success of Montreal encouraged an attempt to repeat the process for climate change. Mustafa Tolba, Executive Director of the United Nations Environment Programme (UNEP) when the Montreal Protocol was being negotiated, stated that the mechanisms designed for the protocol would be used as the blueprint for the development of a response to the problem of climate change (Benedick, 1991, 7).

SCIENCE, NORMS AND THE KYOTO PROCESS

The equivalent international agreement developed in response to the threat of climate change – the Kyoto Protocol – necessarily saw national interests figure much more prominently during negotiations than had been the case at Montreal, with science proving much less effective in producing consensus. With climate change, the proposed emission reductions have far more serious and pervasive and unpredictable effects on energy supplies and fuel competition than substitution for CFCs, which were produced only by a handful of companies eager to retain advantage in the production of substitutes.

The original Kyoto decision had proven to be too advantageous to the EU, and concessions had to be granted to others in the form of provision for sinks and emissions trading to secure agreement, despite explicit attempts to use science and strong normative arguments to bring non-European parties into agreement. Meantime, in March 2001, the USA effectively exited the Protocol,
rendering not just its effectiveness but its relevance to the climate change issue problematic.

Does this suggest that we should discount the importance of epistemic consensus as a factor in the development of political agreement? We shall suggest in this book that we need not discount totally the views of Peter Haas (1990); on the contrary, the pressure for consensus among scientists was great but could not overcome the many issues of equity and practical implementation raised by the proposed solutions. But, as we shall show, not only did interests feature more prominently with climate change than with ozone depletion, but the science of climate change itself (contra ozone) has been inescapably tied up with the play of interests from the outset. Rather than a scientific consensus evolving gradually as more and more research was conducted, as it did with ozone, institutional means were developed to produce a scientific consensus in the expectation that this would be decisive in producing a political consensus in favour of action on climate change – and action of a particular kind at that. An international organization, the Intergovernmental Panel on Climate Change (IPCC), was specifically established to generate a consensus that could be presented as being ‘scientific’. We shall discuss to what extent this label is merited.

With ozone, in other words, science was essentially an independent variable, and the consensus it produced a dependent variable. With climate change, we suggest, causality has been more confused simply because human understanding of climate, its natural variability and impacts remains limited and contested among several disciplines. The epistemic community on climate change science is self-selected and is dominated by a few governments with strong atmospheric-science/climatology research capacities and space lobbies: the United States, the United Kingdom, Sweden, Canada, Japan, Germany and Australia. Most of these countries also have in their national interests a prominent component of interests such as oil companies, whose gas holdings are made more valuable by restrictions on coal (USA, UK, Canada). The nuclear programmes and industries of some are similarly advantaged (USA, UK, Canada, Sweden, Japan, Germany), and some had heavily subsidised coal industries that they wished to close but needed political support to do so (UK, Germany). The UK and Germany have been particularly advantaged by the form of international commitments negotiated thus far. Climate change also seemed to require action which reinforced policies aimed at providing both energy security and taxation revenues. Australia is unusual in this company, because (uranium exports aside) restrictions on the emission of greenhouse gases represent considerable costs, and its scientific commitment has thus conflicted with its national interests.

The scientific endeavour of climate research itself has thus resonated strongly with significant national interests, but science itself has also been an interest. The threat of anthropogenic climate change has led governments collectively
to spend billions of dollars on climate research, based largely on computer modelling rather than empirical research, much of it redirected from studies which might have had more immediate returns in predicting natural variability, such as droughts. This has created a ‘grant-dense’ environment for climate change science, and especially meteorology, which was institutionalized domestically and internationally in a well-established intergovernmental organization and quickly, if reluctantly at first, made this part of its global research agenda funded by national governments. The geological and space sciences are still attempting, with little success, to enter this field. Many dedicated research centres for climate change modelling have been created and the ‘science politicians’ involved in both the allocation and securing of funds have set priorities which can exert a powerful pull on research. Climate change policy became in large part research policy.

We consider that this milieu has meant that the science of climate change is no longer ‘pure’, but also reflects, rather than simply drives, politics. The need for ‘relevance’ and the dependence of society on those who have an interest in there being a problem has left decision-makers dangerously exposed to the possibility of Lysenkoism on a global scale: Soviet scientist Trofim Lysenko set the science of genetics back years in the USSR by advancing the false theory that improvements in things such as milk production could become acquired characteristics which could be inherited by successive generations – a theory which (though false) resonated loudly with Marxist–Leninist ideology.1

It is not that we consider all climate science to be on a par with Lysenko’s genetics – far from it. Nor do we reject the possibility that anthropogenic GHG emissions might have an impact on future climate. Rather, we are sceptical about greenhouse science as it has been funded and used for policy purposes – as we think everyone should be of all science. And we consider that climate change science is riddled with interests to the extent that it has much less power as a force for consensus than was the case, for example, with ozone, asbestos, ionising radiation or even acidification of surface waters.

We shall argue that the attempt to construct a scientific consensus has involved the science politicians in attempting to impose a political consensus on states. This attempt itself has certain attributes that seem to require that the science should be responded to in a particular way. The science politicians, in other words, have sought to impose a particular problem definition and solution on society. This, they seem to think, will trump the powerful interests that would otherwise block action. The proposed solution is one which ‘demands’ emission reduction rather than adaptation strategies, even though (should their own predictions prove correct) emission reduction is likely to be futile! This problem definition closely tied to the solutions was particularly attractive politically because some solutions were already available and had been proposed initially not to reduce emissions from fossil fuel combustion but to replace fossil fuels
that had either become too expensive – the oil shocks of the 1970s – or were allegedly threatened by rapid depletion, according to the ‘limits to growth’ discourse of the 1970s.

Any emission reduction measures likely to be politically possible may well prove futile if CO₂ has indeed a long residence period in the atmosphere – in excess of 100 years (the contrarians say 20 or 30 years) – so that accumulated CO₂ already emitted together with that emitted over the next century will raise levels in the atmosphere. The 5.2 per cent cut agreed to in Kyoto would (even if achieved) quickly be wiped out by growth in emissions by developing countries. The IPCC argues that a 60 per cent reduction in total global emissions would be required to stabilize atmospheric CO₂ levels. Given this assumption, there is a fundamental flaw in the case that compels us to pursue vigorously emission reductions: unless CO₂ emissions are slashed by at least half, CO₂ levels will continue to rise and (if the predictions of the scientists and energy forecasters in the IPCC consensus are correct) climate change will inevitably ensue. There is a strong argument, therefore, that dangerous change should be slowed a little, but that adaptation and longer-term technological change are surely more important priorities. Why then the enormous, if so far only very partially successful, effort to reduce emissions undertaken at the global level?

If the IPCC scientific consensus proves correct, some adaptation to climate change is inevitable. Hence a response strategy focused primarily on emission reduction would seem to be flawed. The most important policy issue would appear to be one of how to respond (in the face of uncertain science) to the possibility of climate variability – with a strong regional dimension – which might be exacerbated by human activity. Climate is inherently variable and unpredictable; it has changed greatly over geological time scales and much apparent unusual climate behaviour is merely created by omitting from the picture earlier periods when change has been even faster than today, without any human presence (Gorshkov and Gorshkov, 1998; Berner and Streif, 2001). Avoidance of climate change is an impossibility. It is by no means clear that attempting to prevent climate change is the best strategy, and an ability to provide economically the means to adapt to and absorb climate variability is central to any response strategy. Many see emission reduction as likely to be driven more by technological change, such as the development of more energy-efficient devices such as fuel cells, than by policy, and particularly by policies which have high costs that might limit our collective ability to meet the costs of adaptation. These policies do, however, add another interest to an already complex circle of international, national and subnational actors, namely bureaucratic agencies that have been enabled to acquire information, count emissions, administer, tax, and regulate activities giving rise to GHG emissions to an extent quite unusual in an era of deregulation and privatization.
Yet the thrust of the international policy process remains overwhelmingly towards reduction strategies. Why? We suggest that the reason lies in an understanding of interests primarily related to energy which infuse both the science of climate change and the moral arguments invoked to give the science force. We suggest in this book that the Kyoto process has not been successful because it is based upon an assumption that a scientific consensus and strong moral injunctions will be sufficient to drive international policy. We argue that the negotiation of the Kyoto Protocol was a triumph for an interest-based explanation because of, rather than despite, the provision of science and normative arguments which were employed. This was because both the science and the normative arguments reflected the play of some powerful interests, and were being employed to push the direction of the process not just towards emission reduction rather than adaptation, but towards policy instruments which favoured some national or economic interests at the expense of others.

Under these circumstances, science and normative arguments had less force than suggested by many accounts of international environmental politics, ironically because the international system has ‘learned’ that scientific consensus tends to amount to a consensus negotiated between selected scientific institutions dependent on official funding and eager to exclude competing disciplines, and that strong normative arguments can do only so much to drive actors towards accepting ‘interdependency’ rather than ‘sovereignty’. Kyoto also revealed that, at the end of the day, there is little policy which is solely ‘environmental’, as the issue had important implications for many other policy areas, which brought in other interested actors. It is not so much that interests were stronger than they were in the ozone case, and the scientific and moral forces were thus insufficient, but that the scientific and moral interests exerting themselves in favour of Kyoto reflected (to a much greater extent than with ozone) the interests of those who would benefit from restrictions being placed on selected emissions.

This conclusion, which we shall argue in detail, accords with other recent studies of international environmental politics, where a more nuanced understanding of the place of science and norms is emerging. To give but one example, according to Ronald B. Mitchell (employing discourse analysis), through international treaties states redefine their rights in areas of common jurisdiction and these redefinitions of rights then redefine sovereignty. But the key question in an anarchic international system concerns whether—and under what circumstances—de jure redefinitions of sovereignty alter the de facto practices of sovereignty that harm the environment (always assuming that there is general agreement on what is ‘harm’). Mitchell (1998, 275) suggests that: ‘The success of efforts to alter sovereign practice by redefining sovereign rights depends, at least in part, on the form of discourse used to justify the redefinition.’ Drawing on the work of Goldstein and Keohane (1993) and Sikkink
Mitchell distinguishes between ‘instrumental’ (or interest-based) discourse, causal (or science-based) discourse, and ‘principled’ (or morals-based) discourse.

Mitchell suggests that instrumental discourse will only result in reluctant states accepting new norms of sovereignty if that discourse coincides with new patterns of power and interests that would ‘force’ them to accept such norms anyway. Available solutions each have their own champions in the form of interests pushing not only for solutions which advantage them, but also for problems which advantage their solutions – in the manner of Cohen et al.’s (1972) notion of problems and solutions meeting in the ‘garbage can’, or Winner’s (1977) notion of adapting ends to available means. Scientific (or ‘causal’) discourse will only prevail over short-term interests when sufficient scientific consensus and acceptance of that consensus persuades decision-makers to focus their attention on ‘how nature will respond to their actions rather than on how other states will respond’ (Mitchell, 1998, 283). He also warns, and we agree, that not only does moral (or ‘principled’) discourse often fail to lead to the acceptance of new principled beliefs, but it is likely to be counterproductive, leading states to reject new norms of sovereignty unless more direct, material incentives encourage their acceptance.

Note that Mitchell focuses on a distinction between de jure redefinitions of sovereignty and the de facto practices of sovereignty, which point to an increasing focus on international policy-making rather than just international politics – a focus (introduced from policy studies at the domestic level) on implementation and outcomes, rather than on whether interdependency norms prevail over sovereignty norms. Unlike ‘high politics’, the ‘low politics’ (Hoffman, 1966) of which international environmental regulation is so typical requires that we move beyond politics to policy, and consider the terms of ‘global governance’ (Soroos, 1986). Scholars such as Hanf and Underdal (1998) have suggested that the importance of science and norms might be limited only to particular stages of the international policy process, such as initiating negotiations rather than the process of devising workable solutions, and our findings here support that conclusion. (More on this in Chapter 2.)

Implementation is not just a process which must follow treaty adoption and accession. It is a process which may impact significantly on the negotiating process itself. It has been observed in studies of negotiations between nations in the European context that the tough and detail-minded negotiators are those who later tend to implement decisions correctly, while those who are most ready to compromise tend to have poor records of compliance (Weiler, 1988, 355–6). Laxity in implementation allows those nations least supportive of high levels of protection to sign agreements, knowing that they can drag their feet on implementation (Eichner, 1997). Many accounts of the development of MEAs ignore implementation and therefore miss an important dimension, not
just for issues of compliance, but for the implications of a low probability of compliance with agreement.

At the time of writing, the Third Assessment Report (TAR) of the IPCC has just been released. While it contains a large number of ‘scenarios’, the one which has been given prominence by IPCC Chairman Robert Watson is one which shows an alarming rate of global warming: 5.8°C over the next century. This result, generated from computer models, is the most extreme: it assumes that sulphate aerosols which cool the atmosphere will be controlled but that CO₂ will not, and economies will continue to be extremely heavily dependent on fossil fuels, with economic growth rates that seem unrealistic even if desired. Watson and other IPCC spokesmen have made statements accompanying the release of TAR to the effect that these predictions make it imperative that nations implement the Kyoto Protocol reductions: advice we consider quite improper as ‘scientific’ advice. We suggest on the basis of the analysis which follows that this was a misguided political attempt to use science to trump interests. Not only did it lead to an outcome in Bonn in 2001 widely regarded as a failure, but it runs the risk of being one cry of ‘Wolf!’ too many.

**PLAN OF THE BOOK**

We see the Kyoto process as having been modelled on the stages outlined by Brenton, but argue that this ignores both the need to negotiate interests and important stages in the international policy process. Specifically, the model ignores both implementation and an important distinction between policy initiation (where science and principled discourses can help initiate action) and policy adoption (where instrumental discourses are needed). The Kyoto process, by allowing reliance on normative arguments and science to spill over into policy adoption, actually marginalized the instrumental discourses needed to develop practical policy instruments, resulting in what Hanf and Underdal (1998) call the vertical disintegration of policy. We shall argue for this in detail in Chapter 2.

In Chapter 3 we set out the nature of the most significant interests in the Kyoto process, and then show in Chapter 4 how they were central to the negotiation. Chapter 5 examines the principled discourse employed in the Kyoto process, arguing that the use of such discourse was made by agents which did not rise above the interests at stake. We also maintain that the science in the Kyoto process failed to overwhelm interests, partly because the attempt to create an institutional consensus was also mixed up with various interests, partly because – despite these efforts – the science was inconclusive, and partly because even settled science neither suggests nor demands any particular response and thus has limited power to produce a policy consensus.
reference throughout to examples of peer-reviewed science which point to possible sources of error in the IPCC consensus. We explore the development of the IPCC in Chapter 6, arguing that the body institutionalizes not just a scientific consensus, but a certain kind of consensus intended to produce a certain kind of policy response. We provide some examples of this in Chapter 7, before arguing in Chapter 8 for our conclusion: that reliance on strong normative and causal discourse in the Kyoto process, rather than helping produce a consensus in favour of a workable response to climate change, actually contributed to an outcome widely seen as disappointing.

NOTE

1. Trofim Lysenko rejected the ‘dangerous Western concepts’ of Mendelian and Darwinian genetics and evolution in favour of somewhat bizarre Lamarckian views that, under a socialist system, cows could be trained to give more milk and their offspring would then inherit these traits (see Cole, 1983). Heisenberg’s uncertainty principle had received similarly short shrift in Soviet science. Claus and Bolander (1977) have noted the key features of Lysenkoism which can be seen in the politicized science of today: a necessity to demonstrate the practical relevance of science to the needs of society; the amassing of evidence as substitute for causal proof as the means of demonstrating the ‘correctness’ of the hypotheses; ideological zeal supplanting devotion to science, so that dissidents could be silenced as enemies of the truth. Manipulating data to support the ideological cause was permissible, since this was a higher truth.