

# Women in Physics in Israel: An Overview<sup>1</sup>

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**Abstract.** This paper presents the data on gender balance in physics in Israel, from the first encounter of young pupils with the subject, mainly at high school, through higher education, to the academic staff at Israeli institutions. The segregation by gender by field of study and, later, by occupation becomes very clear when the data on physics education and academic careers in Israel are analyzed. The percentage starts at about one-third girls who study physics at high school, drops down to about 16% of female students at the first, second, and third university degrees, and then drops further down to about 7% of academic staff. During the last few years, universities in Israel have applied a series of initiatives to promote gender balance, but apart from preliminary evidence, it is still not possible to assess the success of these programs in improving gender balance.

## HIGH SCHOOL STUDENTS

Physics is a science discipline with a persistently poor gender balance and particularly acute underrepresentation of women in academia in many countries. This paper presents the data on gender balance in physics in Israel, from the first encounter of young pupils with the subject, mainly at high school, through higher education, to the academic staff at Israeli institutions.

Choosing to learn physics at school is the first step for higher education in the field and reflects not only the pupils' preferences and merits but also social norms and cultural and gender perceptions of what is a "right" profession for girls and for boys.

In Israel, girls constitute about one-third of physics students in high school. In comparison to other scientific fields (Table 1), girls' representation in physics is similar to that in computer science. On the other hand, girls' representation in mathematics is almost equal to that of boys (47% girls in 2010).

**Table 1.** Percentage of Boys and Girls Studying Mathematics, Physics, or Computer Science at High School (at the highest level, 5 units) [1, p. 29]

	2001		2005		2010		2012	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Mathematics	54	46	52	48	53	47	—	—
Physics	70	30	68	32	65	35	66	34
Computer sciences	69	31	69	31	68	32	—	—

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## RECIPIENTS OF ACADEMIC DEGREES

Women constitute 58% of the overall bachelor's, master's, and doctoral degree recipients in Israel, but there is clear gender segregation in academic education between fields of study, which reflects gendered perceptions of professions.

Examining the percentage of women among the overall first, second, and third degree recipients in universities, we found that women are underrepresented in physics and in other mathematics-intensive fields: mathematics, computer sciences, and electrical engineering (Table 2). Moreover, women are overrepresented in several fields of study in the natural sciences—biology, chemistry, and medicine—as well as in other fields such as education and teacher training, paramedical studies, social sciences (such as psychology), humanities, and architecture.

Women constitute only 16% of the overall first, second, and third academic degree recipients in physics in Israel (18%, 11%, and 17%, respectively).

**Table 2.** Percentage of Women Recipients of Degrees from Universities in Israel, by Selected Subjects and Degree (2015–16) [2, table 3.8]

	Total	First Degree	Second Degree	Third Degree
Physics	16	18	11	17
Mathematics	25	25	25	19
Computer sciences	27	28	26	28
Electrical engineering	14	15	13	9
Chemistry	58	61	58	51
Biology	66	70	61	52
Medicine	53	53	52	NA
Psychology	76	77	71	73
Grand total* (all subjects)	58	58	58	49

\*Diploma not included in the grand total.

## SENIOR ACADEMIC STAFF IN HIGHER EDUCATION INSTITUTIONS

In general, women constitute about half of the academic staff at the entering stage in higher education institutions. Nevertheless, they are underrepresented in senior academic staff, in both universities and academic colleges (Table 3).

As in other countries, the “scissor graph” holds in the Israeli case in all fields. For example, in Mathematics and computer sciences, women representation starts at 29% at the lecturer rank and drops down to 16% at senior lecturer, 12% at associate professor, and only 6% at full professor [1, p. 49].

**Table 3.** Percentage of Women in the Academic Staff, by Degree (2012–13 academic year) [1, p. 40]

	Lecturer	Senior Lecturer	Associate Professor	Professor	Overall Staff
Universities*	49	36	27	16	29
Academic colleges (budgeted)	50	39	21	12	39

\*The Open University is not included.

For academic staff in science, technology, engineering, and mathematics (STEM) fields (Table 4), we found a clear underrepresentation of women; they constitute only 7% of the academic staff in physics. Female representation in physics is low as in other STEM fields (7–14%); the rates are better only in the biological sciences and in medicine (30% and 35%, respectively).

For physics alone, in the faculties in six universities, the overall number of principal investigators is 219. Of these, sixteen are women (7.3%): six full professors (5.5%), three associate professors (5.7%), and seven in tenure-track positions (12.3%).

**Table 4.** Percentage of Women Staff in Higher Education Institutions in Israel by STEM Field and Institution (2012–13 academic year) [1, p. 43: 3]

	<b>All</b>	<b>Hebrew Univ.</b>	<b>Technion</b>	<b>Tel Aviv Univ.</b>	<b>Bar-Ilan Univ.</b>	<b>Haifa Univ.</b>	<b>Ben-Gurion Univ.</b>	<b>Weizmann Institute</b>
Mathematics, statistics, and computer sciences	11	8	7	5	7	21	8	22
Physical sciences (includes chemistry)	13	7	11	8	8	—	15	21
Physics only [3]	7	<b>5</b>	<b>9</b>	<b>11</b>	<b>6</b>	—	<b>9</b>	<b>6</b>
Engineering and architecture	14	10	16	14	21	—	11	—
Biological sciences	30	17	39	23	32	26	22	39
Medicine	35	27	21	47	—	—	39	31

## **CURRENT INITIATIVES TO INCREASE GENDER BALANCE IN PHYSICS IN ACADEME**

During the last few years, Israeli universities have applied a series of initiatives to promote gender balance in academia. Most initiatives are directed to increase female representation in all STEM fields and at all levels (MSc and PhD students and postdoctoral fellows) as well as staff scientists. The main initiatives are the following:

- a. Empowering and encouraging graduate students through special training on work-life balance as well as leadership workshops, mentoring programs by senior scientists, young mother financial support for traveling, and the like.
- b. Encouraging postdoctoral training overseas through meetings of graduate students with returning scientists, information on postdoctoral opportunities, and financial support for traveling and postdoctoral training abroad.
- c. Increasing awareness of gender equality on campus through unconscious bias training and sexual harassment training for all staff members, strengthening the connections and networking among women scientists, and mentorship programs.
- d. Formulating a comprehensive organizational strategy to promote gender balance. Several institutions have recently formulated and implemented an overall organizational program, with measurable goals to increase the gender balance in STEM fields at all levels.

## **CONCLUSIONS**

The segregation by gender by field of study and, later, by occupation becomes very clear when the data on physics education and academic careers in Israel are analyzed. The percentage starts at about one-third girls who study physics at high school, drops down to about 16% of female students at the first, second, and third university degrees, and then drops further down to about 7% of academic staff. During the last few years, universities in Israel have applied a series of initiatives to promote gender balance, but apart from preliminary evidence, it is still not possible to assess the success of these programs in improving gender balance.

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