



The Problem of Biological Weapons

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Introduction: Carl Kaysen, David W. Skinner Professor of Political Economy Emeritus, Massachusetts Institute of Technology

No one has more distinguished qualifications for speaking in an authoritative, informative, and stimulating way about biological weapons than does Matthew Meselson. He is a biological scientist, a student of warfare, a reflective observer, and an effective participant in the national and international political processes that shape war and peace.

Matt received his undergraduate education in liberal arts from the University of Chicago and moved on to graduate study in physical chemistry at the California Institute of Technology, where he received his Ph.D. in 1957. After appointments as a research fellow, assistant professor of chemistry, and senior research fellow in chemical biology at CalTech, he came to Harvard in 1961 as an associate professor of molecular biology. In 1964 he became a full professor and in 1976 was appointed Thomas Dudley Cabot Professor of the Natural Sciences.

His scientific research, I am told, covers a broad range of problems in molecular genetics. In an important early experiment, Matt and Franklin Stahl demonstrated that in the division of a bacterial cell, one strand of the DNA double helix goes to each daughter molecule, thus preserving the parental genetic code in each and demonstrating how DNA replicates. Working with invertebrates of the phy-

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lum Rotifera, Matt is currently studying how sexual reproduction is maintained in evolution.

The awards and honors for his scientific work constitute a long list, including the Thomas Hunt Morgan Medal of the Genetics Society of America, the Eli Lilly Award in Microbiology and Immunology, and the National Academy of Sciences Prize in Molecular Biology. He holds honorary degrees from Chicago, Columbia, Princeton, and Yale Universities and is a member of the National Academy of Sciences, the American Philosophical Society, the Royal Society, the Académie des Sciences (Paris) and the Accademia Sanctae Clarae (Genoa). He was elected to the American Academy of Arts and Sciences in 1962.

For more than three decades, Matt has had an active interest in the threats posed by chemical and biological warfare. Demonstrating the same energy, persistence, and inventiveness in this domain as he does in science, he has been a consultant to government agencies, a leader in nongovernmental efforts to deepen public understanding of the potential threats of chemical and biological weapons, and a force in both pushing and helping governments to participate in arms control agreements. About these activities I can speak from my own knowledge and observation.

Jointly with Julian Robinson of the University of Sussex, Matt has directed the Harvard Sussex Program on CBW Armament and Arms Limitation. To deepen his own understanding of these weapons and the context of their potential use, he created and for two years taught a Harvard course on conventional warfare.

Matt's notable achievements in the domain of arms and arms control include the following:

- He demonstrated that the 1979 anthrax epidemic in Sverdlovsk resulted from a release of an anthrax aerosol from a Soviet military enclave, killing people as much as 5 kilometers distant and sheep as much as 50 kilometers away.
- He disproved US charges of biological warfare in

Laos and Cambodia in the late 1970s and early 1980s. In early 1982 Alexander Haig, then secretary of state, accused the Soviets of providing North Vietnam with biotoxins that were subsequently released from the air over Laotian and Cambodian villages. Later in the year, the charges were repeated by Haig's successor, George Schultz, and widely publicized by the Reagan administration as examples of Soviet violations of arms control agreements. In a tour de force of biochemical, zoological, botanical, and forensic investigation, Matt showed that the so-called yellow rain was nontoxic bee excrement discharged in flight and that the initial reports of toxins could not be verified in further tests. An international conference held at the House of the Academy in April 1983 helped establish these conclusions.

- He undertook a major role in mobilizing expert and public opinion in support of US ratification of the Chemical Weapons Convention in 1994, the year it went into effect.

Matt continues to pursue these efforts, inter alia, as a member of the Academy's Committee on International Security Studies. In recognition of his work, he has been honored with the Public Service Award of the Federation of American Scientists, the Leo Szilard Award of the American Physical Society, and the Scientific Freedom and Responsibility Award of the American Association for the Advancement of Science.

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Every major technology—metallurgy, explosives, internal combustion, aviation, electronics, nuclear energy—has been intensively exploited, not only for peaceful purposes but also for hostile ones. Must this also happen with biotechnology, certain to be a dominant technology of the coming century?

Such inevitability is assumed in "The Coming Explosion of Silent Weapons" by Commander Stephen Rose (*Naval War College Review*, Summer

1989), an arresting article that won essay awards from the US Joint Chiefs of Staff and the Naval War College:

The outlook for biological weapons is grimly interesting. Weaponeers have only just begun to explore the potential of the biotechnological revolution. It is sobering to realize that far more development lies ahead than behind.

If this prediction is correct, biotechnology will profoundly alter the nature of weaponry and the context within which it is employed. During World War II and the cold war, the United States and the Soviet Union developed and field-tested biological weapons designed to attack people and food crops over vast areas. During the century ahead, as our ability to modify fundamental life processes continues its rapid advance, we will be able to devise additional ways not only to destroy life but also to manipulate it—including the processes of cognition, development, reproduction, and inheritance.

A world in which these capabilities are widely employed for hostile purposes would be a world in which the very nature of conflict had radically changed. Therein could lie unprecedented opportunities for violence, coercion, repression, or subjugation. Movement toward such a world would distort the accelerating revolution in biotechnology in ways that would vitiate its vast beneficial application and could have inimical consequences for the course of civilization.

Is this what we are in for? Is Commander Rose right? Or will the factors that have thus far prevented the use of biological weapons survive into the coming age of biotechnology? After all, despite the fact that the technology of devastating biological weapons has existed for decades, their only use in war appears to have been that of the Imperial Japanese Army in Manchuria more than half a century ago.

The longstanding norm against any use of biological weapons serves not only to constrain the actions of the majority who are influenced by it but also to enhance the deterrence of any who may be disposed