Seascale hazard

SIR — The letter from Pomiankowski (*Nature* 13 September, p.100) raises two points which he considers introduce doubts about the conclusions of the report of the Black Advisory Group into the possible increased incidence of cancer in West Cumbria.

The first concerns the appropriate index on which to rank the occurrence of lymphoid malignancy in the 675 electoral wards of the Northern Children's Cancer Registry region. The suggestion is that the report was incorrect to include a table showing the wards with the highest incidence rates per 1,000 children, and that using instead the associated Poisson probabilities would have been more appropriate. It is important to recognize that these two sets of figures are not simple alternatives, since they measure different aspects of the disease frequency. The rate per 1,000 is a direct measure of the proportion of children under 15 years of age registered with lymphoid malignancy over the period 1968–82, which gives 9.73 per 1,000 in Seascale — calculated on the basis of a total of four cases during the 15 years and the 1981 census population. The cumulative Poisson probability, on the other hand, is a measure of the chance of finding the observed rate (or an even greater one) if the true (rather than the estimated) local ward rate were the same as the overall regional rate of 0.61 per 1,000.

The first index is an assessment of the average risk of a child in the area developing lymphoid malignancy before 15 years of age, whereas the latter is an indication of how unlikely it is that the raised rate in Seascale could have occurred by chance under a particular hypothesis. Each of these indices has its role and importance. In the case of a small-sized population and a small number of cases, the observed rate is subject to sampling fluctuation — and the associated Poisson probability helps to assess the size of this. Both figures are therefore informative and are given in the report. It is not true, however, to refer to the latter as representing the "incidence" of lymphoid malignancy — as was done by Mr Pomiankowski.

The second point concerns two childhood cases of lymphoma in Seascale registered since 1982. It is said that the exclusion of these from the calculations of rates and Poisson probabilities is "disturbing". The figures given in the report were provided by Dr Craft and his colleagues from the Northern Children's Cancer Registry for the years 1968–82. At the time (late 1983/early 1984) when these figures were being prepared, it was too early to include comprehensive cancer registrations beyond 1982 over the whole Northern Region since there is inevitably some delay in the notification of cancer cases to the regional register and, thus, in the availability of complete annual records for inclusion in analyses. For this reason it

is premature to consider the effect of these two cases — known about because of the special attention to the village — on the ranking of Seascale: it remains to be seen whether or not further cases of lymphoid malignancy have moved other small communities up into higher rankings, either of rates or probabilities. No doubt Dr Craft and his colleagues will do this in due course, and make further assessment of the situation possible.

M.J. GARDNER

*MRC Environmental Epidemiology Unit,
(University of Southampton),
Southampton General Hospital,
Southampton SO9 4XY, UK*

Defining length

SIR — On 21 October 1983, the Comité International des Poids et Mesures (CIPM) promulgated a new definition of the metre as: the length of the path travelled by light in vacuum during a time interval of $1/299\,792\,458$ of a second¹. This new definition raises some fundamental and practical problems.

At the fundamental level, one must reformulate Einstein's second relativity postulate: "Light is always propagated in empty space with a definite velocity which is independent of the state of motion of the emitting body"². For Einstein, this was an empirical fact. Now, this has become a definition and the corresponding empirical fact is that the length of a solid body depends neither on its spatial orientation, nor on the inertial frame where that body is at rest. (For example, in Michelson's celebrated experiment, the length of the arms of the interferometer did not change as that instrument was rotated or as it was carried by the Earth in an orbit around the Sun.) It is easy to derive the Lorentz transformation law from the above postulate.

On the practical side, this new way of defining length implies that there must be two *synchronized* clocks at the extremities of the measured object, in order to determine the corresponding time interval. As synchronization is best performed by light signals², this effectively means that in order to measure the length of an object, one ought to observe the round trip time of a light signal and divide the result in two.

Moreover, the return trip of the light signal must follow precisely the path along which the signal was sent. This is because a closed path surrounding a nonvanishing area (with a suitable set of mirrors) yields a result depending on the direction of travel, if the body being measured rotates. The difference in travel time (clockwise versus counterclockwise) is³

$$t = 4\omega A/c^2,$$

where ω is the angular velocity and A is the surrounded area.

If this effect is ignored (the round trip rule is not even mentioned in the CIPM recommendations!) the circumference of the Earth at the Equator is 123.9m longer if

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measured eastward than if measured westward.

ASHER PERES

*Department of Physics,
Technion-Israel Institute of Technology,
32 000 Haifa, Israel*

1. Giacomo, P. *Am. J. Phys.* **52**, 607-613 (1984).
2. Einstein, A. *Ann. Physik* **17**, 891-921 (1905).
3. Landau, L. & Lifshitz, E. *The Classical Theory of Fields*, 282 (Addison-Wesley, Cambridge, Mass., 1951).

Red Sirius

SIR — The recent correspondence (*Nature* 6 September, p.8) concerning the colour of Sirius reminds me that in the ancient astronomy of Iceland, the star was called Loki's Brand, obviously because of its periodic disappearance into the "underworld", but also because of its flaming colour. This apparent colour-naming is therefore not just a Greek phenomenon, but something which doubtless has considerable significance.

NIGEL PENNICK

*142, Pheasant Rise,
Bar Hill, Cambridge CB3 8SD, UK*

Mount Wilson costs

SIR — Your report (*Nature* 15 August, p.88) on the Carnegie Institution's plans to sell the Mount Wilson Observatory understates the scientific importance of this facility and overstates its operating costs. The \$1.56 million budget for Mount Wilson listed in the Carnegie Financial Report — apparently your source for this figure — includes all astronomers' salaries, fellows' salaries and support operations both for Mount Wilson and for the Las Campanas Observatory that Carnegie operates in Chile. A California consortium hoping to operate Mount Wilson asked the director to estimate operating cost for Mount Wilson alone. A detailed estimate, made by our business manager, was produced: \$0.75 million per year. This includes the fraction of all engineering and support services spent on Mount Wilson, but of course not those devoted to Chile.

Many individual astronomers and a number of organizations within and outside the United States have inquired about obtaining all or part of Mount Wilson Observatory. The reason is that it is an excellent site for stellar and solar astronomy. Your implication that this work is less exciting than extragalactic astronomy simply reflects a bias, one that is certainly not shared by all astronomers.

At the recent (October 1984) European meeting on solar physics, the current Mount Wilson solar and stellar research was described as vital, and a resolution was adopted urging that all possibilities for its continuation be explored.

DOUGLAS DUNCAN

*Mount Wilson and
Las Campanas Observatories,
813 Santa Barbara Street,
Pasadena, California 91101, USA*