



The foundations of Israel's ongoing love affair with science

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ABSTRACT

During the last two decades, the history of science in Israel has attracted much scholarly attention. Historians of science, science and technology studies (STS) scholars, and Middle East/Israel studies experts have focused on specific scientific disciplines or periods, analyzing the uniqueness of science and technology in Israel. This article explores what characterized Israel's scientific activity precisely at the time of the state's birth, and examine how the perception of science as key to Israel's survival was constructed and reinforced in that formative phase. The focus here is on the natural sciences, as the perception of the natural sciences' importance and their contribution to building the state and its security differed essentially from that of other disciplines. As this article demonstrates, the challenges that the natural sciences faced during Israel's War of Independence were far more difficult than those faced by the social sciences and the humanities. This study analyzes scientific activity that took place in one single year, beginning with the establishment of the Science Corps in March 1948, two months before Israel's declaring independence, until the end of its War of Independence in February 1949. As this study shows, both the war effort and the civilian activities strongly influenced scientific research and implementation in the nascent state.

Introduction

Nine and a half million citizens currently live in Israel, but when the state was established in 1948, its population numbered less than one million. During the decades of its existence, Israel has been involved in several wars against neighboring Arab countries and a series of military operations against Gaza's Palestinians, and has made headlines around the world mostly for these ongoing armed conflict. Nevertheless, Israel is also famous for its advanced science and technology, and for being one of the states with the world's highest number of scientists and engineers per capita, despite its population's small size and young age as a state. At the beginning of the 1990s, Israel led in global scientific publications per capita, and today, it is still one of the top ten countries in scientific publications per capita in mathematics, psychology, neuroscience, physics, and astronomy (Ministry of Science and Technology, 2018).

The seeds of Israel's love affair with science were planted decades before the state was established, and they can be easily traced through the thought and rhetoric of Zionism, the Jewish national movement that arose in the last quarter of the nineteenth century. Zionist thinkers and activists believed that harnessing modern science to their cause would

enable transforming the wilderness of the Land of Israel to a flourishing landscape and that consequently would enable establishing a Jewish state therein. In his books *Altneuland* and *The Jewish State*, Jewish visionary and founder of the World Zionist Federation Benyamin Ze'ev [Theodor] Herzl, designated a key, significant role to science and technology in forming the new state that he envisioned and the new society therein (Elboim-Dror, 1993; Shapira, 2012, p. 18). For Herzl and other Zionist leaders, excellence in science and advanced technology signified the country in the making, as well as the secular embodiment of "the Chosen People" (Paz, 1997).

Science and technology were perceived as essential for the development and thriving of industry and agriculture by Jewish pioneers who, from 1882 onward, came to live in the Holy Land. These pioneer immigrants, mostly from Eastern Europe, believed that science would enable producing enough food and keep them healthy. Moreover, those Zionist pioneers viewed scientific and technological activities as something that distinguished 'the new Jew' from Orthodox Jews of the 'old Yishuv'¹ on the one hand, and from their Arab neighbors on the other. At the same time, the Zionists argued that not only they would benefit from Western science and technology, but so would the local "primitive" Arab

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¹ The 'old Yishuv' refers to the tiny Jewish presence in Palestine that had been there for centuries, made up of devout Jews who lived off of donations from Jews in the Diaspora and who spurned modernity; in contrast to 'the (new) Yishuv', which refers to the Jewish population of Palestine that arrived from 1882 onward, inspired by Zionism.

population. Thus, aside from contemporary practical considerations and hopes for a better future, science played an important role in Zionists' self-image as bringing the West to the Middle East (Efron, 2014, pp. 67–93).

The state of Israel was established in 1948, and soon thereafter, stood out among countries that gained their independence after World War II, in its scope of scientific infrastructure and technology; and the trend of investment in science and its implementation continued to grow during Israel's early years. The high value placed on the sciences is exemplified by the fact that Albert Einstein was proposed as Israel's first president. When Einstein declined the position, the well-known chemist Chaim Weizmann (1874–1952) was appointed (Cohen & Chazan, 2016). Israel's fourth president was biophysicist Ephraim Katzir (1916–2009), (Katzir, 2008), and as Noah Efron put it, "It seems that for a time, the road to the presidential residence in Jerusalem ran through the laboratory" (Efron, 2011).

During the last two decades, the history of science in Israel has attracted much scholarly attention. Historians of science, science and technology studies (STS) scholars, and Middle East/Israel studies experts have focused on specific scientific disciplines or periods, analyzing the uniqueness of science and technology in Israel (Abu El-Haj, 2001; Efron, 2014; Falk, 2017; Golan & Corry, 2010; Hirsch, 2009; Katz, 2001; Kirsh, 2003; Vertommen, 2017). In this article, I explore what characterized Israel's scientific activity precisely at the time of the state's birth, and examine how the perception of science as key to Israel's survival was constructed and reinforced in that formative phase. I will ask to what extent that perception of science was a mere continuity of the ethos of science prevalent in the Zionist movement from its inception, and to what extent it was influenced and shaped by the establishment of the State of Israel in 1948 and its War of Independence.

I chose to focus solely on the natural sciences, as the perception of the natural sciences' importance and their contribution to building the state and its security differed essentially from that of other disciplines. As I will demonstrate, the challenges that the natural sciences faced during Israel's War of Independence were far more difficult than those faced by the social sciences and the humanities. I studied scientific activity that took place in one single year, beginning with the establishment of the Science Corps in March 1948, two months before Israel's declaring independence, until the end of its War of Independence in February 1949.

Throughout the period that I address, a bloody war was fought. In its first stage, immediately following the United Nations decision of November 29, 1947 to end the British mandate over Palestine and establish two states in its place, war broke out between the Jewish and Arab populations therein. From mid-May 1948, after the last British soldier departed Palestine and the state of Israel was declared, the fighting intensified and the regular armies of the neighboring Arab countries—Egypt, Jordan, Syria, Lebanon, and Iraq—joined the war against the newly declared Israel.² Concomitant with the war, Israel established state institutions and geared up to take in hundreds of thousands of immigrants: survivors of the Holocaust in Europe, and Jews fleeing Arab countries. As I will show, both the war effort and the civilian activities strongly influenced scientific research and implementation in the nascent state.

Background: Science in Mandatory Palestine

While the Jewish community in Palestine under the British Mandate at the end of the 1920s numbered only 150,000, it began establishing scientific institutions—each of which employed dozens of researchers—as early as the mid-1920s. The Hebrew University in

Jerusalem, established in 1925, was the main research institution at the time. The Hebrew University's founders envisioned it as a prestigious scientific institution as well as a modern national temple and symbol of the Jewish national renaissance (Barshai, 1982; Heyd, 1999; Lavsky, 1997, p. 122; Paz, 1997, p. 281). However, in its first years, the Hebrew University was perceived by some as not manifesting full identification with the Zionist endeavor and interests of the Yishuv. The Yishuv's inhabitants perceived a certain alienation between "the valley" and "the mountain": while the core values of the Jezreel Valley pioneers included physical labor and a deep affinity for the land and nation, the professors on top of Mount Scopus were engaged in intellectual endeavors and viewed themselves as belonging to the global science community (Cohen, 2006; Shapira, 1997). Moreover, Hebrew University Chancellor Judah Leon Magnes, and some of the prominent professors and lecturers, whose political identity differed wildly from the prevailing political identity of the Yishuv, adopted an anti-militaristic, pacifist approach and in 1925 founded Brit Shalom ["Covenant of Peace"], which advocated a binational Arab and Jewish state (Shapira, 1999). Yet despite the perceptions of the university faculty's distance from the local Yishuv society, a recent study revealed that many of the university's researchers were actually guided by national emotions and values that were similar to those of the surrounding society (Kirsh, 2022).

By the time of the state's founding in 1948, the Hebrew University already had a faculty of 159 (Gurevich et al., 1947, p. 341).³ The Technion, Israel's institute of technology in Haifa (Dror, 1995), had been established in 1924, a year before the Hebrew University, and by 1948 had a faculty of sixty researchers and thirty assistants (Lavy, 1999, p. 255). In 1933, with the support of the Sieff and Marx Jewish British families, Weizmann founded the Sieff Institute in Rehovot. By 1948, the Sieff Institute, which succeeded in attracting world-renowned scientists to its ranks, numbered twenty-nine researchers and sixty laboratory assistants and technicians, and in November 1949 it was renamed the Weizmann Institute of Science after its founder (Cohen, 2016). Another research institute established in Rehovot was the Agricultural Research Station of the Jewish Agency (*Hasochnut*). An additional agricultural experiment station operated in Acre, and although it was affiliated with the British mandatory government, all of its departmental directors were Jews, as well as most of its staff.

Aside from those large institutions, small research facilities were founded by Jews who immigrated to Mandatory Palestine. These focused on a specific problem, such as the Pasteur Institute, founded in 1913 by Dr. Leo (Arieh) Bohm, to study bacteriology (Davidovitch & Zalashik, 2010); and a malaria research station in Rosh Pina headed by Prof. Gideon Mer. The British set up some laboratories as well, among them a standards institute and a veterinary institute, which focused on time-specific, local problems.

During World War II, science in Palestine suffered from various limitations and even a partial freeze due to the difficulties in making contact with scientists abroad. Beginning in 1942, David Ben-Gurion (1886–1973),⁴ head of the Jewish Agency in Jerusalem and later Israel's first prime minister, worked to formulate a plan for expedited immigration of one million Jews within 18 months. It is worth noting that the Jewish population of Palestine numbered only about half a million at that time. To implement his plan, Ben-Gurion formed a committee that included scientists and other experts (Barell, 2014, chapter 3).

With the war's end, Palestine's Jewish community geared up for the next stage in the struggle for independence, wherein again Ben-Gurion surmised that the Jewish community's main advantage in the upcoming struggle against the Arab armies lay in its ability to exploit

² The war's dynamics changed greatly from November 1947 until the 1949 armistice, and historians usually divide the war into five phases (Lorch, 1968; Oren, 2004). I may explore the question of how the various phases of the war's development affected the use of and attitude to science in a future study.

³ See also [no author and publisher names] (1957) *The Hebrew University of Jerusalem* – 1957. pp. 166, 173, and [no author and publisher names] (1960) *The Hebrew University of Jerusalem* – 1960. pp. 212, 220.

⁴ On David Ben-Gurion, see Shapira (2014).

scientific and technological innovations on the battlefield. To that end, in early May 1947, Ben-Gurion contacted Technion Professor of Architecture Yochanan Ratner and asked him to head the scientific activity of the Hagana [Hebrew for “defense,” the primary quasi-military body of the Jewish community in Palestine], saying:

Scientists constitute a respectable portion of our potential, and we must enlist them. They can invent substitutes for raw materials that we lack, perhaps weapons that can be secretly manufactured (Barell, 2014, p. 258, original in Hebrew, translated by Miriam Erez).

As part of the recruitment to the Hagana, and thereafter to the IDF (Israel Defense Forces), young scientists acquired practical experience, and as will be shown in the next section, the scientific, technological, and security needs of the state-in-the-making were identified.

Science serves the war effort

On March 17, 1948, two months before Israel’s founding, the Hagana command officially founded the Science Corps, (or *Hemed*, in Hebrew), to which engineers and dozens of the Hebrew University and Technion physics and chemistry students were recruited, as well as professors and research assistants. The corps’ headquarters were established in Tel Aviv, and Science Corps bases were built in Givatayim (outside Tel Aviv on a hill, which was appropriate for setting up a radar detection unit); as well as in Jerusalem, Haifa, and Rehovot. At its height, the corps numbered 800 recruits, a remarkable number when taking into account the small number of scientists in the population at the time (Bachrach, 2016). A central function of Hemed was industrial-scale production of weapons such as mines, “Molotov cocktails” (bottle bombs), and smoke grenades. In addition, they were developing cannons without recoil, missiles, rockets, and projector infantry anti-tank weapons (Katzir, 2008, pp. 100-107).

The services of the corps’ scientists during the War of Independence forged ties that evolved into fruitful collaborations that continued for decades. The electronics laboratories that the corps set up at the Sieff Institute during the war were the basis for future developments in electronics in Israel (Flowers, 1975, p. 55). As well, nuclear physics solidified in Israel owing to the joint services of physicists in the corps. With the war’s end, they returned to their studies in the Hebrew University. After completing their MA, their professor, Giulio Racah, assisted them in enrolling in other universities so as to familiarize them with various facets of nuclear physics; two of them went on to doctoral studies in Zurich and each of the remaining four went to Chicago, Bristol, London, and Amsterdam. Upon their return, these young scientists first worked at Weizmann Institute and at the Defense Ministry, and afterwards they founded the Nuclear Physics Department at the Weizmann Institute (Ne’eman, 2001; Cohen, 1999, p. 26).

The IDF was a fertile meeting ground for scientists not only in the Science Corps, but also elsewhere. A young female medic, who would later become the internist and hematologist Prof. Bracha Ramot, (2001 Israel Prize laureate) was posted to the northern Negev, where she met physician Baruch Padeh during her service. With Padeh’s encouragement, she enrolled in the Hebrew University Medical School immediately upon her discharge (Kirsh, 2006; Grunseid, 2021). Yet, despite the importance of these encounters and the ties that they produced between scientists and future scientists, during the war itself, the scientists’ enlistment into the military significantly decreased scientific activity.

Not only were individual scientists harnessed to the war effort, but so were entire research institutes whose researchers were compelled to desist from a substantial portion of their regular activities in deference to war-related works. Organic chemist Ernst David Bergmann, who served as scientific director of Sieff Institute, placed a good portion of the institute’s labs and equipment at the disposal of the Science Corps, and he proudly reported that its staff worked “7 days a week, 24 h a day” (Jensen et al., 2011, p. 136). Bergmann and his team even took over the laboratories of the nearby Agriculture Faculty of the Hebrew University

in order to use them for the war effort. Many of the Sieff Institute, the Hebrew University, and Technion scientists, as well as Jewish scientists from English-speaking countries who had come to Israel during the war, worked together under Bergmann’s direction. Their objective was to produce weapons and explosive compounds, and to conduct research in biological warfare, but their means were few and they worked under sub-par conditions in terms of equipment and technical knowledge (Flowers, 1975, pp. 42-44; Yekutieli, 1996, pp. 17-19).

One of the Sieff institute’s projects was the production of long-range weapons that would enable covering distances between 0.8 and 5.0 km. Producing such missiles necessitated researching the physics of the flight of missiles and the chemistry of propellants. The Sieff Institute’s scientists sought to develop propellants that did not depend upon the import of materials from abroad, by creating a mixture of inorganic salts from the Dead Sea with high polymers such as plastic and natural rubber (Jensen et al., 2011, pp. 144-145). Electronic research was carried out in the institute to design infra-red night-vision goggles. Other projects were the manufacturing of walkie-talkies and producing tear gas. In addition, the scientists sought to prepare for a situation wherein the enemy would use gas against Israeli soldiers. Bergmann wrote to Weizmann:

There is a definite danger that the Arabs may use gas in the future, and we are trying to make the necessary preparations to meet this menace. We are working on methods for the production of Chloramine T against mustard gas, and of 2,3-dithiopropanol against lewisite⁵ (Jensen et al 2011, pp. 143-144).

Meanwhile, Israeli Scientists were in disagreement regarding the role of science when the cannons roar. Some—mainly the younger ones—believed that all science resources should be mobilized for the national struggle; while others argued that a clear distinction should be drawn between the needs of the nation and those of science (Cohen, 2006, pp. 111-112).

Chaim Weizmann, who was in the USA engaged in diplomatic activity, was furious at the Science Corps’ commandeering the institute that he had founded fifteen years earlier. In a July 1948 letter to his confidant, Meyer Weisgal, he wrote:

I have no information of what is really going on there except some scanty communication to the effect that the whole Institute is switching over to what is called war work. This means that the entire scientific basis of the Institute has been changed. [...] there is no reason why the whole of the scientific work, into which so much energy, devotion, and love has been poured, should be replaced by something which is not science but making of explosives. [...] It literally hurts me to feel that the Institute to which I have devoted so much energy and so many hours of endeavor should be desecrated... (Kleiman & Chalom, 1980, pp. 191-193).

While Weizmann understood the urgency of the war effort, he felt that Bergmann overly expedited the process, and worse, did so without informing him or asking his permission. A rupture thus occurred between Weizmann and Bergmann, who had been very close for many years. The rupture stemmed both from disagreements over the Institute’s character, and due to Bergmann’s becoming science advisor to Ben-Gurion, Weizmann’s rival in the Zionist leadership (Cohen, 1999, pp. 14-15; Rose, 1986, pp. 284-285).

The labs and workshops of the Technion were no less harnessed to the war effort. Just days after the declaration of the State of Israel, the Technion administration announced that it was placing the institution and all its apparatus at the disposal of the new government (Alpert, 1982, p. 235). The first air force technicians were trained at the Technion, where airplane engines were brought for repair or rebuilding. The Technion staff also improved a device for identifying enemy planes.

⁵ An arsenic-based poison gas developed by the American chemist W. L. Lewis during WWII.

Because of the security-related activity conducted at the Technion, its campus was placed under heavy guard, with regular patrols conducted around the clock.⁶ Edward Isaac Jacob Poznański, academic secretary of the Hebrew University, remarked that at the Technion “work toward the war effort was in full swing,” and added, “My heart felt a twinge when I compared the quiet, the intact buildings, the clean landscape, and the offices wherein routine work continues apace, to the situation in our university.”⁷ In the next section, I will discuss the severe harm and harsh circumstances with which the Hebrew University had to contend.

Reduction in non-war-related scientific activity

“Our science lives were put on hold”⁸

Our science lives were put on hold, particularly in the Natural Sciences Faculty, while the humanities continue apace. We’re lacking modern means and we’re losing people. We need to persuade the administration that our situation is dire. They place the emphasis solely on teaching, ignoring research.⁹

Biochemist Andor Fodor’s words in the senate meeting described the situation of Jerusalem’s natural scientists, which was far worse than that of the humanities, as well as that of other research institutes. In fact, at a certain point, there was not one chemistry laboratory in all of Jerusalem; to prevent total dismantlement of the Hebrew University Chemistry Department, a proposal was put forth to urgently open a temporary laboratory in Jerusalem’s city center, as well as to contact other institutions and ask them not to hire Hebrew University personnel without the university’s agreement.¹⁰ In other areas of the natural sciences, research that was begun before the war was halted too. In radiology, for example, activity was reduced to the most urgent only. The Hebrew University Radiology Department personnel opened a temporary animal shelter in order to continue raising the breeds that they had been raising for the past twelve years. They managed to transfer the radium, the microscopes, and other essential equipment from the university buildings on Mount Scopus (which was cut off from the rest of Jerusalem throughout the war), and asked for two rooms elsewhere and a budget in order to continue working. The radiologists also exploited the wartime to work on and update the scientific archives and research summaries from the last decade.¹¹

The reduction—and often even paralysis—of scientific activity stemmed to a great extent from scientists enlisting in the Science Corps and the mobilization of science institutions to security-related activity. Moreover, some senior scientists and many students were recruited to other branches of the military.¹² Even scientists who did not join the IDF participated in defense activity in an unofficial capacity, some guarding Mount Scopus, and others patrolling their own neighborhoods. Geneticist Elisheva Goldschmidt, for example, who lived in Katamon, a Jerusalem’s neighborhood that became a combat zone, took part in patrols and was given a grenade, though she did not know how to use it (Kirsh, 2013).

⁶ Rustom Bastoni, an Arab architecture student at the Technion and later a Knesset (Israel’s legislative body) Member, was prohibited from entering the campus due to classified activity taking place there (Alpert, 1982, p. 236).

⁷ Poznański, A visit to the Technion in Haifa, 4 September 1948 (original in Hebrew, translated by Mirian Erez), The Hebrew University Archives (hereafter “HUA”), 185/48.

⁸ Protocol of Senate meeting no. 16, 24 August 1948, p. 3, HUA 100/48.

⁹ *Ibid.*

¹⁰ *Ibid.* (original in Hebrew, translated by Mirian Erez).

¹¹ Halberstädter to Senator, 12 September 1948, HUA 244/48.

¹² Protocol of the Executive Committee, meeting no. 24, 7 September 1948, HUA 100/48. For example, 51-year-old zoologist and entomologist Shimon Fritz Bodenheimer of the Hebrew University, served in the IDF and was wounded in the battles for Jerusalem (Bodenheimer, 1959).

Being cut off from the international science arena

Another facet of the reduction in science activity during the war was the difficulty in maintaining ties with researchers abroad. Hosting scientists from other countries, attending conferences, visiting and working at foreign institutes, and even acquiring equipment from abroad are essential to scientific activity, especially for a small, outlying country. It was no surprise, then, that the involuntary detachment from other scientists during the war in itself impeded scientific activity. Although research funds continued to be sent from abroad,¹³ lectures by visiting scientists that had been planned for 1948 were canceled.¹⁴

Trips abroad by Israeli scientists fell to a minimum, but did not stop entirely.¹⁵ In the summer of 1948, physicist Giulio Racah from the Hebrew university attended a conference in Birmingham, UK, on the atom¹⁶; and parasitologist Shaul Adler went from Jerusalem to Washington, DC to attend a conference on tropical medicine. Adler was asked to collect catalogs and make inquiries as to innovative laboratory equipment available in the US and the UK.¹⁷ About four months later, even though the university had less than half the sum needed, chemist Ladislaus Farkas was sent to the US to procure equipment for the natural sciences laboratory. Sadly, Farkas’ plane crashed, and he died.¹⁸

Being cut off from Mount Scopus

On November 29, 1947 the United Nations General Assembly voted in favor of ending the British mandate over Palestine, and partitioning Palestine into two countries. According to the UN decision, Jerusalem would have an international status and its future was to be finally determined after ten years. The day after the UN vote, transportation to and from Mount Scopus became dangerous. The road to the University and Hadassah Hospital, both on Mount Scopus, passed through the Arab neighborhood Sheikh Jarrah, and vehicles traveling thereon were attacked. This added to the difficulty of engaging in scientific activity, as it effectively cut scientists off from access to their equipment; neither could they reach their specimen collections and books in the university library. Yet, when the members of the Board of Governors suggested transferring the Mathematics and Natural Sciences faculty to Tel-Aviv or to Rehovot, both the Executive Council and the Senate opposed, declaring it to be vital and essential that the university remain in Jerusalem. Such a move, it was believed, would compromise the university as an academic institution, and also undermine the Jewish status of Jerusalem (Cohen, 2003; Ehrenwald, 2006).

Researchers who did risk the trip and made it to the university campus on Mount Scopus were compelled to dedicate an inordinate amount of time to guard duty, so that research barely took place. For this reason, as early as March 1948, physicist Shmuel Sambursky proposed urgently opening a research laboratory off site from Mount Scopus,¹⁹ and as per his proposal, the university rented an apartment in Rehavia neighborhood in Jerusalem for the physical chemistry and chemistry departments. Much of the equipment was transferred there from Mount

¹³ Memorandum, 27 April 1948, HUA 48/661.

¹⁴ Protocol of the permanent committee, meeting no. 10, 24 December 1948, HUA 232/48.

¹⁵ The Hebrew University was asked to send a representative to the University of Prague’s 500th anniversary celebration ceremony. Sending a personnel member who was already in Europe was considered, but in the end this did not happen. Fekete to the university’s president, 15 February 1948, HUA 181/48.

¹⁶ A letter to Sir Leon Simon [sender’s name not mentioned] 25 August 1948, HUA 100/48.

¹⁷ Senator to Adler, 12 August 1948, HUA 244/48.

¹⁸ Meeting no. 2 of the Mathematics and Natural Sciences Faculty, 22 December 1948, p. 2, HUA, 2300/4; a conversation between Senator, Farkas, and Neumond, 27 December 1948, HUA, 201/48; (Anonymous, 1949).

¹⁹ Meeting no. 3 of the Mathematics and Natural Sciences Faculty, 21 March 1948 HUA 2300/48.

Scopus, and from the beginning of May 1948, the physics department continued its activity, engaging mainly in research related to the war effort.²⁰

On April 13, 1948, a convoy to Mount Scopus traveling through Sheikh Jarrah was attacked. Seventy-eight passengers were killed, among them physicians and other Hadassah Hospital personnel, including Hadassah Director Dr. Chaim Yassky, as well as Hebrew University faculty members, one of whom, Dr. Leonid Dolzhansky, was head of the experimental pathology department and head of the cancer research laboratories at the Hebrew University. His work contributed greatly to our understanding of the process of healthy cells turning cancerous, and the behavior of viruses within cells. On that morning, Dolzhansky was in the convoy to Mount Scopus, where he intended to take devices and materials from his laboratory there to the emergency laboratory that he had opened in the city center. When the convoy was attacked, he was killed together with two other researchers from his department: Dr. Dov Boris Miszursky, an embryology and cytology researcher; and Hanna (Hedi) Mittwoch, survivor of a Nazi concentration camp who worked as a laboratory technician, and who was only 23 at her death. After the death of the aforementioned three many at the university felt obligated to continue Dolzhansky's team research and to publish their studies that had been completed.²¹

Following the deaths of the dozens of passengers in the Hadassah convoy, both studies and research on Mount Scopus were suspended. Thenceforth, Mount Scopus remained an enclave, cut-off from university faculty who no longer had access to it. Despite this, university personnel insisted that the Hebrew University remain in Jerusalem, and not be moved to Tel Aviv (Cohen, 2006, pp. 105-107; Porath, 1987). Laboratories and science personnel were instead moved temporarily to the Sieff Institute, which served as a military research center.²² Biochemist Andor Fodor expressed fear that the excellent laboratory equipment in Rehovot and the institute's material means, would cause the Hebrew University scientists to desert the Hebrew University and join the Sieff Institute.²³ The university personnel were also disturbed by the wartime spotlight being shined on Sieff Institute and the lack of recognition of Hebrew University's part in the war effort.²⁴

Continuing science alongside war

Research

Despite the aforementioned difficulties, research in certain disciplines that were not directly related to the war effort continued throughout 1948. Geology is a good example of both the limitations and the possibilities that scientists faced during this period. In terms of recruiting scientists to the army, the situation in geology was no different than in other fields, and it was declared that "All staff at the geological institute, except for Professor Picard, are enlisted."²⁵ In fact, despite his advanced age, even Leo Yehuda Picard served in the first part of the war as a conveyance officer in the Hagana, transporting weapons

and ammunition across Jerusalem using his own vehicle, as well as conveying wounded soldiers to the hospital. When the benzene ran out, he continued, using a donkey (Picard, 1996, p. 9).

With Mount Scopus cut off from the rest of Jerusalem, some research activity was moved to geologists' homes. Picard, who was head of the Geology Department, processed technical material in his home together with an assistant. He completed his professional survey of the groundwater of the Lower Galilee, including two geological maps, and sent it to the Jewish Agency,²⁶ noting the difficulty in geological mapping due to Israel's borders not yet having been marked, compelling him and his colleagues to depend upon maps drawn under the Mandate.²⁷

In 1947–1948, rumors began circulating of petroleum deposits in the Sinai and Negev deserts whose locations the British had kept secret (Dostrovsky, 1989, pp. 45-46),²⁸ and geological work related to the search for water sources and petroleum continued apace. At the war's end, the Science Corps, Hemed, was asked to confirm or deny the rumors. A short time later, the corps reported to Ben-Gurion that the rumors held little truth, either about petroleum or natural uranium deposits needed for nuclear development.

The Industry and Trade Ministry indicated interest in collaboration with the Hebrew University Geology Department in applied research, and while the war was still raging, contacts were made between ministry representatives and the university, and a contract was drafted between them.²⁹ While the war had a dampening effect on geological field research, excavations of fortresses and paving roads opened windows of opportunity therefor. Reliable geological information was also needed for the planned construction boom of new towns and villages intended to settle a massive influx of immigrants: Holocaust survivors from Europe as well as Jewish immigrants from Asia and Africa. Toward the end of the war, this constituted a possibility for thawing the partial freeze on geological research.³⁰

In addition to the geologists, other scientists took part in applied research that was urgently needed. Leo Olitzky, head of Hebrew University's Bacteriology and Hygiene Department, was a member of the committee that handled the water supply in besieged Jerusalem, and established a laboratory for testing drinking water. Scientists' assistance was also needed for finding other water sources, applying scientific methods to agriculture, and advancing industry.³¹

Another field in which scientists made vital contributions in the new state was that of health. Scientists were involved in preventing outbreaks of communicable diseases such as dysentery and typhus. The swamps in the Upper Galilee were known to be sources of malaria, especially in the spring and summer of 1948, due to lack of staff and equipment for treating the swamps after the winter rains; and the malaria research station at Rosh Pina served as a regional IDF laboratory, which assisted in implementing preventative measures (Levensohn, 1950, pp. 87-89; Toren, 1950). In addition, Hebrew University Entomologist Oskar Theodor studied malaria-transmitting ticks found in the foundations of ruins of houses where IDF soldiers had been.

As part of the preparations for intake of Jews from the Middle Eastern countries and Holocaust survivors from Europe, the Jewish Physicians' Society opened a course in preventative medicine facing epidemics. Sixty-five enrolled in the course's first class in Jerusalem,

²⁰ Senator to Farkas, 14 June 1948 and Sambursky to the rector 13 December 1948, HUA 232/48.

²¹ "A letter to our offices and delegates" 21 April 1948, HUA, 661/48; Adler to Senator, 18 April 1948 HUA 244/48; The Executive Committee of the Pre-Faculty to the University administration, 5 May 1948, *ibid*; Edmund de Rothschild to Zander [undated], *ibid*.

²² Senator, Visit to Rehovot, 29 July 1948, HUA, 187/48.

²³ Protocol of Senate meeting no. 15, 2 August 1948, HUA 100/48.

²⁴ Senator, Visit to Rehovot, 29 July 1948, HUA, 187/48; conversation between Senator and Farkas, 30 July 1948, *ibid*; conversation between Neumond and Efraim Katchalski, 29 October 1948, *ibid*; Neumond to Gitlin 3 November 1948, *ibid*.

²⁵ Joshua Greenbaum of the Trade, Industry, and Supply Ministry to Neumond, 12 November 1948, HUA, 237/48 (original in Hebrew, translated by Miriam Erez).

²⁶ A brief report on the work of the Geology Department in the last two months, [undated, probably from the beginning of March 1948], HUA, 237/48.

²⁷ Prof. Picard, Proposal for a Temporary Arrangement of the Geological Section [undated], HUA, 237/48.

²⁸ See also: Ben-Gurion Diary, 16 June 1949, The Ben-Gurion Archive (hereafter "BGA").

²⁹ Note on conversation with Dr. Bernstein, 3 August 1948 and a contract [undated], HUA, 237/48.

³⁰ Avneymelech to Picard and Theodor, 18 December 1948, HUA, 237/48.

³¹ 'Why the Hebrew University Must be Supported Today' [undated], HUA, 661/48.

designed and taught by parasitologist Dr. Meir Yoeli, who specialized in research on malaria and Mediterranean diseases, and who served as the head of the Jerusalem branch of the IDF's Hygiene Unit.³²

During the war, students continued to submit papers and dissertations in all scientific fields, faculty members were appointed to judge them, and many degrees were awarded.³³ The question was raised whether war-related topics proposed by research students could be accepted for their theses and dissertations, and the School of Mathematics and Natural Sciences opposed this option.³⁴ Occasionally, extenuating circumstances were taken into account, and administrative processes were expedited. For example, the head of a school approved a study without presenting its peer reviews to the school council; or a substitute reader was appointed for a faculty member who had gone to Tel Aviv.³⁵ In another case, a chemistry doctoral candidate who could not present his dissertation owing to Mount Scopus's isolation from the rest of Jerusalem was given special dispensation:

In light of the war's having broken out and the inaccessibility of the laboratories, the candidate could not process the problem in all its facets. Taking into account the extenuating circumstances of the case, and based on the head referee's opinion as well as that of the co-referee, and after consulting with the co-referee and obtaining his agreement, the committee voted to approve the paper.³⁶

The effect of the war was palpable at Sieff Institute as well, although less so than at the Hebrew University. At the beginning of the war, Sieff scientists continued their routines, and after hours, could even be seen enjoying themselves at Café Kapulsky on Rehovot's main street. But by May 1948, the Kapulsky crowd vanished and the effects of the war were felt (Jaffe, 1996). Looking at the list of scientific publications from Sieff's scientists, we see that the number of those published in the year following the War of Independence (testifying to research activity during the war) was far lower than that from the year preceding the war: thirty-nine articles in 1948, reflecting the institute's activity before the war; and only nineteen in 1949.³⁷

Among the studies conducted at Sieff Institute during the war, the effort to "green the wilderness" was conspicuous, the goal being to exploit the Negev desert to grow high-value crops. It was found that castor and carob trees could be grown in the Negev's briny sand. The researchers tested possibilities of using castor oil in the plastics industry, and succeeded in extracting therefrom a substitute for nylon; from the carob they extracted rubber that could be a raw material in the pharmaceutical, food, and textile industries. Another research direction was the search for ways to bring water to the desert and reduce the salinity of the soil there. A pamphlet published for the Friends of the Weizmann Institute described the Institute's scientists as:

...stubbornly disregarding the gunfire and explosions that rattle throughout the land. They are pursuing their own special enemy – the desert.³⁸

Later in the pamphlet, the researchers describe their desert research

using more military expressions such as "The desert is the enemy"; "The scientists are attacking the desert, conquering it, and causing it to retreat."³⁹

Teaching, awards, and ceremonies

While producing knowledge is considered to be scientists' main role, scientific activity did not end there; an important portion thereof was transmitting knowledge to both students and the public. Discussion on holding university classes despite the state of emergency began on December 1947, when most of the Hebrew University's students were recruited to defend Jerusalem and its environs. It was proposed that studies be in session alternately: two weeks for the humanities students, then two weeks for natural science students. But it was impossible to implement this schedule, as it was too difficult to release the students from their military service even partly, and also due to the lack of safe transportation to Mount Scopus. Later it was proposed that only the third and fourth year students continue classes, and in February, Ben-Gurion himself sent a letter to the Jerusalem District Commander asking to allow students who were in the final stages of their degrees to continue their studies as much as possible. Still, only a small number of students managed to get released from their military duties (Ehrenwald, 2006). Eventually, after the murder of university staff and hospital personnel in the "Hadassah convoy" in April, when it became clear that Mount Scopus was permanently cut off, classes were canceled (Cohen, 2003).

While the war disrupted regular classes at the Hebrew University, courses continued at Sieff Institute for the university's natural science students,⁴⁰ and throughout 1948, lectures were given to the public. At the beginning of July, mathematician Abraham Halevi Fraenkel lectured at Strauss House Health Center in Tel Aviv representing the Tel Aviv Friends of the Hebrew University, mentioning the symbolism of giving a scientific lecture at that juncture. At the end of September, a meeting of the Society for Natural Sciences took place at the same venue, featuring two lectures on meteorology.⁴¹ These examples testify to the fact that in Tel Aviv, alongside leisure and entertainment, cultural and scientific activity also took place during the war.

The Hebrew University's adult education activity, which began during World War II, reached 2,000 lectures in the two years preceding the state's establishment, most in the form of mini-courses or survey courses offered in the three large cities (Jerusalem, Tel Aviv, and Haifa), thirty agricultural villages, and 100 kibbutzim and worker villages. During those years, the Hebrew University broadcasted lecture series on the Voice of Jerusalem radio station. The lectures were not limited to the humanities and the social sciences; many addressed the natural sciences—physics, chemistry, math, biology, and medicine—and drew large, enthused audiences.⁴² After the state was established, five lecture series were broadcast on the Voice of Israel station, all touching on current events. For instance, four of biochemist and philosopher Yeshayahu Leibowitz's lectures addressed "Science and the War", and the title of the final lecture was "Science as Peacemaker". Physicist Shmuel Sambursky lectured on science in the service of the state, discussing the future of applied science in Israel.⁴³

³² Preparations against epidemic outbreaks, 3 August 1948, HUA, 661/48.

³³ Meeting no. 3 of the Mathematics and Natural Sciences Faculty, 21 March 1948, HUA, 2300/48.

³⁴ Meeting no. 1 of the Mathematics and Natural Sciences Faculty, 17 November 1948, HUA 2300/48, p. 2.

³⁵ Meeting no. 4 of the Mathematics and Natural Sciences Faculty, 28 June 1948, HUA, 2300/48.

³⁶ Meeting no. 2 of the Mathematics and Natural Sciences Faculty, 22 December 1948, HUA, 2300/48, p. 2, (original in Hebrew, translated by Miriam Erez).

³⁷ List of publications, 11/13 (1947–49), Weizmann Institute Archive (hereafter "WIA").

³⁸ From: 'Uprooting the Palestine Desert', American Committee for the Weizmann Institute of Science, July 1948, WIA, Publications file, foreign press until 1964.

³⁹ Ibid.

⁴⁰ Meeting no. 2 of the Mathematics and Natural Sciences Faculty, 22 December 1948, HUA, 2300/48, p. 2.

⁴¹ Fraenkel to Senator, 7 July 1948, 285/48; An Invitation sent by Klopstock 19 September 1948, HUA, 181/48.

⁴² Abraham Halevi Fraenkel and Simcha Assaf, opening remarks to the Hebrew University's educational radio program, [undated] HUA, 285/48.

⁴³ Abraham Halevi Fraenkel, opening remarks to the Hebrew University's educational radio program [undated], HUA, 285/48; Simcha Assaf's talk, 13 September 1948, *ibid*; program proposal for broadcasts on the Hebrew radio, attached to a letter from Berman to Solovitchik, 25 July 1948, *ibid*.

At the height of the War of Independence, ceremonies were held occasionally among the science community, where prizes and research grants were awarded. At the Technion, for example, a degree awarding ceremony and inauguration of chemistry labs was held in January 1948,⁴⁴ and in May, a collection of articles was published in honor of the seventieth birthday of Prof. Max Kurrein from the Technion's Machine Engineering Department.⁴⁵ At a festive conference at the Technion held on May 20, 1948 in honor of the declaration of the state, only a few of the 680 students were present, as most of them were drafted, as were many of the faculty. One hundred fifty Technion students, or over one fifth of the enrollees, filled command positions in the IDF (Alpert, 1982, p. 235). Also that May, the City of Tel Aviv awarded prizes to two physicians for professional publications (Anonymous, 1948), and these are only a few examples of such events.

Plans and organizing toward the war's end

Re-formation of the Israel Science Council

Councils for advising and directing scientific research were established by several countries as early as World War I, and this trend gathered momentum following World War II (Kevles, 1977; Guston, 2000; Gummet, 1980; Yoshikawa and Kaufmann, 1994; Jacq, 1995; Carson and Gubser, 2002). These councils functioned to coordinate between the state and the scientific research apparatus, and to set priorities in allotting resources to scientific research. These coordinating bodies were in most cases the continuation or the revival of coordination activity between governments and researchers who had been mobilized during the war to their respective countries' dedicated goals, when such activity was limited to short bursts.

In Palestine as well, at the end of World War II, a Council for Scientific and Industrial Research was formed, funded by the British Mandatory government, and it acted continuously until the end of the mandate in May 1948. During this period, 150 research proposals were submitted to the council, sixteen of which received funding. These studies were in the fields of animal feeding and health, construction engineering, food and food preservation, pest control, and physical chemistry, and were conducted in academia and research institutes in Palestine (Rozin, 2006). After the mandate ended, Shmuel Sambursky, administrative secretary of the council, asked the newly formed Israeli government to support the council's activity and ensure its funding:

I greatly fear that applied research is liable to divide into several portions, the consequence of which will be a decrease in its efficiency and inefficient use of state funds. From my years of experience heading applied research, I have learned that only with proper central guidance and planning is applied research likely to be conducted successfully, both in industry and agriculture and public health.⁴⁶

On September 17, 1948, even before the War of Independence ended, Prime Minister Ben-Gurion met with Sambursky at IDF headquarters, and discussed the science council with him. The willingness to dedicate time and thought to organizing science in the nascent country,

⁴⁴ Invitation from the Technion administration in Haifa, January 1948, HUA, 181/48.

⁴⁵ Jubilee Volume in Honor of prof. M. Kurrein' *Haaretz*, 23 May 1948, p. 3.

⁴⁶ Sambursky to Ze'ev Sherf, secretary of the government, 8 September 1948, the Council for Scientific and Industrial Research file, 25/1881, Israel State Archive (hereafter "ISA"). Original in Hebrew, translated by Mirian Erez.

which was already war-torn, testifies to the place that science occupied on the national agenda, and to the great importance that Israel's first prime minister attributed thereto. More meetings between Ben-Gurion and Sambursky were held that December, and the Israel Science Council was formed on February 13, 1949 (Mushin, 1989).⁴⁷

At the Council's first session, both Ben-Gurion and Sambursky announced that it would not only be a continuation of the one that operated during the British Mandate, but would have renewed and expanded functions. In fact, both councils were similar in their main role: shaping science policy through cooperation with existing research institutions, with state funding. It is interesting to note that in the council established in 1949, the percentage of scientists among the committee members was higher than that in the council that operated until 1948. Most of the scientists in the new council were particularly active in the war effort, among them parasitologist Shaul Adler, Geologist Leo Picard, physicists Giulio Racah, chemist Ernst Bergmann, and engineer and Technion President Shlomo Kaplansky.

The Councils' structure has not changed since; like the previous one, it consists of a plenum and disciplinary professional committees. Three disciplinary committees—basic science, agriculture research, and industrial research—were inherited from the previous council. To these three committees, Ben-Gurion sought to add committees that would focus on aircraft, vessels, and defense. Eventually, the two committees added were construction research and food exploration, reflecting the needs of the nascent state that was poised to absorb a huge wave of immigration (Barell, 2014, pp. 134-158).

Sambursky declared new goals for the Council: establishing new research institutes that would work under the Council's auspices; funding young researchers' study of practical issues in existing intuitions; international science relations; and a journal. It was clear that the new Council's budget should be much larger than that of its predecessor: some spoke of sixfold, while others asked that it be twenty-five fold. Demonstrating the state's important regard and high hopes for the newly-formed organization, in 1949 the state allocated a budget of 100,000 Israel pounds (or lira) to the science Council, in contrast to an annual budget of 16,000 Palestine pounds allocated to the pre-state science Council by the British Mandatory government.⁴⁸ Prime Minister Ben-Gurion was the chair of the science Council and set aside one hour of his sixty hours weekly fixed schedule for the Council matters (Barell, 2014, pp. 133-158).

Gearing up for the war's end at the science institutes

During the War of Independence, conducting experiments and observations was understandably limited. Nonetheless some scientists' efforts and free time were devoted to planning the renewal of scientific activity after the war, and the expansion and improvement of the laboratories and their staffs. "It is incumbent upon us to behave as England did after the [Second World] War," said mathematician Zelig Brodetsky, "Every department must draw up a list of urgently needed equipment, both for instruction and for research."⁴⁹

Planning for the future served both to raise the morale of the furloughed researchers, and in a certain sense, the morale of the entire Israeli populace. When Felix Bergmann was appointed Professor of Pharmacology at the Hebrew university, it was stated that the University

⁴⁷ See also: Ben-Gurion Diary, 17 September 1948, 9 December 1948, BGA; The Scientific Council of Israel, 1949-1954 (Jerusalem: Israel Scientific Press, 1955) [Hebrew], p. 5, available: <https://www.archives.gov.il/archives/Archive/0b07170680014dab/File/0b07170689137e55> (accessed 23 August 2022), file ISA-PMO-PMO-001nhmp, ISA.

⁴⁸ I thank Arie Krampf for his advice regarding the currency systems during the 1940s. See also Ottensooser (1955).

⁴⁹ Protocol of Senate meeting no. 16, 24 August 1948, p. 3, HUA 100/48 (original in Hebrew, translated by Mirian Erez).

would make every effort not only to continue routine work, constrained though it was under the circumstances, but also to keep up with plans for the future and act to realize them.⁵⁰ A few days later, Rector Simcha Assaf claimed, “We must deviate from the accepted framework in order that it be clear that university will remain open.” David Werner Senator (1953–1896),⁵¹ the university administrative director, joined him in this sentiment, and claimed that due to the low morale caused by Mount Scopus having been cut off from the city, and the inability to engage in scientific work, “We must take a revolutionary step and announce immediately an expansion and development plan for the natural sciences.” Agreeing, Rector Assaf added, “Great importance lies in the university staff and the public knowing that attention is being paid to development and expansion of the natural sciences, and one way theretoward is hiring the best and the brightest.” In opposition thereto, there were those who cautiously expressed doubts about such hiring, “... as there is in fact no work in the sciences. Recall that excellent science personnel will also need equipment, budgets, and working conditions that the university cannot provide at this time.” But Shlomo Gintzberg, the university secretary who expressed this doubt, was the lone dissident.⁵²

In Rehovot, the Agricultural Research Station, which had been under the auspices of the Jewish Agency up until Israel’s founding, was supposed to have been transferred to the Agriculture Ministry. The station was also looking for a new director, and the Hebrew University asked to be a potential partner in discussions on the station’s future, toward strengthening its scientific image and raising its academic standing.⁵³ At that time, also in Rehovot, construction continued of a new building for the Weizmann Institute, but only a tenth of the workers needed to build it could be found, and even they could not come to work regularly. Relying on Ben-Gurion’s special fondness for science, Chaim Weizmann wrote to him asking for his assistance, and reminding him of the institute’s contribution to the war effort. Weizmann’s letter apparently worked, as a month later, he delightedly announced the continuation of the construction and its soon-to-be completion (Kleiman & Chalom, 1980, pp. 219, 228-230).

As part of the scientific institutions’ organization, the needs of the nascent state were taken into account. There was particular focus on the anticipated wave of immigration and on science and technology’s role in the immigrants’ intake. For this reason, special attention to hygiene and preventative medicine was written into the Hebrew University’s medical school curriculum, and the appointment of a professor of hygiene was perceived of as especially urgent.⁵⁴ At the Standards Institute in Tel Aviv, a chemical standards committee was formed, and the Industrialists Association proposed that this committee draft standards for whitewash, gypsum, foundation insulation, and roofing asphalt for construction, as well as carpenters’ glue, paints, and varnishes.⁵⁵ Meanwhile, at the Industry and Trade Ministry, an Industrial Research Division was opened, whose role was to organize and develop industrial research.⁵⁶ In addition, the ties between the Meteorological Service and Hebrew University’s Meteorology Department were tightened.⁵⁷

Another important facet of planning and organization for the future

⁵⁰ Professor of pharmacology appointed at Hebrew University, 4 August 1948, HUA, 661/48.

⁵¹ On Senator, see Selzer (2013, pp. 42-45) and Livny (2020).

⁵² Protocol of weekly consultation no. 8, 15 August 1948, HUA, 2340/48 (original in Hebrew, translated by Mirian Erez).

⁵³ Senator, Visit to Rehovot, 29 July 1948, HUA, 187/48; conversation with Aharon Zisling, Agriculture Ministry, 19 September 1948, HUA, 237/48; Neumond to Zisling, 11 November 1948, HUA, 100/48.

⁵⁴ The Hebrew University of Jerusalem’ Newsletter, 5 January 1948, HUA, 661/48, pp. 3–4.

⁵⁵ Eretz Israel Standards Institute, Chemical Standards Committee: Review [undated], HUA, 201/48.

⁵⁶ Camil Cohen to the Hebrew University 17 August 1948, HUA, 201/48.

⁵⁷ Senator to Heinz Gutfeld, 1 August 1948, HUA, 100/48.

was intake of Jewish scientists from abroad. As mentioned above, even before the state’s establishment, Jewish scientists arrived to enlist in the Science Corps. With the founding of the state, the effort to welcome scientists from abroad did not cease (Flowers, 1975, pp. 175, 185; Yekutieli, 1996, p. 17). Weizmann was in contact with British biochemist Ernst Boris Chain, recipient of the Nobel Prize for his research on penicillin; as well as Oxford pathologist and cancer researcher Isaac Berenblum, aiming to bring these Jewish scientists to Israel and hire them at the Weizmann Institute. While Berenblum joined the Weizmann Institute in 1950 and won the 1974 Israel Prize in life sciences, Chain did not end up coming to Israel (Kleiman & Chalom, 1980, p. 79).

Weizmann was aware of the revolution that analytical chemistry had undergone since World War II, and of the importance of spectroscopy methods, and sought to bring them to the Weizmann Institute. For this purpose he set an interview in London with 24-year-old Joe Jaffe, who had earned a doctorate in 1946 in spectroscopy and invited him to join the institute in Rehovot. In his memoirs, Jaffe described his arrival to Palestine, at the height of tensions, where he traveled by armored car from Lod Airport to Tel Aviv, and then a second leg, no less dangerous, in an unarmored taxi from Tel Aviv to Rehovot. He also wrote with humor and emotion his experience of the day of Israel’s declaration of independence, when about 30 faculty members crowded into one of the labs to hear the declaration by radio, many with tears in their eyes. Jaffe did not fail to mention that due to the crowding in the room, a dropper containing tear gas fell and shattered, adding to the tears already being shed (Jaffe, 1996, pp. 7-9, 24-27).

At the same time, the Hebrew University considered hiring young American physicists who had worked on classified projects related to the war effort.⁵⁸ Mathematician Zelig Brodetzky pointed out the urgent need to appoint a professor of experimental physics after Dr. Gideon-Gunther Wolfson had been killed in the Hadassah convoy. Brodetzky preferred not to seek candidates who already had worldwide reputations, as “They won’t come [from abroad], even if they’re ardent Zionists,” adding that while about half of the scientific personnel in atomic labs at the time were Jewish, to attract one of them to Jerusalem, costly equipment would be needed in order to ensure the continuation of their research.⁵⁹ An ad issued for the position of instructor of experimental physics was answered by six candidates: one from the Hebrew University, two from Tel Aviv, two from Cambridge, and one from Bucharest. The one chosen for the position was 27-year-old Dr. Solly Gabriel Cohen, who during World War II had conducted atomic energy research in Canada, and then in Cambridge’s Cavendish Laboratories. The Natural Sciences faculty members were unanimous in their belief that Cohen’s research area was one of the most important in the new physics.⁶⁰

By December 1948, some of the Hebrew University’s natural science laboratories had begun to work in Jerusalem’s center at Terra Sancta College, which the University rented from the Franciscans. The Geology Department, which collaborated with the Israeli government, was located in another building nearby.⁶¹ The academic year was supposed to begin in November 1948, and the university asked the IDF to discharge enlisted students who did not fill essential roles, but when this request was denied, the opening of classes was postponed. Discharge orders for about 500 students arrived only in February 1949, as the students themselves had demanded their own discharge. Ultimately

⁵⁸ Protocol of the permanent committee, 16 March 1948, HUA 232/48.

⁵⁹ Protocol of Senate meeting no. 16, 24 August 1948, p. 2, HUA 100/48 (original in Hebrew, translated by Mirian Erez).

⁶⁰ Meeting no. 2 of the Mathematics and Natural Sciences Faculty, 22 December 1948, p. 2, HUA, 2300/4; Report of the Committee for the Appointment of Instructors in Experimental Physics, 12 December, HUA, 232/48.

⁶¹ Meeting no. 2 of the Mathematics and Natural Sciences Faculty, 22 December 1948, p. 2, HUA, 2300/48.

classes began on April 24, 1949, with the university facilities spread out between approximately fifty different locales throughout Jerusalem (Levensohn, 1950, pp. 83-84; Toren, 1950).⁶²

There is no doubt that the war was an excellent illustration of the contribution of science and technology to the country's security. Technion President Dr. Shlomo Kaplansky stated in a November 1948 speech:

The War of Independence underscores all too well our dependence upon aviation and maritime transport. Our backs are to the sea, and transport and air defense are as essential to us as oxygen.⁶³

Kaplansky accordingly concluded that there was a need to develop aeronautics at the Technion. He emphasized the urgent need to open an aeronautics department, a hydraulic engineering department, a land and maritime transport department, and a department of economics and administration. Kaplansky proposed, in addition, that the Technion take upon itself the training of Arab high school teachers.

The Technion's return to routine at the war's end was gradual. Commencement exercises were held in March 1949. Many of the graduates and others in the audience were still in uniform. Four of the diplomas, given out by Chief of Staff Yaakov Dori (1899–1973), were conferred posthumously upon students who had fallen in battle. It was also announced that the Technion Pedagogical Council had decided officially to open an aeronautics department. Like at the Hebrew University, the Technion re-opened on April 24, 1949 (Alpert, 1982, pp. 238-241). At Weizmann Institute, the Chaim Weizmann Research Building was supposed to have opened in April 1948 with an inaugural ceremony to which 300 distinguished scholars and guests from all over the world had been invited. Due to the war, the opening was postponed, and in the meantime, the building served as a hub of security-related science activity. The ceremony ultimately was held on November 2, 1949 (Flowers, 1975, p. 48).

The price of the war and the damage to science's future

The loss of life imposed a heavy price not only on the bereaved families and loved ones, but had long-term implications for the society and country as well. The potential damage to the future of science and the humanities in Israel arose more than once during the War of Independence. For example, upon the fall of thirty-five combatants, referred to as "the convoy of 35", who were en route from Jerusalem to the besieged Gush Etzion in January 1948, the Hebrew University's administration issued this statement: "The incident at Kfar Etzion proves the need to distribute the university's personnel among various brigades of various types. This brigade included 17 students of a total of 35 fallen."⁶⁴

Among the convoy of 35 was 24-year-old Tuvia Kushnir, who had been headed toward a promising scientific career. Kushnir had almost completed his studies and planned to go to England to do his doctorate under the mentorship of renowned geneticist J. B. S. Haldane (Kushnir, 1982, p. 216). Specializing in biochemical genetics, and with his keen understanding of the importance of unicellular organisms as research models, Kushnir succeeded in identifying new trends in science. During his studies, Kushnir examined the genetics of colors in the iris, on which he published an article in 1947 (Kushnir, 1947). In his genetics research on field mice, Kushnir studied the development of their skin color, as well as the phenomenon of their chasing their own tails due to a

hereditary defect in their brains (Kushnir, 1982, pp. 232-234).

Kushnir wrote his thesis under the advisorship of Elisheva Goldschmidt on the evolution and cytogenetics of the mole cricket, but did not complete it.⁶⁵ He discovered a population of mole crickets with a unique number of chromosomes, until then unknown to science, which constituted a link between the European mole cricket and the African one. He also found a population of mole crickets at the Dead Sea area with the same number of chromosomes as the African mole cricket, but which differed from the latter in the rest of their characteristics (Kushnir, 1982, p. 155; Prywes, 1960). Two of the cricket species that Kushnir profiled chromosomally and morphologically, and whose distribution in Palestine he mapped, were recognized fifty years after his death as new species: the Tali mole cricket and the Dead Sea mole cricket (*Grylotalpa tali* and *G. umarismortui*). Kushnir's article on the mole crickets was published in *Nature*, of which he was notified but never saw in print (Kushnir, 1948). The importance of his discoveries is evidenced by the fact that his findings and conclusions about the crickets appears in the textbooks *Modes of Speciation* and *Animal Cytology and Evolution* (White, 1954; White, 1978).

Jerusalem writer and intellectual Yeshurun Keshet expressed the sense that loss of human life among the scientists and scholars of the humanities might bear a long-term price for those disciplines in the nascent state, and wrote:

There's no wisdom in sending to the front those whose strength lies not in their muscles, but rather in their minds and spirits; promising scientists such as Tuvia Kushnir and instructor Horn and scores of others who have fallen and are irreplaceable (Sivan, 1991, p. 103, original in Hebrew, translated by Mirian Erez).

Keshet's words did not sway the decision makers, they testify to the deep sorrow felt for those who fell, and to the concern for the long-term effects thereof. The Hebrew University administrative director, Senator, also expressed his concern about losing so many talented young minds:

The tragic victims who fell en route to Mount Scopus, beginning with the first attacks [on the convoys] in early December until the day of the tragedy, are only some of the terrible losses that the university suffers. Students have been wounded and killed to an incomparable degree with students at any other university. En route to Kfar Etzion, in the Old City of Jerusalem, at all of the fighting fronts, in kibbutzim, and in cities, the best of our students have fallen. [...] We need to revisit the efficient use of the science faculty and the students toward keeping the new generation of students of our nation safe, as they are irreplaceable.⁶⁶

Unlike the commanders of the Arab Legion, who advised the Arab students not to volunteer for their war effort, but rather to continue their studies (Sivan, 1991, p. 109), the Jewish students were not released from their life-endangering military duties, nor were they distributed between the various corps as the university had requested. Even when the Hebrew University students were offered the option of transferring to less dangerous units that would only draft them part time so that they could continue their studies, many of them opposed the university's request, even condemning it (Ehrenwald, 2006, pp. 411-415). In an interim summation in September 1948, the Hebrew University academic secretary Pozansky counted 40 fallen soldiers who had been enrolled at the Technion, and at least double that number at the Hebrew

⁶² Only in the mid-1950s did the university move to the new campus on Givat Ram. Mount Scopus remained an isolated enclave until 1967.

⁶³ Kaplansky's Speech on Technology and Science in Israel, November 1948, HUA, 185/48, pp. 3-4 (original in Hebrew, translated by Mirian Erez).

⁶⁴ Demands of the university administration regarding the recruitment of students [undated, no author name], HUA, 201/48 (original in Hebrew, translated by Mirian Erez).

⁶⁵ Tuvia Kushnir's widow, Aviva, continued his research in Goldschmidt's apartment, where the laboratory was temporarily moved due to the disconnection from Mount Scopus. Interview with Eliezer Goldschmidt, 8 August 1996.

⁶⁶ David Werner Senator, Memorandum on the Problems of the Hebrew University, 29 July 1948, HUA, 100/48 (original in Hebrew, translated by Mirian Erez).

University.⁶⁷ This was publicized with the aim of raising the alarm to the damage that had been caused to Israel's intellectual and scientific potential. Similar to the University administration's attitude toward the draft, Technion President, Kaplansky, was ambivalent too. Kaplansky encouraged the faculty members and students to fulfill their obligations in defending the nation, he also begged the IDF to release students or professors whose duties were non-essential (Alpert, 1982, p. 236).

Thirty years earlier, World War I had left its victors with a sense of a vacuum, as well as sorrow over the elite's slaughter. In England, for example, over a fourth of Oxford's and Cambridge's new graduates had been killed in the war (Hynes, 1991, pp. 385-386; Winter, 1986, pp. 92-99). When referring to the British casualties in World War I, the term "lost generation" expressed the impairment of the elite's ability to pass the torch to the next generation and preserve cultural patterns. Moreover, the term as used in Britain was a euphemism for the inordinately high rate of loss among the elite, which far surpassed that of other sectors (Winter, 1977; Wohl, 1979, pp. 1-4, 85-86, 203-237).

Regarding the nascent Israeli society, there was not yet even a routine for transmission such as there had been in Europe, as from the inception of the Zionist struggle, the Yishuv was in a state of constant transformation. Yet, another aspect of the "lost generation" term referred merely to the higher proportion of fallen soldiers and officers among the elite.

Against this backdrop, historian Emmanuel Sivan (1991, pp. 108-109) examined the War of Independence's role in Israeli society. He showed that the number of fallen students was 120, or 8.8 % of 1,360 enrolled in the 1948-49 academic year. Most of the fallen students, or seventy-seven of them, were enrolled at the Hebrew University, and their portion of the total enrollment of 690 that year was 11.2 %, nearly double that of their entire age cohort, which was 6 %. In most cases the fallen were young students at the start of their science studies, and testimonies to the talent that was lost among their ranks were only partial. Such testimony can be found in the book *Analytic Mechanics* by physics students Israel Grinfeld and Treves (1950), each of whom fell in a separate battle defending the route to Jerusalem, and who left behind a manuscript based on Giulio Racah's lectures. Their friends posthumously edited the manuscript and submitted it for publication.

Conclusion: Science in the young state of Israel

It is difficult to evaluate the precise role that science played in Israel's military success in its War of Independence. While conventional explosives and tear gas were probably of great importance before reliable European supply sources were established, the value of other projects is less clear (Jensen et al, 2011, p. 148). It is obvious, however, that scientific activity occupied an important place on the agenda of Israel in its first year as a state.

How science was perceived in 1948 was definitely influenced by its earlier centrality in Zionist thinking and practice from the latter decades of the nineteenth century. Nonetheless, there are some aspects in which the attitude toward science underwent a clear transformation during the State of Israel's first year. The words of academic, political, and military leaders can tell us much about this transformation in the perception of science. In a speech toward the end of the war, Technion President Shlomo Kaplansky said:

It is only owing to science education and training brought from Europe and America, owing to the exploitation of the conquests of science and technology toward solving problems that we face in agriculture, industry, construction, and transport in the Land of Israel, that we created the economic and technical foundation and an efficient defense force that ensured the state's establishment and its resilience, and that are the conduit to its future and its peacetime

security. Only our quality advantage up until now in science and technology can explain the miracle of the victory of the few over the many, of our successfully defending our young nation of 750,000 Jews from the armies of five Arab countries whose populations total 25 million.⁶⁸

The idea raised by Kaplansky, that science would create an advanced Western island in the heart of the Middle East and dramatically improve agriculture, industry, construction, and transport, was as old as the inception of the Zionist movement (Penslar, 1991; Troen, 1991). Yet, the strong connection between science and the military was new, as it only emerged toward the outbreak of the War of Independence, but quickly spread among the nascent state leaders.

After visiting the Science Corps base, Yaakov Dori, Israel's first Chief of Staff (and president of the Technion from 1951 to 1965), Naor (2011) cited the exploitation of "Jewish genius" therein, enabling the few to face the many. Dori mostly spoke of science as a weapon, and when he briefly mentioned the aspiration to harness science in peacetime, it sounded like a distant, messianic vision:

In our unique situation, for many years, science will be our strongest and surest weapon to make us—the few, stronger than the many—enemies. And even if our true aspiration is to use science as a device for construction and development of a supreme objective—our happiness and productivity and that of humanity at large—for a long while to come, we will reluctantly be compelled to use it to face the enemy and resisting its anticipated efforts to annihilate us.⁶⁹

As mentioned above, even though the idea and praxis of the Science Council could be traced to the pre-State period, the Council established in 1949 reflected a shift. The new Council was designed to serve the needs of the nascent state, and therefore not only was its budget much bigger, but it included two new committees on building research and food exploration, and most of its scientists members were those who were particularly active in the war effort. The Prime Minister's words at the opening the first meeting of the Israel Science Council testify to how the engagement with science was perceived to a great extent as a link to and a reproduction of accepted norms in the West:

We seek to build a foundation for transforming Israel into a worldwide respected center of science, and to make science an engine for our economy, our security, our health, and our culture While we cannot compete with the rest of the countries in wealth, power, or numbers, there is no reason why we cannot compete in scientific power and capability.⁷⁰

The vision of Israel as an esteemed worldwide center of science that can compete with other countries, sounds bold and even wild, if we recall that Israel was a poor country with less than one million citizens at that time. David Ben-Gurion regarded science as essential for the establishing and existence of the new state, well before its founding, but as Ari Barell (2014) showed, Ben-Gurion's cooperation with scientific experts and his vision of science as an engine for development intensified after 1948. While other prominent leaders may have had ambivalent attitudes toward science in pre-state years, from 1948 onward, the positive attitude toward science became consensus and not subject to discussion. Past critical voices which blamed the intellectuals and scientists on Mount Scopus of being detached from the pioneers in the valley, disappeared after Israel's War of Independence. The war made the importance of science much clearer, and the involvement of

⁶⁸ Kaplansky's Speech on Technology and Science in Israel, November 1948, HUA, 185/48, 2 (original in Hebrew, translated by Mirian Erez).

⁶⁹ Yaakov Dori in Hemed's guest book. Appears in the Daily Command of Hemed Headquarters, Central Zionist Archive (hereafter "CZA"), 182/121/1950 (original in Hebrew, translated by Mirian Erez).

⁷⁰ Protocol of the Scientific Council Meeting, 13 February 1949 BGA, 30,909 (original in Hebrew, translated by Mirian Erez).

⁶⁷ Poznański, Visit to the Technion in Haifa, 4 September 1948, HUA, 185/48.

scientists and scientific institutes in the war effort was unquestionable.

The shift that has taken place vis-a-vis science in Israel from 1948 onward has been reflected not only in rhetoric but also in budget allocation and the intensification of several scientific disciplines. While scientific activity in a few disciplines was reduced or frozen during the war, in security-related disciplines, it intensified. Consequently, certain disciplines gained attention and resources, not only during the war, but years later as well.

Physics and chemistry, which were harnessed to the war effort more than other disciplines, proved its essentiality and won not only prestige in Israel, but also support of young researchers, efforts to bring Jewish physicists and chemists from abroad, and large investment in equipment that would enable advanced research. For example, at the war's height, physical chemist Ladislaus Farkas approached Prime Minister Ben-Gurion regarding the need to groom a cadre of young scientists who would devote themselves to studying isotopes, which are needed to producing nuclear weapons. Accordingly, an expert was brought in from abroad at Ben-Gurion's request to examine the possibility of establishing a nuclear laboratory.⁷¹

In geology, whose anticipated contribution to the young state in the search for petroleum and water sources was unquestioned, the period of the war was exploited to forge collaboration between the interim government and the Hebrew University's Geology Department. In addition, studies related to desert soil continued to be conducted.

The War of Independence sharpened the Israeli perception that in a small country surrounded by enemies, scientific advances were essential for survival. Recall that the timing was in the wake of World War II, which wrought worldwide changes in perceptions and attitudes toward science. Therein, the US and Britain underwent processes of harnessing science efforts to the war, similarly to what Germany had done previously. The end of World War II in Japan and its exposure to the power of nuclear bombs created an overall impression that science was synonymous with victory, both on the battlefield and elsewhere. In the young Jewish State, the remembrance of six million Jews that were perished in the Holocaust just a few years earlier caused science and technology to be synonymous with survival.

Israelis' strong belief in science during the first year of the state is still a prominent belief in Israeli society to this day. The images of and perceptions of science that were formed during the formative period of its founding can help us understand Israel's scientific and technological excellence and achievements at the end of the twentieth century and first decades of the twenty first century.

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The author declare that she has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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⁷¹ Conversation between Senator, Farkas, and Neumond, 27 December 1948, HUA, 201/48; A Preliminary Report on a Visit to Israel, 22 March 1949, CZA, 437/1308/1950.

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