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The Problem of Biological Weapons

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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 twenty-first century?

Such inevitability is assumed in "The Coming Explosion of Silent Weapons" by Commander Steven Rose (*Naval War College Review*, Summer 1989), an arresting article that won 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, the United Kingdom, and the Soviet Union developed and field-tested biological weapons designed to attack peo-

ple 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 not only to devise additional ways to destroy life but will also become able 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 towards such a world would distort the accelerating revolution in biotechnology in ways that would vitiate its vast potential for 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 thus far have prevented the use of biological weapons survive and even be augmented in the coming age of biotechnology? After all, despite the fact that the technology of potentially devastating biological weapons has existed for decades, and although stocks of such weapons were produced during the Cold War, their only use appears to have been that by the Imperial Japanese Army in Manchuria more than half a century ago.

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A similar history of restraint can be traced for chemical weapons. Although massively used in World War I and stockpiled in great quantity during World War II and the Cold War, chemical weapons—despite the hundreds of wars, insurgencies, and terrorist confrontations since their last large-scale employment more than 80 years ago—have seldom been used since. Their use in Ethiopia, China, Yemen, and Vietnam, and against Iranian soldiers and Kurdish towns, are among the few exceptions. Indications that trichothecene mycotoxins had been used in Laos and Cambodia in the 1970s and 1980s proved to be illusory.

Instead of the wave of chemical and biological terrorism some feared would follow the Sarin gas attacks perpetrated by the Aum Shinrikyo cult in Japan in 1994 and 1995, or would be occasioned by the arrival of the new millennium, there has been only an epidemic of "biohoaxes" and several relatively minor "biocrimes", confined almost entirely to the USA. Nothing has come to light that would contradict the 1996 assessment of the Federal Bureau of Investigation, reaffirmed in July 1999, that:

> Our investigations in the United States reveal no intelligence that state sponsors of terrorism, international terrorist groups, or domestic terrorist groups are currently planning to use these deadly weapons in the United States.

Continued surveillance to deter and forestall terrorist violence and contingency plans to limit and ameliorate the consequences, if it should occur, certainly merit the attention and resources of government. But sensationalist publicity is at odds with the historical record.

Whatever the reasons—and several have been put forward—the use of disease and poison as weapons has been extremely limited, despite the great number of conflicts that have occurred since the underlying technologies of the weapons became accessible. Human beings have exhibited a propensity for the use, even the veneration, of weapons that bludgeon, cut, or blast, but have generally shunned and reviled weapons that employ disease and poison. We may, therefore, ask if, contrary to the history of other major technologies, the hostile exploitation of biotechnology can be averted.

The factor that compels our attention to this question is the possibility that any major turn to the use of biotechnology for hostile purposes could have consequences qualitatively very different from those that have followed from the hostile exploitation of earlier technologies. Unlike the technologies of conventional or even nuclear weapons, biotechnology has the potential to place mass destructive capability in a multitude of hands and, in coming decades, to reach deeply into what we are, and how we regard ourselves. It should be evident that any intensive exploitation of biotechnology for hostile purposes could take humanity down a particularly undesirable path.

Whether this happens is likely to depend not so much on the activities of lone misanthropes, hate groups, cults, or even minor states as on the policies and practices of the world's major powers.

In the United States, there was abrupt and remarkable change—from nearly thirty years of being deeply engaged in the development, testing, and production of biological weapons to the dramatic and unconditional US renunciation of biological weapons declared by President Nixon in November 1969 and the US renunciation of toxins three months later. Today, the former US offensive biological weapons programme, and the logic behind its abolition, are largely forgotten, although there are valuable lessons to be learned from both.

During World War II, research, development, and pilot-scale production of biological weapons was centred at Fort (then Camp) Detrick, in Maryland. Large-scale production was planned to take place at a plant near Terre Haute, Indiana, built in 1944 for the production of anthrax spore slurry and its filling into bombs. Equipped with twelve 20,000-gallon fermentors, it was capable of producing fill for 500,000 British-designed 4-pound anthrax bombs a month. Although the United Kingdom had placed a large order for anthrax bombs in

1944, and the plant was ready to begin weapons production by the following summer, the war ended without it having done so.

Contrary to the view that biological weapons are easy to develop and produce, by the end of the war Fort Detrick comprised some 250 buildings and employed approximately 3,400 people, some engaged in defensive work but many in the development and pilot production of weapons. Several years after the end of the war, the Indiana plant was demilitarized and leased to industry for production of antibiotics. It was replaced by a more modern and flexible biological weapons production facility constructed at Pine Bluff Arsenal, in Arkansas, which began production late in 1954 and operated until 1969.

A major effort of the 1950s was encompassed under Project St. Jo, a programme to develop and test anthrax bombs and delivery methods for possible wartime use against Soviet cities. In order to determine quantitative munitions requirements, 173 releases of non-infectious aerosols were secretly conducted in Minneapolis, St. Louis, and Winnipeg—cities chosen to have the approximate range of conditions of climate, urban and industrial development, and topography that would be encountered in the major potential target cities of the USSR. The weapon to be used was a cluster bomb holding 536 biological bomblets, each containing 35 millilitres of anthrax spore slurry and a small explosive charge fused to detonate upon impact with the ground, thereby producing an infectious aerosol to be inhaled by persons downwind.

In later years, a strain of the bacterial pathogen of tularemia, less persistent and with an average human infectious dose more reliably known than that for anthrax spores, was standardized by the US military as a lethal biological agent. Other agents—the bacteria of brucellosis, the rickettsia of Q-fever, and the virus of Venezuelan equine encephalomyelitis, as well as fungi for the destruction of rice and wheat crops—were also introduced into the US biological weapons stockpile, along with improved biological bomblets for high-altitude delivery by strategic bombers and spray tanks for dissemination of biological agents by low-flying aircraft. According to published accounts, these developments culminated in a major series of biological weapons field tests using various animals as targets, conducted at sea in the South Pacific in 1968.

Soon after Richard Nixon became President, a comprehensive review was undertaken of US biological weapons programmes and policies—which had been unexamined and unanalysed by policy makers for fifteen years. Each relevant government department and agency was instructed to present its evaluation of the arguments for and against each of several options, ranging from retention of the offensive BW programme to its entire abolition. Following this review,

the President announced that the United States would unilaterally and unconditionally renounce biological weapons. The US biological weapons stockpiles were destroyed and the facilities for developing and producing them were ordered dismantled or converted to peaceful uses. President Nixon pledged that the US biological programme would be restricted to "defensive purposes, strictly defined". He also declared that, after nearly 50 years of US recalcitrance, he would seek Senate agreement to US ratification of the 1925 Geneva Protocol prohibiting the use in war of chemical and biological weapons. In addition, he announced US support for an international treaty proposed by the United Kingdom, banning the development, production, and possession of biological weapons, leading to the Biological Weapons Convention (BWC) of 1972.

It is important to note that these US decisions went far beyond the mere cancellation of a programme. They renounced, without prior conditions, even the option to have biological and toxin weapons. What was the underlying logic?

First, it had become evident through the results of the US biological weapons programme that deliverable biological weapons could be produced that, although subject to substantial operational uncertainties, would be capable of killing people, livestock, and crops over large areas.

Second, it was realized that the US biological weapons program was pioneering a technology that, although by no means simple to bring into existence, could be duplicated by others with relative ease, enabling a large number of states to acquire the ability to threaten or carry out destruction on a scale that could otherwise be matched by only a few major powers. The US offensive programme, therefore, risked creating additional threats to the nation with no compensating utility or benefit, and would undermine prospects for combating the proliferation of biological weapons.

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The clear policy implication, reinforced by widespread abhorrence for any use of disease as a weapon, was that the United States should convincingly renounce biological weapons and seek to strengthen international barriers to their development and acquisition. The US renunciation of biological weapons was seen as a major step away from a universal menace. As wisely expressed by President Nixon, "Mankind already carries in its own hands too many of the seeds of its own destruction."

The BWC entered into force in 1975—the first worldwide treaty to prohibit an entire class of weapons. The Convention now has 143 states parties, the most important holdouts being in the Middle East. Unlike the Chemical Weapons Convention (CWC) of 1993, it has no organization, no budget, no inspection provisions, and no built-in sanctions—only an undertaking by its

states parties never in any circumstances to develop, produce, stockpile or otherwise acquire or retain:

> (1) Microbial or other biological agents or toxins, whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes;
>
> (2) Weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict.

The significance of the BWC lies in its statement of a clear norm—reinforced by international treaty—prohibiting any exploitation by states of biological agents and toxins for hostile purposes. It is important to note that its prohibition of biological agents and toxins for all but "peaceful purposes" and its reference not only to "armed conflict" but, more generally, to "hostile purposes" make the BWC applicable not only to hostile purposes of a state directed against another state but also to hostile purposes of a state directed against its own citizens or anyone else. Thus, the BWC embodies an international norm and provides a legal bulwark against the exploitation of biological agents or toxins by states for hostile purposes whether in armed conflict or in any other circumstances.

While the United States renounced biological weapons and abided by the BWC, the Soviet Union did not. According to statements by officials of the former Soviet programme, it was believed that the US renunciation was a hoax, intended to hide a secret offensive programme. Aware of the post-war US biological weapons programme and of the dynamic US lead in molecular biology and biotechnology, the Soviet Union continued and intensified its preparations to be able to employ biological weapons on a large scale.

An example was the standby facility built in the early 1980s for the production of anthrax bombs at Stepnogorsk, in what is now the independent republic of Kazakhstan. Recently dismantled in cooperation with Kazakhstan under the US Cooperative Threat Reduction Program, it was equipped with ten 20,000-litre fermentors; apparatus for the large-scale drying and milling of the agent to a fine powder; machines for filling it into bombs; and underground facilities for storage of filled munitions. According to its Cold War deputy director, the facility conducted numerous developmental and test runs but never produced a stockpile of anthrax weapons. Nevertheless, there is no doubt that its purpose was to provide a capability to commence production on short notice if ordered to do so.

Field testing of Soviet aircraft and missile delivery systems for biological agents was conducted on Vozrozhdeniye Island in the Aral Sea. In a 1998 inter-

view with a Moscow newspaper, the general in charge of Russian biological defence is quoted as saying that activities at the test site in the 1970s and 1980s were "in direct violation of the anti-biological treaty".

The Russian Federation has done little to convince other nations that the military core of the Soviet biological weapons programme has been dismantled. The former Soviet biological weapons facilities at Ekaterinburg, Sergiyev Posad and Kirov remain closed to foreigners. The US-Russian-British discussions that had achieved agreement on the principle of reciprocal visits to each other's military biological facilities, as a means of resolving ambiguities, have foundered and are in abeyance. Resolving the problem and establishing conditions that will allow the nations to cooperate in fostering global compliance with the BWC will require that the matter be accorded high priority on the agenda of US-Russia dialogue.

At present, we appear to be approaching a crossroads—a time that will test whether biotechnology, like all major predecessor technologies, will come to be intensively exploited for hostile purposes, or whether instead our species will find the collective wisdom to take a different course. An essential requirement is international agreement that biological and chemical weapons are categorically prohibited. With the BWC and the CWC both in force for a majority of states, including all the major powers—and notwithstanding the importance of achieving full compliance and expanding the membership of both treaties still further—the international norm of categorical prohibition is clearly established.

The CWC, now with 135 states parties, prohibits the development, production, acquisition, retention, transfer, and use of chemical weapons. Like the BWC, its prohibitions are purpose-based, so that a toxic chemical or precursor intended for peaceful purposes—so long as its type and quantity are consistent with such purposes—is not a chemical weapon within the meaning of the Convention. As with the BWC, this criterion for what is and what is not prohibited, termed the General Purpose Criterion, is intended both to avoid hampering legitimate activities and to help keep the Convention from becoming outmoded by technological change. Also like the BWC, the language of the CWC is applicable not only to prohibited weapons intended for use against another state but also to such weapons intended by a state for use against anyone.

The stringent verification provisions of the CWC, designed with the active participation of the chemical industry, require initial declaration of chemical weapons and chemical weapons production facilities, and subsequent verification on-site of the correctness of the declarations. Declared chemical weapons and chemical weapons production facilities must be secured and subject to routine inspection until they are destroyed, and such destruction must be verified

on-site. Facilities that produce more than designated amounts of certain chemicals, deemed to be of particular importance to the objective of preventing diversion for chemical weapons purposes, must be declared annually and be subject to inspection. Suspect sites, whether declared or not, are subject to short-notice challenge inspection under managed access procedures designed to protect legitimate confidential information and to avoid abuse. All inspections are conducted by experts of the Technical Secretariat of the Organization for the Prohibition of Chemical Weapons (OPCW), the international operating arm of the CWC headquartered in The Hague. In the three years since April 1997, when the CWC entered into force, there have been nearly 700 inspections at declared sites. These include 60 chemical weapons production facilities in nine states (China, France, India, Iran, Russia, the UK, the USA, and one other and the Aum facility in Japan) and 31 chemical weapons storage sites in four states (India, Russia, the USA, and one other), holding 8.4 million chemical munitions and bulk containers, most of them in Russia and the USA.

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In Geneva, the Ad Hoc Group of States Parties to the BWC is negotiating a protocol to strengthen the Convention, including measures for verification. There is general agreement that there should be an international operating organization similar to the Technical Secretariat of the OPCW, and that there should be initial declarations of past offensive and defensive BW activities and of current biodefence programmes and facilities, vaccine production facilities, maximum containment facilities, and work with listed agents. It is also generally agreed that there should be provision for challenge investigation at the request of a state party, including investigation on-site, of suspected breach of the Convention.

In order to encourage accuracy in declarations, and to help deter prohibited activities from being conducted under the cover of otherwise legitimate facilities, some states believe that declared facilities should be subject to randomly-selected visits by the international inspectorate, using managed access procedures to protect confidential information, similar to those practiced under the CWC. Other states and certain pharmaceutical trade associations have so far opposed such on-site visits. Other important matters, including the scope and content of declarations, the procedures for clarifying ambiguities in declarations, the substantive and procedural requirements for initiating an investigation, measures for assistance and protection against biological weapons, measures of peaceful scientific and technological exchange, and provisions affecting international

trade in biological agents and equipment, also remain to be resolved and are the subject of intense negotiation.

What can international treaties like the CWC and a strengthened BWC accomplish? First, they define agreed norms, without which arms prohibitions cannot succeed. Second, their procedures for declarations and on-site visits, monitoring, and investigation, including challenge investigation, pose the threat of exposing non-compliance and cover-up, creating a disincentive for potential violators and increasing the security of compliant states. Third, these same procedures have the potential to resolve unfounded suspicions and to counteract erroneous or mischievous allegations. Fourth, the legal obligations and national implementation measures of such treaties act to keep compliant states compliant, even when they may be tempted to encroach at the limits, or to ignore violations out of political expediency. Fifth, treaty-based regimes legitimate and facilitate international cooperation to encourage compliance and to take collective action against violators, thereby enhancing deterrence. And sixth, as membership in the treaty approaches universality, and its prohibitions and obligations enter into international customary law, holdout states become conspicuously isolated and subject to penalty.

In sum, a robust arms prohibition regime like that of the CWC and the BWC, strengthened by the kind of protocol that one may hope will emerge from the present negotiation, serve both to ensure vigilance and compliance by the majority who are guided by the norm, and to enhance the deterrence of any who may be disposed to flout it.

The prohibitions embodied in the BWC and the CWC are directed primarily to the actions of states, not persons. Both conventions enjoin their states parties to take measures, in accordance with their constitutional processes, to ensure compliance anywhere under their jurisdiction, including a provision in the CWC obliging its parties to enact domestic penal legislation to this effect, and to extend it to cover prohibited acts by their own nationals wherever such acts are committed. Nevertheless, important as such domestic legal measures can be, neither the CWC nor the BWC seeks to incorporate its prohibitions into international criminal law, applicable to individuals whatever their nationality and wherever the offence was committed.

Recently, interest has developed in the possibility of enhancing the effectiveness of the BWC and the CWC by making acts prohibited to states also crimes under international law. A treaty to create such law has been drafted by the Harvard Sussex Program, in consultation with an international group of legal authorities. It is patterned on existing international treaties that criminal-

ize aircraft highjacking, theft of nuclear materials, torture, hostage taking, and other crimes that pose a threat to all, or are especially heinous. Such treaties create no international tribunal; rather their provisions for adjudication, extradition, and international legal cooperation are aimed at providing enhanced jurisdiction to national courts, extending to specific offences committed anywhere by persons of any nationality. The proposed treaty would make it an offence for any person—including government officials and leaders, commercial suppliers, weapons experts, and terrorists—to order, direct, or knowingly render substantial assistance in the development, production, acquisition, or use of biological or chemical weapons. Any person, regardless of nationality, who commits any of the prohibited acts anywhere in the world would face the risk of prosecution or extradition should that person be found in a state that supports the proposed convention. Such individuals would be regarded as *hostes humani generis*—enemies of all humanity.

International criminal law to hold individuals responsible would create a new dimension of constraint against biological and chemical weapons. The norm against using chemical and biological agents for hostile purposes would be strengthened, deterrence of potential offenders, both official and unofficial, would be enhanced, and international cooperation in suppressing the prohibited activities would be facilitated.

Avoiding the hostile exploitation of biotechnology will require wider understanding that the problem of biological weapons rises above the security interests of individual states and poses an unprecedented challenge to all.

What we see here—the non-use of biological and chemical weapons; the opprobrium in which they are generally held; the international treaties prohibiting their development, production, possession, and use; the mandatory declarations and on-site routine and challenge inspections under the CWC; the negotiations that may lead to strengthening the BWC with similar measures; and the possibility of an international convention to make biological and chemical weapons offences crimes under international law, subject to universal jurisdiction and applicable even to leaders and heads of state—suggests that it may be possible to reverse the usual course of things and, in the century ahead, avoid the hostile exploitation of biotechnology. Doing so, however, will require wider understanding that the problem of biological weapons rises above the security interests of individual states and poses an unprecedented challenge to all.