

Cell Biology in Israel

Background

The bulk of academic life science research in Israel is performed in the life sciences faculties and medical schools of the country's six teaching universities, and at the Weizmann Institute, a research institute that awards graduate degrees. Three of these institutions (the Hebrew University in Jerusalem, the Technion in Haifa, and Weizmann in Rehovot) were founded in the 1920s and 30s during the British mandate. The rest (Tel-Aviv, Haifa, Bar-Ilan, and Ben-Gurion [in Beer-Sheba] universities) came into being following establishment of the state of Israel in 1948. Life science disciplines assumed a prominent status from the very inception of Israeli academic institutions, fostering a rich tradition of academic research in these fields. International recognition of the significance and impact of Israeli research in the life sciences was most recently recognized by a trio of Nobel Prizes in Chemistry. These were awarded in 2004 to the biochemists Aaron Ciechanover and Avram Hershko (Technion) for the discovery of ubiquitin-mediated protein degradation, and in 2009 to the structural biologist Ada Yonath (Weizmann) for describing the structure of the ribosome at atomic-level resolution.

In a country built by immigrants, the organization of Israeli academic institutions was initially modeled on the traditional structure of European institutions. With time, however, considerable modernization of research programs took place, including those at life sciences and medical school facilities. The field of cell biology now occupies a major position among the various life sciences disciplines, evidenced by the presence of dedicated cell biology departments in most institutions and of an active professional society. Representative areas of research in the field include "classical" aspects such as cell adhesion, cytoskeletal dynamics, transcriptional regulation, intracellular trafficking, neurosciences, cancer cell biology, epigenetics, and apoptosis, to name but a few. These have been supplemented in recent years by a variety of topics stemming from work on model genetic organisms (e.g., *Arabidopsis*, *Drosophila*, *Caenorhabditis elegans*, zebrafish, and mice). Current cell biological research

is also characterized by a strong emphasis on systems biology approaches, ranging from physiology of microorganisms to high-throughput, automated screens of mammalian cell cultures.

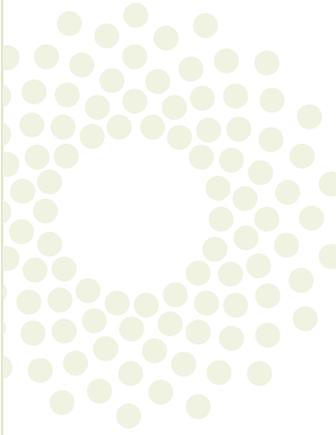
The Realities of Israeli Life Sciences Research

The outlines of a conventional academic career for a cell biologist in Israel can help illuminate both positive aspects and unique challenges that typify research programs within Israeli life sciences labs. Graduate students are commonly in their mid- to late-twenties when beginning their research work, a delay primarily caused by compulsory military service. These students, who constitute the backbone of academic research labs, are therefore relatively mature and focused from the outset of their career. A period of postdoctoral training outside of Israel, most commonly at U.S. and European academic institutions, is a near-obligatory next step for those contemplating a research career in academia. The need to move abroad may entail uprooting a family and therefore constitutes a potential hurdle, particularly for women. On the other hand, this transition is of immense importance to the progress of Israeli life sciences research as a whole, as it ensures exposure of future PIs to cutting-edge science, allows for acquisition and eventual importation of expertise in new arenas of research, and establishes productive links with leading international labs and academic institutions.

The ability to recruit and "repatriate" Israeli life scientists who have completed a successful postdoctoral training period abroad is, undoubtedly, the most critical juncture of the academic research career. The desire to "return home," even in the face of attractive offers from foreign institutions, is pervasive among Israeli life scientists at this point in their careers. However, the supply of available PI-level positions at academic institutions is insufficient to cope with the demand. This situation, common to many scientific disciplines, has resulted in a so-called "brain drain," which is perceived as a problem at the national level.

Once a life science research lab is established, it will face the professional





demands of a tenure-track process similar to the system in the U.S., as well as issues of recruitment and funding common to labs worldwide. Approximately 1,000 PhD and MSc degrees in the life sciences are awarded each year, demonstrating the capacity of Israeli universities to attract and train a steady stream of quality graduate students. However, the above-mentioned preference of graduates to seek postdoctoral training abroad greatly limits the availability of “home-grown” researchers at this level. International postdoctoral fellows, mainly from Asia, provide some relief, but this resource tends to be limited in size. It is likely that the constant political turmoil of the Middle East, with which Israeli science has in general learned to cope successfully, serves as a deterrent for potential applicants in this particular context. This sentiment contrasts sharply with the actual experiences of foreign postdoctoral fellows who do come to Israel, and—as a rule—enjoy their stay. For example, Jorge Verdin Ramos, a Mexican postdoctoral fellow at the Technion, recently told us in a discussion of these issues that “...life in Israel is very safe, I have never felt any danger. Israel is a stimulating and exciting place to do science and to be a postdoc.”

Major sources of financial support for life science research are the Israel Science Foundation (ISF), the public agency entrusted with distribution of the government investment in basic research; a series of granting agencies that allot funds generated via bi-national agreements; dedicated philanthropic organizations; and internal research institution grants and fellowship programs. Although broad in scope, these sources fund relatively small grants, placing limits on lab size, and on the ability of single labs to “scale-up” research projects and acquire expensive equipment (e.g., sophisticated imaging systems for cell biologists). For example, the ISF funded 150 new individual lab grants last year, averaging approximately \$55,000 (U.S.)/year for three or four years. Additionally, although much more competitive, funding opportunities are available internationally. These have traditionally included the U.S. National Institutes of Health and American disease-oriented foundations. More recently, however, the focus has shifted to Europe, as funding via both the European Union frameworks and the European Research Council has become increasingly available to Israeli researchers.

Future Prospects and Challenges

While Israeli life science research, in which cell biology figures prominently, tends to be appreciated and highly valued internationally, dedicated efforts are clearly required to sustain the current status. This was evident following award of the 2009 Nobel Prize to Yonath, an event that generated considerable public excitement, along with serious debate of what lies ahead. Much of the discussion centers on the means to raise the degree of public expenditures devoted to basic academic research. This would open up more investigator positions, enhance funding of individual labs, and compete with the appeal of the country’s lucrative high-tech industry for young minds.

A second aspect we feel worthy of attention in this context is the capacity to expand the scope and diversity of researchers at all levels. As already mentioned, recruitment of international research personnel faces the difficulties associated with the uncommon, and at times unsettling, political/security situation in the region. Programs aimed at demonstrating the many positive aspects of living and performing research in Israel—some already in place—are essential for spreading the word to help remedy this situation.

In parallel, more can be done to enhance the appeal of academic research careers among sectors of the Israeli population, such as the Arab Israeli and Jewish Orthodox communities. The ongoing, successful incorporation of immigrant life science academics, and in particular those hailing from the former U.S.S.R, following the large waves of immigration in the 1980s and 90s, is instructive. This experience demonstrates both the advantages of expanding the pool of researchers, and the capacity of Israeli institutions to perform such tasks.

Despite the many complexities, Israeli life sciences research is vibrant and thriving. It offers a variety of opportunities for both Israeli and foreign researchers at all stages of their academic careers. The following Internet resources are appropriate starting points for readers wishing to pursue in greater depth issues related to academic research in Israel:

- Israel Academy of Sciences and Humanities: www.academy.ac.il
- Israel Science Foundation: www.isf.org.il
- Mobility Portal Israel: eracareers.most.gov.il ■
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