

WEIZAC: An Israeli Pioneering Adventure in Electronic Computing (1945–1963)

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1 Introduction

The State of Israel was just born and the small economy of the newly created country emerged in shambles from the war that had just ended. The Jewish community in Palestine, which in 1948 numbered about 650,000 on the termination of the British mandate, had a heavy defense burden as well as the burden of absorbing hundreds of thousands of refugees and immigrants. Hundreds of thousands of Palestinian Arabs had fled or had been forced to leave. The Jewish population in Israel doubled itself in the first three year of its independence. Israel faced problems that characterize young countries, but also problems unique to a country that absorbs masses of immigrants and struggles with a hostile political environment: economic, social, cultural and security problems, alongside the need to establish a civil rule of law. Food and foreign currency were lacking and the government implemented a regime of austerity, which was officially in place until 1959, and in which basic goods (including food, fuel, clothes and furniture) were strictly rationed.

Shaped by ideas and processes that originated very far away from the dramatic events that dominated post-war Middle East, this was also the dawn of the digital age and of the rise of the new electronic computing technologies. These two separate and deeply unrelated historical threads, the creation of the State of Israel and the rise of the electronic computer, had a lasting impact, each in its own manner, on the way that the world would develop in the second half of the twentieth century. But curiously enough, their individual paths crossed with each other in a quite unlikely, yet highly important encounter in the 1950s. This happened when one of the earliest high-speed electronic, digital stored-program computers, WEIZAC, was designed and built in the sleepy farming town of Rehovot, about 20 Km south from Tel Aviv.

Rehovot had been established in 1890 by a group of Polish Jewish pioneers belonging to the earliest wave of Zionist immigration to Palestine. In 1948, it had a population of about 12,500 inhabitants, most of them successful citrus growers. An Agricultural Research Station was opened in Rehovot in 1932, and two years later, in 1934, the Sieff Institute for Chemical

Research was established very close to it. The Sieff Institute was later expanded to become the Weizmann Institute of Science (WIS), which was formally opened in 1949. The Weizmann Institute would raise to become a world-class research institution, whereas Rehovot, alongside it and now with a population of nearly 150,000, turned into a busy hub of agricultural and scientific research and of global high-tech companies. Electronic computers, needless to say, dominate all aspects of local life in town, as well as the scientific activity of its institutions. But when the idea of building an electronic computer in Rehovot started to be discussed in the late 1940s, it sounded not only as a foolish idea in the context of an impoverished and troubled society, but also as one that was basically unnecessary for conducting scientific research as broadly conceived then in Israel.

The driving force behind the WEIZAC project was Chaim Leib Pekeris (1908–1993) a Lithuanian-born Jew, who received his basic mathematical training in leading academic institutions in the USA. He became acquainted with electronic computers as early as 1943 and had the opportunity to develop his skills, hands-on, working with the most advanced machines that were operational at the time. An enthusiastic Zionist, Pekeris attributed primary importance to science and technology as fundamental tools for promoting economic development and modernization in the new Jewish state. After joining WIS in 1948, he started to pursue his project for building an electronic computer as a flagship initiative for attaining such aims.

WEIZAC was built in the years 1954–55 and worked in full capacity for almost a decade. Its designers and builders used cutting-edge technology and achieved the highest benchmarks of computing performance at the time. The computer was modeled after the famous machine of the Institute for Advanced Study (IAS) in Princeton, which operated since 1952. In fact, the chief engineer of the project was Gerald Estrin (1921–2012) who had actively participated in the IAS computer project. Mathematicians and scientists from the Weizmann Institute and from other research institutions in Israel, as well as members of other Israeli government organizations, used the computer to advance science in Israel and to spread the word of this new technology all over the country.

This book tells the story of the WEIZAC project and of its immediate contribution to creating a computer-savvy community of users within the scientific and industrial realms in Israel, as well as in preparing the road for adopting the computer as a main tool in government and security agencies. The first of the two main chapters of the book explain the background to the apparently exceptional decision to build a computer in the challenging environment of the newly created State of Israel. We start (§ 2.1) with a brief account of the development of electronic computers in general, in the years before and during the construction of WEIZAC. We explain the innovative aspects of EDVAC, at the Moore School of Electrical Engineering of the University of Pennsylvania, and of the IAS machine at Princeton, two of the earliest machines to successfully implement the stored-program architecture in 1951, and we briefly discuss their overall impact. We then present a comparison of the situation in Israel with those of Taiwan, Ireland and India. These were three countries that in the 1950s, like Israel, had small economies and had only started to develop, with moderate success, local traditional industries. We find this comparison important because electronic computers were introduced in those countries much later than in Israel, and none of them came up at the time with a similar idea of a project to build their own machine. The background account and the comparison with other countries helps providing the right setting within which to understand the peculiarity of the WEIZAC story.

We then move to discuss the second component in the background to the project, namely the creation of WIS in Rehovot. In § 2.2 we focus on the figure of Chaim Weizmann, in his dual role of well-known scientist and Zionist leader. We discuss his conceptions about the role of science as part of the Zionist project, and his somewhat ambivalent attitude towards the question of what kind of research, pure or applied, should be pursued in the newly created institutions of higher learning in Mandatory Palestine. Section § 2.3 is devoted to the creation of WIS, initially as the Sieff Institute in Rehovot, and then in 1949 as the Weizmann Institute of Science. This section allows us to introduce the main players in the decision-making processes, and those who would have to approve and create the material conditions for carrying out the WEIZAC project. Section § 2.4 focuses on the figure of Chaim Leib Pekeris, and on

his views about computation-intensive science. We discuss here the question how these views contrasted with those pursued at the time at the Hebrew University in Jerusalem. Pekeris's views became fundamental for the kind of activities promoted at WIS and for turning the electronic computer into the tool without which no cutting-edge research could be carried out.

Against the background provided in chapter 2, the second main chapter of the book discusses the processes leading to the decision to build the computer (§ 3.1), and the actual stages in its design and construction. This comprised several tasks that, considering the historical and geographical circumstances, can only be described as extremely unlikely: putting together a team of personnel equipped with the necessary skills (§ 3.2); building a lab and purchasing the required electronic components (§ 3.3); and in particular acquiring a “Magnetic Core Memory,” the crucial component of which at the time existed only a handful in the entire world (§ 3.4).

Chapter 3 closes with a brief, but thoroughly documented analysis of the impact of WEIZAC on actual scientific research in Israel and beyond. This account makes clear the astounding extent to which research based on calculations performed with WEIZAC (as well as with the two machines that followed it at WIS, GOLEM and GOLEM B) were at the heart of the processes that turned WIS into the kind of world-class leading institution that it became. It also makes clear the extent to which WEIZAC was at the heart of the creation of a relevant community of scientists, engineers, technicians, and users, at all levels, of computing technologies in Israel, in its research institutions and in its government branches.

The concluding chapter summarizes the entire discussion, and locates it within the realm of broader historical issues, such as the role of science and technology in the process of nation-building in general and in the case of the State of Israel in particular. A main issue that arises in this context, and that appears as a connecting thread throughout the book, is the fundamental role played in this story by Jews and Jewish institutions all around the world, but particularly in the UK and in the USA. This is true for the people directly involved in the WEIZAC project in Rehovot, like Pekeris and Philip Rabinowitz, who joined WIS, above all, out of Zionist

motivations. This is also true concerning the ways in which the Jewish institutions and the Jewish networks of cooperation worked on behalf of WIS and of the project, and without which the project could not have been successfully completed. The integration of the organizational mission as shaped by Weizmann himself and by the leaders of WIS, with the Zionist motivations of the key figures involved in the project, together with their views on the role of science as a main tool for nation-building, and with the aims of those who supported the project from abroad, were instrumental in leading to its eventual success. This is why it is fair to speak about WEIZAC not just as the first electronic computer to be built in Israel, but more specifically as the first Zionist electronic computer.