

# Chief Scientist World

## In this issue

### It's the economy...

Don't go to politicians without an economic argument, Whitty warns p2

### Credibility at risk

CSAs should avoid being seen as advocates for particular policies, says Gluckman p3

### At last

President Obama gets serious about science cooperation with Africa p4

### 'Not sure about tomorrow'

Ukraine's scientists count the cost of Crimea separation p5

### Arctic ambition

China plans infrastructure development p6

### The prof who would be PM

Ignatieff says don't let my failure put you off p8-9

### Learning to fail better

Is there a right way to make errors in policy-making? p11

### Tell us what you think

Write to editor Ehsan Masood: ehm@researchresearch.com

If pioneering government chief scientific advisers from the past were to attend the Global Science Advice meeting, what would they think?

They would no doubt be intrigued by the industrial scale of scientific advice today, but perhaps surprised by how many of the challenges they faced still hinder their successors.

Take Solly Zuckerman for example. Were Zuckerman, an adviser to a succession of UK politicians from the second world war to the 1970s, alive today, he would surely see little new in the opposition to Anne Glover, CSA to the European Commission's president. Glover, an enthusiast for novel technologies in agriculture, has the backing of her peers and many of the leading scientific societies—but not of environmentalists.

In 1972, Zuckerman fought a battle against a then nascent green movement that was championing the idea of a UN body to protect the global environment. He, in common with some scientists and the UK government, felt that evidence of an irreversible environmental threat wasn't compelling enough to warrant the creation of the UN Environment Programme.

"There are some extremists," Zuckerman said with characteristic gusto, "professional scientists not among them, but men who comment from the sidelines, who see pollution as a menace which much inevitably grow. I, however, know of no scientific evidence for this view."

Or take Abdus Salam, a Nobel laureate in physics. Salam was sacked as CSA to Pakistan's prime minister because he privately opposed the government's plan to acquire nuclear weapons capability. For Salam, as for so many of today's CSAs, the need to remain independent of government was paramount, even if it meant losing his job.

So what, then, has changed?

Today's CSAs operate on a much larger scale. In some instances, this has produced the kind of interdepartmental turf war that the CSA post was supposed to rise above. And the explosion in scientific output and publishing has necessitated a stronger need for synthesis skills.

At the same time, having so many visible CSAs has made them more of a target for lobbying. Given their proximity to prime ministers, this isn't a surprise. Yet, paradoxically, the trend for prime ministers to create large, private offices separate from cabinet-level ministries, and the advent of behavioural economics, will in future make it harder for CSAs to have a direct line to the top. There will be less space for CSA exceptionalism.

I suspect that our visitors from the past would be surprised to see today's CSAs operating around the clock in a world where public confidence in the authority of experts and elected politicians is falling. And they would probably be horrified to see the role becoming more professionalised, as they would prefer the immediacy of less formal ways of making and communicating decisions. Today's culture of systems, processes and, yes, accountability would be frankly unwelcome.

The world of the CSA has moved on considerably since the generation of its pioneers. So much so that our visitors from the past might well decide that the world of the CSA isn't for them. **Ehsan Masood**

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## upfront

# BRICS summit produces no concrete science plan

Ministers from Brazil, Russia, India, China and South Africa have yet to finalise an agreement on science cooperation, having failing to do so at the sixth BRICS summit in Fortaleza, Brazil.

At the summit on 15 and 16 July, leaders deferred the signing of a memorandum of understanding until the next meeting of science ministers, even though plans had been made for the agreement to be completed this year.

However, India's prime minister Narendra Modi floated plans for a BRICS university to connect the five countries, as well as joint training initiatives and massive open online courses.

A BRICS science strategy has been on the cards for some time, as the countries aim to maximise their impact on world science by combining their efforts. Plans have been made to tackle shared problems and generate innovative products and services in combination, as well as to team up to conduct BRICS partnerships with other developing regions.

Research priorities that have been identified as common targets include food security and sustainable agriculture, climate change, alternative energy, space science, biotechnology and nanotechnology, and

by **Laura Greenhalgh**

improvements in technology transfer. Also in the pipeline is a dedicated BRICS science training programme, to fill gaps in each country's expertise.

In a declaration published after the summit, the BRICS leaders maintained their commitment to these plans and instructed national science ministers to sign the agreement at their next meeting. They also welcomed the establishment of a BRICS information exchange platform to help the countries cooperate in trade and investment. Further efforts should be made to help companies play a part in R&D, the leaders said, and to support young people and small businesses in innovation.

During the summit, Modi said that this could be taken further through the establishment of a BRICS university, which would "connect campuses in each of the countries—virtually, as well as through intensive student, faculty and research collaboration".

The five nations should also establish a forum for young scientists and set up language schools for exchanges and training, said Modi, as well as considering joint mechanisms for Moocs to make "quality education that is accessible to all".

## 'Don't go to politicians without an economic argument,' warns DFID's scientific adviser

Scientists in government must know how to explain the economic cost, significance or impact of their work, Chris Whitty, chief scientific adviser to the UK's Department for International Development, has said. "Economics is the language of policy—don't go to politicians without an economic argument," he advised.

Whitty was speaking in London on 24 July at the first David Dickson memorial lecture, in recognition of the science journalist and founder of the not-for-profit news agency SciDev.Net who died in August last year.

Whitty also said that global challenges would not be solved just by giving more money to funding councils. He said that although he fully supported the work of the UK research funding councils, some research disciplines had remained "untouched for years" and were unlikely to be brought back into play purely by the councils being provided with extra money.

There is wide variation in the amount of policy-relevant research in different subjects, Whitty said, and it should be the government's job to address these gaps.

by **Rebecca Hill**

He described the idea of carrying out excellent science and then looking for a policy problem to address with the work as "intellectually flimsy".

However, he added, the government cannot just provide short-term funding for such areas: "No-one will change careers based on one 3-year grant." Instead, funders have to persuade people that career opportunities are available if academics decide to shift their research interests to one of these challenges.

Whitty also questioned the need to incentivise individual scientists to talk to policymakers about their specific research. This, he said, could do "more harm than good".

The best model for getting science into policy, he said, was to carry out primary research, synthesise all the available evidence—within one discipline and then across disciplines—and communicate that to policymakers and the public.

# Scientists and CSAs need to be honest brokers, says Gluckman

Peter Gluckman, chief scientific adviser to New Zealand's prime minister John Key, has said that public trust in science requires both scientists and CSAs to avoid being seen as advocates for particular policies.

"The integration of scientific evidence in policy can be corrupted by advocacy manifesting as science or scientists not distinguishing between knowledge brokerage and values-based advocacy," Gluckman said during his opening address at a 2-day international conference called The Interfaces of Science and Policy and the Role of Foundations.

"Active scientists wishing to have impact on society... must tell their stories better. But in doing so I would hope they would better appreciate that credibility is at risk if their claims to special expertise are used to extrapolate beyond their science."

The organisers of the conference, held in Berlin on 16 and 17 June, included Germany's Stiftung Mercator foundation and the UK's University of Sussex.

Gluckman said that trust in science advisers was higher when they focused on knowledge and did not get involved in politics and value debates.

by Helen Lock

He explained that the position of chief scientific adviser in government had become more difficult. This, he said, was partly because science had become more complex in that its answers had become less certain and more probabilistic. Scientific answers to grand challenge questions also have to consider the social sciences.

Tension between science and policy was a further complicating factor: science, he said, claimed relative objectivity, whereas politics and policy were shaped by values and public opinion.

However, he said that there was a difference between neutrality on policy matters and advocacy for the science funding system. "There is now a broad recognition of the need for the science system to better justify itself," Gluckman said.

"The utilitarian argument is not, as many perceive it, an argument between basic and applied research. Rather, it is about ensuring that the ultimate funders understand the purpose of the investments across the whole ecosystem."

## news in brief

### CSA network created

Anne Glover, the chief scientific adviser to the European Commission's president, has launched a forum of 15 national scientific advisers. Announcing the European Scientific Advisers Forum at the Euroscience Open Forum in Copenhagen on 23 June, Glover said the group would give consensus opinions on scientific issues, particularly in emergency situations.

### NOAA gets chief scientist at last

Rick Spinrad, vice-president for research at Oregon State University in the United States, has been named chief scientist at the National Oceanic and Atmospheric Administration. It took 5 years for the federal agency to find a CSA after re-establishing the position in 2009.

### Double life for Wales science adviser

David Langley, director of research and enterprise development at the University of Bristol, has taken up his position as the UK's first professor of research management. He will use the part-time role, based at the Cardiff Business School, to develop and launch the UK's first masters programme in research management. The rest of his time will be spent as director of research delivery in the Welsh government. Langley also won the Association of Research Managers and Administrators' inaugural Carter Award for Excellence this year.

### Calls for chief social scientist in Australia

Australia should appoint a chief social scientist to advise governments on complex policy and research areas such as welfare, ageing and crime prevention, a Senate inquiry has heard. Leading academics from the Council for the Humanities, Arts and Social Sciences and the Australasian Consortium of Humanities Research told the inquiry that Australia must broaden the way it measures innovation success and include areas such as the arts, sociology and philosophy.

### Supercomputer to aid policy-making in Colombia

Researchers in Colombia have built a supercomputer that they claim can speed up data analysis and generate evidence needed in decision-making processes. The \$2.5-million (£1.5m) computer was built by a team of researchers from the ministry of information technologies and communications and the department of science technology and innovation, as well as researchers from the IT companies Microsoft and Hewlett-Packard.

### Every New Zealand ministry to get a CSA

New Zealand is to appoint chief scientific advisers at all 30 government departments, to improve the use of research in policy-making processes. Peter Gluckman, chief scientific adviser in the prime minister's office, says the role of the advisers will be to provide scientific advice and to help ministries plan and evaluate policies.

## news

# Lack of legislation blamed for African health research 'void'

Africa's nations have a worrying lack of legislation governing health research, say six researchers from the World Health Organization's Africa office.

Their article in the *Journal of the Royal Society of Medicine* says that their research found less than a third of surveyed countries to have official health research policies, only half of which were implemented. Only eight countries were found to have a national health research plan.

"Given the absence of guiding documents for national health research systems, it is not surprising that only one-third of the countries had a functional national health research system," the authors warn.

Their article suggests that although it is believed that political will and interest in health research are gaining traction on the continent, actual data are not forthcoming, leading to a "very partial overview".

A survey-based method was used to gauge the levels of health research systems of 44 countries through national informants.

by Christiaan van der Merwe

Just over a third of the respondents said they believed they had a "functional national health research system" in their own country. The survey found ethical reviews of health research to be scant: only 15 countries reported having hospitals with ethics review committees and only half said they had a national ethics committee.

The authors suggest that lack of legislation is a big problem, and that if legislation were put in place it could act as a "conduit" for research ethics in the countries.

Fewer than half the surveyed countries made research allocations in their health budgets. "Analysis of funding sources across all the countries showed that by far the most notable funders for health research activities were the multilateral and bilateral donors," the authors say.

As a result of this funding trend and the lack of national guidelines, they warn, research may be influenced by external funders or nations and not be to a country's own benefit.

## Obama and Africa: cooperation at last

Scientific partnerships featured strongly in the United States-Africa summit held in Washington DC from 4 to 6 August.

The majority of the \$33 billion funding in Africa announced during the summit centred on business, but there were also commitments in science, in particular for food security and health.

In food security, the US will collaborate with the African Union Commission to facilitate a \$10bn industry investment through the G8's New Alliance for Food Security and Nutrition. The US also announced 1,300 additional fellowships for Africa-based researchers in the Feed the Future programme, the government's worldwide scheme to advance food security.

A further \$1-million fund was announced for the World Bank's Agricultural Insurance Development programme, which helps countries develop and implement agricultural insurance.

Moreover, Sierra Leone, the Ghana Open Data Initiative, technology firm IBM and the Kellogg Company all joined the US government's Global Open Data for Agriculture and Nutrition initiative, which advocates for all agricultural and nutritional data to be made available by open access.

US president Barack Obama also announced that his government would help west African nations in their

by Christiaan van der Merwe

attempts to improve their ability to combat crises such as the ongoing Ebola outbreak.

The summit brought together the first 500 African Mandela Washington fellows, who are identified as promising future leaders in a variety of fields. A total of \$5m in small-grant funding was announced for the use of selected fellows. An additional \$5m will be made available for fellows to start up non-governmental organisations and carry out development work in Africa.

The US delegates also committed to establishing African Centres for Disease Control and Prevention in collaboration with the African Union.

South Africa's science minister, Naledi Pandor, criss-crossed the US capital during the summit to discuss bilateral issues with her US counterparts. Foremost among her commitments were talks with John Holdren, the White House's top science official.

In a statement, Pandor said: "Science and technology is at the heart of South Africa's national development plan and should also be a key element of regional growth and development strategies for Africa."

South Africa's National Research Foundation held a side-event at the summit together with the US National Academies and the Carnegie Corporation of New York.

## Ukraine counts the cost of Crimea separation

Ukraine's institutions are struggling in response to budget cuts and a loss of researchers and facilities, brought on by the region's political crisis.

The 1,291 scientists who work in the 22 institutions in Crimea were lost from Ukraine after Russia annexed the peninsula in March. This has forced Ukraine's institutions to either restructure or drop some research programmes, says Anatoly Zagorodny, vice-president of Ukraine's National Academy of Sciences.

Astronomy research at the academy has been brought to an end following the loss of the Crimean Laser Observatory, which was established in 1999 and was the country's only institution for research into radio and other forms of astronomy.

"The annexation of Crimea has caused the loss of important and expensive laboratory and technical equipment, buildings and telescopes," says Zagorodny.

The Crimean branch of the Institute of Oriental Studies has also been lost, but Zagorodny says the academy is discussing the creation of a similar department in Ukraine. A department of archaeology has already been established in Ukraine, but will have to operate without "considerable parts of archives and cultural exhibits of worldwide significance" that now belong to Russia, Zagorodny adds. Ukraine will also have to buy data for "climatic and meteorological forecasts" from other countries, as Russia now owns six of its weather stations and a satellite data receiving centre.

by Deborah-Fay Ndlovu

Restructuring of major marine research programmes has already begun at the academy, after it lost the Marine Hydrophysical Institute and the Kovalevsky Institute of Biology of the Southern Seas. Also gone is the seismology department at the SI Subbotin Institute of Geophysics, where research focuses on the evolution of ecosystems of the Black and Azov Seas.

The academy is no longer able to reach and research restricted areas of the seas, because it had to give up a research vessel, the Professor Vodyanytsky. And it will need to create alternative test sites for algal blooming research, as previous sites are now regarded as Russian territory and no longer accessible.

The impact has been felt by institutions collaborating on marine research programmes, says Yuriy Kostyuchenko, an assistant professor at the National University of Kiev. The university was involved in the analysis of surface films of pollution and streams in offshore areas, but that work has, at least temporarily, stopped. "We are not sure about tomorrow," says Kostyuchenko.

The loss of research facilities is not the only problem for Ukraine's scientists. The government has also cut the national science budget, forcing the National Academy of Sciences to freeze salaries and meaning that scientists including Kostyuchenko have had to cut down on travelling to international conferences.

## NIH leader: flat budgets need 'creative' managers

Research administration in the United States has become a "creative endeavour" as funders and grantees respond to flat budgets, rapid technological change and closer scrutiny, according to Sally Rockey of the National Institutes of Health.

Rockey, deputy director of extramural research at the NIH, was the keynote speaker on the opening day of the annual conference of the International Network of Research Management Societies in Washington DC. The conference took place at the beginning of April.

The NIH's annual budget more than doubled to \$30 billion from 1998 to 2008. However, the US is one of a minority of developed economies to have capped any further increases to its biomedical spending for the past 5 years.

Rockey said she would have preferred a gradual increase to the NIH budget, instead of a massive increase followed by flat cash. "A steady increase would have been better. We would have adapted as a community and been able to manage the increase better."

Until this year there had been no let-up in demand for NIH grants, Rockey told her 450-strong audience from

by Rebecca Trager

more than 40 countries. NIH grant success rates have "plummeted" from about 30 per cent in the 1990s to about 17 per cent today. This year, demand has dipped slightly for the first time.

Rockey also spoke at length about the NIH's record on equality and diversity. Fewer than 30 per cent of its principal investigators are women, despite women making up 55 per cent of biomedical PhD holders and 85 per cent in veterinary medicine.

Only 1.5 per cent of principal investigators are from black and African American groups, a figure that has remained the same for 30 years. Rockey also revealed that African Americans are less likely to get NIH funding "even when you control for 70 variables". It is, she added, "a huge issue for the NIH and we want to know what is going on".

Rockey said that the NIH's recently appointed chief diversity officer Hannah Valentine would be working on an action plan involving work at the undergraduate level with universities.

## news

# China sets its sights on Arctic infrastructure development

China should focus on developing facilities in the Arctic as part of its growing role in the region, the head of the country's polar research has said.

According to Zhang Xia, head of strategic research at the Polar Research Institute of China, focusing on infrastructure would help the country become a leading force in the region. China is aiming to play a role in the development of the Arctic, where opportunities for business and research are increasing as the polar ice melts.

"Infrastructure in the Arctic is weak and urgently needs Chinese labour and capital. China can learn about advances in environmental protection and technologies during its engagement," said Zhang.

China should also focus on expanding its research capacity in the Arctic and building links with other regions, said Zhang. This follows the launch of the China-Nordic Arctic Research Center in Shanghai in December 2013, to link Chinese and Nordic researchers. "We plan to establish a scholar exchange mechanism to strengthen academic communication," said Zhang.

It is likely that melting ice in the region will free up oil and gas reserves, but Zhang said China should resist

by Laura Greenhalgh

becoming involved in this aspect of development. Instead, it should focus on exploiting the Arctic as a shipping link between the Atlantic and Pacific Oceans. "Mining the area's energy resources is not realistic for China, given current technological and political difficulties, but the use of the route is much more practical," said Zhang.

On 4 July, the Chinese Academy of Sciences announced that a sixth expedition of researchers would begin to study changes at the North Pole. The study will involve 65 scientists from China, France, Germany, Russia and the United States.

"Exploring the Arctic Ocean is vital to understanding the link between climate change in the Arctic and increasing extreme weather events in China," said Wang Yong, head of science programmes at the Chinese Arctic and Antarctic Administration. "As a latecomer, China is accelerating its pace in exploring the Arctic," he added. This includes plans to construct an icebreaker by 2020 to enhance the country's capacity for polar expedition.

## Rise or fall? Mashelkar and Rao debate prime minister's inaugural science budget

Narendra Modi has set out his first annual budget as India's prime minister, increasing funding for the majority of science and research departments.

However, the overall budget appears to represent a real-terms decrease, which has prompted a lively debate between two of the country's science advisers.

According to the figures for 2014-15 announced on 10 July, the department of science and technology will receive just over 35 billion rupees (\$580 million), an increase of 11 per cent from the last budget. Spending for the department of scientific and industrial research will rise by nearly 4 per cent to 37bn rupees, and the space department will receive 72bn rupees, an increase of almost 7 per cent from last year.

The government says it plans to strengthen five technical research centres in areas including nanotechnology, materials science and biomedical device technology. In biotechnology, the research clusters in Faridabad and Bangalore will be scaled up, with an emphasis on international partnerships in disease biology, stem cells and electron microscopy. Agri-biotech will also be prioritised.

by Laura Greenhalgh

Meanwhile, the extra funds for space will be used for an experimental flight of India's capacity launcher and the launch of two navigational satellites, as well as to support the Mars Orbiter Mission.

However, some researchers are disappointed because the extra money for science represents a real-terms cut in spending. Overall, science departments will receive 4 per cent more than in 2013-14, significantly less than the level of inflation, which is 8 per cent.

"I was expecting much more from the Narendra Modi government," *Nature* quotes the chemist CNR Rao, head of the scientific advisory council to former prime minister Manmohan Singh, as saying. "I'm upset that no new national mission has been announced for energy or water management," he said.

But RA Mashelkar, chairman of India's National Innovation Foundation, cautioned scientists against worrying about departmental allocations. "I would look at where the opportunities lie," Mashelkar said in an interview with *Chemistry World* magazine.

# Turkey's rectors challenge Israel's universities to take anti-government stance

The rectors of more than 100 universities in Turkey have warned that they will end their collaborations with Israel's universities unless more of Israel's academics speak out against military action in Gaza.

In a letter published on the website of Ondokuz Mayıs University on 29 July, the Turkish rectors criticised the use of air strikes and ground attacks by Israeli forces, which had begun to intensify on 8 July. They said they would cease their "academic, cultural and social relations" with any Israeli universities that failed to take a stand against their government's actions.

Describing the bombing campaign as "a great tragedy of humanity", the rectors also claimed that the "whole world" was behaving "as if they were all deaf and blind". In the letter, the rectors promised to seek compensation for the wounded and to start aid campaigns at universities around Turkey.

"As academics and individuals we believe that we do have a responsibility to do something in order to stop the attacks of Israel and help to bring peace in Gaza," said Mahmut Aydin, vice-rector of Ondokuz Mayıs University, in an interview with *Research Europe*.

by Penny Sarchet

A spokeswoman for the European University Association, which has posted a link to the letter on its website, said she would not comment on the letter's content. Of the universities represented in the letter, 41 are EUA members.

Yaakov Nahmias, director of the Hebrew University of Jerusalem's centre for bio-engineering, told *Research Europe* that "liberal voices speaking against government policies are very common". He also said that comments that did not address Hamas's actions were "counterproductive" and weakened efforts to bring a quick end to the conflict.

Nahmias, whose family was originally from Istanbul, says he has many Turkish collaborators based at universities in the United States. "Fortunately, Turkey is not a major scientific partner of Israel," he says, adding that he believes there is an ulterior motive to the rectors' message. "This letter, I feel, has nothing to do with Gaza and speaks more of the rising antisemitism spurred by [prime minister Recep Tayyip] Erdogan's party in Turkey."



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interview michael ignatieff

# Don't let my failure put you off, Ignatieff tells academics

Michael Ignatieff's failed bid for Canada's highest office must not put off other intellectuals from trying, he tells **Brian Owens**.

The first thing Michael Ignatieff wants people to know, when discussing his thwarted political career, is that he is not bitter about the way it turned out. "I'm glad I did it. I have no regrets; it's the way it is," he says. "It would be stupid to get on the ice in a professional hockey game and complain when you get checked into the boards."

There is no denying, though, that the Harvard academic, author and public intellectual was given a rough time in his brief spell leading Canada's Liberal party, facing off against one of the most partisan and tactically minded prime ministers in recent memory: Stephen Harper. And for portions of *Fire and Ashes*, a memoir reflecting on his political experiment, it is clear that the relentlessly personal attacks on his character and motives have left deep scars.

But he insists that the experience has not left him pessimistic about the state of politics in the country. "Pessimistic? No. Politics is always a rough, physical game," he says. "But the conclusion of the book says what I really think, which is that it's a vocation and our societies can't do without it."

Ignatieff does not, of course, blame his downfall entirely on the Machiavellian manoeuvring of Harper. In his time as leader of the Liberals, he struggled to connect with Canadians, who never quite figured out what to make of him. Perhaps people were expecting Ignatieff to embody the image of a stuffy, aloof professor, and so they never quite bought the image of him wearing a cowboy hat in Alberta or flipping burgers at a suburban barbecue. But that wasn't an act, he says: both aspects of his personality were just as genuine. "I'm an old, hopeless intellectual, but I liked doing the popular things because it was worth telling people that I actually love sports. I like hockey, I like skating, I like wearing funny hats, I like going to barbecues. That's the way I've been all my life."

Part of the problem, he says, is that academics are "taken prisoner by clichés about academic life", which make it hard to succeed in politics. "People had some difficulty putting the pieces together," he says. "Because they have some idea that intellectuals or academics think it's beneath them. I didn't think anything was beneath me."

He found that people were strangely hostile to his academic background. "I had a hugely difficult time with being from Harvard," he says. "As if the fact that I had a PhD from Harvard meant I thought I was better than anybody. It doesn't make me better, and it doesn't even make me smarter. It's just something I did."

That anti-education, anti-intellectualism sentiment was something that took him by surprise. "One of the things that is astonishing to me is that western liberal democracies such as Canada, the United States and Britain are better educated than at any time in history, yet there is a huge resentment of education," he says.

This, he adds, is bad for the country not just because all snobbery is ugly and undesirable, but because economic prosperity depends on education. "We want to be the most global society in the world, the most open, the most curious and the most respectful of education and learning," he says. "It's the key to economic success."

Ignatieff says the only way to get past that strange resentment of learning is to "democratise education even further" and make sure that nobody thinks post-secondary education or training is beyond them. This was one of the main policies that he backed when he ran for prime minister. It is here in our conversation, discussing the policies that he will now never get to implement, that he begins to show some fire and passion—emotions that were conspicuously absent when he talked about the attacks aimed at him personally.

"When you put all this together, this is the most exciting part of our national life to me," he says, talking about his vision for a "complete chain of learning" that starts with early childhood, on through primary and secondary education and up into apprenticeships, university and the highest levels of scientific research. Such a holistic view is necessary, he says, in order to balance Canada's fortune in natural resources with a high-quality labour force. "There's only one standard now, and that's world class," he warns. "Are we the best in Canada is not an interesting evaluator anymore. The question is: are we the best in the world? And that's what the world is like now, on research, on pretty much everything."

But his argument is not just about economic prosperity. "I don't like reducing it to jobs," he says. "It's because it is fun. You don't want to be a country that's the third or fourth adopter of other people's ideas. I'm

'We must ensure that nobody thinks postsecondary education is beyond them.'

excited by the fact that we have a John Polanyi, who won a Nobel prize. I see John in the street, I kind of get a thrill. It's not just jobs; it's national pride, national prestige, excitement, fizz, buzz, all that stuff."

But that kind of excitement is missing from the government's thinking, he says, as it cuts funding for basic research to focus on near-market work and business innovation. "I haven't exactly heard words of excitement about science, research and learning, or universities, from this government at any point since 2006."

That's a shame, he says, because to improve the country's performance there needs to be a national consensus on the importance of science and research. "We have some good national consensuses," he says. "We have a very good national consensus, for example, on deficits. Right across the political spectrum we think deficits are a really bad idea, and we cannot pay ourselves more than we earn. We ought to have a similar consensus about research investment."

But to get a consensus like that requires a more diverse group of people to get involved in politics. "We have a very narrow slice of Canada in our parliament. There are too many damn lawyers," he says. "We need more scientists, researchers, professors. We need more union leaders and more working men and women."

Ignatieff came to politics late, when a trio of Liberal party organisers he calls the "men in black" visited him in Boston in the early 2000s to convince him to return to Canada with the goal of eventually taking over the leadership of the party and running for prime minister. He joined a party that, though it was often called Canada's natural governing party, was exhausted by more than a decade in power, torn by years of bitter internal sectarianism, and weighed down by a spending scandal that had ruined its public reputation.

A few years later, after the party's fortunes had fallen further, Ignatieff got his chance as leader. But it was never going to be an easy ride. Facing a minority Conservative government intent on shoring up its control, he immediately faced an election-style campaign to discredit him. Again, though, he doesn't think he was treated unfairly. "It's part of politics, to make it personal. Because then you don't have to refute what a guy is saying." But there was one particular attack that still stings.

Ignatieff had sold his return to Canada as a homecoming, returning to the land of his birth to give something back. The Conservatives, however, turned this on its head. "Michael Ignatieff—Just Visiting" said the TV ads. "Michael Ignatieff—he didn't come back for you." He found these attacks confusing, as millions of Canadians have lived, studied and worked abroad. "We're a very global, international bunch of people," he says. "Certainly the generation I teach, people in their 20s, you just assume they're going to be in London or New York for a couple of years."

He fears that such attacks could drastically reduce the leadership pool, excluding a number of potentially excellent politicians. "If these attack ads start to create a political culture in which the only good Canadian is a Canadian like Harper, who's never really been anywhere, that's a shame," he says. "I feel a sort of righteous indignation—not for me anymore, because I'm done and lost that battle. But I want someone else to win it."

Academics might have a particularly tough time, he says, as the very qualities that make a good thinker—intellectual curiosity, an instinct for seeing both sides of an issue and a willingness to follow a thought wherever it leads—can be liabilities in the political arena. "I think academics, being ideas people, overestimate the importance of ideas in politics," he says. "Ideas in politics are extremely important as elements of leadership and differentiation. But politicians by and large aren't interested in ideas for ideas' sake—and intellectuals are."

That is why he thinks most academics and intellectuals with a desire to influence policy would be better off as advisers, working on the sidelines. But in the British parliamentary tradition, with its permanent civil service, it is difficult to get academics and scientists into the political process. "The distance between academic life and political life in Canada is very great, and it's only slowly being broken down," he says.

In contrast, he adds, his colleagues in the US are often testifying before Congress or taking a leave of absence to work in the White House. "I'm struck by how permeable the membrane is between policy and politics; between academia and the administration or Congress," he says.

It's hard to imagine a situation in the UK or Canada, for example, where someone like Steven Chu could become minister of energy. "I think there's one academic economist chair at the department of finance. What's that about?" he says. "You ought to have 20 Canadian economists working at the department of finance or the Bank of Canada. Then going back and forth, so they know what the hell policy-making is actually like."

So it is a challenge to the parties, he says, to actively recruit more candidates from universities and to welcome them in. Meanwhile, academics will need to develop sharp elbows. "Step up, push your way in and don't take no for an answer," he says.

As for the unpleasant state of political discourse in the country, Ignatieff thinks Harper will "always be associated with a certain style of politics". "A lot of prime ministers were associated with things that moved the country forward. I think this guy will be associated with something that moved the country backwards, to be frank. That's what will be on his political tombstone, so there will be consequences."

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'Politicians aren't interested in ideas for ideas' sake.'

## analysis

# Pick a number

Contrasting figures abound on the state of America's science and technology workforce. The result is evidence to support every policy, finds **Rebecca Trager**.

It is often put across as common knowledge that the United States has a skills shortage in science and engineering that, without policy action, can only get worse.

In 2011, President Barack Obama called for 10,000 engineers to be trained annually and 100,000 additional teachers to be brought into science, technology, engineering and mathematics by 2020. And in 2012, the President's Council of Advisors on Science and Technology estimated that a million extra STEM graduates would be needed in the next decade.

STEM skills also feature in the immigration debate. Obama, along with powerful figures in Congress and industry, advocates importing more workers with STEM degrees or expertise. Employer groups argue that increased immigration is needed to compensate for a lack of STEM graduates, and the tech industry is pushing for the number of H-1B temporary visas available for highly skilled workers to be increased from 65,000 annually to as many as 180,000.

Among the beneficiaries of the perceived national STEM shortage are universities, which can draw in more students—including those from abroad, who pay full tuition—with the promise of job opportunities. Hi-tech employers also benefit because wages are suppressed when there is a large pool of qualified job applicants.

And yet whether the US is truly short of STEM graduates remains unclear. This is because of, rather than despite, the plethora of statistics on the issue.

Counting graduates is the easy part. In a report released on 9 May, the congressional Government Accountability Office said the number of STEM degrees awarded in the US had grown by 55 per cent between 2002 and 2012: from 1.35 million to more than 2m.

Trickier to determine is how many STEM jobs await these graduates. The GAO reported that the number of jobs in STEM fields jumped by 16 per cent between 2004 and 2012, from 14.2m to 16.5m, while the number of non-STEM jobs remained steady.

Different bodies have produced different figures, however, all using different criteria. In July 2011, the Department of Commerce concluded that 7.6m people had worked in STEM jobs in 2010, comprising about 5.5 per cent of the US workforce. In January 2013, the National Science Foundation put the figure for 2010

at 12.4m. The NSF's count includes several professions excluded by the commerce department, such as health-care, psychology and social science.

There is no consensus among the various data sources about how to define a STEM worker: for example, must a STEM worker hold a degree in a STEM field or simply have a job that requires the use of a scientific or technical discipline?

And most difficult of all is determining whether the supply of STEM graduates matches the demand for their skills. The GAO concluded that it could not determine whether workforce needs were being met—partly, it said, because demand for STEM workers can “fluctuate” with economic conditions.

Meanwhile, a May report from the Center for Immigration Studies, a not-for-profit research organisation that advocates immigration reduction in the US, concluded from census data that the country had more than twice as many workers with STEM degrees as there were STEM jobs. It found that there were more than 5m native-born Americans with STEM undergraduate degrees working in non-STEM occupations in 2012, and another 1.2m who were unemployed or out of the labour force.

None of the figures are definitive, says Robert Charette, president of ITABHI Corporation, a business and technology risk management consultancy based in Spotsylvania, Virginia. Charette believes that minor skills shortages in certain career fields have been used to create a “massive issue” about STEM graduates being needed to save the US and help it regain its competitive edge. “It is a little over the top,” he says. “The stats that people use to claim there is a shortage are very squishy.”

Jeff Neal, senior vice-president of ICF International, a technology and policy consulting firm in Fairfax, Virginia, says there is a genuine skills shortage. He thinks that better data are needed about “that point where supply and demand meet”.

Neal notes that the Bureau of Labor Statistics gathers employment data on individual locations, identifying where particular talents are in short supply. Better analysis and presentation of these data, he says, could help employers work out why, for example, certain jobs remain vacant. “You can get a massive amount of data, but they have never been turned into information; just a bunch of data points with dots that haven't been connected,” he says.

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‘The most difficult aspect is working out whether supply meets demand.’

# Learning to fail better

Rules have exceptions; policies are imperfect. But we can strive to make the right types of mistake in policy-making, argues **John Whitfield**.

One of the most frequently aired nostrums of behavioural economics is how irrational people are. In experiments, humans show consistent biases. They find losses more psychologically significant than gains, for example, and they will put more at risk to avoid a loss than they will to pursue an equivalent or greater gain.

Most people, for example, would choose £90 in the hand over a 90 per cent chance of winning £100, but would rather take a 90 per cent chance of losing £100 over a guaranteed £90 loss. The same goes for medical gambles: a treatment with a low but certain efficacy seems more appealing than one that might work either perfectly or not at all, even when the overall probabilities are equal.

This might seem like a bug in decision-making, but it's far more likely to be a feature. Risk aversion will keep you from getting some good things, but if you are too risk-prone you might not get a chance to correct your mistakes. The cost of heeding a mistaken cry of 'wolf' is smaller than the cost of ignoring a genuine one.

In general, faced with the inevitability of error, human psychology has adapted to steer us towards making the less costly sort of mistake. This is, of course, just a long-winded way of saying that it's often better to err on the side of caution.

What goes for individuals also goes for societies. You can't expect policy or law to be perfect, so you need to build biases into the system that push errors in the right direction. I expect that most of us, for example, believe that it is worse for an innocent person to be jailed than it is for a guilty one to go free. As a result, the criminal-justice system requires a high burden of proof for a conviction to be made.

Similar choices must be made in every area of life. Security policy balances the risk of invading the privacy of the innocent against that of missing a terrorist. Environmental regulation weighs the cost of missing economic opportunities against that of unleashing damaging unintended consequences. Welfare policy is determined in part by whether it is considered worse to give benefits to someone who doesn't need them than it is to deny benefits to someone who does.

This is a meeting place for evidence and values. Those responsible for designing and testing policy should be alert not just to what works, but also to situations where what works doesn't work; elected politicians, and society at large, have to decide which errors are to be tolerated

and which avoided. A policy with biases that protect the vulnerable, for example, may not deliver its benefits as efficiently as one lacking such a safety margin.

So, although fit-to-work firm Atos was criticised for the mistakes it made while administering the UK Department for Work and Pensions' work capability assessments, it was the department that decided what the minimally fit-to-work person looked like. With that, it was decided which sick and disabled people would fall inside the error bars.

The effort to redefine what constitutes disability has been mirrored across welfare policy. The coalition has emphasised the impact of fraudulent benefit claims, even though DWP figures suggest that the annual value of unclaimed benefits is at least twice as large. Meanwhile, the UK's *Mail on Sunday* recently expressed horror that its reporters were able to obtain food from food banks without being made to prove their poverty or hunger.

One of the harshest benefit cuts of the past couple of decades has been to the benefit of the doubt.

On the other hand, while austerity has brought welfare spending in general under scrutiny, it is politically more difficult to remove child benefit from well-off families, or to means-test the winter fuel allowances and free TV licences given to senior citizens. It almost looks as though the criterion for tolerating a policy inefficiency is whether it benefits someone who is likely to vote.

It has been said that you can tell a lot about a society from how it treats its prisoners. The types of mistake a society is willing to put up with are just as telling. The point here, though, is not so much to argue for the virtues of one type of error over another. It's to argue for the inevitability of error to be recognised, and for error engineering to become part of the process of evidence-based policy-making.

Of course policies should be designed to minimise error rates. And we can't expect mainstream political debate to take up the argument about the virtues of one type of mistake over another—it would sound too much like voicing a penchant for failure. But when we hear about errors in policy, we would all do well to think not just about how mistakes can be avoided, but about what kinds of mistake we want.

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'One of the harshest benefit cuts has been to the benefit of the doubt.'

## book review science and government

# The fine line

CP Snow's 1960 book *Science and Government* studied wartime feuds in the civil service to conclude that the best advisers rely on consultation, not conviction. A new edition shows that the lesson is still relevant today.

CP Snow, who died in 1980, is best known for his 1959 lecture *The Two Cultures*, on the tensions between the sciences and humanities. He is also remembered as the author of perceptive but somewhat dated novels about social intrigue within academic and political corridors of power, a phrase that he coined.

Less familiar are Snow's writings about the politics of science, even though he trod this territory as a senior civil servant with a scientific background during and after the second world war. One text that draws directly on this experience is his short book *Science and Government*, based on the Godkin lectures he delivered at Harvard University in 1960.

Focusing on how the UK government handled science advice before and during the war, the lectures, which have just been republished, are inevitably dated. The scientist-advisers, for example, are all male and mainly physicists.

Nevertheless, as Robert May, the UK government's chief scientific adviser between 1995 and 2000, points out in his introduction, Snow's insights into what makes for effective science advice remain relevant today.

At the heart of the lectures is a vivid account of the rivalry that developed during the war between two influential physicists and former friends, Henry Tizard and Frederick Lindemann. Tizard was largely responsible for promoting the development of radar that played a vital role in, for example, the Battle of Britain. Lindemann, whom Winston Churchill appointed chief scientific adviser soon after becoming prime minister in 1940, championed strategic bombing, which caused huge civilian casualties in Germany without bringing the collapse of military morale that Lindemann had predicted.

Snow's conclusion is that radar succeeded not only for technical reasons but also because Tizard, though personally convinced of its value at an early stage—as a top science adviser in the late 1930s, he argued successfully that radar should have priority over all other military R&D projects—took care to consult leading scientists at every step of the planning and development stage.

In contrast, Lindemann's advocacy of strategic bombing drew support from the Royal Air Force, to which it gave a tactical role, but paid limited attention to scientists who criticised his calculations of its effectiveness. They said, correctly, that he had overestimated the effects by almost an order of magnitude.

The moral that Snow draws from this parable is that the best science advice does not come from one individual, however talented. Rather, it originates in close scrutiny of a topic by a range of experts prepared to weigh up the evidence for and against a particular path of action—as Tizard had done with radar—before making a recommendation to decision-makers.

The weakness in Snow's argument, similar to that in *The Two Cultures*, is his tendency to overemphasise the values he associates with science, for example when invoking the concept of "scientific judgement".

Snow contends that Tizard displayed such judgement in arguing for radar. In contrast, he says, Lindemann lacked it when recommending strategic bombing. Snow's analysis emphasises the importance of personality: Tizard was open-minded and gregarious; Lindemann was self-centred and repressed. Yet successful scientists come in both shapes; one is not more scientific than the other.

Or take his conviction that science allows its practitioners to see the future more clearly than civil servants and administrators can. This reeks of the scientism behind the "white heat of technological revolution" pursued in the 1960s by the Labour government—of which Snow was a member—which imploded amid environmental protest and student revolts against technocratic planning.

Knowing the fine line between confidence and hubris is essential for good science advice. May points out that the UK government misjudged this in the late 1980s when it used statements by scientists to justify its announcement that beef potentially contaminated with BSE was safe for human consumption.

Since then, procedures have been modified to ensure that the advisory process is more transparent and inclusive, that counter-arguments are taken seriously and that recommendations are backed up by reliable evidence. All of these Snow would have approved of, as indicated by his clear preference for Tizard's approach.

That—plus the reminder of the unnecessary deaths caused by Churchill's decision to listen to Lindemann rather than Tizard on the issue of strategic bombing—is what makes his analysis as relevant today as when his lectures were delivered more than 50 years ago.

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*David Dickson, a former director of www.scidev.net, contributed this review before his death in August 2013.*

### Science and Government

by CP Snow is published by Harvard University Press and costs £11.95.