

## Earthquake risk

SIR—The recent earthquake in Armenia has once again focused attention on the need to adhere to some minimal building code in order to minimize earthquake hazards, especially in developing countries in seismically active zones (*Nature* **336**, 625; 1988). This is the only practicable solution for such countries, where the development of facilities and capabilities for data-acquisition and data-processing to monitor the build-up of strain and to predict its release in earthquakes is still far in the future.

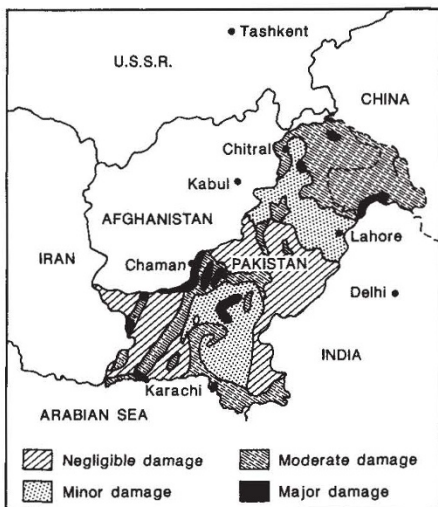
Towards the middle of the next century, the developing countries in Asia with a history of destructive earthquakes will experience a growth of development in communication, energy, irrigation and industry, financed largely by international agencies and executed under the supervision of experts in the countries concerned.

These agencies and experts must make themselves responsible for minimizing natural hazards, of which earthquakes are the most sudden and destructive. They should perhaps specify that a seismic zoning map should be available when a large project is planned.

A seismic zoning map of Pakistan (see below) is being published for the information of international funding agencies and for those involved in structural designs for dams, power and chemical plants and so on in Pakistan.

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This map, constructed from macro-earthquakes data from 1905 to 1979, can be used for risk assessment if one assumes that if ground motion of a certain intensity is experienced once in a certain area, it is likely to be experienced again in that area. Map adapted from Building Code of Pakistan, Ministry of Housing & Works, Islamabad, 1986, pp 11–38 to 52.

## Looking-glass land

SIR—Our solution of the molecular structure of foot and mouth disease virus (*Nature* **337**, 709; 1989) involved an intriguing number of coincidental connections with the life and career of Lewis Carroll, the mathematician and author of the Alice in Wonderland books. He was born and spent his early years in Daresbury, the location of the SERC synchrotron source where the X-ray diffraction data were collected. He later moved to Oxford to teach mathematics and it is there that the data were analysed and the structure of the virus solved. Carroll also owned a house in Guildford, which is close to Pirbright, where the virus was grown and crystallized. The final link was provided by the representation of the virus structure featured on the cover of *Nature*. This picture is as the virus would have been seen by Alice through the looking-glass — it was printed as the mirror image of the true structural organization of the particle.

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## Aluminium limits

SIR—It has been known since 1983 that a blood serum level of aluminium in excess of 0.1 mg per l presents a significant risk of neurological damage<sup>1</sup>, yet the permissible level of aluminium in European Communities domestic water remains at 0.2 mg per l. Are we not expecting to much from the European kidney?

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1. Savory, J. & Berlin, A. *Annals of clinic. Lab. Sci.* 444–451 (1983).

## Improbability

SIR—Respondents to Bruce Denness's query (*Nature* **336**, 614; 1988 and **337**, 498; 1989) are surely correct that scientists need not be too much concerned with far-fetched theories that are fabulously contrived to explain phenomena. But the fantastical context of the discussion should not be permitted to obscure a serious, but related, scientific problem.

One reason to reject the spontaneous or wilful creation of the Universe in the recent past is that we have a good explanation that hinges improbabilities of the recent past on the even more improbable

(in the sense of lower entropy) less-recent past. But in a Big-Bang cosmology, this particular buck can be passed back only so far. How did the earliest times come to be so improbable? Roger Penrose has estimated<sup>1</sup> that the original conditions of our Universe, if generated randomly, had a likelihood comparable to 1 part in 10 to the power of 10<sup>123</sup>. It is not clear that such a staggeringly improbable initial condition is any easier to arrange than admittedly preposterous, direct fabrication of a recent state of the Universe replete with falsified history.

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1. Penrose, R. "Time-Asymmetry and Quantum Gravity" in *Quantum Gravity 2*. Isham, Penrose and Sciama (Oxford, 1981).

## Anthropic principle

SIR—I was surprised to learn in the slightly misleading report from M. Abramowicz and G. F. R. Ellis (*Nature* **337**, 411–412; 1989) that a feature of the Venice Conference on cosmology and philosophy (18–19 November 1988) had been my abandonment of the final anthropic principle. In fact, my talk was concerned primarily with other subjects. However, the documented discussion following other speakers reveals that the scientific basis of this proposal was presented and defended. It is particularly interesting in view of recent ideas about information processing and complexity. For a truer picture, I refer the interested reader to the conference proceedings which will be published by Cambridge University Press under the editorship of U. Curi.

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## Retraction test

SIR—I agree with John Maddox (*Nature* **338**, 13; 1989) on the importance of full retraction by an author who discovers nontrivial mistakes in his or her previously published work. It is a litmus test of scientific integrity.

To any researcher hesitant about publishing a retraction when necessary, I would say that I can immediately think of colleagues whose reputations went up in my estimation when they published retractions.

I was horrified to read that some funding bodies apply the opposite criterion. This must be stopped.

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