



The Canada-UK Colloquia

Science and Public Policy

Rapporteur's Report

Ronald Amann

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*Canada-United Kingdom Colloquium
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British Committee, Canada-UK Colloquia
School of Policy Studies, Queen's University

The Canada-UK Colloquia

The Canada-UK Colloquia are annual conferences which aim to increase knowledge and to educate the public about the advantages of a close and dynamic relationship between Canada and the United Kingdom. These conferences take place alternatively in each country, bringing together British and Canadian parliamentarians, public officials, academics, representatives from the private sector, graduate students, and others. The organizers focus on issues of immediate concern to both countries. One of the main endeavours is to stimulate and publish research in each subject under discussion. The publications listed at the end of the book demonstrate the wide range of topics covered by recent Colloquia.

The Colloquia are supported by the Department of Foreign Affairs and International Trade in Canada and by the Foreign and Commonwealth Office in the United Kingdom. The conferences are organized by the School of Policy Studies at Queen's University on the Canadian side; and by the Canada-UK Colloquia Committee on the British side, from which an executive board, the Council of Management, is elected annually.

The first Colloquium, attended by some sixty distinguished participants from both countries was held at Cumberland Lodge in Windsor Great Park in 1971 to examine the bilateral relationship. This theme figured in the Colloquium held at Leeds University in 1979, at Dalhousie University in 1984, and again at Queen's University in 1996. A British steering committee, later to become the British Committee, was launched in 1986. The School of Policy Studies assumed responsibility on the Canadian side in 1996, succeeding the Institute for Research on Public Policy.

At the Denver Summit in June 1997, Prime Ministers Blair and Chrétien issued a Joint Declaration to mark a program of modernization in the bilateral relationship which included a role for the Canada-United Kingdom Colloquia. The programme was reaffirmed during Mr. Chrétien's visit to the UK in 1998.

Ronald Amann

Ronald Amann's original field of research was into the economics and politics of innovation in centrally planned economies — in the former Soviet Union, in particular. At a time when public discussion was largely dominated by the “Soviet threat,” he was one of a small group of academic specialists who advised Mrs Thatcher about the terminal economic weaknesses of the USSR, and predicted the rise from relative obscurity of the reformer Mikhail Gorbachev: an interesting example of the influence of original social science research on public policy. Following a spell as Pro-Vice-Chancellor of the University of Birmingham, he spent five years as Head of the UK Economic and Social Research Council. During this period all the research councils, the ESRC included, built a much more powerful “user” dimension into their networks and funding priorities. Subsequently, he became the founding Director General of the Centre for Management and Policy Studies (CMPS) in the Cabinet Office, responsible for Civil Service training (including a new programme of training for ministers), and strengthening the links between government policy makers and the research community. Ron retired from this position in September 2003 and returned to the University of Birmingham as an Emeritus Professor. He is currently working on the Political Sociology of Civil Service Reform.

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Preface

This Rapporteur's Report summarizes the discussions at the recent Canada-UK Colloquium on "Science and Public Policy." It is a pleasure to thank Professor Ron Amann, who served as Rapporteur and subsequently prepared this thoughtful and comprehensive report. We are especially grateful to Sir Chris Llewellyn Smith for chairing two days of lively debate among a distinguished group of participants. The greatest credit must go to our advisors who crafted the programme, led on the UK side by Professor Michael Gibbons and on the Canadian side by Professor William Leiss.

Once again, the Colloquium received strong support from our two governments, through the Department of Foreign Affairs and International Trade in Ottawa and the Foreign and Commonwealth Office in London. We would like to acknowledge the generous financial contribution of the Walter and Duncan Gordon Foundation, Centrica Plc, the UK Department of Trade and Industry, the British Council and the Association of Commonwealth Universities. All these supporters make the Colloquium possible.

The Colloquium depends on the heroic efforts of small numbers of people. Special thanks go to George Edmonds-Brown, Executive Secretary of the Canada-UK British Committee, and Julie Burch of Queen's School of Policy Studies whose superb arrangements ensured a successful Colloquium. We are also grateful to the Canadian and British High Commissions for their continued assistance.

Robert Wolfe
School of Policy Studies
Queen's University

Baroness Fookes of Plymouth
Chairman
British Committee

Foreword

The discourse within the public policy community internationally has conventionally addressed science from two distinct points of view; either in terms of policy *for* science or in terms of science *in* policy. The former is shorthand for the types of public policy which affect the rate and direction of scientific activity itself, while the latter is shorthand for the ways in which science enters the policy formulation process. On this view, policy for science channels scientific activity in the direction of producing certain types of results perhaps guided by national priorities, while science in policy makes use of these results, along with other kinds of inputs, in the formulation of public policy.

Accordingly, the Colloquium on Science and Public Policy set out to explore new links between policy for science and science in policy in the contemporary context. It began with an examination of the changing nature of the relationship between society and science and of the emergence of what might be called a new social contract between society and science. The aim was to explore how the changing nature of science, on the one hand, and parallel changes in society, on the other hand, were altering the ways in which science enters into the formulation of public policy. These developments set the context for the Colloquium.

Two key points guided discussion throughout the individual sessions. On the one hand, there was the recognition that the production of scientific knowledge is no longer, if it ever really was, a self-contained process. The production of scientific knowledge is now

more widely distributed throughout society, in the sense that there are now many more places where recognizably competent research is carried out both nationally and internationally. The distributed character of knowledge production constitutes a fundamental change both in terms of the *numbers* of possible sites of expertise and in their degree of *connectivity*. On the other hand, the production of research by many more diverse groups has resulted in many more ways in which society can “speak back” to science, armed, as it were, with its own scientific research. The line that used to separate science and society has now been well and truly transgressed and it is this that renders the relationship between science and society more complex; not only in terms of the problems that are addressed but also in the mode of addressing them. These developments are having a profound impact on the nature of scientific expertise and therefore on the ways in which knowledge enters the policy formulation process.

Holding a Canada-United Kingdom Colloquium on the theme of Science and Public Policy was, then, a very timely event. As the papers included in this report make evident, the former distinction between policy for science and science in policy is now, if not obsolete, then unhelpful. Policy makers in both countries are trying to cope with new, more complex environments. There can hardly have been a more propitious time to compare practices and share experiences. But perhaps the Colloquium has also served to reduce somewhat the anxieties that always accompany change and give us the comfort that though we may work day-to-day in our own, necessarily restricted, national context, we are, in fact, not alone. As one advertisement current in the United Kingdom puts it, “It’s good to talk,” and we thank the members of the Canada-United Kingdom Colloquium for providing the opportunity to do so.

Michael Gibbons
December 2003

Science and Public Policy

Ronald Amann

Two major and connected themes ran through the presentations and discussions at the Colloquium. They reflected a departure from more traditional ways of conceptualizing the relationship between science and society, and in terms of their practical implications present a new set of challenges to government and the scientific community. The creation of new institutional partnerships and forms of engagement with the public lie at the heart of these challenges.

The first theme focused on economic relationships. Back in the 1960s innovation was seen primarily as a linear process, the main stages of which were set out in the OECD's Frascati definition of R and D. Rather like a relay race, the baton was passed on through various phases of research and experimental development, culminating eventually in new products and processes. Seasoned practitioners, of course, always knew that in the real world these stages of R and D often merged, and that the individuals involved in the process played a variety of different roles in order to move projects forward. In particular, the strictly technical aspects of innovation were invariably embedded in complex market relationships and a web of supporting services. Nevertheless, vestiges of this kind of linear thinking have persisted until fairly recently. By contrast, Stan Metcalfe introduced members of the Colloquium to some of the most recent work which

he and his team have carried out on “systems of innovation,” and how these systems or clusters achieve an edge in what is essentially a relentless flow of competitive pressure; those who are able to learn and adapt in this environment survive to fight another day — those who can’t, don’t. These insights have major implications for the role of government in supporting both business and the scientific community. It requires a reconsideration of what forms of intervention can most fruitfully bring about effective partnerships. It also raises to the top of the political agenda issues to do with the scale and focus of national science funding and training. I will say more about these matters below.

Traditional thinking about the social relationship between science and the general public has been steeped in linear thinking of another kind. Obviously, in a democratic society public support and trust is ultimately needed to provide the necessary authority for substantial government spending on science, and to secure legitimacy for areas of research which are perceived to be controversial in terms of ethics and/or public risk. As Alan Urwin, Brian Wynne, and other participants at the Colloquium argued, however, we have now moved on a long way from the old “deficit model” which held that members of the public were essentially ignorant; to overcome this regrettable deficiency, representatives of the specialist scientific community needed only to communicate the “true facts” in a clear and simple way. All would then be well. Alas, life is more complicated than that. Recent research carried out in Canada, the UK, and elsewhere has made us appreciate that publics, drawing upon their personal circumstances and experiences, have valuable practical insights into the contexts in which new technologies are deployed, and into the motivations of those who are deploying them. These critically important contextual factors, because they are nebulous and difficult to handle, are often excluded from “rigorous” scientific assessments. Bringing them back in raises issues of the highest importance. It raises philosophical issues about how different streams of knowledge can be blended and conclusions drawn. It raises practical political issues about the terms on which scientific advice is given to governments, and about effective mechanisms for engaging the public in a manner that goes beyond symbolic consultation. When it comes to the very

complicated matters of scientific uncertainty and proportionality of action — in particular, making the “precautionary principle” operational in practice — we are brought face to face with the task of reconciling elegant frameworks with messy reality.

It is interesting to note that much of the debate at the Colloquium centred around the social dimension of “the new engagement” rather than the economic dimension, suggesting that perceptions and anxieties about the social impact of science and technology take precedence in our attention these days over the formulation of positive strategies for wealth creation. Although the Colloquium did not address this question specifically, it would have been interesting to speculate about whether this balance of priorities reflected social trends in Canada and the UK more broadly, and if so, why? In any event, there was a broad consensus among participants that the economic and social changes under consideration were of a fundamental character. There would be no going back to an earlier and simpler era.

The general aims of the Colloquium, therefore, were (i) to be clear about concepts and underlying causes; (ii) to understand the consequential issues and dilemmas better, with the help of specific case studies drawn from both the UK and Canada, and to achieve a measure of agreement about the broad approach to policy; (iii) to make a few dipstick observations about the current effectiveness of policy in both countries. Each of us, of course, was greatly assisted in addressing these aims by being able to draw upon a distinguished cast of participants whose collective expertise embraced a wide range of specialist and practitioner skills (often combined in the same person).

FUNDING AND INFRASTRUCTURE ISSUES

All participants at the Colloquium recognized that there was tension between the original values of the Enlightenment, with its stress on individual quality of mind and the exercise of reasoned enquiry for its own sake, and more recent expectations about the “products” which publically funded groups of scientists could and should “deliver.” This is, of course, only one aspect of a more general scepticism which has been prevalent among governments in recent years. Although it may

be uncomfortable for professional groups such as doctors, teachers, and lawyers to have their autonomy and judgement called into question, government has come to recognize that professions have, often powerful, sectional interests that do not necessarily coincide with those of “the customer” — though this divergence is typically difficult to unpick from ringing mission statements! In a cheerful spirit of self-criticism it might be held that the academic community is especially good at expressing its professional self-interest in terms of philosophical high mindedness, precisely because its members can pitch their argument in the language of the Enlightenment.

Tom Brzustowski expressed this underlying tension very well when he spoke of the “new contract” which now exists between the scientific community, their political paymasters, and the general public. Scientists are increasingly concerned to establish what the appropriate terms of engagement are, and where the balance lies between professional autonomy and practical relevance. This more demanding accountability is complicated by the fact that different stakeholders approach the matter from different perspectives. Government clearly wants to keep down the fiscal cost and to be able to demonstrate benefit to its electors. The business sector as a whole in Canada has a shared interest in better training and skills, though it is primarily the larger firms which have a direct interest in research carried out at the universities. Evidence shows that the general public is not hostile to science provided that it meets “their” needs.

Funding bodies in both countries continue to explore ways to reconcile these constraints. In Canada, for example, all the research councils (including the council responsible for the Social Sciences and Humanities) cooperate to fund over 20 major interdisciplinary research networks based upon initiatives which bubble up from members of the academic community themselves. As a matter of routine, Canadian universities now have to submit strategic plans to their funding bodies which specifically include plans for increasing access and broadening the curriculum. These initiatives find clear parallels in Britain following the 1994 Government White Paper, “Realising Our Potential,” where new funding regimes were put in place which had a wide impact across the whole higher education sector.

In this new political environment it is clearly critical for the scientists to keep the politicians onside. The tendency for the popular press to poke fun at seemingly esoteric research projects is, of course, virtually an occupational hazard — and if it gains wider currency can be damaging (whether it applies to Canadian research on fruit flies and bumble bees or a British national survey of sexual behaviour, to quote a few well-known examples). An effective way forward, as one participant pointed out, is for scientists to appreciate that elected representatives are potential allies, and to engage with them not sporadically when a particular issue happens to have come to a head, but on a continuing basis. In the Canadian case this may be made more difficult by the fact that there is no minister with a dedicated portfolio in this area to cut through superficial impression and prejudice. However, even when you do have such a minister you are not necessarily out of the wood. We were told that some years ago (I won't be precise) a British science and industry minister, renowned for his leonine charm and self-confidence, had suggested to one of his most senior civil servants that expenditures on science should be confined only to the most successful projects. In the true spirit of "Yes Minister" the civil servant replied that he would accept that principle with pleasure if it could also be applied to the workings of the stock market, with all investors guaranteed to make a gain. Nothing more was heard of it!

A further major question is whether the scientific community itself has the necessary set of skills and the appropriate mindset to operate comfortably within this new environment of greater visibility and public accountability. In Canada, this issue will become especially pressing over the next decade when, it has been estimated, around 20,000 senior university academics appointed mainly during the 1960s will retire. The optimistic view expressed by several Canadian participants is that the new generation which will succeed them is likely to be more attuned to ethical issues and to have internalized their obligations as recipients of taxpayer's money to a greater extent than their predecessors. There is also a clear opportunity to appoint more women and members of ethnic minorities.

The question remains, however, of whether well-qualified candidates are likely to be coming forward in sufficient numbers. The UK

trends presented by Brian Fender suggest that this may not be plain sailing. Although there has been an increase in “A” Level candidates of around 5 percent on average over the last decade, most of this increase is accounted for by substantial increases in such subjects as business studies, IT, and general studies; set against this, is a general decline in the sciences. Some science subjects at university such as psychology and physical geography continue to grow, but in most other areas it is becoming increasingly difficult to fill available places with good candidates. Brian Fender concludes from this evidence that undergraduate training in science and engineering needs to be made more attractive to candidates, firstly by designing a broader and more flexible curriculum and, secondly, by allowing students more scope for independent work and self-expression (considered to be one of the main selling points of the humanities and social sciences, where on the whole, applications are booming). The practical challenges of taking such a policy forward within particular institutions was described by Suzanne Fortier. Here, one encounters consumer resistance among students who fear that unfamiliar subjects will weaken their overall grade profile, and resistance from professors who continue to squash more and more specialist content into their courses. The massive increase of staff/student ratios in Canadian universities over the last decade (from 1:24 on average, to 1:36) further reduces the scope for initiatives. Nevertheless, there is evidence of a more layered approach to the organization of learning at both Queen’s University (the “Integrated Learning Initiative”) and at the University of Toronto, with more flexible subject groupings moderating the former dominance of departments.

But does this yet get to the root of the matter? It was pointed out by several participants that a downward spiral could now be observed in British schools. There are insufficient numbers of new teachers entering the profession with good qualifications in mathematics and science, thus weakening at the very base of the education system the capacity to educate and enthuse the university applicants of the future. To quote just one particularly stark statistic, at present only 20 percent of UK children continue to study maths beyond the level of the GCSE compared with nearly all French children of the same age. It is becoming increasingly clear that in order to climb out of this pit,

teachers themselves need to be given further scientific and mathematical training.

As we look across national research infrastructures, it should be appreciated, of course, that government funding is not the only game in town. Around 20 percent of total science funding in the UK is provided by charities, forming a distinctive but complementary part of the whole. As we heard from Mark Walport, some of these contributions are very significant indeed. The Wellcome Trust, for example, with an endowment of just over £10 billion spends £400 million annually on science and science-related activities. These activities include the funding of research on the human genome, support for research on ethical issues such as the use of human tissue in research (where the perceived independence of Wellcome is an important factor in gaining credibility), substantial expenditures on research infrastructure, and work on public education. The Trust has entered recently, for example, into a £51 million partnership with the UK Department of Education and Skills to build a national network of Science Learning Centres. The key point here is that the scale of these expenditures is so significant that, in effect, an “equity partnership” between government and Wellcome has been created, with the implied expectation on the part of Wellcome that they will have an important input into the policy process.

INNOVATION ISSUES

The countries of the European Union are aiming to achieve a target level of spending on science of, on average, 3 percent of GDP by 2010. These expenditures are seen as a vital investment which will establish a platform for future competitiveness. However, as Stan Metcalfe reminded us, diminishing returns are an inherent feature of R and D spending. From the point of view of policy makers, a key question is how the scientific enterprise can be made more effective. Where can government resources best be targeted in order to achieve this effectiveness? The answer to this question, according to Stan, lies not in the continuation of the “market failure” model, with government intervening from time to time with small packets of money to fill gaps or stimulate changes in behaviour, but rather in policy

initiatives which reflect a more comprehensive understanding of the innovation system as a whole. Key to this is an appreciation of the restlessness and ruthlessness of the market, and the evolutionary process which it triggers.

The primary focus of policy in this respect is not on the internal organization of individual firms and universities, for example, but on how to orchestrate their mutual collaboration: on “distributed systems of innovation” which take into account technical partnerships, the investment climate, and sources of macro-economic stability. In short, the focus needs to be on “systems failure” rather than on market failure. The kinds of specific measures which arise from this analysis include policies that seek to encourage universities and firms to achieve greater clarity in their research strategies, so that potential partners can locate and engage each other; national funding strategies that build bridges between different sectors (such as Foresight and Faraday Centres in the UK) rather than the current dual support system which, it was pointed out, can have quite the opposite effect; a re-alignment of resources between the higher education sector and industry in order to strengthen the power of the customer for research; and firmer management structures within universities to deliver on jointly agreed objectives.

As I write, HM Treasury has just published the Lambert Report which covers much of this policy ground. In a sense, members of the Colloquium were privileged to be given a preview of some of the basic concepts which underpin this report. It is particularly timely, therefore, that major questions were raised by participants. Principal among these, perhaps, was the worry that if the balance of funding power swung too far toward the “customer” (shades of the Rothschild Report of the 1960s) resources within universities would become too hypothecated, cramping the amount of time necessary for free thought, and the energy necessary to develop links with new partners. The implication was that if this strategic re-balancing went too far, it could be self-defeating. Questions were also raised about the capacity of corporate laboratories, which it was generally accepted had become much weaker over the last decade or so, to act as an “intelligent customer” for university research.

It was fascinating that many of the general insights described above were confirmed independently by Ed Levy in his account of the Canadian biotech sector. His case study focused on Visudyne, an innovative treatment for age-related eye disease. This treatment was developed over a 13-year period, from initial university discovery to the development of a final product. Total development costs came to around \$800 million, facilitated by a series of partnerships with the private sector. However, this successful venture exposes some more general problems of the Canadian biotech industry which a simple count of numbers of companies tends to obscure. It emerges, for example, that only two or three dozen of the more than 500 companies publically traded in North America are profitable, and crucially for Visudyne, virtually none in Canada are sustainable as integrated companies or otherwise large enough to provide opportunities for merger once promising technologies have matured. In seeking to strengthen the Canadian biotech sector, the continuing support of centres of scientific excellence remains important, as does the expansion of tax credits. But other key lessons are the need of government to consult closely with the sector directly, before launching any new initiatives, and the need to develop an holistic approach to policy rather than tolerating the uncoordinated efforts of different departments, often pulling in different directions. It was emphasized that “system building” should be the ultimate goal.

POLICY ADVICE ISSUES

Members of the Colloquium were struck, even a little startled in the case of some UK participants, by the vivid account which Jeff Hutchings gave of the decline of Canada’s fish stocks. We were told that Canada’s stocks of Northern cod, for example, had fallen by 99.9 percent since the early 1960s, and that fishing had been permitted by the government even when it had become abundantly clear that only smaller fish were being caught. This raises intriguing questions about the role and effectiveness of scientists in giving advice to politicians, and the way in which this advice is used.

In general, there are many ways in which scientific evidence can come to be disregarded by government. Scientists can fail to get their

message across because their main concern is to showcase their research rather than addressing themselves to the specific questions which concern policy makers. Different fields of science can advance at different rates, thus limiting the capacity of the scientific community to appreciate the full implications of a particular technology or policy; for example, the technology of catching fish could run ahead of the more complex science of depletion. Similar considerations might apply in the case of genetically modified crops, for example. Even if well-focused advice is available, government can wilfully distort it for its own purposes (it is difficult to escape from the conclusion that this was a factor in decisions which led to the depletion of Canadian cod stocks). Finally, private offices, in their laudable aim of protecting ministers and reducing the amount of paperwork, can screen out information which should properly have found its way onto the minister's desk. This danger is heightened by the fact that relatively few individuals involved in policy management have a scientific background.

It is evident, therefore, that what we often refer to rather simply as a "failure of communication" can have complicated causes. Participants at the Colloquium were in agreement that one very helpful way of avoiding these potential dangers is to draw upon the advice of independent panels of scientists. The role of the Royal Society in providing answers to specific policy questions was thought to represent a particularly effective model. The institutional strength and independence of the Royal Society ensures that the advice of individual scientists is not diluted as a result of their isolation and cooption in the policy-making process. If the rules of engagement are not made clear, it was appreciated that such involvement can be a fatal embrace. Scientists who are fully coopted sometimes "offer only a timid challenge" despite the fact that from a professional point of view they have a wider public obligation to make their views known.

A further source of influential scientific advice, as Karen Brown pointed out, lies in the growing number of international networks and organisations. In the environmental sphere these cover such major areas as marine fisheries, species survival, hydrological systems, and climate change. There are marked variations in how well focused and formally organised they are, but at their best these networks,

which draw considerably on the voluntary efforts of scientists, provide blunt advice which is hard for governments to ignore. It was argued that governments could play a very positive role in investing further in many of these fledgling organizations.

An important methodological difficulty, which was alluded to by several participants, is that different streams of scientific advice are often difficult to reconcile and evaluate. This becomes especially difficult where the results of social science research need to form part of an overall judgement (let alone expressions of public opinion — see next section). The need for scientific synthesis is often pressing, yet there appears to be no clearly articulated “meta science” that assists this process. The international Cochrane Collaboration in the area of medical research and the equivalent Campbell Collaboration in various areas of social research, not discussed at the Colloquium, provide models of how some progress might be made toward meeting this objective.

Listening to the discussion one could not help feeling that there was an elephant in the room which had not really trumpeted its presence: raw politics. No matter how sound the advice and how circumspect the methodology for producing it, there are always going to be circumstances in which ministers feel impelled to be seen to act in a crisis, without the benefit of sound advice or even in the face of it, and times when they will be driven by sectional interests and public sentiment. As one of our discussants put it, “Don’t lose sight of the fact that politicians are politicians.”

ISSUES INVOLVED IN ENGAGING THE PUBLIC

If the relationship between policy makers and the scientific community is occasionally strained, relationships with the general public can, for a variety of reasons, be even more fraught. Handling these relationships is one of the most challenging aspects of contemporary science policy. The “ritual slaughter” of the deficit model may have taken place, to echo a phrase used by Alan Urwin, but vestiges of this approach continue to hamper the two-way flow of communication between government and citizens.

Drawing upon his experience as a former government chief science advisor and current president of the Royal Society, Bob May expounded a passionate case for government adopting a policy of maximum openness and transparency in its dealings with the public on scientific and technological matters. (A fuller version of these arguments, including a fascinating section on “Science as a Way of Knowing,” is contained in his recent Annual Presidential Address — obtainable at www.royalsoc.ac.uk). To clear the ground, Bob takes issue with two currently fashionable notions. Firstly, with reference to early smallpox vaccinations — not to mention Galileo’s seminal conflict with the church — he disputes the fact that public opposition to scientific discoveries is really anything new. Secondly, evidence suggests that greater knowledge about science may not, at least in the short term, lead to a reduction in the level of public anxiety about the impact of new discoveries. This seeming paradox can be explained by the fact that a better educated public is more keenly aware of the uncertainties inherent in all scientific enquiry, and is therefore clearer about the “Faustian deal” on offer. But if a sustainable level of trust is ever to be achieved between government, scientists, and the general public, there is simply no alternative to engaging all the main stakeholders in a meaningful way. Here, scientific evidence frames the debate. As Bob puts it in his presidential address, “It is most important ... to separate the scientific facts and uncertainties, which must serve as a constraining background, from policy choices — guided by public debate and opinion — which will usually involve values, feelings and beliefs. In this crucial yet difficult task of distinguishing the constraining scientific stage on which the value-laden play is to be acted out, note that science and scientists do have a special role to play in assembling the backdrop, but no special role — just citizens along with others — in the drama of choosing.”

The role of the press in reporting scientific developments adds another layer to this rough and tumble. One Canadian participant at the Colloquium who had long experience in this field informed us that in their search for an eye-catching story line, editors would typically ask two questions — Who is responsible? How are they to blame? Whilst this formulation struck others as being a shade too pessimistic, there seems little doubt that press coverage is a key factor in the

“social amplification of risk.” The fault is not only on one side. Scientists are often not very good at expressing themselves effectively to a non-specialist audience. A number of participants felt that skills in media presentations should form a necessary part of postgraduate training. This is a matter for the research councils (some are acting upon it already). In order to emphasize the importance of communicating with the public, notable success in this area has become one criterion which the Royal Society now take into account in their annual election of new Fellows. The cost of not communicating carefully and professionally with the public, both nationally and internationally, and in a way which they can understand, was demonstrated all too clearly in Robert Clarke’s account of the traumatic collapse of Canadian beef exports after the discovery of BSE.

From the theme of general engagement with the public, aimed at sharing a broad understanding of social impact, discussion moved on next to the more focused business of specific risk assessment, where public perceptions need to be incorporated in any final decision. Central to this process is the application of the “precautionary principle.”

Conrad Brunk explained that the precautionary principle seeks to address two problems: (i) the level of risk in science, and (ii) how to handle conflicting values and interests. There has been a lively debate in Canada as to how compatible or incompatible these various elements are in any assessment process. Conrad occupies a “compatibilist” position in this debate, identifying sets of guidelines in areas such as safety standards, burdens of proof, and standards of evidence, which are relevant to both scientific and management assessments. This thinking forms the basis of a highly developed grid, with scale of risk along one axis and degree of precaution along the other.

In rather sharp contrast to this calm academic analysis, Ruth Deech, the current head of the UK Human Embryo and Fertilisation Authority, provided us with what was in effect a report from the front line. The regulatory principles which the authority is seeking to implement are constantly under threat from populist pressures transmitted through the political system, from litigants who can raise

substantial resources through selling their stories to the press, through inaccurate media coverage, and from courts which have tilted their interpretation of legislation in the direction of individual rights rather than more aggregated notions of the public good. Moreover, international controls are weak in this field because there is no shared international understanding of risk, which could then be embedded in harmonized national legislation and in the concerted actions of regulatory bodies. In this chaotic market, determined individuals can usually escape from national regulatory constraints. Paradoxically, this situation has arisen because some countries, for religious reasons (in the case of Italy, for example) or as a result of historical sensitivities (in the case of Germany), have been disinclined to address the issue squarely.

Of course, it is all too easy to despair of any systematic approach to risk assessment and regulation in the face of this messy reality. On the other hand, the management of major industrial projects, or the development of corporate business strategies, are also notoriously messy undertakings. Yet few would argue that a systematic methodology doesn't help, even if it is not adhered to in every particular. Like science itself, risk assessment frameworks are "a way of thinking about complex systems" (to quote one of our discussants).

During the course of our discussion on how politicians and scientists should engage the public, discussants around the table succeeded in raising at least two serious additional questions which were not answered — but are worth recording here. The first question is this. If, during the course of a major public consultation, all streams of opinion and diverse interests are taken into account (and scientists, having erected the backdrop, retire from their special place on the stage) who puts the case for "the public good"? Is this something more than a negotiated compromise? The second question concerns a not unrelated dilemma. Strictly scientific assessments of risk were intended to establish a value-neutral common ground which would help to facilitate international agreement. However, if the assessment frameworks are broadened to include values, cultures, contexts, and perceptions, this value-neutral framework is, by implication, weakened. Is there a way round this?

SOME PERSONAL THOUGHTS

I believe that a number of questions related to the general theme of the Colloquium might profitably have been explored further, if time had allowed. Not enough was said, I think, about the deeper causes of declining public deference towards science. The fact that governments have become more managerial and are looking for more tangible value for money on behalf of the electorate is only part of the story. The wave of critical social theory of the 1960s and 1970s, much of it written by former members of the famous Frankfurt School of Social Research, challenged the status of science as a uniquely valid form of social knowledge. At the same time, the writings of Thomas Kuhn and others, in their portrayal of “normal science,” emphasized the consensual character of science rather than the heroically refutational model offered by Karl Popper. It is true that relatively few students have read these works in the original (though, quite by chance, one of the organizers of the Colloquium was actually supervised by Marcuse), but thousands upon thousands of that generation who passed through university are familiar with the general ideas. It has engendered a pervasive disposition not to take matters on trust from the established institutions, to expose hidden agendas, and to make judgements about “where people are coming from.” Arguably, this cultural environment is different from the past, both in the quantity and in the quality of the opposition to science to which it periodically gives rise. This needs to be understood better in order to pave the way for more effective engagement with the educated public.

More might have been said about the new forms of engagement between policy makers and the scientific community, given the importance that participants gave to ensuring that this engagement takes place on a continuing basis. This is how sustainable trust is built. We had rather set our faces against periodic arm’s length consultation with scientists, or the use of focus groups for anything other than monitoring public moods. Innovative attempts to link together senior civil servants and scientific specialists within specific policy domains, by designing internet (and intranet) facilities such as policy “knowledge pools,” seem well worth a close examination since they satisfy two objectives simultaneously: improving the quality of policy-relevant

evidence derived from primary scientific sources, and building firm bridges of respect between the two professional communities. With its innovative “Policy Research Initiative, linking government departments with relevant academic specialists,” Canada is widely regarded as a model which other countries can learn from. The UK government has also developed some innovative approaches through its “Policy Hub” web site and the creation of the prime minister’s Strategy Unit.

It is interesting that in considering the role of the scientific community in providing policy advice, the key issue of freedom of information legislation did not enter our calculations. It is often argued that if the door opens only one way, so that scientists provide information on request without having any say in how it is used or any influence in shaping the initial questions, their enthusiasm to engage with government will be reduced. In some cases, they may simply walk away. A specific issue is whether academics and other members of the public have access on request to the evidential underpinnings of policy. This kind of access is qualitatively different from the propensity of some departments to permit the indiscriminate publication of documents and research materials, without indicating how they have contributed to particular policies. This is rather like submitting a PhD thesis with a very extensive bibliography but no footnotes, leaving the examiners to ponder about whether the material listed has actually been used. The comparative experience of the Canadian and British governments in addressing this issue would have been illuminating.

The movement from a “market failure” model of government support for innovation to a “systems failure” model, would mark a radical shift in thinking. In order to avoid shocks and perturbations to all the players involved, a carefully worked out programme of transition would seem to be required. This is an interesting area of discussion which, at least in the case of the UK, may be far from academic over the next few years.

Many contributors to the discussion called for scientists, and everyone else, to be much more open about the fact that to a significant degree scientific research was an inherently uncertain affair. By

admitting this up front, so to speak, we would begin to move toward a more mature understanding by the public of what science can and cannot do. An interesting question, therefore, which we did not discuss explicitly, is why such candour is not more prevalent. I would suggest a number of reasons for this. Governments often want to justify their actions in terms of the certainty of the advice they have received. Scientists, though scrupulously realistic in the seminar room, can give a different impression when it comes to putting forward their case in public expenditure rounds. The media, in their search for a good story, are not especially interested in shades of grey. And even the general public, much more litigious these days, needs a simple paradigm of blame in order to take effective legal action. If we did not know it already, all this seems to show that there are no quick fixes to the problem of drawing members of society into a meaningful discourse.

APPENDIX

PROGRAMME

Colloquium Chairman: Professor Sir Chris Llewellyn Smith FRS

Thursday, November 20

5:00pm Registration

7:30pm Informal Welcome and Dinner

Hosted by Baroness Fookes, Chairman of the British Committee

Friday, November 21

7:30am Breakfast

8:45am Opening remarks by Baroness Fookes, Chairman of the British Committee CUKC, Professor Robert Wolfe, Queen's University, and the introduction of the Conference Chairman

9:00am *Science and Society*

- British Speaker: Lord May of Oxford OM, AC, Kt, PRS President, The Royal Society
- Canadian Speaker: Dr. Thomas Brzustowski OC President, Natural Sciences and Engineering Research Council of Canada

10:30am Coffee

10:45am *Science and Government (1)*

- British Speaker: Dr. Mark Walport FMedSci Director, The Wellcome Trust
- Canadian Speaker: Dr. Robert Clarke Executive Director, McLaughlin Centre for Population Health Risk Assessment

12:45pm Lunch

2:00pm *Science and Government (2)*

- British Speaker: Professor Alan Irwin
Dean of the Faculty of Arts and
Social Sciences, Brunel University
- Canadian Speaker: Dr. Jeffrey Hutchings
Canada Research Chair, Marine
Conservation and Biodiversity,
Dalhousie University

3:30pm Tea

3:45pm *The Role of the Private Sector, R & D and Innovation*

- British Speaker: Professor J. Stanley Metcalfe CBE, FRSA
Stanley Jevons Professor of Political
Economy and Cobden Lecturer,
CRIC, University of Manchester
- Canadian Speaker: Dr. Ed Levy
Adjunct Professor, Centre for Applied
Ethics, University of British Columbia

7:00pm Reception

Hosted by H.E. Mr. Mel Cappe, High Commissioner for Canada

7:45pm Dinner

*Hosted by Baroness Fookes, Chairman of the British Committee
CUKC*

*Speaker: Dr. James Young MD, Commissioner of Public Safety
and Security Chief Coroner for the Province of Ontario and
Assistant Deputy Minister, Public Safety Division, Ministry of
Public Safety and Security*

*This dinner is sponsored by The Office of Science and
Technology, DTI*

Saturday, November 22

9:00am *Science and Education*

- British Speaker: Sir Brian Fender CMG
Chairman BTG Plc

- Canadian Speaker: Professor Suzanne Fortier
Vice Principal Academic
Queen's University

10:30am Coffee

10:45am *Science, Ethics and the Precautionary Principle*

- British Speaker: Dame Ruth Deech DBE
Principal, St Anne's College
Oxford University
- Canadian Speaker: Dr. Conrad Brunk
Director, Centre for the Study of
Religion and Science
University of Victoria

12:45pm Lunch

2:00pm *International Collaboration*

- British Speaker: Professor Brian Wynne
Deputy Director, UK ESRC, Centre
for Economic and Social Aspects of
Genomics, Lancaster University
- Canadian Speaker: Dr. Karen Brown
Assistant Deputy Minister,
Environment Canada

3:30pm Tea

3:45pm *Rapporteur's Report* : Professor Ron Amann Ac.SS, FRSA
Emeritus Professor, University of Birmingham

4:00pm Colloquium Chairman's remarks and end of formal sessions

4:30pm Organisers' meeting

7:45pm Dinner

Hosted by Sir Anthony Goodenough, KCMG, Honourary President CUKC. Professor Michael Gibbons and Professor William Leiss, the Advisers to the 2003 Colloquium, will give their reflections on the event.

This dinner is sponsored by Centrica Plc

LIST OF PARTICIPANTS

Professor Ron Amann Ac.SS, FRSA
Emeritus Professor, University of Birmingham

Dr. Zaki Badawi
Director, The Muslim College, London

Mrs. Sue Barnes MP
Member of Parliament, London West

M. Georges Beauchemin
Director of Ministerial Affairs, Department of Public Security,
Government of Quebec

Professor John Bridgeman CBE TD DL
Director of Regulatory Impact Unit, Cardew Chancery Ltd. and
CUKC Council Member

Dr. Conrad Brunk
Director, Centre for the Study of Science and Religion,
University of Victoria

Dr. Karen Brown
Assistant Deputy Minister, Environment Canada

Dr. Thomas A. Brzustowski OC
President, National Sciences and Engineering Research Council of
Canada

Mr. Bernard J Bulkin
Chief Scientist, BP

Ms. Julie Burch
School of Policy Studies, Queen's University

Mr. Peter Calamai
National Science Reporter, *The Toronto Star*

H.E. Mr. Mel Cappe
High Commissioner for Canada

Mrs. Marnie Cappe
Urban Planning and Local Government Consultant

Dr. Robert Clarke

Executive Director, McLaughlin Centre for Population Health Risk Assessment

Ms. Fiona Clouder Richards

Head of Science and Technology, Foreign & Commonwealth Office

Dr. Peter Collins

Director Science Policy, The Royal Society

Professor David Cope

Director, Parliamentary Office of Science and Technology

Ms. Tammy Davies

Acting Director, Health Canada

Dame Ruth Deech DBE

Principal, St Anne's College, Oxford University

Mr. George Edmonds-Brown

Executive Secretary, CUKC

Mr. Richard Fadden

President, Canadian Food Inspection Agency

Sir Paul Fender CMG

Chairman, BTG Plc

Baroness Fookes of Plymouth DBE

Chairman, CUKC

Professor Suzanne Fortier

Vice-Principal Academic, Queen's University

Professor Michael Gibbons MBE

Secretary General, Association of Commonwealth Universities

Sir Anthony Goodenough KCMG

Honorary President, CUKC

Ms. Fredericka Gregory

Director, Northern Europe Division, DFAIT

Dr. Chris Henshall

Director of the Science and Engineering Base Group, Office of Science & Technology, DTI

Dr. Stephen Hill

Assistant Professor, Environmental and Resource Studies
Programme, Trent University

Ms. Julia Hinde

Science Officer, British High Commission, Ottawa

Dr. Jeffrey Hutchings

Canada Research Chair, Marine Conservation and Biodiversity,
Dalhousie University

Professor Alan Irwin

Dean of the Faculty of Arts and Social Sciences, Brunel University

Mr. Kevin Edson Jones

PhD Candidate, Brunel University

Dr. Kevin Keough

Chief Scientist, Health Canada

Mr. Michael Klosowski

Director, Impara Ltd

Professor William Leiss FRSC

Queen's University, Former President of the Canadian Royal
Society

Dr. Ed Levy

Adjunct Professor, Centre for Applied Ethics, University of British
Columbia

Professor Sir Chris Llewellyn Smith FRS

Director of Culham Laboratory, UKAEA

Miss Patricia Mann OBE, FRSA

Senior Non-Executive Director, Centrica Plc and CUKC Council
Member

Dr. Caroline Martin

Science Officer, Canadian High Commission

The Lord May of Oxford OM, AC, Kt, PRS

President, The Royal Society

Professor Stanley Metcalfe CBE, AcSS FRSA
Stanley Jevons Professor of Political Economy & Cobden Lecturer,
CRIC, University of Manchester

Mr. Gordon Morrison
Deputy Director, North European Division, DFAIT

Ms. Margaret Munro
Science Reporter, *CanWest News*

Mr. Ken Ogilvie
Executive Director, Pollution Probe

Mr. John O'Leary
Editor, *Times Higher Educational Supplement*

Mr. Philip Peacock
Treasurer, CUKC

Dr. Karen Phillips
McLaughlin Centre for Population Risk Assessment, University of
Ottawa

Mr. David Pollock
Executive Director of the Pembino Institute for Appropriate
Development

Ms. Margaret Read
Manager Internal Science Policy, Office of Science & Technology,
DTI

Mr. Martin Rickerd MVO
Team Leader, North America, Foreign & Commonwealth Office

Mr. David Rogers
PhD Candidate, University College London and Commonwealth
Scholar

M. Michel Têtu
Counsellor Trade, Investment and Technology, Canadian High
Commission

Mr. Mike Tyshenko
Queen's University

Ms. Jennifer Warrington
Treasury Board of Canada, Secretariat

Dr. Mark J Walport FMedSci
Director, The Wellcome Trust

Mr. Jeremy Webb
Editor, *The New Scientist*

Professor Robert Wolfe
School of Policy Studies, Queen's University

Mr. Lee Woolgar
PhD Candidate, University of Manchester

Professor Brian Wynne
Deputy Director UK ESRC, Centre for Social Aspects of Genomics,
Lancaster University

Dr. James Young MD
Commissioner of Public Safety and Security, Chief Coroner for the
Province of Ontario and Assistant Deputy Minister, Public Safety
Division, Ministry of Public Safety and Security

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