

Centre for Science and Policy
Churchill College, Cambridge

Statesmanship in a scientific age

A report to the Churchill Statesmanship Programme 2015

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a workshop on 'Science and 21st century leadership' held on
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Foreword by Dame Athene Donald FRS, Master of Churchill College

Organisations and institutions around the world have come together to present Churchill 2015, a programme of Churchill-related activity taking place around the world to commemorate his achievements, highlight his vibrant existing legacy and bring his life and work to new audiences.

Churchill 2015 is being led by an alliance of those charities and institutions with an interest in the life or legacy of Sir Winston, including the College and Churchill Archives Centre. Underpinning all of the activity is the [Churchill Central website](#), a comprehensive new online resource providing a wealth of content on the man, and a portal to other Churchill sites and resources, including the College.

Churchill was unusual as a politician and statesmen, especially in his time, in his high degree of interest in the implications of modern science, in peace as well as war. It therefore seemed appropriate for the College, teaming up with Cambridge University's well know Centre for Science and Policy, to address the issues facing today's politicians and statesmen in handling an ever more complex array of scientific information and to explore the processes and approaches that lead to successful evidence informed policy making. Our report explores these issues and makes recommendations relating to the skills and resources needed.

Key Findings

- Churchill's appreciation of what science could do, for good and ill, was vital to his success as a statesman.
- Today's leaders need to understand the role of science and technology in the dynamics of the economy and society, in a time when scientific discovery is rapid, innovative and disruptive.
- If politics is the art of the possible, science may be said to address the art of the soluble. Statesmen combine their political skills with their understanding of the available evidence to bring about change in what is politically possible.
- Solutions to public policy problems have a greater chance of success if fully informed by relevant, robust and comprehensive evidence.
- 'Evidence' is derived from systematic, tested understanding, drawn from the natural and social sciences and the humanities, but also from rigorous consideration of the experience of non-specialists, including public servants.
- Open approaches to policy making are more likely to ensure that all varieties of useful knowledge are accessed.
- Policy making requires the provision of evidence not simply reactively but also proactively; horizon scanning is essential to strategic policy development.
- Policy problems are multifactorial by nature, with social, economic and technical aspects and therefore require multidisciplinary approaches; ensuring that all relevant fields of knowledge and experience are engaged is the great challenge of public sector knowledge brokers.
- The most serious policy problems arise where the evidence is incomplete and insufficient for making decisions; this is where politicians add value by exercising their judgment in taking decisions.
- In these cases, the role of the specialist is to provide information on what is and is not known, and what the constraints on effective political action are. It is not for the specialists to decide either the policy questions or options but to help identify and define them.
- Specialist knowledge is most effectively accessed when policy makers include specialist knowledge brokers in their teams; the role of the specialist in government is to enable communication with external deep expertise.
- The 'generalist/specialist' divide in the civil service militates against effective integration of specialist knowledge in policy making.
- Our education system is failing both scientists and non-scientists; the latter through inadequate teaching of what science does as opposed to 'facts'; the former by inadequate training in how science is applied outside academia, in business or in policy.

Recommendations

- Policy professionals in government (and indeed citizens at large) will find it difficult to operate in today's technical climate without a good understanding of how science and statistics work and their limitations; school and university education and training should provide a better basis for today's citizen.
- Correspondingly, the education of scientists needs to include an understanding of how science is applied in government and business. To become effective in government, specialist graduates and postgraduates who have the appropriate aptitudes for and interest in policy work need to be given exposure to the theory and practice of policy making and of the UK's (unwritten) constitution, as well as to the sociology, history, philosophy and epistemology of their specialty.
- A core skill of experts within government is communication; training in all forms of communication, including modern media technologies, should be part of all undergraduate courses
- The civil service needs to ensure that it retains and develops sufficient policy-trained expertise to enable it to communicate with all relevant sources of expert knowledge.
- Horizon scanning is best undertaken as a joint exercise between government and the research community; spaces (e.g. The Foresight Programme) need to be maintained and created where possible future challenges can be explored with policy makers before they become crises.
- The programmes that have developed already to expedite networking between public policy makers and academic expertise (such as that of Cambridge University's Centre for Science and Policy CSaP) should be built on and expanded.
- Science capability in the civil service has been strengthened in recent years, in particular through the development of the professional stream GSE (Government Science and Engineering); Parliament needs to strengthen its abilities if it is to investigate and challenge technically based policies effectively.
- The Research Councils should invest in comparative research on the effectiveness of different models for enabling evidence-informed policy making
- Our greatest future resource lies in our young people; the postgraduate/early career training of the sort launched under this programme should be continued and extended, to develop a widely networked cadre of young specialists and policy makers to provide the next generation of leaders.
- **This Churchill Programme has provided a point of initiation and the momentum it has generated needs to be carried forward.**

Core Arguments

Churchill's leadership from the start demonstrated an awareness of the importance of science to life and politics in the twentieth century. He viewed this not as someone with science training but as a politician and journalist with a strong sense of history who was fascinated by what science could do. Churchill brought an acute eye to the technological changes occurring within his lifetime, and to their political, military and moral implications. His early writings show a prescient understanding of just how much new science and emerging technologies could change the conditions of war and peace¹; later he grew concerned at how failure against the Nazis might result in “a new Dark Age, made more sinister...by the lights of perverted science”².

As Prime Minister, Churchill faced huge policy challenges in the course of a war that was not only geographically extensive but which included the widest possible range of technological problems and solutions. He recognised early on his dependence on technical capability, both for offence and defence. With help and, at times, hindrance from his friend and personal science adviser, Lindemann, Churchill and his ministers ensured that the best scientific minds in “The Wizard War”³. The roll-call of brilliant scientists engaged in wartime Government included JD Bernal, Patrick Blackett, Dorothy Hodgkin, Henry Tizard and Solly Zuckermann, among many others.

The approaches used to harness science, from Lindemann's role as, effectively, a Government Chief Scientific Adviser before the term existed, to the use of expert committees and specialist laboratories, tested every option to the extreme and demonstrated their strengths and weaknesses. Churchill's Statistical Department, was intended to “get a grip on all the ...statistics, and present them to me in a form increasingly simplified and graphic”. Along with the development of new techniques in statistics and operational research, the creative approaches to presentation of data by Lindemann's team made it easier for the war cabinet to grasp complex situations rapidly⁴. Similar creativity applied to generating solutions to military and to civil problems; not all of the ideas were workable but the best of them, such as radar, computing, antibiotics, radio-navigation and atomic power, measurably shortened the war and saved lives. The work of Elsie Widdowson⁵ and Robert Macance, for example, ensured that a fair, effective and accepted system of food rationing was based on a sound understanding of the different dietary needs of soldiers and workers, children and adults, men and women.

¹ Lyons, JD (2010) Churchill on Science and Civilization. *The New Atlantis* (Summer 2010) 75-84 http://www.thenewatlantis.com/docLib/20100914_TNA28Lyons.pdf

² “Finest Hour” speech to the House of Commons, 18.06.40

³ Chapter title in Churchill's *History of the Second World War* (Volume II, Bk II, Ch XIX).

⁴ Fort, A (2003) *Prof: The Life of Frederick Lindemann* Random House, London 364pp. See esp. 187-8 and 209

⁵ Ashwell, M. (2002). Elsie May Widdowson, C.H. 21 October 1906 - 14 June 2000. *Biographical Memoirs of Fellows of the Royal Society* **48**: 483. doi:10.1098/rsbm.2002.0028.

Today's challenges are as tough as any Churchill faced. Today's leader in policy needs to be clear-eyed and well informed on the scientific, economic and social realities as well as politically acute and astute; the best leaders will approach issues not only from a pragmatic standpoint but also an ethical one, presenting a values-driven vision for the future while showing respect for evidence and rational analysis.

Science is essential to policy making at every level. Science is a vital component of the innovation crucial to economic growth and competitiveness, and policy towards investment in research will play a critical part in economic and social success. Science is the basis for the delivery of public goods and the control of public harms, both in the formulation of effective regulation and in the monitoring and enforcement needed to deliver the right results. Churchill recognised⁶ the extent to which the United Kingdom as a small open country in a globalising world could survive only on its wits; this insight applies to its policy making as much as to its industrial competitiveness. This position still applies.

Science is used here in the broadest sense; we are discussing not just "STEM" (Science - physical and life; Technology, Engineering, Mathematics) but the social sciences (including economics) and the arts and humanities – all sources of useful knowledge. We tend to use the single word 'evidence' to incorporate outputs from all of these without listing them but it should not be forgotten that 'evidence' is drawn not only from professional disciplines but also from the experience and knowledge of social actors (in industry, the third sector and in government, and among that fictional group 'the public at large'). What constitutes 'useful' may not always be obvious but it is important to remember that, in discussions with experts, whether their expertise is professional or experiential, a wide diversity of mind-sets is as much a part of the solution generation as a variety of knowledge.

Horizon scanning and foresight is essential to help the policy maker stay ahead of the relentless press of events. Intelligent investment in research into emerging issues can help to ensure measured responses rather than panic reactions. The purpose is not so much to provide ready-made solutions to problems in the future as to develop expertise and understanding of the policy issues; the policy maker's best resource is state-of-knowledge expertise that is already attuned to the way the issues play out in political terms. This cannot be developed overnight. Further, in the policy context, creative thinking needs to be nurtured and there is good evidence that inter-disciplinary approaches generate novel ideas at the boundaries of knowledge silos.

The gold standard for policy these days is "What works" and 'what works', loosely, can be said to be comprised of two elements: -

⁶ "Since we have neither the massive population, nor the raw materials, nor yet the agricultural land to enable us to make our way in the world with ease, we must depend for our survival on our brains, on skilled minds that are at least proportionately equal to those in the United States and Soviet Russia. This is far from being achieved and, even when it is, we shall only have reached a quantitative target. In quality, we should endeavor to outstrip our friends and rivals, as we have done in the past." Speech on the occasion of the tree planting at the opening of Churchill College 1959 <https://www.churchillcentral.com/timeline/stories/churchill-planting-a-tree-at-churchill-college-on-17-october-1959>

- The Practical – technical feasibility, affordability, deliverability – Politics as *the Art of the Soluble*; this is where expert advisers add value.
- The Political – tractability and achievability – Politics as *the Art of the Possible*⁷; this is where political judgment is at a premium.

Great leaders, the statesmen, will combine these to change the boundaries of what is politically possible, leading, explaining and showing the way to achieving higher goals. In doing so they will need to harness all the practical opportunities that science provides and be aware of all the problems that science identifies.

Scientific advance has been unprecedentedly rapid since the War and novel technologies have brought with them both new opportunities, especially in industry, health and communication, and new types of policy problems, notably in the environment and security domains. Increasingly, in the modern world, problems and solutions are not only complex but interconnected, cross national boundaries, and have no single or simple answers; they are, in the current jargon, increasingly, "wicked"⁸. For example, Professor Sir John Beddington has talked of a "Perfect Storm"⁹ of food, water and energy shortages by 2030, linked to population and consumption growth, climate change and ecosystem service loss, as well as to changing global security conditions. Research is beginning to provide tools for approaching complexity, notably through modelling, but there are still many conceptual difficulties in dealing with the unpredictability, open-endedness, and emergent conditions of complex systems. Problems of this kind mean that Governments need all the resources of understanding and knowledge that the research and other expert communities can supply if they are to grapple with decision making in such an environment.

Evidence informed policy making, therefore, presents special challenges for policy makers, both of mobilizing all the sources of relevant evidence and of understanding what that evidence means. Policy processes are generally thought of as cyclical; a problem presents itself or emerges from political thinking; its formulation is debated (often a matter itself of hot political disagreement) and, when decided, efforts are made to identify and appraise workable solutions and to consult with all affected parties. Once agreed, a policy will be implemented and, ideally, its effectiveness will be assessed through monitoring and evaluation, leading to further problem identification and new policy actions.

Evidence and analysis is needed at every stage in this cycle; in particular the identification and framing of the issue is crucial to whether the solution identified

⁷ The expression is Bismark's "*Die Politik ist keine exakte Wissenschaft*", said to have been included in a Speech to the Prussian Upper House on 18 December 1863. Peter Medawar adapted this phrase to distinguish science from other endeavours in his book *The Art of the Soluble* (1967, OUP); it is here readapted to a policy application. Science can, in particular, help to address the practical aspects of workable policy.

⁸ Conklin, Jeffrey (2006). *Dialogue mapping : building shared understanding of wicked problems*. Chichester, England: [Wiley Publishing](http://www.wiley.com). ISBN 0470017686.

⁹ see for example <https://www.youtube.com/watch?v=9rXjmr64KjU>

will actually deliver the desired outcome. Politics is often driven by urgent timetables so this phase of “opening up a problem” may be curtailed with bad consequences for eventual results. Worse, political imperatives may drive the selection of evidence to support existing policy conclusions; such ‘policy informed evidence gathering’ leads only to confirmation bias and ignorance of counter information.

The multi factorial nature of policy problems means that they and their solutions invariably require coordination of many different sources of knowledge; if they didn’t, they probably wouldn’t be political issues in the sense of issues involving people and their values as well particular technical options. Multi-disciplinary analysis of issues and proposals is essential, if difficult; different disciplines have their own jargon, mindsets and framings, and need to make an effort to talk across their own boundaries. A key role for policy makers is to ensure focus on the problem, as problem-orientation necessitates thinking outside disciplinary boxes. The trend today towards “open policy making” reflects the difficulties of ensuring that all relevant sources of information are made available. In his famous disquisition on different states of knowledge, Donald Rumsfeld¹⁰ focused attention on the importance of “Unknown Unknowns” in generating new policy problems but omitted a further category, the “Unknown Knowns”, the things that “we” don’t know about but *someone else does* (a minefield for the politician). It is therefore important to go beyond the ‘usual suspects’ in seeking advice and ideas, and equally important to ask the apparently stupid question, which may elicit new thinking and alternative viewpoints. Young people here have an advantage of older more experienced operators, in possessing a greater willingness to ask and less concern about losing face.

Risk assessment (and its management) is a crucial tool for policy makers, but assessing risks at a formal level may require more information than is available. The normal condition of political discussion is one of uncertainty and ambiguity about key issues, and some decisions have to be made in conditions of genuine ignorance (think of the early days of BSE, where little-to-nothing was known about the disease or its implications). Different degrees of uncertainty and ignorance call for different methods of approach to problems, a field in which some of the social sciences can play a particularly helpful role¹¹.

High levels of uncertainties or high decision stakes make such an open approach even more vital, and, in reality, that is the norm in politics; indeed it could be said that politicians earn their salaries by making the decisions that can’t be made solely on the available evidence. Where there is technical certainty and broad agreement, relatively straightforward technical solutions to problems can be delivered through Government agencies and NDPBs, but where issues become political, it is usually because the facts, or their interpretation, are contested, values are a key part of any decision and/or there is significant uncertainty over the risks involved. Open policy

¹⁰ US Department of Defense news briefing, Feb 12, 2002; <http://www.defense.gov/transcripts/transcript.aspx?transcriptid=2636>

¹¹ Stirling, A. (2007) *Risk, Precaution and Science: towards a more constructive policy debate*. EMBO Reports 8(4) 309-315

making helps to engage not just all the relevant sources of evidence, but to have their disagreements brought to the surface and made clear to stakeholders in the policy decision, whose engagement become increasingly vital as uncertainty about the facts increases¹². In the end, in this sort of complex political decision making, the evidence may *constrain* the limits of effective action (as a simple example, policy options that contravene the laws of gravity are unlikely to work) but may not be enough in itself to *determine* the choice of options. It is for the policy maker to weigh all the conflicting evidence in the balance and make a judgment that includes the application of values.

Road Blocks

Over fifty years ago, Harold Wilson was warning that the Britain that would be “forged in the white heat of [technological] revolution” was no place for traditional approaches and closed minds¹³. Concern about the abilities of the Civil Service to deal with the complexities of modern scientific knowledge go back in fact at least as far as the First World War and were addressed in the famous Haldane Report of 1918¹⁴. The Fulton Report in 1968¹⁵ identified the philosophy of the amateur or ‘generalist’ as inimical to professionalism and noted that scientists, engineers and other specialists “are given neither the full responsibilities and opportunities nor the corresponding authority they ought to have”. The philosophy that ‘scientists should be on tap, not on top’ (an aphorism attributed to Churchill by his son¹⁶) has pervaded Civil Service thinking to the detriment of both scientists and policy makers. While, typically, Churchill put his finger on an important point - that experts speaking outside their expertise are of no more value than any other non-expert to policy discussion - it is nonetheless unhelpful if policy makers treat experts as an optional extra, to provide advice on demand but otherwise to keep silent. The very rapid development of science and technology in the second half of the Twentieth Century has made the professionalisation of that relationship both more essential and more difficult, for both sides.

The historical distinction between ‘specialist’ and ‘generalist’ endures within the psyche of today’s Civil Service and embeds some unhelpful assumptions¹⁷. The obvious misleading assumption is about whether the ‘policy skills’ developed by ‘policy professionals’ are in some way unavailable to specialists, despite the reality that specialists with long civil service careers often develop acute policy sensitivities

¹² Funtowicz, S.O. and Jerome R. Ravetz (1991). "A New Scientific Methodology for Global Environmental Issues." In *Ecological Economics: The Science and Management of Sustainability*. Ed. Robert Costanza. New York: Columbia University Press: 137–152

¹³ Wilson, H. (1963) Labour’s Plans for Science (<http://nottspolitics.org/wp-content/uploads/2013/06/Labours-Plan-for-science.pdf>)

¹⁴ Ministry of Reconstruction (1918) *Report on the Machinery of Government Committee, under the chairmanship of Viscount Haldane of Cloan OM*. London, HMSO Cd 9230

¹⁵ The Civil Service Vol. 1. Report of the Committee 1966-68 London, HMSO Cmnd. 3638, 206pp

¹⁶ Randolph S. Churchill, (1964) *Twenty-One Years*, 127. Weidenfeld & Nicolson, London, 1965.

¹⁷ Cf. Isaiah Berlin’s *The Hedgehog and the Fox: An Essay on Tolstoy’s View of History*, London: Weidenfeld & Nicolson, 1953

and capabilities (and indeed some go into policy leadership). As such, specialists are best integrated in policy teams (a developing practice in some Departments) rather than kept on tap in specialised units. The less obvious misleading assumption is that evidence provision is solely a function of the academically qualified professions, which means that there is a lack of recognition by specialists (and often 'generalists') of the value of the experiential expertise developed by many policy professionals, which forms an essential component of any policy decision.

The current approach to educating non-scientists has led to the problem that, C.P. Snow, sometime Minister for Technology in that Labour Government, typified as "The Two Cultures" in his Rede lecture of 1959¹⁸. He was concerned, in particular, that humanities graduates could be considered educated without even a basic understanding of the developments of modern science. The implications were greater perhaps in the Civil Service of his time, dominated by Classicists and other humanities graduates, but it is reasonable to have concerns to this day that the early specialisation that is a feature of our education system means that intelligent students can cease studying science after the very limited introduction they receive at GCSE. An important gap in the training of many civil servants is the absence, not of in-depth scientific training, but of an understanding of what is meant by 'scientific method', of what scientists understand scientific knowledge consists (its provisional, testable nature), and of the interpretation of statistical information. These days, with a stronger recruitment of scientists into the ranks of the policy professionals, the problem is declining in the civil service, but it remains highly significant in politics. Very few MPs in recent parliaments have had any scientific training beyond a primary degree (one each in the current and last Parliaments) and the quality of science-related debate in the House of Commons is often poor; unsurprisingly, it is much better in the Lords, populated as it is with some of the most distinguished scientists in the country. Parliament is supported by the excellent Parliamentary Office for Science and Technology (POST), but this is a small resource. Without better training in at least the basics of science, politicians and civil service policy professionals are at risk of misunderstanding the advice they are given, especially where the specialists themselves are in disagreement about either the science or its implications.

Traditional scientific education on the other hand does not provide scientists with the tools to engage effectively with policy makers. Importantly, few natural science undergraduates are taught about the philosophy of science and epistemology, nor about the valuable insights of the social scientific study of natural science. Too often, science graduates emerge with black and white conceptions of scientific 'truth' and 'proof'. The provisional nature of scientific theory, the importance of hypothesis, test and refutation in the development of scientific knowledge, and the role of scientist as actor in a social process, are not part of routine teaching. More importantly, the focus on scientific 'facts' in teaching contrasts sharply with the reality that in policy contexts, the scientific understanding is often contested and/or incomplete; students are not provided with ways of addressing the limits of their

¹⁸ Snow, C.P. (1964) *The Two Cultures* (2nd Edition) CUP.

knowledge, and of handling and communicating uncertainty, nor of skills needed in developing ‘best expert judgment’ ideas to help policy makers.

An understanding of the British constitution and the working of policy is not part of undergraduate science training. To some degree, universities are now training science under- and post-graduates in the role of science and innovation in industry but few, if any, are addressing the applications of science in policy making. Given that many graduates may end up as working scientists or, indeed, as policy professionals in government, this is an important lacuna. In particular, young scientists often misunderstand the motivations of policy makers and the fact that many other issues besides scientific knowledge will play a part in a policy decision. Civil Service recruiters have no difficulty in finding excellent young scientists to join departments and their agencies, but are well aware that a significant amount of in-house training and experience will be needed before these recruits can become useful advisers to and members of policy teams.

Communication problems emerging from language and conceptual differences exacerbate these training gaps. This is not limited to communication between ‘scientists’ and ‘policy makers’ but within the sciences. Notably, the natural scientists, social scientists and economists use many common terms in quite different ways (including even the ways that graphs are drawn). Failures of communication and understanding between specialists can confound a policy discussion. The different mindsets should be a strength, in providing many ways of viewing problems, but, in the absence of effective communication, can lead to quite different and antithetical framings of problems, or at the least to conceptions of approach that don’t join up across disciplines. A notable feature of specialist training is that it approaches communication solely within the context of the academic journal and conference, with little thought for non-academic audiences or even for communication with other specialisms. Finally, specialist training seems to focus on *telling* rather than *listening* and a critical need in the application of specialist knowledge to policy problems is to listen to the person with the problem first, even if the next step is to suggest alternative framings and formulations.

Timescales in politics and science are quite different. Though statesmen may focus on the strategic and long term, practical politics requires an ability to deal with the tactical and short term (“Events, my dear boy”, as Harold Macmillan probably didn’t say). Timing is everything; the right solution a day late is lost. Scientists, particularly research scientists, find this sort of time pressure difficult. It doesn’t allow for checking and testing; it presses for answers where complete answers can’t be given. Policy makers need to be aware of this and recognise that these pressures are critical in particular at the “opening up” phase of political debate, where time and thought given to formulation and framing may be crucial to delivering properly targeted solutions, but where often the political pressures to ‘do something’ to address a newly emergent problem can lead to early closure and misdirected resources.

The value of history in understanding current problems can easily be lost in the pressure of political forward movement. Fewer policy makers nowadays are

historians by training and history is not part of the ‘expert’ discourse of specialist advisers¹⁹. Churchill, with his very acute sense of history, would be dismayed, even though his own approach shows that history can be used and abused to make political points or to justify contestable assumptions. Nonetheless, an understanding of how we got to the point we are at, and what the factors were that led that way, is essential to formulating approaches to the way forward. The absence of historians among advisers often leads to the re-invention of wheels and the repetition of past mistakes.

Enablers

Policy leadership in today’s world will require a high degree of professionalism and integrity in handling difficult evidence issues, in terms of both the intellectual ability to grasp and communicate complex ideas from many disciplines and of the clear eyed understanding of their implications and the ability to turn such understanding into visions to which others can adhere.

This is a moment for optimism, despite what has been said about ‘road-blocks’ above. The trend towards smaller government of recent decades is also, necessarily, a trend to more open government, as Ministers will need access to resources that are no longer possible to provide solely from within a closed-doors civil service. They and their remaining civil service core will turn for information, ideas and advice not just to their remaining in-house experts and the PSREs²⁰, but outwards to academia, the think tanks and consultancies. The big challenge will be to find the approaches that enable trust and mutual understanding while encouraging the necessary level of challenge to ensure that ideas are tested and validated.

Networking and porosity across institutional boundaries will be key to this. Recent Governments have favoured the possibilities of bringing outsiders into the civil service and it is more possible now for government to bring those with expertise into policy teams. For this to work, Governments need trusted networks giving access to the right expertise at the right time; Cambridge, through the Centre for Science and Policy has pioneered an approach to networking academia and Whitehall through its *Policy Fellowships* programme²¹, which could be rolled out to other universities. Further research is needed on effective networking between government and sources of expertise, especially to address the issues of openness in policy making in a democracy. The Workshop for early career Fast Stream policy makers post-doctoral researchers held under the auspices of this Programme²² suggest a model for developing effective networks from the earliest stages of professional

¹⁹ See for example James Wilsdon (2014) From foresight to hindsight: the promise of history, *Journal of Responsible Innovation*, 1:1, 109-112, DOI: [10.1080/23299460.2014.885176](https://doi.org/10.1080/23299460.2014.885176)

²⁰ Public Sector Research Establishments. These range from Research Council institutes focused on strategic research to government laboratories focused on scientific services (for e.g. licensing, inspection, monitoring and enforcement purposes) supported by research.

²¹ <http://www.csap.cam.ac.uk/programmes/policy-fellowships/>

²² See Annex

development; the enthusiasm and activity in that workshop also suggest that there is a pent-up demand for exactly this sort of opportunity.

Rethinking the level of science training that all school pupils should receive is overdue²³. Ensuring that every young adult has at least a basic understanding of what science is and does should be seen part of the normal equipment of people to be intelligent citizens in a democracy in an age where science is so important to everyday life. This needs to go beyond the very simple, fact based teaching of current GCSEs and equivalent; Ways of maintaining some of this understanding at University level for non science students should be at least as important as encouraging science students to remain aware of and interested in the arts and humanities.

Reforming under- and postgraduate education in the sciences and humanities, to ensure that graduates are introduced to the widest possible applications of their training is crucial to these developments. Considering that only a small percentage of students will end up in long-term academic or research roles, it is essential that their development should include exposure to industry and to policy making, and that they should be given the tools to consider how their knowledge can be practically used, including a good grounding in philosophy of science, epistemology and the social science of knowledge. Further, the strongly disciplinary focus of undergraduate and post grad training needs to be tempered with awareness of the contributions and paradigms of other fields, and the benefits that can spring from multidisciplinary approaches to problems. While the basics should form part of any undergraduate training, postgraduates (most of whom after their doctorates will go out of academia) should receive further training.

Students should be supported in their initiatives to improve their own policy and professional skills. In Cambridge, there are the examples of the Cambridge University Science and Policy Exchange (CUSPE²⁴, a group initially of postgraduate scientists) and Polygeia²⁵(an initiative started by medical students but now extending to many other disciplines), who have successfully experimented with different approaches to training and experience gathering. Similar initiatives exist in other universities and deserve encouragement.

Communications training is a core requirement, and communication starts with listening skills. Training needs to emphasise that the humility to listen is essential to gaining an understanding of the underlying epistemological assumptions of your interlocutors. Correspondingly, the skills needed to speak in others' terms and language, and in as transparent as possible a way, should be part of the training of students. A good grasp of language, coupled with clarity of thought, is essential to providing the courage to offer ideas, challenges and arguments. This is not a point unique to the training of natural scientists; we all, specialists and other policy

²³ See the Royal Society's 'Vision for science and mathematics education', <https://royalsociety.org/education/policy/vision/>

²⁴ <http://cuspe.soc.srcf.net>

²⁵ <http://www.polygeia.com/>

professionals alike, tend to speak in jargon, and this jargon can be used to obscure political discussion to the detriment of democracy²⁶. One option for ensuring that this is taken seriously might be for examinations to have an element of the marks given specifically to lay communication and clarity.

Modern communications media will be an inevitable part of this communication and it is vital for policy makers and specialists to learn their use with skill. They may be an enabler or a distraction/distorter, and indeed will be both. Learning the methods of counteracting distorted communications while ensuring that information reaches as many people as possible will be vital in a modern democracy. As well as training, research and development will be needed.

Experts within government will continue to play a vital role as brokers between the academic and wider research community and policy makers. Their function is not expertise in depth but the ability to identify and intelligently communicate with those with the expertise in depth. They act as interpreters of deep expertise to non-expert colleagues (including those expert in other fields) and of policy needs in the language of the expert communities. As such they can play a crucial role in framing and formulating policy issues as well as connecting policy makers to providers of possible solutions. Their professional training is therefore critically important; some of this is linked to what has already been said about university level education and some to their on-the-job training within government. In this respect, the steady growth in effectiveness of the cross governmental professional bodies such as GES (the Government Economic Service) and, more recently, GSE (Government Science and Engineering)²⁷ is greatly to be welcomed; continuous professional development needs to be a mandatory part of civil service training for specialist. However, attention needs to be paid not only to continuously improving training but also to recruitment. Not all specialists will have the aptitudes for the work of policy analysis and advice; recruitment criteria need to include an ability to listen, an empathy with and a curiosity and awareness about, politics and the clarity of mind to communicate simply and effectively, all within a context of political, rather than research, time pressures.

Broadening the reach of expertise to government will be important. One of the biggest challenges to government is to refresh its in-house expertise, especially when government itself is shrinking. There is a tendency for in-house expertise to reflect the issues of the past twenty years rather than the future. Ways will have to be found to ensure that government becomes an intelligent customer for advice in areas where it is currently not strong, for example in history, anthropology and geography, where some departments are very short of expertise. Solutions to the problem include improved engagement with academic expertise in these sectors (difficult if a department lacks the relevant intelligent customer capability), making greater use of limited resources across departments (for example DCLG has

²⁶ George Orwell's 'Politics and the English Language'
http://www.orwell.ru/library/essays/politics/english/e_polit/

²⁷ the others are GSR (Government Social Research), GORS (Government Operational Research Service) and GSS (Government Statistical Service).

significant resources in geography, D. Transport in engineering, Defra in ecology) and taking a new approach to the recruitment of generalists to recognise their academic training as having benefit beyond simply the content of their degrees (the fast stream still benefits from recruiting history graduates for example; greater use of post grad recruits could be made). Beyond the core of government, there needs to be a reconsideration of the national requirements for applied science represented by the PSREs, and whether after decades of reform, agencification and privatisation, we have the balance right in terms of national capability.

The strengths and weaknesses of the UK's 'Chief Specialist Adviser' model should be kept under review. The appointment of a top scientific adviser to Government and/or to individual departments of state is used very effectively in several countries (including the US, Ireland, Australia and New Zealand) though has found less favour with governmental systems in most of the rest of Europe, which prefer more conciliar approaches. Each approach has strengths and weaknesses. Chief Scientific Advisers are generally externally recruited from among experienced high profile academics, which brings new experience and challenge to Government departments but sometimes fails because of lack of policy experience or skills; the limitation to external recruitment also puts a career ceiling on internal scientists. Chief Economists, Statisticians or Social Researchers tend to be recruited internally, with the reverse benefits and problems. Because of the costs of senior posts, 'Chiefs' frequently have to double up across specialisms, implicitly becoming Chief Evidence Officers, without the full implications of such a role having been thought through, especially with respect to their all-important roles as Heads of Profession and guardians of professional quality and integrity. The CSA model is often operated along side a more conciliar model as used elsewhere (e.g. the UK's CSA also has the Council for Science and technology; the US president has his Science adviser and the Presidential Council on Science and Technology). Conciliar models have advantages with respect to the range of expertise that can be brought to bear but sometimes weaknesses with respect to their ability to integrate effectively into government decision making. We have much to learn from other countries and should continually seek to improve the effectiveness of our approaches to top level advice on evidence for policy making.

Select Committees of Parliament need stronger specialist support. Government's respect for scientific evidence is proportional to the degree of challenge they receive on it. The growth of the challenge function of Select Committees has been a very positive trend to effective Parliamentary democracy in recent years, but compared to, say, US Congressional committees, their resources of expert advice are small. POST does an excellent job but on too small a scale; the Committees themselves need budgets, access to experts and sufficiently expert staff to inform their inquiries.

Ensuring that funding models can accommodate 'heretical' research is of great importance to horizon scanning. For all the benefits of the Research Excellence Framework, it has tended to focus research on the safe and the incremental. Governments need out-of-box thinking as much as they need good applied science, if

they are to get early awareness of disruptive trends, whether for good or ill, and to access innovative approaches to policy solutions.

Selling it

The programme of ideas suggested in the last section will need to be debated and further developed with a very wide range of stakeholders, in government, academia and the professional bodies, in particular:-

- Politicians, including Ministers and members of Select Committees.
- Those responsible for Civil Service reform, in particular the heads of the Policy Profession, and supporting organisations such as the Institute for Government
- The Heads of the specialist professions in the Civil Service and their disciplinary professional bodies (GES, GSE etc.)
- The Royal Society and other Academies, and the professional Institutes (e.g. The Royal Society of Chemistry, The Institute of Physics, the Society for Biology)
- The Research Councils, especially insofar as they can fund research into these issues.
- The Higher Education Sector
- Student bodies with an interest in policy development for science students

Key actions will be

- Engagement with others involved in Civil Service reform and modernisation, notably the Institute for Government,
- Support for centres of expertise and research into the interactions of science and government, especially interdisciplinary research; networking of such bodies nationally and internationally. The EU supports useful research in this area; its Joint Research Centre could provide a platform for cross European discussion,
- Collection and publication of case studies, including historical studies of successful evidence-informed policy making (and of failures), and evaluations of past practice (for example the historical effectiveness of the CSA model); this would require funding,
- Workshopping and networking opportunities (such as and including CSaP's Policy Challenges²⁸) for senior policy makers and researchers,
- Training programmes for young specialists and young policy makers, based on the success of the Churchill Workshop, opened out to a wider range of universities and government departments.

The Churchill Programme provides a point of initiation and the momentum it has generated needs to be carried forward.

²⁸ <http://www.csap.cam.ac.uk/policy-challenges/>

ANNEX

Professional Development Policy Workshop: Science and 21st Century Leadership 15 April 2015, Churchill College, Cambridge

The workshop provided junior policy makers and early career researchers with an insight into the role of expertise and evidence in policy making. Delegates included 18 early career researchers from the University of Cambridge, and 18 civil servants (each representing a different branch of government).²⁹ Invited speakers from academia and government discussed their experiences of gathering and presenting scientific evidence for policy.

Session 1: How do policy makers make the best use of evidence?

Dr Miles Parker (Centre for Science and Policy, Cambridge University) introduced the day and chaired the first session. He spoke, of the future challenges for policy makers and the type of leadership required to solve them.

- **Professor Stuart Rogers** (Chief Scientist, CEFAS) '*Cefas as provider of advice and expertise to government*'. He spoke about his role in gathering evidence and providing scientific advice to inform policy. He gave examples both of when the science had been a deciding factor in shaping policy, and of when it was superseded by other considerations.
- **Graham Pendlebury** (Director of Local Transport, Department for Transport) spoke on '*Working with Academia: Sustainable Transport Policy in DfT*'. He outlined 6 key ways academic researchers could get involved in policy making (Academic Challenge; Joint Collaboration; Policy-oriented research contracts; Policy Evaluation; Secondments; working with Local Authorities), and described policy making as a '3-ring circus', where the evidence, political considerations and do-ability all have to be balanced.
- **Sir Richard Mottram** (a former Permanent Secretary at many Government Departments) described the different dimensions to policy making, emphasising the need to embed implementation considerations and a means for evaluation into policy from the very beginning. He also spoke about how departments tend to use established networks of experts, but that these networks are often geared towards tackling historical, rather than future, challenges.

The Q&A after the panel covered epistemology and the concept of 'evidence'; how government and academia can engage in the public debate on policy development; the potential for bias towards internal evidence; and whether academics can supply government with a methodology for identifying "what works".

Session 2: How can academia research contribute policy making?

Professor James Wilsdon (Professor of Science and Democracy, SPRU) chaired:

- **Professor Peter Guthrie** (Director, Centre for Sustainable Development, University of Cambridge) spoke of his time on Defra's Scientific Advisory Council, offering an

²⁹ Government departments represented: BIS; Cabinet Office; DCLG; DCMS; DEFRA; DfID; DfT; DWP; Department of Health; FCO; Food Standards Agency; Health and Safety Executive; HM Treasury; Home Office; MoD; Ministry of Justice; Scottish Government.

academic's perspective on how evidence is absorbed into government. He described how, during an emergency when a policy response is required immediately, science and evidence are given primacy over other considerations. When a matter is politically pressing, but not an emergency, science and evidence are necessary but not sufficient to formulate policy. And the less salient the issue, the less weight is given to the evidence.

- **Professor David Spiegelhalter** (Winton Professor for the Public Understanding of Risk, University of Cambridge) described various policy initiatives he had been involved with (PIP Implants (the Keogh review), the Meningitis B vaccine and Plain Packaging of Cigarettes), and outlined the circumstances in which evidence can have a significant impact upon policy: it is easiest to have impact when government has passed responsibility to technical agency (e.g. NHS, NICE); difficult when against strong political/commercial lobby. He also spoke of the need to improve the language of uncertainty when talking to policy makers.
- **Dr Stephen John** (Lecturer in the Philosophy of Public Health, University of Cambridge) described his efforts to get involved in policy making, which he labeled 'failures'. This led to a discussion about why similar efforts can fail, what can be done to combat the causes of this failure, and assessing what it means to have 'impact' on policy.

The Q&A that followed the panel discussed uncertainty and the limits of evidence, how much evidence is 'enough' evidence, and returned to the issue of methodologies for identifying what works in public policy.

Session 3: Group Task – Alcohol minimum pricing and the below-cost ban as a worked example

Attendees divided into groups to prepare for an 'elevator pitch' to recommend a policy to a 'minister'. They had an hour to prepare, and the issue was minimum pricing of alcohol and the ban on below-cost selling. Jennifer Rubin (Vice President, RAND EUROPE) played the Minister, listening to the presentations, asking questions and then providing feedback. Of the 6 groups, 5 advised her to keep the ban. Issues explored included: public education campaigns; 'nudge' policies; licensing restrictions; better enforcement; pilots of incentives and punitive measures; the role of Local Government; all in the context of the politically possible and practicable.

Session 4: Discussion with Dame Athene Donald (Master of Churchill College and Professor of Experimental Physics at the University of Cambridge)

Discussion covered the main challenges and roadblocks in linking scientific advice to policy making, and what to recommend to government for improving policy making. Both the civil servants and the researchers had an appetite for improved engagement and, with departmental research budgets falling, recognised that government will have to rely increasingly on the broader research community for evidence. However, both were uncertain and apprehensive about how to approach the other, and how to identify the relevant people. This highlights the importance of forging networks and relationships based on trust. A broad and ongoing effort is needed across the civil service to encourage engagement with external expertise and to give junior civil servants the confidence to do so. Institutional inefficiencies act as barriers to engagement, so networking must be promoted from the top down between academia and civil service, to encourage those lower down.

A reception after the workshop provided an opportunity for more informal networking among participants.