

A New Deal for national science policy

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What do rank-and-file scientists think the aim of peacetime national science policy should be? Should it be economic competitiveness? That is not what they said the last time they were asked.

A 'NEW DEAL' is needed for national science policy in peacetime. Most would agree that research priorities, funding levels and accountability mechanisms have been distorted in the past by concern about national security. But what would it mean to remove these distortions? The last time this question was asked was after the Second World War, during the debate over the establishment of the US National Science Foundation (NSF). But because the NSF ended up incorporating many wartime science policy mechanisms into its day-to-day practices, we shall have to explore the road not taken, the one that would have led back to the original New Deal, President Franklin Roosevelt's policy of economic reconstruction in the 1930s.

Even before the end of the war, the heads of many US state universities had begun to worry that peer-reviewed funding procedures in peacetime would exaggerate differences in resources between elite and non-élite institutions that had arisen from selective corporate investment in research and development (R&D) before the war¹. Peer review, long a mechanism for evaluating the suitability of finished research for publication, was extended during the war to assess a scientist's worthiness for doing research in the first place. Jointly threatened by the prospect that the Nazis might devise the first nuclear weapon, the Allied physicists put aside their theoretical differences and focused on bringing together the colleagues most likely to help them quickly achieve their goal. There was little disagreement about whom to select, and the job got done as planned.

Old prejudices

But to entrust scientists with dividing up resources for research once they were no longer focused on a common goal seemed to many policy-makers at the time to invite the kind of partisanship that could easily compromise the research process. Specifically, self-serving judgements that scientists routinely suppress when weighing the merits of completed work might re-emerge when evaluating the prospects of work yet to be done. Such scientific outsiders as Faraday, Darwin and Einstein would have probably seemed too radical and unproven to receive peer-reviewed funding, yet their work was readily published by peers upon completion.

As it turns out, concern about élitism

has been well-placed. In recent years, 50 per cent of US federal science funding has gone to 33 out of more than 2,000 institutions of higher education, virtually the same 33 that receive the lion's share of corporate sponsorship². One way of preventing this situation would have been to follow the advice of Frank Jewett, former president of the National Academy of Sciences, and establish a system of checks and balances — one modelled on the US Constitution itself — to prohibit the same scientists from serving on the governing boards of the main journals, professional societies and private and public funding bodies³. In effect, a wider cross-section of scientists would govern their fields, creating a broader sense of scientific 'peerage'. This would, in turn, counteract the so-called principle of cumulative advantage, science's interlocking reward structure that allows the rich to grow richer while the poor get poorer⁴.

More radical proposals would have banished peer review from the funding arena altogether. Peacetime science policy would have resumed the comprehensive welfare programme initiated by the New Deal. Edwin Land, the inventor of the Polaroid camera's self-developing film, called for the federal government to grant scholarships to science students as seed money for potentially lucrative inventions. Others suggested an 'affirmative action' programme for traditionally disadvantaged regions whereby they would receive disproportionately more funds than regions that have traditionally benefited from private endowments. There was even talk of a national service programme that would have set aside scholarships for clever students from impoverished backgrounds to matriculate at the major universities, on the condition that they would then staff technical training and research facilities in economically underdeveloped regions⁵.

All these proposals merit a second look today. Especially noteworthy at the time was the claim that science was suitable for redistributive policies precisely because its modes of enquiry could, in principle, be understood by everyone. Any differences in scientific performance between universities or regions could be attributed to differences in the quality of the training and research facilities at their disposal — not the quality of the people staffing them⁶. This analysis proved persuasive just as long

as the fast-paced, high-tech research that characterized the Second World War was considered an aberration that would be redressed in peacetime by a science policy sensitive to the rate at which scientific innovation can be assimilated by society at large. Unfortunately, a Cold War was declared soon after the Allied victory, and this required the rapid deployment of technically trained personnel, a policy that clearly favoured scientists already at the major research centres.

New battleground

We are on the verge of making the same mistake again, as 'economic competitiveness' has become the ersatz battleground in the post-Cold-War era. The United Kingdom has already taken its place on the front line by subsuming the Office of Science and Technology in the Department of Trade and Industry. Not surprisingly, this has been followed by a spate of calls for the state to concentrate its research funding on the universities best equipped to make the biggest international splash. The most recent and significant call has come from the National Academies Policy Advisory Group (NAPAG), a consortium of the country's most venerable scientific societies. The NAPAG estimates that the number of British universities that are internationally competitive over a broad range of fields is 15 out of around 100. It recommends that research funding should be restricted to the most competitive departments, thereby openly endorsing the principle of cumulative advantage⁷. But will this prove to be a sound strategy?

Ironically, the best argument against making competitiveness the main goal of national science policy comes from Robert Reich, Secretary of Labor in the Clinton administration, which has otherwise been the world's biggest promoter of the competitiveness model. Reich criticizes the model for presupposing that a country's inhabitants necessarily benefit from the economic success of companies with their headquarters nominally within its borders⁸. Applied to science, this means that the number of papers published or patents registered by a country's leading companies and universities does not automatically translate to benefits for either the scientific community or the larger public of that country. That will depend on the full range of its people's skills, attitudes and work

conditions. Arguably, in the past 25 years, Japan and Germany have made better use of the knowledge produced in the United States and the United Kingdom than have the Americans and British. To be sure, scientists already on the 'cutting edge' will always benefit, but that just reinforces the élitism the competitiveness model breeds. A country gains ground on its competitors at the cost of polarizing its own residents.

This problem can be tackled from either the demand or the supply side of science. The demand-driven strategy is to adjust the training, incentives and rewards of scientists (and science students) so they appear more attractive to foreign and domestic companies. Despite the lip service often paid to this strategy, its implementation would be prohibitively expensive. This point contributes to the 'realism' of the NAPAG triage approach to research funding. But even with adequate economic resources and political will, the sheer provision of highly skilled, appropriately motivated scientific professionals does not guarantee their gainful employment in what has increasingly become a buyer's market for brains. As the scientific infrastructure of the developing world grows faster than the rise in labour costs, countries and universities have seen fit to 'outsource' substantial research projects to scientists from these regions. The United States and the United Kingdom have benefited from this 'globalization of R&D' by providing high-grade skills at marginally lower labour costs than Japan and Germany⁹.

False beliefs

But the demand-driven strategy to peacetime science policy suffers from enormous presumptuousness, which in turn reflects the lack of a voice for rank-and-file scientists in setting national science policy. Specifically, the scientific community has never been consulted on its commitment to 'competitiveness' as a goal of its activities, be it defined in military, industrial or even scholarly terms. More generally, whereas the scientific beliefs of nonscientific adults and pre-college science students have been extensively and periodically surveyed, comparable data are lacking for scientists themselves. The NSF's biennial *Science and Engineering Indicators* contains country comparisons of the educational attainments, employment categories, income levels and career patterns of scientists — but nothing about their attitudes toward their work and whether these are adequately represented by their professional spokespersons and policy-makers.

The first step toward a supply-driven response to the competitiveness model of science policy would be just such a periodic inventory of the scientific beliefs of the scientific community, including tertiary-sector science students. Without such systematic information, even leaders of the scientific community have been prone to stereotype

their constituency. A striking example is Leon Lederman, who in 1991, as president of the American Association for the Advancement of Science, issued a "cry of alarm" calling for the federal government to double its non-defence spending on science. To make his case, he restricted himself to surveying the opinions of tenured and untenured faculty members at the 50 leading research universities in the United States¹⁰. Before it was disbanded by the Republican-controlled Congress, the Office of Technology Assessment had begun to take stock of science's missing voices by drawing attention to statistical data on groups that do not fit the stereotypical scientist: graduate students, women, ethnic minorities and the 20 per cent or more of the scientific workforce that is migratory and contract-based, otherwise known as the 'unfaculty'¹¹. Although these data only scratched the surface, they showed that the scientific community has not been uniformly sold on the idea of competitiveness as a peacetime goal.

More indirect support that scientists would welcome a New Deal for science policy comes from a Carnegie Foundation survey on the effects of the research university model on academic work conditions across the entire tertiary sector, including private and public universities and liberal arts and community colleges¹². The imperative to become more 'research competitive' was shown to be a pervasive source of stress in academics' lives, especially in the sciences, as it drew them away from their preferred image of scholarship as educational, open to interdisciplinary influences and less focused on sheer productivity. The survey found that although academic identity was tied more to disciplinary than to specific institutional affiliation, the type of institution in which academics worked shaped their sense of what constituted appropriate scholarship in their discipline. On that basis, accrediting agencies and professional associations should evaluate and promote academic work in ways that avoid polarizing academic institutions into a two-tier funding structure that inevitably ranks research above teaching and relegates public service to the sub-intellectual¹³. Similar findings in the UK context suggest that the minister for science and technology should be relocated to the Department of Education and Labour.

With the end of the Cold War, physics is probably the discipline with the strongest pressure to treat its degree-holders as stakeholders. In January 1991, the Council of the American Physical Society adopted a public position on funding priorities for the first time in its 93-year history, a position that favoured broadly based physics research over the more glamorous but élitist Superconducting Super Collider¹⁴. Three years later, two write-in candidates were elected to the council who, reflecting on the fact that PhD production in physics was

still growing at Cold War rates of 10 per cent a year, called for "limit[ing] the growth of the physics community in the USA to sustainable levels" and "help[ing] young scientists who wish to make a transition out of physics"¹⁵. This has, in turn, sparked a more general debate about whether science degree programmes are broad enough to enable young scientists to work in environments that are increasingly interdisciplinary and nonacademic¹⁶.

Full constituency

Today's problems often rest on maintaining distinctions that previously did not make a difference, and no one was the worse for it. The New Deal approach to national science policy did not presume as strong a distinction between scientists and nonscientists as operates today in, say, the contrast between 'peer reviewed' and 'earmarked' research. Rather, the idea was to extend scientific peerage, not simply by recruiting more scientists, but by ensuring that science's full constituency was represented on governing boards and policy forums. Were this principle in operation today, it is unlikely that we would witness the repeated complaints that federal science panels are 'biased' and 'narrow'¹⁷. Public involvement would not seem so alien to scientific autonomy if a wider range of scientists sat on such panels in the first place. In the twentieth century, élitism in science has been driven primarily by military preparedness and, more recently, economic competitiveness. The twenty-first century offers an opportunity for science to regain the lost legacy of this century, whereby science would be driven by the entire community of enquirers. □

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