

210–211; *The European Report on Science and Technology Indicators, 1994* (European Commission, Luxembourg, 1994), Statistical Annex, Table 1.11.i.

Response: I welcome these comments on my partly factual, partly speculative Policy Forum. In reply, I have the following comments.

With respect to Barreto's letter, my Policy Forum mentioned many possible biases in the ISI database and in subsequent comparisons among countries (see my original note 6). Barreto emphasises one such possible bias, and he offers interesting and original approaches that could shed light on the question. I hope this will prompt further work.

I speculated that the explanation for France's ratio of output of papers to input of public money being so much lower than Britain's may lie in differences between the institutional settings in which the work is typically done. Bauin effectively rebuts this speculation, at least for CNRS institutes. The question, however, remains: What does cause these large differences in output/input ratios?

Although the lower ranking places in the world's share of papers, or of citations, depend on the details of how papers with authors from several countries are handled (as discussed in note 8 of my Policy Forum), Gómez *et al.* are correct in identifying an error in the last three places (13, 14, and 15) in my table 1, which ranked countries by their shares of the world's papers. This error resulted from my combining separate tables, as part of the editorial process in reducing the length of my Policy Forum. The top 12 countries in table 1 are, as Gómez *et al.* note, correct; the bottom three were originally present for other reasons.

The omission of Spain from table 1 was particularly unfortunate, because—as Gómez *et al.* emphasize—it has done a remarkable job in recent years of advancing the strength of its science base, doubling government investment between 1981 and 1993 and trebling output.

The suggestion by Herskovic that CERN may largely account for Switzerland's top ranking in papers or citations per capita is interesting, but I think it can be dismissed as the primary cause. A glance at table 2 of my Policy Forum, which shows the five top countries in each of ISI's conventionally defined fields of science as ranked by a quality measure (essentially, average citations per paper), reveals Switzerland indeed first in physics, but also first in immunology, molecular biology and genetics, and pharmacology. It is also second in five other fields and is overall in the top five in 15 of the 20

fields. Ranking by papers or citations in relation to population size gives a similar picture.

In answer to White, table 3 in my Policy Forum, which arguably is its most significant "league table," made it clear that Israel is one of the world's top three countries in terms of quantity and quality of scientific output per capita. In the original, longer manuscript, the remark about "no high relative performance by a very small country" referred back to the opening paragraph about Olympic medals, adding, "there are no Tongas in science." This definition of "very small country" was lost in the published version; countries like Israel, Switzerland, and Sweden do superbly well in relation to their small size, but tiny Tonga they are not!

White also raises the interesting speculation that immigration of scientists from the former Soviet Union may have raised Israel's rankings over the past ten years or so. In fact, Israel produced 1.1% of the world's literature in 1981 and held this fraction steady, apart from an occasional fluctuation to 1.0%, through 1993, when the figure was again 1.1% (data from reference 2 of my Policy Forum). There is no evidence for change here, although the underlying questions are more complicated.

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Corrections and Clarifications

In the 28 March Random Samples item "Tyler award honors primatologists" (p. 1883), the age of the award was incorrectly stated. The prize was established in 1973.

The lower photo accompanying the Research News article "Thanks to a parasite, asexual reproduction catches on" by Martin Enserink (Research News, 21 Mar., p. 1743) should have been credited to "Stephen L. Dobson/Yale University."

Letters to the Editor

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