

## Careers in science offer women an unusual bonus: immortality

Sir — I was alarmed to learn in your Opinion article<sup>1</sup> that President Clinton's National Science and Technology Council was "toothless" in its failure to address the shortage of women and minorities in science, technology and engineering, and that this situation could have "devastating" consequences by 2050 for the US economy and scientific leadership<sup>2</sup>.

An analysis of death notices and obituaries in *Nature* every 10 years from 1949 to 1999, and in *Science* every 10 years from 1949 to 1969 (after which it stopped regularly publishing these) suggests a way of increasing the number of women scientists dramatically. As I show here, women scientists rarely die. Once word of this acquired immortality gets out, women should flock to scientific careers.

Of 1,184 obituaries in a three-year period coded for year of publication, sex, age at death, cause of death (if known) and field<sup>3</sup>, women accounted for 49 of 917 (5.3%) in *Science* and 13 of 267 (4.9%) in *Nature*; of the 44 commemorated in both journals, two were women. *Science* carried 3.43 times more obituaries than *Nature*; but the proportion of women remained constant at about 5% in each journal.

The dramatic increase in the number of women entering science, technology and engineering during the past 40 years (in which the number of female doctorates has grown at more than twice the rate of that for men, averaging 7.5% per year<sup>3</sup>) coincided with acquisition of immortality in increasing numbers of these women.

Although women in the physical sciences were represented by 4.8% of the death notices in *Science* and 8.3% of the obituaries in *Nature* in 1969, by 1979 there were none — they had become immortal (see Fig. 1). Since women received only 2.2% of US doctorates in engineering by 1978, more time is needed to assess the degree, if any, to which women in this field have acquired immortality. Women in the life sciences started to become immortal in 1979, but immortality is not yet fixed in this group, since one obituary appeared in 1999 — a year after women received 45.4% of the doctorates in that field (see Fig. 1). This trend is also found in other scientific and science-related fields of endeavour.

The fact that women were featured in some obituaries between 1949 and 1969 for all fields except engineering demonstrates that noteworthy women were contributing to scientific and scholarly endeavours half a century ago. As more females received doctorates over

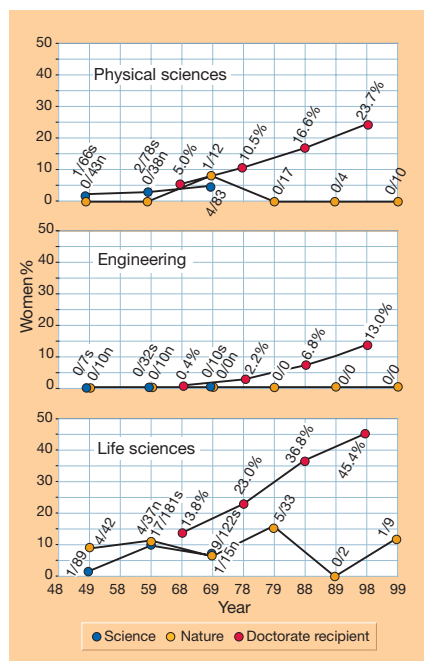


Figure 1 Percentages of women who received doctorates compared with those who received obituaries. Red circles, percentages of US doctoral degrees awarded to women during 1968, 1978, 1988 and 1998; blue circles, percentage of death notices for women in *Science* for 1949, 1959 and 1969; yellow circles, percentages of obituaries for women in *Nature* for 1949, 1959, 1969, 1979, 1989 and 1999. The numerator of fractions provides the number of obituaries for women; the denominator represents the total number of obituaries; s, *Science*; n, *Nature*.

subsequent years, however, the numbers of obituaries for women decreased to zero in the physical sciences, social sciences, education, humanities and other categories. One may therefore conclude that women in these fields no longer die.

The big question, of course, is what are the factors that led to their immortality? Is there a gene that predisposes women scientists to live for ever? If so, I propose the name *foy* (fountain of youth), and suggest that the researchers at DREADCO look into this.

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1. *Nature* **404**, 795 (2000).
2. Wadman, M. *Nature* **404**, 800 (2000).
3. <http://www.nsf.gov/sbe/srs/srs00410/htmstart.htm>

## Enigma thief stole a very special machine

Sir — Natasha Loder writes (*Nature* **407**, 278; 2000) that the particular kind of four-rotor Enigma machine used by the German Abwehr — and stolen from

Bletchley Park earlier this year — is very rare, and that the only other known example is owned by the US National Security Agency.

This is correct. But, rare though the Abwehr versions are, there are several other four-rotor Enigma machines in existence and available to collectors by legal means. I myself own one: No. 877, bought at Sotheby's in March 1994 (it was previously sold at Phillips in April 1993). At least three others were sold at Phillips and Sotheby's during the 1990s.

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## Did civil reactors supply plutonium for weapons?

Sir — We welcome the recent publication by the UK Ministry of Defence (MOD) of the first official inventory of the country's military plutonium<sup>1,2</sup>. The report contains a remarkable admission<sup>2</sup>: "These figures show that the weapon cycle stockpile is in fact some 0.3 tonnes larger than the amount of plutonium the records indicate as available". Hence, the MOD was not aware of the existence of 60 bombs' worth of weapons-grade plutonium. The report does not attempt to identify the origin of this plutonium, simply quoting<sup>1</sup> "From unidentified sites, 0.37 tonnes", despite there being very few sources of weapons-grade plutonium.

We believe some calculations we published 15 years ago<sup>3</sup> can help the MOD identify the source. In their early years (1963–72) the UK's civil Magnox reactors produced significant amounts of weapons-grade plutonium. In 1984 it was admitted that it was reprocessed at Sellafield in the same line, and at the same time, as the weapons-grade plutonium from military reactors<sup>4</sup>. British Nuclear Fuels Ltd, the plant operators, admitted that they called the weapons-grade plutonium "military" irrespective of origin<sup>4</sup>. It would have been consistent with these practices if all weapons-grade plutonium was shipped to the MOD's Aldermaston site. The government stated in 1983 that there was no weapons-grade plutonium in the civil stockpile<sup>5</sup>.

Today, the UK government refuses to quantify plutonium production from civil reactors for these early years. In 1985 we published an estimate of  $(0.36 \pm 0.11)$  tonnes for the total weapons-grade plutonium produced by the UK civil reactors<sup>6</sup>. This agrees remarkably well with the MOD figure of 0.37 tonnes for plutonium of unknown origin. We conclude that about 11% of the

plutonium in UK nuclear weapons originated in civil reactors.

The MOD reports do not separate the transfer data into weapons-grade and non-weapons-grade plutonium, and there are no data on production in the country's dedicated military reactors at Calder Hall and Chapel Cross.

We call on the MOD to provide this information. Similar data have been made public in the United States<sup>3</sup>. The UK government is now in an anomalous position, having published the military stockpile while refusing to publish similar figures for civil plutonium. We request that they do so, and clarify the contradictory statements that have been made to Parliament about the fate of civil plutonium.

The Magnox reactors have entered their shutdown phase and are again producing significant amounts of weapons-grade plutonium. The UK government has recently decided to restrict information on plutonium production in civil reactors<sup>7</sup>. One hopes that history will not repeat itself.

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1. *Plutonium and Aldermaston: An Historical Account* (Ministry of Defence, London, 2000). <http://www.fas.org/news/uk/000414-uk2.htm>
2. *Historical Accounting and Plutonium* (Ministry of Defence, London, 2000). <http://www.fas.org/news/uk/000414-uk3.htm>
3. Barnham, K. W. J., Hart, D., Nelson, J. & Stevens, R. A. *Nature* **317**, 213–217 (1985).
4. Layfield, F. *Sizewell B Public Inquiry: Summary of Conclusions and Recommendations* (Department of Energy, London, 1987).
5. *Hansard* 27-7-83, cols 439–440 (1983).
6. *Plutonium: The First 50 Years* (Department of Energy, Washington DC, 1996).
7. Barnham, K. W. J., Nelson, J. & Stevens, R. A. *Nature* **395**, 739 (1998).

## Achievers should stay to aid Brazilian science ...

Sir — The Opinion article “Genome sequencing for all” (*Nature* **406**, 109; 2000) exposed a patronising view of research in developing countries.

In my view, *Nature* could have used its valuable space to tackle more interesting, painful yet real issues surrounding scientists in developing countries (see the News feature “A springboard to success” in *Nature* **407**, 440–441; 2000). For example, why was the Brazilian paper celebrated in your Opinion article an exception rather than the rule?

Local antinationalism has allowed imperialism from industrialized countries to survive for centuries. So, although I understand the views of the Brazilian

scientists abroad “who frequently decide not to return, citing a lack of scientific opportunity”, they are also being used as cheap labour in rich countries. Hence they are perpetuating an unfair situation by their short-sightedness and selfishness (very often their studies have been funded by Brazilian public money).

By leaving Brazil they may well avoid having to carry out less ‘important’ or ‘glamorous’ science. But they also lose the chance to involve themselves in relevant issues such as the dismantling of Brazil’s public university system, or to claim the right to better jobs and working conditions, or to build a better future for themselves and for future generations.

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## ...yet the path is strewn with needless obstacles

Sir — I am a young Brazilian scientist and I agree with Tomas Prolla’s point in Correspondence<sup>1</sup> that the rigid bureaucracy in Brazil turns scientific research into a nightmare.

Four years ago, I asked the director of the institute where I did my PhD to release funds (about US\$20) so I could send reprints to England, as one of my results was going to be cited in a textbook to be published there. The director punched his desk and said that he was not there to support my megalomania. I sent the reprints using my own money, and my result was cited in the book<sup>2</sup>. A professor from another university told me that to behave as I had done, at my level of seniority, would cause fear among my superiors.

I recently entered the selection process for a professor’s position in one of Brazil’s leading universities. One of the interviewers asked why I wanted to stay in academia instead of working in industry for better pay. I did not get the job.

The person who got the job has published about six papers in journals, and is corresponding author on none of these. My curriculum vitae lists 21 papers in good international journals. In 20 of these I am the corresponding author and in 11 I am the sole author. I have spent \$23,000 of my own money doing serious research in this country and I receive about \$200,000 as a government grant. In my laboratory I have the first atomic force microscope for biological research in the country.

This is the fourteenth selection process I have undergone in this country. Before I

received the result of my latest attempt, I was advised by another professor to go to the United States as I do not fit in the Brazilian system.

It seems that Brazil can produce good scientists for export, but this material does not bring income into the country.

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1. *Nature* **406**, 826 (2000).
2. Walker, G. *Yeast Physiology and Biotechnology* 16–17 (Wiley, Chichester, 1998).

## If free speech costs lives that’s a high price to pay

Sir — Stewart *et al.* are right to remind us that the 17 years following the discovery of HIV have been a long time (*Nature* **407**, 286; 2000).

Both of us lost grandparents and great-grandparents to tuberculosis. One might have thought that in the hundred or more years since Robert Koch discovered *Mycobacterium tuberculosis* (without fulfilling all his postulates), we would have done a little better than the state we are in today: some 1.7 billion infected, with an annual death rate of 1.8 million. Of course we could all agree on tuberculosis being caused by another, as yet undiscovered, microbe riding on the intimate coat-tails of *M. tuberculosis*. Then perhaps the lack of progress would make sense. Paradigm lost.

In an earlier life one of us was valet to the French philosopher Voltaire. I remember cleaning his room one day, coming across a letter to Jean-Jacques Rousseau. As a Huguenot, I rejoiced at the remark, “I disapprove of what you say, but I will defend to the death your right to say it”. What is not widely known is the next sentence: “My only question, Sir, is whether the columns of *Nature* are appropriate?”

We are staunch believers in the right to free speech, but is *Nature* the appropriate place to militate in favour of the pre-Copernican model of the universe or the existence of phlogiston? After all, there is Speakers’ Corner in Hyde Park, when it’s not raining. To demand the right of reply or equal time on such matters is a trick the creationists have used.

HIV causes AIDS. Problems arise when the proposed alternative costs lives.

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