State of British science

SIR — Terence Kealey[1] argues that British science is growing, relative to other major industrialized countries, because cuts in government funding have been offset by increased support from industry and charities. This may be correct in Kealey's own field (clinical biochemistry), but it is certainly not true in general.

The United Kingdom is the only developed country in which government spending on civil science has decreased in recent years as a proportion of gross domestic product (GDP). In 1978–79, spending was 0.6 per cent of GDP; ten years later, in 1988–89, it was 0.52 per cent[2]. A recent study[3] shows that, in 1987, total government spending on civil research and development was £2,400 million in the United Kingdom, £4,670 million in France and £6,430 million in West Germany. As the populations of these countries are very similar (57 million, 56 million and 61 million respectively), there is a massive shortfall in per capita spending by the UK government relative to comparable European countries. Kealey claims that this shortfall is made up by industry and charities. In fact, when industrial funding of research and development is taken into account, the gap widens. (Industrial funding in 1987 in the United Kingdom was £4,700 million, in France £5,200 million and in West Germany £11,570 million. These figures are for industrial funding of both civil and defence research and development[3].) Outside medical research, funding by charities is negligible.

Because of cuts in support for UK science in recent years, it is particularly difficult to fund important new developments. For example, most of the major developments in high-T_c superconductivity are from Japan and the United States. This is hardly surprising in view of the funding figures for superconductivity research. In 1989, for example, the United States (industry and government funding) spent £175 million, Japan £125 million, India £10 million and the United Kingdom £10 million[4]. The United Kingdom is therefore now funding an important research area at the same level as India. In 1989, the United Kingdom spent only 1.5 per cent of world expenditure on superconductivity research, and contributed about 1.5 per cent of the 15,000 publications on superconductivity. Thus, in science, as in other areas, you largely get what you pay for.

The low UK expenditure on superconductivity research is echoed in other areas of research. In the same issue of *Nature* in which Kealey's letter appeared, there was a news item[5] in which it was reported that the United States planned a massive increase in the $1,600 million that the federal government now spends on materials research. A number of states match such funding in state universities, so the total public funding of materials research in the United States is probably about $2,000 million. In the United Kingdom, by comparison, the total public funding last year of materials research was about £60 million[6], that is, about 20 times lower than that in the United States. And support by the Science and Engineering Research Council of new research grants in materials and other areas is being halved this year relative to last year because of inadequate government funding.

All governments have a duty to the people they govern to protect the future of their country. A developed country is unlikely to survive economically without a strong science-based industry, and unless it plants the seedcorn of research it is unlikely to reap the harvest of production and profits. Science and technology are now advancing so rapidly, and the learning curve is so steep, that once a nation has fallen behind in a particular area, it is very difficult to catch up. A government that fails to invest adequately in scientific research is undermining the future of its country in a serious and fundamental way, and the damage is likely to be permanent and irreversible.

COLIN HUMPHREYS

University of Cambridge,
Department of Materials Science and Metallurgy,
Pembroke Street,
Cambridge CB2 3QZ, UK

1. Kealey, T. *Nature* **350**, 370 (1991).
2. *Annual Review of Government Funded Research and Development 1990* (HMSO, London, 1990).
3. Atkinson, H., Rogers, P. & Bond, R. *Research in the United Kingdom, France and West Germany: A Comparison* (SERC, Swindon, 1990).
4. *Review of the UK National Superconductivity Programme* (Joint DTI/SERC report, in the press).
5. Anderson, C. *Nature* **350**, 365 (1991).
6. Humphreys, C. J. *Angew. Chem. Adv. Mater.*, **101**, 1103–1104 (1989).

SIR — Terence Kealey's letter is seriously misleading.

According to the Institute for Scientific Information[1], British performance as measured by the Citation Impact rating fell by 3.4 per cent over the period 1981–85 to 1986–90 while those of the United States, West Germany (as was), France and Japan have all risen.

Between 1980–81 and 1988–90, although there was a 7.5 per cent fall in the number of wholly university funded staff in science and engineering, a net increase of 13 per cent occurred because of a rise in short-term appointments. But about two-thirds of such posts are funded by research councils, not by industry or charities, and the majority are PhD students taking research assistant posts because postgraduate training grants are too low[2].

Funding by British industry and charities did increase between 1983 and 1988[3] from about 10 per cent to 14 per cent of the total for research and development performed in higher education institutions (HEIs). But the funds from charities are almost entirely for medicine, and the main industrial contributors are from the pharmaceutical sector; basic research, and especially the physical sciences, enjoy little benefit. The proportion of research at HEIs funded by industry has reached 6 per cent, about the same level as in Germany and the United States; it is unlikely to grow substantially greater.

The support for research in British HEIs as a fraction of GDP, or per capita (from all sources) is, according to the latest figures from the Organization for Economic Cooperation and Development, the lowest of nine European countries (including Switzerland). In West Germany it is more than 25 per cent higher — worth about £400 million a year.

Mrs Margaret Thatcher has explained[4] why government has the major responsibility for funding the science base, and stressed the importance of 'curiosity-led' research. The dangers of neglect are taught by history — although not in the bizarre reading due to Kealey.

In Margaret Gowing's words[5]: "The doctrine of *laissez-faire* reached its zenith in Britain just as industrialisation accelerated into so-called revolution . . . Britain . . . had been very obviously outclassed in the Paris international exhibition of 1871, most notably by Germany . . . (where the) states had endowed science . . . by financing a system of universities . . . Yet despite increasingly urgent warnings the British government, averse from increasing public expenditure, did almost nothing." The consequences became apparent when the First World War broke out and Britain "found herself ignominiously dependent for crucial science-based products on imports from Germany". It was this rude awakening that led to the setting up of the Department of Scientific and Industrial Research, later to become the Science and Engineering Research Council.

The relentless decline[6] as a fraction of GDP in the British government's funding of civil research, including the science base, while in other countries higher levels of government investment have been maintained, or reached, lies at the root of the present threat to the continued excellence of British science, and to its capacity to support a future high-technology based economy[7].

JOHN H. MULVEY

Save British Science,
PO Box 241, Oxford OX1 3QQ, UK

1. *Science Watch* January 1991.
2. Evidence to the House of Commons Select Committee on Education, Science, and the Arts by M. Sharp, Save British Science, in the Committee's Report *Science and the European Dimension* (HMSO, London, Dec. 1990).
3. *Annual Reviews of Government Funded R&D* (HMSO, London, 1986–90).
4. Speeches to the Royal Society (Sept. 1988) and the Parliamentary and Scientific Committee (Dec. 1989).
5. 'An old and intimate relationship', Spencer Lecture 1982 (Oxford Univ. Press, published in *Science and Politics* 1984).
6. *British science: Benchmarks for the year 2000* (Save British Science, Oxford, 1990).
7. 'The economic value of basic science', Kay, J. A. & Llewllyn Smith, C. H., *Fiscal Studies* **6**, no. 3 (1986).