LETTERS

Women in Science: Cultural Comparisons

In the article by Marcia Barinaga "Surprises across the cultural divide" in the Women in Science '94 special section (11 Mar., p. 1468) as well as in the Policy Forum "Interventions to increase the participation of women in physics" (11 Mar., p. 1392), statistics originated by W. J. Megaw are presented about women's share in physics degrees and faculty positions. My native country, Hungary, seems to have a positive record of 50% and 47% for bachelor's degrees and faculty members, respectively. These numbers are the highest among the countries investigated. The statistics shown for various countries are used to rationalize existing gender differences by cultural tradition and then, indirectly, to suggest policies for overcoming barriers. Therefore, the accuracy of the data is essential.

Having been educated as a physicist between 1978 and 1983 at the L. Eötvös University of Science in Budapest and having kept a close association with the university afterwards, I cannot verify the figures presented for Hungary. My recollection is that the number of women among the roughly 30 students starting each year to become researchers in physics never exceeded 4; female faculty members at the five physics departments were even more scarce (no woman was giving lectures to my class). I remember similar situations at the other two science universities. Women staff members at the research institutes of physics of the Hungarian Academy were again extremely few. The situation can hardly be much better today.

One possible explanation for the discrepancy between the presented numbers and my experience may lie in the (nowadays softening) rigid university system of Hungary. While researchers (also teachers for the secondary schools, for ages 14 to 18) were educated at the elite science universities, specialized colleges (often with a large number of female students) produced the teachers for primary schools (for ages 6 to 14). A strong gender segregation might be hidden if the numbers were averaged over these different institutions.

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Response: I am grateful for Furó's interest in the survey of the world's physics departments that I did in 1990. I wrote to the five Hungarian universities that appeared (from *The World of Learning*) to have a separate department of physics. Unfortunately, the two largest (L. Eötvös University of Science, with 11,000 students, and the Technical University of Science, with 8,400 students) did not respond. Of the three that did reply, which had a total of about 12,000 students, one did not complete the question on gender distribution of faculty, the second reported 15% women faculty, and the third reported 53% women faculty. It is, of course, possible that the last misinterpreted the question "Number of physics faculty members, M . . . F . . . ."

Nevertheless, the answers to the other questions in which there does not seem to be room for misunderstanding indicate that, of the students graduating with the equivalent of a bachelor's degree in physics in 1990, 52% were women; for master's degrees, 25% were women; and for Ph.D. degrees, 27% were women. Of the students entering graduate work in 1989–1990, 39% were women. These figures suggest that Hungary is doing rather better than many other countries as far as the proportion of women studying physics is concerned.

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I appreciate the effort and skill of *Science's* team in building the excellent "Women in Science '94" around the hard core provided by W. J. Megaw's data. While enhancing the reader's interest, the anthological approach may, however, be somewhat vulnerable. Surprise is expressed about the high number of female researchers found in some of the "less advanced" countries. But shadows are found (under headings like "pay," "rank," and "status") that darken the picture. Yes, the climate seems to be women-friendly, but the status of science in these countries is low and so are academic salaries. The field is open to women only because it is undesirable to men. And being a scientist in these countries has a different meaning; it is more like a "cultural activity." Women are hitting the glass ceiling, and there are few full professors and almost no top university administrators or policy-makers.

As the article implies, it is meaningless

Correction

29 April (p. 734) and 13 May (p. 911) issues of *Science*

The talk being given by Dr. Harold Varmus at the *Science*/HUGO Human Genome 1994 meeting on Monday, 3 October, in Washington, D.C., is entitled "Manipulating Cancer Genes in the Mouse."

to speak about "rank" in those eastern European countries where the pyramidal system of the university kept women, as well as men, away from the top. The same considerations are valid for other criteria, like "status" and "pay." Pay should be considered within a system of reference. Is it low compared with that of men or with that in other professions, or it is low compared with that in other countries?

The meanings our profession could have in different societies is one of the important issues to be debated in the future, and "Women in science '94: Comparisons across cultures" is an excellent opening to a new and fascinating topic. Meanwhile, I can only hope that what my colleagues and I have been doing over the years has been science and not some kind of "cultural activity."

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Barinaga questions the extent to which "the Protestant work ethic" is predicated on the service of women behind the working men. She quotes Judith Perry as saying

> A lot of northern Europeans say the Latins . . . don't do as much, but is that true if we look at the whole society and not just individuals? One of the reasons women are more integrated may be that they are leading a healthier life as a society.

Taking this argument a step further leads one to question whether science can progress as well as it does in the United States without Nobel Prize winners and famous individuals running large laboratories (and their wives taking care of their daily necessities). Is it possible to have some kind of less hierarchal structure in which each individual perhaps devotes less time and energy to science (and more time to housekeeping and child care, for example), but the laboratory as a whole produces just as good (or better) science? Perhaps women's advancement can proceed only at the expense of individual fame and fortune. Or is it too dangerous for us to question such basic tenets of our society and the scientific establishment?

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I take strong exception to the contention in the editorial by Daniel E. Koshland Jr. (11 Mar., p. 1355) that a society in which women "stay home and mind the children" is underutilizing the abilities of half of its citizens. It is true that women have a variety of abilities to offer to society, a variety at least as great as men, but it does not follow that women or men who choose to use their talents in raising children are being underutilized. If I had chosen to stay home and mind the children instead of being the more traditional breadwinner, I would not say that my abilities were being underutilized.

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Radon Risk Estimates

We are writing in reference to the article by Richard Stone "EPA analysis of radon in water is hard to swallow" (News & Comment, 17 Sept. 1993, p. 1514), and his more recent remark on the same topic in another News & Comment article "Can Carol Browner reform EPA?" (21 Jan., p. 312). Stone attributes much of the debate over regulation of radon in drinking water to the scientific merit of Environmental Protection Agency's (EPA's) risk assessment for radon. The purpose of this letter is to clarify several issues related to that assessment.

Although Stone emphasizes that there are "uncertainties in the science underlying the risk analysis" for radon in drinking water, he does not report that EPA itself conducted a quantitative uncertainty analysis of the radon risks (*1*). In that analysis, inhalation and ingestion risk estimates were characterized in terms of median values and credible ranges that were based on uncertainties of various parameters used in the risk calculations. The analysis was reviewed and generally well received by the Radiation Advisory Committee of EPA's Science Advisory Board (SAB) (*2*).

In discussing EPA's estimate "that radon in drinking water causes 192 excess cancer deaths," Stone states that this figure was based "primarily on an unpublished study . . . on . . . xenon." The xenon study is an EPA-funded project to improve the dosimetric estimates of ingested radon (*3*). This report has been available to the public since July 1991, when EPA published the proposed national primary drinking water regulations for radionuclides (*4*). More important, the findings of the uncertainty analysis indicate that the inhalation risk of decay products from waterborne radon actually dominates ingestion risk of radon in water. The median value of estimated cancer deaths per year (113 cases) from inhalation is 2.5 times higher than the 46 cases from ingestion (*1, 5*). Furthermore, the inhalation risk estimate is based on strong epidemiological evidence from studies of underground miners and is supported by animal studies (*6*).

Stone quotes the SAB Executive Committee's letter (*7*) to the effect that (in absence of direct human or animal data) "it is not possible to exclude the possibility of zero risk from ingested radon." Although there are no human or animal data that directly demonstrate risks attributable to ingestion of radon, ingested radon irradiates tissues of the body with alpha particles and can lead to cancer risk (*1, 8, 9*). EPA's estimate of risk is derived from information on (i) the biokinetics of radon in the body; (ii) the radiocarcinogenic effects of ionizing radiation in humans, primarily the information on effects of gamma rays from atomic bomb studies; and (iii) the relative biological effectiveness of alpha particles compared with gamma rays, inferred mostly from animal studies (*1*). While EPA has followed the recommendations of the National Academy of Sciences committees in estimating the risks from internally deposited alpha emitters (*6, 8, 10*), we recognize that there is not universal agreement with this approach. To the extent possible, EPA quantified the uncertainties in its estimates and discussed in qualitative terms uncertainties that could not be quantified (*1, 5*).

Risk assessment is a continuing process that evolves as new data becomes available. There is always room for scientific debate over radon risk estimates and their associated uncertainties. However, in our opinion, most of the controversy surrounding the regulation of radon in water is really about whether EPA should examine the risks of radon in greater context and focus its efforts on the problem of radon in indoor air (*2, 7*). EPA's risk assessment shows that the magnitude of population risk attributable to waterborne radon is relatively small compared with that attributable to radon entering homes from soil. Whether or not a well-characterized estimate of 192 annual excess cancer deaths from waterborne radon indicates a major threat to public health, and whether or not waterborne radon risk should be balanced against indoor air radon risk are legitimate topics for public debate. We believe that it is incorrect, however, to imply that the basic issue is a scientific one.

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