such a policy is particularly important in order to avoid any conflict of interest, or even appearance of conflict of interest, between public responsibility and personal benefit.

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Will Deterrence Survive a Nuclear Winter?

Herbert A. Simon (Editorial, 24 Feb., p. 775) notes that the public has received the "nuclear winter" findings (23 Dec. 1983, p. 1283; p. 1293) as "just one more chapter," possibly the final, in the story of Armageddon. He correctly points out that the findings on nuclear winter differ from other research results on the consequences of nuclear war not only in severity but in strategic and policy implications (*1*). His conclusion that a scientific confirmation of the nuclear winter findings would render nuclear weapons suicidal, however, and that "the futility of mutual deterrence [would be] complete," ignores the devastating consequences of a nuclear strike below the nuclear winter threshold.

Even if we assume that the results of the nuclear winter scenario of lowest explosive yield, 100 megatons, were replicated in upcoming collaborations (Letters, 13 Apr., p. 110) and, even if we were to attach a 99 percent confidence interval of ±5 megatons to the threshold point estimate (given that other assumptions of the model were met), each side would still be capable of launching a nuclear attack of more than 90 megatons without committing suicide. With the new generation of American Pershing II and ground-launched cruise missiles averaging between 10 and 50 kilotons per warhead, the United States would be able to launch thousands of nuclear weapons. The Soviet Union, with its SS-20 missiles and corresponding developments, would also be able to launch several hundred, if not thousands, of weapons. To put this into perspective, the Cuban Missile Crisis, which involved enough missiles to kill 80 million Americans (*2*), arose from concern over 42 medium-range ballistic missiles and 24 to 32 intermediate-range ballistic missiles.

Thus, even if the nuclear winter findings were confirmed, the motivation for each side to maintain a deterrent would likely continue. What would change is not deterrence, but the deterrent itself. The deterrent for optimal security would move from the most powerful nuclear force available to a nuclear force positioned in such a way that it would take more than the nuclear winter threshold amount of weapons (plus a margin of error) to destroy the target's retaliatory capacity. Any nuclear weapons beyond that amount would not only be militarily superfluous, they would, as Simon indicates, contribute a nonzero probability of accident or miscalculation.

This probability is far from negligible. In fact, William Perry, former under secretary of defense for research and engineering and member of the President's Commission on Strategic Forces, has asserted that "the most realistic danger posed by nuclear weapons is the risk of nuclear war by accident or miscalculation" (*3*, p. 18). The worldwide network of nuclear warheads is a system with 50,000 "moving parts," each component of which includes still more parts in its own system and linkage to the network. In view of these numbers, it is hardly surprising that there have been hundreds of American false alarms depicting an imminent Soviet attack and at least 32 Broken Arrows, or major accidents involving nuclear weapons (*4*). No comparable figures are available for Soviet nuclear accidents.

One of the most effective ways to reduce the chances of a nuclear war is, of course, to reduce the number of operative nuclear weapons, and here rests the central policy implication of a nuclear winter threshold. What the findings on nuclear winter contribute is an assurance that, at present levels of armament, a reduction of our nuclear forces will not lead to a reduction in our nuclear deterrent. The United States nuclear arsenal stands at more than 10,000 megatons today, and the Soviet arsenal, at somewhat more than that. If a nuclear winter threshold of 100 to 200 megatons were confirmed, this would mean that the nuclear disarmament equivalent of more than 90 percent of all existing explosive yield could be safely undertaken without even addressing the issues of deterrence and verification (as cheating would be to no advantage).

While the confirmation of a nuclear winter threshold may well replace nuclear deterrence as we have come to know it in the 1980's, it will certainly not supplant nuclear deterrence in general; confusion of the two is but a testament to how much fat can be trimmed before hitting the bone of the problem.

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Immortality

In the article "Gene therapy method shows promise" (Research News, 30 Mar., p. 1376) Gina Kolata states that "Cells of the bone marrow . . . contain stem cells that are immortal . . . and they essentially divide indefinitely." This notion, if true, has profound implications in many biological disciplines, not the least of which are gerontology, developmental biology, and evolution. Contrary to the quoted statement, there is no unequivocal proof of the immortality of any normal vertebrate somatic cell population studied in vivo or in vitro (*1*). In fact, the literature is replete with reports of the replicative finitude of normal bone marrow cells and other normal hematopoietic stem cells. A few examples are given here (*2*).

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The choice of the word "immortal" was unfortunate, but I hope that most readers will have understood what was meant. After all, it takes a long time to show that any cells are truly immortal.

—GINA KOLATA

Erratum: In the article "Inherently safe reactors and a second nuclear era" by Alvin M. Weinberg and Irving Spiewak (29 June, p. 1398), figures 1 and 2 were interchanged. The captions are correct.

Erratum: In the credit for the photograph on page 1086 of the issue of 8 June accompanying the Research News article "Crystal anisotropy directs solidification" by Arthur L. Robinson (p. 1085), Kurt Nassau's affiliation is incorrectly given as Western Electric. Nassau is at AT&T Bell Laboratories, Murray Hill, New Jersey.