



Committee for the Evaluation of Geology and Earth Science Study Programs

**Hebrew University of Jerusalem
The Fredy and Nadine Herrmann Institute of Earth Sciences
Evaluation Report**

August 2013

Contents

Chapter 1: Background..... 3
Chapter 2: Committee Procedures..... 4
Chapter 3: Evaluation of the Fredy and Nadine Herrmann Institute of Earth Sciences at
the Hebrew University of Jerusalem..... 5

Appendices: Appendix 1 – Letter of Appointment
Appendix 2 – Schedule of the visit
Appendix 3 – Minority Opinion by Dr. Yair Rotstein

Chapter 1: Background

At its meeting on October 10 2011, the Council for Higher Education (CHE) decided to evaluate study programs in geology and earth science during the 2012/2013 academic year.

Following the decision of the CHE, the Minister of Education, who serves ex officio as Chairperson of the CHE, appointed a review committee consisting of

- Prof. Edward Stolper, Division of Geological and Planetary Sciences, California Institute of Technology, USA (review committee chair);
- Prof. Henry Elderfield, Department of Earth Sciences, University of Cambridge, UK;
- Prof. Kenneth Larner, Department of Geophysics, Colorado School of Mines, USA;
- Dr. Yair Rotstein, U.S.-Israel Binational Science Foundation, Israel;
- Prof. Gerald Schubert, University of California Los Angeles, USA; and
- Prof. Mark Thiemens, University of California San Diego, USA;

with Ms. Daniella Sandler serving as coordinator of the committee on behalf of the CHE.

Within the framework of its activity, the review committee was requested to¹

1. examine the self-evaluation reports, submitted by the institutions that provide study programs in geology and earth science and to conduct on-site visits at those institutions;
2. submit to the CHE an individual report on each of the evaluated academic units and study programs, including the committee's findings and recommendations; and
3. submit to the CHE a general report regarding the examined field of study within the Israeli system of higher education, including recommendations for standards in the evaluated field of study.

The process was conducted in accordance with the CHE's October 2012 Guidelines for Self-Evaluation.

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

Chapter 2: Committee Procedures

The review committee held its first meetings on January 8, 2013, during which it discussed fundamental issues concerning higher education in Israel, the quality assessment activity, and geology and earth science study programs in Israel.

From January 9-16, 2013, the review committee visited the Ben Gurion University, Tel Aviv University, and Hebrew University. During the visits, the review committee met with various stakeholders at the institutions, including management, faculty, staff, and students.

This report deals with the Fredy and Nadine Herrmann Institute of Earth Sciences at the Hebrew University of Jerusalem. The review committee's visit took place on January 15-16, 2013.

The schedule of the visit is attached as Appendix 2.

The review committee thanks the management of Hebrew University and the Institute of Earth Sciences for their self-evaluation report and for their hospitality towards the committee during its visit.

Chapter 3: Evaluation of Geology and Environmental Studies in the Fredy and Nadine Herrmann Institute of Earth Sciences, the Hebrew University of Jerusalem

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 review committee based on the documentation provided by the institution, information gained through interviews, discussion and observation, and other information available to the committee.

1. Executive Summary

The Fredy and Nadine Herrmann Institute of Earth Sciences (IES) at Hebrew University has a strong, internationally competitive research program. It is large enough and broad enough to cover a wide swath of the earth sciences, yet it has sufficient depth in selected areas (particularly geochemical approaches to geological and environmental science) to be recognized and distinguishable on the international scene.

The IES retained its faculty size (in the low 20s) and increased its undergraduate student population over roughly a decade of limitations imposed by national and university-wide pressures. As a consequence, it is in a strong position for the next decade.

Starting in 2005 with a university-led review by a committee comprising mostly earth scientists from outside Hebrew University², the faculty of the IES has been thinking about the future of the Institute and has had an explicit strategic plan for research and faculty renewal. Their approach of having such a plan to identify and leverage strengths and opportunities, while also being flexible in hiring outstanding people opportunistically, has worked for them and they propose to continue it. The IES faculty also recognizes the small size of the pool from which they can draw faculty appointments, and they have the patience to wait for critical opportunities and even creatively to craft such opportunities. The committee applauds and endorses this approach.

The IES has identified several factors that will influence its opportunities for the next decade:

- There are great intellectual opportunities in the study of the Earth's present and past environment, and there is and likely will continue to be considerable interest among Israeli students in these areas and jobs for them after they graduate with undergraduate and graduate degrees.
- The relocation of the Geological Survey of Israel onto the Givat Ram campus will help with teaching and research and will provide leveraged opportunities for both organizations.
- The recent finds of gas in the eastern Mediterranean Sea and other possible Israeli hydrocarbon resources are changing the nation's energy prospects. The IES wants to find ways to help the nation, the Hebrew University's research programs, and its students via this opportunity; and it is most likely the unit within the Hebrew University best suited to prepare students at all academic levels to accomplish these goals.

The oil and gas opportunities are of particular importance and illustrate the IES's approach. The IES strives to contribute to solving world-class scientific problems in the earth sciences

² Prof. Edward Stolper was a member of the evaluation committee in 2005

while contributing to Israeli society primarily through this research and the training of its students. In this particular case, however, the faculty argues that most exploration and specific technical knowledge regarding identification of hydrocarbon resources will come from the hydrocarbon industry. Based on this viewpoint (which might be debatable), the goal of the IES has been to identify whether there are research areas that will contribute to the nation's educational and research infrastructure in oil and gas (and energy, more broadly) that also make sense intellectually for a research university with the goal of creating new knowledge and producing scholars and an educated work force. In this context, the IES is thinking about investing in the larger field of geophysics, including seismology. Hebrew University has traditionally not put much emphasis in this critical and core area of earth science, which is also at the heart of the science of oil and gas exploration and broader approaches to understanding earth structure and history. By taking the opportunity to expand in this direction, the IES argues that it will help the national effort in research and training of students related to this new (for Israel) industry while also making a major difference for the IES and the university by moving it into an important discipline. At the same time, the growing interest in fossil fuels is influencing other research areas within the IES, including organic geochemistry, regional geology, and studies of submarine landslides.

We note that prior to our visit to Hebrew University, the review committee had already identified geophysics, especially seismology, as an attractive potential growth area for Israeli higher education. The review committee believes that the approach to the oil and gas opportunity being taken by the IES has merit. Moreover, the IES is taking steps to initiate the proposed program. For example, the Geological Survey has recently appointed a seismologist, and we understand that the IES has recruited him to teach seismology at the university. The idea would be to introduce undergraduate and graduate students to seismology; student interest in geophysics is thereby expected to grow, and a cadre of graduates interested in advanced degrees in seismology and geophysics will also grow. This group of students might then pursue graduate studies in these areas and be available in the future as a reservoir of possible faculty appointments to allow the academic program to grow. There have already been discussions with the Geological Survey and the Ministry of Energy about this approach and the IES has shown some interest in collaborating with other Israeli universities. The IES is also being opportunistic in its current effort to hire a faculty member in paleomagnetism, another area of geophysics. Finally, the IES is also proposing to pursue a fossil fuel educational program, likely at the M.Sc. level, possibly in collaboration with other Israeli universities, and this could be an attractor for students and for new sources of funds.

Given the proposed emphasis on geophysics and its connection to fossil fuels, the position of the IES is that to avoid spreading itself too thinly it should not pursue other major new directions, and the committee judges this to be a realistic approach. Other areas of interest for hiring over the next decade could include oceanography (retaining the current research and teaching center at Eilat and expanding to embrace the oceanographic aspects of the gas finds in the eastern Mediterranean); geochemistry, which will need to be renewed given upcoming retirements; and continued emphasis on the environment, including hydrology and water resources more broadly. Opportunities to invest in these areas will arise naturally over the next decade given anticipated retirements and the current strengths of the IES. Finally, the faculty has analyzed the demographics of the IES and, given the current age distribution, a target of one appointment per year would be reasonable to maintain the current size of the institute; several years of up to two appointments per year would allow gradual growth to 25-26 faculty members, which the committee views as a reasonable target in light of the university's plans for growth in experimental science over a decadal time period.

2. Organizational Structure

Observations and findings:

The IES structure and organization are well conceived and executed. Although he has been in his position for only a few months, the head of the IES, Professor Oded Navon, has been developing academic plans to take to the faculty for discussion. The committee was told, however, that the IES has only two faculty meetings in a semester. Particularly at a time such as now when significant programmatic changes are under consideration (e.g., with new collaborations with other universities and the Geologic Survey of Israel; with the contemplation of possible new research directions in response to Israel's efforts at oil and gas development; with the university's plans for expansion; and with upcoming retirements), the IES should consider more frequent faculty meetings as necessary to maintain dialogue and interaction among the faculty on critical decisions.

3. Mission and Goals

Observations and findings:

The IES's mission is to contribute to solving world-class scientific problems in the earth sciences while contributing to Israeli society. Appropriately, the IES faculty approach thinking about themselves and planning for the future explicitly in this context.

4. Faculty

Observations and findings:

The number of faculty members in the IES is currently in the low 20s; they cover a broad range of the earth sciences including substantial strength in geology and geochemistry, atmospheric sciences, and oceanography. The faculty carries out world-class research and is successful in attracting external support. The IES is experienced in the development of a strategic plan for hiring of new faculty, and it is currently actively engaged in establishing a plan for the near future. The head of the IES has tentatively identified solid-earth geophysics as a future growth area, with seismology (both whole-earth and exploration-related) taking a major place among the disciplines to be pursued. This direction makes sense to the review committee both because it is a critical earth science discipline that is not well represented in Israel or at the Hebrew University and because it relates to the perceived need for Israel to do research and to train students that will connect to the nascent oil and gas industry in the country. The recent appointment of a seismologist in the Geological Survey will enable the IES to make a start in this direction by involving this person in the teaching and research activities of the Institute. Although the interactions between the Geological Survey and the IES are already strong, the movement of the Geological Survey to campus will encourage even closer connections, including helping to insure that the new seismologist at the Survey can be effectively involved with the IES.

An analysis of the IES's demographics indicates that retirements over the next several years will be evenly distributed and that the size of the faculty can be maintained if new appointments are made at the rate of about one per year. An occasional infusion of an extra appointment could bring the number of faculty to about 25 or 26, a level we recommend to accommodate the IES's plans to expand in the area of geophysics and other fields. Among these other areas of possible expansion are oceanography, associated with the newly established Mediterranean Center and the existing Inter-University Institute in Eilat; energy and the environment, stimulated by recent discoveries of gas reserves in the

eastern Mediterranean and other possible hydrocarbon resources within Israel; hydrology, to address Israel's ongoing water resource issues; and paleomagnetism, a component of solid-earth geophysics. The expectation is that the area of geochemistry, which spans many components of the IES's programs and is one of its particular strengths, will be refreshed opportunistically as retirements occur.

5. Students and Study Program

Observations and findings:

Given its size and the breadth of disciplines that it covers, the IES is able to offer a program that covers a wide range of disciplines in the earth and environmental sciences. Based on our evaluation of the course offerings and our discussions with students and alumni, the review committee judges that the undergraduate program provides the basis for a solid, thorough, and balanced education. With the world-class research that is being carried out in the IES, its M.Sc. and Ph.D. programs also perform at a high level. We nevertheless have several suggestions for the IES to consider that would improve on its already strong program.

- Students who selected one of the more quantitative study programs that the department offers appear to need and want the opportunity of receiving more rigorous mathematical (and probably physics) training. This may stem, in part, from the fact that IES students take mathematics, physics, and chemistry classes alongside biologists and/or pharmacology students rather than with chemistry or physics students, a practice that has been in place for several years. It appears that in the more distant past, these classes were taken together with the chemistry students, leading to a more quantitative track. The IES should consider ways to make a more quantitative track available to those students who would benefit from it, such as taking some of the classes alongside the physics and/or chemistry majors.
- The undergraduate program is unusually rigid in the sense of having a very high percentage of required courses compared to what we are familiar with elsewhere in the world. (The committee notes that this is true of all of the programs we reviewed during our visit.) The large number of mandatory courses that the students are required to take leaves them with little opportunity to pursue directions and courses that might interest them and/or benefit them as they prepare for jobs after graduation. These may include, for example, additional mathematics and physics courses, computer classes, environmental classes, etc. In addition, the large number of required courses leads to high teaching loads for the faculty, leaving little room for them to develop and teach graduate courses; this in turn leads to a lack of classes being taught at the graduate level and frustration among the graduate students. The committee recommends that the faculty consider reducing the number of mandatory undergraduate courses, thereby liberating the students to explore and make choices, and freeing up time for the faculty to develop and sustain an interesting graduate curriculum. Note that since most undergraduates in Israel appear to proceed to an M.Sc. degree, they will have the chance to take as graduate students many of the subjects that would no longer be required of them as undergraduates.
- As mentioned above, some of the students in the department, for example those who go into atmospheric sciences, require a strong mathematical background. Much of it is given as part of the second year curriculum, but the material is already needed in some simultaneous or previous courses in the IES. In addition, undergraduate students who wish to get a stronger physical-sciences base frequently have problems with conflicting class schedules; this interferes with their participation in classes offered outside the

IES. We suggest that the faculty explore options for such students such as offering those focusing on these disciplines the choice of replacing some of the present courses in chemistry, physics, and mathematics with higher-level courses that the university offers; this might require coordination in class schedules across departments to make such choices feasible. Solutions to this problem could be connected with the previous bullets regarding the need for more rigorous mathematical and physical-science training and the large number of required courses and largely inflexible choice for undergraduate courses.

- As discussed previously, the IES is missing a strong geophysical component in its research programs, and this propagates into its teaching program as well. The IES has engaged a new staff member at the Geological Survey of Israel to teach seismology. This is a good start, but it is unlikely to represent a long-term solution; such a solution will depend on the success of the IES's nascent plan to build up a significant research program in geophysics. Until that happens, the IES is discussing possible joint programs with the Tel-Aviv University, which does have a strong geophysical program, and this appears sensible to the review committee. Other areas in which the IES might productively collaborate with other Israeli universities in curriculum development are fossil fuels, engineering geology, and atmospheric chemistry. These three areas in particular are of potential interest for students planning to take positions in industry or government.
- The number of faculty in the core areas of geology in the IES is not large. The department should continue to monitor carefully the balance between such core areas on the one hand and growth into new areas on the other because this could have impact on teaching and research capabilities.
- As described in a previous bullet in this section, there are limited course offerings for graduate students in the IES. This relates to the fact that many previously were undergraduates at Hebrew University with heavy undergraduate course work requirements, with the consequence that there are limited opportunities for them to take courses as graduate students. Another factor mentioned above is that the faculty are fully committed to teaching required undergraduate classes, resulting in few courses being offered at the graduate level. Since the MSc students are required to take courses, in order to make up for the limited courses available to them in the IES they often take them in other departments. Although this by itself is not necessarily a bad thing (i.e., it broadens their background and exposure to other scientific disciplines), as described above, the committee recommends that the IES consider creative approaches to addressing this and related issues.
- The committee notes that a majority of the graduate students in the IES also did their undergraduate studies there. In general, we feel that this practice should be discouraged; students (and especially those studying at the Ph.D. level) can benefit by exposure to different academic environments and approaches to science, by which they can gain additional knowledge and different perspectives. Although the possibilities for such moves are quite limited inside Israel, the department should consider encouraging its B.A. and M.Sc. graduates to study elsewhere if they seek additional education. Similarly, the department should make additional efforts to recruit students from other Israeli universities and from abroad to their M.Sc. and Ph.D. programs. Coordination with Tel Aviv University and Ben Gurion University could be beneficial in this regard, since all three universities have similar issues.
- Courses in the physical sciences usually benefit by having teaching assistants doing exercises with the students, going over examinations, etc. Teaching assistants also free

some of the time that faculty members must devote to classroom teaching, leaving them with more time to train research students. The review committee was told that the IES previously had funds for eleven teaching assistant positions but that this number is now down to only four. The details of this need to be verified and understood, but the committee feels strongly that sufficient funds should be allocated from the university to support a robust teaching assistantship program – it enhances the education of the students enrolled in the courses and the training opportunities for the teaching assistants. Recognizing the need for teaching assistants, the faculty in the IES has responded to the diminished university-provided funding for this purpose by using funds from their research grants to pay graduate students to function as teaching assistants. This practice is unwise for many reasons, and we recommend a concerted effort to stabilize university funding of teaching assistantships at a reasonable level.

6. Research

Observations and findings:

The research at the IES is of high quality. The IES has been an internationally recognized department for decades and it continues to be so. In particular, although it has a reputation as a world leader in the broad area of geochemistry, the program is broadly rooted in geology, atmospheric sciences, and oceanography. As mentioned previously, the current number of faculty members in the IES is in the low 20s; there is a long-term goal of modest expansion, which will offer the opportunity not only to continue its strengths, but also to branch into new or currently under-represented areas of research. The IES's efforts are incrementally enhanced with cross-campus interactions based on research expertise in hydrology and environmental sciences. The IES's demographics are good, ranging from strong, promising new faculty members to an established senior faculty. The faculty's research facilities are state of the art in many fields, and the IES works at maintaining this important position. The IES is carefully and strategically assessing its future, asking specifically what areas make the most sense to maintain and develop given the institutional strengths and capabilities and the needs of Israel. The IES is also embracing external collaborations to develop strong interdisciplinary efforts across multiple areas, including the environment and fossil energy.

The IES has a close working relationship with the Geological Survey of Israel, which has broadened both research and educational opportunities and led to “the whole being greater than the sum of its parts” for both institutions. The move of the Geological Survey to the Givat Ram campus will afford even greater opportunities for collaboration in research and for shared infrastructure, likely allowing for instrumentation opportunities now not currently feasible for the individual institutions. This connection will also make it even easier than it is already for Geological Survey scientists to engage in teaching in the IES and amplify further their professional opportunities and development.

The IES has engaged in interdisciplinary research “centers” that extend across campus and have the potential to enhance its ability to expand into new areas and, potentially, to establish new funding streams. These research areas include energy, the environment, Quaternary research, and marine science. It has also engaged with the Institute of Physics in a center on exoplanets that leverages both groups, with physics as the lead.

The IES also has had a longstanding research program in oceanography and a significant field station at Eilat that allows the research program in oceanography and marine geochemistry to flourish. It is also an internationally accessed and utilized facility that has led to a steady stream of international scientists who use the facility and collaborate with the research scientists at Hebrew University. Moreover, the facility and program are part

of a consortium that benefits the research efforts of Israel as a whole. This is an excellent resource and the committee endorses the IES and university commitments to support and maintain it a high level.

The discovery of oil in the eastern Mediterranean offers a range of possibilities that might benefit the IES, Hebrew University, the Geological Survey, and Israel at large. We endorse the approach being taken by the IES, with a possible emphasis on geophysics, of supporting individuals as they see opportunities in their own research programs to benefit from and contribute to this. Moreover, the university level goal of embedding these opportunities in a larger, coordinated university-wide set of activities in energy-related science also appears wise. We also endorse IES's efforts to pursue educational opportunities connected with these discoveries (e.g., an M.Sc. in fossil fuels; enhancing teaching in geophysics), including its exploration of collaborations with other Israeli universities in these teaching programs. Likewise, we also endorse IES's engagement in inter-university research activities (especially the new marine sciences program centered at the University of Haifa, which can ensure engagement of the Hebrew University with national efforts in this area). Finally, recognizing the importance of the Eilat facility, the review committee endorses the university's intention to maintain this valuable educational and research resource.

The IES has a strong group of ~4-5 postdoctoral scholars (4-5), including funding from the IES for two of these. These scholars enrich the research efforts of the IES and allow development of new areas and enhancement of its international atmosphere and presence. Maintenance and growth of the population of world-class postdoctoral scholars is vital and important, as is recognized by the faculty. The IES and university are to be commended for the activities in this regard, and we recommend and strongly support continued efforts to raise the number of postdoctoral scholars in the IES.

7. Infrastructure

Observations and findings:

The need for high-quality and sustained technical support in a modern laboratory environment was emphasized by the faculty. One aspect of this is a university-wide concern about the long-term availability of facilities such as machine shops and glass-blowing facilities that transcend the needs and capabilities of individual departments and research programs. We have no specific recommendations on this point other than to emphasize the need for such capabilities and for the university as a whole to work at keeping them available on a recharge basis. Another aspect is the need for highly qualified technical support within the IES to help maintain capabilities, especially advanced and complex instrumentation that is at the heart of a state-of-the-art scientific enterprise. This requires continuous attention from the faculty and the leadership of the IES. While the faculty can always make the case that they could effectively utilize higher levels of institutional support, the committee judged that the generous start up-packages for new faculty has been helping and that the current level of about six person-years of IES support for technical personal, if wisely deployed, is a significant resource by any measure.

8. Self-Evaluation Process

Observations and findings:

The IES took seriously its charge and prepared a thoughtful and comprehensive self-study and update.

Signed by:

Edward Stolper

Prof. Edward Stolper- Chair

Henry Elderfield

Prof. Henry Elderfield

Gerald Schubert

Prof. Gerald Schubert

Ken Lerner

Prof. Kenneth Lerner

Mark Thiemens

Prof. Mark Thiemens

Appendix 1: Letter of Appointment

February 21, 2012

Prof. Edward Stolper
Division of Geological and Planetary Sciences
California Institute of Technology
USA

Dear Professor Stolper,

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, provide the public with information regarding the quality of study programs in institutions of higher education throughout Israel, and ensure the continued integration of the Israeli system of higher education in the international academic arena.

As part of this most important endeavor we reach out to world-renowned scientists to help us meet the critical challenges that confront the Israeli higher education by accepting our invitation to participate in our international evaluation committees. This process 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 enterprise.

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 Geology and Earth Science. The composition of the Committee will be as follows: Prof. Edward Stolper (Chair), Prof. Harry Elderfield, Prof. Ken Larner, Dr. Yair Rotstein, Prof. Gerald Schubert, Prof. Mark Thiemens.

Ms. Marissa Gross 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

Appendix 2: Site Visit Schedule

Earth Sciences- tentative schedule of site visit- Hebrew University

Tuesday, January 15, 2013

Time	Subject	Participants
11:15-12:00	Opening session with the heads of the institution	Asher Cohen – Rector Yaacov Schul- Vice Rector
12:00-12:45	Meeting with the Dean of the Faculty of Mathematics and Sciences	Yigal Erel Conference Room Floor 1, room 411
12:45-14:30	Transportation to Safra Campus Lunch –Meeting with the chair of the Institute of Earth Sciences	Oded Navon Conference Room Floor 1, room 411
14:30-15:10	Meeting with faculty I*	A. Amrani, S. Emmanuel, C. Haspel, R. Kessel, B. Lynn, M. Pinsky, Y. Shaked.
15:10-15:50	Meeting with Faculty II*	A. Agnon, D. Avigad, J. Erez, A. Matthews, D. Rosenfeld, M. Stein.
15:50-16:30	Tour of the Institute (classes, library, offices of faculty members, computer labs etc.)	Oded Navon (Labs; Classes; Offices).
16:30-17:10	Meeting with Faculty III*	H. Gildor, H. Gvirtzman, B. Lazar, N. Paldor. A. Angert, R. Rabinovich
17:10-17:30	Meeting with technical staff	Y. Sherer, O. Dvir, O. Tirosh, E. Barkan, H. Krugliak
17:30-18:00	Closed Door Committee Meeting	

Wednesday, January 16, 2013

Time	Subject	Participants
08:45-9:30	Meeting with Bachelors students* ***	
9:30-10:15	Meeting with Masters Students* ***	
10:15-11:00	Meeting with PhD Students* ***	
11:00-11:45	Meeting with Alumni* ***	
11:45-12:30	Meeting with the chair of the Institute of Earth Sciences	Oded Navon
12:30-13:00	Meeting with the Dean of the Faculty of Mathematics and Sciences	Yigal Erel-at Institute of Earth Sciences.
13:00-14:00	Lunch and Closed-door working meeting of the committee	
14:00-14:30	Transportation to Mount Scopus	
14:30-15:00	Summation meeting with heads of the institution	Asher Cohen – Rector Yaacov Schul – Vice Rector

* The heads of the institution and academic unit or their representatives will not attend these meetings.

*** The visit will be conducted in English with the exception of students who may speak in Hebrew and anyone else who feels unable to converse in English.

Appendix 3: Minority Opinion by Dr. Yair Rotstein:

Evaluation of Geology and Environmental Studies in Hebrew University of Jerusalem

This member of the committee agrees with most of the observations and recommendations that comprise the committee's report on the Earth Science Institute of the Hebrew University. In particular, I agree with the statement "The Fredy and Nadine Herrmann Institute of Earth Sciences (IES) at Hebrew University has a strong, internationally competitive research program". Nevertheless, I would like to express a minority opinion on some aspects of the evaluation considered by the committee as being important and discussed as such in the report these relate to the strategic plan that the department prepared and presented to the committee in the self-evaluation report, as well as verbally during our visit. These issues are particularly relevant to this department (IES), because of its obvious central role as the leading earth science department in Israel.

The department presented to the committee a strategic plan that was apparently prepared in 2006 and later updated in 2010. The updated strategic plan discusses the replacement of retiring faculty members until 2020, assuming that no additional positions will become available. The hiring strategy clearly displays the way the department would like to position itself in the foreseeable future. In this regard the plan is disappointing and, in effect, disturbing. Although the world around us is rapidly developing and changing, the plan does not appear to respond to such changes by strengthening disciplines that can be of particular importance to Israel, such as seismology, hydrocarbon exploration, hydrology, etc. Instead, the plan gives the distinct impression that the department would like to preserve its current distribution of disciplines, in which geochemistry appears to be over represented and overwhelmingly dominant.

The committee's report names two fields that it considers as being particularly important and which require particular attention by the department in its strategic plan, Geophysics (particularly seismology) and hydrocarbon exploration. Unfortunately, the committee's report gives the impression that the present deficiency in these two disciplines is being properly addressed in the department's plans. It is my opinion that this is clearly not the case. The written updated plan actually calls for hiring only "**one in geophysics (including tectonics or magnetism)**". Not only can a single position hardly be considered as sufficient, but the reference to tectonics and magnetism as fulfilling the goal of strengthening the role of geophysics in the department means that the problem is not addressed at all. Verbally, the committee heard that the department is planning to fill this single position with a talented paleomagnetic specialist. Paleomagnetism, however, is an esoteric field that is closely related to tectonics, but is quite removed from classical geophysics. The committee heard also that the department plans to cover the important field of seismology, with the help of an external scientist, one who the Geological Survey of Israel plans to hire. This can hardly be regarded as a satisfactory solution since the main commitment of the new recruit is to the organization that hires him, rather than to the department. It is therefore my opinion that the department should revise its future hiring

plan and hire at least one new faculty in what is considered classical geophysics, namely applied or earthquake seismology.

Geophysics is also a central tool in hydrocarbon exploration, which is the other field considered important by the committee and not addressed by the future plans of the department. The gas discoveries offshore Israel and the renewed interest in oil exploration onshore and offshore Israel are quite recent, and are still in their infancy. Based on experience from other regions of the world, they are here to stay for a long time. Even at this early stage the gas discoveries have had a large impact on the Israeli economy and are expected to assume a dominant and critical role in the future. Yet Israel is clearly not prepared in terms of human resources to deal with the hydrocarbon discoveries. Local oil and gas companies are all very small, and lack in-house expertise in exploration and development. Large international oil companies shy away from Israel for obvious reasons, and the exploration is led by Noble, a mid-size independent company based in the U.S. Moreover, because hydrocarbon exploration experience is scarce in Israel, the government of Israel lacks the technical expertise even to regulate and oversee the development of these newly found resources. Thus, there is clearly an urgent need in Israel to develop a program in hydrocarbon exploration that in the future will lead to local know-how, both in the government and the exploration companies. This concern was raised by the committee in its meetings with the faculty, department head, and Dean. Although some faculty members identified hydrocarbon exploration as an important area that the department has to develop, they appeared to have been overruled. Instead statements that the committee heard such as that Israelis will learn from working in the oil companies and that the Department does not want to engage in oil and gas exploration because it may involve the danger of becoming the equivalent of a technical institute too much beholdng to the hydrocarbon industry (the actual statement was considerably more harsh). Both statements are unacceptable. Clearly, the oil companies presently in Israel cannot serve as a platform for educating a generation of Israeli explorationists, and Noble, which is the only company with in-house expertise, is doing the work abroad.

I also appreciate the importance of intellectual freedom and its implication that the department must be generally free to make its strategic decisions involving the disciplines it wishes to develop. However, I find it unacceptable that a university program in hydrocarbon exploration could be considered by the department as inappropriate in a leading academic institution. One can mention MIT and Stanford to name just two, which had programs related to hydrocarbon exploration without compromising on their academic stature. I submit that the department, being supported mostly by government money, has a responsibility to Israeli society that it has to take into consideration, just as it does with regards to the environment, oceanography, etc.

Finally, in an era of economic difficulties, in which universities struggle to preserve their existing human and physical infrastructure, the hydrocarbon finds in Israel, should be looked upon by the department as a unique opportunity. The government of Israel has a clear interest in developing local expertise in hydrocarbon exploration in its widest sense, which is likely to include related fields such as oceanography and environmental science, to name just two. The department should be proactive in exploring the possibility that this

interest in offshore hydrocarbon exploration will enable it to gain important new faculty positions and new funds so as to develop a viable geophysics program and renew its presently defunct program in sedimentology, of particular importance not only in hydrocarbon exploration, but also in educating geologists in general.

In summary, I find the department to be in an excellent position to seize new opportunities and develop in important and exciting research directions. Unfortunately, the department seems to be reluctant to make the effort under the misguided perception that important and challenging research areas related to hydrocarbon exploration are not of appropriate interest in academia.

Dr. Yair Rotstein

A handwritten signature in blue ink, appearing to read "Y. Rotstein". The signature is written in a cursive style with a large initial "Y".