



EVALUATION OF LIFE SCIENCES STUDIES **GENERAL REPORT**

COMMITTEE FOR THE EVALUATION OF LIFE SCIENCE STUDIES IN
ISRAEL

October 2023

Section 1: Background and Procedures

- 1.1** In the academic year 2022, the Council for Higher Education [CHE] put in place arrangements for the evaluation of study programs in the field of Life Sciences and Biology in Israel.
- 1.2** The Higher Education Institutions [HEIs] participating in the evaluation process were:
- Achva Academic College
 - Ariel University
 - Bar Ilan University
 - The Hebrew University
 - The University of Haifa
 - Technion
 - Tel Aviv University
 - Weizmann Institute
- 1.3** To undertake the evaluation, the Vice Chair of the CHE appointed a Committee consisting of¹:
- **Prof. Lynne Regan** – Institute of Quantitative Biology, Biochemistry and Biotechnology, Edinburgh University, UK. *Committee chair.*
 - **Prof. Joseph Buxbaum** – Department of Psychiatry, Icahn School of Medicine at Mount Sinai, USA.
 - **Prof. Edna Cukierman** – Cancer Signaling & Microenvironment Program, Fox Chase Cancer Center / Temple Health, USA.
 - **Prof. Orna Elroy-Stein** – Shmunis School of Biomedicine and Cancer Research, Tel Aviv University, Israel.
 - **Prof. Mark Hauber** – School of Integrative Biology, The University of Illinois at Urbana-Champaign, USA.
 - **Prof. Bruno Lemaitre** – School of Life Science, École polytechnique fédérale de Lausanne (EPFL), Switzerland.
 - **Prof. Carol Shoshkes Reiss** – Department of Biology, New York University, USA.
 - **Prof. Shai Shaham** – Developmental Genetics, Rockefeller University, USA.
 - **Prof. Vincent Tropepe** – Department of Cell and Systems Biology, University of Toronto, Canada.

Anat Haina served as the Coordinator of the Committee on behalf of the CHE.

- 1.4** The evaluation process was conducted in accordance with the CHE's Guidelines for Self-Evaluation (January 2022). Within this framework the evaluation committee was required to:
- examine the self-evaluation reports submitted by the institutions that provide study programs in Life Sciences and Biology;
 - conduct on-site visits at those institutions participating in the evaluation process;

¹ The committee's letter of appointment is attached as **Appendix 1**.

- submit to the CHE an individual report on each of the academic units and study programs participating in the evaluation;
 - set out the committee's findings and recommendations for each study program;
 - submit to the CHE a general report regarding the evaluated field of study within the Israeli system of higher education including recommendations for standards in the evaluated field of study;
- 1.5** The evaluation committee examined only the evidence provided by each participating institution — considering this alongside the distinctive mission set out by each institution in terms of its own aims and objectives. This material was further elaborated and explained in discussions with senior management, lecturers, students, and alumni during the course of each one-day visit to each of the institutions.
- 1.6** In undertaking this work, the committee considered matters of quality assurance and quality enhancement — applying its collective knowledge of developments and good practices in the delivery of higher education in Life Sciences and Biology (mainly from European countries and North-American countries) to the evaluation of such provision in Israel.

Section 2: Executive Summary

The Evaluation Committee visited eight different institutions with noted differences between them. Many of the recommendations, therefore, are institution-specific (as detailed in each individual Institution report).

There were some common themes which emerged, and several that can more appropriately be addressed at the national level. Thus, this general report discusses some general issues that arose as a result of our evaluations of the eight Life Sciences institutions listed above.

The key topics are listed here, and each is elaborated on below

- 1) Undergraduate Education: Nature of instruction (difficulties to fully implement active learning methodologies); High drop-out rate from undergraduate degrees; financial support; Career advice
- 2) Graduate Education: Language of instruction in graduate programs; funding for TAs and equitable healthcare coverage for all nationalities; extended PhD research, if required, supplement in CHE-approved institutional support, not individual PI resources; Career advice.
- 3) Research Support: National e-journal subscriptions; better management of national (expensive, high-tech equipment) resources; national negotiation of service contracts; national recognition of staff scientists; increased support for lab managers

Section 3: General Observations

The Committee conducted site visits to eight higher education institutions involved in Life Science teaching and research in January and June 2023. The Committee was very well received by all programs and institutions, and discussions with students, professors, senior academic administrators, and others, highlighted the strengths and weaknesses of each institution and the relevant programs, along with a strong desire for improvement expressed by all.

Many Israeli higher education institutions in the Life Science field have implemented best practices to enhance teaching and research, such as establishing doctoral schools, providing wet-lab training for all students; implementing mentoring systems; standardizing tenure and promotion; and increasing the use of English in courses. As a result, several Israeli Institutions have gained reputations comparable to the best institutions worldwide. The recruitment of highly talented young faculty members, from renowned universities, further demonstrates the attractiveness of Israeli higher education.

The Committee was impressed by the dedication of faculty members and all relevant staff to teaching, and by their high productivity in research, despite often facing financial challenges. The students and postdocs displayed enthusiasm and motivation, recognizing the value of the training they receive in general, and particularly in the Life Science Programs. The Committee acknowledges the crucial role that higher education institutions play in the economic and intellectual growth of Israel. The Committee is of the opinion that strengthening financial commitments to universities is a wise investment that will pay off quickly.

The Committee was well-positioned to comment on the overall Council of Higher Education's review process as it applies to the Life Sciences. Our comments are based on the self-evaluation reports and the feedback we received during our on-site visits. We hope that institutions will find our reports useful. Some of our recommendations suggest the adoption of practices that are routinely applied in North American and European higher education institutions. We believe that there is no need to 'reinvent the wheel' and urge the adoption of best practices that have been shown to work well elsewhere. Considering the tight budget issues of most institutions we visited, we hope that these recommendations can be applied without creating an excessive bureaucratic burden or consuming the precious time of already committed faculty. Faculty time should be protected, in order for research and teaching to continue to flourish in Israel.

Thus, we hope that we have been successful at this evaluation task which can never be perfect. The recommendations we have made have all been drafted with care and made with the best possible intentions to improve higher education in Israel.

3.1 Undergraduate programs

The Committee learned that all the evaluated Israeli institutions are interested in being at the forefront of modern teaching. To achieve this challenge, they invest time and effort in establishing special units to support the training and implementation of state-of-the-art techno-pedagogical tools. However, as of today, most exams are conducted in a multiple-choice questions format, which tests lower-order cognitive skills. Many of the institutions indicated that the default exam format was multiple-choice questions, because there were too few teaching assistants (TAs) available to grade the exams. Sufficient academic support for courses, essay examinations and recitation sessions would enhance the learning

experience of the students. In most cases, there are not enough oral and writing assignments, which are of major importance because the language skills in English and Hebrew of many students are poor. Class attendance has been decreasing steadily due to the availability of the class recordings, and the Committee is concerned the students are not used to reading material.

It is clear that all institutions recognize the necessity to encourage self-learning skills by moving gradually to modern teaching, which facilitates active learning. It should be recognized that full implementation of active learning methodologies relies on small classes, frequent quizzes, exercises and written assignments, and checking of open-questions exams. To meet this challenge, a significant number of teaching assistants (TAs) is required. Unfortunately, the number of TA positions is very limited in Life Science Faculties nationwide. It is assumed that this situation stems from the fact that TA positions are traditionally assigned to math, physics, and chemistry courses (so called "exact" sciences" courses), while the biology-based courses are hardly assigned any, or very small numbers of TAs. It should be recognized that many Biology disciplines have gradually changed from phenomenological and descriptive to hi-tech based exact science and include sophisticated information which require exercises for theoretical and technical understanding. Ignoring the modern reality of the Life Sciences, and the needed support for advanced teaching and research, limits higher education in Life Sciences in the state of Israel. Means should be found to provide universities/institutions several TA positions per course to support active learning of Biochemistry, Molecular Biology, Cell biology, Physiology, among other courses, in addition to the TAs allocated to lab courses in these fields. Furthermore, the criteria and compensation for acting as TA should be transparent and consistent within the institutions.

Every institution the Committee visited reported a significantly higher dropout rate for Israeli-Arab, and possibly students from other minority groups (e.g., Haredi) than for other groups. This is clearly a national issue. A national resource of best practices (evidence-based) should be established, with CHE funding. Institutions should be provided additional CHE funding to implement these practices; data should be collected about all minority groups so that it is possible to identify and address any negative trends.

3.2 Graduate programs

The Committee agrees with the CHE 2011 Evaluation Committee, which reported on the continuous need for reasonable financial support for graduate students. The present Committee heard that in most institutions, the budgetary support for graduate students is not adjusted to the cost of living in Israel. It does not allow them to finance even a very modest life and spend most of their time in studies. While some students struggle and continue, others drop out. Disparities in support, even within the same institution, should be addressed, to allow all students to maximize the time they spend in their studies.

PhD program regulations, including mentorship, thesis committee structure, milestone timing, length, and thesis defense regulations, differ between institutions, and even between different Life Science programs at the same institution. We also learned that despite the formal 4-years duration to complete a PhD thesis, the actual duration in most institutions ranges between 4.5-5.5 years, generating a budgetary burden on the mentors. We encourage the adoption of realistic and updated program regulations across all institutions and Life

Science relevant disciplines. The most comprehensive (and well-received by students) programs we heard about featured activities that were not present in all programs. These activities include regular meetings or workshops, alumni visits, alternative career fairs, etc., and are typically used in many US and European programs. Adoption of such practices would be worthwhile. Clear and consistent criteria for graduate training and degree completion will promote fairness and transparency throughout the country.

The Committee learned that many graduate courses in most institutions are taught in English, the *de facto* international language of science. English should be the standard language of Life Science instruction at the graduate level. Hebrew remains critical for students in Israel, and additional resources should be provided at no cost to students to support non-native speakers of both languages. By ensuring a consistent language of instruction, and providing English courses gradually during the undergraduate program, universities can maximize learning experiences and attract international students.

We learned that not all students are provided with comprehensive information, skill-training opportunities, role models, and clear paths to academic and non-academic careers. Discipline-specific job fairs and employment support for various sectors can empower students to make informed decisions and maximize career opportunities. Most institutions do not use program-specific alumni engagement to offer valuable guidance and networking opportunities for their students. The Committee considers involving program alumni who have gone on to a variety of careers as one of the most effective (and inexpensive) methods to provide career advice. The Committee also noted that students are not often exposed to information about fellowships for postdoctoral training; the types of awards, their deadlines, and links to the applications should be available to the students through the Directors of the PhD programs in each school/institute.

3.3 Disparities

The Committee was made aware of specific social determinants that hinder the pursuit of excellence in all Life Science programs. These obstacles, such as income status, geographic location, prior education quality, culture and religion, home life, mental and physical disorders, disabilities, and more, were found to be recurrent and not adequately addressed. For example, disparities were observed between students from mainstream Jewish schools and those from Arab and/or Haredi neighborhoods in terms of resources, training, opportunities, and language proficiency.

To address the disparities arising from social determinants, the committee recommends that CHE encourage Higher Education institutions to systematically identify and collect data on recurring issues affecting Life Science students and then join forces to establish national standards applicable to all Life Science programs (and potentially all higher education programs). The Committee recommends that a national effort should be invested to develop a PRE-High-Education Toolbox and an accompanying assessment test to recognize the candidates who need it. It is recommended to provide the supplemental Toolbox in a national context with governmental support as summer or pre-higher education year-long programs before they start their formal undergrad studies to enhance equity in the Israeli society.

The Pre-High-Education Toolbox should cover the following topics, as separate units which could also be offered to students who take the current preparatory courses:

- a. Language proficiency: Implement national standards for assessing and improving language proficiency in both Hebrew and English across all programs. Importantly, these need to be specifically tailored to the unique demands of the Life Science field. For example, the focus should be on Life Science-relevant functional language proficiency. These standards should apply to both domestic (English and Hebrew for undergraduate programs) and international students (English for graduate students).
- b. Time management and learning training: Students should be taught how to apply modern learning methods and how to manage their time efficiently.
- c. Organizational training: Require all students in Life Science programs to take a course with modules focusing on organizational skills and providing information on available resources, support services, and mechanisms to address discrimination, harassment, bullying, and other inequities. Similar training should be provided to all other personnel in higher education institutions.

The Committee heard that international students do not have the same health coverage options as Israeli students. The Committee was surprised to hear about cases of acute health emergencies whose costs were covered by the mentor. Moreover, the international students we met informed us about their inability to serve as TAs, due to restrictions stemming from their Visa status. The Committee suggests that trainees, including international students, should have access to visas that allow them to be paid when assigned TA positions. In addition, measures should be taken to provide an adequate solution at the Institution or national level for payment of acute serious health problems.

3.4 Academic Faculty and Human Resources

The expectation for postdoctoral research to be conducted abroad as a requirement for obtaining a faculty position in Israel should be re-evaluated. While career mobility is important, exceptional scientists with mobility constraints should not be penalized. The Committee urges the CHE and higher education institutions to work together with the goal of countering the perception that foreign-trained individuals are superior to those trained in Israel. The committee recognizes that in the early years of the nation, it was desirable for scientists to do postdoctoral work abroad so they could bring back new technological expertise to Israel. The Committee estimates this point still applies in some circumstances. But now there are several highly ranked and well-established institutions and laboratories in Israel. And surely, they are able to provide high quality postdoctoral training, comparable to that acquired abroad. The Committee brings attention to this point, because it was repeatedly pointed out that uprooting spouses and children was particularly difficult for women. Thus, the requirement contributes to the small number of women and minorities who are faculty members at Israeli Institutions.

Faculty diversity should reflect the diversity of students and the Israeli population being served by the educational institutions, in terms of gender, ethnicity, and other factors. To minimize biases, recruitment committees with diverse membership should be established, and diversity criteria should be considered in hiring decisions of new faculty members. In addition, mentoring programs should be tailored to encourage BSc and graduate students of underrepresented minorities to excel and pursue academic careers.

3.5 Research

The role of lab technicians (also called 'lab managers') is essential for experimental research in all universities, since the faculty members are required to spend a large fraction of their time doing activities other than research. An efficient state-of-the-art research program can be guaranteed only if a lab manager oversees the lab's daily requirements and teaches the graduate students and postdocs the techniques used in each lab, some of which are very demanding and require a high level of expertise. A lab manager not only provides the know-how and troubleshooting insights, they are essential for the continuity of the gradual build-up of the wisdom which passes on, across generations. The Committee was told that previously such positions existed in Israeli universities (100% institutional FTE per research lab) but have since been gradually abolished. The deterioration has reached the level that today most research labs do not have a stable lab manager position. Some PIs have institutional 50% FTE and cover the rest of the salary from their own soft money resources; some get 0% FTE with or without some institutional soft money to cover 30-50% of the salary while the rest is covered by the PI's soft money resources. We learned that the 50% FTE of base funding viewed as a critical support to PI labs, is precarious because of the need to find the additional 50% of the funding from grants. This allocation often prevents staff continuity (especially when current grants are small or dry up, which is when these positions are most needed). The level of compensation for lab managers should reflect the professional nature of these positions, the qualifications of the individual, and the longevity in that role; this should be set bearing in mind "market forces" that attract the best and brightest to industrial positions.

Funding support for infrastructure renewal for Life Science Faculties in Israel on a more predictable frequency, is recognized as an ongoing challenge in all institutions in times of rapid technological developments. There is really no need for every university to showcase modest next generation sequencing (NGS) or other OMICS platforms and invest in staffing and maintaining them. The Committee strongly advocates for the Israeli government to invest in specific types of OMICS equipment which can be used nationally (e.g., national core facilities), such as for DNA/RNA sequencing, Mass spectroscopy, metabolomics in the initial stage, and later on any other analysis technologies that require transport of samples to a common shared facility. Such a national OMICS-facility should be staffed with highly motivated, educated, and experienced professionals employed directly by the government. They should be offered prestigious positions and competitive salaries. Moreover, this National Unit should be administered by administrative staff using governmental resources to cover annual maintenance contracts, workshops, and online lectures and updates.

For other (non-OMICS) facilities and services, the emerging network of Israeli core facilities (IRCF²), and The Nancy and Stephen Grand Israel National Center for Personalized Medicine (G-INCPM) at WIS may be an appropriate route. However, The G-INCPM, which is administered by professional staff scientists, is mostly used by WIS users (only one-third are external users). The IRCF model for coordinating the institutional core facilities across the entire country, should go beyond a website repository of information, which seems to be its current status. It should be championed by the senior administration to be an operationally integrated initiative for sharing expertise, reducing the costs and redundancies for well-

² www.israel-cores.org

established platforms, and enhancing research productivity within a highly research-active but geographically small country.

Universities may still choose to develop special expertise in boutique methodology that then can be shared with other members of the network. Infrastructure such as an imaging facility or a flow-cytometry Unit, for example (which requires in-house work by Faculty and graduate students), requires professional staff scientists to operate, troubleshoot technical issues, and train users. **Staff scientist positions** should be recognized as very important for modern experimental biology. As mentioned above, the Committee learned that previously such positions existed in Israeli universities, but have since been abolished. The Committee was surprised by this information, because in North America and in Europe the importance of such positions is being increasingly recognized as opposed to eliminated. With the purchase of high-tech new equipment in other countries, it is becoming a requirement to specify a funded position for the scientist who will be in charge of the equipment, and thus provide research support and training to users. The Committee emphasizes the importance of such stable, appropriately funded positions. Such continuity will allow researchers to make the best use of high-tech instrumentation, and thus enable them to generate high quality data for internationally competitive science.

The Committee is surprised by the lack of universal access to leading electronic journals in Israeli life sciences institutions. The Committee proposes that all institutions have access to a wide range of e-journals, databases, and licenses for commonly used commercial software. Because Israel is a small country, the Committee is of the opinion that these are things that should be negotiated (and funded) at the national level. A shared government-paid national access to e-journals, software and databases will enhance research efficiency while lowering expenses, across Israel. The CHE must determine how to make this proposal work in practice.

Section 4: Recommendations

4.1 Recommendations and Comments for CHE

Essential

1. Establish a National OMICs facility (*within 2 years*). Within the first stage, the facility should include a DNA/RNA sequencing unit, Mass spectroscopy unit, and Metabolomics unit. Long-term planning should consider future inclusion of a national Electron Microscopy services unit. The facility should be a free-standing facility run under national administration and employ highly experienced professionals who will provide ongoing services to all high-education institutions.

2. Further develop of the emerging network of Israeli core facilities (IRCF) with an allocation of funding for coordinating the institutional core facilities, across the entire country, beyond a website repository of information. (*within 1 year*)

3. Coordinate and allocate sufficient funds to Establish a National network of online resources (e-journals, databases, and widely used software. (*within 1 year*)

Important

1. Allocate funds and encourage Institutions to develop a PRE-High-Education Toolbox that will include language proficiency (Hebrew and English), time-management skills, and organizational training, to decrease disparities in access and enhance high education success in a national context. Students should not be expected to pay for the essential preparative courses.

General comments

1. Shorten the SER and remove its redundancies, for example 'executive summary' and 'conclusions' are repetitive.
2. Highlight key numbers in the reports (Total number of students at the institution, in the faculty, faculty number, % of females, diversity...) for a clear understanding of the institutional context.
3. Include a schema of the institution organization and teaching tracts.
4. Add an introduction that summarizes the history and context of the institutions. For both, specify word limits.

4.2 Recommendations for Institutions

Essential

- 1. Increase TA positions** to support modern teaching of modern biology courses; specific metrics should be developed that include the ratio of TAs to number of students enrolled to each course, the number of contact hours for recitations of assessing long-form exams or laboratory supervision **(within 1 year)**
- 2. Increase financial support (fellowships) to graduate students** by adjusting it as much as possible to the high living cost in Israel. All enrolled graduate students must be assured of the annual support during their studies. **(within 2 years)**
- 3. Reinforce research by adding lab technician (also called 'lab-manager') position for each research laboratory. (within 1 year)**
- 4. Language of instruction within graduate programs should be in English (Within 2 years)**
5. Systematically identify recurring gaps affecting Life Science students due to disparities. Then establish national standards by developing a PRE-High-Education Tool Box (using VATAT-mediated funds) to facilitate language proficiency (Hebrew and English), time-management skills, and organizational training. **(within 2 years)**
- 6. Promote diversity in hiring and promotion processes (Within 3 years)**

Important

- 1. Recognize Staff scientist** as a very important profession for modern experimental biology and provide staff scientist **positions**.
- 2. Take measures to lower the high BSc dropout rate of Arab students.**
- 3. Increase the official funded length of PhD studies from 4 to 5 years and up to 6 years for direct PhD track; increase the time supported for MSc students from 2 to 3 years when the research requires (as determined by the faculty advisory committee).**
- 4. Define and communicate to students the required milestones for completing the graduate program.**
- 6. Consider outstanding Israeli-trained postdocs for new faculty positions.**

Desirable

- 1. Prepare students for diverse post-degree careers.**
- 2. Take measures to provide an adequate payment solution to cover acute serious health problems to international students who don't have sufficient health insurance coverage.**

Signed by:

Prof. Lynne Regan

Committee Chair



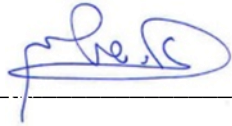
Prof. Joseph Buxbaum



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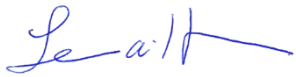
Prof. Orna Elroy-Stein



Prof. Mark Hauber



Prof. Bruno Lemaitre



Prof. Carol Shoshkes Reiss



Prof. Shai Shaham



Prof. Vincent Tropepe



Appendix I: Letter of Appointment



October 3, 2022

Prof. Lynne Regan,
Institute of Quantitative Biology, Biochemistry and Biotechnology,
Edinburgh University
UK

Dear Professor,

The Israeli Council for Higher Education (CHE) strives to ensure the continuing excellence and quality of Israeli higher education through a systematic evaluation process. By engaging upon this mission, the CHE seeks: to enhance and ensure the quality of academic studies, to provide the public with information regarding the quality of study programs in institutions of higher education throughout Israel, and to ensure the continued integration of the Israeli system of higher education in the international academic arena.

As part of this important endeavor, we reach out to world renowned academicians to help us meet the challenges that confront the Israeli higher education by accepting our invitation to participate in our international evaluation committees. This process establishes a structure for an ongoing consultative process around the globe on common academic dilemmas and prospects.

I therefore deeply appreciate your willingness to join us in this crucial enterprise.

It is with great pleasure that I hereby appoint you to serve as chair of the Council for Higher Education's Committee for the Evaluation of **Life Science and Biology** departments. Other members of the Committee will include: Prof. Joseph Buxbaum, Prof. Edna Cukierman, Prof. Orna Elroy-Stein, Prof. Mark Hauber, Prof. Bruno Lemaitre, Prof. Carol Shoshkes Reiss, Prof. Shai Shaham, and Prof. Vincent Tropepe.

Ms. Anat Haina will be the coordinator of the Committee.

I wish you much success in your role as a member of this most important committee.

Sincerely,

Prof. Edit Tshuva
Vice Chair,
The Council for Higher Education (CHE)

Enclosures: Appendix to the Appointment Letter of Evaluation Committees

cc: Dr. Varda Ben-Shaul, Deputy Director-General for QA, CHE
Dr. Liran Gordon, Senior Advisor for Evaluation and Quality Enhancement
Ms. Anat Haina, Committee Coordinator