# Armageddon Revisited

*The government's latest profile of World War III fails to consider climatic effects*

THE quality of life after World War III, according to two recent reports, is likely to be better, or worse, than war planners have assumed. The optimistic view comes from civil servants at the Federal Emergency Management Agency (FEMA), and the dark view from members of an international scientific body known as the Scientific Committee on Problems of the Environment (SCOPE).

FEMA came out with its optimistic interpretation last month in a report called the "Nuclear Attack Planning Base–1990" (NAPB-90). The document will be sent to every state emergency planner in the nation for comment and, later, for use in civil defense plans. According to study director Ronald Treichel, NAPB-90 improves upon a 1975 survey of the same kind. It should come as no surprise that other FEMA officials see the new study as a mandate for spending more money on postwar survival schemes—FEMA's specialty.

In FEMA's report, 130 million U.S. citizens are classified as living in areas where bomb blast overpressures, heat, and radiation would be severe. The people in this high-risk category face a "sure probability of being injured or killed." FEMA interprets this as good news because its 1975 study concluded that 156 million Americans (26 million more than now) were in this category. FEMA thinks that as many as 112 million (up from 86 million in 1975) live outside the perimeter of immediate death and have a fair chance of living beyond the first hours of a nuclear attack.

The reason for the new scenario, officials say, is that FEMA has modernized its target assumptions. When FEMA last peered into the abyss in 1975, it assumed that the Soviet Union would detonate two warheads on each target, one at ground level and one in the air. This degree of overkill no longer makes sense. In addition, the agency assumed that the explosive power of each warhead would be roughly 20 megatons, about 20 times the size of devices used in more accurate modern weapons. The result was what FEMA describes as a "worst-worst case" scenario, one that no longer seems plausible. In the new study, FEMA posits a more widespread Soviet attack, but one that is more accurately focused on military and economic targets.

However, the report also says that people living outside the immediate blast zone would confront many other lethal hazards. Approximately 45 million of them live in the "low direct effect risk" zone, meaning that they might not be killed outright by blast overpressures but could be killed by flying debris or severe burns. A final 63 million live so far from targets that the direct blast effects would be of no consequence.

But even the remote 63 million are not safe. FEMA perceives a "vast and far-reaching" threat from radioactive fallout. "None of the continental U.S. land area can be considered categorically secure from this risk," it says.

The most dangerous fallout areas include the western and midwestern states where missiles are buried (Colorado, Missouri, Montana, Nebraska, North Dakota, South Dakota, and Wyoming), 30% of the U.S. landmass. These areas would be dusted with heavy fallout from ground bursts intended to destroy silos. Only people hiding in shelters capable of reducing the gamma radiation to one-fiftieth the outdoor level could expect a 50-50 chance of living for 2 months after an attack. If they were well protected in this fashion, over 15% still would die of cancer later on.

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Another 70% of the United States (supporting 170 million people) appears in the "low fallout risk" category. People in this category who find no shelter in the first week after an attack can expect "debilitating illness and possible death." For those who survive the flying debris and the fires, the quality of radiation shielding could mean the difference between life and death.

After about a week, according to FEMA, people in low-risk areas might be able to venture out of their shelters into the open to begin scratching out a postwar existence. But they must be warned that "unnecessary outdoor work should be avoided until all necessary radiological monitoring and decontamination has been completed." FEMA does not say who would do the monitoring or decontaminating.

What this analysis entirely fails to register is the impact of a nuclear attack on agriculture, trade, or any of the social institutions that support life in the 20th century. The omission is striking because this subject has been at the center of an intense debate in the scientific community in the last 5 years under the heading of "nuclear winter."

The original nuclear winter theory postulated that smoke rising from the belligerent countries would so darken the atmosphere that a catastrophic frost would ensue. Although atmospheric scientists disagreed about the severity of the chilling effect (*Science*, 16 January, p. 271), most agreed that the smoke would trigger a climatic change of global proportions. They also agreed that the social impacts would be devastating.

Researchers met in two gatherings recently, the latest in a series of efforts to smooth out their differences. The earlier meeting, sponsored by SCOPE, took place in Bangkok, Thailand, in February, and the second, sponsored by the U.S. Defense Nuclear Agency, took place in Santa Barbara, California, in April. The upshot was a statement of consensus, released at a press conference in Washington on 28 May. It was signed by Sir Frederick Warner, chairperson of SCOPE's nuclear war study group, and 11 others.* Not all disputants added their signatures, but a leading dissenter from the original nuclear winter theory, Stephen Schneider of the National Center for Atmospheric Research, says he finds the new statement sound.

The statement points out that only 1% of the world's population could survive without organized agriculture. A large nuclear war could produce enough smoke, the researchers agreed, to cause a temperature drop over much of the Northern Hemisphere lasting for weeks and possibly produce other long-term climatic disruptions lasting for months. These effects would be severe enough to cause extensive crop losses around the world, triggering a period of famine.

*A. Barrie Pittock, Thomas P. Ackerman, Paul J. Crutzen, Michael C. MacCracken, Charles S. Shapiro, Richard P. Turco, Mark A. Harwell, Thomas C. Hutchinson, Wendell P. Cropper, Jr., Christine C. Harwell, and Herbert D. Grover.

"Consequently," the SCOPE group concluded, "the majority of the Earth's human population is vulnerable to starvation following a large-scale nuclear war, even though total human extinction is not predicted." This means that the climatic effects of a nuclear war are likely to be more significant than the direct blast effects.

Why, then, did FEMA ignore climatic effects? Treichel, the study director, says: "Nuclear winter was not considered because at the time we were producing the study, there were many, many questions about the validity of the theory and the assumptions that were made." It will not be included in FEMA's attack planning base until scientists come up with "a conclusive theory that's scientifically acceptable."

Many local planning agencies will find a use for FEMA's weighty report, despite its limitations. But one that will not is the Emergency Preparedness Office of Washington, DC. It happens to be the planning body closest to FEMA headquarters, a colleague by virtue of living within the same target coordinates. "I don't know what we'll do with [NAPB-90]," says spokesperson Cecilia Perry. "The District of Columbia doesn't have any plan for a nuclear attack." The citizens of ground zero decided by referendum in 1982 that it would be a waste of time to devise a civil defense strategy. ■

ELIOT MARSHALL

# IOM Elects New Members

The Institute of Medicine has elected 40 new active members and 5 new senior members. This brings the total active membership to 466 and the total senior membership to 266. The new active members are:

**Marshall H. Becker,** health behavior and health education, University of Michigan School of Public Health, Ann Arbor; **Leslie Z. Benet,** pharmacy, University of California, San Francisco; **Michael S. Brown,** molecular genetics, University of Texas Health Science Center; **Doris H. Calloway,** provost, University of California, Berkeley; **John W. Colloton,** director, University of Iowa Hospitals and Clinics; **Joseph M. Davie,** preclinical research, G. D. Searle & Co.; **Anthony S. Fauci,** director, National Institute of Allergy and Infectious Diseases; **Suzanne W. Fletcher,** medicine, University of North Carolina School of Medicine, Chapel Hill; **Joseph L. Goldstein,** molecular genetics, University of Texas Health Science Center; **Richard W. Hanson,** biochemistry, Case Western Reserve University School of Medicine; **Birt Harvey,** pediatrician, Palo Alto, CA; **Bernadine Healy,** chairman, Research Institute, The Cleveland Clinic Foundation; **Samuel Hellman,** physician-in-chief, Memorial Sloan-Kettering Cancer Center; **King K. Holmes,** medicine, University of Washington, Seattle; **Donald R. Hopkins,** deputy director, Centers for Disease Control; **Richard T. Johnson,** microbiology and neuroscience, Johns Hopkins Medical Institutions; **Jerome Kagan,** human development, Harvard University; **Philip J. Landrigan,** community medicine, Mount Sinai School of Medicine; **Gerald D. Laubach,** president, Pfizer, Inc.; **Paul C. MacDonald,** obstetrics-gynecology and biochemistry, University of Texas Southwestern Medical School, Dallas.

**Adel A. F. Mahmoud,** medicine, Case Western Reserve University School of Medicine; **Manuel Martinez-Maldonado,** medicine and physiology, University of Puerto Rico School of Medicine; **Howard E. Morgan,** physiology, Milton S. Hershey Medical Center, Pennsylvania State University; **Adrian M. Ostfeld,** epidemiology and public health, Yale University School of Medicine; **Mark V. Pauly,** health care management and economics, University of Pennsylvania Leonard Davis Institute of Health Economics; **Charles E. Putnam,** radiology, Duke University Medical Center; **Alan S. Rabson,** cancer biology and diagnosis, National Cancer Institute; **Steven A. Rosenberg,** surgery, National Cancer Institute; **Roger A. Rosenblatt,** family medicine, University of Washington School of Medicine, Seattle; **Russell Ross,** pathology, University of Washington School of Medicine, Seattle; **Arthur H. Rubenstein,** medical sciences, University of Chicago; **Abraham M. Rudolph,** pediatrics, physiology, obstetrics, gynecology, and reproductive sciences, University of California School of Medicine, San Francisco; **Alan C. Sartorelli,** pharmacology, Yale University School of Medicine; **David Satcher,** president, Meharry Medical College; **Edward H. Shortliffe,** medicine and computer science, Stanford University School of Medicine; **Margaret D. Sovie,** nursing practice, University of Rochester School of Nursing; **Michel M. Ter-Pogossian,** radiation sciences, Washington University Medical Center, St. Louis; **Samuel A. Wells, Jr.,** surgery, Washington University School of Medicine, St. Louis; **Ioannis V. Yannas,** polymer science and engineering, Massachusetts Institute of Technology; **Edward Zigler,** psychology, Yale University.

The new senior members are:

**Henry L. Barnett,** medical director, Children's Aid Society, New York; **Minor J. Coon,** biological chemistry, University of Michigan Medical School, Ann Arbor; **Howard A. Eder,** medicine, Albert Einstein College of Medicine; **Morton Kramer,** mental hygiene, Johns Hopkins University School of Hygiene and Public Health; **Alexander R. Margulis,** radiology, University of California School of Medicine, San Francisco.

*Briefing:*

## States Want More Time to Prepare SSC Bids

Three members of the House Science, Space, and Technology Committee are urging committee members to support an amendment to give states five more months to prepare site proposals for the Superconducting Super Collider (SSC). Without an extension of the 1 August filing deadline, several states will be precluded from preparing "a truly competitive response," say Representatives Tim Valentine (D–NC), Marilyn Lloyd (D–TN), and Sid Morrison (R–WA) in a 19 May letter to colleagues.

Slipping the date to 31 December is justified, they argue, because the Department of Energy (DOE) failed to recognize that many states were not able to begin preparing the submissions until President Reagan submitted the SSC proposal to Congress in February.

On another front, the Senate has approved an amendment to the supplemental appropriation bill for fiscal year 1987 that alters the rules of the competition between states for the $4.4-billion SSC. The amendment, put forward by Senator Pete Domenici (R–NM), would require DOE to pick the site on the basis of quality—not just the packages offered by finalists. The amendment is supposed to put poorer states on a more equal footing with wealthier ones.

Meanwhile, DOE may shift the management of the SSC's Central Design Group away from University Research Associates (URA). The organization also runs Fermi National Accelerator Laboratory in Illinois, a candidate site for the SSC. DOE is worried that the selection process may appear tainted if URA is awarded a new contract for the design group. ■ **M.C.**