

information for a large container into a small genome. They argued that the repeated use of a single protein to form a symmetric viral capsid could require as little as one gene, making efficient use of genetic information. Today, asymmetrical designs, like those of the cytoskeleton, capture our imagination. Their routes to self-assembly, unlike the pathway described by Lewis Carroll, do not keep "one principle object in view — to preserve its symmetrical shape".

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Spanish researchers defeated by the system

Sir — It is with the utmost satisfaction that I read the articles on Spanish universities *Nature* **396**, 709, 712; 1998). So far, the press, with a few exceptions which now include *Nature*, have simply echoed the encouraging words of the present and previous Spanish governments. Though many alleged 'reforms' of the last 15 years may look quite sensible, insiders can see that successive governments have promised much and delivered nothing. They claim to devote more funds to research, hoping the figures won't look too embarrassing when Spain's scientific budget is compared with those of other EU members every year.

It is true that, as the science budget has increased, so has the number of publications. It is also true that several research groups are among the best in the world in their fields. What the Government fails to mention is how many publications are by Spanish scientists working abroad, and how many are the result of international collaborations. The top groups' achievements are more due to the devotion of their members than to any government policy. The Government's zealotry in allocating more research funding has never been followed by any interest in ensuring that these funds (often from the EU rather than the Spanish budget) were properly used. There are no inspections, no yield assessments, no questions asked.

Against this background, vast sums of money have been invested in the creation of dozens of ridiculously small and unnecessary universities over the past decade. Hundreds of positions have been

created and filled — most, if not all, by local applicants with hardly enough experience to defend a master's thesis. These people are now being promoted to permanent professorships, while much more qualified candidates are humiliated and rejected on the most extraordinary grounds. In return for making these appointments, the university rectors and heads of departments ensure their own right to do exactly as they please, if anything at all.

The case of Dr Ferriz, described in your articles, would not surprise any Spanish scientist. In fact, what would be surprising is to learn that at least one Spanish university has not yet been sued. I took the University of Seville to court in 1994, for very similar reasons to those of Dr Ferriz. The outcome of the litigation, which I expect any time within the present geological era, is as unpredictable as next week's lottery results, given that the Spanish legal system is as anachronistic and bureaucratic as the one that rules the universities, and judges only rarely consider information from independent researchers.

It results in a system which is essentially unfair and leaves everybody defenceless. I personally will not attempt to return to Spain until the Government, for the first time in history, seriously decides to implement a rational science policy.

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Can teaching ethics make people ethical?

Sir — In a leading article you claim that "extreme misconduct tends to occur most frequently" in biomedical research (*Nature* **395**, 727; 1998). You fail to cite data to substantiate the claim that extreme misconduct in biomedical sciences is more frequent than in other sciences, but it is obvious that it is vastly more frequent than is acceptable. It is also embarrassingly obvious that more ethics is probably taught in medical faculties than in any other scientific discipline. It is hard to find a medical school in the developed world without at least some formal medical ethics education. But I doubt if any mathematics or physics departments offer courses in 'mathematical ethics' or 'physical ethics'.

Those of us who teach medical ethics must therefore ask ourselves the hard question whether we are really teaching what we ought to teach, and whether 'ethical people' can really be produced by academic instruction. Classes on ethics of genetic engineering, cloning, brain death and when the embryo becomes a person

can be exciting and intellectually stimulating but they don't necessarily make physicians, nurses and biomedical researchers more honest.

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Glaciation: the snowball theory still holds water

Sir — D. M. Williams *et al.*¹ propose a mechanism² whereby an initial high obliquity for the Earth could have rapidly changed to its present low value of ~23.5° near the end of the Proterozoic eon. Following G. Williams³, they note that the mean annual insolation would have been lower at the Equator than at the poles if the Proterozoic obliquity exceeded 54°. They infer that low-latitude glaciation observed near the beginning and end of the Proterozoic could be explained without the need for an ice-covered 'snowball' Earth^{4,5}.

However, neither Williams *et al.*¹ nor the accompanying News and Views article⁶ discuss the implications of high obliquity for glaciation *per se*. The basic requirement for glaciation is a net accumulation of winter snow after summer melting. High obliquity enhances seasonality^{3,7}, creating very cold winters with reduced snowfall and very hot summers with maximal melting.

The recognition that glaciation is favoured by cool summers, not cold winters, is the crucial difference between the Milankovitch theory and the much earlier Croll theory of orbital forcing⁸. High obliquity has the greatest effect on seasonality at the poles, but insolation during the warm seasons at the equator is equally high irrespective of obliquity.

Whatever merit it has for the early Earth¹, high obliquity seems insufficient as an explanation for low-latitude glaciation⁷ and glaciating the poles as a means of reducing a high obliquity¹ is highly improbable.

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