

# Where now with nuclear winter?

*The US academy's predictable plea for more research should be granted if people are that worried. But the real need is for steady nerves — and atmospheric physics.*

THE US National Academy of Sciences' report *The effects on the atmosphere of a major nuclear exchange* (see p.683, this issue) turns out to be what it always had to be, a first or, rather (*pace* Turco *et al.*, *Science* 222, 1283–1292; 1983), a second approximation to reality. The original account of what might happen if the atmosphere is loaded with soot from the fires ignited by 5,000 megatons of TNT in nuclear explosions is qualitatively confirmed, but hedged around with so many qualifications that a null outcome could well be compatible with the academy committee's analysis. Nuclear winter, in other words, would almost certainly be less severe, less widespread and shorter-lasting than Turco *et al.* originally declared and might even be indistinguishable from nuclear summer (which is not a pleasant prospect either). That, no doubt, is why the academy's committee has studiously refrained from using the term "nuclear winter", which is a pity; the phrase is too graphic to be ignored.

As things are, the new report will be mullied over by specialists in the field for its review of what is known of problems as different as the size-distribution of particles of smoke, the mechanisms by which the fireballs of nuclear explosions loft material to high altitudes and the ways in which climatic models may have to be refined to accommodate the needs of those who would model nuclear winter. (Cloud formation, as always, is a bugbear, what happens at the edges of a cloud a novel problem.) Latecomers in the field may, for the time being, be perplexed to know what more there can be to say, but no doubt reflection and ingenuity will enable them to think of something.

In passing, however, it must seem to many people odd that the nuclear winter subcommittee of the International Council of Scientific Unions (ICSU)'s Scientific Committee on Problems of the Environment (SCOPE), which is due to publish its own study next June, should have been able to afford time for a five-day workshop at Bellagio to draft and put out a statement which, on the face of things, will compromise the impartiality of its own work. The statement says that the prevention of nuclear war is a challenge for mankind (true), that there is "no hope" that technical innovations such as "weapons systems in space" will provide "clear superiority or significant protection" (which is probably true) and that

everybody must be "aroused" to the threat of nuclear war and to "the possibility that in some circumstances one of the results may be what has come to be called nuclear winter . . .".

The notorious ineffectualness of manifestoes apart, the danger of such statements is twofold. First, they give the impression that the issue has been decided before the study is complete. And, second, by giving needless offence to people who disagree, however wrong-headedly, with steps in their argument such as the assertion that space-based defence against ballistic missiles is impossible, they diminish their potential influence. That such a distinguished group of people (which includes Lord Zuckerman, Professor Charles Townes and Professor Abdus Salam) should be predicating its proposals for the avoidance of nuclear war on "fundamental changes in international relations, especially . . . between the Soviet Union and the United States", for all the world like old Keir Hardie socialists predicating social equality on "a change of heart", is nevertheless remarkable. The more serious problem of arms control is to avoid nuclear war even when the superpowers are daggers drawn.

This prompts one of the three general questions raised by the National Academy's deadpan text (which lets slip a flicker of emotive prose only in its last sentence, "one can ask whether even now the full range of physical consequences . . . of nuclear warfare is within our comprehension") and by the way in which the concept of nuclear winter has been used this past year. Politicians have embraced the idea (see *Nature* 13 December, p.593), usually with the best of motives. Technical people have followed suit, not for reasons that are political in the partisan sense but apparently in the belief that the threat of nuclear winter will persuade governments towards effective arms control. The risk is that such an incentive can be no more substantial than the threat. Some have further endangered their position by using the same bogey-man against extraneous targets as when Professor Paul Ehrlich told a BBC radio audience the other day that the British government's arrangements for civil defence were "nonsense", perhaps not knowing that those plans are justifiable only against a few bombs not an attack that could cause nuclear winter.

One of the technical community's admirable achievements, in what other com-

munities call the nuclear age, is its stiffness of purpose about the need somehow to contain the threat that a third nuclear weapon, then perhaps a fourth, and so on, might be used in anger. What those who work the nuclear-winter lobby overlook, or even reject outright, is that occupants of other lobbies, even the star-wars bunch, are equally steadfast in saying that their objective is to avoid nuclear hostilities. Logic-chopping in such circumstances serves little purpose (but in the 1950s it persuaded nuclear governments that the risk of genetic defects from fallout was too great to allow unrestrained nuclear testing in the atmosphere). The sad truth is that trying to bridge this gap is a plainly more formidable task than that of winning more general huzzas by identifying a hazard that others have not seen.

In the circumstances that have now developed, it is hard to know what should be done. The National Academy report asks that there should be more research. It does not say how much more. What the report has done is to identify a series of important and interesting problems in atmospheric physics that, in their own right, deserve attention. Dealing with them under the contrived rubric of nuclear winter rather than atmospheric physics will be artificial and even uneconomic. The price worth paying will depend on how deeply and generally ingrained is the belief in the certainty of nuclear winter after nuclear war. The ideal would be to spend the extra on atmospheric physics.

What should be done? Bigger and better models are not the immediate need. What the argument about nuclear winter has vividly demonstrated is that future models need better ways of dealing with physical processes in the atmosphere. After a century of research (since C.T.R. Wilson), the dynamics of cloud formation is only poorly understood, yet clouds provide the rain that cleanses the atmosphere of nuclear smoke as well as other things. Taking account of discrete clouds (as distinct from average cloudiness) in climatic models remains a puzzle. Dealing with what happens when contiguous columns in the atmosphere differ sharply in constitution (as at the edge of a cloud of nuclear smoke) is an interesting challenge. It may not be one of those "fundamental and moral challenges to all of humanity" referred to in the preamble to the SCOPE subcommittee's manifesto, but it might help people to sleep more easily in their beds. **John Maddox**