

Agriculture R & D

SIR — Without entering into the substance of the debate that W.S. Wise raised in his letter (*Nature* 3 January p.8), there is one comment I would like to make.

There are, of course, many ways of combining measures of volume of research and development with other statistics, such as Gross Domestic Product or the number in the population. Some may illuminate issues such as how the United Kingdom compares with other similar nations in the field of research and development funding. One such combined indicator was quoted in the *Annual Review of Government-funded R&D*. It concerned the volume of expenditure by government on research and development specifically to improve productivity and competitiveness of an industrial sector by comparison with the importance of that sector to the nation's economy. The *Annual Review* gave figures for a number of countries showing how many units of national currency the government spends on research and development for an industrial sector for every thousand units of currency earned by that sector for the economy. The purpose was to compare UK government priorities for industrially related research and development with those of other countries, taking account of the different economic significance of each industrial sector to each country.

To have added in university funding for agriculture research and development would simply have resulted in the comparison of some other quantity: university priorities in basic research are not necessarily the same as government industrial sponsorship priorities. Similarly, to have used population as a normalizing factor results in a less relevant comparison. I should also add that the Organization for Economic Cooperation

Misquoted

SIR — In your report (1 November 1984, p.7) on my talk at the dedication of the Monsanto Company's new Life Sciences Center, I'm said to have "attacked the government practice of supporting work by a single investigator in a single department. . .". What I actually said, in the context of discussing interdisciplinary research, is "that the project grant mechanism implicitly assumes a single principal investigator working within a single department. That is increasingly not the case."

For the record, I continue to regard grants to individual investigators as the single most powerful reason for the sustained excellence of American basic research.

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and Development (OECD) was the primary source of data in order that the United States and Japan could be included in the comparisons; as Mr Wise acknowledged, the OECD data do not allow the comparison that he has carried out for European countries.

I would not argue that either of the measures Mr Wise proposes are non-valid or necessarily less valid than the ones chosen for the *Annual Review*. I would simply suggest that they are different, and do not quite address the issue that the review was considering.

I would also like to point out that the published *Annual Review* represents the government's desire to make available generally the factual material that was used in the 1984 review, and so to facilitate informed debate such as the one Mr Wise has initiated. It would be inappropriate for such a document, which is essentially statistical in nature, to have attempted to capture a "spirit of enterprise" as he suggests at the end of his letter.

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Conditions for disarmament

SIR — R.I.P. Bulkeley's objection to our defence-protected build-down (DPB, *Nature* 312, 301; 1984) is a valid one if, as he assumes, the defence is deployed to protect cities. However, in our longer descriptions of our proposal (for example, *The Bulletin of the Atomic Scientists* 40, 18-23; 1984) we make clear that DPB would initially be deployed only to protect the strategic, land-based force which is perceived by the other side as posing a first-strike threat. This defence might be short-range terminal anti-ballistic missile (ABM) interceptors, swarm-jet or even decoy holes (which, though passive, achieve the same objective as do active terminal defences).

Thus even if the side which has adopted DPB strikes first with only 90 per cent of the force it had before deploying its terminal defence, the "ragged" counter-attack would still be sufficient to destroy the attacker's cities. In short, we do not visualize DPB as eliminating deterrence by Mutually Assured Destruction (MAD), but simply as starting a process which, at each stage, lowers the level of violence at which MAD operates.

We do not insist on precise mathematical equivalence at each stage. DPB, confined to terminal defence of land-based missiles, makes unilateral reduction of the first-strike weapons politically feasible. We should expect that such a move (confined to protection of missile sites) could not be

perceived as threatening by the other side since, if first strike were intended, it is illogical to dismantle some of one's first-strike weapons. Whether de-escalation under DPB continues depends, of course, on each side's recognizing that reduction of first-strike weapons is the best possible evidence that a first-strike is not intended. This, coupled with constraint on deployment of ABM around cities, could lead to a gradual de-escalation of both sides' offensive nuclear arsenals. That stability still depends on MAD is a dismal reality; perhaps, if DPB leads to sufficiently deep reductions in first-strike weapons, MAD might eventually be replaced by Mutually Assured Survival—but this is far from today's reality.

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Human embryos

SIR — So the House of Commons opening debate on the Warnock Report was "muddled", "down-at-heel" and peppered with some laughable "misunderstandings" (*Nature* 29 November, p. 389). Of course those who were hoping — as you were — that liberal opinions on human embryo experimentation would win the day, will have been disappointed by the mainly pro-life speeches. The fact is that there are many others (recent polls and petitions would suggest a majority of millions in the United Kingdom) who are saying "No" to most of Warnock's recommendations and the research-must-go-on ethic. As you know, most are persuaded, from scientific as well as other evidence, that human life begins at conception. The human zygote is therefore a fellow human being and, as a consequence, worthy of all the protection we afford ourselves. As a leading article in *New Scientist* put it, "the idea of experimenting on human embryos leaves a nasty taste in the mouth". And as you rightly say (*Nature* 308, 1; 1984), "the sources of anxiety should be identified and recognized . . . but each of them must be met". If there really are convincing legal, logical, moral or scientific arguments that would make research on human embryos acceptable, then let's have them; clearly Warnock was not able to raise many.

To you, the opportunities in this field of experimentation may be "exciting and important"; to the great British public and many of your readers, that is not the measure of what is right and proper. These experiments are considered to be sinister and inappropriate and to be forbidden.

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