



Committee for the Evaluation of Chemistry Study Programs

Ariel University Center of Samaria

The Faculty of Natural Sciences

Department of Biological Chemistry

Evaluation Report

March 2012

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Chapter 1- Background

At its meeting on July 14, 2009, the Council for Higher Education (CHE) decided to evaluate the study programs in the field of Chemistry in higher education in Israel.

The initial steps by CHE included the formulation of a self-evaluation study for each participating institution and the appointment of an evaluation committee consisting of:

- Professor Richard Eisenberg, Department of Chemistry, University of Rochester, Rochester, NY
- Professor Allen J. Bard, Department of Chemistry, University of Texas, Austin, TX
- Professor Tobin J. Marks, Department of Chemistry, Northwestern University, Evanston, IL
- Professor William L. Jorgensen, Department of Chemistry, Yale University, New Haven, CT
- Professor Joan S. Valentine, Department of Chemistry, University of California - Los Angeles, Los Angeles, CA
- Professor David Milstein, Weizmann Institute of Science, Rehovoth

Each of the committee members is a research active chemistry faculty member with broad disciplinary experience. Each non-Israeli member is a member of the U.S. National Academy of Sciences and is fully involved in all aspects of chemistry programs at the graduate and undergraduate levels.

The committee was assisted in its efforts by Ms. Alisa Elon, Coordinator of the committee on behalf of the Council for Higher Education.

Within the framework of its activity, the Committee was requested to submit the following documents to CHE:

1. A final report on each of the evaluated departments,
2. A general report on the state of the discipline in the Israeli higher education system, including recommendations to the CHE for standards and potential state-wide changes in the evaluated field of study.

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

The process was conducted in accordance with the CHE's Guidelines for Self-Evaluation (of October 2009).

Chapter 2- Committee Procedures

The Committee held its first meetings on June 12, 2011 during which it discussed fundamental issues concerning higher education in Israel, the quality assessment activity, as well as Chemistry study programs.

In June 2011, the Committee held its first round of visits and went to Ben-Gurion University of the Negev, Bar-Ilan University, and the Weizmann Institute of Science. The second round of visits was carried out in December 2011 with site visits to the Hebrew University, the Open University, the Ariel University Center of Samaria, the Technion Israel Institute of Technology, and Tel Aviv University.

This report deals with the evaluation of chemistry studies at the Department of Biological Chemistry at the Ariel University Center of Samaria.

In preparation of this report, the committee visited the AUC campus and met with faculty, students, adjunct instructors (who are the M.Sc. and Ph.D. students conducting research at AUC) and AUC administrative leaders. The committee visited the instructional facilities and the laboratories for both teaching and research. The analysis given below reflects the results of those meetings coupled with the information provided by University Center of Samaria in its self-evaluation study.

The Committee's visit to the University Center of Samaria took place on December 15, 2011. The Committee thanks the management of the Ariel University Center of Samaria and the Department of Biological Sciences for their self-evaluation report and for their hospitality towards the Committee during its visit at the institution.

The schedule of the visit is attached as **Appendix 2**.

Chapter 3-Executive Summary

The chemistry faculty is relatively small at AUC with 8 full-time faculty members. A search for a new faculty member is currently in progress. In addition to the undergraduate students enrolled in Biological Chemistry, there are M.Sc. and Ph.D. students who carry out research under the joint supervision of one AUC faculty member and a second faculty member at one of Israel's Ph.D. granting universities. AUC does not offer graduate degrees in Biological Chemistry or Chemistry. The M.Sc. and Ph.D. graduate students play an important role in the instruction of undergraduates and in stimulating their long-term interests in the discipline.

Specific Committee recommendations:

- Course offerings in chemistry at the undergraduate level should be increased to broaden student exposure beyond biological chemistry.
- Students should be exposed to industrial chemistry and to I.P. concepts.
- Fellowships should be made available to talented undergraduates to encourage research projects during the summer in research laboratories.
- Career counseling for undergraduate students is recommended.
- Excellence of self-learning laboratory experiences analogous to the medicinal chemistry laboratory course should be implemented in other areas of chemistry.
- Maintain teaching staff level commensurate with expansion as needed with growth in the program.
- Additional space allocated for research is needed. This is discussed further in the report.
- The need for a new building for research laboratories should be developed further as discussed in the report.

Chapter 4- Evaluation of Chemistry Studies at the Department of Biological Sciences at the Ariel University Center of Samaria

- *This Report relates to the situation current at the time of the visit to the institution, and does not take account of any subsequent changes. The Report records the conclusions reached by the Evaluation Committee based on the documentation provided by the institution, information gained through interviews, discussion and observation as well as other information available to the Committee.*

Background

The Ariel University Center of Samaria (AUC) is a college that was certified to award Bachelor's degrees in Biological Chemistry in 2003. AUC has four Faculties including the faculty of Natural Sciences under which the chemistry faculty members are grouped. While AUC has approximately 8800 students in degree programs at its campus on the outskirts of Ariel, those under the Faculty of Natural Sciences are among the smallest with total student enrollments in Biological Chemistry and Molecular Biology of 43 and 83, respectively. The Biological Chemistry and Molecular Biology programs offer enrolled students the same courses during the first three semesters of study.

Undergraduate Program

The original goal of the B.Sc. degree in Biological Chemistry was to train chemists who have a broad knowledge in some of the most important aspects of modern biology and are able to work on multidisciplinary biochemical research projects. In academic year 2009-2010, there were 43 undergraduate students in the Biological Chemistry program, spread approximately equally over the three years of the program. In addition, the department offers chemistry service courses to large numbers of students in other programs.

The teaching program in AUC biological chemistry is different from the other well-established chemistry departments in Israel in that it combines a wide range of chemistry courses with relevant biology topics and basic studies in physics and mathematics. Students from both the Biological Chemistry Department and Molecular Biology Department participate in the same classes during the first three semesters. Chemistry as a main study track begins only in the fourth semester. The curriculum is spread over 6 semesters and lasts 3 academic years. During the study program, students are required to accumulate 138.5 credit units that include 18.5 laboratory units and 12 units of Jewish Heritage studies.

During the first two years of study, the Biological Chemistry program includes courses in general, organic, inorganic, physical, and analytical chemistry; advanced spectral and instrumental methods; cell and molecular biology; biochemistry; microbiology; and genetics, in addition to basic courses in mathematics, physics, and Jewish heritage studies as well as a course in advanced mathematics. The third year of study includes advanced courses in inorganic and organic chemistry, bioelectrochemistry, molecular spectroscopy, industrial processes in inorganic chemistry, bioorganic chemistry, quantum chemistry, and synthesis of pharmaceutical compounds. While the Biological Chemistry Department

does not offer a final project in the coursework, it offers a popular semester-long pharmaceutical synthesis laboratory course (Med. Chem. Lab - approximately one day per week), where each student undertakes a multi-step synthesis and full characterization of an assigned drug molecule.

It is the opinion of the committee that the Department of Biological Chemistry at AUC offers a rigorous, high quality chemistry program with an emphasis on biological chemistry. The classes are small, and there is considerable informal as well as formal interaction between the students and the faculty. The students are engaged and enthusiastic about their studies and inspired to continue them in the future. A few undergraduate students are involved in undergraduate research projects, and the drug synthesis project in the required laboratory in medicinal chemistry gives each of the students a taste of what research is really like.

Since Biological Chemistry is the only chemistry degree program offered by AUC, the committee believes that it is important for the program in the future to offer additional elective courses in non-biological chemical subjects in order to ensure that students who choose to pursue an advanced degree or a career in chemistry unrelated to biology are not limited in their options.

The Committee also recommends further that scholarships be made available for talented undergraduates to carry out research projects in the laboratories of faculty members in the first or second year, with the hope that this activity will continue during their final year of undergraduate study. A capstone event such as a departmental undergraduate research poster session or an undergraduate honors thesis should be considered. In the same vein, programs are needed (not necessarily courses) that expose undergraduates (and graduate students) to career options in chemistry and allied fields such as exposure to industrial chemistry and chemists, and to I.P. concepts.

Recommendations

- **Course offerings in chemistry at the undergraduate level should be increased to broaden student exposure beyond biological chemistry.**
- **Students should be exposed to industrial chemistry and to I.P. concepts.**
- **Fellowships should be made available to advanced undergraduates to encourage research projects in the groups of faculty members.**
- **Career counseling for undergraduate students is recommended.**
- **Excellence of self-learning laboratory experiences analogous to the medicinal chemistry laboratory course should be implemented in other areas of chemistry.**

Graduate Student Activities

After receiving their B.Sc. degree, a significant number of Ariel Chemistry students choose to continue research and education activities at Ariel by enrolling in a Chemistry graduate program at a collaborating Israeli university. Under this arrangement, they conduct thesis research at Ariel under the joint guidance of an Ariel faculty thesis mentor and a co-advisor at the collaborating university. All coursework leading to the advanced degree is taken at the collaborating institution, and the advanced degree is granted by the collaborating institution. At present, seven M.Sc. and seven Ph.D. students are engaged in this research at Ariel. This arrangement is clearly popular and provides the students with a high-quality research experience. Moreover, it provides both teaching manpower and additional mentoring personnel for undergraduate researchers at Ariel. Nevertheless, it is difficult to see how this graduate education arrangement can grow further due to the

current limitations in laboratory space, research instrumentation, resources and faculty size at Ariel.

Faculty

The Department of Biological Chemistry is one of the five departments in the Faculty of Natural Sciences with a B. Sc. program. There are 8 senior Academic faculty members engaged in teaching and research (4 professors, 3 senior lecturers and 1 lecturer. Senior faculty from the molecular biology, mathematics, and physics departments also teach in the undergraduate programs. In addition Senior Adjunct Teaching Staff (Adjunct Lecturers) who hold doctorate degrees and Junior Adjunct Teaching Staff from graduate programs participate in the teaching of the laboratory and lecture courses. Although two of the senior Academic Faculty currently are President and Rector, the current size of the chemistry faculty appears adequate to handle the approximately 50 students enrolled in the Biological Chemistry program (with service courses in other departments), depending on the assigned teaching loads, but would need to be increased if the proposed expansion of the program occurs. The current faculty covers synthetic organic, inorganic and bioinorganic, radiation, and theoretical chemistry and electrochemistry. Future hires in complementary areas, such as analytical, polymer and solid state chemistry, should be considered.

The startup packages for new faculty are modest but appear to be sufficient for current expenses involved in their research programs. However, these amounts are insufficient for any major equipment purchases.

Recommendations:

- **Maintain teaching staff level with expansion as needed with growth in the program.**

Research

The senior faculty members are expected to conduct research, and it is an element of the promotion criteria. The research is typically performed with assistance from technicians, Ariel undergraduates, and graduate students. The graduate students are formally enrolled in external graduate programs and fulfill course requirements at those institutions. There have recently been 14-15 M.Sc. and Ph.D. candidates conducting research at Ariel. The list of equipment available for research is substantial including a 300 MHz NMR, GC-MS, FTIR, SEM, and X-ray diffraction instruments.

Considering the size of the program, the research productivity has been good. Roughly ten publications in chemical and biochemical journals are being produced by the group each year. The faculty members have also been admirably active and successful in seeking research support through grants, especially from the Israeli Ministry of Industry Framework. Such research activities certainly enhance the academic environment at Ariel at all levels. However, the allocated space is limited and beyond full capacity. Thus, if the research activities are to expand, new laboratory facilities are needed. Prof. Gellerman's laboratory for organic synthesis is especially over-crowded. In this laboratory, undergraduate students are conducting experiments in conjunction with Med. Chem. Laboratory. The laboratory is insufficient in space to accommodate any expansion of the undergraduate program, however modest. Each student needs a fume hood in which to do experiments and syntheses.

Recommendations:

- **Additional space allocated for research is needed.**

Facilities, Resources

The teaching laboratory regularly serves both the Biological Chemistry and Chemical Engineering Departments. It is reasonably well equipped, with standard chemical laboratory equipment and instrumentation, as outlined in the self-evaluation report. In addition, students use ICP, GC-MS and a thermal analyzer, and have excess to a 300 MHz NMR spectrometer.

Other instruments that serve all Department members include: Scanning Electron Microscope, X-ray diffractometer, a High Performance Ion Chromatography System, Mass Spectrometer, 2 FTIR spectrometers, 2 UV/VIS Spectrophotometers, ICP, FPLC, HPLC, Ultra-Low Temperature freezer, diode- array spectrophotometer.

The Library is well equipped and serves all the academic disciplines. Students and lecturers have direct access to electronic journals and web resources.

The departments of Biological Chemistry and Chemical Engineering share two relatively small floors and the available space is hardly sufficient for existing equipment and personnel. The research laboratories are crowded and not compatible with further growth. There is no space for recruitment of additional staff. There is no chemical storehouse. While every effort was done to maximize the laboratory capabilities in the former industrial building in which they are located, the current laboratories do not have the needed durability for long-term use. There are plans "on paper" for a new building.

Recommendations:

- **The Committee endorses the need for a new building for research laboratories.**

Signed by:



**Prof. Richard Eisenberg
Committee Chair**



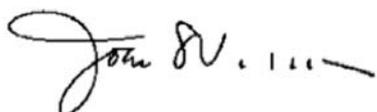
Prof. Allen J. Bard



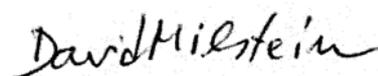
Prof. Tobin J. Marks



Prof. William L. Jorgensen



Prof. Joan S. Valentine



Prof. David Milstein

Appendices

Appendix 1- Copy of Letter of Appointment

March, 2011

Prof. Rich Eisenberg
 Department of Chemistry
 University of Rochester
 USA

שר החינוך
Minister of Education
 وزير التربية والتعليم

Dear Professor Eisenberg,

The State of Israel undertook an ambitious project when the Israeli Council for Higher Education (CHE) established a quality assessment and assurance system for Israeli higher education. Its stated goals are: 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. Involvement of world-renowned academicians in this process is essential.

This most important initiative reaches out to scientists in the international arena in a national effort to meet the critical challenges that confront the Israeli higher educational system today. The formulation of international evaluation committees represents an opportunity to express our common sense of concern and to assess the current and future status of education in the 21st century and beyond. It also establishes a structure for an ongoing consultative process among scientists around the globe on common academic dilemmas and prospects.

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

It is with great pleasure that I hereby appoint you to serve as the chair of the Council for Higher Education's Committee for the Evaluation of Chemistry Studies.

The composition of the Committee will be as follows: Prof. Rich Eisenberg (Chair), Prof. Allen Bard, Prof. William Jorgensen, Prof. Tobin Marks, Prof. David Milstein and Prof. Joan Valentine.

Ms. Alisa Elon will coordinate the Committee's activities.

In your capacity as the chair of the Evaluation Committee, you will be requested to function in accordance with the enclosed appendix.

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

Sincerely,


 Gideon Sa'ar
 Minister of Education,
 Chairperson, The Council for Higher Education

Enclosures: Appendix to the Appointment Letter of Evaluation Committees

cc: Ms. Michal Neumann, The Quality Assessment Division
 Ms. Alisa Elon, Committee Coordinator

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כתובת אתר ממשל זמין: <http://gov.il>

כתובת אתר המשרד: <http://www.education.gov.il>

Appendix 2- Site Visit Schedule

09:00-12:30	closed working meeting	
12:00-12:30	Lunch	
12:30-13:00	Opening session with the heads of the institution and the senior staff member appointed to deal with quality assessment	President: Prof. Dan Meyerstein Rector: Prof. Michael Zinigrad Head, Quality Assessment System: Dr. Nitza Davidovitch
13:00-13:30	Meeting with the heads of the Faculty of Natural Sciences	Prof. Alexander Domoshnitsky
13:30-14:00	Meeting with the heads of the Department of Biological Chemistry	Dr. Alex Schechter
14:00-14:45	Meeting with Senior Academic Faculty* + representatives of relevant departmental committees*	Prof. Haim Cohen (head of Teaching committee) Dr. Haya Kornweitz Dr. Gery Gelerman Dr. Guy Patchornik (head of Recruiting committee)
14:45-15:15	Meeting with Junior academic faculty* and Adjunct teaching faculty	Prof. Miriam David Prof. Eduard Burmasenko Dr. Hannan Teller Dr. Ludmila Buzhansky Dr. Olga Kirchevsky Dr. Gadi Turgeman Dr. Yevgni Royz Dr. Bunimovich Svetlana Mr. Uri Grin Mr. Boris Redko Mr. Tzahi Shalit Ms. Inbal Lapidot Mr. Roy Lieberman Ner
15:15-16:45	Tour of campus (Including classes, labs, library, offices of faculty members, computer labs etc.)	Prof. Haim Cohen Dr. Alex Schechter

16:45-17:30	Meeting with B.A. students*	
17:30-18:00	closed working meeting	
18:00-18:30	Summation meeting with heads of the institution and of the faculty and department	President: Prof. Dan Meyerstein Rector: Prof. Michael Zinigrad Head of faculty: Prof. Alexander Domoshnitsky Head of department: Dr. Alex Schechter
18:30-19:00	closed working meeting	