

Is global warming climate change? Hungarian science

SIR — Hardly had 1996 arrived when the UK Met. Office issued a press release to the effect that 1995 was the warmest year so far¹. But the press release failed to contain three important provisos.

(1) The December surface observations were not yet available, so that provisional information from upper air charts was used to compute an educated guess. The December temperature anomaly used was therefore not compatible with the other months of the year.

(2) The temperature anomaly for the globe was determined largely by that for the Northern Hemisphere. The Southern Hemisphere had nowhere near the warmest year so far, even if computed from surface data.

(3) The NASA MSU satellite record which monitors the temperature of the atmosphere showed that 1995 was eighth out of the 17 years available.

Interestingly, the fall in temperature in the Northern Hemisphere from November to December was more than 0.7 °C, constituting the greatest month-to-month change in the entire record of 203 values.

In the context of the global warming debate it is important to define what is meant by the term 'climate change'. The Australian Delegation to the Madrid meeting of Working Group 1 of the International Panel on Climate Change (IPCC) succinctly pointed out a prevalent ambiguity.

"Climate Change' in IPCC Working Group 1 usage refers to any change in climate over time whether due to natural variability or as a result of human activity. This differs from the usage in the Framework Convention on Climate change where 'climate change' refers to a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods."²

Let us consider the first definition and ask whether natural variability can produce long-term trends comparable to those observed in the historical record and those predicted to occur during the next century.

During the past ten years, it has often been stated that the previous year was the warmest on record, or that the past decade contains six of the warmest years on record³. Such statistical events may not constitute as clear an indication of induced global warming as might appear at first sight. There is an alternative explanation, the random walk. The somewhat remarkable mathematical properties of the simple random walk resulting from games of chance are well described by Feller⁴. One of these is that the winning player is likely to be further ahead at the end of the last trial than at any previous time. This property alone is conducive to the generation of trends in games of relatively short

duration. Analogies between the statistical properties of random walks and temperature trends have been made by several authors^{5,6}.

Bye^{7,8} introduced the concept of 'bounded random walks', the extents of which increase as the exchange coefficient with the deep ocean decreases. It is suggested that there are two processes determining a climate which is not being subjected to human interference. One is a cyclic solution representing a deterministic system in which all properties can be forecast from the radiation cycle; the other is due to perturbations in the radiative and ocean current fields, which give rise to bounded random walks, which are superimposed on the former to produce the observed interannual climate variability. Although it is not the intention of the authors to deny that the observed trends in the surface temperature record may be caused by human interference (the enhanced greenhouse effect), it is proposed that the observed variability, including any observed trends, may be explained by internal mechanisms which drive the ocean-atmosphere system.

The IPCC has given little or no consideration to the generation of 'bounded random walks' in their publications and pronouncements.

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3. Ratcliffe, R. A. S. *Weather* **2**, 193-194 (1990).
4. Feller, W. *An Introduction to Probability Theory and its Applications* Vol. 1, 77-87 (Wiley, New York, 1960)
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Yes to transplants

SIR — Paula J. Mohacsy *et al.* quote me as having said, in a personal communication, that opposition to xenotransplantation is expressed by, among others, potential transplant recipients (*Nature* **378**, 434; 1995). The facts are that 10 per cent of such patients expressed opposition, 90 per cent did not. The 90 per cent was made up of 50 per cent of patients in agreement and 40 per cent who were undecided.

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SIR — *Nature* recently published a report about Hungarian science seeking guidance from the European Union¹. We agree that international cooperation is needed, but we would like to add a comment.

The Hungarian government started a new system for the support of research in 1986, the first country in the area to do so. That system, like those of most industrialized countries, is based on applications and grants, independent of government regulations and the current political situation.

The applications are first submitted to the OTKA (State Research Foundation), which asks for the opinion of three independent and recognized experts in the field. Second, an expert committee will rank the applications. Grants are for between one and four years, and progress is checked periodically. The system seems to work efficiently, to judge by the *Science Citation Index*², which shows that Hungarian scientists are approximately as productive as their colleagues in countries with a wealthier funding background. For instance, in the most recent academic period for which there are figures, researchers at the institution at which we

	Number of projects	Support in HUF
Social sciences	731,409,000	498
Natural sciences	1,553,132,000	697
Life sciences	1,292,276,000	528
Total	3,576,817,000	1,723

work, which is Hungary's largest medical university, published 2,406 articles with a cumulative impact factor of 1846.997.

The system is certainly functioning well, but some features cause concern. For example, well recognized and successful centres (sometimes understandably) claim for more support. This means that new teams or researchers that are not yet well known may face difficulties in finding grants to support their projects. Another problem is that while Hungary's gross domestic product (GDP) has been growing, the funds for research have been decreasing, not only in total value, but also in percentage of GDP (2.6 per cent in 1988, compared with 0.7 per cent in 1995). Finally, although the role of private foundations, both domestic and foreign, has been growing, it has not yet reached the importance of OTKA.

The table shows projects supported by the OTKA in Hungary, for the next academic period³. (US\$1 = 136 Hungarian forints.)

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