**Popular Sciences for Jewish Children and Youth in the 18th and 19th Centuries in Europe**

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**Chapter 1**

**Sciences for Jewish Children and Youth in the Modern Era**

In the middle of the 20th century, Dr. Emil Feuerstein (1912-1993) wrote a book entitled *Jewish Discoverers and Inventors* (published in Hebrew by Sherbarak Publishing of Tel Aviv). Feuerstein was born in Hungary and educated in a traditional *heder* (Jewish religious primary school), and as an adult, he studied at the University of London and the University of Basel (Tidhar 1949, p. 1362). In 1935, Feuerstein immigrated to Israel and began publishing popular science books in Hebrew, many of which were aimed at adolescents. *Jewish Discoverers and Inventors* opens with the author’s dedication to his son: “This is a gift to my firstborn, Benjamin, who is about to take on the yoke of the mitzvot,” (Feuerstein [1953] 1955, p. 3). The publisher, Sherbarak, specialized in youth literature, the audience for which this book was intended (Neiger 2017, pp. 102-106). Its table of contents includes a long list of Jewish personalities from the 19th and 20th centuries, some well-known and others lesser-known, who contributed to the development of science and technology in the modern era: Siegfried Marcus (1898-1931) who invented the automobile; Yitzhak Meritt Singer (1811-1875) who developed the sewing machine; Wolfgang Pauli (1900-1958) and Albert Einstein (1879-1955), both winners of the Nobel Prize in physics; and Chaim Weizmann (1874-1952) a scientist who became the first president of the State of Israel; along with many others.

Feuerstein extolled the role that Jews played in the advancement of modern science and technology. The first chapter, “Jewish Geniuses Among Nobel Prize Recipients,” describes in detail the Jews who made up a high percentage of those who won this prestigious award. According to Feuerstein, the achievements of the Jewish people were obscured because their scientific achievements were recorded on behalf of the countries in which the Jewish scientists lived. He described how non-Jews, especially the Nazis, appropriated the achievements of Jewish scientists and inventors. For example, the Nazis stole the credit from German-Jewish inventor Siegfried Marcus for developing the first model for an automobile (Feuerstein [1953] 1955, p. 14). Fritz Haber (1868-1934), a chemist from Breslau, developed the gunpowder that contributed to Germany’s victory in World War I, yet ended his life as a refugee (ibid., pp. 60-64). Albert Einstein suffered poverty and hardships in Switzerland because he was Jewish (ibid. p. 97).

What was the main goal of Feuerstein’s book? One goal was to disseminate scientific and technological knowledge; he described the principles of how penicillin works, the structure of the atom, and the fundamentals behind producing loudspeakers and radios. Like many authors and educators in the modern era, Feuerstein believed that scientific and technological knowledge has an essential and practical value for the younger generation. Beyond this, he emphasized its important role in establishing national identity.

With this book, Feuerstein endeavored to strengthen his readers’ national pride by showing these Jewish scientists and inventors as worthy role models for the generation of young Israelis. He emphasized that the achievements of these individuals in the fields of science and technology illustrate the unique character of the Jewish people. In doing so, Feuerstein expressed a concept deeply rooted in Western culture; that the Jewish people have exceptional intellectual abilities. This myth originated from scientists and intellectuals of the 19th and early 20th centuries, who claimed that the Jews were biologically-genetically different from other people (see Gilman 1996, pp. 33-51; Schaffer 2008).[[1]](#footnote-1) Feuerstein’s book feeds on this myth and even cultivated it among its audience of young Jews. *Jewish Discoverers and Inventors* typifies modern scientific literature for children and youth that goes beyond merely imparting knowledge and strives to also transmit to the young generation complex messages in the emotional, social, and national realms. This genre emphasizes the importance of the sciences and technology in advancing human culture, and their role as the cornerstones upon which modern society and national cultures are built. As I will show in this book, these ideas emerged in the earliest stages in the development of Hebrew popular science literature for children and youth in the 18th and 19th centuries.

# The Popularization of the Sciences in Modern Culture

A discussion of the process through which the sciences became part of popular culture for children and youth requires an explanation of the theoretical concept of “science.” The traditional view among historians of science is that this field developed in professional institutions founded mainly in modern Europe. However, an in-depth examination of how scientific knowledge developed across human cultures reveals a much more complex picture. Many cultural factors have been involved, both formally and informally, in the development of the bodies of scientific knowledge. Further, scientific knowledge may appear in a wide variety of configurations and cultural sites. A critical analysis of historical-sociological thought regarding the culture of science must address the relationship between science and modernism. The identification between these two concepts obscures the complex contexts in which science is created, consumed, and assimilated into human culture. Therefore, in referring to “scientific knowledge,” it is necessary to accept observations from a wide range of times and geographical locations, and not to be satisfied with those that are limited to the ways in which it has been interpreted in Europe in the modern era. Examining the interrelationship between knowledge and the set of social, political, and economic factors in which knowledge develops is necessary for a multifaceted understanding of the complex concept of science (Burke 2013, pp. 1-7; Daston 2017, pp. 135-142).

There has also been criticism of the conventional view of science as a homogenous concept whose development was linear. In his pioneering book *The Structure of Scientific Revolutions*, Thomas Kuhn rejected the commonly-accepted description of scientific knowledge as evolving through a process of accumulation. Through historical observations, Kuhn noted the revolutionary pattern in the development of science. According to Kuhn, in every era, a certain scientific theory is accepted as “truth” while others are marginalized. He attributed an important role to popular science texts aimed at a general audience in establishing the scientific paradigm. These texts create the perception that there is a continuity of knowledge and that the contemporary paradigm is ahistorical. Further, he asserted that popular science textbooks and educational materials are completely subordinated to the needs of the prevailing scientific system, and simplify scientific knowledge in order to uphold the dominant paradigm (Kuhn [1962] 2011, pp. 45-61; 211-220).

However, some scholars have objected to this pejorative view of popular science as superficial and passive. They have asserted that this corpus is necessary to explain the complex scientific processes that have taken place in Western culture. Additionally, some scholars have differentiated the contents and goals of textbooks and popular science works from those in the formal scientific literature. For example, Cooter and Pumfrey (1994) criticized the sweeping assumption that the knowledge transmitted in popular science books and textbooks is drawn directly from the scientific system, but in a simplified and superficial form. In their view, this literature expresses the reciprocal relationship between general culture and scientific activity. Similarly, other scholars have stated that in popular science literature, the agents of knowledge offer their own distinctive interpretation of the bodies of scientific knowledge and scientific concepts, and even develop a new repertoire of knowledge (Benaude-Vincent et al. 2005; Cooter and Pumfrey 1994, pp. 237, 249-250; Gaukroger 2020, 340; Olesko 2006, p. 869). Recent research on popular science literature has examined a wide spectrum of issues regarding the relationship between science and culture, such as the timeline of the development of popular science literature, the roles of various agents active in the field, cross-cultural interactions that dictate the nature of this relationship, the creative input of the people who popularize the sciences, and the various means of transmitting scientific knowledge that they use (Daum 2009, pp. 321-327; Lightman 2016, pp. 352-355; Nieto-Galan 2016, pp. 118-121, 123-126).

In Europe, between the 16th and 18th centuries, the sciences gradually became a new authoritative source that competed with traditional authorities. Its impacts were evident in religious, social, and economic realms. This “scientific revolution” encompassed a set of changes in various scientific disciplines, which combined old and new concepts. These processes occurred at differing paces. They arose both in monarchies and modern nation-states (Channell 2019, 13-15; Mazeh 2021, pp. 1-2, 43-60; Porter and Teich 1992; Principe 2011; Shapin 2009, pp. 79-95, 140-153; Wootton 2015, pp. 22-50).

Technological innovations based on scientific knowledge reshaped the daily lives of the people at that time. Popular texts described and explained scientific concepts and technological tools, and they were addressed in literature and artistic works as well (Channell 2019, pp. 3-9; Nieto-Galan 2016, pp. 43-48; Noakes 2016, pp. 153-157).[[2]](#footnote-2) At the end of the 18th and the beginning of the 19th centuries, European scientific societies and universities increased their efforts to make scientific knowledge accessible to the masses. The now-familiar separation between scientific knowledge published in specialized academic settings and that in popular science texts began to emerge. Popular science literature played an important social and cultural role in bringing scientific knowledge and ideas to the general public and was a powerful agent for the establishment of new scientific fields (García-Belmar et al. 2005, pp. 222-224; Gaukroger 2020, 336-338; Myers 1989, p. 173; Russell 1983, pp. 42-43; Topham 2009). There was an assumption that scientists had an obligation to disseminate scientific knowledge to all social classes. Science textbooks were often written by well-known authorities and personalities, which contributed to the prestige of these books (Knight 2001, p. 87). Despite the difficulty of popularizing the sciences without over-simplifying them, disseminating scientific knowledge raised the level of technological skill among the working class and increased public support for the development of the sciences. The claim was made that acquiring a scientific way of thinking would contribute to citizens’ moral development and adoption of the beneficial civic attitudes necessary for a democratic society (Yeo 2001, pp. 72-82).

Accelerated technological development in the second half of the 19th century further reinforced the status of the sciences. In the nation-states that formed during this period, great importance was attributed to scientific and technological development as a means to assure their position and prestige on the international stage, and to gain economic and military power (Gordin 2009, pp. 99-102; Harrison and Johnson 2009, p. 8; Kim 2016, pp. 83-85). The extensive and diverse corpus of popular scientific literature created during this time, for example, in Russia and England (Shavit 2020, pp. 336-339; Topham), indicated the importance attributed to transmitting the sciences to the public. In general, scientific research and technological developments were presented as positive and essential, despite the difficulties and negative consequences they caused, such as impacts on the economic structure or environmental pollution (McCormick 1989, pp. 1-17; Nieto-Galan 2016, pp. 159-169).

Harrison and Johnson stated that the culture of science and the modern nation-state developed hand-in-hand. Eric Hobsbawm noted the effort invested in “the invention of tradition” for nations, in which the sciences and technology symbolized the future, and scientific modes of thinking and scientific bodies of knowledge were adopted as its necessary infrastructure. Science and technology education for all citizens became a core goal, both to produce a new generation of scientists and to establish public recognition of the need to support the scientific system:

Educating citizens is one of the projects that modern states undertake, and the education of scientists, in particular, has been the domain of the nation-state […] students learn not only how to be good scientists but also how to be good subjects or citizens of the states that sponsor their training (Harrison and Johnson 2009, p. 10).

How did scientific and technological knowledge spread in the general culture? How was it integrated into the promotion of social and national values? The two main channels were popular science literature and textbooks used in the formal education system.

# Popular Scientific Literature for Children and Youth and Scientific and Technological Education in the Modern Era

In the modern era, textbooks and newspapers became the primary means of disseminating scientific knowledge and concepts throughout Europe (Cooter and Pumfrey 1994, p. 237). The development of scientific and technological education is intertwined with the appearance of popular children’s literature that dealt with these issues. Both indicate an emerging recognition of the importance of the sciences, particularly for the younger generation. Initially, the boundary between popular or educational texts and professional scientific literature was not clear. Similarly, the distinction was blurred between didactic writings produced by people who were self-taught and materials about science and technology that emerged from the world of higher education (García-Belmar et al., 2005, pp. 223-226).

There has not yet been an in-depth study on the means used to transmit information about science to children and youth, despite the importance of this topic for understanding the interrelationships between the development of science and the resultant dilemmas in social, religious, and moral realms. It is widely recognized that scientific writing for children tends to adopt the canon, and therefore may serve as a sensitive measure for assessing the spread of science and its implications. Furthermore, if the discussion about religious institutions and the state includes an analysis of how scientific knowledge is presented in texts for children, it becomes possible to reconstruct the social vision regarding the sciences that emerged at that time. This novel perspective necessitates considering various aspects such as the type of scientific knowledge that is perceived as appropriate for children’s intellectual and cognitive abilities at various ages, and the goals underlying the dissemination of such knowledge to the younger generation (McDowell 2016, p. 134; Pandora 2009, pp. 75-79; Secord 1985, pp. 128-129).

Early evidence of the new place that science and technology held in European education can be found in a book for children entitled The Visible World in Pictures (*Orbis sensualium pictus*) by Jan Amos Comenius (1592 - 1670). This pioneering text, composed in the middle of the 17th century, introduces children to a wide range of objects and phenomena from various scientific fields, such as the natural water cycle, animals, organs in the human body, and technologies such as the printing press (Comenius 1658).

In the first half of the 18th century, the scope of popular science books for children and youth expanded. Children’s books published in the 18th and 19th centuries explained scientific concepts such as Newton’s theory of gravity (Secord 1985, p. 127). These books were hugely successful and helped spread the values of the Enlightenment and modernization to a young audience (Koepp 2006). The growth of science literature for children is related to the establishment of a public sphere in European culture, of which books served as a central pillar. Science books for children can be seen as historical documents that help reconstruct the complex modes through which scientific knowledge was transmitted in modern culture (Myers 1989; Olesko 2006).

Another indication that science became increasingly important in children’s culture in the modern era can be seen in the educational programs recommended by key figures. For example, the English philosopher John Locke (1632-1704) argued that teaching sciences was essential, and even developed texts for teaching them (Secord 1985, p. 131). The well-known French philosopher Jean-Jacques Rousseau (1778-1812) asserted in his seminal treatise on education, *Emile* (1762), that children should be taught about what is relevant to their world, and he taught his apprentice, Emile, geometry, geography, astronomy, physics, and chemistry using experiential learning methods (Rousseau [1762] 2009, pp. 306-330). Following Rousseau and the ideas of the Enlightenment, an educational movement known as philanthropism, which emphasized the natural sciences, emerged in northern Germany in the last third of the 18th century (see more on this below).

Teaching science and technology to children and youth was necessary to help them integrate into the modern and industrialized economy and society. Scientific curricula were first adopted at the end of the 18th century and the beginning of the 19th century in countries that had well-funded public education systems and a high percentage of children who attended school, such as the USA, Canada, and Prussia. One goal was to make their industrial systems more prosperous (Kamens and Benavot 1991, pp. 143-146). This educational content played an equally critical role in establishing young people’s national identity. At the turn of the 18th century, Napoleon founded an education system that included military academies. This system gradually displaced religious education and from the 1830s, modern public education had spread throughout France (Green 1995, pp. 132-133; Lachapelle 2015, p. 49). In response, France’s rival Prussia quickly moved to also establish a modern national education system and universities (Bowen 1981, pp. 244-257; García-Belmar et al. 2005, p. 224; Nieto-Galan 2016, p. 123). Various entities worked to strengthen the teaching of science and technology in 19th-century England, arguing that they must not fall behind neighboring nations (Green 1995, pp. 125-126; Lightman 2016, p. 345). Similar claims were made in Russia and England from the end of the 19th century through the turn of the 20th century regarding the importance of scientific education to uphold national resilience, and these subjects were integrated into the curricula of their national educational systems (Ellis 2012, pp. 47, 59-60; Guseva 2018, pp. 487-490; Vucinich 1970, pp. 35-70). Science and technology became integral parts of formal curricula throughout the Western world during the 19th century, especially in the second half of the century (see for example, Donnelly 1991, 2001, pp. 14-20; Gaukroger 2020, 342-347; Kohlstedt 2010, 11-36; Lerman 1997; McClellan and Dorn 2006, pp. 309-310).

The goals of scientific and technological education varied from country to country, depending on their social, economic, and political situations, but in general, they tended to be linked to national goals. For example, in England, science education was intended to reduce the danger of political bias by an uneducated lower class, while in the USA it expressed the value of empowering the general public (Ezrahi 1990, pp. 164-165). In Norway, national education at the turn of the 18th and 19th centuries combined civic and patriotic content by striving to achieve economic efficiency and technological training (Nodeland 2021, pp. 194, 198-199). However, the spread of curricula on scientific and technological subjects in the West during this period was not linear or constant, and it differed in urban and rural areas (Heywood 2018, p. 78). This trend was sometimes delayed by opposition due to concerns that science posed inherent threats to religious belief, students’ morality, and national political stability (Kamens and Benavot 1991, pp. 151-154, 166-167).

Reforms in formal education often suffered from inadequate or lethargic management, but children and youth often received scientific and technological knowledge in their leisure time through literature provided by other cultural entities. This was particularly noticeable in France in the 1860s, where publishing houses began to issue science books and magazines for children. For example, Pierre-Jules Hetzel (1814-1886), who ran the main French literary publishing house for some fifty years (Lachapelle 2015, p. 48), believed that France lost the war against Prussia (1870-1871) due to the inferior level of education among France’s population.

For many years, Hetzel edited a bimonthly magazine for children and youth that included attractive and entertaining stories about science and scientists. Hetzel also provided a platform for the famous science fiction author Jules Verne by publishing his books and including his stories in the magazine. Verne’s works, aimed mainly at youth, had exciting plots based on contemporary scientific and technological knowledge. In the last third of the 19th century, the idea took root in France that the route to their nation’s success lay in the mastery of science and technology, and that teaching scientific knowledge can be used to transmit patriotic messages, as well as educational ones (Evans 2000; Hendrick 1992; Unwin 2000, pp. 46-48). During this same time in England, a wide range of games and books were designed to encourage enthusiasm and passion for science and technology among middle-class children from a young age (Gaukroger 2020, pp. 347-348; O’Malley 2003, p. 6).

Various literary means were used to attract a young audience and to encourage them to ingest scientific and technological knowledge. For example, scientific themes were integrated into fairy tales and monster stories (Gaukroger 2020, pp. 348-356). Children’s magazines were another important conduit for teaching science and offered an alternative to the official education system. The authors and editors of these magazines strove to raise children’s interest in science and to provide them with knowledge about science and technology, for example with articles about zoology or experiments in chemistry and electricity (Dixon 2001; Hellman 2013, pp. 67-72; Kohlstedt 2010, p. 31; Noak 2004; Sheets-Pyenson 1985, p. 560; Sumpter 2016).

The writers of science textbooks or popular science texts for children were not satisfied with simply encouraging scientific curiosity and conveying factual information; they also used these channels to teach values, ideologies, and moral concepts (García-Belmar et al. 2005, p. 227; Myers 1989; Secord 1985, pp. 135-139). They presented scientists, inventors, and explorers such as Christopher Columbus, Michael Faraday, Alexander von Humboldt, and Charles Darwin as heroes (Lightman 2016, pp. 346-348). Biographical or autobiographical texts about Isaac Newton, Benjamin Franklin, Louis Pasteur, and the Russian physician Nikolai Pirogov became educational classics (see examples of this in Hellman 2013, pp. 145 -146; Hendrick 1992, p. 149; Secord 1985, p. 135; Sinkoff 2000; Theerman 1990). They presented science and technology as positive forces that had a critical role in shaping the morality of the younger generation. Knowledge in these fields was expected to be utilized to achieve ideological, religious, social, and national goals. For example, the *Child’s Magazine*, which began publication in the USA in the 1830s, included articles about the microscope, the water cycle, the solar system, exotic animals, and various species of trees. The purpose was to teach children about God’s wonders, and thus make them more moral and able to contribute to the nation (Connors and MacDonald 2011, p. 116). Science education in the USA had a clear national and social orientation: to create upright and productive citizens, and schools were viewed as fertile ground where the next generation of brilliant scientists would be cultivated (Slotten 1991, pp. 330-337).

This spread of formal scientific and technological education did not bypass Jewish society in Europe. As in the non-Jewish educational system, science textbooks and popular science literature dealt not only with the dissemination of purely scientific content but strove to provoke a profound change in the Jewish educational ideal.

# Acquisition of Scientific and Technological Knowledge Among Ashkenazi Jewish Children and Youth

In Ashkenazi Jewish communities, education was focused on preserving traditional values and community structures. In *cheder* (religious schools for young boys) students were taught to read Hebrew scriptures for worship and religious study, and other areas of knowledge were hardly addressed. Few didactic texts were produced for children or youth (Katz 1957, pp. 221–222; Kleinberger 1962, p. 21; Marcus 1998, pp. 57–72; Ofek 1979, pp. 19–26).[[3]](#footnote-3) Despite this tendency toward inertia, by the 16th century, *yeshivot* (religious study halls) began to change their study patterns and the first efforts were made to integrate subjects such as philosophy and science (Elbaum 1990, pp. 17, 155-156; Reiner 2007, 2011). However, even in the 18th and 19th centuries, mainstream Ashkenazi education was still based on the traditional ideal of the *talmid chakham* (Torah scholar), and the main texts used to teach children were the Bible, prayer book, and especially the Talmud (Sharpstein 1943, pp. 93-117; Toriansky 2010; Zelkin 2008a, pp. 22-23). The ways in which Jewish children and youth in this environment were exposed to science and technology, either within the education system or outside of it, differed over time, and it is not possible to talk about a uniform experience through which Jewish students became familiar with these subjects.[[4]](#footnote-4)

The Jewish Enlightenment (*Haskalah*) movement sought to reform the prevailing tradition in Jewish education. This included giving a central place to the sciences. The Haskalah movement first emerged in northern Germany toward the end of the 18th century. Its advocates for modernizing Jewish culture operated in various population centers throughout the 19th century. Followers of the Haskalah saw modern education as a primary means of influencing the future of Jewish society, and pinned their hopes on Jewish youth reforming and improving Jewish culture (Katz 1985, pp. 125-127; Kogman 2010; Rafal 1986, Shah; Shavit 2014; Zelkin 2008a, pp. 13-19). Jewish schools based on Haskalah ideals were founded in Central and Eastern Europe from the end of the 18th century and throughout the 19th century. They adopted a modern curriculum that included the sciences. However, these schools had limited success. In 1832, only 100 out of 1,000 children in Berlin attended Jewish schools. In the first half of the 19th century, most Haskalah schools closed, or their Jewish character was minimized (Eliav 1960, pp. 79, 94, 173-174; Feiner 1995, pp. 423-424; Sharpstein 1945, pp. 92-96).

While modern Jewish education weakened in many Central European cities during this period, it did not completely disappear. The educational patterns created there were adopted, at least in part, by Haskalah educators throughout the Ashkenazi world (Feiner 2001; Levin 2001, pp. 123-125; Stanislavsky, 1993, pp. 127, 131-132; Zelkin 2008a, pp. 125-128). Haskalah schools were founded in Vilna, Oman, Odessa, Kishinev, and other communities in the Russian Empire in the first half of the 19th century, by teachers who used a curricular model they brought from Galicia, which included science education (Stanislavsky 1993, p. 135; Zelkin 2000, pp. 80-81; Zelkin 2006, pp. 244-246). Although traditional education continued to be dominant in Eastern Europe, by the end of the century there were an increasing number of private educational institutions and *“*reformed *cheders”* that offered a modern Jewish education (Kreiz 1994, pp. 285-296; Zelkin 2008a, pp. 147-151; Zipperstein 1988).

From the middle of the 19th century onwards, most Jewish children in Central Europe attended public schools (Eliav 1960, pp. 204-208; Fahn 1919, pp. 71-74; Kieval 1987, p. 96; Machman 1979, pp. 128-138; Rahden 2000, 158-159; Rotman 1999, 57-92; Wistrich 1990, p. 24). This clearly contributed to the spread of the new ethos of science and technology among Jewish youth. Once European universities became open to Jewish students, they began to aspire to prestigious careers in the sciences, and despite the many obstacles to realizing their dreams, they arrived at the universities *en masse* (Efron 2007, pp. 171-173). In the German-speaking region, at the end of the 19th century and beginning of the 20th century, the new figure of the successful Jewish scientist emerged, who was a member of the bourgeois class and aspired to integrate into general society. The diligence, perseverance, and motivation to grapple with intellectual issues that had been instilled in them through Torah study were now directed to the challenges of science (Efron 2014, pp. 170-174; Volkov 2001, pp. 261-263).[[5]](#footnote-5)

Autobiographies and biographies of Jewish scientists born in the 19th century in Central Europe show that they were able to succeed because they knew the language of the country where they lived, their parents had the desire to acculturate, and they were removed from the traditional Jewish framework and education. For example, Ferdinand Julius Cohn (1828-1898) from Breslau became a lecturer on biology at the university in Breslau and was among the few Jews who received an award for his achievements in science and loyalty to the city (Rahden 2000, pp. 225-230). In his autobiography, he recounted his early interest in learning and particularly in the sciences. He learned to read by the age of two, and by three he read *Naturgeschichte für Kinder* *(A System of Natural History, Adapted for the Instruction of Youth)* by Georg Christian Raff (Cohn 1901, p. 16). Cohn most likely read the book in the original German, even though it had been translated into Hebrew a quarter of a century earlier (see more on this below). Cohn’s formal schooling and sources of knowledge were non-Jewish. He attended the public education system (ibid, pp. 16-21). It is difficult to see to what extent the Jewish scholarly tradition influenced his scientific work (see discussion of the relationship between the two in Charpa and Deichmann 2007/2008, p. 98). Similarly, Jewish chemist Fritz Haber (1868-1934), also from Breslau, who won the Nobel Prize for Chemistry in 1918 was educated solely in the public school system (Stoltzenberg 2004, pp. 12-20). Richard Willstätter (1872-1942) born in Karlsruhe, Germany, who won the Nobel Prize in Chemistry in 1915, acquired his scientific knowledge at a young age from postage stamps and books in German. His formal education took place in a public pre-gymnasium school, and later at a gymnasium in Nuremberg (Willstätter 1949, pp. 18-28).

Albert Einstein (1879-1955), winner of the Nobel Prize in Physics in 1921, was also educated outside of Jewish frameworks. The book *Naturwissenschaftliche Volksbücher* *(Popular Books on Natural Sciences)* by Dr. Aaron David Bernstein (1812-1884), a Jew from Gdansk, had a pivotal impact on him (Charpa 2007, p. 174). Einstein read Bernstein’s books in the original German, although they had been partially translated into Hebrew and published in Warsaw in the 1880s (see below).[[6]](#footnote-6)

Young Jews in Central Europe followed primarily non-Jewish paths to science and acquired their knowledge through modern languages. Young people born into highly acculturated Jewish families took advantage of opportunities to integrate into the public education system. Even if their success in the field of science stemmed from the Talmudic tradition, as Charpa and Deichmann (2007/2008, p. 108) claim, their studies in the European public education systems also made a decisive contribution. Young Jewish students internalized the European educational ethos championing the sciences that was transmitted through public elementary schools, gymnasiums, and universities.

However, among Eastern European Jewish communities, the spread of the educational ethos of science and technology was more complicated. It was linked to the modernization of Jewish education, and Jewish youth could encounter the sciences either through the state’s public education system or in modern Jewish educational settings. While Jewish students in the state’s public schools certainly learned about science and technology, few were able to access this option. Unlike in Central Europe, there were many barriers to the integration of Jewish children in state schools. In the first half of the 19th century, Russian Jews resisted the mandatory educational requirements imposed on them. In the last two decades of the 19th century, government quotas limited their entry into the public education system (Edwards 1982; Goldstein 1986, pp. 148-149; Kreis 1994; Nathans 2002, pp. 261-266; Rabkin 1983, pp. 22-23; Stanislavski 1993).

The Haskalah schools established throughout Eastern Europe from the start of the 19th century apparently had some impact in encouraging science education, but, as mentioned, there was a limited number of these schools in this region. Some young Eastern European Jews were introduced to the sciences at rabbinical seminaries in Zhytomyr and Vilna, where modern subjects, including science, were taught (Dohrn 2001; Slutsky 1993; Zalkin 1995). The level of this scientific education depended on the teacher, but even if they did not provide in-depth scientific education, they made an indirect contribution to it because students learned modern languages (Zalkin 1997),[[7]](#footnote-7) which gave them access to up-to-date scientific knowledge in non-Jewish sources.

Mastery of languages such as German, French, and Russian was a precondition for autodidactic learning that was a common way of learning about the sciences and technology at the time. Jewish scholars and authors who knew European languages bridged that gap and brought the sciences to the Jewish world (Shavit and Reinherz 2011, pp. 55-61). For example, the poet and physician Shaul Tschernihovsky (1875-1943) learned Russian at the age of five from his aunt, and became interested in nature studies through books in that language, such as one on the “Three Kingdoms of Nature” (Tschernihovsky 1994, p. 57).

Similarly, Zvi Hacohen Rabinowitz (1832-1889) learned German from his uncle and studied books in that language on mathematics, natural science, geography, and astronomy. This extensive knowledge base enabled him later to write a series of science books in Hebrew, *Otzar Ha-chochma Vi-hameda* *(The Treasure of Wisdom and Science)* (Shavit and Reinhertz 2011, pp. 122-126; Zagorodsky 1886, pp. 442-443).

Yehezkel Kotik (1921-1947) studied in a Russian school from the age of ten. Within a single year, he learned Russian and was able to read translations of Jules Verne’s works. In the last decade of the 19th century, Kotik worked to make popular science literature available in Yiddish, because most Jewish children at that time did not read Russian (Cohen 2020, pp. 128-130, 309-310). At the beginning of his book *Winter Abendaen (Winter Evenings),* Kotik argued in favor of popular science writings for children. Hesaid that Jewish children need the scientific knowledge and ideas of the modern era, and rather than waiting until they were permitted to attend public schools *en masse*, these subjects should be available in their mother tongue, Yiddish (Kotick 1896, IV).

Gradually, the sciences and technology became a legitimate component of modern Jewish education in Europe. Scientific and technological knowledge was disseminated in two intertwined ways. One was through Haskalah educators and others who popularized science and technology because they viewed this knowledge as essential for students (Zalkin 2016, pp. 155-157). The other was popular didactic texts, books, and journals in Hebrew that made knowledge about the sciences accessible to both teachers and students. Reformers of Jewish education accepted that science and technology were necessary for the intellectual and spiritual development of Jewish children and youth, to prepare them for the modern labor market, and to strengthen their Jewish national identity.

# Popular Science Texts in Hebrew: A Core Means for Teaching Science to Jewish Children and Youth

Formal education for Jewish children in Eastern Europe was limited and marginal until the end of the 19th century, and most were not able to learn the languages in which scientific literature was written at the time. Therefore, popular literature in Hebrew was a means for introducing scientific concepts to Jewish youth and satisfying their curiosity about the technological innovations they encountered in their world. Jewish thinkers and scientists in Eastern Europe recalled their early exposures to the sciences and their strong desire to study them in greater depth. Chaim Weizmann (1874-1954), who became a scientist and a central figure in the Zionist movement, credited much of his knowledge to a gifted chemist who taught at the public school in Pinsk (Weizmann 1944, p. 27). Weizmann also thanked an exceptional teacher at the *cheder* for even earlier exposure to the sciences:

He was an ‘enlightened’ type; that is, he was influenced by the spirit of the Haskalah, which was widespread at the time in the main centers of Russian Jewry. He managed to sneak in secular studies during the breaks between sacred studies. I remember how he brought to the *cheder*, clandestinely but with great joy, a Hebrew textbook on nature and chemistry, the first book of its kind to reach that area. I don’t know how this treasure fell into his hands. Without ever having seen a chemistry laboratory, and with no knowledge of the natural sciences, as was typical among Jews living in the ghettos in Russia, he would delve into this book and explain what he had learned to select students. He even lent it to some students to read in the evenings. And sometimes – although there was a risk that his actions would be discovered and lead to his immediate dismissal – he would read us some pages which he found especially interesting. Understandably, these were read aloud with the traditional chant used when studying the Gemara, so that anyone passing by outside would not suspect that we were not engaged in the regular *cheder* studies (Weizmann 1944, p. 11).[[8]](#footnote-8)

It is possible that the book this teacher read from was the *Book of Separation and Assembly* from the previously mentioned *Treasure of Wisdom and Science* by Zvi HaCohen Rabinowitz (Vilna, 1876). Weizmann was quoted as saying that this work by Rabinowitz affected him deeply and led him to the world of science.[[9]](#footnote-9)

The Haskalah-oriented school teacher Weizmann mentioned was Rabbi Avraham Yitzchak Motolansky (Rose 1986, pp. 20-21). Weizmann’s two sisters also studied with Motolansky when they were around 10-12 years old, and he left an indelible mark on all of their lives. His sister Haya Weizmann-Lichtenstein (1879-1959) mentioned Motolansky in her memoirs and said that he introduced his students to contemporary Hebrew scientific literature and taught them about how technological innovations such as telegraphs and trains worked (Weizmann-Lichtenstein, pp. 49-50). She also noted that her brother learned from Bernstein’s popular science books (1880-1885), which had been translated into Hebrew under the title *Yediot Hateva (News of Nature*). This shows that although traditional Jewish education did not support teaching science and often even saw it as subversive, the subject was nevertheless taught sometimes within these settings.

Similarly, Russian-born Jewish historian Ben Zion Dinor (1884-1973) mentioned in his memoirs Haskalah teachers who introduced their students to science literature in Hebrew. Dinor wrote about a teacher who would read to his students on the Sabbath before Rosh Chodesh from books on the geography and history of Israel by Kalman Shulman, *Shulamit*, *Har’el* and *Halichot Kedem*. During summer vacations, Dinor and his friends read modern Hebrew literature together, including Kalman Shulman’s book *Musadi Eretz (Foundations of the Earth)* on European geography (Dinor 1958, pp. 37; 40; see more on Shulman’s books in Chapter 3).

For Jewish students who were denied the opportunity to participate in formal education and could not learn European languages, the only option was to learn about science from popular science books published in Hebrew. Shlomo Maimon (1753-1800) from Lithuania, who became a well-respected 18th-century European philosopher, described how he learned cosmology from a Hebrew textbook that he secretly took from his father’s bookcase (Maimon 1792-1793, pp. 37-40).

Jewish students continued to learn science from popular literature through the end of the 19th century. In his memoirs, Ahad Ha’am (Asher Zvi Hirsch Ginsberg, 1856-1927) said that when he was 11 years old, he studied mathematics and engineering from the Hebrew book *Melekhet Mahashevet* during school breaks, when he was supposed to be memorizing passages from the Gemara (Ahad Ha’am 1959, pp. 481-482). This book, attributed to Eliyahu of Pintsov, had been published in Berlin about a hundred years earlier (1765). Ahad Ha’am said studying it became an addiction that helped him quit his other harmful habit of smoking cigarettes. But when he began to scribble mathematical formulas on the doors and windowsills of his house, his “crime” was discovered and the book was taken away from him. He said *Melekhet Mahashevet* was the foundation for his ongoing independent study in the field of mathematics: “I admit that my knowledge of mathematics began with this book. Many years later, when I studied mathematics from books more suitable for this purpose, the knowledge I acquired in the *cheder* was of great help to me,” (ibid). He said that he read these books on mathematics in the bathroom because he was afraid that his father or other adults would confiscate them (Ahad Ha’am 1989, p. 482). Another book he read as a young child was *Yesodei Hochmat Hashiur* by Chaim Zelig Slonimsky (ḤaZaS), published in 1865 in Zhytomyr. Slonimsky, (whose life and work are described in detail in Chapter 6), was a key figure in disseminating and popularizing scientific knowledge among Jewish youth. Eliezer Ben Yehuda also said that the books of Slonimsky and Rabinowitz set him on his path to the Haskalah so that he eventually gave up his Torah studies in favor of going to university and studying medicine (Ben Yehuda 1986, p. 61). For others, such as Yehezkel Kotik, whose families would not allow them to study in secular institutions, reading popular educational texts was their only consolation (Kotik 1998, pp. 347-348).

The role played by popular Hebrew science literature in forging a path to modernization in the 18th and 19th centuries differed between various parts of the Ashkenazi world, depending on what formal education young Jews were able to receive. By the middle of the 19th century, most Jewish children and youth in Central Europe had been integrated into public education settings and studied the sciences in the national language, and science became a means for social mobility. In Eastern Europe, traditional Jewish education was still prevalent and the integration of Jewish children into public education was slow. For these youth, popular science literature in Hebrew played an important role in modernization and education throughout the 19th century.

At the turn of the 20th century, a popular book on astronomy by Nicolas Camille Flammarion was translated from French into Hebrew as *Hashamayim* (*The Heavens*) and published in Warsaw. The translator, Michel Weber (1859-1907) said he had to edit the original so it would be appropriate to the low level of scientific knowledge among the Jewish public, and bemoaned the unfortunate lack of comprehensive scientific education (Flammarion 1898, “Translator’s Introduction”, pp. 3-4).

Hebrew literature on science had a particular appeal for young people, whether they learned this material openly or in secret. In general, Jewish modernization movements were led by Jewish youth who were open-minded, courageous and had a tendency toward subversiveness (Biale 1983; Hotam 2008; Werses 2000).[[10]](#footnote-10) Youth adopted new knowledge and ideas with relative ease, and this was a major force in changing traditional Jewish views, including the perception of the sciences.[[11]](#footnote-11) Learning about science could significantly undermine their worldview and change their attitude toward Jewish tradition (Sofer 2007, pp. 56-57; Zalkin 2005, p. 250; Zalkin 2007, p. 243). For example, Yehuda Leib Katsenelson (Buki-ben-Jogli) recalled his shock when, at age 15, he read Slonimsky’s *Sefer Kukhva di-Shevit* about the heliocentric structure of the solar system (Buki-ben-Jogli 2017, pp. 71-76), which contradicted the outdated astronomical model that was accepted still widely in the Jewish world at that time (see more about this below). He also said it was a spiritual revelation when he read about the telegraph in a Hebrew scientific journal *Hatzifira (The Siren),* founded and edited by Slonimsky. Even though Slonimsky’s journal and books were not specifically aimed at youth, it is clear that they read his works.

Jewish youth widely read educational texts, and even wrote many of them (Feiner 2011, pp. 214-215). This is particularly noticeable in scholarly journals, which included many popular science articles (see more about this in Chapter 2), which appealed to a general audience, but were mainly read by young people. Yitzchak Eichel (1756-1804) was one of the founders and editors of the first educational journal in Hebrew, *Hame’asef*, published in Germany in the last two decades of the 18th century and the beginning of the 19th century.

Eichel saw *Hame’asef* as an enterprise by and for a young audience: “Because we are young, and most members of our community are working hard just to buy their daily bread, both those involved in teaching the youth or those engaged in matters of business [...] new things will awaken in a young man’s heart the desire to strive for success,” (Eichel 1788, Introduction, pp. 12-13, my numbering).

 Almost 80 years later, Kalman Shulman, a scholar and author of popular science books, said: “*Sefer* *Hame’asef* was successful and brought more benefit to youth than schools could,” (Shulman 1866, p. 26). *Sefer Hame’asef*, an anthology of this journal published in Warsaw in 1886, presented this early modern Hebrew journal as an expression of the predominance of youth culture:

They were especially happy about *Hame’asef* in Berlin, which was the cornerstone for the education of Israel [Jews] at that time. [...] Eichel and Barsley[[12]](#footnote-12) found many young people who were dedicated to the Haskalah and whose souls were connected to the ancient language [Hebrew] and longed to renew it. Even Ben-Menachem[[13]](#footnote-13) himself reached down to young people from his lofty position and published a few poems in *Hame’asef* [...] In the introduction to the first issue of *Hame’asef*, the editors printed an article by a young man who anxiously asked that *Hame’asef* open its gates to him. It was as if they wanted to open their people’s eyes and say: **A new day has arrived; the time has come for the elderly Eliphaz to give his place to the young Elihu. The time has come when the great will listen to the small when young people will prove to our people that they can teach their elders understanding and bring them wisdom**.” (Department for the Development of Language and its Literature in the Society for the Spread of Enlightenment among the Jews of Russia, 1886, p. 3, my emphasis).

A similar trend can be seen in other Hebrew journals. *Hatzifira,* edited by Meïr Halevi Letteris (1822) appealed to youth (Mahler 1961, p. 60) and was read by some Beit Midrash students (Sofer 2007, pp. 61-62; see more on this in Chapter 6). Yosef Perl (1773-1839), a leader of educational reform in Galicia, said that the primary goal of the journal *Kerem Hemed* was to spread values among Jewish youth (Mahler 1961, pp. 60, 158). In the second decade of the 19th century, he founded the journal *Tzir Ne’eman* for students of his school (see more on Perl in Chapter 3). Moshe Yehuda Leib Lilienblum (1843-1910), a well-educated early Zionist, said that when he was about 15 years old, he began to read the journal *Hamagid*, and later, when he became a respected teacher, his students subscribed to this journal and discussed it in a weekly circular (HaCohen 1883, pp. 105-107). Ben Zion Dinur said that he subscribed to *Hamelitz*, as did other students at the yeshiva where he studied (Rosolio-Davidovich 2019, p. 25).

Teachers brought the journal *Hashachar* and Haskalah books to students in a small town in Lithuania to spread the ideas of the Haskalah (Proosh 2001, pp. 72-73). Young people not only read these publications, they became partners in their creation, as Eichel noted in his description of the *Hame’asef* enterprise at the end of the 18th century (see above). This phenomenon continued into the 19th century. The authors on which the Hebrew press in Russia relied at this time were primarily young adults (see Segev 2015, pp. 146-160).

One reason these journals attracted young people was that they included news about science and technology. Interest in these subjects became an identifying feature of this young generation. Yitzhak Weinert, the editor of the journal *Hatzir* which was published in Lviv in 1861-1862, addressed political issues for the general public but recognized that news about technological innovations was of special interest to youth (see Chapter 5). Author and translator Jacob Fichman (1881-1958) implied that the degree of attraction to science and technology differed between younger and older generations. He recalled being hosted by a Jewish family when he was 14 years old, and as he enthusiastically read aloud excerpts from the Hebrew scientific journal *Hatzifira*, his elderly host fell asleep (Fichman 1943, pp. 6-8). This can also be seen in Buki-ben-Jogli’s description of how *Hatzifira* fell into his hands for the first time:

One of my relatives, a politician by nature, was traveling in Warsaw for business purposes. He heard that a Hebrew journal had begun publication there, and immediately subscribed to it and brought three issues with him to Russia. “I really made a mistake this time,” he lamented, holding the three issues folded together. “I thought this would be about Napoleon III and the Queen of England, but instead they print the devil knows what strange things, with pictures and drawings, like those drawings in Tractates *Kil’ayim* and *Eruvin* that I’ve always been afraid of. I am sorry that I wasted my money on nothing. I already paid for half a year. Here, you take these issues. You are well versed in Tractate *Eruvin* and might find something interesting in them” (Buki-ben-Jogli 1772, p. 73).

His elder was interested in politics and considered learning about science and technology a waste of time, but young Buki-ben-Jogli enthusiastically read about these topics. Young people’s attraction to science and technology made them the natural agents for spreading this knowledge in their social environment. After Buki-ben-Jogli read in *Hatzifira* about how the telegraph worked, he explained it to the older men at his Beit Midrash, although they were more interested in politics. He recalled this unusual experience, in which he, as the youngest in the group, imparted knowledge to his elders:

The small group had already gathered around the long table by the stove and were talking about politics. With trembling legs, I approached them and announced proudly: “Gentlemen! The secret of the telegraph will be revealed, I will reveal the secret of the telegraph!” Together they cried “Is that so?” and stood up awkwardly from their seats. “Yes, yes, I am here and I will explain it to you.” At the moment, Napoleon and the Queen of England were both forgotten and I, who already knew Slonimsky’s article by heart, took a piece of coal from the stove and drew on the white table a diagram of the electric battery and its key, the magnetic ingot and the writing machine – each in proper style. **The idea, that I, the youngest in the group, led the discussion that day, gave me the ability to explain all the details explicitly and clearly. While I spoke, they all sat down and remained silent, without interrupting me** [...] (Buki-ben-Jogli 1811, p. 75, my emphasis).

In contrast to the older generation, who studied traditional holy texts or read about practical and current affairs, Jewish youth were thirsty for scientific and technological knowledge. Buki-ben-Jogli emphasized the challenge of being a young man teaching his elders, but his mastery of the knowledge from *Hatzifira* gave him the strength and confidence to do so. Another expression of this distinction between generations also appears in “A Story of What Happened,” published in the journal *Ivri Anochi* (*I am a Hebrew*) in 1890.[[14]](#footnote-14) The story’s hero, 16-year-old Michael, was an avid reader of Haskalah books, and his “disgrace” eventually became widely known. In a dramatic scene, Michael is put on trial for possessing Haskalah books including one titled called *Achein Yesh Hashem (Surely There is a God*) (Vilna, 1875)[[15]](#footnote-15) which described the theory of evolution:

In a large, long hall [...]Rabbi Haran, in his green coat, sat in his large chair and scrolled through a small book with contemptuous eyes. At the white table, old men sat to his left and right, among them Shmuel Haroeh and Israel Katina [...] There was complete silence in this fearful place. Nobody spoke, not a word was said, those at the table were looking down at the poor and vulnerable boy, who was standing, with humbled eyes, at the end of the table, in front of the terrible gathering. For a moment, his forehead creased and his face clouded [...] as if there was no life spirit left in him [...]Rabbi Haran began angrily: “You, Michael, in this Garden of Saints, have become a heretic, and rebellion has arisen in your heart? You read foreign books and seek what is above and below? Or you are an uncouth fool!” Michael’s face fell. The rabbi’s face flushed and in his great anger he reprimanded him bitterly: “I have been young, and now am old; yet have I not seen the righteous forsaken, nor his seed seeking knowledge. Look here, men, at this book *Surely There is a God*. Surely there is a God, in clearly understood language. Woe to the listeners who hear that!”

The description of Michael as a “poor and vulnerable boy” facing his elders who were judging him highlights the gap between youth and adults and draws the lines between their interests. The young man wishing to deepen his knowledge of science is a symbol of the future of modern Jewish society, while the elderly rabbis represent the old, traditional world, in which modern science and technology have no part. This growing gap between the cultures of youth and adults led to the development of science literature in Hebrew directed especially at children and youth.

# Differences Between Texts for Children and for Adults, and the Development of Science Literature in Hebrew Aimed at Children and Youth

During the modern era in Europe, public interest in science and technology grew rapidly and great importance was attributed to these topics for the future of the nation. Therefore, in many European countries, a distinct genre of scientific literature for children and youth developed. This was part of a broad trend, which gradually spread in Europe beginning in the modern era, of clearly differentiating between books for children and those for adults, and the creation of a special market for children’s books. Texts specifically aimed at children reflected modern conceptions of childhood and new educational trends among the middle class (Müller 2011; Shavit 1990). James Secord described the development of popular science literature for children in England in the 18th century, and its gradual separation from literature for adults:

Throughout this period, the specific category of “children’s literature” was in the process of being defined, and works written specifically for young people often contain long quotations from those intended for adults […] it is likely that many children had their first exposure to science through simple descriptive works from their parents’ libraries (Secord 1985, p. 130).

In research on English children’s books in which animals were represented, Ritvo claimed that at the beginning of the 19th century, the distinction between books for children and for adults was still unclear (Ritvo 1985, p. 74). McDowell examined how the theory of evolution was presented in books published in the United States at the turn of the 19th century, and noted that authors tended to direct scientific texts to children and adults simultaneously (McDowell 2016, pp. 139, 148). Many journals published in the UK in the 19th century were intended as “reading material for the family,” and therefore were aimed at children and adults alike (Connors and MacDonald 2011, pp. 101, 104). This was also true of magazines for children and teenagers published during the 19th century in the USA (Kilcup 2021, pp. 2-4). A series of science texts for children published in the late 19th century in France was designed to teach adults as well, based on the widespread concept that learning and doing experiments together would bring children and their parents closer (Lachapelle 2015, pp. 50-53). Some texts included separate sections addressed to children and adults, indicating ambivalence regarding separating children from adults during this period.

There was also a long process of differentiating between texts for Jewish children and adults. In traditional Jewish communities, there was little Yiddish literature specifically for children, so children read popular Yiddish literature, which appealed to them as well (Shamrock 1979, pp. 172-174). Since children were a primary audience for Yiddish literature in the pre-modern period, many stories were adapted for them, with characteristics of children’s literature such as a simple plot structure, illustrations, and didactic content (Berger 2016, p. 10). Many books published in Yiddish and Hebrew were directed at young people and adults alike (Kogman 2013, p. 203; Shamrock 2016, p. 170; Shavit 1986; Udel 2020, pp. 6-13). These unclear boundaries indicate a lack of differentiation between adults and children as cultural categories in traditional Jewish society. This was particularly evident in formal educational texts for children (Kannerfugel 2003, pp. 56-58; Shavit 1993, pp. 195-196; Weinstein 2005).[[16]](#footnote-16)

Research on translations of Haskalah texts into Hebrew in the 18th century showed the difficulty in differentiating between those intended for children and those for adults and concluded that most were aimed at both, based on a perception among Haskalah authors that the Jewish public as a whole had “childlike” characteristics (Idelson-Shein 2016, pp. 385-386). A clear distinction between children’s and adult literature in the Jewish world only began to emerge at the turn between the 19th and 20th centuries (Ferger-Wagner 2020, pp. 256-257; Fogel 2004, pp. 250, 295-296; Hoge 2007).

Science literature for Jewish children and youth expanded in the last two decades of the 18th century and throughout the 19th century. This literature was mostly written in Hebrew, or as bilingual texts in Hebrew and the national languages. The authors specifically addressed Jewish children and teenagers, who were the main, if not the only, target audience of their book. This shows the emerging role of science in shaping modern Jewish identity among the young generation. As mentioned, Hebrew scientific literature aimed at a general audience was often read by youth. The opposite is also true; some textbooks for children and youth were read by adults, for example, *Reshit Limudim (First Studies*) (Lindau 1788), and *Shevilei Olam (Ways of the World)* (Bloch 1822, 1828), which will be discussed in more depth later. The authors were mostly members of the Haskalah or Chochmat Yisrael (Academic Study of Judaism) movements. These books are part of a broad corpus of Hebrew popular science literature created during this period (Shavit and Reinhertz 2011). They expressed a desire to develop Hebrew as the cultural language of the Jews (Grossman 2000, pp. 116-119; Shavit 1993), and to expand into areas of knowledge shared with non-Jews by enriching young Jews’ scientific and technological knowledge. Not all of these texts aspired to secularize the Jewish world; some rabbis promoted knowledge of the sciences, albeit cautiously. During the 19th century, there was a trend in which national languages replaced Hebrew. This changed the status of scientific literature in Hebrew in traditional study circles, because some rabbis came to believe that the younger generation would want to learn Hebrew so they could read texts about the sciences in which they were so interested (Kogman 2017).

During the period covered in this study, the mother tongue of most Jewish youth was Yiddish. To varying degrees, they also knew Hebrew and state languages such as German, Russian, and Polish, which they learned in the public education system or informally on their own. Multilingualism varied across Central and Eastern Europe, and between urban and rural areas. Hebrew was mainly taught to Jewish boys in the traditional education system and in “reformed cheders” (Fishman 2005, pp. 29-30; Stampfer 2010, pp. 196-206; Zelkin 2008a, pp. 69-74, 147-164). Knowledge of Hebrew was less common among Jewish girls, but their command of the national languages improved as they began attending public schools toward the end of the 19th century (Manekin 2020, pp. 12-30, 305; Parush 2004, pp. 57-70; Stampfer 2010, 185-186; Zipperstein 1988).

Educational texts in Hebrew texts for children and youth emerged in the last third of the 18th century and continued to expand during the 19th century. However, children’s literature in Yiddish began to appear only in the second half of the 19th century, with the establishment of a modern education system in Yiddish. The process of separation between Yiddish literature for children and adults accelerated, and by the turn between the 19th and 20th centuries, a corpus of children’s literature in this language began to take shape. However, it wasn’t until the years between World War I and World War II that children’s literature in Yiddish truly flowered (Bar-El 2008; Cohen 2021; Ofek 1988a, pp. 56, 62; Shamrock 1978, p. 171; Veidlinger 2009, p. 111). Therefore, scientific literature for children and youth published in Hebrew was the main arena in which a scientific ethos was expressed in the Jewish educational world during this time.

The current book will examine popular literature on science and technology for Jewish youth, the specific topics it addressed, the ways it was designed for a young Jewish audience, its social, religious, and ethical messages, and its relationship with contemporary science literature from the non-Jewish world. It highlights the role of intellectuals and educators who worked to spread the sciences among this population, such as Baruch Lindau, Joseph Perl, David ben Jacob Aaron Luria, and Buki-ben-Jogli (Yehuda Leib Katsenelson). The last chapter focuses on one of the main popularizers of the sciences in the 19th century, Chaim Zelig Slonimsky, and how he worked to spread scientific and technological knowledge among young Jews.

At the core of this book is the corpus of Hebrew scientific texts aimed at Jewish children and youth, including anthologies, textbooks, books, and journals. This book’s purpose is to outline the main paths in the development of popular Hebrew science literature for children and youth in Europe in the modern era. It shows how a scientific educational ethos was part of the modernization processes in the Jewish world in Europe. Analysis of these texts and the actions of the agents involved in their dissemination among youth shows how a new educational ideal spread throughout the Jewish-Ashkenazi world during the modern era. In this way, I demonstrate the role of science and technology in modern Jewish identity. Additionally, I show how clear boundaries began to be set between the worlds of children and adults and literature aimed at each.

1. On the “Jewish mind” see Cochran and Harpending 2006; Katz 2002. For more on the development of this myth in the modern era, and the lack of an adequate explanation for the meteoric success of Jewish scientists at the turn of the 19th and 20th centuries, see Kogman 2013b, pp. 2-3. For an extended discussion of this, see Efron 2014, pp. 1-11. [↑](#footnote-ref-1)
2. While in modern times, the link between science and technology is widely accepted, there has been research and debate regarding the nature of their relationship and the extent of their collaborative and mutual contributions. See more on this in Chapter 5. [↑](#footnote-ref-2)
3. Although there were calls to reform Jewish educational teaching methods beginning in the 16th century with the Maharal of Prague, Jewish education in the Ashkenazi community remained fundamentally unchanged (Kleinberger 1962; Toriansky 2010). More significant reforms took place in the Sephardi Jewish education system, such as in Amsterdam. Alongside religious studies, the Sephardi schools also taught Hebrew, the state languages, and general secular subjects (see?? WHAT IS בס ת"ם). The Sephardi educational model influenced Ashkenazi scholars, such as Naphtali Hirz Wessely (Feiner 2011, p. 103; Klausner 1930 vol. 1, pp. 110-111). [↑](#footnote-ref-3)
4. Efron (2021, pp. 8-11) described the complex and varied ways in which Jewish scientists entered and were integrated into the scientific world in the 20th century. [↑](#footnote-ref-4)
5. As mentioned earlier, the extraordinary success of Jewish scientists in the 20th century have not yet been adequately explained, but many researchers see the Jewish Talmudic tradition as one of the factors that led to it. [↑](#footnote-ref-5)
6. See more on Aaron David Bernstein and his books in Shavit and Reinherz 2011, pp. 136-138. [↑](#footnote-ref-6)
7. On this subject, see the memoirs of Chaim Ze'ev Margaliot (1840-1911), a student at the Beit Midrash in Zhitomir, who compared his experiences of studying science with a teacher who understood the relevant teaching materials and methods, in contrast to a teacher who did not (Margaliot 1895, pp. 36-38). for a source on the rabbinic Beit Midrash study halls as a route to modernization and the acquisition of sciences see Ibn Notzetz 22.9.1864. [↑](#footnote-ref-7)
8. Many people affiliated with the Haskalah read secular Hebrew texts aloud in the same way they read sacred texts; see Veidlinger 2009, pp. 70-73. [↑](#footnote-ref-8)
9. According to Eliyahu HaCohen, Weizmann recounted this memory in a speech to an assembly in Kharkiv in October 1902 (Weizmann 1986, pp. 402-405), but I was not able to locate the text of this speech. HaCohen noted that Rabinowitz's books opened a window to science for many residents in this region. Hebrew writer Reuven Brainin (1862-1939) also attested to the importance of Rabinowitz's works in spreading the sciences among Jewish youth at that time (Brainin 1999, p. 30). WHAT IS THE REFERENCE FOR HACOHEN? [↑](#footnote-ref-9)
10. See the analysis of the profile of the founders of the Jewish Culture and Science Association, which was established in the second decade of the 19th century (Livna-Freudenthal 2018, pp. 70-78). [↑](#footnote-ref-10)
11. See the description by Meïr Halevi Letteris (1868, p. 84) of how young Jews were persecuted for reading modern literature in German. He mentioned, for example, a friend who was reprimanded by his father for this. [↑](#footnote-ref-11)
12. Mendel Barslev (1761–1827) was one of the founders of *Hame’asef* and the author of Hebrew textbooks. [↑](#footnote-ref-12)
13. Moshe Mendelssohn (1729-1786), one of the leaders of the German-Jewish Haskalah movement. [↑](#footnote-ref-13)
14. The serialized stories appeared in *Ivri Anochi* from April to June 1890 (issues 14-19). [↑](#footnote-ref-14)
15. Written by Yosef Yehuda Leib ben Yehiel Michal Zusnitz (1837-1910), see Shavit and Reinherz 2011, pp. 84-85. [↑](#footnote-ref-15)
16. See more on the traditional Ashkenazi education system below. Research on childhood in European Jewish society is still in its infancy and further research is needed to clarify its characteristics (Baumgarten 2005; Brenner 2018; Goldin 1998; Zelkin 2008b.) [↑](#footnote-ref-16)