
Israel and Chemical/Biological Weapons: History, Deterrence, and Arms Control

AVNER COHEN¹

*Dr. Avner Cohen is Senior Fellow at the Center for International and Security Studies at Maryland, as well as the Program on Security and Disarmament, at the University of Maryland. He is the author of **Israel and the Bomb** (New York Columbia University Press, 1998).*

In April 1948, David Ben-Gurion, Israel's founding father and first prime minister, wrote a letter to Ehud Avriel, one of the Jewish Agency's operatives in Europe, ordering him to seek out and recruit East European Jewish scientists who could "either increase the capacity to kill masses or to cure masses; both are important."² One of the scientists Avriel recruited was a 30-year old epidemiologist and colonel in the Red Army named Avraham Marcus Klingberg. In time, Klingberg became one of Israel's leading scientists in the area of chemical and biological weapons (CBW). He was among the founding members and, subsequently, the deputy director of the Israel Institute of Biological Research (IIBR) in Ness Ziona, a dozen miles southeast of Tel Aviv.

Decades later in 1983, Professor Klingberg was secretly arrested, tried, and convicted as a Soviet spy. It took another decade until the espionage case at IIBR—one of Israel's most sensitive defense research facilities—was publicized. To this day, the Israeli security establishment treats all details of the Klingberg case as highly classified.³ Until the news of Klingberg's arrest and imprisonment was published, there was almost no public reference to Israel's CBW programs. The limited disclosures about the

Klingberg espionage case, as well as the 1991 Gulf War and the subsequent revelations about Iraq's chemical and biological programs, have aroused public curiosity and speculation regarding Israel's capabilities in the CBW field. Yet details about these programs—their history, strategic rationale, and technical capabilities—remain shrouded in secrecy.

A comparison with Israel's nuclear weapons (NW) program highlights this point. Although Israel has not acknowledged possessing NW and has declared that it "will not be the first to introduce nuclear weapons to the Middle East," the existence of the Israeli bomb has been the world's worst kept secret since about 1970.⁴ That is not the case, however, for Israel's other potential non-conventional capabilities, especially biological weapons (BW). To this day, the Israeli government has issued no policy statement on biological arms control, and it has neither signed nor ratified the 1972 Biological Weapons Convention (BWC).

This paper is an effort to penetrate the "black box" of the Israeli CBW programs. The first part provides a brief overview of the evolution of Israeli attitudes and percep-

tions on non-conventional weaponry. The second part attempts to trace, decode, and interpret Israeli history, attitudes, and current capabilities in the area of CBW, especially BW. The third part places the CBW issue in the broader context of Israeli defense policy, deterrence, and arms control, both vis-à-vis Iraq and other hostile states in the region. Finally, the paper reviews and examines Israel's approach to CBW arms control and disarmament, and how accession to the BWC and the Chemical Weapons Convention (CWC) would affect Israeli security and economic interests. All of the research for this paper was conducted exclusively with open sources.

ISRAEL AND NON-CONVENTIONAL WEAPONS

Ben-Gurion's desire to seek out scientists who could "either increase the capacity to kill masses or to cure masses" implied—in the 1948 context—an interest in biological warfare, but it also reflected a more general national imperative. In its pursuit of national survival, Israel could not avoid developing indigenous non-conventional capabilities. Since then, this imperative has remained the driving force behind Israel's pursuit of non-conventional weapons. To understand why Israel committed early on to acquiring such weaponry, one must look beyond geopolitics and state interests. Three factors were critical in shaping Israeli attitudes on matters of security and survival: (1) the Zionist ethos that led to the establishment of Israel as a nation-state; (2) the key historical memories that shaped Israel's approach to national security; (3) the unique group of leaders who were committed to the pursuit of non-conventional weapons.

Zionist ethos

From its early days, the ethos of the Zionist movement stressed the role of science and technology in advancing the dream of establishing a Jewish state. For Ben-Gurion, scientific and technological achievements were the hallmarks of the Zionist revolution, a secular manifestation of the notion of the Jews as the "chosen people." For him, science and technology had two key roles to play in the realization of Zionism: (1) to advance the Jewish homeland intellectually and materially; and (2) to provide it a better defense against its external enemies. This ethos highlighted the view that science and technology could compensate for Israel's small population and lack of natural resources. "We are inferior to other peoples in our numbers, dispersion, and the characteristics of our political life," Ben-Gurion remarked, "but no other people is su-

perior to us in intellectual prowess."⁵ As Shimon Peres put it, "Ben-Gurion believed that science could compensate for what Nature has denied us."⁶

Historical memories

The state of Israel was born in the shadow of two traumatic historical experiences: the Nazi Holocaust and the 1948 War of Independence. The memory of these events provided the subtext for Ben-Gurion's pursuit of non-conventional weaponry (in particular, the nuclear project). As a student in Istanbul, Ben-Gurion witnessed the genocide of the Armenian minority in Turkey during World War I. This horrifying experience gave him an early lesson that ethnic minorities that could not protect themselves in a hostile environment faced the real threat of genocide. The subsequent Nazi Holocaust and the failure of the world to save the Jews from Hitler forced Ben-Gurion to recognize that his people were equally vulnerable. As the Nazis decimated the Jews of Europe, the leaders of the *Yishuv*, the Zionist community in Palestine under the British mandate, felt utterly helpless.⁷ The determination to prevent a similar catastrophe from happening again strengthened Ben-Gurion's campaign for Jewish statehood after World War II.

Imbued with the lessons of the Holocaust, Ben-Gurion was consumed by fears for Israel's long-term security because of the geopolitical realities of the Arab-Israeli conflict.⁸ As the War of Independence concluded in 1949 with an impressive Israeli victory, Ben-Gurion was already worried about Israel's future. He became convinced that the cessation of hostilities would not lead to a lasting peace, but would be only a temporary pause before the next round of Arab-Israeli fighting.⁹ Two decades later, in a letter to U.S. President John F. Kennedy, Ben-Gurion stressed Israel's "unique security problem." Another Holocaust could happen to the Jewish people, he wrote, because of the depth of Arab enmity towards Israel. "It is not our democratic system, or our borders and independence alone which are threatened, but our very physical existence is at stake. What was done to six million of our brethren twenty years ago . . . could be done to the two million Jews of Israel, if, God forbid, the Israel Defense Forces are defeated."¹⁰

Ben-Gurion's strategic pessimism regarding the Arab-Israeli conflict was rooted in three fundamental convictions:

- (1) The Arab-Israeli conflict ran deep and was not amenable to a quick diplomatic solution. Only when the

Arabs were convinced that Israel could not be eradicated by force and accepted their losses as final would lasting peace become possible.

(2) The conventionally armed Israel Defense Forces (IDF) would have great difficulty deterring a pan-Arab war coalition. Given the geopolitical asymmetries of the Arab-Israeli conflict, conventional weapons might not be sufficient to ensure victory.

(3) After the Holocaust, the small Jewish community in the Middle East, lacking a formal alliance with an outside power, required an existential insurance policy for “a rainy day.”¹¹

Ben-Gurion’s conviction that the Holocaust might not be a single and unique event in Jewish history but a recurring threat became engraved in Israel’s collective psyche and its concept of national security. Beginning in the early 1950s, Israeli military planners considered a scenario in which a pan-Arab military coalition would launch a war against Israel with the aim of liberating Palestine and destroying the Jewish State. This worst-case contingency became known as *mikre ha-kol*, the “everything scenario.”¹² Israel’s pursuit of non-conventional weaponry was a direct answer to Ben-Gurion’s fundamental anxieties about national survival. Ensuring that the Holocaust would never happen again to the Jewish people meant that Israel must have the capability to deter such a calamity—if necessary by threatening to inflict a holocaust on its enemies. This conviction led the new state of Israel to build infrastructure and capabilities in all three areas of non-conventional weaponry, notwithstanding the great effort and cost involved.

Unique group of leaders

A human alliance was indispensable for Israel’s decision to pursue non-conventional weaponry; without it, such a large-scale national commitment could not have been set in motion. The alliance consisted initially of Prime Minister Ben-Gurion and his loyal scientific lieutenant, Professor Ernst David Bergmann. In the mid-1950s, the young Shimon Peres, Ben-Gurion’s chief aide, joined them. This triumvirate was critical in achieving the vision of a nuclear Israel. Less well known is the fact that the three men also played a central role in Israel’s pursuit of CBW capabilities. Despite the differences between Israel’s nuclear, chemical, and biological weapon programs, there are intriguing historical and organizational parallels, linkages, and interactions among them.

It is important to recognize that as a matter of national policy, Israel’s pursuit of the non-conventional option—in all three areas—has always been a somewhat reluctant one. Although Ben-Gurion believed firmly that Israel must possess a non-conventional option for situations of last resort, he and other Israeli leaders also recognized that Israeli interests required that non-conventional weapons not be introduced into the Arab-Israeli conflict. Because of Israel’s geopolitical predicament, it was more vulnerable to non-conventional weaponry than its larger Arab enemies. If Israel’s own pursuit of these weapons led hostile Arab states to obtain them as well, the search for absolute security would become self-defeating. Israeli leaders have always been aware of this predicament, and the result has been a determined but covert pursuit of a multi-pronged non-conventional option. Even more than thirty years after crossing the nuclear threshold, Israel has always been extremely cautious to avoid any actions that would confirm its nuclear capability. As a matter of state policy, supported by a strong national consensus, Israel has made great efforts to keep its nuclear profile “opaque.”¹³ Israel’s policy on CBW is generally similar to its opaque nuclear policy. Still, there are some important differences in perceptions and policy between the two areas, as well as between chemical weapons (CW) and BW.

ISRAEL’S EARLY CBW PROGRAMS

To understand the direction of Israel’s early quest for non-conventional weaponry, one must look at the scientists who were close to Ben-Gurion in the 1940s. Prominent among them were Ernst David Bergmann (born 1903), the scientific director of the Sieff Institute in Rehovot, and the Katachalsky brothers, Aharon (born 1913) and Ephraim (born 1916).¹⁴ All were educated and worked in the fields of chemistry and microbiology. These scientists cultivated—perhaps even planted—in Ben-Gurion the view that Israel’s competitive edge in the struggle for survival depended on investing in science and technology.

In the 1930s, the Katachalsky brothers were among the first to study chemistry at the Hebrew University, where they completed both undergraduate and graduate university work conducting molecular research that linked organic chemistry with microbiology. They both received a Ph.D in macromolecular chemistry in 1941. Parallel to their studies, they were also active members of the *Haganah*, the Jewish paramilitary organization in Pales-

tine. During the mid-1940s, before Bergmann returned to Palestine, Aharon Katchalsky was said to be the scientist closest to Ben-Gurion.¹⁵ In the mid-1940s, a small scientific department was founded within the *Haganah*. As a young lecturer at the Hebrew University in 1946-47, Aharon recruited science students to form the first units dedicated to experimenting with weaponry and explosives. Subsequently, in 1948, a Science Corps, known by its Hebrew acronym HEMED, was established within the IDF.¹⁶ Ephraim Katchalsky was in the United States in 1947, studying with Edwin Cohen at Harvard University and with Herman Mark at the Brooklyn Polytechnic Institute. When he returned to Israel in late May 1948, he was appointed commander of HEMED.

By 1948, Professor Bergmann was already a well-established organic chemist. Since the mid-1930s, he had been a protégé of Chaim Weizmann—an eminent Zionist scientist and political rival of Ben-Gurion—but in the late 1940s became increasingly drawn to Ben-Gurion's conviction that science and technology were critical for Israel's future.¹⁷ Indeed, Bergmann fit Ben-Gurion's ideal of a scientist: one who did applied research in the service of the Zionist revolution.¹⁸ In August 1948 Ben-Gurion appointed Bergmann as the head of the scientific department of the newly founded IDF, and three years later he became the prime minister's scientific advisor at the Ministry of Defense (MOD).¹⁹ Although Bergmann is best known today as the father of the Israeli nuclear program—he founded the Israel Atomic Energy Commission (IAEC) in 1952 and shaped its early activities—his contribution to the establishment of Israel's CBW capabilities was even more crucial.

In early 1948, Alexander Keynan (born 1921), a Ph.D. student in microbiology who headed a small group of students at the pre-medical school of Hebrew University, urged General Yigal Yadin, the *Haganah* operations chief, and Prime Minister Ben-Gurion to establish a new unit within HEMED devoted to biological warfare. Yadin and Bergmann gave their blessing to the idea, and Ben-Gurion needed little persuasion to approve it. On February 18, 1948, by order of Yadin, Keynan left Jerusalem for Jaffa (a town adjacent to Tel Aviv), where he set up his new unit, named HEMED BEIT. The unit subsequently relocated to Abu Kabir, a former Arab village just few miles south of Tel Aviv. After the 1948 war, HEMED BEIT moved to its permanent location in a single building in a remote orange grove outside the town of Ness Ziona.²⁰

The creation of HEMED BEIT was controversial from the outset. In 1993, in an extraordinary, "reluctant" interview with journalist Sara Leibovitz-Dar of the Israeli newspaper *Hadashot*, Ephraim Katchalsky (who later took the Hebrew surname Katzir) and Alexander Keynan explained the circumstances that led to the establishment of HEMED BEIT.²¹ Katchalsky stressed the historical context. It was only two years after a group of Holocaust survivors had sought his assistance to avenge the Nazi genocide of the Jews through a mass poisoning of reservoirs in Germany's largest cities.²² Moreover, as a matter of historical context, every major combatant state in World War II had a BW program.²³ Reflecting almost 45 years later on the rationale behind the founding of HEMED BEIT, Katzir noted the following:

I was involved in HEMED BEIT from the beginning. We planned various activities, to get a sense what CBW is and how could we build a potential [in this area] should there be a need for such a potential. We needed to know how to defend [against such weapons]. . . . I thought that we ought to know what was going on in this field. We knew that in the surrounding countries others were also developing BW. [We believed that] scientists should contribute to the strengthening of the State of Israel.²⁴

In fact, this retrospective account is inaccurate and self-serving. No evidence suggests that in 1948 any of the surrounding Arab countries were developing BW, and HEMED BEIT was probably not created for defensive purposes. Moreover, there was a climate of deep ambivalence and even opposition within HEMED regarding the creation of HEMED BEIT and the whole issue of BW. HEMED's military commander, Colonel Shlomo Gur, was uncomfortable about the new biological unit under his command. "The initiative did not come from Ben-Gurion," Gur recalled in that 1993 interview, "but from the scientists themselves, although someone [General Yadin] cared to move them from Jerusalem and gave them a house inside the grove, where they did what they did."²⁵ Over time, according to Colonel Gur, the commanders of the biological unit did not report about their operations to HEMED headquarters but rather directly to General Yadin.²⁶

Gur did not hide his personal ambivalence about biological warfare and elected to know as little as possible about "his" biological unit. "Physically, I sat at HEMED headquarters in Tel Aviv, and in those days it was difficult to travel," he explained. "I was also mentally remote

from them.”²⁷ Looking back, Gur said that his opposition to HEMED BEIT was based on an instinctive feeling that BW were “dirty” and that Israel had no need to resort to them. When journalist Leibovitz-Dar asked Gur in 1993 whether his opposition had been motivated by concern about harming civilian noncombatants, he responded that he might have had such thoughts, “but it becomes articulated in such fashion only now when you ask me about this. In those days I did not think about those things, I simply had a mental opposition to it. I thought that our war effort had no need for that.”²⁸

Tight secrecy characterized all matters related to HEMED BEIT, and the biological unit was insulated from all other HEMED units. To this day, there is no public record of HEMED BEIT’s operations during the 1948 war—indeed, all archival material relating to the unit is classified and unavailable to scholars—and Israeli historians have not shown any great interest in exploring this subject. Still, rumors about secret BW operations in Palestinian villages and towns have persisted for years.²⁹ Dr. Uri Milstein, an iconoclastic Israeli military historian, maintains, “in many conquered Arab villages, the water supply was poisoned to prevent the inhabitants from coming back.”³⁰

It is believed that one of the largest operations in this campaign was in the Arab coastal town of Acre, north of Haifa, shortly before it was conquered by the IDF on May 17, 1948. According to Milstein, the typhoid epidemic that spread in Acre in the days before the town fell to the Israeli forces was not the result of wartime chaos but rather a deliberate covert action by the IDF—the contamination of Acre’s water supply. Milstein even named the company commander who was involved in the operation. When journalist Leibovitz-Dar found this individual in 1993, he refused to talk. “Why do you look for troubles that took place forty-five years ago?” he asked. “I know nothing about this. What would you gain by publishing it. . . . Why do you need to publish?”³¹

The success of the Acre operation may have persuaded Israeli decisionmakers to continue with these activities.³² On May 23, 1948, Egyptian soldiers in the Gaza area caught four Israeli soldiers disguised as Arabs near water wells. A statement issued by the Egyptian Ministry of Defense on May 29 stated that four “Zionists” had been caught trying to infect artesian wells in Gaza with “a liquid, which was discovered to contain the germs of dysentery and typhoid.” According to the Egyptian statement, a confession had been obtained during interrogation of one

of the captured Israelis, David Horin. He reportedly admitted that their commander had given them a canteen filled with dysentery and typhoid bacteria “to be thrown into the well to kill the Egyptian army.”³³ The four Israelis were put on trial, convicted, and executed by hanging three months later.³⁴

Israel firmly denied the Egyptian allegations of bacteriological warfare, calling them a “wicked libel.” The Israeli government admitted only that the four soldiers were involved in an intelligence operation aimed at monitoring military movements and assessing the morale of the Arab population. In 1993, when Leibovitz-Dar asked the commander of the Gaza operation whether the soldiers had been sent to gather intelligence or to complete a BW mission, he refused to respond. “You will not get answers on these questions,” he said angrily. “Not from me, and not from anyone. . . .”³⁵ When Leibovitz-Dar asked former HEMED chief Colonel Shlomo Gur whether he was aware of HEMED BEIT’s secret operations during the 1948 War of Independence, he responded somewhat vaguely, “[w]e heard about the typhoid epidemics in Acre and about the Gaza operations. There were many rumors, but I did not know whether they were true or not.”³⁶

It seems that many people knew something about these operations, but both the participants and later historians chose to avoid the issue, which gradually became a national taboo. Leibovitz-Dar, in her 1993 article, noted the great difficulties she faced in getting people to discuss the history. “Everybody who had something to do with those activities prefers today to keep silent,” she wrote.

What was done then, with deep conviction and zealotry, is nowadays concealed with shame. Among the living, most preferred to keep silent, meetings were cancelled at the last moment, phones were hung up when people understood what was involved. “Not everything we did in those days requires discussion,” said Ephraim Katzir.³⁷

Despite the official silence, it appears there is little doubt now about the mission of the failed Gaza operation. Still, unresolved questions remain about HEMED BEIT’s activities during the 1948 war. For example, was the failed Gaza operation an isolated Israeli experiment with BW that ended with that failure, or part of a larger campaign? If the latter is true, how widespread was the campaign, and against whom was it directed? What was the strategic rationale? Specifically, is Milstein correct in suggesting that the purpose of the campaign to contaminate the

water supplies of conquered Palestinian villages was to prevent the refugees from returning? If so, who authorized the campaign? And how effective was it?

The nearly complete absence of Israeli BW activities in the Palestinian narrative of the 1948 war (known to the Palestinians as *Al-Nakba* or “cataclysm”) is both intriguing and revealing. A scan of mainstream Internet sites discussing the war, including that of the Center for Research and Documentation on Palestinian Society at Birzeit University, turned up no references to Israeli use of bacteriological warfare, biological warfare, or well poisonings during the war.³⁸ This fact indicates that claims of Israeli BW are not central to the official Palestinian version of events. Nevertheless, rare mentions of “bacteriological warfare” can be found in some Palestinian documents from the time. For example, on July 22, 1948, the Palestinian Arab Higher Committee submitted a 13-page memorandum to the United Nations accusing “Palestinian Jews” of various war crimes, including “bacteriological warfare.”³⁹ According to this document, “[f]or several years the Zionists have planned and prepared for the use of bacterial warfare. To that end, they set up laboratories in Palestine.” The memorandum stated there was “some” evidence, albeit inconclusive, that the Zionists were responsible for an outbreak of cholera in Egypt in November 1947, and in Syrian villages near the Palestine-Syrian border in February 1948. The memorandum also refers to the communiqué by the Egyptian Ministry of Defense of May 28, 1948, regarding the capture of the four “Zionists” in Gaza.⁴⁰

In 1999, a Palestinian physician, Dr. Salman Abu Sitta, speaking before the British House of Commons, claimed that in 1948, “even bacteriological warfare was used by poisoning wells and infecting drinking water with malaria and typhus. That was the case in Gaza in the summer of 1948, as Ben-Gurion admitted in his diary.”⁴¹ Interestingly, however, no known Palestinian sources allege that the epidemics in Acre resulted from Israeli sabotage. The absence of Arab reports on this incident may suggest either that the “bacteriological warfare” campaign, if it occurred, had limited results, or that in the chaos of war the Palestinian refugees were unaware of the campaign. Also, if the BW operations aimed primarily at preventing the return of the Palestinian population to their deserted villages as Milstein claims, this could explain the relative lack of evidence of such operations.

Ultimately, the creation of HEMED BEIT must be understood—and judged—in the context of the time. It took

place only three years after the end of World War II, at a time when the Zionist movement had just begun to grapple with the devastating blow the Jewish people had suffered in the Nazi Holocaust. One should also consider the military situation as seen by the *Haganah* leaders in early 1948, the time when HEMED BEIT was created. In response to the imminent possibility of an invasion by the Arab states, the *Haganah* prepared a broad strategic plan, known as Plan D, to address such a contingency. This plan included provisions for the expulsion of hostile or potentially hostile Palestinian villagers. During April-May 1948, *Haganah* commanders implemented elements of Plan D by clearing vital roads and Palestinian communities in border areas. In the words of historian Benny Morris,

There was never, during April-May, any national-political or General Staff decision to expel “the Arabs” from the Jewish state’s areas. There was no “plan” or policy decision. The matter was never discussed in the supreme political decision-making bodies; but it was understood by all concerned that, militarily, in the struggle to survive, the fewer Arabs remaining behind and along the front lines the better and, politically, the fewer Arabs remaining in the Jewish state, the better. At each level of command and execution Haganah officers in those April-June days when the fate of the state hung in the balance, simply “understood” what the military and political exigencies of survival required.⁴²

One must also recall that until mid-1948, the creation of a Jewish state was by no means a certain proposition: the *Yishuv* leadership still feared the possibility of Zionist defeat and possibly even annihilation.⁴³ Moreover, establishing a strong Jewish majority in the conquered territories was seen as essential for the future Jewish state. The founders of HEMED BEIT shared this mindset: they were committed to do whatever was necessary to create a Jewish homeland in the land of Israel.⁴⁴ They firmly believed that, after the Holocaust, this sacred mission could not be derailed by the luxury of moral revulsion against “dirty weapons.” If microbiology could help in providing the means to establish the Jewish state, so be it.

FROM HEMED BEIT TO IIBR

In 1949, after the War of Independence, a period of reorganization began both at the IDF and the civilian

MOD. The 90,000-strong wartime army was reduced to about 35,000 recruits. There was also a need to restructure the entire defense establishment, both its civilian and uniformed components, to adjust to the postwar conditions. HEMED was still part of the IDF, but the majority of HEMED's 560 employees were civilians, and the military utility of the Science Corps was not clear to the supreme command. Each of the five research centers acted as an autonomous unit, loosely administrated by the HEMED command. As the military budget shrank in 1950-51, the IDF was determined to rid itself of the burden of supporting HEMED.⁴⁵

The reorganization at MOD coincided with some important personnel changes. In mid-1951, the rift between the aging Chaim Weizmann, the founder of the Seiff Institute (later renamed the Weizmann Institute of Science), and his long-time protégé, Professor Bergmann, then the institute's scientific director, reached a final showdown. Their disagreement centered on the future of the Weizmann Institute and the role of the state in sponsoring scientific research. During the 1948 war, Bergmann had effectively turned the institute into a HEMED base and subordinated much of its research effort to the needs of the *Haganah* and, later, to those of MOD.⁴⁶ After the war, Bergmann proposed "to convert the Weizmann Institute into Israel's national scientific research center, dedicated to both civilian and military tasks."⁴⁷ This plan was unacceptable to Weizmann, who had returned to the institute in 1949 while serving as Israel's first president. Weizmann adamantly opposed Bergmann's concept of state-sponsored science.⁴⁸

On July 15, 1951, Weizmann forced Bergmann to resign his post as scientific director and governor of the institute.⁴⁹ On that same day, Ben-Gurion appointed Bergmann to dual posts: scientific advisor to the prime minister and chief of research at MOD. In effect, Bergmann became the nation's chief scientist, a position that enabled him to pursue his grand vision of setting up government-sponsored research centers funded by MOD and under the jurisdiction of the Prime Minister's Office.⁵⁰ The two main areas of government-sponsored research that Bergmann sought to establish under the rubric of "national science" were nuclear and chemical-biological.⁵¹

The establishment of a civilian Division of Research (under the Hebrew acronym EMET) to coordinate all research at MOD required a transition from specific wartime projects to building a national research infrastructure and broad set of capabilities guided by long-term needs.

One reason for this approach was the extremely limited research infrastructure left by the British mandate in areas such as public health and epidemiology. Bergmann firmly believed that the Defense Ministry's EMET was the only body in the new state of Israel capable of building a research infrastructure at the national level (as opposed to academic centers or other governmental agencies such as the Ministry of Health). As part of this organizational restructuring, HEMED was converted into a group of MOD-sponsored civilian research centers called "Machons." With backing from Ben-Gurion but opposition from some top defense bureaucrats and senior military officers, Bergmann established in 1952 both the IAEC and IIBR.⁵²

IIBR resulted from the merger of two Machons, one of which was a continuation of HEMED BEIT. Accordingly, the initial IIBR laboratory was the building in the fenced orange grove outside Ness Ziona that had housed HEMED BEIT. Among the founders of IIBR were Alexander Keynan, who was the head of HEMED BEIT and had become the institute's first director; Robert Goldwasser, who later directed the institute during the 1960s; and Marcus Klingberg.⁵³ For all practical purposes, Bergmann was also one of the founding fathers of the new institute. His name appeared as a joint author on many of the scientific publications of IIBR during the 1950s, especially in the chemical field.

From its inception, IIBR was given a "dual identity."⁵⁴ For security and bureaucratic purposes, it was regarded as a highly classified research center ("Machon 2") operated and funded by the MOD EMET. For representative and scientific functions, however, it was named the Israel Institute for Biological Research, under the jurisdiction of the Prime Minister's Office.⁵⁵

Given the climate of the times, it is doubtful that Bergmann and his IIBR colleagues made a distinction between defensive and offensive research and development (R&D). In those days, national CBW programs were not illegal or even at odds with international norms. The 1925 Geneva Protocol, which prohibited the use of CBW in warfare, was silent about developing, producing, and stockpiling such weapons. Moreover, many countries that ratified the Geneva Protocol did so with a reservation reserving the right to employ CBW for retaliation in kind (Israel acceded to the Geneva Protocol only in February 1969).⁵⁶ By the 1950s, all three major NATO powers—the United States, the United Kingdom, and France—had

significant offensive CBW capabilities. While Bergmann and Keynan were well aware of those CBW programs, they sought a research mandate for the new institute that was much broader than merely satisfying the needs of the Israeli defense establishment.

Considerations of Israel's long-term scientific infrastructure needs guided the way Keynan (with Bergmann's support) transformed HEMED BEIT into IIBR in the early to mid-1950s. Keynan and Bergmann believed that basic research provided an essential foundation for applied research, and they strongly advocated the role of the state, in particular MOD, in sponsoring scientific research projects relevant to the national interest.⁵⁷ Their approach was that Israel should set up a national laboratory responsible for chemical and biological R&D. In contrast, senior bureaucrats at MOD, such as EMET chief Munya Mardor, believed that given Israel's limited financial resources, MOD should invest in specific research projects only with clear military purpose. Bergmann's counter-argument was that only after the creation of a national scientific infrastructure would it be possible to conduct specific projects effectively. It appears that both sides in the debate invoked the issue of CBW to support their positions.⁵⁸

Bergmann and Keynan insisted that IIBR be set up with a research mandate covering a broad spectrum of nationally significant scientific research projects, and not just a military CBW program. Furthermore, given the circumstances under which Bergmann was forced to leave the Weizmann Institute, he was personally motivated to establish a system of state-sponsored research centers that rivaled the Weizmann Institute in quality and prestige. In addition to these motivations, security and academic considerations may have contributed to Bergmann's (and Keynan's) insistence on giving IIBR a civilian identity and a broad research mandate. From the outset, Bergmann recognized the intrinsic civil-military ambiguity of CBW research, and he believed that giving the laboratory a broad research mandate would provide a legitimate cover for the scientists working there. His active involvement in hiring top-quality scientific staff at both IAEC and IIBR seems to illustrate this point. By maintaining a broad civic organizational structure and rationale for IIBR, Bergmann sought to attract first-rate scientists by offering them the kinds of intellectual and material benefits available at academic institutions: the freedom to publish research in scientific journals, attend international conferences, take sabbatical leaves, and so forth.⁵⁹

In December 1957, for example, Bergmann was involved (along with Keynan and Klingberg) in the appointment of Professor Ludwig Fleck as director of the section of experimental pathology at IIBR. Fleck was a prominent microbiologist and philosopher of science who had immigrated to Israel from Poland just two months earlier. A former member of the presidium of the Polish Academy of Sciences who had published some 130 scientific papers, he brought to IIBR the kind of expertise (in the area of diagnosis of contagious diseases) and international prestige that Bergmann considered essential for the scientific quality of the new institute.⁶⁰ Also in line with Bergmann's broad approach, throughout the mid-1950s IIBR was given the lead responsibility for a multi-year national project to develop a vaccine against polio.⁶¹

Notwithstanding Bergmann's grand plans and ideas, IIBR in its early years was, like the rest of Israel, a small and intimate place. In the fiscal year 1964-65, total funding for IIBR was about \$1 million, of which more than half came from the government and the rest from external sources. The authorized budget was even smaller at about \$600,000. About 70 percent went to salaries, 20 percent to research proper, and the rest to administration.⁶² For comparative purposes, in 1966 Israel's total government budget was about \$1.6 billion, and the defense budget was nearly \$400 million, of which about 10 percent (\$41 million) went to R&D.⁶³ In all, IIBR's budget accounted for approximately 2 percent of the overall R&D budget of MOD.

SECRECY, TABOO, AND AMBIVALENCE

To this day, Israel's past and present activities in the CBW field are treated as a national taboo—similar to, and perhaps even stronger than, the nuclear taboo. The Israeli security establishment considers the IIBR facility, like Israel's nuclear facility at Dimona, one of the nation's most secret defense installations. Over the years, the single building hidden in an orange grove on the outskirts of Ness Ziona has grown into a multi-acre modern research complex, surrounded by a six-foot-high concrete wall topped with electronic sensors that reveal the location of any intruders. For security reasons, the Ness Ziona facility has been deleted from aerial survey photographs and maps of the town, and orange groves inserted in its place.⁶⁴

Ever since the founding of IIBR, the secrecy surrounding it has been reinforced by strict military censorship. As a matter of policy, IIBR employees, including the director-general, are strictly prohibited to speak with the media.

IIBR has no official spokesman, and the spokesman for the Prime Minister's Office is the only person authorized to respond to press queries about the institute.⁶⁵ In the early days, secrecy was so pervasive that IIBR's existence was hardly acknowledged, but this situation changed in the early 1990s. A number of developments, both global and domestic, made this change inevitable. The 1991 Gulf War, in particular, put the CBW issue at the top of the international security agenda. Israeli experts and media closely followed CBW developments, especially those related to Iraq.

During the 1990s, a number of developments in Israel brought IIBR into the headlines and highlighted the extraordinary secrecy surrounding its activities. First and foremost was the Klingberg espionage case, which became public in 1993. Press stories revealed that a decade earlier, Professor Avraham Marcus (Marek) Klingberg (born 1918), a world-renowned Israeli epidemiologist who had served as deputy director of IIBR for many years, had been secretly arrested, tried, and convicted as a Soviet spy.⁶⁶

Klingberg was born in Poland to an observant Jewish family. During World War II, in his early twenties, he fled to the Soviet Union. After graduating in medicine from the University of Minsk in 1941, he joined the medical corps of the Red Army as a military epidemiologist and rose to the rank of colonel. Klingberg immigrated to Israel in 1948 and joined the IDF, where he served both in the Medical Corps and in HEMED BEIT. As noted earlier, he was among the founding members of IIBR in 1952. During his thirty-year tenure, he held key positions as administrative director, director of the epidemiological division, and deputy director. At the time of his arrest, Klingberg was also professor of epidemiology at Tel Aviv University School of Medicine. (Since 1967, many senior scientists at IIBR have had academic appointments at that institution.)

Nearly all details of the Klingberg espionage case are still treated by the Israeli security establishment as classified, including the circumstances that led to Klingberg's capture and the secrets he divulged to the Soviets. No official account of the case has ever been released by the Israeli government. It is believed that Klingberg was arrested at Ben-Gurion Airport in January 1983 on his way to a conference in Europe. He was secretly tried in the Tel Aviv District Court and sentenced in June 1983 to an 18-year prison term—the same jail term that Mordechai Vanunu, Israel's nuclear whistleblower, received in 1986.

While no specifics were made public, Klingberg is widely believed to have been Israel's most damaging espionage case.⁶⁷ Given his seniority at IIBR and his long and intimate acquaintance with Israel's other defense establishments, one must assume that for decades, Klingberg gave Israel's most sensitive military secrets to the Soviet Union—primarily in the CBW arena, but in other sensitive domains as well.

The Israeli government never released any information about Klingberg's arrest, trial, and conviction as a Soviet spy. Even Klingberg's family was forced to be an accomplice in the efforts of the security authorities to conceal his fate. Immediately after his arrest, security personnel removed all personal files relating to him from IIBR and the School of Medicine at Tel Aviv University. People who had known Klingberg in Israel were told—apparently as part of a cover story—that his disappearance was the result of a mental breakdown and hospitalization while traveling in Switzerland. Some who doubted this story speculated that Klingberg might have defected to the Soviet Union. The few who were aware of his true whereabouts, including his immediate family and close colleagues, were sworn to secrecy. Even in jail, Klingberg was given a fictitious identity and spent much of his time in solitary confinement.

By sheer chance, a British investigative reporter named Peter Pringle “stumbled” onto Klingberg's disappearance in the summer of 1985. At that time, Pringle was investigating charges by the Reagan Administration that the Soviet Union had used a fungal poison known as “yellow rain” as a BW agent in Afghanistan (U.S. and British scientists later refuted those claims). One of Pringle's British sources suggested that he interview an Israeli epidemiologist named Marcus Klingberg. As a young epidemiologist with the Red Army Medical Corps during World War II, Klingberg had been involved in studying a mysterious outbreak of poisoning in the Russian town of Orenburg (north of Kazakhstan) that killed thousands of peasants. He and his colleagues were able to identify the cause of the outbreak: a fungus that infected stored grain and produced a powerful toxin.

In the fall of 1985, Pringle traveled to Israel to try to interview Klingberg, hoping to shed light on the “yellow rain” controversy. Instead, he accidentally stumbled into the even bigger mystery regarding the whereabouts of his source. Pringle wrote: “[e]ach time I mentioned [Klingberg's] name to his Israeli colleagues, they said his disappearance was ‘hush-hush,’ but they did not believe

the official explanation that he had fallen [mentally] ill in Switzerland and disappeared.”⁶⁸ While searching for archival materials on Klingberg, Pringle found only a short feature in the Israeli newspaper *Ma’ariv* dated October 24, 1983, in which the author noted: “Nobody knows where the head of the department of preventive medicine at Tel Aviv University disappeared nine months ago.” When Pringle called up the reporter who had written the story, the man was evasive, hesitant, and reluctant to cooperate.

The mystery deepened further when Pringle visited Klingberg’s wife Wanda (a microbiologist at Ness Ziona who died in 1990) in her Tel Aviv apartment. It became evident that she knew the whereabouts of her husband but could not talk about it. Pringle suspected that Klingberg had defected to Russia, but the more he looked into the disappearance, the stranger it became. At one point during his inquiries, Pringle wrote,

I took time off to visit a crusader castle at Ashkelon. My car was broken into and my briefcase, containing papers about Klingberg and my passport, was stolen. . . . A few months later, the police returned the briefcase and my passport, but some papers and photocopies of newspapers articles from Tel Aviv archives were missing.⁶⁹

When Pringle’s article about Klingberg’s mysterious disappearance was published in England in 1985, the Israeli military censor took an unprecedented measure and banned the Israeli media from reporting the story; journalists were not even allowed to mention Klingberg’s name. In early 1988, *Yisrael Shelanu*, a small Hebrew weekly magazine for Israeli expatriates published in New York, revealed that Klingberg was being secretly held in Israeli jail on the charge of spying for the Soviet Union, and that he might be released as part of a three-country spy exchange. Israeli officials refused to comment on that report or even to acknowledge it. In August 1993, a decade after Klingberg’s disappearance, Israel’s Supreme Court accepted a petition from Schocken Media Group and forced the Israeli military censor to partially lift the secrecy surrounding the Klingberg case. In effect, it was the first admission by the Israeli government that espionage had occurred at the highest levels of IIBR.

The Israeli security establishment and the judiciary firmly opposed numerous humanitarian requests for Klingberg’s early release on the grounds of his age and deteriorating health. Only in September 1998, after a long

legal battle, was Klingberg released from jail and placed under strict house arrest. The security establishment still treats him as a major security risk, and the terms of his release deny him any contact with the outside world. The extraordinary secrecy measures that the Israeli security authorities imposed for years on the Klingberg case, some of which remain in effect to this day, indicate the extreme sensitivity with which Israel views the activities of IIBR.⁷⁰

In another development, residents of the town of Ness Ziona, after decades of anxious silence, have begun to voice concerns about the potential impact of IIBR on their lives. To be sure, the residents’ protests are not about Israeli CBW policy, but whether Ness Ziona should be the site for such activities. As the town’s attorney, Shay Segal, put it: no one disputes that Israel needs such a research center, “but far away from here—not in a residential area where people live.”⁷¹ Grass-roots activity in Ness Ziona intensified in 1998 when it became known that IIBR planned to expand its perimeter by 12.5 additional acres. In an unprecedented move, the mayor of the town instituted legal proceedings to prevent the institute’s expansion on environmental and safety grounds. Confronted with the lawsuit, the Israeli government temporarily dropped its expansion plans and promised to conduct an environmental impact study before any decision was made. It was clear that the Israeli government wanted to avoid a high-profile legal battle with the town.⁷²

In August 1998, *Yediot Ahronot*, Israel’s leading newspaper published a long exposé on IIBR, referring to it as “metropolitan Tel Aviv’s most severe environmental hazard” and raising questions about the “conspiracy of silence” surrounding its activities.⁷³ Drawing on a hearing by the Knesset Science Committee, the article revealed that four serious accidents had occurred at IIBR over the previous 15 years, resulting in three fatalities and 22 injuries. No details were given about the nature of the accidents, but the British *Foreign Report*, citing unnamed Israeli sources, claimed that one accident was so serious that authorities were on the verge of evacuating the entire town of Ness Ziona before IIBR scientists concluded that the threat had passed.⁷⁴

The next revelation came in October 1998, when Israel finally confirmed that an El Al Boeing 747 cargo aircraft that crashed near Schiphol Airport in Amsterdam in October 1992 had been carrying a shipment destined for Ness Ziona that contained DMMP, a dual-use chemical used as an ingredient in the manufacture of sarin nerve gas.⁷⁵ In the months and years after the El Al crash, hun-

dreds of people living near the crash site and rescue workers developed inexplicable illnesses ranging from breathing problems to skin rashes, nervous disorders, and cancer. It was suspected that the illnesses stemmed from exposure to toxic compounds carried by the Israeli aircraft, which burned after the crash. The confirmation that DMMP had been on board was provided, only after six years in which Israel had refused to provide a full accounting of what the plane was carrying, admitting only that it had was “commercial cargo.” The contents of the 20 tons of cargo, some or all of it apparently shipped by the Israeli Defense Ministry, have yet to be fully identified. El Al’s lawyer in The Hague, Robert Polak, told the Dutch government that the details would never be forthcoming because of what he termed “state security reasons.”⁷⁶ In any event, if Israel had hoped to shield the involvement of IIBR, the cover-up had the opposite effect. The mystery over the shipment drew new attention to the top-secret facility in Ness Ziona.

Israeli attitudes towards IIBR are characterized by an aura of secrecy, ambivalence, and taboo. Although Israeli citizens have recently become more willing to ask tough questions about the potential environmental and safety hazards posed by IIBR, most prefer not to know too much about what goes on behind the high walls of the institute. The issue is also taboo for Israeli-based think-tank and academic analysts. Although there has been some public discussion of CW recently by defense journalists and academic strategists in the context of the debate over whether Israel should ratify the CWC, there has been virtually no academic discussion of the BW issue. The most that Israeli analysts are willing to say publicly regarding Ness Ziona is that the critical issue for deterrence is that the Arabs believe that Israel has all weapons of mass destruction (WMD), including BW.⁷⁷

ASSESSING IIBR

Today, almost five decades after IIBR was founded, it is remarkable to realize how much of Bergmann’s founding concept has survived the passage of time and changes in Israeli science and politics. The current public mission statement of IIBR, as it appears on the institute’s elaborate website, still reflects the broad scientific mandate advocated by Bergmann back in the 1950s. In accordance with this philosophy, the IIBR mission is described in the following way:

Backed by close to five decades of experience, the Israel Institute of Biological Research—

IIBR—specializes in applied research, development and production in the fields of biology, chemistry, ecology and public health, in addition to basic research studies emanating from IIBR’s applied projects.⁷⁸

According to the website, IIBR is organized into three scientific divisions—Biology, Medicinal Chemistry, and Environmental Sciences—that “cooperate in a synergistic relationship, enabling the formation of optimum interdisciplinary teams tailored to the needs of each individual project.”⁷⁹ The Institute’s staff comprises approximately 300 employees, 120 of them scientists holding Ph.Ds in biology, biochemistry, biotechnology, chemistry, mathematics, pharmacology, physics, and environmental sciences. IIBR’s technical staff consists of 100 certified technicians, representing a broad spectrum of capabilities.

The website also describes IIBR’s three scientific divisions. The Division of Biology conducts research in the areas of recombinant DNA technology, engineering of proteins and enzymes, fermentation biotechnology, fuel and environmental biotechnology, mechanisms of viral and bacterial pathogenesis, and diagnosis of infectious diseases. With respect to research on pathogenesis, the website states:

IIBR is investigating viral and bacterial pathogenesis mechanisms in an attempt to design new strategies for vaccine development. The IIBR approach is based on development of various strains of pathogens, which differ in their virulence. The comparison of the different variants is then used to elucidate the genetic determinants responsible for virulent traits. This leads to the determination of the biological pathways in which virulence is exhibited and has the potential of being used as a guideline in the design of attenuated vaccines.⁸⁰

The site also states that IIBR has a Center for the Diagnosis of Infectious Diseases “engaged in the development of novel diagnostic assays, the production of reagents, the determination of antibodies in serum and the diagnosis of clinical specimens.” Specifically, the Center “produces antigens, antibodies and conjugates for the diagnosis of viral, rickettsial, and leptospiral diseases; performs serological diagnostic tests, isolation of the agents, and offers diagnostic consultation to hospitals and clinics in Israel.”⁸¹

IIBR's Division of Medicinal Chemistry conducts research on the synthesis of fine chemicals and drugs, environmental and biopharmaceutical analysis, pharmacology and behavior assessment, and Alzheimer's disease and related disorders. Many of these capabilities are relevant to both defensive and offensive CBW. The Division of Environmental Sciences does research in the fields of atmospheric optics, air pollution meteorology and risk assessment, physical surface chemistry, and detectors and biosensors. With respect to biosensor development, IIBR has interdisciplinary capabilities including the chemistry of detectors (i.e., reagents, shelf life), mechanics, electronics, and air sampling.

Presumably, the IIBR website was carefully designed to present its defensive CBW mission as well as its civilian and unclassified side as a top-quality national research institute. By and large, IIBR presents broad technical capabilities that could be used for both defensive and offensive purposes, specific civilian projects such as research on Alzheimer's disease, as well as research areas and projects with a clear defensive orientation. IIBR national capabilities and expertise are clearly consistent with the full array of activities associated with a strong CBW defense program, but they could also support an offensive orientation. Although the IIBR website carefully avoids discussing the motivation and intent behind the institute's research, it may serve a deterrent function. Without stating anything explicitly, the IIBR website demonstrates that Israel has powerful capabilities in the CBW area.

In the early 1990s, IIBR underwent a major financial and organizational reform. According to the new arrangement, the Israeli government agreed to fund the portion of the institute's staff and activities defined as "preservation of an essential field of knowledge for the national interest." The rest of IIBR supports itself by selling research and development services through contracts with outside clients, both in Israel and abroad. As is the case with the Soreq and Dimona nuclear research centers under the auspices of the IAEC, the IIBR budget is entirely classified.⁸²

In the absence of almost any public historical information about IIBR, sensationalist rumors and speculation abound, along with a few more cautious inferences. Given the Israeli taboo on the subject, a foreign journalist—Dutch reporter Karel Knip—has conducted the most extensive investigation into IIBR history and research activities. By searching Internet-based databases of the medical literature, Knip turned up hundreds of scientific

publications written by some 140 scientists affiliated with IIBR over nearly 50 years. Aided by eminent authorities on CBW, such as the British expert Julian Perry Robinson, Knip has reconstructed a rough history of the type of CBW research conducted at Ness Ziona.⁸³

On the chemical side, according to Knip's analysis, IIBR was involved in an extensive effort to identify practical methods of synthesis for nerve gases (such as tabun, sarin, and VX) and other organophosphorus and fluorine compounds.⁸⁴ Knip's findings are consistent with other indications that Israel initiated a CW program in the mid-1950s. IIBR also carried out studies of chemical incapacitating agents, which are designed not to kill but rather to incapacitate an adversary for a certain amount of time. Before 1970, the U.S. CW program experimented with numerous chemical incapacitants, including psychotropic drugs such as LSD, although the only incapacitating CW stockpiled by the United States was "BZ," which was phased out in the early 1960s.⁸⁵

On the biological side, Knip's survey identified several types of disease agents, toxins, and incapacitants studied at IIBR. In the early to mid-1950s, much of the research activity focused on the causative agents of plague (*Yersinia pestis*), typhus, and rabies, followed subsequently by studies on breeding insects that transmit those diseases, such as mosquitoes, fleas, and ticks. Until the 1960s, insect and arthropod vectors provided the primary means of delivery for the U.S. and British BW programs.⁸⁶ Also during the 1950s, a significant number of studies at IIBR focused on anti-livestock agents, following the path of other national BW programs at the time.

Another central area of study at IIBR since the 1950s has been research on toxins: non-living poisons derived from plants, animals, and bacteria. According to Knip's bibliographical review, IIBR has done research on at least 15 different toxins, some of which may have been intended for use in special covert operations. One toxin on the list is *Staphylococcus* enterotoxin B (SEB), a potent incapacitating toxin produced by the bacterium *Staphylococcus aureus*. SEB was one of the toxin agents weaponized by the U.S. offensive BW program.

Knip's overall conclusion is that IIBR, since its establishment in the early 1950s, has been involved in a diverse array of research activities that, as a whole, imply the possibility of offensive CBW research.⁸⁷ In Knip's words, "[t]he many hundreds of articles prove beyond doubt that the IIBR is Israel's main center for research

into both chemical and biological weapons. The research conducted at the Institute consists of a bizarre combination of activities that acquire significance within one specific context, that of chemical and biological warfare.”⁸⁸

Although a survey of published scientific literature is a useful tool for reconstructing the research interests at IIBR, it is important to recognize its limitations. Bibliographical analysis can suggest institutional trends, but it cannot indicate by itself whether Israel has offensive BW or CW programs. Medical and agricultural research institutions worldwide conduct extensive basic research on disease-causing microorganisms. For this reason, Israel’s motivations in the CBW fields, defensive or offensive, cannot be inferred merely from the existence of research activities involving potential CBW agents. To do so would be an unjustified leap. If additional relevant information is available regarding weaponization or large-scale agent production, however, it could alter the significance of the basic research.

The fact that many research findings by IIBR scientists have been published in scientific journals—meaning that Israeli security officials consider them unclassified—highlights the intrinsic ambiguity that characterizes basic research on dangerous pathogens. Such research may be relevant to offensive BW but also have “legitimate” applications in medicine and agriculture. With respect to studies of bacterial or viral pathogenesis, it can be difficult to determine whether the intent of a particular research project is to create a “defensive” capability (e.g., vaccine development) or an “offensive” one (e.g., engineering more virulent strains). Because of this intrinsic ambiguity, Article I of the BWC does not ban basic research. Although development directly related to weaponization is prohibited, such activities would be classified and hence difficult to trace through open scientific publications.⁸⁹

Knip’s bibliographical survey confirms what many have presumed and what IIBR seems to imply through its own website: that Israel has substantial research capabilities relevant to both defensive and offensive CBW. Still, to make judgments about Israeli intentions, motivations, and strategy with regard to CBW—especially regarding weaponization—one needs to know much more. The indisputable facts are as follows. IIBR is one of Israel’s most secretive and guarded scientific installations. Israel signed the CWC but has not ratified it.⁹⁰ Israel has refused to sign the BWC and has never issued a public policy statement on the issue of BW.⁹¹ Unlike other Western states that openly acknowledge a defensive BW program, Israel

has not even bothered to characterize the research conducted at IIBR as “defensive,” and hence legitimate.⁹² Finally, unlike the case of Israel’s nuclear program, of which Mordechai Vanunu revealed some of the technical capabilities to the London *Sunday Times*, there has never been a comparable whistleblower at IIBR. This last issue perhaps explains why the Israeli security apparatus acted so harshly to protect the secrets of Ness Ziona in the Klingberg case.

Another difference between the two cases highlights this point. In 1999, in a response to a petition submitted to the court by *Yediot Ahronot*, the Israeli security authorities preempted a decision by the Supreme Court and released over a thousand pages of court documents related to the Vanunu trial, about 40 percent of the trial documents. The daily *Ha’aretz* submitted a similar petition on the Klingberg case to the Supreme Court in 1999. In contrast to the Vanunu petition, the Israel security authorities firmly opposed any release of documents relating to the Klingberg case. In August 2001, the Israeli Supreme Court accepted the position of the security authorities and denied the petition.

Lacking hard information, foreign-based publications have made all kinds of claims about Israel’s BW capabilities, from the mundane to the fantastic.⁹³ As a matter of policy, the Israeli government has always refused to comment on these reports. For this reason, any assessment of Israel’s BW program and capabilities is inevitably tentative and speculative. A near-consensus exists among experts—based on anecdotal evidence and intelligence leaks—that Israel developed, produced, stockpiled, and perhaps even deployed CW at some point in its history. In 1974, U.S. senior military officials testified in Congress that they knew, from conversations with their Israeli counterparts, that Israel had an offensive CW capability. When asked about Israel’s BW capability, however, the Americans professed ignorance.⁹⁴ Although most analysts believe that Israel has maintained some offensive BW capabilities, it is difficult to characterize exactly what those capabilities are and their current status.⁹⁵

The U.S. government has never included Israel in its public list of states with an offensive BW capability, although some have argued that Israel is one of two unnamed states in the list of 12 assessed to have an offensive program.⁹⁶ The 1993 report on weapons proliferation by the Russian Foreign Intelligence Service included an ambiguous characterization of Israel’s BW capability:

There is no direct evidence of the presence of biological weapons in Israel. At the same time, according to various indications, a ramified program of biological research of a general nature, in which elements of a military-applied purpose are present, is being implemented in Israel. Specifically, Israeli research centers are cooperating closely with the American military laboratories within the framework of a U.S. Defense Department program for protection against biological weapons. As a whole, Israel possesses a strong civilian biotechnology base, which, if necessary, could be redirected fairly easily to the production of biological weapons.”⁹⁷

The four elements considered necessary for the weaponization of biological agents are research, development, testing, and evaluation. It would be logical—given the BW threat from Iraq—that Israel has acquired expertise in most aspects of weaponization, with the possible exception of testing.⁹⁸ Although it is highly probable that Israel has maintained some sort of production capability, it is doubtful that Israel engages in the ongoing production or stockpiling of BW agents.

STRATEGY, DETERRENCE, AND POLICY: BW, CW, AND NW

To reconstruct the development of Israeli strategic perceptions and attitudes toward BW, one must go beyond assessing the technical capabilities of IIBR and look at the issue in a broader strategic-historic context, including strategic linkages between BW and the two other categories of non-conventional weaponry: chemical and nuclear.

Ben-Gurion firmly supported the establishment of IIBR in 1952 and monitored the institute’s development throughout his time in office. His daughter, Dr. Renana Leshem, worked as a microbiologist at IIBR for about 20 years. Even so, it is doubtful that Ben-Gurion ever considered BW as Israel’s ultimate strategic deterrent. It is not known if, and to what extent, Ben-Gurion, Bergmann, and Peres weighed the BW option against the nuclear option during the 1950s. But a variety of practical and military considerations, as well as diplomatic and moral considerations, made BW the weapon of mass destruction least suited for deterrence.

One can make the case against BW and in favor of the nuclear option in the following way. The awesome destructive power of the atomic bomb is associated with three

fundamental features: visibility, predictability, and immediacy. No other non-conventional weapon can produce as visible, predictable, and rapid destructive effects as NW. These characteristics make the atomic bomb the most effective means of deterrence. BW, on the other hand, is distinguished by a lack of transparency: the effects of BW are invisible, uncertain, and delayed. BW agents can be released covertly, and lethality is contingent on weather conditions and the mode of dispersal. In fact, because it can be difficult to distinguish a biological attack from a natural outbreak of disease, uncertainty may exist as to whether biological agents were actually used, and if so, by whom. The drawbacks of BW for deterrence purposes would become advantages, however, in the case of clandestine use.⁹⁹

All indications are that from early on, Ben-Gurion and Bergmann viewed the atom bomb—not BW—as the answer to Israel’s strategic predicament. In the early to mid-1950s, however, an operational Israeli nuclear capability was still far off in the future, and CBW may have been seen as a way to fill the gap. According to persistent rumors, in 1954 Israeli Defense Minister Pinchas Lavon proposed using BW for some special operations. These proposals apparently stirred up a great deal of controversy among the handful of officials who knew about them, including Prime Minister Moshe Sharett. Veiled references to such “crazy” proposals can be found in Sharett’s diaries.¹⁰⁰

When Ben-Gurion returned to power in 1955, he immediately initiated parallel efforts—near- and long-term—to provide Israel with options of last resort.¹⁰¹ In the spring of 1955, he launched a crash project to develop “a cheap non-conventional capability.” Convinced that war with Egypt was inevitable, Ben-Gurion was determined to “set up another line of defense, beyond the conventional means of the IDF, in case the enemy [Egypt] would use non-conventional weapons on the battlefield or against the civilian population.” He ordered that this non-conventional capability be operationalized—i.e., weaponized and stockpiled—as soon as possible and before a war with Egypt broke out. The “cheap non-conventional capability” that preceded the nuclear option was CW, not BW.¹⁰²

In his book *RAFAEL*, Munya Mardor, the founder of Israel’s Weapons Development Authority (RAFAEL), refers obliquely to the “crash project” and reveals that Ben-Gurion monitored it closely. The prime minister asked detailed questions about the pace of production, “evidently concerned that we would not meet the deadline he had

set, worrying that the enemy would have such capability and we would have nothing to deter or retaliate.”¹⁰³ Mardor hints that the emergency transition from research to crash development and then production of the “final products” posed extraordinary challenges for the project managers. The program involved a crushing timetable, procurement of equipment and material from overseas, and the conversion of research facilities—as well as commercial plants—to production.¹⁰⁴

To address Israel’s long-term security needs, Ben-Gurion also launched a NW program. By 1955-56, MOD director-general Shimon Peres and Bergmann explored whether and how it would be possible for Israel to build the technological infrastructure to pursue the nuclear option. By mid-1956, France was Israel’s first choice as the foreign supplier, but the French government hesitated as to the extent of the nuclear cooperation it was prepared to offer. A year later, in the wake of the alliance between the two countries during the Suez crisis, those hesitations faded. In October 1957, Israel signed a secret agreement for nuclear cooperation with France, and a few months later, construction began on the nuclear facility at Dimona.¹⁰⁵

Still, the nuclear program did not lessen Israel’s interest in CBW. Bergmann’s old arguments that led to the establishment of the Ness Ziona facility in 1952 were even more applicable in the early to mid-1960s. The timeline of the Dimona project remained uncertain; in the meantime, Israel had to counter Egypt’s growing non-conventional capabilities. Dimona was never meant to be a substitute for Ness Ziona, but rather complementary.

Egypt was the first Arab country to develop, produce, deploy, and use CW. The Egyptian CW program began in the early 1960s. Its main production facility at Abu Za’abal, 10 kilometers (km) northeast of Cairo, produced and stockpiled various chemical agents including tear gas, mustard, and possibly nerve gas.¹⁰⁶ Egypt used CW several times during its military intervention in the Yemen civil war (1963-67). The first Egyptian CW attack took place in June 1963 at Al Kawama, a remote village in North Yemen, and can be characterized as primitive. Some British officials who examined fragments from the chemical bombs concluded that they had been improvised from tear gas grenades abandoned by British forces when they withdrew from Egypt.¹⁰⁷ On several occasions from January to July 1967, however, Egypt engaged in extensive and effective use of CW against civilian populations in Yemen.

Two Egyptian chemical attacks inflicted hundreds of casualties. In the first attack on January 5, 1967, nine Egyptian bombers dropped 27 chemical bombs on the village of Kitaf. According to eyewitness accounts, some 95 percent of the people occupying the area up to 2 km downwind were seriously or fatally gassed. A quarter of the population was apparently killed, and another quarter severely injured (250-300 casualties), all apparently suffering from lung injuries.¹⁰⁸ The second chemical attack in Yemen occurred on May 10, 1967, just four days before Egypt started to mass troops near the Sinai for what was to be the Six-Day War against Israel. Some analysts have suggested that the Yemen civil war provided Egypt with an opportunity to test its CW arsenal.¹⁰⁹

In 1959 or 1960, Egypt also initiated a secret program to develop and produce ballistic missiles with the aid of German scientists who had worked on the V-2 rocket during World War II. By late 1961, this program had produced two prototype missiles, the *Al-Zapher* (with a range of 350 km) and the *Al-Kafer* (with a range of 600 km). In July 1962, the 10th anniversary of the Egyptian revolution, Egypt test-launched four of the prototype missiles and displayed 20 of them in a parade in Cairo. Israel was stunned when it learned of the German-assisted Egyptian missile program, not realizing initially that the prototypes had no electronic guidance systems. Initial Israeli concerns were heightened by reports that Egypt was developing, with the aid of German scientists, radiological or chemical warheads for the missiles. Even when it became evident in the mid-1960s that Egypt had difficulty developing reliable missile guidance systems, there were still indications that Cairo was planning to build an arsenal of about 1,000 missiles.¹¹⁰

Some evidence suggests that Israel upgraded its own offensive chemical capability in the early to mid-1960s to counter the growing Egyptian CW arsenal. Reportedly, Israel collaborated with France around 1960 on chemical matters, including visits by Israeli scientists to the French CW testing range at Beni Ounif in the Algerian Sahara.¹¹¹ As Julian Perry Robinson pointed out, an IIBR publication in 1963 disclosed “all but the last step” in the synthesis of the VX nerve gas. Because the chemical structure of VX was not then known outside the United States, this observation suggests that IIBR scientists were engaged in developing VX-related nerve gases.¹¹²

Given the information about Egypt’s use of CW in Yemen in 1967, Israeli officials were deeply concerned on the eve of Six-Day War about the possibility that Egypt

might resort to CW, either as a battlefield weapon or against the Israeli civilian population. In response to these concerns, Israel purchased tens of thousands of mask gas in Europe (primarily West Germany) just days before the war began. Some evidence also suggests that Israel made its CW capability battle-ready.¹¹³ According to an Israeli analyst, “Egypt did not resort to chemical warfare because it feared Israeli retaliation in kind.”¹¹⁴

Senior Israeli military officers viewed CW and BW quite differently during the 1960s, although the 1925 Geneva Protocol prohibited the use of both types of weapons. As mentioned above, Israel did not accede to the 1925 Geneva Protocol until February 20, 1969. CW were considered “nasty” but probably legitimate retaliatory weapons, especially after it was known that Egypt had employed them in Yemen. Moreover, the United States and some NATO countries stockpiled chemical munitions at that time for deterrence purposes. Although the United States also had an offensive BW program until 1970, the Israeli military perceived BW quite differently. The handful of senior military officers familiar with the effects of BW considered them morally repugnant and militarily unusable. The case against BW was formulated more in military terms than in moral ones: because wars in the Middle East tended to be short-lived and decisive—terminated within days—no military use could be found for unreliable weapons with a long incubation period. Israeli military planners concluded that BW lacked both the political credibility required for strategic deterrence and the military utility needed for situations of last resort.¹¹⁵ At best, BW might be suitable for special covert operations. Given these views on the part of the Israeli military, it seems unlikely that Israel stockpiled operational BW on the eve of the 1967 War.

As the development of NW approached completion in the mid- to late 1960s, Israeli strategists began to articulate a more systematic rationale for the nuclear program. They conceived various “last resort” situations that could trigger the demonstration or employment of NW.

Each of these scenarios was defined as a threat to the very existence of the state of Israel, against which the nation could defend itself by no other means than the use of atomic weapons. One contingency involved enemy chemical or biological attacks against Israeli population centers.¹¹⁶ A conceptual linkage was drawn between a massive CBW attack and a nuclear reprisal. This scenario was probably in the minds of the small group of Israeli decisionmakers who, on the eve of the Six-Day War, took emergency steps to make the country’s rudimentary

nuclear capability operational and put it on alert.¹¹⁷ By 1970, Israel’s status as a nuclear weapon-capable state was generally accepted.¹¹⁸ Since then, all Israeli governments have reaffirmed the commitment to maintain, preserve, and modernize the country’s nuclear option.

During the 1973 Yom Kippur War, both Israel and Egypt possessed some non-conventional weapons to be used as a last resort. Although it has been reported (but never confirmed) that Israel armed its NW, it is less well known that Egypt apparently prepared CW for launch in the event that Israel continued its military offensive and reversed Egypt’s early gains in the war.¹¹⁹ In 1975, still under the veneer of ambiguity, Egypt Chief of Staff General Mohammed El-Gamasi warned publicly that Egypt would employ its own non-conventional arsenal if Israel resorted to the nuclear option.¹²⁰

Nevertheless, the two-decade period from 1970 to about 1990 was the golden age of nuclear opacity. Israelis came to view the policy as a success, because it provided the benefits of existential deterrence at a low political cost. Furthermore, many Israelis came to believe that the low-profile nuclear deterrent played a constructive role both in making peace (in the case of Egypt) and in deterring regional war (in the case of Iraq). After the 1973 war, Egyptian President Anwar Sadat recognized that the Arab-Israeli conflict could not be settled militarily, which led him to the search for peace. This all occurred, however, in the shadow of the Israeli bomb. In 1981, when Israel successfully bombed the Iraqi Osiraq nuclear reactor, Iraq did not retaliate—both because it lacked long-range aircraft or missiles, and because it was presumably deterred by Israel’s nuclear capability.¹²¹

During the 1970s, Egypt supplied Syria with CW agents; and in the 1980s, after signing the peace treaty with Israel, Egypt cooperated closely in the CW area with Iraq during the latter’s war with Iran.¹²² At the same time, the Arabs began to promote the idea that CBW might become their strategic weapon base—the so-called “poor man’s atom bomb”—to offset Israel’s nuclear capability. Even after Iraq employed CW during the Iran-Iraq War, Israel did not view CW as an existential threat to its security. Nevertheless, Israel’s high-profile participation in the Paris conference on CW in 1989 demonstrated that Israeli interests had converged with those of the international community in strengthening the international norm against chemical warfare. There was a growing perception in the Israeli strategic community that participation in the emerging CWC would be in Israel’s interests. With respect to

BW, however, the Israeli government maintained its total silence on the subject.

NUCLEAR VS. CBW DETERRENCE: THE UNCERTAIN LESSONS OF IRAQ

The 1991 Gulf War shattered Israel's sense of strategic complacency. More than any other country, Iraq elevated the value of CBW as a counterweight to NW. Iraq's extensive use of CW in the Iran-Iran War revitalized the old Soviet term "weapons of mass destruction," which combined the three types of non-conventional weapons into one ambiguous category. Saddam Hussein's acquisition of a massive CBW arsenal and long-range delivery systems also spawned an intricate web of possible linkages among the three types of non-conventional weapons in the context of deterrence, use as a last resort, and arms control. Ultimately, the 1995 revelations regarding the nature, scope, and rationale of the Iraqi BW program led some analysts to revisit the role of BW as a strategic deterrent, especially against the use of NW. Conversely, the Iraqi case led to a reexamination of the effectiveness of NW as a deterrent against the use of BW. These issues have since become central to the Israeli strategic predicament.

During the final stages of the Iran-Iraq War, Saddam Hussein employed CW both as a tactical weapon of terror and as a strategic deterrent.¹²³ On April 1, 1990, four months before the Iraqi invasion of Kuwait, Saddam elevated the strategic role of CW even further by threatening "to make fire burn half of Israel" by using what he called "the binary chemical weapon," should Israel strike "at some Iraqi industrial installation."¹²⁴ This threat signaled Saddam's interest in projecting a new deterrence posture vis-à-vis Israel. Iraq's large arsenal of advanced CW, along with ballistic missile delivery systems that could now reach Israeli territory, implied (from an Iraqi perspective) that Iraq had now achieved strategic parity, establishing a "balance of terror" between the two states.¹²⁵ Ballistic missiles with chemical warheads were portrayed as providing Iraq with the military means to confront a nuclear-armed Israel.

The specific context and purpose of Saddam's threat was to deter Israel from launching a military strike against Iraq's nuclear installations. It implied that an Israeli attempt to destroy Iraq's nuclear installations, similar to the 1981 attack on the Osiraq reactor, would be considered a *causis belli* and lead to severe retaliation.¹²⁶ In so doing, Saddam raised CW to the level of a strategic deterrent, or

at least a shield for Iraq's nuclear program through this vulnerable period. Israel took Saddam's deterrent threat seriously, concluding that an attack on Iraq's nuclear program would trigger an all-out war that could easily escalate to the non-conventional level. As a result, the 1981 Israeli strike on Osiraq could not be repeated in the new strategic environment.

Iraq's chemically armed ballistic missiles also became the central pillar of its deterrence strategy towards the United States and Israel after the invasion of Kuwait.¹²⁷ Both the United States and Israel lacked detailed information about the Iraqi BW program, but they took Saddam's CW threats seriously. Without neglecting defensive measures, both nations issued stern counter-threats. Secretary of State James Baker warned Iraqi Deputy Foreign Minister Tariq Aziz that any Iraqi resort to non-conventional weapons would be unacceptable to the American people and would provoke devastating retaliation. Baker's carefully worded message avoided stating explicitly what the U.S. response might be, but it did not rule out anything, including nuclear reprisals.¹²⁸ Meanwhile, Israeli Prime Minister Yitzhak Shamir pushed the policy of nuclear opacity to its limits when he issued a solemn warning to Iraq promising to inflict "terrible and awful" pain on Iraq, without ever using the "n-word."¹²⁹

By the end of the Gulf War, Iraq had fired some 40 Scud missiles at Israel, most of them aimed at Israeli population centers. Given that Iraq did not launch a CBW attack at Israel, many Israelis believe that the opaque nuclear deterrent was effective in deterring Saddam's use of non-conventional weapons.¹³⁰ This assertion may be true, but it is only one of several explanations. It also leaves many open and nagging questions. Can NW effectively deter the use of lower-level WMD? Under what circumstances is such deterrence posture likely to be effective? Are there situations in which NW simply cannot deter a non-nuclear adversary equipped with CBW? It is possible—and consistent with what has been learned about Iraq's BW program—that Saddam's strategic CBW assets were held in reserve, for use only in extreme and desperate situations of last resort? One can only guess as to their ultimate purpose, but it may have been more for revenge than for traditional deterrence.¹³¹

Had Iraq escalated its Scud attacks to the non-conventional level, Israel would have found itself in an extremely difficult dilemma. Facing the specter of Iraqi CBW attacks, Israeli leaders and strategists could not fail to recognize the profound limitations of NW vis-à-vis CBW.

After all, under almost any circumstances, Israel could not use its NW in retaliation for Iraqi CBW attack. To employ NW legitimately, Israel must face a true last-resort situation, in which its national survival is at risk. It is unlikely, however, that CW attacks would ever pose an existential threat to Israel. Could Israel then use NW in retaliation for a CW attack? If not, could Israel make a demonstration nuclear use over Iraq's unpopulated territory (e.g., desert) as a final act of deterrence?

Both before and during the Gulf War, Israeli military planners worried about Saddam launching a limited CW strike against Israeli territory in a deliberate effort either to call Israel's bluff and demonstrate the emptiness of its nuclear deterrent threat, or to provoke an Israeli nuclear response. Some analysts even worried that Saddam might attempt to trap Israel into some kind of nuclear demonstration. Such an action by Saddam could have been taken to break up the U.S.-led coalition, end the war, and portray Israel—not Iraq—as the real nuclear threat to the region. Apparently concerned about escalation that could potentially invoke an unjustifiable nuclear use, Israeli Minister of Science Yuval Ne'eman openly suggested in July 1990 that if Iraq used CW against Israel, Israel should retaliate "with the same merchandise."¹³² Ne'eman also proposed to the Israeli Cabinet that in facing the threat of Iraq's CW, Israel should issue a credible chemical threat of its own. In this way, Israel would not be compelled to cross the nuclear threshold in response to an Iraqi CW attack. Although Ne'eman made his proposal public, it was not endorsed officially. Apparently, there was no great desire to qualify or diminish Israel's nuclear deterrent by stating in advance that the Iraqi use of CW would not invoke an Israeli nuclear response.

Although the atomic bomb was undoubtedly Saddam's most sought-after non-conventional weapon, his second choice was BW (not CW). The Iraqi BW program was shrouded in secrecy, however. Only in August 1995, after the defection to Jordan of General Hussein Kamel, did Iraq admit to having had an offensive BW program. According to Iraq's own disclosures, which were still self-serving, after the August 1990 invasion of Kuwait, Baghdad had initiated a crash effort to weaponize its BW program and render it operational for military use. Saddam regarded BW as the ultimate strategic weapon, to be used in situations of "last resort." In the wake of the United Nations Security Council (UNSC) vote on November 29, 1990, authorizing war against Iraq if it did not withdraw from Kuwait, Iraq reportedly filled and armed 25 Scud war-

heads with BW agents. These warheads were then stored at remote airfields, from which they were to be fired at targets in Israel and Saudi Arabia if the Coalition forces marched on Baghdad and the regime fell.¹³³

Iraq invoked the specter of the Israeli bomb to justify its secret BW program, explaining it as "a viable deterrent in answer to the possible attack by Israel using nuclear weapons."¹³⁴ Although this linkage of the Iraqi BW program to the Israeli nuclear program was politically self-serving and historically inaccurate, it sheds light on the motivation and the strategy that guided Iraq's BW program. Avigdor Haselkorn suggests, ironically perhaps, that Saddam's "germ in the basement" posture mirrored Israel's opaque nuclear posture: Iraq established a secret arsenal of weaponized BW for situations of last resort, while using ambiguity to invoke deterrence. Nevertheless, the unpredictability, invisibility, and belatedness of germ weapons make them less of a deterrent and more the ultimate terrorist weapon.¹³⁵

The United Nations Special Commission (UNSCOM) and the International Atomic Energy Agency (IAEA) investigated Iraq's WMD programs beginning in April 1991. But it was only in the period 1995-98—after the defection of Hussein Kamel—that UNSCOM analysts were able to identify, clarify, and assess many aspects of Iraq's vast BW program. In the wake of the defection, Iraq withdrew its third Full, Final and Complete Disclosure (FFCD) on the BW program and admitted a far more extensive effort, including weaponization and testing of biological munitions. In the spring of 1998, UNSCOM experts concluded that Iraq's latest FFCD was deficient in all areas related to the BW program, including history, organization, acquisition of raw materials, research and development, agent production, weaponization, and deployment.

The post-war discoveries about Iraq's BW capabilities allow us to revisit the Gulf War. By Iraq's admission, in desperate situations where Saddam's own survival was in danger, it is likely that he would have resorted to the use of non-conventional weapons if only as a means of revenge.¹³⁶ A threat of nuclear reprisal, even one perceived as credible, might not have been effective in deterring such use. Thus, in situations of last resort, an Iraqi BW capability could provide a more effective deterrent than an Israeli (or U.S.) nuclear counter-deterrent. Iraq would not even need fully operational BW systems to produce deterrent effects; the very uncertainty of the Iraqi response would give rise to deterrence.

Iraq's interactions with UNSCOM regarding its BW program during 1995-98 have aroused additional concerns. Even though the BW program would be the easiest of Iraq's WMD programs to reconstitute, Iraq is suspected to have kept a substantial portion of its BW stockpile hidden from UNSCOM, while claiming to have destroyed it. It would have been easy for Iraq to turn over most of its BW stocks to UNSCOM while retaining the seed cultures, and then insist that it no longer had a BW program. But Iraq chose not to follow this path. According to some analysts, a possible explanation for Iraq's behavior may have been the desire to retain a future option for state-sponsored bioterrorism whose source could not be traced forensically. The argument is this: bioengineered pathogens can be traced by their DNA signatures. If Western authorities had samples of the seed stocks from which the BW agents were derived, they might be able to use an agent's DNA signature to determine who was behind a bioterrorist attack. Without samples of the original stocks, however, such forensic analysis would be very difficult.¹³⁷

Decades ago, Israeli leaders made the fateful choice for existential nuclear deterrence. They concluded that acquiring nuclear capability would allow Israel to ensure its survival by establishing a stable deterrence relationship with its Arab neighbors. They also hoped that this situation would eventually force the Arabs to recognize the futility of war and bring the conflict to an end. Israel's opaque nuclear posture was designed to project deterrence and yet be as unprovocative as possible. With the adoption of nuclear deterrence, Israel cut back its CBW programs and maintained a national infrastructure primarily suited for defensive research.

The lessons of Iraq's CBW programs appear to have cast some doubt on this old Israeli strategic calculation. The U.S. government believes that, in addition to Iraq, Egypt, Iran, Libya, and Syria have secret offensive CBW programs.¹³⁸ Recall Yuval Ne'eman's "private" comment prior to the Gulf War that Israel should retaliate in kind if attacked by Iraq with CW. After the Gulf War, some Israeli strategists argued that NW might not provide the most effective deterrent against state-sponsored bioterrorism, especially if the attack leaves no return address. Such lessons may strengthen those who argue that Israel should maintain some form of "biological option" (or "chemical option") as a deterrent in the event of use of BW or CW against Israel by Iraq or some other country.¹³⁹ At the least, those who hold this view contend that "the lessons of Iraq" provide a rationale for Israel to continue keeping

a posture of "biological ambiguity" by remaining silent on the BW issue.

Such lessons, however, are dangerously misleading. Israel should maintain a strong infrastructure in the CBW fields oriented for defensive needs, but this is not equivalent to the endorsement of the notion of "biological ambiguity" (or "chemical ambiguity") as a legitimate strategic concept. Based on both strategic and moral considerations, Israel should make clear that it does not consider CBW to be legitimate. I will elaborate on these considerations in the last section of the paper.

ISRAEL AND CBW ARMS CONTROL

Over the past four decades, the international community has negotiated three separate treaty regimes covering nuclear, biological, and chemical weapons. During the Cold War, nuclear proliferation was the paramount topic of concern for international security, so the first control regime focused on NW. The Treaty on the Non-Proliferation of Nuclear Weapons (NPT) was opened for signature in 1968 and entered into force in 1970. As of today, adherence to the NPT has reached a near-universal level; the treaty has 187 parties, and only four states remain outside (Cuba, India, Israel, and Pakistan).

The CW control regime is much younger, but more sweeping in its disarmament objectives. Although the international legal norm against the use of CBW in warfare dates back to the Geneva Protocol of 1925, it took seven more decades to negotiate a global ban on development, production, stockpiling, transfer, and use of CW. Opened for signature in January 1993, the CWC entered into force in April 1997. The CWC requires all parties to destroy any CW stockpiles and production facilities within ten years after its entry into force. It also has a stringent verification regime that commits its members to a high level of transparency and subjects all declared CW-related facilities (including certain commercial industry facilities) to a system of routine inspections. These inspections are augmented with the right of any member country to request a short-notice challenge inspection of any suspect facility, declared or undeclared, on the territory of another member. As of this writing, 143 countries have ratified the CWC.

The weakest WMD disarmament regime involves BW. The BWC, which was opened for signature in 1972 and entered into force in 1975, prohibits the development, production, stockpiling, acquisition, and transfer of patho-

gens or toxins “in types and quantities that have no justification for prophylactic, protective and other peaceful purposes.” The BWC does not include monitoring or enforcement mechanisms to ensure compliance, and it explicitly permits research and development for defensive purposes. As of this writing, the BWC has 143 state parties and 18 additional signatories. Multilateral efforts to negotiate an inspection protocol for the BWC have so far proved unsuccessful.

Traditionally, Israel has always taken a skeptical view of *global* arms control and disarmament treaties. The reasons are intimately tied with Israel’s geopolitical predicament vis-à-vis the Arabs. As long as the Arab-Israeli conflict has not come to closure, and Israel’s Arab neighbors have not accepted its legitimacy as a state, Israel must maintain the deterrent capabilities needed to assure its survival. For this reason, the Israeli government has generally been reluctant to join global disarmament and arms control regimes. Instead, Israel has advocated a *regional* approach; namely, that progress on the control and elimination of WMD in the Middle East must be made by linking the political issues of recognition, legitimacy, and peace to measures for arms control and disarmament.

In 1968, the year the NPT was opened for signature, Israel resisted strong U.S. political pressure to join the treaty, explaining that given its security predicament—including the Soviet threat—it simply could not renounce its nuclear option.¹⁴⁰ Unlike other advanced states in the nuclear field, such as West Germany and Italy, Israel had no formal security commitment from the United States to protect it from Soviet nuclear blackmail or attack. During the War of Attrition (1969-70), for example, Israeli and Soviet pilots engaged in direct aerial engagements over the Suez Canal, alarming Israeli decisionmakers such as Minister of Defense Moshe Dayan. In 1969, Israeli Prime Minister Golda Meir explained to U.S. President Richard Nixon why Israel had developed NW, why it could not sign the NPT, and why a low-profile posture of nuclear “opacity” would serve the interests of both countries. Israel pledged not to test NW or to admit publicly to possessing them. The United States, aware that the Israeli bomb was a *fait accompli*, stopped pressuring Israel to sign the NPT.¹⁴¹ This arrangement became the basis for the Israeli posture of nuclear opacity.

The creation of the Arms Control and Regional Security (ACRS) working group in 1991-92 was consistent with Israel’s regional approach. Israeli officials hoped that the creation of ACRS could establish new measures for con-

fidence-building and security cooperation among the countries of the region, in parallel to the peace process. The conclusion of the CWC in late 1992 led Israeli policymakers to reconsider, however. Despite the fact that the CWC challenge-inspection provisions posed a potential threat to the secrecy of the Dimona facility, Israeli leaders concluded that CW was the best issue on which they could demonstrate a more open-minded attitude towards arms control. Given Israel’s uncompromising position on the NPT, signing the international treaty to ban CW was seen as preferable to remaining outside, whether or not the Arab states followed suit.

In 1992-93, Prime Minister Yitzhak Rabin considered the CWC a “net benefit” for Israel. Given its nuclear capability, Israel had a clear strategic preference for a Middle East in which no country had CW, and a CWC that was universally respected would offer the best chance to eliminate CW from the region. Even if major Arab states refused to join the CWC, an Israeli decision to sign would probably improve its position in ACRS, perhaps even easing the pressure on the nuclear issue. The Rabin government also recognized that signing the treaty, while an important symbolic act, was not the final word; only ratification would make the commitment final. Guided by these considerations and pressured by the United States, Israel signed the CWC on January 13, 1993, the first day it was open for signature.¹⁴²

As a signatory-state, Israel was entitled to participate in the CWC Preparatory Commission in The Hague, which refined the verification procedures of the treaty in preparation for its entry into force. Israel was particularly engaged on the issue of “managed access,” with an eye to minimizing the security risks posed to it by challenge inspections. At the same time, Israel postponed a decision on CWC ratification for further review. As long as the U.S. Senate put off consideration of the treaty, it was convenient for Israel to delay as well. The United States finally ratified the CWC in April 1997, and following the treaty’s entry into force a few days later, the issue of Israeli ratification resurfaced as a priority policy issue.

A high-level ad hoc ministerial committee, headed by Prime Minister Binyamin Netanyahu, was formed to re-examine Israel’s position on the CWC. This committee included Defense Minister Yitzhak Mordechai, Commerce Minister Natan Sharansky, and National Infrastructure Minister Ariel Sharon.¹⁴³ After a series of meetings, the committee decided to take a “wait and see” attitude, that is, not to submit the CWC to the Israeli parliament for

ratification in the immediate future but to keep the issue open pending a future review. As Minister Mordechai put it:

I think that we have to wait and see how things develop. The problem is that some of the states in the region are not signing, and there is no way of inspecting those who are [not signing]. We had discussion in the cabinet, and we decided to postpone a decision for a certain period. We will discuss it again.¹⁴⁴

As of this writing, the Israeli government has not formally reexamined the issue of CWC ratification. Informally, however, it is evident that Israeli thinking about the CWC has changed profoundly in recent years. The treaty is no longer seen as a “net benefit” to Israel. A series of external developments in recent years related to WMD have raised serious concerns and doubts regarding CWC ratification. Here is a quick list.¹⁴⁵ First, the ACRS process reached an impasse in the mid-1990s and entered into complete freeze. Second, most of the major Arab states with CW capabilities, including Egypt, Iraq, Syria, and Libya, have not signed the CWC. (Syria is believed to have the largest and most sophisticated stockpile of CW in the region, as well as missile delivery systems.) Third, even under the relatively intrusive UNSCOM inspection regime, Iraq was able to hide important elements of its CBW programs; since December 1998, Iraq is no longer under inspection and is believed to be reconstituting these capabilities. Fourth, Iran, which did sign and ratify the CWC and even declared some past CW-related activities, is believed to be still producing and stockpiling CW in violation of the treaty.

These developments have returned Israel to its traditional cautious attitude on issues of arms control and disarmament. Two related areas of concern have emerged as the focus of the defense establishment’s opposition to CWC ratification: deterrence and security. With respect to deterrence, in 1993 Prime Minister Rabin concluded that the political-diplomatic benefits of joining the global effort to eliminate CW outweighed the benefits of projecting “chemical ambiguity” as a deterrent. This view no longer prevails. A senior Israeli defense official recently expressed the current Israeli thinking on CW in the following way: “We believe that chemical weapons should be taken off arsenals all over the world. But as long as this is far from reality, we have to contend with the threats surrounding us. These weapons do have some deterrent value, and we see certain advantage in it.”¹⁴⁶ Evidently,

the view that Israel must retain some ambiguity about its CW capabilities for purposes of deterrence is now firmly held by the Israeli defense establishment.¹⁴⁷

Concerns about security and secrecy have always underlined Israel’s skeptical view of arms control and disarmament agreements. In 1993, however, Prime Minister Rabin overruled senior defense bureaucrats and decided that Israel should sign the CWC. He believed that Israel could live with the security risks entailed by the verification system of the CWC. By the late 1990s, however, the death of Rabin and the transformation of the regional security situation caused the old concerns of the defense establishment to resurface and prevail. One specific concern is that the CWC challenge-inspection provision could be abused to infringe on the sanctity of Dimona.¹⁴⁸ Equally important (and more likely) is the concern—never stated in public by Israeli strategists—that the CWC verification process might infringe on the sanctity of Ness Ziona.¹⁴⁹

Not all Israeli officials and agencies agree with defense establishment’s opposition to the CWC. The Ministry of Industry and Trade, concerned about potential economic harm to the Israeli chemical industry resulting from mandatory trade restrictions on non-member states, has lobbied for ratification.¹⁵⁰ Yossi Beilin, former Minister of Justice (under Prime Minister Barak) and the Labor Party’s most prominent dove, has called openly for Israeli ratification of the CWC. Alluding to the defense establishment’s fears about revealing past secrets, Beilin noted: “We can’t be stuck in the mud forever, only because of things that were or were not done in the past.”¹⁵¹ By September 2000, officials at both the Foreign Ministry and the Ministry of Industry and Trade called for a new governmental review of the 1997 decision not to ratify the CWC.

That very month, however, the second Palestinian *intifada* began, renewing fears of escalation to regional war. Under these circumstances, the defense establishment faced no challenge to its firm position opposing CWC ratification. Senior defense officials insisted that even an annual economic loss of hundreds of millions of dollars could be justified in order to preserve Israel’s posture of “chemical ambiguity.”¹⁵²

Finally, there is the never-discussed issue of the BWC, which Israel has neither signed nor ratified. As noted earlier, Israel has never publicly explained its policy on BW, keeping silent not only about its activities and capabilities in this field but also about its diplomacy.¹⁵³ One can only assume that the reasons mentioned earlier for why Israel

should not ratify the CWC are also applicable to the BWC, but probably compounded. The issue of BW is more politically sensitive than CW, not only because BW are far more lethal, but also because Israel has presumably employed biological or toxin weapons for special operations.¹⁵⁴

POLICY ISSUES

Given the current cycle of violence in the Middle East, Israeli ratification of the CWC appears to be a dead issue. Nevertheless, at some time in the future, when the violence subsides and the region returns to the path of arms control and peacemaking, Israel will have to rethink its present policies on CBW. Relevant to this future policy review is a cluster of considerations: strategic-military, diplomatic, economic, and democratic.

Deterrence and strategy

While it is true that nuclear deterrence does not and cannot provide fail-safe deterrence for all non-conventional threat scenarios, it would be a mistake to conclude that Israel must retain a CBW option. Israel has good reasons to keep a strong national infrastructure for CBW defense, but this need should not be confused with the endorsement of a “chemical option” or a “biological option” as valid strategic concepts. Compared with NW, CW is too limited in its effects, and BW is too uncertain, to serve as effective strategic deterrents. In any event, both types of weapons have come to be seen as morally repugnant. The Arabs have acquired these weapons not because they consider them an optimal deterrent, but because they have nothing better to counter Israel’s NW.

Those Israeli strategists who suggest that Israeli NW do not provide a credible means to deter the first use of CBW by an Arab state—let alone by a sub-national terrorist group—could well be proven correct. Still, that does not mean that an Israeli CBW capability for retaliation in kind would provide a credible deterrent either. Thus, it is not accurate to argue that if Israel abandoned its posture of CBW ambiguity, it would lose a genuine deterrent against CBW attack. The reality is that even under the current posture, it is highly doubtful that Israel would retaliate in kind if it were attacked with CBW.

This assertion is based on two considerations. First, Israel has powerful conventional military capabilities that would enable it to retaliate harshly against nearly all CBW attacks without the need to resort to non-conventional weaponry. Second, Israel has no political interest in legiti-

mizing CBW and therefore has good reasons *not* to retaliate in kind. The most effective and credible way for Israel to deter the use of CBW by its enemies is not by retaining a residual CBW option, but rather by making explicit that Israeli retaliation would be certain and many times more damaging than the effects of the CBW attack itself. The bottom line is that a nuclear-armed Israel, like the United States, has no strategic need to maintain a posture of “CBW ambiguity” on top of its nuclear posture. Only in the extreme case of a devastating CBW attack would Israel consider launching a nuclear reprisal, yet from the Arab perspective such an option exists and must be considered.

Diplomacy and arms control

Given its history and geopolitics, Israel is committed to retain its nuclear capability as a national insurance policy even after the establishment of formal regional peace. Israeli strategists are firmly convinced—perhaps now more than ever—that Israel’s nuclear posture has been a stabilizing factor in convincing Arab leaders, such as Egyptian President Hosni Mubarak, of the futility of a regional war. Israel has proven itself a responsible *de facto* member of the nuclear club.¹⁵⁵ Although Israel has yet to find ways to state this reality, by now most of the world has come to terms with and accepted it. Indeed, it is the *certainty* of Israel’s nuclear capability—not its *ambiguity*—that makes it a credible deterrent for situations of true last resort.

Given the singular importance of its nuclear deterrent, Israel has an interest in designing a policy on CBW that would be supportive of its nuclear posture. In particular, Israel should ratify the CWC as part of an active Israeli arms control agenda, with the ultimate aim of helping to legitimize its nuclear deterrent. Contrary to those Arab states that have conditioned joining the CWC on Israel’s participation in the NPT, Israel’s interest is to de-link the CBW issue from the nuclear one. By ratifying and joining the CWC, regardless of the actions of the Arab states, Israel would join the Western consensus that CBW are immoral and illegal weapons that should be banned from the face of the earth. By the same token, for Israel to insist on retaining a posture of CBW ambiguity could undermine the singular importance of Israel’s nuclear posture, both with respect to its deterrence effects and its political legitimacy.

Economics and CWC sanctions

Thus far, Israel has paid only a small economic price for its decision not to ratify the CWC.¹⁵⁶ If restrictions on trade in Schedule 3 chemicals with CWC non-parties go into effect, however, the economic consequences could be significant.¹⁵⁷ Although it is too early to predict with any precision what the financial cost of Israel's decision to stay outside the CWC might be,¹⁵⁸ the question before Israeli decisionmakers is whether the security benefit of retaining some residual "CBW ambiguity" is worth the economic cost.

Transparency, secrecy, and democratic oversight

Finally, Israeli ratification of the CWC has implications for the health of the country's democracy, an issue that has hardly ever been discussed in this context. As already noted, Israel has employed extraordinary secrecy measures to protect its activities and policies in the CBW field. The Israeli government has never issued an official statement to the citizenry describing its CBW activities. Even the early history of the Israeli CBW program remains classified and thus off-limits to critical study.

From the normative perspective of democratic governance, a situation of total secrecy reinforced by a societal taboo is disturbing. That the citizens of a democratic country have been denied the right to know about their government's choices in a critical area of national policy, and to debate them freely, is detrimental to the spirit of democracy. The total lack of transparency in the CBW area has had many harmful effects, including a lack of democratic oversight, a lack of informed public debate, and concerns over possible harm to public health and the environment.

In the BW field, more than any other area of non-conventional weaponry, secrecy can be easily abused to weaken democratic oversight. Because of the inherent ambiguity between defensive and offensive BW activities, which are distinguished largely by intent, secrecy could allow an ostensibly defensive BW program to "drift" into the offensive mode. In the Israeli context, when the Knesset has virtually no independent means of parliamentary oversight and is fully dependent on information from the executive branch, the lack of democratic oversight over CBW activities is particularly serious. During the recent Israeli inter-governmental debate over ratification of the CWC, excessive secrecy reportedly prevented informed discussion even within the closed walls of officialdom.

Defense officials claimed that many of the arguments against CWC ratification were too sensitive to be shared even with their bureaucratic counterparts in other agencies. Lacking access to information, the Israeli general public was completely excluded from the policy debate.

Finally, the combination of official secrecy and societal taboo makes it easy for the Israeli defense establishment to conceal or cover-up safety hazards, accidents, program mismanagement, and environmental damage associated with CBW activities.¹⁵⁹

POLICY RECOMMENDATIONS

The following policy proposals, while unrealistic given the current political situation in the Middle East, should be carefully considered for the longer-term. Israel should seek the politically appropriate moment to convey a new and clear message regarding its CBW posture. Such a message would in effect involve partially abandoning the current policy of total secrecy and silence and would therefore require substantial diplomatic preparation. A new Israeli policy on CBW should also be an integral component of a larger regional arms control initiative.

A new Israeli policy on CBW should have three basic elements. First, as a matter of principle, Israel should state—somewhat akin to President Nixon's statement on BW in 1969¹⁶⁰—that it does not view CBW as legitimate weapons or instruments of deterrence and thus has no need to retain offensive CBW programs of its own. In line with this message, Israel would ratify the CWC, regardless of its neighbors' actions. If the Israeli government concludes that the Iraqi threat precludes it from acceding to the BWC for the time being, it should at least issue a policy statement explaining its position. These steps would also create new and beneficial norms for Israeli society with respect to transparency and democratic oversight.

Second, Israel should continue to retain a strong scientific and technological infrastructure in the CBW area, devoted solely to defensive purposes. As an important function of its defensive mandate, such infrastructure should include the national body in charge of scientific monitoring, analyzing, and assessing of intelligence relating to CBW programs in hostile countries, as well as new threats of bioterrorism.

Third, Israel should make publicly clear that it has the means and the will to retaliate in the most devastating way against any CBW attack.

¹ This paper was born of an earlier and much shorter piece written for a forthcoming volume, *The Biological Warfare Question: A Reappraisal for the 21st Century*, edited by Susan Wright. I am thankful to Susan for her well-informed comments on the original paper. My colleague Milton Leitenberg encouraged me to continue and expand the earlier research. I am deeply indebted to him for his helpful comments, suggestions, and wisdom. I am also grateful to Jonathan B. Tucker for his assistance in polishing the paper and to Assaf Moghadam for research support. Special thanks goes to Ronen Bergman for sharing with me some of his archival research. This paper was researched, written, and edited prior to the attacks of September 11, 2001, and the subsequent bioterrorism events in the United States.

² Ben-Gurion's letter to Avrieli, dated March 4, 1948, is cited in Michael Keren, *Ben-Gurion and the Intellectuals* (Sdeh Boker: The Ben-Gurion Research Center Press, 1988 [in Hebrew]), p. 32.

³ For more details on the Klingberg case as well as bibliographical references, see footnote 66.

⁴ This euphemistic phrase along with another somewhat contradictory one, "the bomb that never is," both appeared as headlines in two subsequent issues of *The Economist* (October 19, 1991 and October 26, 1991).

⁵ David Ben-Gurion, *Be-mah Nekabel Pnei Habaot* [With What Will We Face the Future] (Tel Aviv: Merkaz Mifleget Po'alei Eretz Israel, November 1948), pp. 35-36; also cited in Ephraim Katzir, "The Beginning of Defense Research: Ben-Gurion and the HEMED," in *David Ben-Gurion and the Development of Science in Israel*, pp. 26-27; and excerpted in David Ben-Gurion, *Be-hilahem Israel* [When Israel Fights] (Tel Aviv: Am Oved, 1950), p. 236. The author did the English translation.

⁶ Shimon Peres, *Battling for Peace: A Memoir* (London: Weidenfeld & Nicolson, 1995), p. 132.

⁷ Tom Segev, *The Seventh Million: The Israelis and the Holocaust* (New York: Hill and Wang, 1993), p. 82.

⁸ In a letter to a noted Israeli scientist, Ben-Gurion wrote, "There is a saying, 'the dead will not praise God,' and if we face the threat of destruction—and unfortunately we do, and Hitler's Holocaust was only the most extensive and terrible of the attempts to destroy us during our history—to a certain extent this is the most fateful of our existence." David Ben-Gurion to Professor Shmuel Sambursky, March 17, 1963, David Ben-Gurion Archive, *Letters*; cited in Avner Cohen, *Israel and the Bomb* (New York: Columbia University Press, 1998), p. 358.

⁹ David Ben-Gurion, *War Diaries, 1948-1949* (in Hebrew), vol. 3 (Tel Aviv: Misrad Habitachon, 1982), pp. 852-53.

¹⁰ Ben-Gurion to U.S. President John F. Kennedy, June 24, 1962, John F. Kennedy Presidential Library, Boston, MA.

¹¹ Ben-Gurion, *War Diaries*, entries of April 26, 1949, and October 23, 1950. For a detailed analysis of Ben-Gurion's views, see Zaki Shalom, *David Ben-Gurion: The State of Israel and the Arab World 1949-1956* (in Hebrew) (Sdeh Boker: Ben-Gurion University of the Negev Press, 1995).

¹² Professor Yuval Ne'eman, Head of the Planning Division of the IDF in 1953-54, personal communication with author, May 1997.

¹³ Cohen, *Israel and the Bomb*, pp. 339-49.

¹⁴ Aharon Katchalsky [Katzir] was probably the Israeli native-trained scientist that Ben-Gurion admired most. Aharon reportedly had open access to Ben-Gurion. At times, after discussing executive matters, Ben-Gurion engaged Aharon in philosophical discussions about the end and limits of scientific inquiry. Colonel Shlomo Gur, Tel Aviv, Israel, interview by author, July 7, 1992.

¹⁵ Aharon Katchalsky [Katzir] was the first to discuss the bombing of Hiroshima and Nagasaki with Ben-Gurion. Renana Leshem, Tel Aviv, Israel, interview by author, 1996.

¹⁶ Ephraim Katzir, "The Beginning of Defense Research: Ben-Gurion and the HEMED" (in Hebrew), *David Ben-Gurion and the Development of Science in Israel* (Jerusalem: Israel National Academy of Science, 1989), pp. 25-42; Munya Mardor, *RAFAEL* (Tel Aviv: Ministry of Defense Publishing House, 1981), pp. 70-72.

¹⁷ Cohen, *Israel and the Bomb*, pp. 14-17.

¹⁸ Peres, *Battling for Peace*, p. 134.

¹⁹ In his eulogy for Bergmann, Shimon Peres described the extraordinary alliance between Ben-Gurion and Bergmann: "Bergmann's scientific vision was attracted to Ben-Gurion's statesmanlike vision, and the plowman met the sower.

From the start, a visionary alliance was forged between them over science, defense, and politics that marked some of the most fateful moves of the State of Israel." "An Israeli Man of Distinction," Jerusalem, Israel, comments delivered by Shimon Peres at the funeral of Ernst David Bergmann, April 7, 1975. Peres' comments were also published in a booklet by the MOD (courtesy of Hani Bergmann and translated into English by the author); cf. Shimon Peres, *From These Men* (Tel Aviv: Ministry of Defense Publishing House, 1975), p. 186.

²⁰ Veterans of HEMED BEIT, interviews with author. See also Sara Leibovitz-Dar, "Haydakim Beshrut Hamedinah" [Microbes in State Service], *Hadashot*, August 13, 1993, pp. 6-10.

²¹ *Ibid.*, p. 6.

²² These large-scale poisoning operations did not actually materialize. See Ehud Sprinzak and Idith Zertal, "Avenge Israel's Blood (1946)," in Jonathan B. Tucker, ed., *Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons* (Cambridge: MIT Press, 2000), pp. 17-41.

²³ The following states that participated in World War II and had BW programs, in one form or another, were: Canada, France, Germany, Italy, Japan, the Soviet Union, the United Kingdom, and the United States. See Milton Leitenberg, "Biological Weapons in the Twentieth Century: Review and Analysis," paper prepared for 7th International Symposium on Protection against Chemical and Biological Warfare, Stockholm, Sweden, June 2001, <<http://www.fas.org/bwc/papers/bw20th.htm>>.

²⁴ Sara Leibovitz-Dar, "Haydakim Beshrut Hamedinah."

²⁵ *Ibid.*, p. 6. Colonel Gur told the author similar things in a long interview on July 20, 1992. However, some HEMED BEIT veterans insisted that they do not recall even a single occasion when Gur expressed such reservations at the time. In fact, they recall that he was always present as HEMED commander when high officials, such as Ben-Gurion, visited the unit at its Abu Kabir facility. Veterans of HEMED BEIT.

²⁶ Colonel Shlomo Gur, July 7, 1992.

²⁷ *Ibid.*

²⁸ *Ibid.*

²⁹ *Ibid.*

³⁰ *Ibid.*

³¹ *Ibid.*

³² *Ibid.*

³³ Thomas J. Hamilton, "Arab Assails the Idea of Minority Shifts," *New York Times*, July 24, 1948; Leibovitz-Dar, "Haydakim Beshrut Hamedinah."

³⁴ The first reference to the capture of the Israeli soldiers appeared in Israel on May 28, 1948, when the daily newspaper, *Yediot Ahronot*, cited a Reuters item from Cairo that reported the capturing of the two Israelis and their confession. Leibovitz-Dar, "Haydakim Beshrut Hamedinah."

³⁵ *Ibid.*

³⁶ *Ibid.* When the author interviewed Colonel Shlomo Gur in July 1992, he acknowledged that he had been aware of HEMED BEIT activities during the 1948 war but stressed that he had not been part of the chain of command, and that he maintained serious reservations about the need for such operations. In the interview, Gur did not specify what the operations were, nor did the author press him on that. HEMED BEIT was a peripheral issue in that interview.

³⁷ *Ibid.*

³⁸ See, for example: <<http://www.alnakba.org>>, maintained by the Khalil Sakakini Cultural Center, as well as the website of the Center for Research and Documentation on Palestinian Society at Birzeit University, <<http://www.birzeit.edu/crdps/>>.

³⁹ Hamilton, "Arab Assails the Idea of Minority Shifts."

⁴⁰ On the cholera outbreaks in Egypt and Syria in 1947, see W. Seth Carus, *Bioterrorism and Biocrimes: The Illicit Use of Biological Agents Since 1900*, Working Paper (Washington DC: Center for Counterproliferation Research, February 2001), pp. 87-88.

⁴¹ Dr. Salman Abu Sitta, speech delivered to U.K. House of Commons, London, November 24, 1999, <<http://www.prc.org.uk/webpages/announcements/lectures/lect-rr.html>>. The author was unable to verify any admission regarding the use of BW in those portions of Ben-Gurion's diaries that are available to researchers.

⁴² Benny Morris, "The Origins of the Palestinian Refugee Problem," in Laurence J. Silberstein, ed., *New Perspectives on Israeli History* (New York: New York

University Press, 1991), pp. 46-47.

⁴³ Benny Morris, *Righteous Victims: A History of the Zionist-Arab Conflict* (New York: Alfred A. Knopf, 1999), p. 217.

⁴⁴ Sara Leibovitz-Dar, "Haydakim Besheret Hamedinah," pp. 6-7.

⁴⁵ Mardor, *RAFAEL*, pp. 53-66, 78-79, 104-6; Shlomo Gur, interview by author, Tel Aviv, June 1993.

⁴⁶ Mardor, *RAFAEL*, pp. 69-75; Cohen, *Israel and the Bomb*, pp. 27-31.

⁴⁷ Mardor, *RAFAEL*, p. 75.

⁴⁸ Norman Rose, *Chaim Weizmann: A Biography* (New York: Viking, 1986), pp. 453-54. On Weizmann's strong resentment of the changes at the Sieff Institute, see *Mivhar Igrot* [Selected Letters] (Tel Aviv: Am Oved, 1988); and Mardor, *RAFAEL*, p. 75.

⁴⁹ Aaron Klieman, ed., "Chaim Weizmann to Ernst Bergmann," July 2, 1951, cited in Barnet Litvinoff, ed., *The Letters and Papers of Chaim Weizmann, August 1947-June 1952*, vol. 23, series A (New York: Rutgers University, 1980), p. 304.

⁵⁰ Bergmann wrote Ben-Gurion on July 1, 1951, "The establishment of an authorized organ for research, especially when the research is military, as a division at the Ministry of Defense under your sponsorship would be like a declaration that the government and the state consider science one of the pillars of the nation's building." Mardor, *RAFAEL*, p. 80.

⁵¹ On the parallel establishment of the nuclear research center, see Cohen, *Israel and the Bomb*, 25-97.

⁵² Anonymous former senior Israeli officials, interviews by author.

⁵³ Mardor, *RAFAEL*, pp. 92-93.

⁵⁴ The author coined this phrase; it is not Bergmann's.

⁵⁵ Bergmann designed and implemented a similar organizational arrangement for HEMED GIMMEL, the historical predecessor of Israel's nuclear program. In 1951-52, HEMED GIMMEL was transferred from the military to become a state-sponsored nuclear research center. The new entity also had a double identity: it was a classified research institute within the MOD (Machon 4) and, primarily for public and international convenience, also a laboratory of the IAEC (the predecessor of the Soreq nuclear research center). See Cohen, *Israel and the Bomb*, chap. 2-3.

⁵⁶ For the historical context see: Barton Bernstein, "Origins of Biological Warfare Programs," in Susan Wright, ed., *Preventing a Biological Arms Race* (Cambridge: MIT Press, 1990), pp. 9-26; Susan Wright, "Evolution of Biological Warfare Policy, 1945-1990," in Wright, ed., *Preventing a Biological Arms Race*, pp. 26-68; Brian Balmer, "The Drift of Biological Weapons Policy in the UK, 1945-1965," *Journal of Strategic Studies*, (December 1997), pp. 115-45; Leitenberg, "Biological Weapons in the Twentieth Century."

⁵⁷ Bergmann to David Ben-Gurion, December 5, 1952, in Mardor, *RAFAEL*, pp. 94-95; Cf. Bergmann to Ben-Gurion, May 4, 1955, in *Igeret*, Israeli Academy of Sciences, November 2000, p. 30. Mardor, EMET's administrator, wrote the following about Bergmann: "While it was natural to me that a prominent scientist as Professor Bergmann would seek to expand pure [basic] science, and not solely for defense needs, I could not always identify with such a trend, which was a violation of EMET's objectives." See Mardor, *RAFAEL*, p. 95.

⁵⁸ Anonymous former senior Israeli officials.

⁵⁹ Anonymous close associates of Bergmann, interviews by author, Israel, 1992-96.

⁶⁰ More than forty years after his death, Ludwig Fleck's writings remain prominent among historians and philosophers of science. His book, *Genesis and Development of a Scientific Fact* (Chicago: University of Chicago Press, 1981), is regarded as a classic. David Bergmann to the Commissioner of Civil Service, "The Late Professor Ludwig Fleck," June 16, 1961, Box 6313/Gimmel, Israel State Archive.

⁶¹ Anonymous former senior researchers at IIBR, interviews by author.

⁶² These figures (in Israeli currency) are found in an attachment to a letter, dated May 12, 1966, from IIBR administrator, M. Danai, to the Deputy Director General of the Prime Minister's Office, Amior Kamir. M. Danai to Amior Kamir, May 12, 1966, Box 6313/Gimmel, Israel State Archive.

⁶³ Yitzhak Greenberg, *Defense Budgets and Military Power: The Case of Israel* (Tel Aviv: Misrad Habitachon, 1997), p. 177. These figures illustrate the claim that CBW matters played a very limited role in Israel's overall defense posture.

⁶⁴ Shlomo Abramovitz and Mordechai Allon, "The Place Where Oranges are

Not Growing," *Yediot Ahronot*, August 14, 1998, pp. 16-20.

⁶⁵ *Ibid.* Recently it became known that the Israeli State Comptroller criticized the government for unnecessary efforts to keep the issue of the BW threat outside the public debate. This policy illustrates how sensitive and secretive the BW issue is in the eyes of governmental officials.

⁶⁶ On the Klingberg case, see the following items: Peter Pringle, "Israel Germ Expert Feared in Soviet Union," *Observer*, September 8, 1985; Ian Black, "Israel Holds Scientist for Spying," *Guardian* (London), February 26, 1988; Michael Binyon, "Riddle of three-way Spy Swap Report," *Times* (London), February 27, 1988; Peter Pringle, "'Missing' Israeli Scientist Was Jailed as Spy," *Independent* (London), August 4, 1993, p. 12; Alex Fishman, *et al.*, "Prof. Klingberg Passed on the KGB Secrets of Biological Warfare," *Hadashot* (in Hebrew), August 3, 1993, pp. 4-5; Yossi Melman, "The Soviet Spy Marcus Klingberg Submitted Pardon Request on Health Grounds," *Ha'aretz* (in Hebrew), August 4, 1993; Michael Rotem, "Klingberg Was to be Part of 3-Way Spy Swap," *Jerusalem Post*, August 6, 1993; "L'espion qui venait du Yiddishland," *Nouvel Observateur*, January 6, 1994, pp. 60-64; Clyde Haberman, "Israel Lifts Secrecy Veil from Spy Convictions," *New York Times*, May 4, 1995, A3; Batsheva Tsur, "Court Orders Klingberg Free," *Jerusalem Post*, September 4, 1998; P. R. Kumaraswamy, "An Embarrassment of Spies," *Bulletin of the Atomic Scientists* (March-April 1999), pp. 14-15, 61.

⁶⁷ Melman, "The Soviet Spy Marcus Klingberg."

⁶⁸ Pringle, "'Missing' Israeli Scientist Was Jailed as Spy," p. 12.

⁶⁹ Pringle, "'Missing' Israeli Scientist Was Jailed as Spy"; Aharon Priel, "Nobody Knows," *Ma'ariv*, October 24, 1983; Fishman *et al.*, "Prof. Klingberg Passed on the KGB Secrets of Biological Warfare."

⁷⁰ Pringle, "'Missing' Israeli Scientist Was Jailed as Spy"; Fishman *et al.*, "Prof. Klingberg Passed on the KGB Secrets of Biological Warfare"; Melman, "The Soviet Spy Marcus Klingberg Submitted Pardon Request on Health Grounds"; Rotem, "Klingberg Was to be Part of 3-Way Spy Swap"; Haberman, "Israeli Lifts Secrecy Veil from Spy Convictions."

⁷¹ "Israel Town Assails Bio Building," Associated Press, October 8, 1998.

⁷² Mark Lavie, "Rumors Abound About Israeli Center," Associated Press, October 24, 1998.

⁷³ Abramovitz and Allon, "The Place Where Oranges are Not Growing," pp. 16-20; Peter Hirschberg, "Inside the Low White Buildings," *Jerusalem Report*, December 21, 1998, p. 18; Aliza Marcus, "In Israeli Town, Rare Challenge to Arms Plant," *Boston Globe*, November 24, 1998, p. A1; "Israelis Play Dice with Danger at Germ Warfare Plant," *Guardian*, October 12, 1998, p. 10. Due to the Israeli societal taboo and military censorship, there is almost no Israeli-based material about IIBR; references to CBW activity are based on "foreign sources."

⁷⁴ "Israel's Secret Institute," *Foreign Report*, August 20, 1998.

⁷⁵ Peter Hirschberg, "Inside the Low White Buildings," *Jerusalem Report*, December 21, 1998, p. 18.

⁷⁶ Peter Hirschberg, Harms van den Berg, and Herman Stall, "The Fatal Fallout from El Al Flight 1862," *Jerusalem Report*, December 21, 1998, pp. 16-21.

⁷⁷ See, for example, Aluf Benn, "Chemical Weapons Convention: Israel's Decision Time," *Bulletin of the Atomic Scientists* 57 (March-April 2001), pp. 22-24.

⁷⁸ For a description of the activities and management, including the mission statement, of IIBR, see <<http://www.iibr.gov.il/profile.htm>>.

⁷⁹ *Ibid.*

⁸⁰ IIBR, "Mechanisms of Viral and Bacterial Pathogenesis," October 25, 2001, <<http://www.iibr.gov.il/mechan.htm>>.

⁸¹ IIBR, "Diagnosis of Infectious Diseases," October 25, 2001, <<http://www.iibr.gov.il/diagnos.htm>>. It appears that the IIBR mission includes some epidemiological functions analogous to those of the federal Centers for Disease Control and Prevention (CDC) in the United States.

⁸² Aluf Benn, "IIBR in Ness Ziona—Center of Essential Knowledge that Employs 320 Personnel," *Ha'aretz*, August 4, 1993, p. 2.

⁸³ Karel Knip, "Biologie in Ness Ziona," *NRC Handelsband* (Rotterdam), February 27, 1999. The detailed expose in Dutch can be found on the NRC website at the following address: <www.nrc.nl/w2/Lab/Ziona/>. Karel Knip generously provided the author a nine-page English translation of his article under the title "Biology in Ness Ziona." All of the quotes that appear here are from the English document that Knip provided to the author.

⁸⁴ *Ibid.*

- ⁸⁵ Stockholm International Peace Research Institute (SIPRI), *The Problem of Chemical and Biological Warfare* (Stockholm: Almqvist and Wiksel, 1971), Vol. I, pp. 75-78; Vol. II, pp. 35-36.
- ⁸⁶ Wright, "Evolution of Biological Warfare Policy," p. 35.
- ⁸⁷ Interestingly, Knip found almost no IIBR publications about the standard BW that Iraq produced, such as anthrax and botulinum toxin, even though it is "inconceivable" (in Knip's words) that IIBR has not conducted research into these areas.
- ⁸⁸ *Ibid.*
- ⁸⁹ On these intrinsic ambiguities, see Susan Wright and Stuart Ketcham, "The Problem of Interpreting the U.S. Biological Defense Research Program," in Wright, pp. 169-196; and Marc Lappe, "Ethics in Biological Warfare Research," in Wright, 78-99.
- ⁹⁰ Benn, "Chemical Weapons Convention: Israel's Decision Time."
- ⁹¹ Aluf Benn, "Israel Reviews Decision not to Sign BW Pact," *Ha'aretz* (Online Edition), January 2, 2001.
- ⁹² Peter Hirschberg, "Inside the Low White Buildings," *Jerusalem Report*, December 21, 1998, p. 18.
- ⁹³ Many of these sensationalist stories appeared in the London *Sunday Times*. One such report cites a biologist who allegedly once held a senior post in the Israeli intelligence: "there is hardly a single known or unknown form of chemical or biological weapon which is not manufactured at the Institute." Uzi Mahnaimi, "Israeli Jets Equipped for Chemical Warfare," *Sunday Times* (London), October 4, 1998. See also, "Israel's Secret Institute," *Foreign Report*, August 20, 1998; "Israel's Nes Ziona Mystery," *Foreign Report*, February 5, 1998.
- ⁹⁴ See remarks by General Almqvist in response to questioning by Senator Sam Nunn, U.S. Senate Armed Services Committee, *FY1975 Department of Defense Authorization Hearings*, Part 5 (R&D), March 7, 1974, p. 4290.
- ⁹⁵ U.S. Congress, Office of Technology Assessment, *Proliferation of Weapons of Mass Destruction: Assessing the Risk*, OTA-ISC-559 (Washington DC: U.S. Government Printing Office, 1993), pp. 65, 80. This report cites 11 public sources (government and NGO arms control experts as well as media) on the CW issue. All 11 sources refer to Israel as "having undeclared offensive chemical warfare capabilities" (Table 2-A-1, p. 80). As to the BW issue, the report cites six public sources, of which four refer to Israel as "having undeclared offensive biological warfare programs" (Table 2-B-1, p. 82).
- ⁹⁶ Milton Leitenberg, "An Assessment of the Biological Weapons Threat to the United States," White Paper prepared for Conference on Emerging Threats Assessment, Institute for Security Technology Studies, Dartmouth College, July 7-9, 2000. See also, Milton Leitenberg, "Biological Weapons, International Sanctions and Proliferation," *Asian Perspective* (Winter 1997), p. 11.
- ⁹⁷ Russian Federation Foreign Intelligence Service, at the Hearing Before the Committee on Governmental Affairs, United States Senate, "A New Challenge After the Cold War: Proliferation of Weapons of Mass Destruction," *Proliferation Threats of the 1990's*, 103rd Congress, First Session, 24 February 1993 (Washington DC: Government Printing Office, 1993).
- ⁹⁸ In the wake of the revelations regarding Iraq's BW program, Israel has presumably made efforts to "mimic" the Iraqi BW weaponization work. One would not be surprised if Israel made, and possibly even tested, models of Iraqi-designed weapons. Recently, it was revealed that the United States conducted similar research that appeared to test the limits of the BWC, if not actually violate it. See, Judith Miller et al., "U.S. Germ Warfare Research Pushes Treaty Limits," *New York Times*, February 4, 2001, p. A1; Judith Miller, "When Is a Bomb not a Bomb?" *New York Times*, February 5, 2001; Barbara H. Rosenberg and Milton Leitenberg, "Who's Afraid of a Germ Warfare Treaty?" *Los Angeles Times*, September 6, 2001; and Elisa D. Harris, "Research Not to Be Hidden," *New York Times*, September 6, 2001, A27.
- ⁹⁹ Cohen, *Israel and the Bomb*, chap. 2-3.
- ¹⁰⁰ Anonymous former senior officials, interviews with author.
- ¹⁰¹ There is evidence to suggest that, in late 1954, Ben-Gurion was preoccupied with the nuclear project. See *Israel and the Bomb*, chap. 3.
- ¹⁰² Aluf Benn, "The Project that Preceded the Nuclear Option," *Ha'aretz*, March 2, 1995.
- ¹⁰³ Mardor, *RAFAEL*, p. 128.
- ¹⁰⁴ *Ibid.*, pp. 128-29.
- ¹⁰⁵ Cohen, *Israel and the Bomb*, chap. 3-4.
- ¹⁰⁶ Stockholm International Peace Research Institute (SIPRI), *The Problem of Chemical and Biological Weapons*, vol. 1, *The Rise of CB Weapons* (New York: Humanities Press, 1971), pp. 86-87, 159-61, 336-41.
- ¹⁰⁷ SIPRI, *The Problem of Chemical and Biological Warfare*, vol. 5 (New York: Humanities Press, 1971), p. 227.
- ¹⁰⁸ *Ibid.*, pp. 228-37.
- ¹⁰⁹ W. Andrew Terril, "The Chemical Warfare Legacy of the Yemen War," *Comparative Strategy*, 10:2 (1991), pp. 109-119; Dany Shoham, "Chemical and Biological Weapons in Egypt," *Nonproliferation Review* 5 (Spring-Summer 1998), pp. 48-58.
- ¹¹⁰ The story of the Egyptian missile program has not yet been fully told. For a partial account, see M. Navias, "Ballistic Missile Proliferation in the Middle East," *Survival* (May/June 1989); Dan Raviv and Yossi Melman, *Every Spy a Prince* (New York: Houghton Mifflin, 1990); Meir Amit, *Rosh Be-Rosh* [Head On] (Tel Aviv: Hed Artzi, 1999), pp. 101-125.
- ¹¹¹ Seymour Hersh, *The Samson Option* (New York: Random House, 1991), pp. 63-64.
- ¹¹² Julian Perry Robinson, "Behind the VX Disclosure," *New Scientist*, January 9, 1975, p. 50. The 1963 scientific paper that Robinson refers to was: Z. Pelchowicz and H. Leader, "Organophosphorous Compounds, Part V," *Journal of Chemical Society* (1962), pp. 3320-23. Professor Zvi Pelach (Pelchowicz) was himself a student of Bergmann and the head of the chemistry division at IIBR for many years. When Munya Mardor wrote about the mysterious "crash program" of 1955 (that this author, following journalist Aluf Benn, interprets as a CW production program), he identified Dr. Zvi P. as one of the key figures in that operation. See Mardor, *RAFAEL*, p. 128.
- ¹¹³ Anonymous former senior American and Israeli officials, interviews by author.
- ¹¹⁴ Shoham, "Chemical and Biological Weapons in Egypt," p. 49.
- ¹¹⁵ Anonymous former senior Israeli officials.
- ¹¹⁶ Cohen, *Israel and the Bomb*, chap. 12.
- ¹¹⁷ Cohen, *Israel and the Bomb*, chap. 13. See also Yuval Ne'eman, "Israel in the Nuclear Weapons Age" (in Hebrew), *Nativ* 8 (September 1995), p. 38.
- ¹¹⁸ Hedrick Smith, "U.S. Assumes the Israelis Have A-Bomb or Its Parts," *New York Times*, 18 July 1970, p. 1.
- ¹¹⁹ President Sadat and Defense Minister Gamasi hinted this after the war. See Shoham, "Chemical and Biological Weapons in Egypt," p. 49.
- ¹²⁰ Cairo Radio, July 5, 1975, in Shoham, "Chemical and Biological Weapons in Egypt," p. 50.
- ¹²¹ It is worth recalling how little attention Israeli strategists gave to the CBW issue when discussing nuclear issues until the 1991 Gulf War. See, for example, Shai Feldman, *Israeli Nuclear Deterrence* (New York: Columbia University Press, 1981) and Yair Evron, *Israeli Nuclear Dilemma* (Ithaca: Cornell University Press, 1994).
- ¹²² Shoham, "Chemical and Biological Weapons in Egypt," p. 51.
- ¹²³ Thomas McNaughter, "Ballistic Missiles and Chemical Weapons: The Legacy of the Iran-Iraq War," *International Security* 15 (Fall 1990), pp. 5-34.
- ¹²⁴ "President Warns Israel, Criticizes U.S.," *Iraqi News Agency*, April 1, 1990, in FBIS-NES-90-064 (April 3, 1990), p. 32; see also Alan Cowell, "Iraqi Chief, Boasting of Poison Gas, Warns of Destruction if Israel Strikes," *New York Times*, April 3, 1990; Karen Eliot House, "Iraqi President Hussein Sees New Mideast War Unless America Acts," *Wall Street Journal*, June 28, 1990, p. 1. In fact, Iraq had crude binary CW that had to be mixed by hand.
- ¹²⁵ "Arab Power for Regional Peace," *Iraqi News Agency*, April 17, 1990, in FBIS-NES-90-108 (June 5, 1990). In his address to the Islamic conference in Baghdad on June 18, 1990, Saddam explained that his threat to burn half of Israel was just a way to signal deterrence, and not a reflection of intent to strike first. See "Saddam Husayn Addresses Islamic Conference," Baghdad Domestic Service (radio), in FBIS-90-118 (June 19, 1990), p. 21.
- ¹²⁶ For more analysis of the Israeli-Iraqi deterrence "dialogue" over the nuclear issue, see Avner Cohen and Marvin Miller, "Nuclear Shadow in the Middle East," *Security Studies* 1 (Autumn 1991), pp. 54-77. For somewhat different readings, see Shai Feldman, "Israeli Deterrence and the Gulf War," in Joseph Alpher, ed., *War in the Gulf: Implications for Israel* (Boulder: Westview Press, 1992), pp. 184-208; Amatzia Baram, "Israeli Deterrence, Iraqi Responses," *Orbis* 36 (Summer 1992), pp. 397-209.
- ¹²⁷ Avigdor Haselkorn, *The Continuing Storm* (New Haven: Yale University

Press, 1999), chap. 3-4.

¹²⁸ James A. Baker III, *The Politics of Diplomacy* (New York: J.P. Putnam Sons, 1995), pp. 359-60.

¹²⁹ Avner Cohen, "The Israeli Press Covers, and Then Covers Up, the Bomb," *Deadline* 6 (Summer 1991), pp. 17-19; Shai Feldman, "Israeli Deterrence and the Gulf War"; Haselkorn, *The Continuing Storm*.

¹³⁰ Gerald M. Steinberg, "Parameters of Stable Deterrence in a Proliferated Middle East: Lessons from the 1991 Gulf War," *Nonproliferation Review* 7 (Fall-Winter, 2000), pp. 43-60; Shai Feldman, "Israeli Deterrence and the Gulf War"; David A. Welch, *The Politics and Psychology of Restraint: Israeli Decision-Making in the Gulf War*, *International Security* 57 (Spring 1992), pp. 328-69.

¹³¹ Haselkorn, "Wartime Strategic Deterrence," chap. 4 in *The Continuing Storm*.

¹³² "Israelis See Chemical Option Against Iraq," *New York Times*, July 28, 1990.

¹³³ For a comprehensive account of the Iraqi BW program including reference to UNSCOM reports, see Raymond A. Zilinskas, "Iraq's Biological Warfare Program: The Past as Future?" in Joshua Lederberg, ed., *Biological Weapons: Limiting the Threat*, BCSIA Studies in International Security (Cambridge: MIT Press, 1999), pp. 137-58; Timothy V. McCarthy and Jonathan B. Tucker, "Saddam's Toxic Arsenal: Chemical and Biological Weapons in the Gulf Wars," in Peter Lavoy, et al., eds., *Planning the Unthinkable: How New Powers Will Use Nuclear, Biological and Chemical Weapons* (Ithaca: Cornell University Press, 2000), pp. 47-78; Milton Leitenberg, "Deadly Unknown About Iraq's Biological Weapons Program," *Asian Perspective* 24, No. 1 (2000), pp. 217-223; Stephen Black, "Investigating Iraq's Biological Weapons Program," in Lederberg, *Biological Weapons: Limiting the Threat*, pp. 158-64; and Richard Butler, "Inspecting Iraq," in Joseph Cirincione, ed., *Repairing the Regime* (New York: Routledge, 2000), 175-84. For an UNSCOM chronology of the Iraqi BW program, see UNSC Document No S/1995/864, October 11, 1995; see also R. Jeffrey Smith, "Iraq's Drive for a Biological Arsenal," *Washington Post*, November 21, 1997, p. 1.

¹³⁴ In a lecture in Israel on July 17, 2000, Former UNSCOM executive director Richard Butler revealed that Iraqi Deputy Prime Minister Tariq Aziz told him that Iraq had BW "to deal with the 'Zionist entity.'" Etgar Lefkovits, "Iraq Brags of Biological Weapons to 'Deal with Zionist Entity,'" *Jerusalem Post*, July 18, 2000, p. 1.

¹³⁵ Haselkorn, *The Continuing Storm*, chap. 4.

¹³⁶ Haselkorn suggests that the last Scud Iraq launched at Israel on February 25, 1991, which was tipped with a concrete warhead, was intended to be a BW warning aimed to deter the United States and Israel from attacking Baghdad.

¹³⁷ Seth Carus and Laurie Mylroie, personal communication with author, Washington, DC, August 2001.

¹³⁸ U.S. Department of Defense, Office of the Secretary of Defense, *Proliferation: Threat and Response* (Washington, D.C.: U.S. Department of Defense, April 1996); Defense Nuclear Agency, "Biological Weapons Proliferation" (Ft. Detrick, MD: U.S. Army Medical Research Institute of Infectious Diseases, April 1994), p. 49; Rear Adm. Lowell Jacoby, Director of Intelligence, Joint Staff, "Anthrax Biological Warfare Threat," statement before the U.S. Senate Committee on Armed Services, April 13, 2000.

¹³⁹ In the CW context, senior Israeli defense officials now openly voice this argument. Benn, "Chemical Weapons Convention: Israel's Decision Time," pp. 22-24.

¹⁴⁰ Cohen, *Israel and the Bomb*, pp. 287-89, 326-27.

¹⁴¹ *Ibid.*, chap. 17.

¹⁴² Gerald Steinberg, "Israeli Policy on the CWC," *OPCW Synthesis*, November 2000, pp. 9-13.

¹⁴³ Steve Rodan, "Bitter Choices: Israel's Chemical Dilemma," *Jerusalem Post*,

August 15, 1997, p. 10; David Makovsky, "Israel Must Ratify Chemical Treaty," *Ha'aretz* (Online Edition), January 8, 1998, <<http://www.haaretz.co.il>>; Benn, "Chemical Weapons Convention: Israel's Decision Time."

¹⁴⁴ Ze'ev Schiff, "An interview with Yitzhak Mordechai," *Ha'aretz*, April 16, 1998, p. 10. See also Steinberg, "Israeli Policy on the CWC."

¹⁴⁵ Aluf Benn, "A Difficult Choice: The Chemical Weapons Convention," *Ha'aretz* (Online edition), November 29, 2000, <<http://www.haaretz.co.il>>; Benn, "Chemical Weapons Convention: Israel's Decision Time," pp. 22-24.

¹⁴⁶ Benn, "Chemical Weapons Convention: Israel's Decision Time," p. 22.

¹⁴⁷ *Ibid.*, p. 23; see also Steinberg, "Israeli Policy on the CWC," p. 31.

¹⁴⁸ Benn, "A Difficult Choice: The Chemical Weapons Convention"; see also Benn, "Chemical Weapons Convention: Israel's Decision Time," p. 23.

¹⁴⁹ Benn cites senior defense officials who expressed strong opposition to the transparency provisions under the CWC, in particular the requirement to reveal all past activities and facilities related to the development, production, and stockpiling of CW. Benn, "A Difficult Choice: The Chemical Weapons Convention."

¹⁵⁰ *Ibid.*

¹⁵¹ *Ibid.*

¹⁵² *Ibid.* Benn summarizes the current view in the Israeli defense establishment as follows: "As long as our neighbors see their CW as their deterrent against us, there is no point in talking about us joining the CWC."

¹⁵³ Benn, "Israel Reviews Decision Not to Sign BW Pact."

¹⁵⁴ Since World War II, poison weapons have been mostly associated with special operations by intelligence services. It is widely believed that in 1997, Mossad attempted to assassinate Khaled Mishal, the head of the political bureau of Hamas in Jordan, by using a lethal dose of the synthetic opiate Fentanyl. Jean Pascal Zanders, "Assessing the Risk of Chemical and Biological Weapons Proliferation to Terrorists," *Nonproliferation Review* 6 (Fall 1999), p. 19; Allan Cowell, "The Daring Attack that Blew Up in Israel's Face," *New York Times*, October 15, 1997, p. A8.

¹⁵⁵ Avner Cohen, "Nuclear Arms in Crisis Under Secrecy: Israel and the Lessons of the 1967 and 1973 Wars," in Lavoy et al., *Planning the Unthinkable*, pp. 104-24.

¹⁵⁶ In the year 2000, when the control mechanisms regarding the treaty's Schedule 2 items went into effect, it applied only to one relevant item used by a single Israeli company. As journalist Benn notes, "the company somehow found a way around the problem." Aluf Benn, "A Difficult Choice: The Chemical Weapons Convention"; Cf., Benn, "Chemical Weapons Convention: Israel's Decision Time," pp. 22-24.

¹⁵⁷ Israeli industries import about 5,000 tons of Schedule 3 items a year, primarily from CWC member-countries such as Germany, Switzerland, the United States, and China. These imported chemicals are used in the manufacturing of drugs, detergents, and various electronic components. Benn notes, "[w]ithout them, industries will have to shut down assembly lines—or transfer their production facilities and R&D labs abroad." Benn, "Chemical Weapons Convention: Israel's Decision Time," pp. 22-24.

¹⁵⁸ *Ibid.* The Israeli defense establishment estimates that if the Schedule 3 sanctions apply in full, the penalty to Israel could reach \$100-200 million.

¹⁵⁹ Eileen Choffnes, "Germs on the Loose," *Bulletin of the Atomic Scientists* 57 (March-April 2001), pp. 57-61.

¹⁶⁰ For the historical context of President Nixon's decision to end U.S. offensive biological and chemical warfare programs, see Robert A. Wampler, ed., "The Nixon Administrations's Decision to End U.S. Biological Warfare Programs," *The September 11th Sourcebooks*, Vol. III: Biowar, National Security Archive Electronic Briefing Book No. 58, October 25, 2001, <<http://www.gwu.edu/~nsarchiv/NSAEBB/NSAEBB58/>>.