The position of British science

SIR — The view that the international position of British science has been declining relative to other countries is supported by various science indicators, but Terence Kealey has claimed (in April 1991[1] and again in August[2] that British science is growing. His argument exhibits very selective use of evidence. Some of his assertions have already been laid to rest[3–7]. However, a number still need to be addressed, particularly now that new data are available.

A recent report from the French Observatoire des Sciences et des Techniques (OST) shows that the British share of world scientific publications fell by 3 per cent between 1982 and 1988 (and by 5 per cent relative to countries of the European Communities)[8]. This is consistent with statistics from the Dutch Advisory Council for Science and Technology Policy, which reveal that, among leading scientific nations, Britain experienced the largest drop (3.5 per cent) in publication share between 1984 and 1990[9]. Furthermore, when the results are expressed in publications per capita, the relative decline is even sharper (around 15 per cent). Nor is the fall confined to one or two fields. The OST results indicate that the British publication share decreased in all fields except clinical medicine, with physical and biological sciences (down 16 per cent and 12 per cent respectively) experiencing the largest falls[8].

There is also new evidence from citation indicators on the changing impact of British science on the international research community. Analysts at the Institute for Scientific Information (ISI, the publisher of the *Science Citation Index*) have examined trends in the average number of citations per paper earned by G7 nations over the period 1981–90. The results show that the United States, the Federal Republic of Germany, Japan and France all improved their citation impact relative to the world average, while Britain experienced the largest drop (down 3.4 per cent)[10]. ISI researchers have subsequently examined the UK data on journal articles in more detail and found that clinical medicine suffered the greatest fall (by 8.6 per cent), with engineering the only field to rise[11].

A similar picture emerges from the OST analysis of the relative impact of papers from different countries. (An impact score of 1.0 corresponds to the world average citation rate.) While UK papers continued to achieve slightly greater impact than average (scoring 1.03 in 1988), there was a steady decline (of 4 per cent) over 1982–88[8], a trend confirmed by ISI data[10]. The United Kingdom was overtaken by Germany (up 13 per cent to 1.05) during the second half of the 1980s. Fields where the UK impact score is now below 1.0 include clinical medicine (down 4 per cent to 0.98), biology (down 14 per cent to 0.92) and physical sciences (down no less than 19 per cent to 0.87). The one bright spot is again engineering (up 11 per cent to 1.16)[11].

Although Kealey examines Britain's record in producing frequently cited papers during 1983 and 1984 (and draws from this the general conclusion that "throughout the 1980s, the British came second"[1]), he fails to look at other years. For the 300 most cited papers published in 1986 or 1987, Britain was actually only third equal with Germany (19 papers each) and some way behind second-placed Japan (23 papers). There has been a substantial decline in the UK share of such publications during the 1980s. On a whole-counting basis, the UK world-share fell from 8.0 per cent for papers published in 1981–82 to 5.3 per cent for those published in 1986–87 (the latest two-year period for which comparable figures for the three fields have been reported by ISI)[12]. The decline is equally marked when fractional counting of papers involving international collaboration is employed, the UK share dropping from 7.0 per cent for 1981–82 papers to 4.7 per cent for those published in 1986–87. Most disturbingly, the UK share (again on a fractional basis) of the 100 most cited papers in physical sciences published in 1987 was only 1.3 per cent (down from 6.3 per cent in 1982), well behind the United States (71.5 per cent), Japan (11.0 per cent), France (3.5 per cent) and Germany (1.7 per cent).

How do these bibliometric statistics compare with the latest data on Nobel prizes? If one divides the past 30 years into five equal periods, in the first of these (1962–67 inclusive) the United Kingdom earned nine prizes, well ahead of France and the Federal Republic of Germany (each with four) and not far behind the United States (with 14). In both the second and third periods, British scientists won six prizes. In 1980–85, the number dropped to four, and for 1986–91 there was just one. In comparison, the 1986–91 figures for other countries include two for France, three for Switzerland, nine for Germany and 22 for the United States. If the figures for the twelve-year period 1980–91 are normalized to take into account the differing sizes of countries, Britain now lags well behind the United States, Germany, Sweden, Denmark and Switzerland in terms of Nobel prizes per head of population.

In conclusion, while it is often possible to find a few isolated indicators to support even the most unlikely of viewpoints, the overwhelming weight of evidence clearly belies Kealey's optimism about the state of British science.

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Page charges

SIR — Y. D. Sharma (*Nature* **355**, 104; 1992) points out that some journals charge authors for processing a manuscript for reviewing, a publication cost for each page and the cost of reprints.

In our view, while a charge for the cost of reprints is reasonable, the other charges are not justified. The costs of the processing and publishing of manuscripts should be covered by the revenues generated through subscriptions and advertisements. These costs should not be charged to the authors, upon whose academic merits the success of the journal is determined. Many authors are in any case also reviewers, who are unpaid and who unselfishly donate their professional time to improve the quality of journals. Charges may reduce the potential of a journal to attract authors of papers of high academic quality. We agree with Sharma that these charges are particularly discriminatory to authors from less developed countries.

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Patent error

SIR — M. P. Bratzel's statement (*Nature* **355**, 292; 1992) that Alexander Graham Bell moved to the United States and secured US citizenship as a prerequisite for obtaining a US patent is in error. US citizenship has never been required in order to file for and obtain a US patent.

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