CORRESPONDENCE

Non-proliferation

SIR — The widespread use of nuclear power plants has caused concern regarding the proliferation potential of commercial plutonium. In a recent article (*Nature* 28 February)[1], Lovins concluded that "with modest design sophistication, high-burn-up plutonium from power reactors can produce powerful and predictable nuclear explosions".

The disadvantage of using even-plutonium isotopes in a nuclear explosive stems from different physical factors, which might be underestimated if considered separately. An example of this is the effect on the critical mass (neutron multiplication and balance)[2,4] or neutron generation time[3,4] of using even-plutonium isotopes in a nuclear explosive. However, by considering (1) the neutron multiplication factor, (2) the neutron generation time, (3) the subcritical multiplication by approaching the criticality and (4) the neutron background due to spontaneous fission, we have found that the explosive yield of a nuclear bomb is decreased rapidly by the presence of significant amounts of even-plutonium isotopes. Our analysis showed that it would not be possible to exceed an explosive yield of 1 kton or 100 ton TNT in the presence of 15 or 25% even-plutonium isotopes, resepectively, in the core of the critical assembly, even using high design sophistication.

However, even a low-yield fissile explosive can ignite a thermo-nuclear explosive. Also, the radioactive hazards of a low-yield nuclear explosive are substantial, as Lovins states[1]. Hence the problems of commercial plutonium with regard to proliferation remain.

The nuclear power countries will not be able to prevent the non-nuclear power countries from going ahead with the commercial exploitation of nuclear energy. The only way in which non-proliferation can be attained will be through a political decision by the non-nuclear power countries.

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1. Lovins, A.B. *Nature* **283**, 817-823 (1980).
2. Sahin, S. *Automkernenegie* **27**, 23-26 (1976).
3. Sahin, S. *An. Nucl. Energy* **5**, 55-58 (1978).
4. Sahin, S. & Yalçin S. *Atomkernenergie/Kerntechnik* **36**, 139-140 (1980).
5. Sahin, S. & Ligou J. *Nucl. Technol.* **50**, 88-94 (1980).

Technical innocence

SIR — It seems likely that 37½ years in the Scientific Civil Service enables me to comment on your article (*Nature* 25 September, p.264).

Frustration and unease are not caused simply by the inability of administrators to comprehend the same "world-image" as we do; nor even is it just that they appear to take our advice or not according to lofty criteria that depend on the (? almost esoteric) concept of "policy" — which may sometimes not be within our own world-image, even though we may have been on more than one management course. Apart from these things we are human beings. Therefore we resent the fact that an administrative or management mandarin is, even when of "equal button", always "equal and above", as expressed in terms of money and in advancement-potential. Scientists, said the late Walter Elliott, should be "always on tap, but never on top". This cynical dictum still "rules" — but it is not OK, and never will be. It is not necessary to try to turn us into "managers" or "administrators" in order to value us as equals, of whatever button. This is the true "parity".

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Read the small print

SIR — I wish to draw attention to a potentially dangerous trend in the presentation of scientific papers. In a paper published in this journal almost a year ago (Meltzoff, A.N. and Borton, R.W. *Nature* **282**, 403-404, 1979) the widely publicized conclusion was that 1-month-old human neonates possess intermodal matching abilities. Although I feel that this conclusion, whether true or false, is derived by fallacious argument, my concern here is with a fault in the presentation of the paper; a fault which may account for the general acceptance of the paper's conclusion; and a fault encouraged in your "Guide to authors".

The authors of the paper use a modified version of a well tried, even "classical", experimental method in their investigation. Regrettably, they confine the description of their modifications to a densely printed figure legend, where it is embedded in the mass of relatively trivial detail intended for any who wish to repeat the experiment. More regrettably, the narrative of the paper carries what appears to be a complete account of an experimental method — the unmodified "classical" method — but it carries no hint whatever that this "classical" method has been modified by the manoeuvres which are mentioned only in the figure legend.

Thus, although all mention of certain heuristically significant experimental detail is omitted from the narrative of the paper, nothing suggests that the argument which is presented in that narrative, and which may impress the reader as being conclusive, fails to take account of all relevant factors.

When the description of experimental detail is fragmented as it is in this paper, there is a risk that fallacious conclusions may acquire an apparent but spurious validity, and a persuasive yet equivocal paper pass unchallenged into "the literature". There is, of course, no way of knowing how often the latter happens. Similarly, no amount of advice in a "guide to authors" can entirely eliminate its occurrence. But the practice of relegating experimental detail to figure or table legends is probably becoming more common; and the more common it is, the more dangerous: for readers learn to assume that authors *never*(!) displace heuretically significant detail from the narrative of a paper without due notice.

Authors cannot be prevented from inadvertently misleading readers, even referees; but perhaps your advice to them should be reconsidered: "Experimental detail vital to the paper yet which would interrupt the narrative is best placed in the figure legends." — Is it?

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Generating costs

SIR — Richard Marshall's letter (*Nature* 18 September, p.184) on the Central Electricity Generating Board's published cost forecasts for new nuclear and coal-fired stations, requires some comment. First, the load factor on any station in any year is a function of two parameters — the availability of the plant and the proportion of total electricity demand which it is economic to allocate to that particular plant. Nuclear stations for most of their life and new coal stations early in their life will normally be operated economically to the limit of their available capacity. In later years they will come a time for both types of plant when, because of the construction of still newer capacity, their load factor will fall below the maximum permitted by availability. Since coal-fired stations have a much higher operating cost than nuclear stations this process will start earlier for coal-fired stations, which will therefore achieve a somewhat lower lifetime load factor than nuclear stations.

The load factor projections are therefore not arbitrary; they derive from a careful estimate of expected economic loading on each plant in each year. The load factors so far achieved on the Hinkley B advanced gas-cooled reactor (AGR) station reflect the fact that this is the first commercial AGR station ever built, still in its early years of experience. Inevitably its availability to date reflects teething troubles. Our projections of future availability are made on the reasonable basis that in due course new plant yet to be built would benefit from this experience.

We would therefore not expect coal to achieve a 70 per cent load factor while nuclear achieved only 50 per cent, but even if this were to happen, the cost projections quoted by Mr Marshall are still incorrect. Accepting for the sake of argument 50 per cent and 70 per cent load factors for new nuclear coal-fired plant respectively, the adjusted generation costs would be 2.6 and 3.1 pence per kWh, thus still retaining the cost ranking as predicted. These figures differ from Mr Marshall's because only the fixed component of the generation cost varies with load factor when working in pence per kWh.

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