Risk&Regulation

Magazine of the ESRC Centre for Analysis of Risk and Regulation

No 11 Summer 2006

Something in the air?

AIR INCIDENT REPORTING
BIRD FLU – PANDEMIC OR PANIC?

PLUS

Regulating Nanotechnology
The Dangers of Financial Modelling
Risk Colonisation

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

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RISK&REGULATION: CARR REVIEW
NO 11 SUMMER 2006

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Debating Risk

CARR Director **Bridget Hutter** on the importance of involving academics and practitioners in debate

Encouraging debate between academics and practitioners is one of CARR's core objectives, engaging a broader public is an additional bonus. And this is what we did through two major public events this spring. Both events touched on politics, business, health and the relationship between science and society. The first event, 'Outbreak? Pandemic Risk and Risk Management in the 21st Century', was sponsored by the ESRC as part of their Social Science week. The purpose of this week is to provide an insight into social science perspectives and how social science research influences our social, economic and political lives. Against the background of Tony Blair's call for 'a far more rational, balanced and intelligent debate as to how risk is debated' we considered the recent responses to the threat of pandemics. Within months of the Prime Minister's speech the media was reporting, often with some alarm, deaths from bird flu in China, Turkey, Indonesia and instances of infected birds across Europe. Germans were warned not to cuddle their cats; we learnt of contingency planning across the City of London; members of staff told employers that they would not be coming to work if bird flu was found in GB; head teachers reassured parents that pupils had been told what to do if they found a dead bird on school premises. Is this society reacting rationally? Is it sensible precaution or unwarranted panic? What can we learn from this about risk management in the 21st Century? These issues were debated by a distinguished panel drawn from different disciplinary backgrounds and from practice.

The debate addressed common risk management problems such as this posed by science: while science may be able to tell us more about risks and their implications, this greater appreciation of the risks may serve to heighten feelings of insecurity particularly as it is rarely matched by a greater ability to control or manage the risks. One of the key features of pandemics now is that they are seen as global risks. This is partly because our understandings of the global nature of risks have increased but also because there is greater transnational activity which in itself may exacerbate risks. For example, international travel can be a vehicle for the spread of viruses. In such a situation we need to examine whether the traditional instruments of the state are capable of managing pandemic risks in a globalised world. Is the structure of international governance suitable or prepared for the management of a worldwide outbreak? Do international institutions have sufficient authority? Are there global business or scientific networks capable of working together? How proportionate are the political and public fears surrounding pandemics and more importantly, prepared should we be? The debate provoked strong reactions with a diversity of visions and predictions for the future. Our panel of experts differed in their views and various levels of precaution were expressed by the audience.

Our next public event took a retrospective look at risk regulation issues. To mark the 10th anniversary of the British Government's announcement of a link between v.CJD and BSE, CARR held a public lecture in which Professor Hugh Pennington considered 'Risk Regulation: BSE … Ten Years On', with Dame Deirdre Hutton

CBE, Chair of the Food Standards Agency, acting as discussant. 1996 was indeed a momentous, even disastrous year, for British food safety. Not only was a possible link between BSE and vCJD announced in the House of Commons, Britain's biggest E.coli O157 food poisoning outbreak occurred in central Scotland, resulting in 17 deaths. These events again raised questions about the relationship between risk regulation and science and the outcomes of these discussions touched on the well being of us all. And these issues reside not just with scientists and governments but in the case of E.coli they are in part reliant on simple hygiene procedures being adopted by us all. The dilemmas surrounding the degree to which the government should intervene to protect the public was starkly brought home by both events.

These are, of course, questions key to CARR's research agenda for the lessons to be learnt are not confined to the food area but characterise to varying degrees all risk regulation domains. Moreover decisions about how to assess expert contradictory evidence and how to react to this knowledge are common to the public and private sectors. In this issue of *Risk&Regulation* CARR staff and Research Associates consider the risk regulation challenges posed by a new technology such as nanotechnology; the use of risk based approaches by governments and markets; and the challenges of avoiding catastrophe in safety critical industries.

Bridget Hutter
CARR Director

Post-traditonal Corporate Governance: A Marriage of Convenience?

With corporate governance still high on the policy agenda, **Joan O' Mahony** suggests that patterns of co-operation between companies and NGOs are increasingly sector-specific

'What if our relationship fails?' 'Who pays the legal bills?' and 'Do we talk to the press?' are questions that one might usually associate with celebrity pre-nuptial agreements. But just such questions are being asked by companies and charities in their rush to get hitched at the altar of corporate social responsibility. Partnership brokers in the UK are currently doing big business with corporations keen to maximise the benefits and avoid the negative risks of new, post-traditional relationships with environmental and human rights groups.

Certainly, much of corporate engagement with NGOs in reality does little more than to add 'civil society' to the list of stakeholders that corporate social reports address. But standing alongside this there is a significant new development: company participation in groups composed of charities and campaigners where institutionalised dialogue over specific public-policy issues takes place on a repeated basis, often with a standing secretariat, and supported by public or semi-public government bodies.

Explanations for this new development are not straightforward. The motivation for NGO involvement can, in part, be attributed to changes in funding opportunities. The chances of receiving funding from, for example, the World Bank are reduced unless one can meet the partnering criterion that appears so frequently in their funding application forms. It is, however, less clear why companies should want to participate. The need to make satisfactory returns to shareholders is of course the immoveable backdrop to any such participation, but meeting that requirement still leaves managers a great deal of latitude in deciding how to address public expectations about broader corporate responsibility, and whether formalising relations with non-traditional stakeholders is a necessary part of that.

My research on the top 100 publicly listed companies in the UK shows that there are systematic differences in such relationships. One might expect that such differences could be explained by reference to the lineage of the firm, to its 'personality', to its professed attitude to issues of corporate responsibility, or to whether its social reports are externally audited. But none of these variables is particularly significant. In fact, the chief determinant of civic-corporate partnerships is sector type. Differences between sectors are not immediately obvious; they are obscured for the most part by the diffuse, cross-sector, and random involvement of many of the FTSE 100 in the big global partnerships, such as the UN Global Compact. But beneath these more visible instances, networking tends to be factionalised. The extractive industries, for example, move in the same circles as the anti-corruption campaign groups, while institutional investors form relationships with elite environmental organizations, and the supermarkets tend to focus on particular consumer fears: currently, depleting fish stocks and the growth of offshore outsourcing.

From these differences, one can develop explanations of corporate-civic engagement, breaking it down into types: for example, reporting networks, knowledge networks, and praxis networks. Reporting networks, such as the Extractive Industries Transparency Network, are increasingly attractive to oil, gas, and mining firms, which are often situated in weak government zones, and which, since they cannot move their assets, find public concern about political payments an unavoidable problem for the maintenance of their reputation. Knowledge networks, such as the WWF-UK Programmes Committee are advantageous to insurance companies, for it provides them with additional information about potential investment risks. In fact, the insurance industry displays a notable level of sophistication in its discussion of corporate social accountability as evidenced by its contributions in UK business forums, and to setting the agenda for the EU green paper on CSR. Praxis networks, such as the Ethical Trading Initiative, offer technical solutions to the large multinational retailers for who supply-chain transparency is now a critical concern.

Such alignments of policy interests between business and civic groups are beginning to disrupt the established assumption that business speaks with one voice. One example of this is last year's unlikely coalition between Friends of the Earth, the Trades Union Congress, and the Association of British Insurers against Gordon Brown's unexpected ditching of the Operating and Financial Review at the CBI conference (The OFR would have made it compulsory for companies to report on non-material risks). But who needs government to lead regulation? The ABI has instructed the sector to proceed as if the OFR had not been abandoned at all!

Civic-corporate networks appear to be a growing field of differentiation and specialisation, where elective affinities exist between types of NGOs and types of business sector. Interest-alignment is the key to their establishment and to their success. The lesson in that for the larger cross-sector networks is that there may simply not be enough incentives in them to prevent their degeneration into mere paper partnerships. Smaller, more targeted policy networks may be the way ahead for joined-up regulation. Finally, the question of social regulation, versus the market, versus the state is not of relevance here. Market logic is the clear driving force for business involvement, but it is a market logic created and sustained by the NGOs, and shored up by government, which increasingly lacks the money, style or institutional reach to know, find or execute all the regulatory solutions. ■

Joan O' Mahony was Leverhulme Special Research Fellow at CARR until June 2005. She is now Alcoa Research Fellow at LSE Environment: Centre for Environmental Policy and Governance

ACADEMICS ABROAD

Bridget Hutter and **Javier Lezaun** represented the UK at the OECD Global Science Forum Workshop on Science and Technology for a Safer Society in Tokyo in December, where they presented a paper on 'Social Science Perspectives on the Governance of Science and Technology'. **Bridget Hutter** also chaired a session on interdisciplinary approaches to managing societal risks.

Martin Lodge visited the Centre d'Etudes et de Recherches de Science Administrative (CERSA) from late March to late April.

In April, **Colin Scott** presented a paper on 'Regulating Private Legislation' at *The Making of European Private Law: Regulation and Governance Design*, a conference held at the European University Institute, Florence.

In March **Robert Kaye** spoke on the regulation of conflict of interest in the modern state at UNAM, Mexico City, at a conference sponsored by the World Bank.

Javier Lezaun spoke on 'The Life of Patents' in January at Amherst College, Massachusetts and in March at Pennsylvania State University in the United States.

Peter Miller gave the keynote address at the International Conference on Coordination and Cooperation across Organisational Boundaries, Universita Cattolica del Sacro Cuore, Milan, in April.

CARR VISITORS

Joanna Gray, a Solicitor and Reader in Financial Regulation at the University of Newcastle upon Tyne, visited during February and March, when she gave a seminar entitled *Risk, Regulation and the BCCI Litigation*.

Dr Yvette Taminiau, from the Vrije Universiteit in Amsterdam, will be a frequent visitor in May and throughout the summer. Dr Taminiau is working on two projects: the impact of institutional pressure at the firm and industry levels, and the struggle for dominant design: engineers in competition with accountants.

Jan Popma visited CARR in December to undertake research on the role social dialogue in regulation, and particularly problems of incommensurability between different world views

CARR NEWS

Julia Black and **Bridget Hutter** organized a second Roundtable on Assessing the Effectiveness of Risk Based Regulation in January, assisted by **Clive Jones**. The event saw contributions from the worlds of business, academia, regulation and the civil service. Presentations were given by CARR's **Mike Power** and **Paul Connolly** of the Better Regulation Executive.

Carl Macrae was invited in April to present his research on aviation safety management (see page 10) at an expert meeting organized by the World Health Organisation World Alliance for Patient Safety.

In April at the University of Reading, **Will Jennings** presented a paper at the Public Services Panel of the Political Studies Association Conference, entitled 'The Public Thermostat, Bureaucratic Control and Policy Responsiveness: Migration Policy in Britain, 1994-2004'.

In March, **Bridget Hutter** and **Robert Kaye** gave a presentation on regulation of the professions to a meeting of the UK Inter Professional Group.

The department of Sociology at the University of Kent, Canterbury, invited **Mike Power** to present 'The Risk Management of Everything' in December. Mike also spoke at *Taking Stock of Trust*, a joint conference held by CARR and the SCARR (Social Contexts and Responses to Risk) Network at LSE's Rosebery Hall in December.

In May, **Bridget Hutter** presented on 'Managing Risks: influence and variation in the food industry' to the Cullen Centre for Risk and Governance in Glasgow.

We welcome two new members of the administrative team. **Phil Lomas** joined us as Centre Administrator in December and **Sonia Malkani** started in January as Events, Finance and Director's Administrator.

Finally, we say *au revoir* to **Colin Scott**, who has left LSE to become Professor of EU Regulation at University College, Dublin. Colin will continue in his role as Research Associate with CARR.

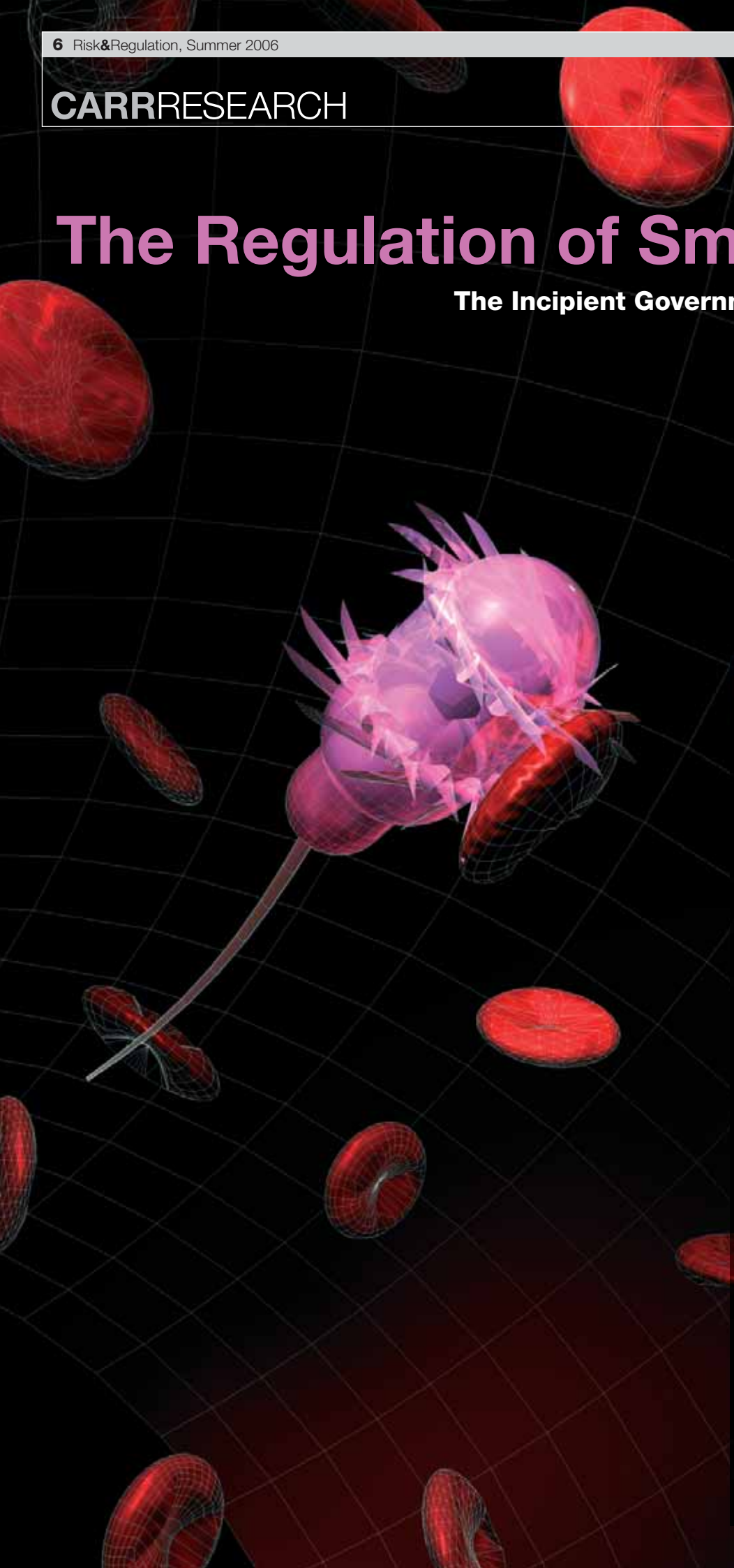
We also say farewell to **Stephanie Harris**, CARR's Events and Publications Administrator, and assistant editor of *Risk&Regulation*.

Have you moved or changed jobs recently? Please keep us informed of any changes in your contact details so you can continue receiving Risk&Regulation. **Email: risk@lse.ac.uk or Tel: +44 (0)20 7955 6577**

The Regulation of Small Things

The Incipient Government of Nanotechnology

Robert Doubleday and
Javier Lezaun



New Properties, New Risks

In January 2000 President Clinton announced the launch of the US National Nanotechnology Initiative, with an initial budget of $500 million. Today, over $9 billion is spent annually on nanotechnology research and development globally, and the US National Science Foundation expects it to have a $1 trillion impact on the world economy by 2015.

Such rapid expansion of research and funding has been fuelled by promises of the radical innovations made possible by nanotechnology, the manipulation of materials at the nanometre scale – a nanometre being one-billionth of a metre. In the words of Clinton's speech:

'*Just imagine, materials with ten times the strength of steel and only a fraction of the weight; shrinking all the information at the Library of Congress into a device the size of a sugar cube; detecting cancerous tumours that are only a few cells in size.*'

Three key industrial trajectories are driving research in this area: continued miniaturisation in electronics; the prospect of developing new materials by engineering nanoscale structures; and the ability to manufacture new interfaces with biological processes leading to new instruments of medical diagnosis and more targeted drug delivery.

Yet, as with any cutting-edge research worth its salt today, nanotechnology comes accompanied by the anticipation of new risks, and by multiple commitments to address its ethical, legal and social implications. The risks and unknowns arise from the tiny scale of these structures. At the nanoscale, materials may acquire new and unexpected physical, chemical or biological properties. An electrically insulating substance can become conductive; gold becomes highly reactive; silver acquires antibacterial properties. Most crucially, at the nanoscale materials can have drastically different toxicological profiles. Their size may allow them to cross cell membranes or the blood-brain barrier, to penetrate more deeply the respiratory system, creating new health hazards. At the end of March 2006, nanotechnology's first

product recall followed reports in Germany that nanoparticles in a bathroom cleaning product were thought to have caused several cases of respiratory problems when used in confined spaces. It is to these anticipated risks that regulatory authorities throughout the world have begun to turn.

Regulatory Challenges

At a meeting convened last year by the US Environmental Protection Agency to discuss possible regulatory pathways for the governance of nanomaterials, a participant compared the deliberations to 'the blind man feeling the elephant'. Indeed, the response of regulatory agencies to nanotechnology has been tentative, programmatic at best, and focused largely on the toxicology of free manufactured nanoparticles, an area regulators hope to address through analogy with the regulation of chemicals.

Two influential reports have called for governments to address potential gaps in the applicability of current regulation to nanotechnology. In 2004 the Royal Society with the Royal Academy of Engineering recommended a review of existing regulation with a view to ensuring that humans and the environment are appropriately protected from new risks. Their report called on European regulation to treat nanoparticles as new substances. It also argued that the release of manufactured nanoparticles into the environment should be avoided whenever possible, and that these structures should be treated as potentially hazardous in the workplace. A recent report from the US think tank the Wilson Center goes further in recommending a new 'Nanolaw' to manage the unique risks of nanotechnology.

These and similar reports are essentially general calls for precaution, and for investing more resources in research on the hazards generated by these new technologies. The principal novelty is that such debates are now occurring early in the life of an emerging technology, before there is sufficient information to develop targeted regulations or design specific institutional frameworks. The challenge for regulatory agencies is how to move beyond inter-departmental review committees and white papers on future research priorities, to drafting regulations to cope with nanotechnologies and materials that are already on the market, when many definitional questions are yet to be resolved.

While governments struggle with questions about the overall regulatory approach to nanotechnology risks, it is in the unglamorous world of international standard setting that the challenge of establishing workable definitions and tests for nanotechnology products is being addressed head-on. The British Standards Institute is at the forefront of international deliberation about the production of measurement tools for the identification and characterisation of materials and particles at the nanolevel. The International Standards Organization (ISO) and the European Committee for Standardization (CEN) have both established technical committees with specific tasks that include developing standards for: terminology and nomenclature; metrology and instrumentation (including specifications for reference materials); test methodologies; modelling and simulation. This work will provide scientific and industry standards, and will also address the protocols for carrying out toxicity and environmental impact assessments.

This is the obscure infrastructure work that is a vital part of regulation but often remains out of sight. It just happens that in the case of nanotechnology, this foundational work is still to be done – basic definitional and taxonomical issues must still be resolved; the instruments for detection and measurement are still to be developed – and the scale of operations presents radical challenges for scientists and regulators alike. The cart of regulation and the horses of standardisation travel here in parallel.

Dislocating the timing of regulation

What we can observe with nanotechnology is thus a profound challenge to those who hold that technology development and regulation should proceed in a linear sequence. Maybe there was a time when science could be developed out of sight from the public, in the seclusion of the laboratory; when regulatory discussions took place only after new products and techniques had been properly characterised and once they were understood and mastered by their inventors. According to this linear view, the debate over the social and ethical implications of a novel technology should wait until its release and commercialisation, when the impacts are clearly and visibly at hand. To some extent, biotechnology has followed this model of sequential development: the regulatory process evolved – and the public debate acquired greater intensity – as genetically modified organisms moved from the laboratory to the field trial, from the field trial to commercial production, and finally to the supermarket. However, and as far as nanotechnology exemplifies a new pattern, this staged chronology of regulatory evolution is no longer the case.

In the case of nanotechnology, the production of new knowledge, the development of measurement tools and systems, the debates over the proper regulatory response, and the activism around its political implications are all happening simultaneously; the boundaries between sequences in the research-regulation spectrum are blurred.

And the key driver of this process is not the eagerness of campaigning organizations and activist groups to make new technologies controversial, but rather the keenness of governments and scientific establishments to proclaim the economic promise and competitive value of the 'next new thing' at the earliest possible moment; their need to 'socialise' new technologies long before they acquire a definitive shape.

When Bill Clinton declared in 2000 (at a time, incidentally, when the forward march of food biotechnology seemed to have been halted across the world) that nanotechnology had become a crucial field for the future of the nation, and that the federal government had a critical role to play in fostering it, there was hardly any campaign organization or activist movement (let alone social scientist) actively following the development of this new field. It was not even clear whether it made sense to describe as 'nanotechnology' a rather amorphous set of products and research agendas that perhaps belonged more comfortably in traditional scientific disciplines or product development cycles. Nanotechnology was first hypostasized and hyped by its enthusiasts. It became a consistent target of public investment before it became a coherent area of research.

Nanotechnology was brought to public attention by its boosters; it entered the public domain on the hopes of its advocates. This is why it is no surprise – and it may be the pattern of new and cutting-edge technologies to come – that it would come surrounded by a set of 'economic, social, and legal' issues, which must be addressed as the technologies and applications themselves progress. Public deliberation on new science and technology must move 'upstream', as a pamphlet from the think tank Demos has recently argued, simply because new technologies are now socialised earlier; as promoters find a political and competitive advantage in broadcasting the promise of new technologies long before they acquire concrete form. It is no wonder then that the public wish to join scientists and regulators in the collective game of feeling this new elephant. ■

Robert Doubleday is a research associate at Cambridge University's Nanoscience Centre.

Javier Lezaun is an ESRC Research Officer at CARR

GUESTRESEARCH

Feedback Loops and Modelling Risks

Mathematical models are now essential to trading and risk management. But the effects of those models on markets need careful consideration, argues **Donald MacKenzie**

We can be confident that astronomers' mathematical models have had no noticeable effects on the motions of the planets. In the social sciences, in contrast, there is always the possibility that models will come to shape the behaviour being modelled. Although, as I shall argue, the resultant feedback loops are not always harmful, they can create what Boris Holzer and Yuval Millo call 'second-order dangers', dangers created or exacerbated by the very systems set up to control risk (CARR Discussion paper 29, November 2004).

I recently explored these issues in a book published by MIT Press (An Engine, not a Camera: How Financial Models Shape Markets). The book describes the transformation of the academic study of finance in the US in the second half of the twentieth century. Up to the 1950s, scholarship in finance was largely descriptive. Many economists would not have recognised it as part of their discipline, and it was located in business schools that were then often seen as sites of low-status, vocational education.

By the end of the twentieth century, all this had changed utterly. Scholarship in finance had become analytical and often highly mathematical. Five finance theorists – including two of the central figures discussed here, Myron Scholes and Robert C. Merton – had won Nobel Prizes in Economics. Many US business schools had become elite institutions, and they were pumping out around 100,000 MBAs a year.

At first sight, the Nobel-prize-wining contribution of Scholes, Merton and their colleague Fischer Black (who died in 1995, before the prize was awarded) seems highly technical, even esoteric. Their model was of the pricing of options, contracts that give their holders the right, but do not oblige them, to buy ('call') a set quantity of an asset at a set price on, or up to, a given future date – or, in an alternative form of the contract, to sell ('put') the asset for a fixed price.

When Black, Scholes and Merton developed the model at the start of the 1970s, options were traded only in small-scale, ad hoc ways, and in the past options trading had often been banned by governments that saw it as a tool of dangerous speculation or even simply as wagering on price movements. Analytically, however, the Black-Scholes-Merton model was strikingly innovative. In it, an option can be replicated exactly by a continuously-adjusted portfolio of holdings or borrowing of the underlying asset and cash. The price of an option must equal the cost of this 'replicating portfolio', because otherwise there is an opportunity for arbitrage – for making riskless profits. Expressed mathematically, this argument leads to what has become perhaps the most famous of all of finance's equations, the Black-Scholes option pricing equation.

The Black-Scholes-Merton model did more, however, than contribute centrally to the transformation of the academic study of finance. It helped the process by which the limited markets in financial derivatives of the early 1970s have grown to today's staggering volumes. A 'derivative' is a contract (such as an option) the value of which depends upon the price of an underlying asset or on the level of an index or interest rate. The Bank for International Settlements calculates that the total amount of such contracts outstanding worldwide at the end of June 2005 was $328.6 trillion, an astounding $51,000 for every human being on earth.

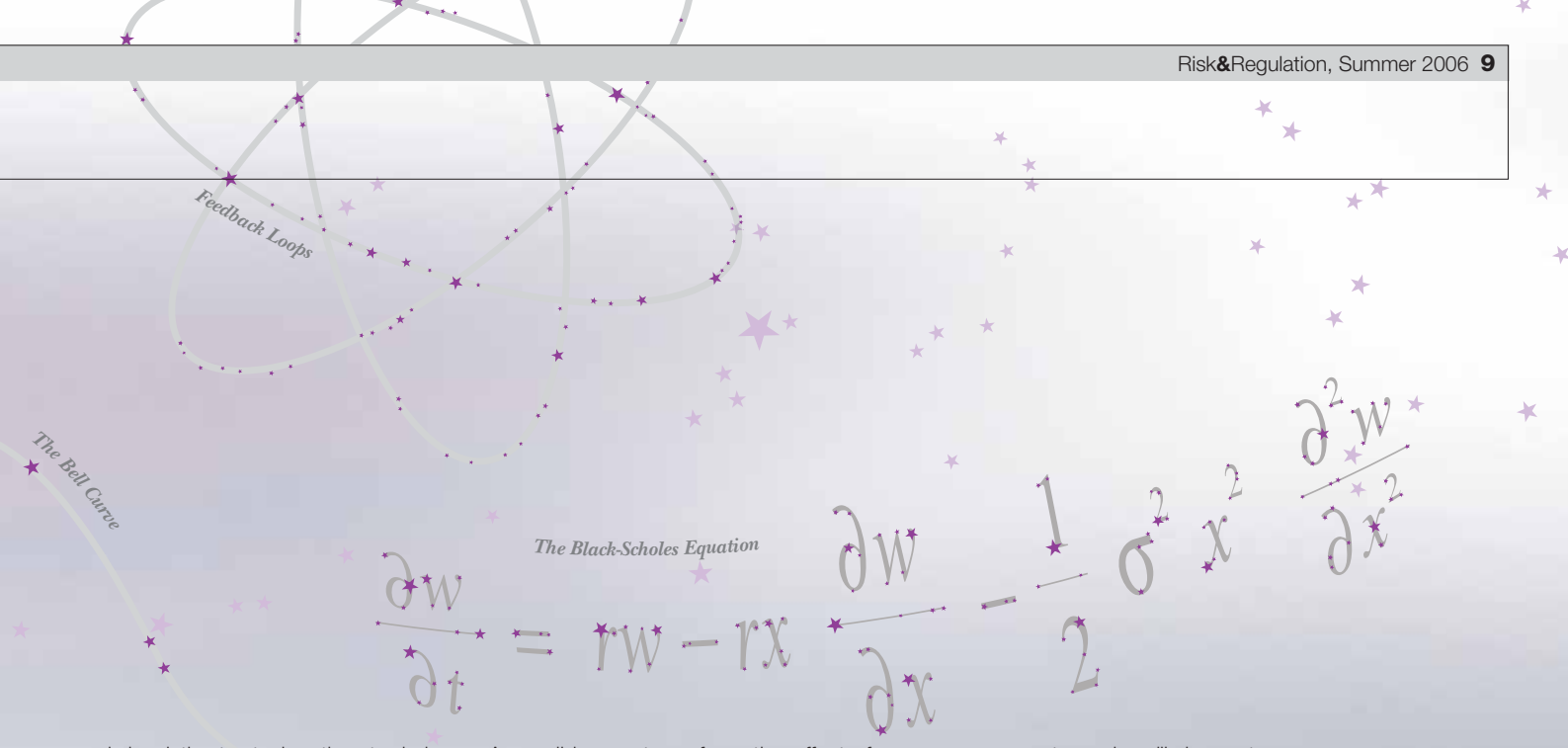
Such a calculation exaggerates the economic significance of derivatives, but even after the total is deflated by a factor of 100 (which may be about the right order of correction), derivatives trading has clearly become a very large-scale activity. The Black-Scholes-Merton analysis contributed to its growth in three ways.

First, the Black-Scholes-Merton model, along with the refinements and developments that quickly followed, provided a guide to trading options, indicating both how to price them and how to hedge the risks involved.

Second, the model provided a way of talking about options. Its crucial parameter was the volatility of the underlying asset (the extent of fluctuations in its price). The model was often used 'backwards', to work out the level of volatility of the underlying asset implied by the price of an option on an asset. By allowing an option price to be converted in this way to an 'implied volatility', the model allowed markets of daunting complexity – puts and calls, each with a range of different exercise prices and expiration dates – to be reduced to a simple, easily understood common metric. Indeed, nowadays option prices are sometimes quoted not in dollars and cents but as a level of implied volatility.

Third, the Black-Scholes-Merton model provided options markets with much-needed legitimacy. In 1973, the first modern options exchange opened in Chicago. Its counsel, Burton R. Rissman, told me in interview:

Black-Scholes was really what enabled the exchange to thrive... [I]t gave a lot of legitimacy to the whole notions of hedging and efficient pricing, whereas we were faced, in the late 60s-early 70s, with the issue of gambling. That issue fell away, and I think Black-Scholes made it fall away. It wasn't speculation or gambling, it was efficient pricing… I never heard the word 'gambling'



again in relation to stock options traded on the Chicago Board Options Exchange.

These practical uses of the Black-Scholes-Merton model affected its empirical validity. The model posited a fully liquid options market in which one could trade without incurring transaction costs. The guide to trading that the model provided helped give participants the confidence to trade much larger volumes of more keenly priced options than hitherto, and the legitimacy it provided helped regulators view hugely-expanded options trading with equanimity.

The practical uses of the model seem even to have helped it to pass the econometric tests of its volatility. When the model was first formulated, the 'fit' between it and patterns of empirical prices was only approximate. During the 1970s, the fit improved rapidly, in part because traders were employing the model to buy options it suggested were relatively overpriced and to sell their underpriced counterparts, a strategy that had the effect of minimizing discrepancies between model and 'reality'. Often, they did this using sheets of theoretical option prices that Fischer Black himself produced and sold.

These various effects of the practical uses of the Black-Scholes-Merton model could all be described as 'performative': they helped to make the world posited by the model more real. The term 'performative' was coined by the philosopher J.L. Austin. He used it to designate utterances that constitute the action of which they speak, rather than describing an already-existing state of affairs. Thus if I say 'I apologise', my utterance is performative: it constitutes an apology.

However, the feedback loops between models and markets do not always have the effect of making the conditions posited by the model more real. 'Counterperformativity' is also possible: the use of a model can make market processes less like the model's postulates.

A possible counterperformative effect of the practical use of option theory was to exacerbate the 1987 stock market crash, the most serious post-war crisis in global financial markets. Black, Scholes and Merton had invoked the idea of an option's 'replicating portfolio' in order to work out how much the option should cost. In the 1980s, however, the followers of the strategy called 'portfolio insurance' drew upon option theory to construct replicating portfolios in practice. Their goal was to synthesize a put option on the set of stocks they managed, in other words, an option to sell the set of stocks for a fixed price. That price would thus be a floor, below which the value of the set of stocks would not fall.

As noted above, an option's replicating portfolio is not static: it needs continuous adjustment. Replicating a put, which is what portfolio insurers were trying to do, involves selling the underlying asset as its price falls. By 1987, portfolio insurance in the US was big business: assets worth around $60-90 billion were managed in that way. The suspicion (never proven) is that huge sales by portfolio insurers contributed to the 20 per cent fall in US stock prices on 19 October 1987. It was the worst ever single day in the US stock market, and it nearly led to a self-feeding chain of bankruptcies that would have undermined the US financial system. For example, by the end of trading that afternoon, the New York Stock Exchange's 'specialists' – the firms that keep stock trading going by matching buy and sell orders and using their own money if there is an imbalance – had in aggregate exhausted two-thirds of their capital.

If portfolio insurance did contribute to the 1987 crash, it would be a counterperformative effect in two senses. First, canonical option theory assumes that the logarithms of the prices of the underlying asset follow a normal distribution (statisticians' celebrated 'bell-shaped curve'). A 20 per cent one-day move was a grotesquely unlikely event on that assumption.

Second, the 1987 crash ended the period in which the fit between the Black-Scholes-Merton model and patterns of option prices was good. On the model, the graph of implied volatility against strike price should be a flat line. Since 1987, the line is no longer flat. A substantial skew (sometimes called the 'volatility smile') has emerged, and it seems persistent: it did not diminish even as the memory of the crash faded.

These effects of option theory on the markets it analyzed are no argument against the theory or against the use of quantitative models in general. The Black-Scholes-Merton model was brilliant, epoch-making theoretical work, whose practical relevance is undiminished: it is still in many ways the benchmark. And one simply couldn't trade derivatives totalling $329 trillion without the guides to pricing and hedging that quantitative models provide.

Rather, the story of option theory's effects on markets indicates good reason to be cautious about situations in which large numbers of participants are all using similar models to guide their trading and to control its risks – perhaps because market regulators are pushing them in this direction in respect to risk management. In such a situation, models may sometimes be performative – they may help shape reality to their contours – but the danger of counterperformativity will always lurk.

Donald MacKenzie holds an ESRC Professorial Fellowship at the University of Edinburgh.

CARRRESEARCH

Harnessing hindsight

Assessing risk, resilience and operational incidents in airlines

Carl Macrae examines how near-miss incident reports are used to oversee and manage risk in civil aviation.

Operational breakdowns are serious in any industry, but in airlines they can be catastrophic. Air accidents, like any organisational collapse, emerge from a complex combination of factors: from gaps in company policy, to clumsy or inappropriate procedures, to the errors of operational personnel. Long considered a safety-critical industry, airlines have been at the forefront of developing a range of approaches to manage these operational risks. One key strategy is analysing and learning from past events and minor incidents. Incident reporting programmes allow personnel at the operational 'sharp-end' to report mishaps, failures or concerns of relevance to flight safety. These can then be analysed and the findings acted on. Developed and used in the aviation industry for the past three decades, incident reporting programmes are increasingly emerging in other domains – most recently healthcare and finance.

Challenges of practice

The focus of scholarly attention, however, remains largely on the design and implementation of reporting programmes: how to establish trust and encourage reporting, how to design databases and information systems, and how to structure causal analysis models and risk analysis tools. Research has rarely examined the practices of assessing and managing incident reports – where the interpretive challenges of risk analysis and management come to the fore.

A large airline can see around eight thousand reports a year from its pilots alone – and similarly high levels of reporting from engineering, ground and cabin crews. But these reports tend to be brief, truncated accounts of what are often complex organisational events. Reports can be 'one-liners', caricatured on occasion as simply saying that 'something went bang as we landed the aeroplane'. Generally, they concern minor operational fluctuations, hiccups and anomalies that typically result in little or no adverse outcome, and are compensated for or worked around – for instance, an error inputting data into a flight computer that is noticed and corrected during a subsequent cross-check. And they span a wide range of operational issues and areas, concerning literally anything that operational personnel decide to report: from circuit-breakers left tripped after a service to inappropriate advice given by a technical department.

Finally, programmes are run by independent organisational units that report to board level, but are separate to line management and have no executive capacity. This encourages reporting by personnel, and allows incident analysis to be removed from operational and commercial pressures. But it also introduces a challenge: these units have no direct authority to enforce action.

Examining the interpretive practices of the flight safety investigators who assess and manage incident reports in airlines provides specific insights into how minor events are analysed and learnt from. It also holds broader implications for how risks can be identified and made sense of in other complex organisational settings. The interpretive practice of investigators can be explained in terms of three analytical concepts: resilience, vigilance and participation. These three concepts respectively characterise how risks are practically understood, identified and acted on in this setting.

Resilience

Operational safety and risk have typically been defined in terms of adverse consequences: a standard metric for risk is the severity and likelihood of a harmful outcome. Likewise, safety is often defined as the avoidance or absence of adverse events. Yet these approaches are found to be of limited use in this safety-critical setting. Investigators take the view that organisational activity is inherently imperfect. Errors

and failures are a normal feature of operations: people will make mistakes as part of their daily work, and components will fail as part of their natural lifecycle. Accordingly, investigators assume that the potential for catastrophe is ever present, as small failures and events could combine in complex, unforeseen ways. The only means of guaranteeing absolute safety, as far as they are concerned, is to keep the aircraft locked in a hangar. In light of these assumptions, investigators differentiate relative safety and unacceptable risk within an interpretive framework that can be characterised as *organisational risk resilience*: the organisational capacity to protect operations from the potential of minor mishaps developing into major breakdowns.

Airline operations are replete with risk controls and safety defences such as routines of cross-checking and reading back instructions, training for out-of-ordinary conditions, and automated warning systems. These defences provide resilience to errors and failures. But acceptable safety requires not merely resilience in this typical sense of 'bouncing back' from actual mishaps. Rather, it requires resilience to the risks of minor operational failures escalating, by ensuring systems of defences remain in place beyond any actually called upon. Further, these defences and risk controls are viewed by investigators as social and organisational processes. So, for instance, the automated warning system that alerts pilots to terrain hazards is understood as a network of practical activities encompassing maintenance work, the ability of flight crew to notice the warning and respond appropriately, the provision of effective training, and the development of appropriate procedures and policy – and not merely as a technical system that is in place or not. Operational incidents are therefore used to diagnose where and how processes of organisational resilience are degraded, rather than to attempt predictions of future catastrophes.

Vigilance

Making sense of incidents and identifying risks is, at core, about using and developing organisational knowledge. Current models of incident analysis and risk assessment focus on the incident data: categorising, classifying, abstracting and quantifying it. In practice, investigators interpret incidents by drawing on their extensive operational experience of organisational risks. Risks are identified through an interaction between what reports say and what investigators know. This includes, for instance, understanding the broader operational context surrounding an event, being aware of any similar problems or incidents experienced elsewhere in the industry, and knowing the operational history of the implicated processes – such as when and why they were developed. The aim of incident analysis, as investigators see it, is to oversee and know about the risks that currently exist. However, one of their most basic assumptions is that their knowledge of risk is always partial and limited. Some risks will always lie outside the bounds of their current knowledge. As such, they continually work to expose these unknown, latent risks. They adopt an approach that is based on humility and scepticism towards the safety of operations, the information they receive, and their own interpretations of risk, that can be characterised as *interpretive vigilance*. This interpretive work is directed at identifying weak and fleeting signs of ignorance, in the form of suspicions or doubts. Four distinct interpretive tactics are used to construct these suspicions, based on identifying patterns of failure, drawing relations between major issues and minor events, perceiving novelty in unrecognised forms of failure, and finding discrepancies in operational practices – or their knowledge of them.

Participation

Incident reports are used not only as a source of risk data, but as specific opportunities to investigate and act on particular aspects of operations. But, as investigators have no direct authority to enforce action, they work to co-opt local specialists and personnel throughout the organisation to investigate, reflect and act on the risks implied by incidents. These means of addressing risks can be characterised as the creation of *participative networks* around risks. Investigators aim to influence and effect organizational action by setting a safety agenda, through initiating local investigations and publishing regular reports and reviews. Their primary tactics are to pose questions about safety and to publicise signs of potential problems, prompting local specialists to examine and review the implicated operational activities. In the case of more complex risks, this often involves bringing together networks of experts from different organisational units and operational areas. In this way, investigators co-ordinate distributed processes of organisational learning around numerous concrete and specific indications of risk: operational incidents. Knowledge is developed and change effected through the active participation and engagement of organisational personnel.

Lessons for theory from practice

What implications does this examination of practice hold for current theory? First, it suggests that current models of risk management, and methods of risk analysis, could be productively extended by more fully attending to the 'positive' face of operational risk – the organizational practices and social processes that underpin organisational resilience – so moving beyond the current focus on predicting and avoiding failures, errors and harm. Second, it emphasises the central place of knowledge – and its dark side, ignorance – in dealing with risk. Assessing small moments of operational failure is an interpretive process that draws on forms of knowledge that are not readily quantified or formalised, such as the particulars, specifics and details garnered from practical operational experience, or vicarious knowledge of similar events experienced by other organisations. And identifying signs of ignorance, in the form of suspicions that arise from subtle relations and mismatches between current knowledge and organisational events, equally appears to offer a useful proxy for identifying latent risks. Third, it points to the importance of institutional designs that balance the tensions between central oversight and local participation and action, and that establish organisational spaces for collective enquiry and sensemaking around risk events. ■

Carl Macrae is an ESRC Postdoctoral Fellow at CARR

CARRSTUDENT

Rising Tides

CARR Research Student **Rita Samiolo** discusses the challenges that Venice's precarious existence poses for risk accounting

Climate change has altered our notion of natural disaster. Extreme climatic events like hurricanes and floods are increasingly seen as a by-product of our modern way of life, the sign of an upset 'natural equilibrium'. As the range of risks that we consider to be purely natural has narrowed, the idea of an untouched, primitive nature, of nature as it would be without human interference, still underlies many political debates as the benchmark against which the environmental consequences of our decisions are assessed.

In few places in the world have the contradictions of modernity been so dramatised as in Venice, the city built of waters that juxtapose an invaluable artistic heritage, capricious sea tides, a rare lagoon environment, and a vast industrial port and petrochemical site which extends on the inner margin of the Venice lagoon like the dark side of the moon.

The history of the city has been marked by an ongoing struggle between waters and water managers. Massive hydraulic works have ensured the maintenance of the Venice lagoon, a transitional environment otherwise destined to disappear naturally through silting up. The lagoon has a fundamental role in absorbing and mitigating sea tides, thus avoiding the flooding of the city. However, in the 20th century, this forced cooperation between man and an already 'artificialised' nature was interrupted. Following a modernist ethos of industrial expansion which would rescue Italy from its stagnant traditional economy, a large industrial site was built on the mainland side of the lagoon.

Industrialisation brought a series of transformations in the lagoon morphology which have been blamed for the rapid sinking of the city and erosion of its lagoon. The result has been an increase in the violence and frequency of floods in the city. In addition, environmental disaster was caused by the progressive discharge into the lagoon of enormous amounts of industrial waste from the petrochemical site, left unchecked for decades. When, in 1966, an abnormal sea storm produced the worst flood in the city's history, the world started fearing for its survival.

An expensive programme to 'safeguard' the city and its lagoon has been in place since the 1970s, involving all levels of government, scientists from Italy and around the world, and international organizations like UNESCO.

This ongoing discussion has recently taken the form of open controversy over a massive engineering project for mobile barriers to protect the city against low probability/high impact floods. Debated since the 1960s, the project was ultimately approved in 2001 and remains controversial today, due to fears over its environmental impact, its estimated cost of about €4 billion and the still uncertain changes that global warming will produce on sea levels.

Floods in Venice ceased to be seen as natural phenomena long before the discovery of global warming; they have become a man-made problem, inextricably linked to the fate of its eroded and contaminated lagoon. Many of those who oppose the mobile barriers think that before any engineering scheme is carried forward, resources should be devoted to the restoration of the lagoon environment. However, experts acknowledge that there is no natural 'benchmark state' to which the lagoon could return, given that its morphology and unique ecosystem have emerged from centuries of anthropic 'interference'. Hence, they claim, any solution to the 'problem of Venice' will have to be 'political'.

Appraisal of the mobile barriers project reflected these tensions. The environmental impact assessment of the project has been especially controversial, being repeated several times by different experts and leading to contradictory conclusions. Performing such cost-benefit calculations and arriving at synthetic figures implies reducing to a common denominator economic, natural and physical elements that are heterogeneous and treated as incompatible in the political arena. It entails quantifying intangible values like heritage, culture and nature, which in the eyes of many is not only scientifically controversial but also morally unacceptable. It risks blurring the boundary between facts and values, risk and uncertainty, objectivity and subjectivity.

The institutional legitimacy of these calculations normally depends on them being perceived as relatively objective, free from political bias. Such credibility results either from complex negotiations of method ultimately institutionalised as standard rules, or from faith in experts and their unbiased, if subjective, judgement. In the case of Venice, however, the intangible has prevailed over the calculable, uncertainty over risk and subjectivity over objectivity. Political controversy and scientific uncertainty have produced divided experts. What is more, the expert debate has been paralleled and challenged by the 'lay' discussions carried out within the media and civil society. While scientists have recognised the political side of the problems they are called to debate, politicians have clung to the notion of scientific uncertainty, exacerbating conflict. As a consequence, the political process of allocating responsibility tends to overlap with the scientific discourse about causes. The task of saving Venice becomes a collective assumption of responsibility for past abuses of the environment, one in which the demand for redress influences the way risks are prioritised.

The case of Venice, in which the legitimacy of science is questioned and its ability to order politics shaken, help us assess what a different politics of the environment might look like. Abandoning dogmatic notions of nature represents an opportunity to leave behind positivist attitudes which appear today as arbitrary, typical of an outdated and technocratic decision making style. However, it also risks falling prey to a political mood which seeks compensation in the name of a violated natural order whose innate laws might elude our cognition, but whose loss still haunts us. ■

CARRSEMINARS

Full abstracts and details of seminars can be found on the CARR website: www.lse.ac.uk/collections/carr

The regulation of genetic testing – a case study in the difficulties of constructing and operating risk-based regulatory regimes

Stuart Hogarth, Cambridge University
17 January 2006

How risky are genetic tests and how should those risks be regulated? In recent years there has been both optimism about the promise of personalized medicine based on a detailed understanding of our genetic predisposition to disease, and concern about the harms which may arise from the widespread use of poorly evaluated genetic tests. Fears that new tests are evading proper regulatory processes have been countered by concerns that over-regulation may hamper innovation. One proposed solution has been to focus regulatory scrutiny on those tests which pose greatest risks to patients. But how does one decide how risky a genetic test is? This seminar explored the factors which influence risk-based regulation by examining how regulatory regimes in the USA, Europe, Canada and Australia have dealt with this issue.

Risk Regulation and Administrative Constitutionalism: Exploring the Interface Between Technological Risk Decision-Making and Administrative Law

Dr Liz Fisher, Corpus Christi, Oxford University
14 February 2006

The public setting of standards and appraisal of risks has been one of the most controversial areas of regulation in recent years and given rise to a range of legal disputes in various jurisdictions. Disputes in this area have largely been characterized as between those who argue that science and expertise are the proper basis for risk decision-making and those who argue that democracy and values are. In this seminar, using administrative law as a starting point, Dr Fisher argued that this dichotomy is wrong. Legal disputes are primarily disputes over how law should constitute and limit public administration where there are competing understandings of what the role and nature of good administration is and should be.

Analysing the Higher Education State

Professor Roger King, CHERI, Open University
28 February 2006

The notion of 'the regulatory state' has been applied in recent years to national and trans-national (EU) systems of governance, and also to particular policy domains. The presentation argued that there are good grounds for referring to a 'higher education regulatory state' – higher education is not 'exceptional' to other policy domains in this respect. The presentation referred to the author's recent research on external quality auditors of universities in England and their exercise of 'regulatory intermediation'. Quality Assurance Agency (QAA) auditors, like some other key groups in higher education, look both 'upwards' and 'downwards' in discharging their regulatory responsibilities, and play important parts in regulatory adaptation, flexibility and legitimation.

Finally, using the UK case, and comparing the higher education sector with those for healthcare, legal services and accountancy, the presentation pointed to 'the different worlds of the regulatory state', in which markets and regulatory design as policy instruments are applied differently and often diametrically in respective policy sectors, thus weakening claims to national homogeneity in regulatory cultures.

Risk, Regulation and the BCCI Litigation

Joanna Gray, University of Newcastle upon Tyne
14 March 2006

2006 saw the final abandonment of the UK's most expensive single set of civil proceedings, brought by the liquidators of the Bank of Credit and Commerce International against the Bank of England for alleged misfeasance in public office in relation to the discharge of the Bank's supervisory responsibilities. Had these proceedings not been abandoned, the resulting judgment would have provided valuable insight into how traditional legal fora and actors in the form of Courts and the judiciary identify and characterise different types of risk that are integral to a banking regulator's task, namely systemic risk (the risk of bank runs and collapse in market confidence) and the prudential risk posed to any individual financial institution and ergo its depositors. Nevertheless, the series of court decisions on the very many preliminary points raised and keenly contested by both sides in the BCCI litigation spans fourteen years and has involved careful legal attention and argument, providing a rich research site for those interested in the relationship between law, regulation and risk.

Public Perceptions and Trust in the Regulation of genetically Modified Food

Dr Wouter Poortinga, Cardiff University
2 May 2006

In this presentation Dr Poortinga discussed the importance of prior attitudes for people's responses to information and trust in the regulation of GM food. An important conclusion of his research is that trust is partly an expression of a more general attitude towards GM food. The results suggest that people with preconceived ideas may not easily change their existing attitudes and attributions of trust. However, the results also suggest that the overall dynamic is biased towards distrust. Negative information appeared more informative for people with no clear view on GM food than positive information. Overall, the results suggest that trust is fairly stable for people with clear positive or negative views on GM food, but relatively volatile for people in the middle.

The Evolution of Patient Safety

Charles Vincent, Imperial College London
16 May 2006

The rising rate of litigation in the 1970s and 1980s was an important stimulus to raising awareness of the problem of patient safety and the development of risk management. Initially risk management had an almost exclusively legal and financial focus, but gradually evolved to address clinical issues and act as a gateway to the underlying problem of patient safety ultimately revealed by retrospective record reviews such as the Harvard Study.

In the United States organizations such as the National Patient Safety Foundation are pioneering a much more sophisticated approach to patient safety, drawing on research and practice from a number of different industries. In Britain the Department of Health commissioned a major report on 'An Organisation with a Memory', a report covering similar ground to the Institute of Medicine report, which in turn has led to the creation of the National Patient Safety Agency. The British Medical Journal devoted an entire issue to the subject of medical error in a determined effort to move the subject to the mainstream of academic and clinical enquiry, and other leading journals are now running series on patient safety.

Evaluating the Performance of Infrastructure Regulators: A World Bank Handbook

Jon Stern, City University, London
30 May 2006

Jon Stern's lunchtime talk at CARR on 30 May discussed the evaluation of regulatory systems for infrastructure industries. This talk, based on a forthcoming World Bank Handbook, concentrated on the issue of how best to estimate the role of regulatory systems and their decisions on infrastructure industry outcomes. This includes outcomes for existing consumers, companies and investors as well as for potential and future consumers. The discussion focused on the role of evaluation as an ex post 'policy audit'. It also included some discussion, firstly, of regulatory governance issues and the relationship between governance quality and industry outcomes; and secondly, of intermediate and transitional regulatory arrangements and how they should be evaluated.

CARR hosts regular risk and regulation conferences.

ESRC SOCIAL SCIENCE WEEK 06

Pandemics and Panic

This year has seen fluctuating concern over the possibility of a human influenza epidemic stemming from the H5N1 strain of avian flu. In March, a dead swan – later found to have been carrying the virus – was found washed up in Fife, Scotland, the UK's first confirmed case of H5N1.

That month, CARR hosted a public debate titled 'Outbreak? Pandemic Risk and Risk Management in the 21st Century'. The event was part of ESRC Social Science Week 2006, and – perhaps inevitably – became focused on the possibility, and the likely consequence, of a flu pandemic.

Peter Baldwin *(professor of history at the University of California, Los Angeles)* contrasted the likely emergence of a flu pandemic with the world's experience of AIDS, suggesting that bird flu was likely to be a 'democratic disease'. It was less likely to result in the 'scapegoating' of sufferers, with consequences for the funding of treatments. However, he said that the possibility of bird flu raised the ominous question, 'Is nature hitting back?'

Professor John Oxford *(Professor of Virology at St. Bartholomew's and the Royal London Hospital, and Queen Mary's School of Medicine and Dentistry)* expected that the virus's mutation into a human strain would come, 'whether it happens this, next year, or the year after', but he declared himself broadly positive about the UK's preparedness – an optimism which he confessed he had not felt around a year earlier. He argued that the Department of Health was now broadly prepared for an outbreak. 'The science is there', he claimed.

However, he was more critical of some other countries, which, he alleged, had shown themselves unwilling to commit financing to protect public safety. He cited as examples the experience of the Tsunami of December 2004 and New Orleans' preparedness for Hurricane Katrina in September 2005.

Professor Thomas Abraham *(director of Public Health Media Project, University of Hong Kong and a former journalist)* pointed out that Hong Kong has had 'two hundred years of epidemics' and could draw on the experience of the SARS outbreak. But in response to John Oxford's criticisms of other countries' lack of preparedness, Professor Abraham pointed out that for developing countries – especially in Asia and Africa – these nebulous threats create genuine dilemmas when pitted against manifest risks like cholera or malaria. 'Where do we take the resources from?' he asked.

He suggested that the impact of bird flu on the developing world could be exacerbated by the 'democratic' nature of a likely outbreak. Reasoning that a pandemic would pose a particular threat to the industrialised world – which takes expectations of good health and reliable infrastructure for granted – he feared that the response might be one of 'every country for itself'. An outbreak would therefore stand in stark contrast to the positive response of the industrialised world to the Tsunami.

David Frediani *(executive director of MMC International, a unit of Marsh & McLennan)* considered the likely impact of bird flu on the corporate world, stressing the importance of resilience for firms, who would need to focus on preparing for worst-case scenarios. He suggested that the prospect of avian flu had already affected some firms' investment decisions. In particular, some firms had curtailed expansion in China – which has often been the site of cross-species virus mutation – fearing that geographical risk was not sufficiently diversified.

John Oxford predicted that the outbreak would last around five to six weeks, and crucially would affect only around 5% of the population at around any one time

Discussion concentrated on the likely popular response to an outbreak. John Oxford predicted that the outbreak would last around five to six weeks, and crucially would affect only around 5% of the population at around any one time.

Thomas Abraham suggested that while individuals would ultimately adjust, it was important to recognise that an element of panic was inevitable. When SARS hit Hong Kong, 'people were genuinely scared'. This experience suggests that panic would be most acute in the first one or two weeks.

Here, suggested David Frediani, was where the media had an important role to play in allaying public concern and ignorance. But he questioned how far this was possible in a 24-hour media environment in which 'reporters want to say something every moment'. Some particular responses caused concern. Echoing Thomas Abraham's fears, Peter Baldwin suggested that bird flu could be 'deglobalised' very quickly if measures such as travel restrictions are brought in. But, John Oxford countered, this wouldn't actually help stop the spread of the pandemic in the medium to long term.

The debate was opened to the audience, where there was perhaps a great deal more concern. For instance, it was suggested that systemic breakdown would occur within days, due to 'just in time' delivery practices, and as members of the public stayed at home, affecting firms' cashflow. (John Oxford noted in response that while this might affect some companies, it could provide new opportunities for home entertainment providers.) A straw poll at the end suggested that while the debate had done little to allay people's fears, nor had it greatly disturbed them.

BSE: Ten Years On

Also in March, CARR was pleased to host a public lecture on risk regulation and food safety by **Professor Sir Hugh Pennington**, emeritus professor of medical microbiology at the University of Aberdeen. Sir Hugh, who chaired a public inquiry into a 1996 outbreak of E.coli O157 that killed 17 people in Lanarkshire, is currently heading an inquiry into a similar outbreak in south Wales in late 2005, in which a five-year old boy died, and over a hundred children were infected.

Sir Hugh noted that 1996 represented a low point for the British food industry. In addition to the Lanarkshire E.Coli outbreak, on March 20th 1996, the Health Secretary Stephen Dorrell announced to the House of Commons a probable link between BSE and vCJD.

The past decade, Sir Hugh argued, had seen varied progress in checking food-borne diseases. E.Coli and Campylobacter had proved particularly difficult to reduce. The biggest threat, he claimed, was evolution, the capacity for organisms to develop into new, more challenging forms. 'What we've been engaged in over the last ten years', he suggested, 'is the battle against the clones'.

Sir Hugh argued that food safety, and in particular avoiding cross-contamination, needed to be given priority at a series of points on the journey 'from stable to table' – or as Sir Hugh also put it 'from turd to tongue'. Much could been done, and was being done, to reduce the spread of infection on farms and in slaughterhouses. E.Coli contamination, for example, could be reduced by clipping sheep. A difficulty here, however, was that, 'many farmers', he argued, 'do not see themselves as providing food'.

Even harder to control was the behaviour of the public – who were not necessarily good at judging risk. Public concern about food-borne diseases, which fears vCJD ahead of E.Coli, E.Coli ahead of Salmonella, and Salmonella ahead of Campylobacter – broadly reflected the mortality threat from each (vCJD is always fatal, Campylobacter rarely so) but lay in complete contrast to the actual incidence of the diseases. The final stage in the journey from stable to table, domestic food preparation, was a particular source of risk: the government can't regulate hand-washing.

Sir Hugh traced the rise and swift decline (once identified) of BSE. The same pattern was evident in vCJD twelve years later – reflecting its long incubation period. While deaths from vCJD are likely to continue, we are seeing the tail-end of the phenomenon. Despite the experience of 1996, BSE is something of a success story – unlike E.Coli O157 BSE is on the verge of being eradicated.

Dame Deidre Hutton, chair of the Food Standards Agency responded to Sir Hugh's speech, stressing the food safety responsibilities of senior managers in the private sector, the agency's attempts to bring together the various inspection regimes confronting firms, and the public's willingness to engage in a reasoned debate over food safety risks.

Even harder to control was the behaviour of the public – who were not necessarily good at judging risk.

Fifth Annual Research Student Conference

CARR's Fifth Annual Research Student Conference will take place on the 21 and 22 September, 2006, at Clement House, LSE.

We are organizing this Conference for students whose research focuses on a topic related to CARR's agenda. The conference is an opportunity for PhD students, especially those at an advanced stage in their research or writing, to present their work in progress, including conceptual issues regarding risk and regulation, empirical findings, methodological issues, or research strategies.

The conference is intended as a forum for intense and constructive discussion and debate between research students and is designed to help students improve their research projects.

In addition to students' presentations, the Conference will include keynote speeches and a series of 'Master Classes', led by members of CARR.

'A great chance to meet fellow researchers working with risk regulation issues in a variety of different fields.'

'I really enjoyed this conference and will definitely be looking for opportunities to come back in the future!'

Further details on how to attend are available on-line at www.lse.ac.uk/collections/CARR/events/

More information on CARR events can be found on CARR's website, www.lse.ac.uk/collections/carr

Colonised by Risk

Henry Rothstein argues that contemporary preoccupations with risk are driven less by a changing distribution of ills in society than by a changing distribution of ills in regulation.

Bird flu, smoking bans, or 'may contain' food labelling, are for many people an expression of our contemporary preoccupation with risk and our urge – for good or for bad – to regulate ever further threats to health, safety and the environment. But in recent years, risk has also emerged as a central organizing principle of public policy and corporate governance; from New Labour's endorsement of 'risk-based' regulation to the requirement that publicly listed companies have risk management systems. Indeed, it seems that the regulation *of* risk is turning into regulation *by* risk.

There is no shortage of explanations for these developments. For Ulrich Beck, this is the 'Risk Society' in which we face risks that are qualitatively different to those of the past. Conversely, for others, such as Frank Furedi, the Risk Society is an illusory product of a 'climate of fear' peddled by scaremongers. For Tony Blair, risk promises to offer a rational instrument for managing threats confronting society as well as aiding entrepreneurialism within government and business. But for Mike Power, risk is another 'ritual of verification': a management fad that could lead to the 'risk management of everything'.

Within these diverse explanations, we can identify two distinct ways in which risk has become central to contemporary regulation. Most obviously, there has been a growth in the regulation of 'societal risks', such as threats to the environment, health and safety, or financial services. Accompanying that expansion has been a qualitative shift towards managing the 'institutional risks' of regulation; that is, threats to organizations regulating societal risks and their practices – such as liabilities, bureaucratic failure and loss of reputation.

Societal risks and institutional risks are easily elided, but they need to be distinguished and their dynamic relationship understood if we want to understand our contemporary preoccupations with risk. In so doing, risk can be seen to assume contemporary significance not so much because of changes in the real or perceived threats to society, but rather because of our attempts to account for the way in which we manage such threats. My colleagues, Michael Huber and George Gaskell, and I have termed this process *Risk Colonisation*.

Societal risks and institutional risks are related to each other through the way in which regulation deals with potential failure. As Christopher Hood and his collaborators have shown, risk regulation regimes can be usefully conceived as control systems for setting and achieving societal goals that work through complex organizational arrangements, rules and cultures. But like any control system, regulation has to deal with failure because of the inevitable difficulties of governing, such as uncertainties, organizational fragmentation, limited resources, non-compliant regulatees and unintended consequences. Such problems create potential institutional risks for regulatory organizations by threatening their legitimacy and practices in managing societal risks.

Regulatory failure is nothing new. Within weak governance structures, however, where little attention is paid to regime coherence, failures can often go undetected, unmanaged or unaccounted for until too late. The failure to enforce regulatory controls on BSE in abattoirs in the early 1990s is just one example. But tighter controls, and greater scrutiny and audit within the public and private sectors has amplified and routinised the management of institutional risks, as failures have to be recorded, potential failures have to be anticipated, and new categories of failure are defined. 'Better regulation', paradoxically, is a source of risk itself.

The use of the term 'risk' to describe both the objects of regulation and threats to regulatory institutions is more than a linguistic coincidence. As Niklas Luhmann argued, modern societies frame decisions in terms of risk in order to manage the inherent uncertainties of rational decision-making. The concept of risk, according to Luhmann, anticipates and legitimates the possibility of failure by transforming decision-making into probabilistic assessments of success and failure. Framing regulatory objects as risks, therefore, is an attempt to manage threats to society as well as reflexively manage the negative institutional externalities of regulation itself.

The rise of the regulatory state illustrates the dynamics of risk colonisation. Within traditional government departments, decision-making can be conducted in the shadow of often opaque administrative procedures and justified by elected Ministers and blame for overall system failure can be lost within highly fragmented regime architectures and confusing accountability structures. But the delegation of regulatory responsibilities to independent agencies has been accompanied by tighter systems of scrutiny and accountability to compensate for the accompanying democratic deficits. Regulators, therefore, have had to find new ways of justifying their decisions, activities and performance. Within that context, framing regulatory objects in terms of risk has proved attractive for rationalising the practical limits of what regulation can achieve. Such dynamics explain the development of risk-assessment and management tools by independent regulators such as the US Environmental Protection Agency and the UK Health and Safety Executive (HSE) in the 1980s, and more recently the UK Financial Services Authority and Housing Corporation.

Attempts to manage the negative institutional externalities of regulation in this way transforms policy problems not conventionally understood as risks into risk problems. Offenders on probation, mental health patients and child welfare, for example, have been turned into risk management problems as state agencies have been increasingly held to account for failures. Such examples of risk colonisation suggest that the emergence of risk is driven more by a new distribution of ills in regulation, than by a new, or imagined, distribution of ills in society.

Framing regulatory objects in terms of risk may reflexively manage the associated institutional threats, but such framings can

encounter a number of problems. Risk assessment, for example, often proves to be an inexact science. Assessing risks as small when events prove otherwise may do little to manage institutional risk. Risk assessment and management can also strain institutional capacities and can conflict with other organizational constraints and ways of working. Risk may consequently provide a lingua franca for decision-making while making little impact on actual organizational practices. Moreover, framing governance problems as risk poses normative challenges if stakeholders weigh the value of risks differently. The public, for example, may be more averse to low probability / high consequence risks than high probability / low consequence risks, even if, from a risk perspective, the collective consequences are identical.

Such challenges may make institutional risk an object of risk management in its own right. Risk communication strategies to persuade audiences of the legitimacy of decision-making, passing the buck and other blame-avoidance strategies have received much attention recently. But decision-makers may develop more formal institutional risk management techniques that subtly shape societal risk management. The HSE, for example, has developed the concept of 'societal concerns' as an attempt to quantify and respond to public anxiety generated around issues that the HSE considers well managed but create reputational concerns, such as children's activity centres.

The management of institutional risk can improve the management of societal risk if, for example, regulators are encouraged to improve the robustness of decision-making. But eliding distinctions between societal and institutional risk may dangerously obscure the way in which trade-offs are made between the two. Institutional risk management, for example, has potentially negative consequences if regulators manage their own institutional risks at the expense of societal risks. Spiralling feedback loops between societal and institutional risk may even emerge in which the management of institutional risk brings ever more domains into the realm of risk governance.

Such dynamics suggest a need to investigate the factors that shape the balance between the management of societal and institutional risk. One possibility is that just as public perceptions of risk are held to be shaped by 'dread' and 'familiarity' characteristics, so regulators' perceptions of risk may be modulated by analogous institutional factors. It's not hard to imagine how the 'dread' of a front page exposé may amplify regulators' attention to policy problems, while lack of public salience may attenuate their risk perceptions. Institutional risks may even be misperceived. Local authorities removing hanging baskets in the absence of any accidents, or increased rates of caesarean sections despite fewer legal claims against the NHS suggest that there is a lot to learn about responses to institutional risks.

Risk colonisation is an attempt to unpack the close relationship between risk and regulation by showing how events brought into the realm of regulation are constituted as risk. Risk colonisation is based on an idealised model of regulatory regimes as tight systems of control where all gaps have to be recorded, anticipated and accounted for within rational bureaucratic terms. In practice, however, regulatory regimes are looser and more patchily scrutinised and held to account, so we might expect a varied topography of risk to emerge across domains. Moreover, there is a need to account for the emergence of risk concepts within extended governance systems. Such systems may act as vectors of transmission of risk ideas, but equally their loose coupling and plural rationalities may attenuate the utility of risk. In practice then, we need to examine the dynamics of risk colonisation more closely to see how far risk ideas are likely to spread. But if risk holds out the promise of displacing the concept of failure within modern regulation and governance more generally, it is not hard to see why New Labour and management consultancies are getting so excited about the concept. ■

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This article draws on Henry Rothstein, Michael Huber and George Gaskell (2006) 'A Theory of Risk Colonisation', Economy and Society, 35(1): 91-112.

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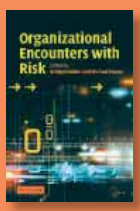

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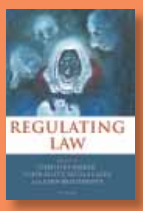

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