The Hebrew University of Jerusalem
Faculty of Mathematics and Natural Sciences

The Oceanography Graduate Program

Self-Evaluation Report

Written by
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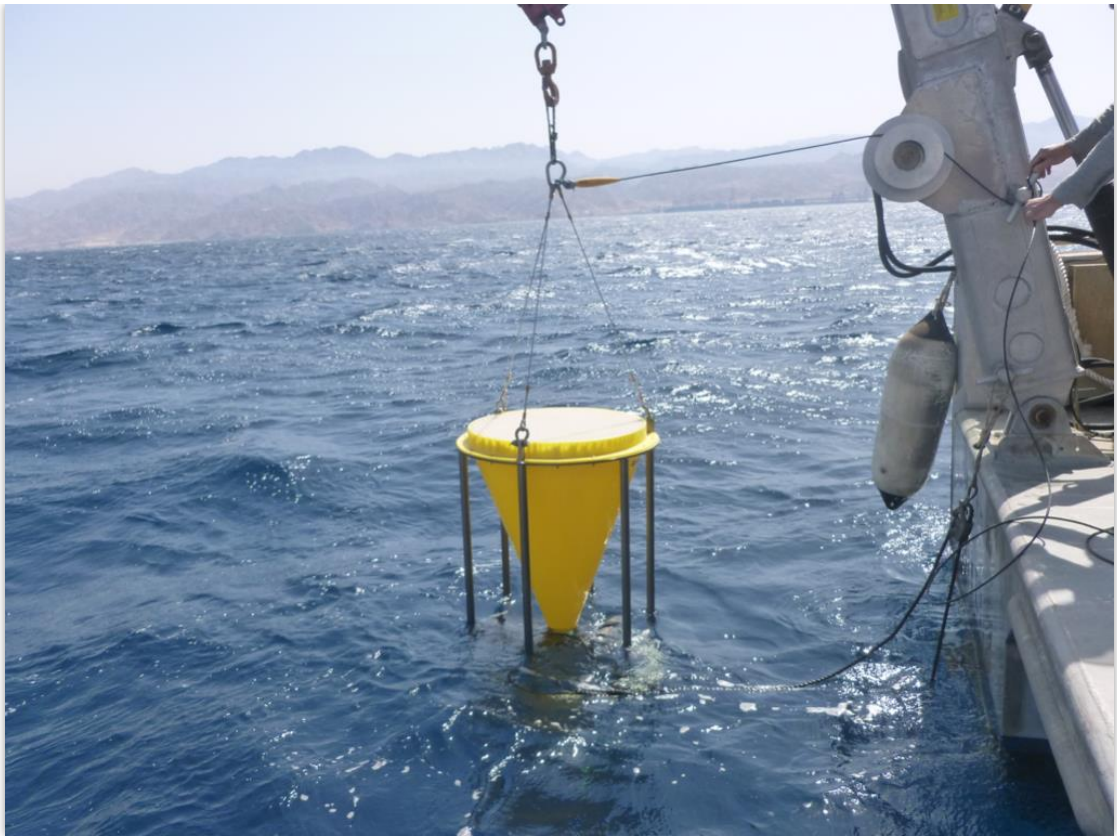
with contributions from Jonathan Erez, Hagit Affek, John Hall, Carynlisa Haspel-Erlick



October 2017

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Executive Summary

- A short summary of the main strengths and weaknesses that were pointed out in the self-evaluation process.
- A short description of the actions the Institution, the Parent Unit and the Department are going to take in order to improve on the weak points that were found.
- A brief summary of the extent to which the Study Program has achieved its mission, goals and learning outcomes, and whether these outcomes comply with its mission statement.
- Are the Institution, Parent Unit and Department satisfied with the outcome of the Study Program?

For decades, the Hebrew University has been leading ocean research in Israel and in certain areas the Hebrew University is a world player. The Oceanography Graduate Program was until a few years ago the only oceanography program offered in Israeli universities. Oceanography has received a national focus in recent years due to recent findings of natural gas reservoirs in the Mediterranean Sea, development of water desalination and purification plants, climate change, etc., as manifested in the creation of MERCI and in the number of tenders by the Ministry of Science and the Ministry of Infrastructures, in which marine sciences have been the focal area. In terms of scientific impact, the Hebrew University faculty members are among the leaders of the marine science community in Israel. At the same time, the gradual retirement of leading faculty members, together with an ongoing decline in the number of graduate students in the program, has already began to compromise the dominance and ability of the Hebrew University to perform in this field.

The self-evaluation has underscored several of the strengths and weaknesses of the program:

Strengths:

- In terms of scientific impact, the teaching faculty members are among the leaders of the marine science community in Israel
- The program has a strong and long track record of students who move on to successful careers in academia, government, and industry
- Our teachers cover all main oceanography sub-fields, namely chemical-, biological-, physical-, and geological- oceanography
- Most of IUI resident scientists (4 out of 7) are HUJI faculty members and they form a dominant factor in the oceanography studies in Eilat.

Weaknesses:

- The teachers of the program are members of different institutes (administrative departments) in the university, none of which considers oceanography a principal research and teaching theme. This feeds into the next items.
    - The faculty teachers are typically affiliated chiefly with other programs (e.g., geology) leading to a high teaching load on these teachers, together with a limited number and scope of courses offered to the students.
    - The funding of the program is insufficient to cover all its needs.
    - The financing of technical staff to oceanographers is based exclusively on grants. This challenges our ability to maintain state-of the-art instruments and to advise the students on their usage.
    - The number of MSc students is 10, below a critical mass of 25 students.

- The HUJI oceanography program builds heavily on courses given at the Interuniversity Institute for Marine Sciences (in Eilat), but has limited influence on their contents and on selection of students in classes limited in participation.
- A significant fraction of the students (~50%) and faculty (4 out of 6 members) are located at the IUI, resulting in a limited presence of core faculty and of students in Jerusalem.

The overarching weakness of the oceanography graduate studies program at HUJI, as outlined in this document, is that it lacks sufficient institutional support, in terms of administrative manpower, teaching facilities, and student fellowships, along with the fact that its most faculty members are primarily associated with other academic / administrative units at the Hebrew University. These structural characteristics require considering a reform, in order to fully realize the unique strengths of this program (i.e., highest quality of oceanography researchers in Israel, accessibility to state of the art research facilities).

In the long-term our goal is to stabilize the number of core faculty at 12, in order to enable us to offer at least the fundamental and mandatory courses on an annual basis. Members of the program recommend that the program of oceanography is upgraded to become an independent unit within the faculty, and that the possibility of establishing a Hebrew University Center for Ocean Teaching and Research, founded with a moderate endowment, be considered. We are confident that we have the best faculty in Israel (as manifested by number of grants per member, positions in academia held by our graduates, etc.), providing the basis for a leading Israeli graduate oceanography program that may be competitive internationally, and be able to participate in exchange programs with other universities.

Actions by Institution, Parent Unit and Department to improve the weak points
Following the preparation of this self-evaluation report, members of the program will submit to the Hebrew University management a detailed development plan. The plan will be considered closely in the next few months.

Compliance with mission, goals, outcomes
Our students are aptly competitive in the job market, and they take with them tools to succeed in lucrative PhD programs and then to be hired academic, governmental, and industrial employments. At the same time, we feel that more can be done in providing the students with a broader fundamental knowledge in some fields. In particular, a “hands-on” research method course for graduate students is missing.

Satisfaction of Institution, Parent Unit and Department with the outcomes of the Study Program

Parent Unit**:** As the scope of IES includes oceanography, that has no budgetary requirement is clearly satisfying. Notwithstanding, it is also well accepted that the potential of the field is far from being realized at present. Overall IES is aware of the challenges pointed out in this report. In the words of the head of study programs:
By and large, the Institute is satisfied with the courses in oceanography offered in the oceanography study program. As is common to other oceanography programs, the course teachers face the challenge of presenting the content of their courses to students with very different academic backgrounds; material at a decent level for students with a background in physics or chemistry may be too difficult for students with a background in life sciences/ecology, geology, or environmental sciences, all of whom are legitimately registered for the same course. Likewise some students come to field courses with experience in field work while others do not. By and large, the course teachers have risen to this challenge and offer interesting and rigorous courses that students with all of these different backgrounds learn from. Graduates of the program go on to higher degrees or postdocs abroad and

within Israel, and their research is well received. The major problem, as mentioned elsewhere in this report, is that there are simply too few oceanography faculty members, and none are actually full time oceanography faculty members. This leaves the program of study precariously thin, with some major graduate courses offered every other year and only a few dedicated oceanography courses offered at the undergraduate level.

Background: The Institution

A. General

The Hebrew University of Jerusalem is Israel's premier university as well as its leading research institution. It was founded in 1918 and opened officially in 1925. The Hebrew University is ranked internationally among the 100 leading universities in the world and first among Israeli universities. It stresses excellence and offers a wide array of study opportunities in the humanities, social sciences, exact sciences and medicine. The university encourages multi-disciplinary activities in Israel and overseas and serves as a bridge between academic research and its social and industrial applications. The Hebrew University strives for excellence. It is among the top winners of the European Research Council's competitive grants to young researchers. One-third of all competitive research grants awarded in Israel are won by Hebrew University scholars.

In Jerusalem, the university maintains three campuses: the Mount Scopus campus, for the humanities and social sciences (the Faculty of Humanities and the School of Education, the Faculty of Social Sciences, the School of Business Administration, the Faculty of Law and the Institute of Criminology, the School of Occupational Therapy, the Paul Baerwald School of Social Work and Social Welfare, the Truman Institute for the Advancement of Peace, the Center for Pre-Academic Studies, the Rothberg International School, and the Buber Center for Adult Education); the Edmond J. Safra Campus at Givat Ram, for exact sciences (the Faculty of Mathematics and Natural Sciences, The Rachel and Selim Benin School of Engineering and Computer Sciences, The Center for the Study of Rationality, The Institute for Advanced Studies, and the Edmond and Lity Safra Center for Brain Sciences); and the Ein Karem Campus, for medical sciences (the Hebrew University–Hadassah Medical School, Braun School of Public Health and Community Medicine, School of Pharmacy, the School of Nursing, and the Faculty of Dental Medicine). It also maintains a campus in Rehovot, for the Robert H. Smith Faculty of Agriculture, Food and Environment, and the School of Nutritional Sciences; a campus in Beit Dagan for the veterinary hospital (The Koret School of Veterinary Medicine); and one in Eilat, for the Interuniversity Institute for Marine Sciences. The university also boasts 3 sports facilities, 11 libraries, 5 computer centers, and 6,000 dormitory beds.

The Hebrew University consists of close to 1000 faculty members, about 2,000 administrative staff, and 20,000 students from Israel and 65 other countries. The university is actively engaged in international cooperation for research and teaching. It has signed 150 agreements for joint projects with other universities and 25 agreements for student exchanges with institutions from 14 countries, in addition to numerous faculty-based exchange programs. The faculty has registered more than 7,000

patents, and faculty members and alumni have won 8 Nobel prizes, 1 Fields Medal for Mathematics, 269 Israel Awards, 9 Wolf Prizes, and 33 EMET Prizes.

The university emphasizes excellence in research and teaching. The Office of Academic Assessment & Evaluation, which reports to the University's Academic Policy Committee (headed by the rector), monitors the implementation of recommendations provided by internal review committees and those appointed by the Council for Higher Education. The Office for Teaching and Studying aims to improve teaching practices through workshops, development of evaluation tools of effective teaching, and more.

B. The Institution's Mission Statement and its Goals

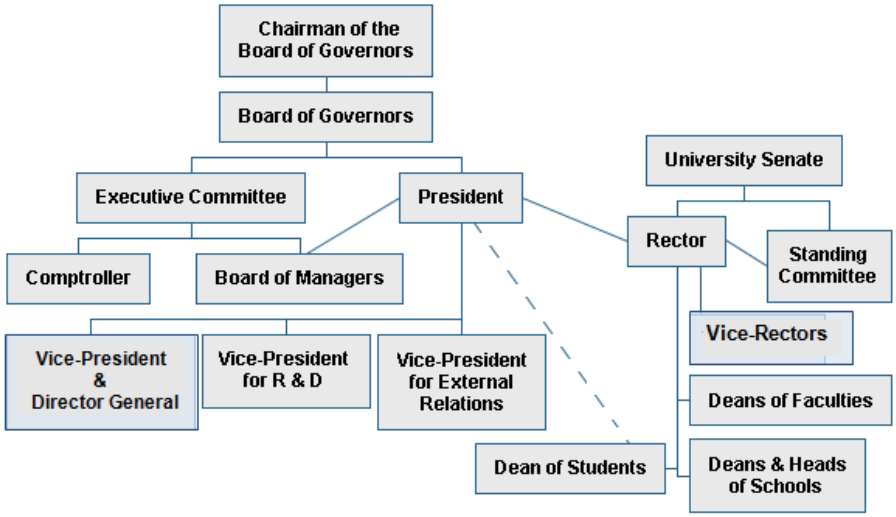
The Hebrew University has set as its goals the training of public, scientific, educational and professional leadership; the preservation of and research into Jewish, cultural, spiritual and intellectual traditions; and the expansion of the boundaries of knowledge for the benefit of all humanity.

The Hebrew University's mission is to develop cutting edge research, and to educate the future generations of leading scientists and scholars in all fields of learning. The Hebrew University is part of the international scientific and scholarly network. It measures itself by international standards and strives to be counted among the best research universities worldwide.

The Hebrew University is a pluralistic institution where science and knowledge are developed for the benefit of humankind. At the same time, the study of Jewish culture and heritage are a foremost legacy of the Hebrew University.

The goal of the Hebrew University is to be a vibrant academic community, committed to rigorous scientific approach and characterized by its intellectual effervescence. These will both radiate and enlighten the University's surrounding society.

C. The Institution's Organizational Structure



Names of holders of Senior Academic and Administrative Positions (2017):

University Administration:

Chairman of the Board of Governors: Mr. Michael Federmann

President: Prof. Asher Cohen

Rector: Prof. Barak Medina

Chancellor: Prof. Menahem Ben Sasson

Vice-President and Director-General: Mr. Yishai Fraenkel

Vice-President for Research and Development: Prof. Re'em Sari

Vice-President for External Relations: Amb. (Ret.) Yossi Gal

Vice-President for International Affairs: Prof. Oron Shagrir

Vice-Rector: Prof. Assaf Friedler

Vice-Rector: Prof. Berta Levavi-Sivan

Comptroller: Mr. Zvi Aizenstein

Deans:

Faculty of Humanities:	Prof. Dror Wahrman
Faculty of Social Sciences:	Prof. Tamir Sheafer
Faculty of Law:	Prof. Michael Karayanni
Faculty of Mathematics & Natural Science:	Prof. Jay Fineberg
Faculty of Agriculture, Food & Environment:	Prof. Benny Chefetz
Faculty of Medicine:	Prof. Dina Ben-Yehuda
Faculty of Dental Medicine:	Prof. Aaron Palmon
School of Business Administration:	Prof. Zvi Wiener
School of Social Work:	Prof. Mimi Ajzenstadt
Dean of Students:	Prof. Udi Shavit

D. Below is the over-all number of students studying towards academic degrees in the institution according to degrees:

Students of the Hebrew University (2016-2017)				
Bachelor degree	Master degree with thesis	Master degree without thesis	Ph.D	Total
11355	2147	2834	2360	18696

The Parent Unit Operating the Study Programs under Evaluation

A. *The name of the parent unit and a brief summary of its history, activities and development in the period of its existence.*

The Institute of Earth Sciences (***IES***) is the primary hub for oceanography studies at HUJI. It was formed in the late 1970's merging two departments: Geology and Meteorology. IES is the academic home for 25 faculty members (plus two adjucts), 13 post docs, 33 PhD students, 47 master students, 124 undergraduate students. The IES hosts curricula in geology, geochemistry, hydrology, atmospheric, environmental and marine sciences. For some decades the IES had a split focus - geology and atmospheric sciences, reflecting its history of amalgamation from its respective constituent departments. Oceanography had emerged as a focus that prompted breaking of disciplinary boundaries within the institute.

B. *Mission statement of the parent unit, its aims and goals.*

Understanding the major components of the Earth system and interactions among them is the main goal of the study program in Earth Sciences. The undergraduate and graduate study programs cover all three geospheres: lithosphere, atmosphere and hydrosphere. The courses and the teaching programs emphasize basic science with involvement in applied sciences through participation in inter- faculty programs in hydrology (mainly hydrogeology) and environmental sciences (atmospheric and geological aspects).

Undergraduate Studies: We believe that a strong background in basic science is crucial for the education of an earth scientist therefore our undergraduate mandatory studies include two and a half semesters of mathematics, two semesters of physics, two semesters of chemistry and two semesters of programming (with emphasize on Matlab). In order to expose students concentrating in all fields of natural sciences to Earth sciences, we offer a special minor program (32 credits) in Marine Sciences (Oceanography). Similar minor programs are offered also in Geology and Climate-Atmosphere-Ocean. Students who wish to invest extra efforts and get more comprehensive Earth science training study in a dual curriculum program (double major). The program integrates one of the Earth Sciences specializations with another field of natural sciences or social/humanities. About half of the students are taking such program together with Environmental Sciences, Life Sciences or Physics. The basic courses for each of the integrations are determined with the help of the curriculum advisors. In order to expose the undergraduates to research advances in Earth sciences participation in IES seminar is mandatory to all senior (third year) students. Applied aspects of the program are given in several field camps and field trips (especially for geology majors). Senior students are encouraged to participate in a "Supervised Research Project" (resembling the senior system in USA universities). Students

taking this course conduct, during the third year, a small research project under the supervision of a faculty member. The participating student summarizes the finding in a small thesis, which is graded by the advisor. We offer several courses in various aspects of Earth sciences for non-Earth science students. The courses are taught at the Edmond Safra campus for natural sciences students, at the Faculty of Agriculture in the city of Rehovot, and at Mount Scopus campus for social and humanities students.

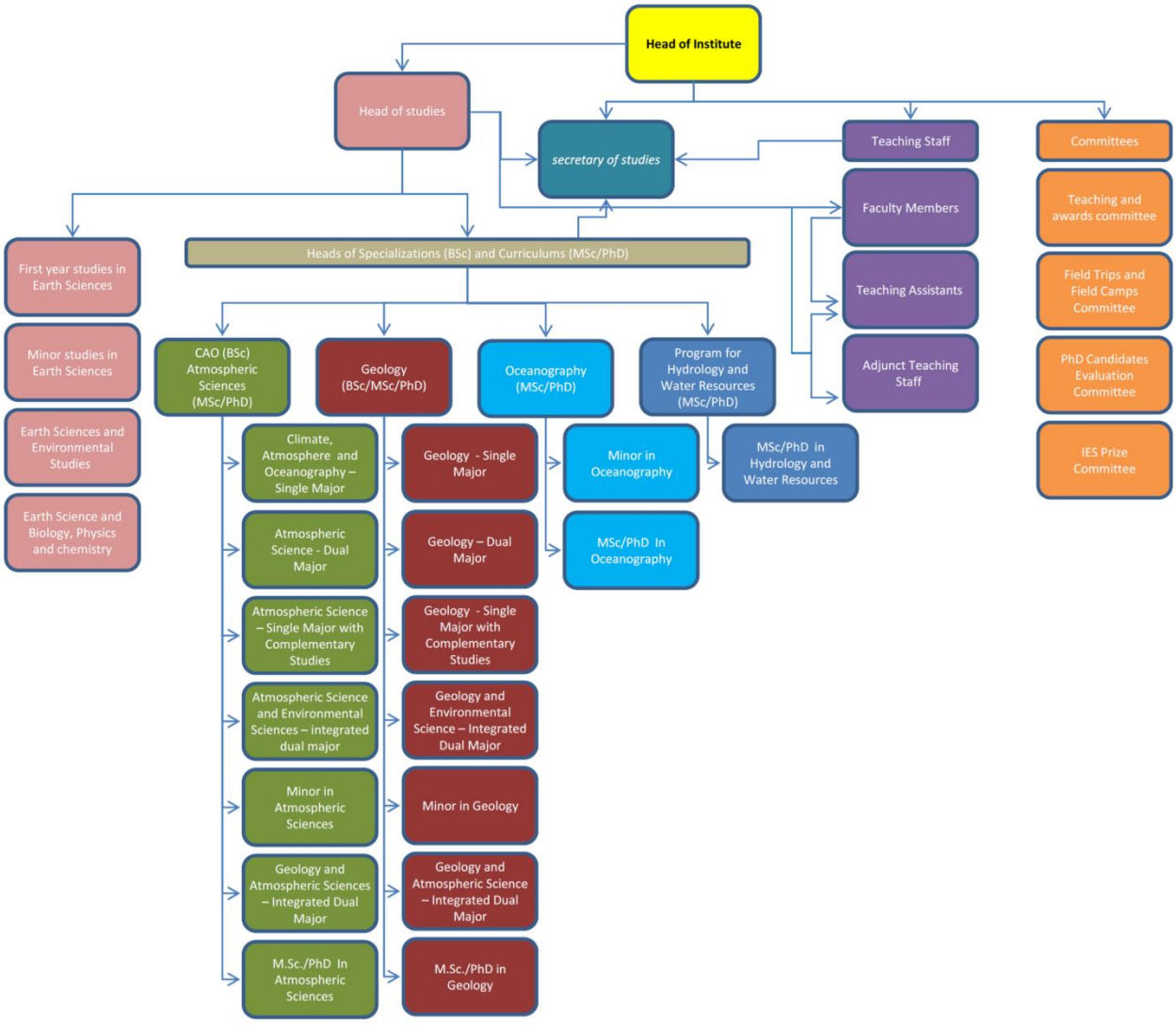
Graduate Studies: The graduate program is the backbone of research and teaching in the IES. The graduate program trains students as professionals (MSc and PhD) and educates the field's research scientists and potential faculty (PhD). As mentioned above, we offer MSc and PhD programs in Geology, Atmospheric Sciences, and Oceanography, and our faculty members are heading the inter-faculty programs in Hydrology and Water Resources, and the Environmental Sciences. All graduate programs comprise of courses (32 and 12 credits for MSc and PhD, respectively), research project, and a thesis. Complementary studies are required from students that are accepted with insufficient background in the specific curriculum. Several of the graduate programs have a mandatory core curriculum for part of the degree credits. Teaching assistantship is considered as part of the training and is offered for the best MSc students and most of the PhD students. We consider it an important experience in the general training of an Earth sciences graduate. We encourage active involvement in writing of either grant proposals and/or the reports for the granting agencies on their research projects. Summing up the research leads to scientific papers for all PhD students and most of the MSc students, and at least one paper is included as a chapter in the theses of most PhD students. Our graduates serve on the faculty of all research universities in Israel, many research institutions in Israel and first class universities in Europe and America (see Appendix 5). Many graduates have positions in the industry, government and NGO's.

C. *Description and chart of the unit's academic and administrative organizational structure (including relevant committees), names of holders of senior academic and administrative positions and list of departments/study programs operating in its framework.*

The chart below describes the organizational structure of the study program in "Earth Sciences". The Head of the IES is responsible for hiring new faculty members and for the Institute's budget (more than 90% of the annual running budget, received from the HUJI is allocated for teaching). Teaching budget includes TAs' salaries, field trips and field camps, teaching aids, stipends for exceptional students, etc. The Head of Studies (Vice Head of IES) is responsible for operating the teaching program and hiring the TAs with the help of the heads of curricula and specializations. The Head of Studies is responsible also for one of the specializations, either Geology or Climate-atmosphere-ocean. The secretary of studies is coordinating the study program, planning course locations and schedules, and is the liaison officer for the students helping them with university bureaucracy and general administrative issues. The heads of specializations/curricula and the head of studies are advising the students in all matters regarding course programs (this is especially relevant for "Integrated Dual Major" programs in which course schedule may overlap). Our faculty members teach almost all the courses except for ~5 that are taught by volunteer teachers from the Geological

Survey of Israel, two of which are Adjunct Professors. In addition, distinguished teachers from abroad are giving one or two classes every year as "Selected Topics". The TAs are the skeleton of the teaching program, they participate in petrographic laboratories, physical demonstrations, field trips, field camps, and frontal exercises.

Holders of senior academic and administrative positions:
Head of IES: Prof. Yehouda Enzel
Heads of study programs:
Earth science and of climatology-atmosphere-oceanography: Prof Carynlisa Haspel-Erlick
Geology: Prof. Ari Matmon
Hydrology: Prof Simon Emmanuel
Environmental Science: Prof. Efrat Morin
Oceanography: Prof. Amotz Agnon (until 10/2017) Prof. Yeala Shaked (from 10/2017)
Secretary of IES: Ms. Keren Shoshana
Secretary of Studies: Ms. Magiuy Perkin



D. ***In the format of table 1 (in the excel appendix), provide the number of students in each one of the Unit's departments who are studying and have studied in the unit in each of the last two years according the level of degree.***

Table 1- Number of MSc students in the Institude of Earth Sciences

Year	2015/2016	2016/2017
Atmospheric Sciences	4	5
Hydrology	10	11
Geology	25	21
Oceanography	10	10

E. ***Please provide the number of international students and scholars in each one of the Unit's departments (including Bachelors, Masters and PhD students, Post-Docs and visiting fellows) according the level of degree and country of origin (if possible).***

N/A

F. ***Who decides (internal/external bodies) on the rationale, mission and goals of the parent unit and of the study programs? What were the considerations behind these decisions and are they periodically re-examined and, if deemed necessary, changed? What were the changes made (if any)? How are the mission, goals and changes brought to the attention of the teaching staff, the students and the institution's authorities?***

IES has undergone an external review committee 2011 (The Council for Higher Education). IES' faculty members hold largely informal communications regarding its rationale, mission, and goals. The relationships between the staff members and the student are rather open and allow the communication of the values to the next generation.

G. ***What is the Parent Unit's perception of the evaluated Study Program/Department within its greater framework? Is the Study Program represented in the Parent Unit's decision-making bodies?***

The oceanography program currently has a minor role in the broad framework of IES. But many of IES members are aware to the central role of marine science within the broader discipline, and its growth potential. The oceanography program is not formally represented in IES' decision making bodies. Members of the oceanography program can serve as the chair of the IES and the head of the graduate studies program Oceanographers from the previous generations within IES held these offices in the past. For example, the last IES review (2011) lists Prof. Boaz Lazar as IES Head of Studies and the head of undergraduate specialization in geology and the graduate curriculums in geology and oceanography.
However, due to the generation gap, this has not happened since.

Chapter 1 - Study Programs

Goals, Structure, Contents and scope of the Study Programs/ Department

A. Program name and history

The Oceanography Graduate Program was established around 1970, taking full advantage of the university's Marine Laboratory in Eilat (Red Sea), later to become the Inter-University Institute (IUI). Two of our recently retired (yet actively teaching) members were students of the founder of the program, the late Prof. Ze'ev Reiss.

In 1968 the Heinz Steinitz Marine Biology Laboratory of the Hebrew University was officially opened in the south coast of Eilat. It served as a facility to study mainly the fish assemblages (by Prof. H. Steinitz and his colleagues). Prof Reiss, a micropaleontologist, was using their facilities (i.e. a boat and a grab sampler to collect sediments). He realized at that stage that there was a very limited information on the physical, chemical and biological oceanography of the Gulf of Aqaba. In ~ 1971 Profs. Zeev Reiss (geology), Dov Por (zoology) and Moshe Shilo (microbiology) initiated the "oceanography curriculum" for M.Sc. students that was open to all the students from natural sciences. A prerequisite was introduction to marine sciences and the core curriculum included: Chemical oceanography, physical oceanography, biological oceanography and practical oceanography (a field course that started in Lake Kinneret and continued at Eilat). Without teachers in some of these fields they invited Arthur Hecht and Salvador Seruya (both at IOLR) to teach the physics, Arieh Nissenbauam (Weizmann) to teach chemical oceanography, while Dov Por and Moshe Shilo taught the biological part. A short time afterwards Y. Kolodny joined the HU and started to teach chemical oceanography. In 1971 Prof. Steinitz died and the directorship of the Marine lab in Eilat rotated between D. Por, Z. Reiss and M. Shiloh. In 1972-3 IOLR loaned their newly donated small yacht (Chris Craft) "Arnona" to the HU and it became the "research vessel" of the Eilat lab. Zeev Reiss obtained funds and started the DCPE (Data Collection Project Eilat) using this boat (with results published by Reiss & Hottiner, 1984, reissued by Springer 2012). Zvi Ben Avraham, Boaz Luz, Jonathan Erez, and Yuval Cohen (and later Eli Tziperman were sent to the USA to do their PhD in oceanography. The following years saw several MSc theses focused on the Gulf of Aqaba and its littoral zone. When the newly graduated doctors returned to Israel they were assimilated in the academic and governmental system and became the next generation of leaders of Israeli oceanographic research. Luz returned to Jerusalem, and Erez to Eilat, where he later headed the Heinz Steinitz Marine Biology Laboratory that was the kernel of the Inter-University Institute (IUI), Eilat. Kolodny, Luz, and Erez are emeriti of the study program. A few years later (late 1980's) B. Lazar (chemical oceanography) and A. Genin (biological oceanography) joined the IUI (joint appointment with IES and EEB, respectively). These developments led to the IUI becoming the focal point of oceanographic research in Israel in general and in the Hebrew University in particular. No new faculty were recruited for about a decade and a half until 2005 (Y. Shaked, IUI-IES, biogeochemical oceanography). In recent years however, another faculty was recruited to the IES (Gildor, 2010, physical oceanography) as well as two new faculty members at IUI (Torfstein, 2013, IES-IUI, geochemical oceanography; Frada, 2015, EEB-IUI, biological oceanography).

A copy of the academic diploma awarded to students:

THE HEBREW UNIVERSITY OF JERUSALEM

The Dean and the Council of the Faculty of Mathematics and Natural Science

Hereby confer on

XXXXX

the degree of

MASTER OF SCIENCE

upon completing the required course of studies and submitting the prescribed thesis

in the department of

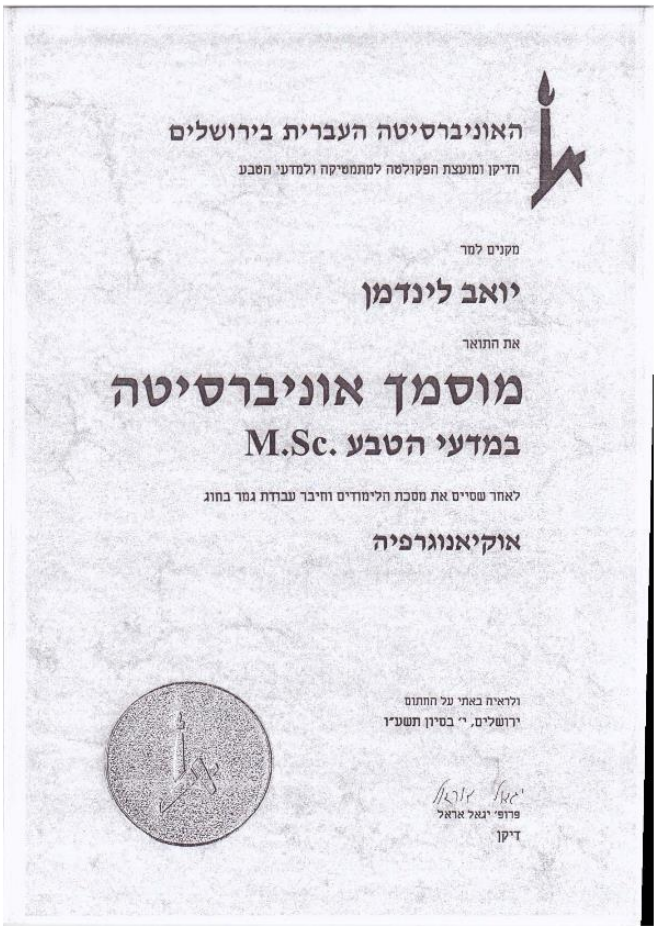
OCEANOGRAPHY

In witness where of I hereby append my signature

Jerusalem, June 2016

Prof. XXXXX
Dean

Translation certified by the Office of Student Affairs



האוניברסיטה העברית בירושלים

הדיקן ומועצת הפקולטה למתמטיקה ולמדעי הטבע

מקנים למר

יואב לינדמן

את התואר

מוסמך אוניברסיטה

במדעי הטבע M.Sc.

לאחר שסיים את מסכת הלימודים וחיבר עבודת גמר בחוג

אוקיאנוגרפיה

ולראיה באתי על החתום

ירושלים, י' בסיון תשע"ו

פרופ' יגאל אראל

דיקן

B. Mission statement

We prepare a cadre of ocean scientists equipped with a diverse background in the sub disciplines of marine science, namely physical-, chemical-, biological- and geological-oceanography. Our students are trained in field work, laboratory experiments, numerical simulation, analytical tools, and data analysis. The world's oceans and seas have been offering opportunities and posing challenges for Human Kind since pre-historic times. These vast water bodies are our closest reserves for natural resources, while our centers of civilization, ever attracted to their coasts, are exposed to their whim. The sediments at the bottom of the oceans and the seas preserve geological archives of the planet's natural history. In the last decade, with focus on recent history, such marine records reveal human impact on the marine and terrestrial environment.

Earth sciences have undergone a paradigm shift six decades ago when the evolving ocean sciences offered a grand unifying scheme to seemingly disparate disciplines. The emerging "plate tectonics" helped resolve issues from the deep history of the continents and Life to the hazards of earthquakes and volcanoes. The paradigm shift was triggered by novel observations in the ocean and the post-World-War-II explosion in marine sciences and oceanography. The new paradigm had attracted to earth sciences in general, and to ocean sciences in particular, generations of scientists from a spectrum of disciplines, with a taste for science outside the lab and close to nature.

In the present era of information technology it is our mission to keep the connection between science and observations outside our labs, from the surface of the sea through the water column and to the bottom and beneath. The “beneath” allows us to infer the state of the ocean, and hence of the planet, back in time.

The potential for scientific discovery in the ocean is mind boggling. The physiography of a scant 12% of the ocean bottom is mapped in detail matching the resolution we have for the moon and our neighboring planets. While all but one of the known animal phyla are found in the sea, almost half are exclusively marine. The >100,000 seamounts >1 km high and mid-ocean ridges and trenches produce the varying habitats that harbor these mostly unknown life-forms, while their steep critical slopes provide the mixing which prevents a stratified and dying water mass. Knowledge of the marine realm is becoming critical for Humanity and for countries seated by the sea. Israel shorelines span about half of its length, its international trade depends on three port cities, and its energy supply is currently dominated by fossil fuels imported or produced offshore, it its exclusive economic zone (with an area comparable to the land territory it controls).

We endeavor to give our graduates a basis in marine science and equip them with state of the art tools for data collection and analysis. The marine environments our studies encompass include ones from the past, as the history can tell us about the present and the future.

As a part of our mission, we maintain IES’ commitment to the IUI enterprise, since the ocean sciences are a critical element of any modern earth science program and the IUI allows the IES to participate in ocean science without having to maintain its own oceanographic institute.

C. Provide a chart of the academic and administrative organizational structure of the departments and its study program/s (including relevant committees and names of senior administration).

Not applicable

D. Provide a flow chart of the program presenting the process of completing the degree fully. The chart should present the "program at a glance" at all degree levels.

Course work (32 credit points) + Research Thesis

E. ***In the format of table 2 (in the excel appendix) provide details about the study program's structure and content, including specializations/tracks, division of courses according to number of credits and type of course (lecture, seminar, workshop, mandatory, elective, etc).***

Table 2. The Study Program: MSc in Oceanography (with Thesis)

Year Semester	Course Title	Course type	No. of Credits	Prerequisites for Admission	Weekly Teaching Hours	Weekly Exercise Hours	Weekly Laboratory Hours	No. of Students	Teaching Staff Name of staff member
Required Courses									
1st; Both semesters	seminar for graduate students atmospheric sciences and oceanography I	Seminar	1	_	1	0	0	~10	Dr. Ori Adam
2nd; Both semesters	seminar for graduate students atmospheric sciences and oceanography II	Seminar	1	_	1	0	0	~10	Dr. Ori Adam
1st; 2nd semester	Supervised research in Atmospheric Sciences and Oceanography	Guided Research	2	_	NA	NA	NA	3-6	Prof. Yeala Shaked
Semi-Required courses (at least one of these two courses)									
Any year, semester 1	numerical methods in earth sciences	Lecture + project	3	_	2	1	0	15-25	Prof. Simon Emanuel
Any year, semester 2	modeling environmental systems	Lecture + project	3	_	2	1	0	15-25	Prof. Efrat Morain
Semi-Required courses (at least two of these eight courses, at least 6 credits)									
Any year, semester 1	research methods in oceanography	Lectures, project, hands-on learning	4	—	A week long course at the IUI			20-25	Dr. Adi Torfstein, Dr. Yeala Shaked, Prof. Hezi Gildor
Any year, 2 semesters	paleooceanography and global change	Lecture	2	Intro to oceanography Intro to geochemistry	2	0	0	8-12	Prof. Yonathan Erez, Dr. Hagit Pnina-Afek, Prof. Yair Rosental
Any year, semester 2	paleoceanography	Lectures, project, hands-on learning	4		A week long course at the IUI			15-25	Dr. Adi Torfstein
Any year, semester 1	physical oceanography (84810)	Lectures, project, hands-on learning		Intro to oceanography	A week long course at the IUI			15-25	Prof. Hezi Gildor, Prof. Yossi Ashkenazi
Any year, semester 2	physical oceanography (84831)	Lecture	3	-	2	1	0	3-5	Prof. Hezi Gildor (TA Hadar Berman)
Any year, semester 2	biogeochemical and biological oceanography	Lecture	3	Intro to oceanography	2	1	0	6-9	Prof. Yeala Shaked
Any year, semester 2	Advanced Biostatistics	Lecture	3	-	2	1	0	20-40	Prof. Liran Carmel
Any year, semester 2	Workshop on English Usage for Graduate Students in Earth Sciences	Lecture	1	-	1	1	0	10-18	Prof. Carynlisa Haspel

Table 2 (Continue). The Study Program: MSc in Oceanography (with Thesis)									
Year Semester	Course Title	Course type	No. of Credits	Prerequisites for Admission	Weekly Teaching Hours	Weekly Exercise Hours	Weekly Laboratory Hours	No. of Students	Teaching Staff Name of staff member
Elective courses (Partial List, out of 30 courses)									
Any year, semester 1	biology of the coral reef	Lectures, project, hands-on learning	7	—	A week long course at the IUI			25	Dr. Dan Yechernov, Prof. Maoz Fine
Any year, semester 2	environmental microbiology	Lecture	2	General Microbiology	2	0	0	10-15	Prof. Shimshon Belkin
Any year, semester 1	advanced topics in water waves: From theory to experiment	Lectures, project, hands-on learning	3	—	A week long course at the IUI			25	Prof. Hezi Gildor, Dr. Yaron Toledo, Prof. Dan Liberson
Any year, semester 2	marine isotope biogeochemistry	Lectures, project, hands-on	4	—	A week long course at the IUI			25	Prof. Mark Altabat, Dr. Adi Torfstein
Any year, semester 2	quantitative methods in marine ecology	Lectures, project, hands-on	7	Statistics	A week long course at the IUI			25	Dr. Kiflwali, Dr. Belmaker, Prof. Genin
Any year, semester 1	plankton biology and ecology	Lectures, project, hands-on	6	—	A week long course at the IUI			25	Prof. Amatzia Genin, Dr. Bracha Farstey
Any year, semester 1	biology and systematics of marine invertebrates	Lectures, project, hands-on	4		A week long course at the IUI			25	Prof. Yehuda Benayahu
Any year, semester 1	marine microbiology	Lectures, project, hands-on	7	General Microbiology	A week long course at the IUI			25	Prof. Oded Basa' Prof. Aharon Oren, Dr. Miguel Frada
Any year, semester 1	marine photosynthesis	Lectures, project, hands-on	6		A week long course at the IUI			25	Prof. Berman-Frank, Dr. Tchernov, Prof. Nir Keren
Any year, semester 2	geology and geophysics of the marine environment	Lectures, project, hands-on	4	Intro to geophysics	A week long course at the IUI			25	Prof. Arnotz Agnon
Any year, semester 2	Classic papers in Earth Sciences	Lecture	2		2	0	0	10-15	Prof. Hezi Gildor, Prof. Oded Navon
Any year, semester 2	geochemistry of radioactive isotopes	Lecture	3		3	0	0	8-12	Prof. Mordechai Stein
Any year, semester 1	stable isotope geochemistry	Lecture	3		3	0	0	8-12	Dr. Hagit Pnina-Afek
Any year, semester 1	ecology advanced level	Lecture	5	Intro to Ecology	3	1	1	20-30	Prof. Ran Natan, Prof. Ronen Kadmon
Any year, semester 2	Chemical Oceanography	Lecture	3		2	1		3-6	Prof. Boaz Lazar
Any year, semester 2	mathematical methods in scientific models	Lecture	2		1	1	0	4-8	Prof. Natan Paldor

F. *Does the study program provide courses to other units?*

We do not provide service courses at the Institute of Earth Sciences. But our courses are open to other programs at HUJI. Also, our courses at IUI are open to all universities.

G. *Internationalization: are there any international features in the department (e.g. student exchange, courses in English or other foreign languages, etc.)?*

We provide English **teaching** upon request when a foreign student expresses his desire for that. Some of our teachers regularly teach in English (**e.g.,** Affek, **Frada**), **and two leading USA scientists -** Yair Rosenthal (Rutgers), Mark Altabet (U. Massachusetts) - teach courses at IES and IUI, respectively. In addition, for the last 3 years the primary course of the IUI – "Introduction to the marine system of the Red Sea" – has been taught in English. This course is regularly given at IUI in two rounds each year IUI, one in English and one in Hebrew. About half of the students in the English round of this course are from Dalhousie University, as part of an ongoing collaboration between IUI and Dalhousie University. During the summer, a corresponding group of Israeli students participates in a reciprocal course in Canada. In both cases, the students receive credits for participation in these courses. Seminars in the ocean-atmosphere series and at the IUI are given in English.

An additional aspect of internationalization is visiting foreign students and scholars who come to conduct experiments or learn new techniques in our laboratories under guidance of our faculty members.

H. *If so, how is the quality of the international elements assured? If there is student exchange, what are the mechanisms for recognition of the students' courses taken abroad?*

The Faculty of Science employs an officer to handle this issue. They consult with the Chair of the study program and relevant specialists as the case may require.

I. *Specify what bodies are responsible for the planning and managing of the study program. What are the mechanisms responsible for introducing changes and updating the study program, and how do they operate. If fundamental changes have been made in the study program during the last five years, please specify what they are.*

The program instructors meet periodically. New courses are proposed by instructors to the Chair and have to be approved first through an internal discussion by program members and then by the Faculty of Science.

J. *Describe the mechanism for coordinating and examining the contents that are, in fact, being taught, if such a mechanism exists.*

The examination is up to the program chair, and no mechanisms are stipulated.

K. *Are non-academic bodies involved in the running and the activities of the parent unit and study program? If so, what are these bodies and what is the mutual relationship between them and the leadership of the parent unit (for instance, the mutual relationship between the Business School and the Manufacturers' Association or Industrial Factories)?*

Ad-hoc but extensive collaborations between the IES faculty and governmental research institutes involve the co-advising of our graduate students. These institutes include mainly the Geological Survey of Israel, but also Israel Oceanographic and limnological Research. The students are allowed to use the laboratories of the governmental institutions and are often granted scholarships from them.

L. To what extent does the department collaborate with other departments within/outside the institution?

The department collaborates extensively with the Inter-University Institute in Eilat (IUI). Our members instruct courses there, including inter-university courses. We encourage our students to take some of their course work at IUI. Our program's chair is permanently a member in the Teaching Committee of IUI. Our parent unit - the Institute of Earth Sciences - is a member in the MERCI - The Mediterranean Sea Research Center of Israel. We aim at developing activities in the Mediterranean in addition to the Red Sea programs in collaboration with Ruppin College (Michmoret) and/or Haifa University.

Numerous courses from other departments (mainly physics, chemistry, life sciences) are available as elective courses to our students, e.g. in fluid mechanics and nonlinear dynamcis.

M. I*n summary, to what extent has the program achieved its mission and goals? What are its strengths and weakness?*

Students that graduate our MSc program are highly qualified for PhD studies, as indeed many of them choose to pursue. Similarly, they are attractive candidates for jobs in the private sector. Yet our program is small in numbers, and the small number of students dictate a limited number of specially designed courses.

We surmise that the modest enrollment stems from three main reasons:
(2) We are at a disadvantage due to the distance from the sea shore. Comparing to other campuses in Israel, Jerusalem is far from coasts and jetties.
(3) HUJI does not have a research unit focused on ocean sciences. As a result, our faculty members come from two institutes, Earth sciences and Life sciences. As a result, the teachers are promoted within their respective institutes, according to the criteria and priorities relevant to these institutes. Also, our undergraduate programs are split in a way that does not give the students a sense of a coherent discipline. Most students major in the joint Climate-Atmosphere-Ocean program and some take the Marine Science minor. Unless IES returns to the previous structure of major in Atmospheric Sciences and a minor in Oceanography, we should take steps to better expose the undergraduate students of the Climate-Atmosphere-Ocean and Geology majors in IES to the program, as well as other majors from the university (biology, chemistry, physics, computers).

(4) The small number of faculty members prevents us from offering fundamental oceanography courses on an annual basis. Budget limitations prevent us from hiring external lecturers, as has been common in the past.

Chapter 2 - Teaching and Learning Outcomes

Teaching

1. A. Does the institution have a structured system for evaluating teaching (e.g. peer reviews; students survey etc.)? Please provide a brief description.

2. How are results of the evaluation activities used? How are negative findings addressed? How are excellent teachers rewarded?

At HUJI, a web page for student feedback opens for each course towards the end of the semester. Instructors are required to encourage student's participation. An anonymous online evaluation form is sent to each participant in the course. The form includes multiple-choice questions as well as open format questions. The results are compiled into a single file which is circulated to the teachers of the course and the head of the program. The students also grade various aspects of the course: the teaching level, difficulties they encountered, how appropriate the work load was, level of TAs, what their general impression of the course is, etc. Filled forms must be submitted before the students get their final grade in the course in order to avoid biased answers based on the course grades. Since the transition from written to on-line questionnaires (about a decade ago), student participation has decreased, especially for courses with multiple lecturers. Due to this reason we think that the questionnaires tend to over-represent students that were either particularly happy, or particularly unhappy with the course.

The results of these surveys are sent to the instructors and are also checked by the head of the teaching program. In a case of severe criticism by the students, the head of the program meets the teacher in question to discuss the students' remarks and possible means to mitigate the problems. Top instructors are listed in the faculty web-site and their names are posted in several locations on campus, but other than that, we do not currently have a reward system for excellent teachers.

We also use these evaluation forms to refine courses and improve the personal teaching capabilities of the teachers. Teaching evaluation reports of faculty member coming up for promotion/tenure are requested by the Faculty and the HUJI. The decisions of the Promotion and Tenure Committee (Faculty/University level) are very much influenced by negative reports on teaching.

IUI has its own evaluation system (results presented below), where all the students fill a detailed online questionnaire toward the end of the course. We chose to show the grading of some of our teachers and courses by using the IUI evaluation system, since the student numbers in these courses are high (20-25) and hence the average scores are more representative than those at HUJI (where very few students fill the evaluation forms). The IUI ranking is between 1 and 10 and as seen in the table below the ranking varies between courses and years. We take seriously the comments raised by the students and use them when planning the next year course.

Course	HUJI/IUI Teachers	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
Ecosystem of the Red Sea	Shaked, Genin, Torfstein (independently)	8.3	9.2	9.3	9.3, 9.3	8.8
Methods in Oceanography	Erez, Lazar, Gildor, Shaked, Torfstein	8.8	9.1		7.4	
Topics in physical oceanography	Gildor	8.1	6.7	7.1	8.3	7.8
Advanced topics in physical oceanography	Gildor	7.6				
Nutrient biogeochemistry and uptake	Shaked			8.9		
Plankton Biology	Genin	9.5	7.2	8.1		8.8
Introduction to Marine Geology & Geophysics	Agnon	8.8	8.9	8.3		9.0

Does the institution have a center for enhancement of teaching? If yes, do all faculty members (including adjunct faculty) participate in its activities? Please provide a brief description. If not, does the institution offer the teaching faculty systematic activities (courses/in service/training/guidance) in order to improve the quality of teaching? Do all faculty (including adjunct faculty) participate in these activities? Please provide a brief description.

At the university level, the Teaching and Learning Center offers (free of charge) workshops on various subjects, including: Powerpoint and alternatives tools; Moodle; Writing exams; Teaching large classes; Teaching multicultural classes. The attendance of these workshops is on a voluntary basis, expect of new faculty members (see below), teachers are not required to attend these workshops.

Do new faculty members receive special support for teaching (preparation seminar, guidance, etc.)? Is there a mentoring program for new faculty (regarding their teaching)? Please specify.

New faculty members are required to attend an introductory two-day workshop, focusing on:

1. Improving frontal teaching by designing lecture structure and using dynamic elements.

2. Avoiding unnecessary conflicts with students by setting clear demands and exercises and demonstrating common goals for students and teachers.

3. Excellence encouragement and efficient use of advisory time to lower first year drop-out extent.

4. Sensing the "pulse" of the class and identifying individuals that contribute or disturb teaching.

5. Planning the course. Planning the whole process, from a single lecture to a complete course program, including tasks.

Are new faculty entitled to reductions or are they excused from teaching in the beginning of their employment?

While no official policy has been formulated at the university level, new faculty are typically given a reduced teaching load during their first years at HUJI.

B. If a structured system for evaluating and improving teaching exist at the department level as well, please provide an answer according to question

Not applicable

C. To what extent do the methods applied to assess and improve the quality of teaching achieve their goals?

Not applicable

We are hardly at a position to assess the improvement.

Learning outcomes

1. *What are the program's intended Learning Outcomes (LO)? How were they set and where are they stated? Are LO defined in the course syllabi? Please refer to each track and each degree level separately.*

The knowledge, skills, and abilities that our students attained in the oceanography program (the learning outcome, LO) evolved over the years as a product of the tremendous development in the field in general and the scientific development of the IES within the HUJI in particular. The LO vary between undergraduate and graduate students. Our faculty members teach few classes to undergraduate students of earth sciences, which provide an overview of the field (such as *Introduction to marine sciences*) as well as hand-on training (such as *Introduction to practical oceanography*). The undergraduate studies were planned to be comprehensive enough to allow our graduates to succeed in graduate studies in any other leading university.

In the graduate program students are require to take more specific courses. Few of them aim to give the student general knowledge in the field, while others aim to prepare him for his specific research project. The graduate program relies on close tutoring by the advisors in order to improve the research skills of the student.

LO are defined for each course and are specified in the syllabus. As an example, the aims for the general *Introduction to marine sciences* are:

1. Learn about geological, chemical, physical and biological processes that occur in the ocean, their observation, and their quantification.
2. Learn about the ocean's role in climate and what we understand about oceanic climate change.
3. Become "Ocean Literate": you will have the knowledge and skills to comprehend discussions on the oceans from sources such as newspapers, the IPCC report summaries, the RealClimate blog, and popular science magazines (e.g. Scientific American).

For more specific courses, such as Physical oceanography, the aims are:
1. Acquire basic knowledge in physical oceanography
2. Understanding of basic equations that describe various physical processes
3. Learning basic methods for problem solving

As mentioned above, the LO is a natural evolution stemming from the general views of the teachers on the important issues in the field, and the developments in oceanography. We discuss these issues in our faculty meetings, and by our teaching committee.

2. Describe the methods applied to measure Learning Outcomes according to the following:

A. Examinations and exercises

1. Describe the method of examinations and their character, the relative weight of each type of examination in the program (written/oral/open/multiple-choice etc.).

We use all types of exams depending on the nature of the course. Written exams are the most common type of examination. This exam encompasses all the information and knowledge provided during the course. Typically, but not always, emphasis is given on testing the students understanding of the material rather than how well he remembers the details. Accordingly, details such as equations, specific names and so on, may be provided on the exam form, if relevant. Typically, the final exam counts for 80-90% of the course grade and the exercises and/or midterm for 10-20%. Multiple-choice exams are used mainly in our service courses where large number of students is enrolled. Several courses use mixed written/multiple-choice method of examination.

Students who have been diagnosed with learning disabilities (by the unit for corrective learning), may be tested orally. Orals are also used to grade students that missed their official schedules due to reserve service or sickness. The final exams of graduate students are always oral.

Some courses also include the submission of a written report several weeks after the end of the semester. The specific requirements are also specified in the syllabus. As an example, the grading in the course Introduction to practical oceanography is composed of:

Written examination – 30%
Presentation – 10%
Participation – 10%
Research project – 50%

2. Who writes the examinations and exercises and how is their validity assessed?

The teachers with the help of the TAs are responsible for constructing the exams. There is no independent way for checking the validity of the exams. In case of a rare complaint by a student, the issue is reviewed very carefully by the teacher and head of studies. For example, an ambiguous answer in a multiple-choice exam is usually explained and corrected by the teacher (after student's question) already during the exam.

3. Who grades the examinations and exercises? Please describe the feedback given to students, apart from the grade.

The exams and exercises are graded by the teachers of each course, sometimes together with the TAs. In many courses, once in a while a class is devoted to review parts of the assignments.

4. Please present the distribution of the final grades over the last three years in the format of a histogram (in all degree levels)

see below (B5)

B. Written assignments (seminar papers, projects, theses, dissertations, etc.)

1. Describe the types of written assignments and other projects required in the program, their contents and scope.

Written assignments (not homework problems) are quite common in the program either in advanced undergraduate years or graduate courses. IUI courses typically include a written report that is submitted several weeks after the course. This report summarizes the group project performed in the course and is usually ~10-15 pages long. The new undergraduate course "*Introduction to practical oceanography*" also includes the submission of a written report (in addition to an exam and evaluation of the student participation in the course).
The MSc and PhD theses are always independently written compositions that may also contain chapters consisting of submitted and/or accepted and/or published papers in professional journals. A lis of PhD and MSc titles is available upon request.

2. Who writes the assignments and how is the validity of the assignments assessed?

The teachers are responsible for constructing the written assignments and train the students how to fulfill these assignments. The general structure of the written assignments is discussed in curriculum meetings and small group-discussions of relevant teachers. There is no central body that checks the validity of every written assignment.

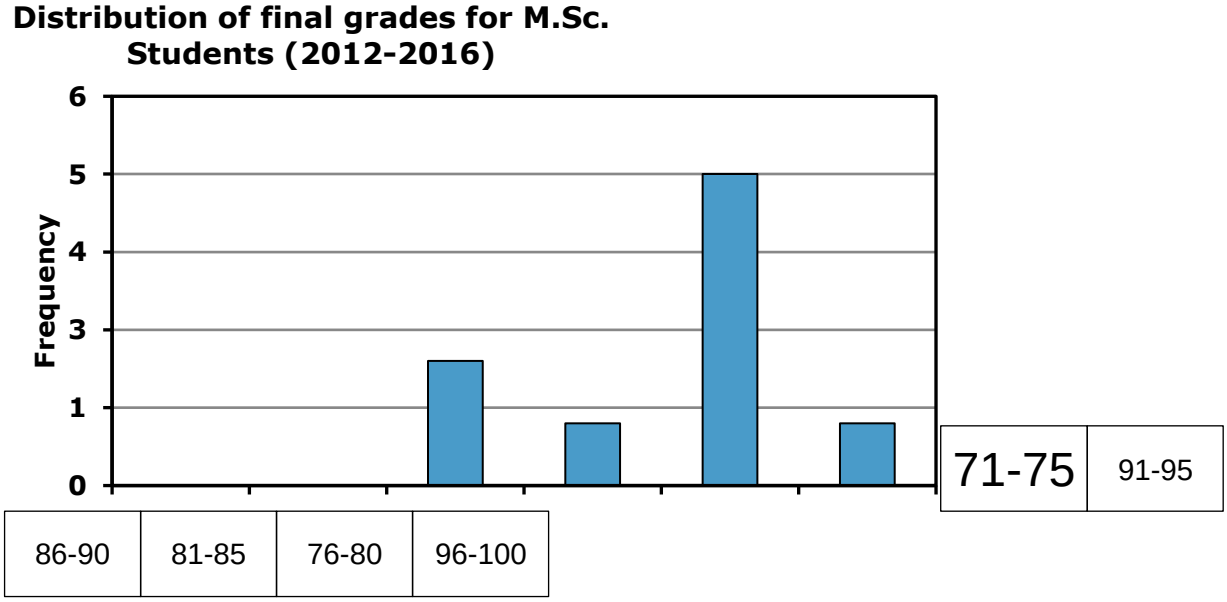
3.Who grades the written assignments?

Most written assignments are evaluated both by the teachers and the TAs.

4. What methods are applied to evaluate written assignments and projects? What kind of feedback, apart from the grade, is given to the students?

Occasionally, we allow students to improve their assignment. Therefore, following the initial submission of the assignment, students who show poor performance are informed about their errors and the need to correct their assignments within an accepted time period (about a week). In such cases, the final grade is given after submission of the corrected assignment. In courses that require a submission of a written assignment prior to giving a lecture, the assignments are being discussed during the student's seminar in front of the whole class.

5. What is the average grade given to the graduates of the program in the final project/ final seminar/thesis in each of the last three years? Please present (in the format of histogram) the grades distribution of the final project/final seminar/thesis.



C. Training and field work

4. 1. Describe the training/field work required in the program, their contents and scope.
Please provide us with a list of places of training including the number of students in each place.

Currently, each undergraduate student is required to take a course in "Introduction to practical oceanography". This course is aimed at providing the students with a hands-on experience of oceanographic work and its core is a 3-4 day camp at the IUI that includes an oceanographic cruise during which the students sample a seawater profile with a rosette and Niskin bottles, evaluate real-time CTD data, and sample short sediment cores using a multi-corer deployed from the RV. The samples are processed in the IUI labs, including chl-a analyses, pH, oxygen, and carbonate contents of the sediments. Given the length of the stay at IUI, each student group cannot develop a research project based on the samples they collect. Hence, each group of ~3-4 students performs part of the analyses and the results are combined. Then, they are evaluated in the context of a very large data set of oceanographic CTD data and nutrient contents collected over more than a decade in the Gulf of Aqaba, and each group develops an appropriate research question. Handling such large data sets

provides added value in the form of gaining significant experience working on the ODV software. The students present their preliminary concepts on the last day of the camp and based on a joint discussion, prepare a summarizing report which they submit a few weeks later.

For some students this is the only actual lab/field training, but others take additional courses at IUI. All courses at the IUI involve field work, and the students are exposed to additional and more extensive "real life" experience in longer courses (up to 10 days long each). It also provides students with an opportunity to interact closely and talk to leading experts in that field (in Israel, from outside HUJI and sometimes from abroad) and also get to know students of their age/status who are interested in the same field.

Graduate students do not have a mandatory course that includes hands-on experience, but if they had not taken such a course before, they are required to take at least one of the IUI courses. In addition, their graduate research involves more specific experience, whether it is lab work, field/ocean sampling, or modeling.

2. ***What methods are applied to evaluate training/field work? What kind of feedback is given to the students?***

In courses which include field and lab work we maintain a low ratio between the number of teachers and TAs, and the number of students. As an example, the course "Introduction to practical oceanography" is given by three teachers and one TA, while the typical number of students is between 18-24. In the practical part of "Topics in physical oceanography", there are two teachers and three TAs, while the number of students is limited to 24.

3. Please specify the number and percentage of graduates who graduated with honors.

During recent years, 2 out of 10 students graduated with an average >95, which is considered to be the marker of excellence in the Hebrew University.

4. Other - any other methods applied to measure the achievements of the students.

N/A

D. In summary, to what extent have the methods applied to measure the teaching and learning outcomes achieved their goals? Do you think that the intended LO were achieved by the students?

Overall, we think that some LO are achieved. This is manifested in the number of high ranking scientists of the Geological Survey, IOLR, and faculty at the many universities within Israel and abroad, that received their training within our program. Yet the inability to guarantee hands-on experience to all students, and years when basic courses are cancelled undermine a full achievement of objectives.

Chapter 3 - Students

Admission, Acceptance process and graduation

A. What are the entry requirements/criteria for the program (advanced degrees including "on probation" status)?

The MSc program:

The MSc program accepts undergraduate students with a minimal BSc average grade of 85 or equivalent in natural sciences from one of the recognized universities. The studies committee of the Earth Sciences with consultation with the head of the program evaluate and can accept students with lower BSc grades, ranging between 80 and 84.9. Student with insufficient background are accepted after fulfilling completion courses (for which they receive no credits) as outlined by the teaching committee. Depending on the background of the student, the completion studies may last up to four semesters (e.g., in the case of a Humanities student with no training in basic sciences). Basic knowledge in oceanography, equivalent to "Introduction to marine sciences", is required. Students are permitted to complete this course during their first year (but it would not contribute to the required quota of credit points).

B. In the format of a histogram, please present the range of psychometric test scores or the equivalent and the range of matriculation averages of the students that were admitted to the program in the last five years. If there is a discrepancy between the admission criteria and the de facto admission data, please elaborate.

Not applicable, as we report only on MSc students with an average grade >85.

C. Please submit data concerning the number of students in the format of table 3 (in the excel appendix) in the last three years (divided by degree) as follows: a. Numbers of applicants; b. number of admitted students and students admitted on probation; c. number of students who started studying in the program

The number of applicants and admitted students for the master program is highly variable between the years, depending mostly on the availability of the faculty mentors, which in turn fluctuates in response to research grants and size of research groups.

In addition to Table 3 (next page), we present in Table A the number of graduate students and post-doc in our program for a longer period of time.. These data indicate a stable number of students over the last 6 years and a recent increase in post-docs (mostly from abroad). In the bottom of Table A we included all the graduate students and post-docs who conduct oceanography related research under the supervison of our 6 active faculty (dedicating >70% of their research and teaching time to the program) and 4 other members (who dedicate 10-30% of their time to the program). It is clear that the actual scope and activity of our faculty is not reflected by the enrolment to the program.

Table A

Students and post-docs registered in the Oceanography program

	2012	2013	2014	2015	2016	2017
MSc	3	6	9	10	10	10
PhD	11	9	8	8	9	10
Post-doc	0	1	0	2	2	3

Total number of students and post-docs conducting Oceanography related research (including those registred in other programs)

Year	2012	2013	2014	2015	2016	2017
MSc	6	10	15	15	18	15
PhD	14	15	16	17	19	20
Post-doc	3	5	4	3	3	6

Table 3 - Student Registration

Academic Year

		2013/2014	2014/2015	2015/2016
MSc	Applicants	10	8	4
	Admitted	5	4	2
	Admitted on Probation			
	Enrolled	5	4	2
	Total number of students	9	10	10
PhD	Applicants	NA	NA	NA
	Admitted	1	1	1
	Admitted on Probation			
	Enrolled	1	1	1
	Total number of students	9	8	8

Students and post-docs registered in the Oceanography program

	2012	2013	2014	2015	2016	2017
MSc	3	6	9	10	10	10
PhD	11	9	8	8	9	10
Post-doc	0	1	0	2	2	3

Total number of students and post-docs conducting Oceanography related research (including those registred in other programs)

Year	2012	2013	2014	2015	2016	2017
MSc	6	10	15	15	18	15
PhD	14	15	16	17	19	20
Post-doc	3	5	4	3	3	6

Outstanding students can choose, under approval of mentors, to transfer to PhD program without finishing the thesis, typically after they present their research proposal to their advisory committee and upon completion of the needed course credits for an MSc (32 points). Upon passing to stage B of the PhD program, they are entitled to and MSc degree. These students appear in the lists as PhD students, although they formally registered as MSc students, causing minor mismatch between the data provided by the faculty (and entered in Table 3) and the data entered in our Tables above that are based on the individual student records kept by the IES secretary.

D. Describe the selection and admission process, the criteria of advancement from year to year and for completion of the studies, including the requirements for being entitled to receive an academic degree.

The head of the program reviews applications under the criteria listed in Answer A above. She notifies the students of her decision. The head and the mentor(s) agree on an advisory committee that escorts the student along the study. The advisory committee comprises the mentor(s) and 2-3 other faculty members. Members of the advisory committee can be from another university or from a governmental research institute (e.g. IOLR and Geological survey). The student has to propose to the committee a course work program equivalent to 32 credit points within four semesters.

In order to receive a master degree the students have to fulfill the following requirements:
1. Submit a research proposal (10-15 pages) after two semesters and defend it in front of the advisory committee (15% of the M.Sc. grade).
2. Pass the courses with minimal average grades of 70/100 (40% of the M.Sc. grade).
3. Conduct a research project and submit a final thesis (up to 100 pages) to the committee for grading (30% of the M.Sc. grade).
4. Defend the thesis in a final exam in front of the advisory committee (15% of the M.Sc. grade).

E. Is there a policy of affirmative action and standards for the admittance of candidates? If so, please describe. How are the admission criteria decided upon, and to what extent are the criteria and procedures for admission related to the aims of the program? What have been the lowest admission data (psychometric score and matriculation grades) to the program?

No. We do, however, encourage minorities (Women, Arabs, Ethiopian, etc) to apply for specific fellowships from the Ministry of Sciences and Technology.

F. What is the drop-out rate of students from the program in each of the study years over the last five years, provide the information in the format of table 4 (in the excel appendix).What are the reasons for their leaving (academic/other)? Is there satisfaction with the drop-out rate? If not, what steps does the unit take in order to change it?

Our dropout rate is very low as shown in the Table below. There were some cases that the students did not find the research topic or methodology appealing or did not fit in the research group. These rare cases happened in the first semester or at most the first year of study. The main mechanism to reduce dropout rate is to provide the MSc and PhD students as much knowledge and acquaintance as possible with their future research and mentors. This is often done through summer projects, where the perspective students conduct an hourly-paid small scale research of 1-2 months. HUJI and IES assist financially with scholarships for some undergraduate students who consider enrolling in MSc programs and wish to conduct such project.

Table 4: Dropout by level in the program

	2012	2013	2014	2015	2016	2017
MSc	0	1	1	0	0	0
PhD	1	0	0	0	0	0
Stage	1st semester	1st year	1st semester			

Students and research

A. Undergraduate students

Not relevant as the evaluation is of the graduate program. However, undergraduate students have the possibility to study for a major in the Climate-Atmosphere-Oceanography program. Undergraduate students may also study for a minor in Marine Sciences (in addition to their major, e.g., in Geology, Biology, etc.).

B. Graduate program

Is the graduate program structured (both MA and PhD programs)? Please specify.

The study programs is structured where both MSc and PhD studies involve specified amount of coursework, a research project, and thesis writing. An official is in charge of monitoring the complience of the program to the stipulations. For PhD students, the official is the Head of Research Student Authority of the Hebrew University. For MSc students, the official is the head of the Oceanography program. In both cases the student is required to find a mentor (or mentors as the case may be). The relevant official appoints two or three experts (preferably faculty members, not necessarily from the Hebrew University) to form an advisory committee attended by the mentors and headed by the chief mentor.

The PhD program is highly structured and closely monitored by the Authority for research students (http://www.research-students.huji.ac.il/en). The studies of a doctoral student comprise two stages: Stage A and Stage B. The Advisory Committee that approves the course program (12 credits). The committee meets with the student to discuss the research program and the student's capability to carry out independent research and also examine the student's knowledge of the field. Admission from Stage A to Stage B occurs once the committee made sure that the topic and the research questions have been composed, that there is a preliminary conviction of preparedness for the thesis and that there is a reasonable feasibility for a worthwhile doctorate upon completion. Summing up the research leads into professional papers and at least one paper is included as a chapter in the theses of most PhD students.

The MSc coursework scope is of 32 credit point courses. Completion studies are required from students that are accepted with insufficient background in the specific curriculum. The program has a mandatory and an elective core curriculum for part of the degree credits (see below). The students are expected to submit a research proposal (10-15 pages) after two semesters and defend it in front of the advisory committee. The advisory committee has the mandate to approve or disapprove the proposed research. In most cases the committee provides useful input and asks for changes in the research plan. Once completed their research project and course work, the students submit a draft of their final thesis (up to 100 pages) to the committee. The committee carefully read the thesis prior to the final exam, where the students defend their thesis in front of the committee. After the exam the students submit their corrected final thesis to their advisors. Teaching assistantship is considered as part of the training and is offered for the best MSc students. We consider it as an indispensable experience in the general training of oceanography graduate who will continue to academic life.

- ***Are there mandatory courses teaching research skills? (e.g. academic writing in English; qualitative research methods; quantitative research methods, graduate seminar).***

The MSc program was changed several times in the last years. Currently the mandatory courses are: Graduate seminar (each year, 82830, 82853) and Guided research project in oceanography (84890), both designed to provide research skills. Then the students select at least one of the modeling/numerical skill courses: Numerical methods in Earth Sciences (70865) and Modeling environmental systems (70897). Other skill courses such as Advanced Biostatistics (72920), Workshop on English Usage for Graduate Students in Earth Sciences (82851), and Methods in Oceanography (84000) are offered as semi-mandatory, meaning that there is a choice but from a rather limited list.

- ***What is the time frame for the graduate program and what is the average time to graduate de facto?***

The time frame for MSc studies is 4 semesters (2 academic years) and 10 semesters (5 academic years) for PhD. Students typically complete their course work on time within the first or second years. Most MSc students summon their evaluation committee and take the research proposal exam towards the end of the 2nd semester. On some occasions, with consent of the head of studies, MSc students defer the research proposal exam to the 3rd semester (rather than 2nd). Some MSc submit their thesis and meet with the committee for their final exam complete their studies at the end of their 4th semester or several months later (they are allowed until Dec 31st of their 2nd academic year). However, often students take another semester or even two semesters to complete the MSc. Examining the list of MSc enrolled in the program between 2011-2015, we find that most students graduated at the end of their 4th to 5th semesters. Some took longer, up to 6 and even 8 semesters. The reasons for delay are often personal (child birth, active military service, start of a new job), although at times the research scope is too large for an MSc thesis. In such cases the evaluation committee, together with the student and mentors, decide how to end the research in a respectful but timely manner.
The PhD program in managed by the Authority for Research Students who keep track of the progress and timing of the research.

- ***What is the policy regarding exceeding the recommended time?***

There is a rather liberal attitude towards students who drag their research due to academic and/or personal or economic problems. It should be noted however that there is no compromise on the academic standards and the requirements for graduation. A useful incentive for the students to graduate on time is that the financial support from the University in the form of TA salary, which is limited to 4 (MSc) and 8 (PhD) semesters. The duration of the financial support from the mentors in the form of scholarships is more flexible. However, the financial load on the mentor often results in pressure to complete the studies in a timely fashion (although 5-6 semesters are not uncommon).

- ***Is there a departmental seminar? Are graduate students participating in it?***

Due to the small number of oceanography faculty and students at HUJI, we conduct a joint weekly Ocean-Atmosphere seminar that takes place every Thursday. It consists of a ~45-50 minute lecture with ~10-15 minutes of discussion thereafter. Seminar speakers are typically researchers at the faculty level from HUJI and other universities, but graduating PhD students are also invited to present their work in the seminar. Graduate student attendance in this seminar is mandatory. In the case of the faculty and students located at the IUI, a parallel seminar series takes place every Thursday, with similar characteristics and requirements from the students. All the students in the program (MSc & PhD) present their final research results in this seminar (or the parallel seminar at IUI, or in both).

C. How do graduate students (MA and PhD) find an advisor and in what point of their studies? Is there a structured mechanism? Please describe the process briefly.

In all cases the graduate students enroll only after finding a mentor. Hence efforts are dedicated to expose 3rd year BSc students from different Universities to the program and the mentors. The hubs for most of the oceanography graduate program activity, namely IES and IUI, have started running an annual "open day" for potential students. As part of this day, the head of the oceanography program, as well as graduate students from the program, present the program, its advantages, the topics encompassed and the mentors. The head of the program also attends a general open day for prospective MSc students run by the Faculty of Science for additional student recruitment activities. Given the intimate atmosphere of the IES, students and faculty get to know each other during the undergraduate courses or as a consequence of the above mentioned "Supervised Research Project". Occasionally, students (especially from outside the Hebrew University) contact the head of the program and seek his assistance to find an adviser.

D. Are graduate students encouraged to publish? If so, how? Do they receive support for doing so?

Graduate students are definitely encouraged to publish. One of the most distinct indicators of the quality of a student's work is whether it is 'publishable', and one of the most distinct indicators of students' aptitude is whether they manage to publish, i.e., have the capability to run high quality research, summarize the findings and write manuscripts. In the last years we have added a course to assist MSc students in writing, titled: "Workshop on English Usage for Graduate Students in Earth Sciences (82851)"

Many of the mentors spend long hours with the students explaining the basics of paper writing, and then help in the structuring and editing of the paper. We take pride that many of our Msc students are lead authors or involved in a peer-reviewed publication, as exemplified in the Table below

Student name	MSc period	Thesis topic	MSc publication	Career path and achievements
Chana **Kranzler** (advisors Shaked & Keren)	2008-2010	Availability of dissolved Iron to a model cyanobacterium	**Kranzler**, C., Lis, H., Shaked, Y., and N. Keren. 2011. The role of reduction in iron uptake processes in a unicellular, planktonic cyanobacterium. *Environmental Microbiology* **13**: 2990–2999	PhD HUJI (2011-2016) Post-Doc Rutgers 2016- Awarded the prestigious HUJI, PBC, Rutgers & Simons Foundation post doc fellowships
Eyal **Wurgaft** (advisor Luz)	2007-2009	Biogeochemistry of dissolved O_2 in the Gulf of Aqaba (Eilat)	**Wurgaft**, E., O. Shamir, E. Barkan, N. Paldor and B. Luz (2013). Mixing processes in the deep water of the Gulf of Elat (Aqaba): Evidence from measurements and modeling of the triple isotopic composition of dissolved oxygen. *Limn. Oceanog.,* **58(4),** 1373-1386.	PhD HUJI 2009-2015 Post-Doc WHOI 2016- (co-PI on BSF grant) Lecturer, The Open University (starting on 2019)
Maayan **Yehudai** (advisors Lazar, Stein)	2011-2014	U-Th dating of calcitic corals from Eilat: Paleohydrological & paleoclimatic implications	**Yehudai**, M., Lazar, B., Bar, N., Kiro, Y., Agnon, A., Shaked, Y. and Stein, M., 2017. U–Th dating of calcite corals from the Gulf of Aqaba. Geochimica et Cosmochimica Acta, 198, pp.285-298.	PhD Columbia Univ. LDEO 2014-
Yair **Cohen** (advisor Paldor)	2007-2009	Laboratory experiments and a consistent theory for low-frequency waves over a linearly sloping bottom on the f-plane	**Cohen**, Y., N. Paldor and J. Sommeria (2010). Laboratory experiments and a non-harmonic theory for topographic Rossby waves over a linearly sloping bottom on the f-plane. *J. Fluid Mech.,* **645,** 479-496. **Cohen**, Y., N. Paldor and J. Sommeria (2012). Application of laboratory experiments to assess the error introduced by the imposition of "wall" boundary conditions in shelf models. *Ocean Model.,* **41,** 35-41.	PhD HUJI (2010-2016) Post-Doc Caltech 2017 -
Maya **Kremian** (advisor Genin)	2011-2013	Physiological benefits of pulsation in soft corals	**Kremien**, M., U. Shavit, T. Mass, and A. Genin (2013). Benefit of pulsation in soft corals. PNAS. 110: 8978-8983.	
Margarita **Zarubin** (advisor Genin & Belkin)	2009-2011	Bacterial bioluminescence in the sea	**Zarubin**, M., S. Belkin, M. Ionescu, and **A. Genin** (2012) Bacterial bioluminescence as a lure for marine zooplankton and fish. *PNAS.* 109: 853-857	PhD HUJI 2011-2017

Ofer **Shamir** (advisor Paldor)	2009-2011	Mixing processes in the deep water of the Gulf of Elat (Aqaba)	Wurgaft, E., O. **Shamir**, E. Barkan, N. Paldor and B. Luz (2013). Mixing processes in the deep water of the Gulf of Elat (Aqaba): Evidence from measurements and modeling of the triple isotopic composition of dissolved oxygen. *Limn. Oceanog.,* **58(4),** 1373-1386. Paldor, N. and Y. De-Leon and O. **Shamir** (2013). Planetary (Rossby) waves and Inertia-Gravity (Poincaré) waves in a barotropic ocean over a sphere. *J. Fluid Mech.,* **726,** 123-136.	PhD HUJI 2011-2017
Hagar **Lis** (advisor Shaked)	2007-2009	Iron uptake mechanisms in marine phytoplankton	**Lis** H., and Shaked Y. (2009). Probing the bioavailability of organically bound iron – a case study in the Synechococcus rich waters of the Gulf of Aqaba. *Aquatic Microbial Ecology.* 56: 241-253.	PhD HUJI (2009-2015) Post-Doc HUJI 2015-2017 2017- Research associate HUJI (Life Sci.)

E. How are graduate students supported financially: are there fellowships (full/partial)? Are they funded by the institution or by their advisor (via grants)? What are the criteria for receiving a fellowship?

Financial assistance for graduate students: Students that finished their BSc with a minimum grade of 90% appear on the "Dean's List" and are eligible for awards (up 100% tuition for a determined percentage of the top students from the list). Students finishing their MSc within the second year and their grades are within the top determined percentage are eligible for second year award. MSc students with minimum BSc grade of 87 and most of PhD students are eligible for teaching assistantship (TA). TAs receive also a minimum of 120% stipend from their advisor (this is an obligatory matching for receiving TA appointment). Several stipend sources are available for graduate students every year. Some stipends are specifically allocated for Oceanography, namely the Baster Award and Meirbaum scholarship. The former is aimed at supporting excellent students, and the latter aims to support starting students from outside the IES (e.g., BSc in physics, chemistry, etc.) who cannot TA during their first year of studies. The IES also provides travel support to their graduate students. In addition, several competitive awards are granted every year in the field, and the nominees are selected by the awards committee. The teaching secretary keeps track on every announcement and notifies potential students. At IUI, two competitive stipends (Berko and Chen-Efrat) are awarded each year to excelling graduate students and TAs, respectively. Other support venues are the MERCI travel fellowships to participation in international meetings associated with the ocean sciences.

Student Support Services

A. Describe the system of academic counselling for students before and during the period of study (including reference to the structuring and approval of the study curriculum).

Before the beginning of each academic year the head of the program set aside days for counselling to help students compile their course-work schedule for the year. The open students/faculty relations in our program encourage the students to directly approach their teachers (senior faculty members and TAs) for counseling. This is usually conducted on daily basis, by ad-hoc appointments.

B. Do students with special needs receive special support? If so, please specify.

There are a number of facilities available for HUJI students with special needs. A description of them is available for students on the web (Dean of Students Office or direct link: http://studean.huji.ac.il). We follow HUJI teaching and exam guidelines regarding students with learning disabilities, including difficulties in Hebrew.

C. Are counselling and assistance provided to students with regard to possible directions for their future professional careers? If so, describe these procedures. Are there work placement services for the graduates? If so, please describe this activity.

There is no formal mechanism in the program for help in job hunting. However, researchers from HUJI, IUI and other universities and companies that have openings in Earth and Ocean Sciences (e.g., prospecting, environmental assessment, etc.) are advertising on the Earth Sciences Institute's board and website (http://earth.huji.ac.il/; Only in the Hebrew version). Research related advertisements (technicians, Msc, PhD, post-doc etc.) in basic and applied ocean and aquatic sciences are also distributed through the mailing list and website of the Israeli Association for Aquatic Sciences (IAAS ; www.israelaquatic.org.il). Openings for marine geologists as well as for general research and scientific administration positions are advertaized at the site of Israel Geological Society (http://www.igs.org.il/announcements). The annual meetings of these societies enable our graduates to informally interact with academic researchers and non-academic professionals. We encourage our graduates to present annually at least in one conference in Israel, preferably the IAAS, but also IGS (Israel Geological Society), ISEES (Israel Society for Ecology and Environmental Sciences), ISM (Israel Society for Microbiology) and others. All these societies keep mailing lists and post job advertisements on their websites (www.isees.org.il; www.ism.org.il). Since the community is small, many of the jobs are distributed through a word of mouth and our ability to guarantee that many of or graduates are of top quality assist in their future job placement.
Many of our students have mentors from one of the research institutes associated with the Ministry of Infrastructures, namely the Geological Survey of Israel (GSI) and Israel Oceanographic and Limnological Research (IOLR). Often these joint mentorships lead our students to jobs in these institutes.

D. Does a monitoring mechanism of the progress of graduate students' research exist? please specify.

The advisory committees and, in particular, the mentors see to the proper progress of the research. The committees normally meet once a year, whereas the mentor is responsible for continuous monitoring.

E. What are the mechanisms that deal with student complaints? Please provide a list of students' complaints over the last two years and the way they were resolved.

Student complaints are submitted to either the faculty or the program's secretary, and they are passed on to the head of studies and if needed also to the Institute's chairperson. The open student-teacher relations that are a characteristic of the IES and the open door policy of the program's heads and secretary are very useful in solving most of the complaints "in-house". Complaints, which involve faculty members or TAs, are clarified and rectified together with them. If a student finds the "in-house" action unsatisfying, he/she is entitled to approach the Faculty's teaching committee for carrying on his complaint. In addition, as described above, most complaints are submitted during the informal meetings conducted by the IES Head and all program heads. These meetings are conducted each semester for three separate groups: first year students, second and third year students and graduate students (and TAs). This is has proved an effective instrument for hearing complaints and discussing the solution mechanisms directly with the students. The Dean of Students acts as the ombudsman for student complaints. Students who have been sexually harassed can contact the Ombudsman for Cases of Sexual Harassment at the Dean of Students office.

F. What financial assistance is provided to students with financial problems and to outstanding students? What other types of financial support is available to students?

Please see above in "Student and Research" section E

Alumni

A. Do the institution and/or the department maintain contact with their alumni, employers, and employment market?

The program has no official policy for keeping track of the alumni that are in the general labor market. Nonetheless, given the small size of the oceanographic community in Israel we know of many of our alumni due to personal contacts with faculty members, as detailed in the next section. The small size of the community means that we are often approached by both employers and former students asking for recommendations and reference letters. As stated above in "student support services" section C, conferences, mails and board-posting are efficient ways to link between employers and graduates.

B. Please specify the extent of integration of alumni into the labor market: where have they found employment, what positions do they hold, how much time has elapsed between graduation and employment

Our alumni hold jobs in universities, teaching colleges, governmental bodies (Ministry of Infrastructure and its research institutes - Geological Survey, Israel Oceanographic and Limnological Research Research, and Geophysical Institute, Ministry of Environmental Protection, Ministry of Transportation), Nature conservation agencies, high school teaching positions, professional positions in the energy and mineral industry in Israel and abroad (e.g., the new offshore gas fields, Israel Energy Initiative, phosphate and potash industry, geophysical survey companies abroad), military and police forces (e.g., intelligence and forensic units), owners and employees of environmental assessment companies, and environmental NGO's and associations. We provide here a partial list of the Hebrew University graduates who are currently involved to some degree with oceanography, limnology or related field.

Universities & colleges	Graduates of the Hebrew University and/or Oceanography program
Hebrew University & IUI	Prof. Amotz Agnon (MSc - 1983) Prof. Boaz Lazar (MSc - 1977, PhD – 1982) Prof. Boaz Luz (MSc - 1970) Dr. Ori Adam (PhD – 2011) Prof. Jonathan Erez (MSc - 1972) Prof. Aharon Oren (PhD - 1978) Prof. Amatzia Genin (MSc – 1981, phD-1987) Prof. Yeala Shaked (PhD – 2002) Dr. Adi Torfstein (PhD – 2008) Dr. Yoni Goldsmith (BA - 2007, MSc - 2011), will start in 2019
Ben Gurion University	Dr. Orit Sivan (MSc - 1997, PhD - 2003) Prof. Osnat Gilor (PhD – 2001) Dr. Roi Granot (MSc - 2004) Dr. Shmuel Bentov (MSc - 2000, PhD, 2006)
Haifa University	Prof. Dorit Sivan (PhD - 1996) Dr. Revital Bookman (Kantor) (MSc - 1996, PhD - 2003) Dr. Dan Tchernov (PhD – 2001) Dr. Tali Mass (PhD- 2010) Dr. Daniel Sher (PhD – 2005) Dr. Nicolas Waldmann (MSc - 2002) Dr. Uri Shatner (BSc– 2000)
Bar Ilan University	Prof. Yishai Weinstein (MSc - 1992, PhD – 1998) Prof. Ilana Berman Frank (PhD 1998)
Michmoret Maritime College	Dr. Gitai Yahel (Msc-1997 , PhD -2003)
Technion	Prof. Debbie Lindell (PhD- 2001)
Tel Aviv University	Prof. Shmuel Marco (MSc - 1990, PhD – 1997) Prof. Roi Holzman (Msc – 2001, PhD -2006)
Open University	Eyal Wurgaft (PhD – 2015); currently post-doc at WHOI, will start in 2019.
Weizmann Institute	Prof. Aldo Shemesh (MSc - 1981, PhD - 1986) Prof. Steve Weiner (MSc - 1972) Dr. Einat Segev (MSc - 2006) Prof. Asaf Vardi (PhD – 2003)

Research Institutions and Government Agencies, NGOS	Graduates of the Hebrew University and/or Oceanography program
Institute of Limnology and Oceanography	Dr. Barak Herut, director (MSc 1988, PhD–1992) Dr. Jacob Silverman (PhD – 2005) Dr. Timor Katz (PhD – 2010) Dr. Ora Hadas (PhD – 1983)
Water Authority of Israel	Dr. Doron Markel (MSc - 1992, PhD – 1999)
Israel Nature and Parks Authority	Dr. Ruthy Yahel (PhD- 2004)
The National Monitoring Program at the Gulf of Eilat	Dr. Yoanthan Shaked (MSc - 1997, PhD - 2002)
Ministry of Environmental Protection	Alon Zask (MSc – 1998)
Ministry of Science	Dr. Moshe Ben- Sasson (Msc - 2008)
Science Museum in Haifa	Dr. Tal Berman (MSc – 1992, PhD – 1999)
Ministry of Energy	Dr. Eran Brokovich (PhD -2009)
Ministry of Infrastructure	Dr. Einat Magal (PhD – 2002)
The Geological Survey of Israel	Dr. Ahuval Almogi-Labin (MSc - 1975, PhD – 1982) Dr. Zohar Gvirtzman (MSc - 1992, PhD – 1997) Dr. Galit Sharabi (PhD – 2017) Dr. Tami Zilberstein (PhD – 2016) Dr. Mordechai Stein (MSc - 1980, PhD – 1987) Dr. Nadav Lansky (MSc - 1997, PhD - 2003) Dr. Eyal Shalev (MSc - 1999) Dr. Ittai Gavrieli (MSc – 1987, PhD – 1992) Dr. Meir Abelson (MSc - 1993, PhD – 1999)

Universities, colleges and government agencies abroad	Graduates of the Hebrew University and/or Oceanography program
Harvard University USA	Dr. Mor Grinstein (MSc - 2006)
University British Columbia	Prof. Marwan Hassan (MSc - 1983, PhD – 1988)
UC San Diego	Prof. Miriam Kastner (MSc - 1964)
UC Santa Cruz	Prof. Adina Paytan (MSc - 1989)
University of Maine	Prof. Emanuel Boss (MSc - 1991) Prof. Lee Karp (MSc- 1991)
Rutgers University	Prof. Yair Rozenthal (MSc - 1988)
USGS - Melno Park, Mizuri	Dr. Shaul Horowitz (MSc - 1994, PhD – 1999) Dr. Alison Hartman (post-doc 2016)
The University of Queensland, Australia	Prof. Salit Kark (PhD 1999)
Aarhus University (Arctic Research Centre)	Dr. Dan Carlson (and CO-PI in the Consortium for Advanced Research on Transport of Hydrocarbon in the Environment (CARTHE)), Norway

C. How many students continue their studies to advanced degrees or other areas (specify area of study and degree level). Relevant surveys would be appreciated.

About 40-50% of the Master students in the program continue to PhD, mostly at HUJI but also in other universities in Israel and abroad. Many of these are excellent MSc students (according to their grades and evaluation of their research progress) who are encouraged after 2-3 semesters to move directly to the PhD program in a direct PhD track. These students receive MSc degree based on an extended report that they submit to their committees and a candidacy exam.

Summary

A. What are the strengths and weakness of the issues specified above?

Strengths:

- The dominance of our graduates in the Israeli academia and industry, as well as abroad.
- A significant fraction of our MSc graduates continue to either PhD programs or find jobs in the private sector.

Weaknesses:

- The very small number of students enrolled in the oceanography MSc program, along with the small number of faculty, themselves usually carrying a joint appointment with a different academic program or located in Eilat, lead to the oceanography program being below a critical mass presence at HUJI. This inhibits activities such as dynamic group meetings, journal clubs, and even seminars and results in student recruitment to the program being even more challenging.

Chapter 4 - Human resources

A. ***Attach Tables 5-7 (In the Excel Appendices) detailing senior and junior faculty, adjuncts (senior and junior), teaching and research assistants, post-doctoral staff members.***

To be attached

B. ***Specify the rules, criteria and procedures for appointing, renewing appointments and dismissals of academic staff, including rules regarding tenure and promotion; what is the standard duration of service at each position?***

As the department has no research function, we do not appoint staff members. Participation in the program is voluntary and informal, and it is open to faculty members in the research units of the Hebrew University. Anybody who teaches in the program is considered a program member, and we invite researchers interested in marine sciences to participate. In practice we have a dominant participation from IES, with an essential contribution from Life Sciences. Teaching assistants in our core courses are appointed by the Head of Studies of IES. Assistant instructors in IUI courses are funded by IUI and assigned by ad-hoc agreements between the course coordinator (our program member) and the IUI teaching officer.

C. ***What steps are taken to ensure that faculty members are informed of these policies and procedures?***

Not applicable to the study program in question, but holds for each instititue (e.g. IES).

D. ***How is the faculty membership divided into areas of specialty in the discipline?***

Faculty members in the oceanography program at HUJI differ in their involvement and commitment to the program. Most faculty share their research and teaching with other programs such as Geology, CAO (Climate-Atmosphere-Oceanography), and Life sciences. In the last years many of the most active and committed members of the HUJI faculty reached retirement age and hence started scaling down their teaching and research activities. In the table below we outline the areas of specialty of our faculty, differentiating between active and retiring faculty and between those who currently dedicate most of their research and teaching to Oceanography and those who are peripheral to the program.

Areas of specialty of the faculty members

Active members (dedicating > 70%)			Less active members (dedicating < 30%)			Nearing retirements and Emeriti	
Prof. Hezi Gildor (80%)	Physical Oceanography- submesoscale processes, ocean mixing Paleoceanography		**Prof. Nir Keren (30%)**	Biological Oceanography- mineral nutrition & photosynthesis in phytoplankton		**Prof. Jonathan Erez (100%) Emeritus**	Biogeochemical Oceanography- biomineralization in foraminifera & corals and links to ocean acidification Paleoceanography
Prof. Yeala Shaked (100%)	Biogeochemical Oceanography- Bioavailability and cycling of Trace elements		**Prof. Hagit Afek (30%)**	Chemical Oceanography- Isotope geochemistry, paleoclimate		**Prof. Boaz Lazar (70%)**	Biogeochemical Oceanography- nutrient dynamics in coral reefs and seawater, water-rock and water-atmosphere interactions
Prof. Amatzia Genin (100%)	Biological oceanography- effect of physics of organism behavior, coral reef ecology		**Prof. Carynelisa Haspel (20%)**	Physical Oceanography- marine optics		**Prof. Nathan Paldor (50%)**	Physical Oceanography- atmospheric and oceanic dynamics
Dr. Miguel Frada (100%)	Biological oceanography- Phytoplankton Eco-Physiology and Diversity		**Prof. Moti Stein (10%)**	Marine Geology- isotope geology and geochemistry,		**Prof. Aharon Kaplan (40%) Emeritus**	Biological oceanography- phytoplankton physiology and chemical ecology
Prof. Amotz Agnon (70%)	Marine geology & geophysics- sea level changes, tectonics					**Prof. Aaron Oren (10%)**	Biological oceanography- microbial ecology
Dr. Adi Torfstein	Chemical & Geochemical oceanography, Paleoceanography					**Prof. Boaz Luz (100%) Emeritus**	Biogeochemical Oceanography- three stable isotope systems as tracers of the biosphere & atmospheric/ocean interaction

F. Please provide the following information regarding gender equality in the department:

- ***How many faculty members are women and what is their percentage in each rank?***

Of our core seven faculty members, one is a woman; of the full 17 members, three are women.

- ***Are there any policies supporting recruitment and promotion of women, in the department or at the institutional level? (e.g. proactive recruitment of woman; affirmative actions; adjusted promotion rules in light of maternity leave etc.) Are there any other activities in that regard?***

Non applicable, see answer to Question B above.

- ***How does the department ensure the dissemination of these regulations and of other activities offered to enhance gender equality (e.g. seminars, special grants and programs, legal rights etc.)***

Non applicable

G. Please provide the following information regarding equality of minorities in the department:

- ***Are there any policies supporting recruitment and promotion of minorities, in the department or at the institutional level? (e.g. proactive recruitment of Arab; affirmative actions; adjusted promotion etc.) Are there any other activities in that regard?***

No, but see answer to Question B above.

- ***How does the department ensure the dissemination of these regulations and of other activities offered to enhance Minority equality (e.g. seminars, special grants and programs, legal rights etc.)***

6. Non applicable, see answers above

- ***What are the department's goals regarding equality in recruitment and promotion of the faculty?***

Non applicable on the program or institute (IES) level.

- ***Is there a person in charge of Arab affaires in the department? If yes, what are his responsibilities? And how does he collaborate with the person in charge in the institution on expanding access for the Arab society.***

Given the unit size, IES does not employ such a person.

- ***Are there any Measures taken by the department to enlarge the representation of the Arab society in the Bachelor & Master degree.***

We endeavor to enlarge overall enrollment. It might be worthwhile to explore possibilities of outreach to potential Arab students.

H. What steps are taken to ensure that staff members are updated, academically and professionally, with regard to the program? Are there professional development plans? Please specify.

The chief means of communication with staff members is electronic mail and occasional faculty meetings. We do not have specific plans as we have no say on recruitment, except in our respective institutes. Within the IES we do voice our desire to encourage recruitments of new oceanographers and marine scientists.

I. What is the definition of the position of the head of the study program? What credentials (experience and education) are required for this position? How the head of the study program appointed and what is the duration of the position?

The Head of Oceanography MSc and Marine Sciences Minor Programs is an informal title - a volunteer to assist the Head of Earth Science study program in matters of marine sciences. Nobenefits are associated with this position (unlike, e.g., for the Head of Earth Science study program). The appointment is made by a general meeting of the Program members. Typically, we appoint a professor. The present head was appointed for 1.5 years (to be over presently) after a ~7 year service of the predecessor, to substitute for the successor (who was on a Sabbatical and is presently stepping in).

J. What is the policy regarding recruiting and absorbing teaching staff (senior / junior/adjuncts) and what are the plans for the future recruitment to the study program? How are these plans made and by whom?

Please see Answer B above. As an integral administrative part of IES we act as individuals to promote recruitments in oceanography, with informal coordination among ourselves.

K. How is full employment defined in the institution for senior and junior staff, and how many hours are they required to teach in each of the study programs?

Full employment amounts to 8 hours of frontal teaching a week, during two semesters with 14 weeks duration each. Teaching in concentrated courses with team projects is computed with each day typically the equivalent of ~ 0.8 hours.

L. Are staff members obliged to serve as advisors for final projects, theses and dissertations? Is there a limitation of a maximum number of graduate students per faculty? Are there criteria for assigning advisors to different research projects?

Formally, no obligations, no maxima. The assignment of advisors to projects is according to their choices and subject to consent of the head of the program.

M. Describe the technical and administrative staff, including the number of staff members and their job descriptions. What kind of support does the technical and administrative staff provide for the academic activity.

Here again the answer to Question B above applies: There are no technical staff members allocated to the program.

N. In summary, what are the points of strength and weakness of the human resources (teaching staff, technical and administrative staff)?

7. *Our main strength is the representation of sub-disciplines: chemical-, biological,- physical-, and geological-* oceanography (in spite of our small number). *The weaknesses are lack of in-HU independent research institute with an over-arching focus on marine sciences.*

Our main weakness is the small number of faculty members. We also suffer from the lack of technicians nor administrative staff members dedicated to oceanography. We anticipate massive retirement in the next 5 years so there will be very little (if any) to report for the next external review committee.

Chapter 5- Research

Due to the difference in character and research efforts of the various programs under evaluation, each institution should handle this chapter in accordance with its stated mission statement.

The Oceanography MSc Study program does not have a direct relation with research, albeit each thesis summarizes the relevant research.

A. *What are the department's special strengths and uniqueness in research?*

We pride ourselves for having a broad basis with representations of chemical-, physical-, biological, and geological-oceanography. We have strong connections with IUI, and our members are involved in state of the art research, published in top journals. We collaborate with international leaders and consider ourselves as the leading edge in several subjects.

B. *What are the research funds (in $) of the study program in the last 3 years (competitive sources (government/non-government), non-competitive public funds, other non-competitive funds (non-government), internal funds, donations) please provide the information by faculty member in the format of table 8 (in the excel appendix).*

Digital Appendix

C. ***Please provide information about the research activities of faculty members (including publications, activities in research centers or other academic bodies and institutions, awards and prizes) from the last 3 years, in the format of table 9 (in the excel appendix).***

Digital Appendix

D. Please list cooperation activities by department members both in Israel and abroad

E. Please detail the research infrastructure of the study program: research laboratories, research centers, specialized equipment and budget for maintenance (level and sources of funding

The main research infrastructure is at the IUI. An external committee for evaluating IUI has been commissioned by the Council for Higher Education and is holding its meetings while this report is being written.

F. Is there a commercialization unit in the institution? Briefly describe its function: number of patents registered and where have they been registered. What is the intellectual property policy of the institution in relation to the specific department?

Yissum (***http://www.yissum.co.il/***): Technology Transfer & IP company Hebrew University Jerusalem. Not applicable to this study program.

G. Which journal ranking does the department relates to when evaluating faculty publications? If the department or institution has its own scale (not international) or another method for evaluating (e.g. peer review) please provide a brief description (and the ranking list if exist).

IES uses ISI-WOS rankings and the Jerusalem Index.

H. *In summary, what are the points of strength and weakness of the research?*

Strengths:

Coverage of disciplines, quality, access to the Red Sea (via IUI), collaborations (internal and external).

Weaknesses:

Distance from sea (relatively to other universities in Israel), lack of oceanographic research unit (compartmentalized administration).

Chapter 6 - Teaching Infrastructure

There is no designated teaching infrastructure associated with the oceanography program. Graduate students use research facilities at HUJI. These facilities are managed and under the responsibility of faculty members, i.e., not associated per se with the oceanography program. In addition, the oceanography program makes substantial use of the teaching facilities available at the IUI. The latter are not owned or maintained by HUJI but are available for use for both teaching of undergraduate and graduate courses, as well as usage by graduate students for their research.

Additionally, the IES maintains close collaboration with the Geological Survey of Israel (GSI), both between individual PIs and on the institutional level. The GSI is located in Jerusalem and will be moving to a new location in the Giva'at Ram campus during 2018, which is expected to further strengthen these working relations. The GSI maintains state-of-the-art laboratories and facilities, including a clean lab, mass spectrometers, SEM etc., which in many cases are used by HUJI graduate students for their research. In many cases, HUJI students are jointly supported and mentored by GSI researchers (roughly equivalent to the MIT-WHOI joint program).

Below, we provide details on the relevant infrastructure available for teaching and graduate student mentoring at HUJI and IUI. This list does not include additional research equipment at the GSI.

HUJI infrastructure:

A. PI-managed research equipment at IES available for graduate student research

- ***Mass spectrometers:***
  - Neptune Plus multi-collector-ICPMS
  - Agilent 7500cx ICPMS
  - Perkin Elmer Optima 3000 ICP-OES
  - Laser Ablation (ASI, SE model), coupled to the ICPMS
  - Bruker Tracer III-V/III-SD Portable X-Ray Fluorescence Spectrometer (XRF)
  - Isotope ratio mass spectrometers. One is used for traditional stable isotope work (O, C, N), a second is used for both traditional, clumped (Δ_{47}) and $\Delta^{17}O$ isotope analyses.
- ***Electron Probe Microanalyzer (EPMA) Lab:*** JEOL Superprobe JXA-8230
- ***Clean lab:*** The clean laboratory is used to prepare samples with pico- to nano molar levels of trace metals for concentration and isotopic composition analyses. Laboratory room surfaces are made of non-corrosive, acid resistant, metal free plastic materials (including floors, cabinets, and benches). It has a monitored positive pressure air supply with HEPA filtration, and has its own clean water supply. The laboratory is composed of several separated working spaces with different degrees of contamination-control.
- ***Electron Probe Microanalyzer (EPMA) Lab:*** JEOL Superprobe JXA-8230
- ***Scanning Electron Microscopy (SEM):*** JEOL JSM6400 Digital SEM with an EDS (oxford) Energy Dispersive X-ray Analyze
- ***Computer cluster for modeling of atmospheric and oceanic Processes:*** The cluster comprises 192 Haswell i7 2.7GHz processors arranged in eight cores of 24 processors each, with each core containing 128GB. In addition, a separate 16-core, 512GB machine is available for big-data processing
- ***Atomic force microscope:*** The instrument is mainly used for studying water-rock interaction at the nano-scale. Nanomechanical properties and magnetic properties of

geological materials are also routinely measured

- ***Confocal microscope:*** The microscope is used for live imaging of biomineralization in calcifying organisms (mainly foraminifera and corals), and allows imaging of fluorescence at a cellular level
- Coral and foraminifera culturing facilities, Automatic alkalinity titrator (Radiometer), Olympus confocal microscope, Leica fluorescent monocular
- HF radar for current measurements
- **Oceanographic equipment:**
  - ADCP (x2)
  - CTD (x3)
  - Thermistor (x6)
  - Two Acoustic release (x2)
  - Microstructure turbulence profiler.
  - Three Glider (x3), shared with WIS, BIU, and IOLR
  - Six Surface drifter (x6)
- ***Four HUJI faculty members associated with the oceanography program are resident scientists at the IUI (Genin, Shaked, Frada, Torfstein) where they manage their labs, which include:***
  - ***Trace metal clean lab (2 labs):***
    - mq water system (x2)
    - prepFAST system for automated chromatographic work
    - UV/vis spectrophotometer
    - flow injection systems for Fe(II) determination
    - Gas Chromatograph, high precision scale
    - pH meter (x2)
    - coulter particle counter
    - portable class 100 HEPA hood for field work
  - McLane PARFLUX automated time series sediment trap
  - KC Denmark sediment traps
  - McLane high-volume in-situ pump
  - General Oceanic trace metal clean sampling Go-Flo bottles
  - *ZOOPS:* optical-acoustic system for in situ zooplankton quantification
  - Camera system for in-situ recording of fish in the coral reef
  - Current meters
  - Oceanographic buoy
  - Flow cytometer (Attune- Life Technologies)
  - Epifluorescence Microscope (Nikon)
  - Bench-top Scanning Electron Microscope (Phenom Pro-X)
  - 2x Thermocycles (PCR) and quantitative PCR (IUI shared equipment)
  - Acclimatized growth chamber for phytoplankton.

B. Neve center for geoinformatics

- ***Field equipment:***
  - Contex IQ4490 - Large format (110 cm) scanner.
  - A3 flatbed scanner
  - Fujitsu ScanSnap - A4
  - Metal detector – Deus RC WS4
  - DGPS – Javad - LS (state of the art instrument with real-time precision of order cm - enables recording of water wave motion and boat rocking).
  - Drones

- DJI phantom 3 advanced
- DJI phantom 3 professional
- DJI Mavic Pro (x2)

o Cameras

- GoPro 4
- GoPro 5
- Karma grip - Stabilizer for GoPro
- Camcorder

o Software

- Petrel Seismic Interpretation (X7) - A responsive and flexible environment for 3D and 2D interpretation.
- Agisoft PhotoScan - software product that performs photogrammetric processing of digital images and generates 3D spatial data.
- Move - Fully integrated 2D and 3D model building and analysis.
- Radexpro - A seismic processing software.
- Seisimager - A seismic software.
- Techlog (X7) - Integration of all wellbore-centric data types into multidiscipline workflows.
- Arcmap 10.3 (X10)
- global mapper
- Photoshop (X2)

 Coastal research infrastructure. The center features instruments for field acquisition of geophysical data deployed on land:

o *Seismic equipment*

- 2 x 24 channel logger (Geode)
- 48 vertical geophones 28 Hz
- 24 Vertical geophones 4.5 Hz
- 12 Horizontal geophones 4.5 Hz

o *Ground Penetrating Radar (GPR) – Cobra CBD Wireless GPR*

 Work stations:

o 10 powerful PCs with extensive disk space, large monitors, gaming graphics.
o 62 inch screen for lecture and video viewing.

 Scanners:

o Contex IQ4490 - Large format (110 cm) scanner.
o A3 flatbed scanner
o Fujitsu ScanSnap - A4

C. HUJI center for nanoscience and nanotechnology (HUCNN)

Four cross-platform research themes have been defined at HUCNN, located at the Giva'at Ram campus, very close to the IES: 1. Nanomaterials for industrial and medical applications, 2. Nano-optronics for sensing and communication applications, 3. Nano Medicine for drug delivery, 4. Solar Energy enabled by Nanomaterials & Nanotechnology.

While these themes do not necessarily correspond with topics relating to the oceanography program, HUCNN maintains very relevant facilities that are available, at cost, to faculty and graduate students, such as:

- Sample Preparation Laboratory
- InVia Raman Microscope
- Environmental Scanning Electron Microscope Quanta 200
- Extra High Resolution Scanning Electron Microsopy MagellanTM 400L
- High Resolution Scanning Electron Microscope Sirion
- High Resolution Transmission Scanning Electron Microscope Tecnai F20 G2
- Simultaneous Thermogravimetry - Differential Scanning Calorimetry coupled with Mass Spectrometry STA TG-DSC MS
- Scanning Probe Microscope Dimension 3100 Nanoscope V
- Transmission Electron Microscope Tecnai T12 G2 Spirit (Cryo-TEM)
- X-ray Diffractometer D8 Advance
- XPS and Auger Spectroscope Axis Ultra

D. Library

The oceanography graduate program does not have a library. Its library services are based on those of the Harman library of the Giva'at Ram campus of HUJI. The latter holds a comprehensive reference collection of general science and marine science as well as electronic access to most periodicals via MALMAD (Israel Center for Digital Information Services), ULS (Union List of Serials in Israeli Libraries) and the ULE (Union List of EJournals). In terms of online resources, faculty and students are provided with free access to the Elsevier library, as well as many other important publications including Nature, Science etc. Access is direct while within the university, or through VPN when away. In both cases the online resources are readily available and useful.

IUI infrastructure:

A. General facilities

8.

- ***Teaching laboratory***– serves the IUI courses. Includes the following:
  - Standard lab facilities – workstations, autoclave, centrifuges, fume hoods, incubators, drying ovens, furnaces, shakers, baths, analytical and semi-analytical balances, refrigerators and deep freezers (-20 and -80^{0}C).
  - FlowCam- benchtop instrument to optically sort microzooplankton and phytoplankton in water samples.
  - Culture incubators – with temperature and light control
  - Aquaria - with running sea water
  - Zooplankton sample sorting equipments - microscopes, dissecting scopes, cameras, fiber optics light source, counting trays, fractionation nets, Stempel Pipettes, Utermoel Sedimentation Chambers
  - Data logger - Unisense
  - Titration systems - for Alkalinity, oxygen and pH

- PCR
- Real-time PCR
- Gel documentation system
- Denaturing Gradient Gel Electrophoresis (DGGE)
- Plate Reader (Multiskan Spectrum)
- Water filtration system
- Epifluorescence microscope
- Dissecting microscopes – 24
- Regular microscopes – 24
- Confocal microscope - Nikon
- Inverted microscope
- Phase-contrast microscope
- Digital sensors – for pH, oxygen and temperature
- Fluorometer - Turner-Design
- Spectrophotometer
- Scintillation counter
- Freeze-drying lyophilizer

- Sediment fractionation column – 5 sieves with different standard mesh sizes and a shaker.

 Lecture hall – with multimedia and video conference facilities; max capacity 50 persons.

 Student computer Room (22 desktop computers)

9.

 Dorms - Eight rooms, furnished, air-conditioned, self-catering kitchens, and dining space. Maximum capacity 32 persons.

10.

 Dive center - highly professional dive center for regular air, Nitrox and Trimix dives, regular dives, technical dives, standard regulators and re-breathers. A high-pressure compressor, O_2/He gas blending system; 18 SCUBA sets, 3 sets of open circuit technical diving equipment and 4 re-breathers; 2 sets for underwater speech communication with full masks.

11.

B. Oceanographic equipment

 Research vessels:

- ***R/V Sam Rothberg*** - A 16 m long research catamaran with twin engines allowing cruising speed of 10 knots. The ship is equipped with state-of-the-art oceanographic instruments and sensors, including a recording sonar, a navigation system, a 1 ton winch with 2 km conductive wire, CTD, a rosette with 11 Niskin bottles, sea-water pump, a water-filtration manifold, and a large winch with a long (>1 km) conductive cable.
- ***Boats*** - two 7 m long skiffs built to carry divers and light operations such as water sampling at single depths, plankton tows, mooring deployments, and more.

- ***Sampling and observational equipment:***
  - Plankton nets - A set of single-mouth plankton nets
  - TSK Flowmeters - for plankton nets
  - Multi-corer (GOMEX) - to obtain 4 sediment cores from soft bottoms at any depth.
  - Gravity corer
  - Sediment grabber
  - Light traps – to trap zooplankton during the night
  - Wave pressure gauge (RBRsolo D & RBRsolo10k D | Depth Logger) – to record time series of wave heights and frequencies.
  - Current meter – Two Acoustic Doppler Current Profilers (ADCPs), two electromagnetic current meter (S4), and Aquadop current profiler
  - Underwater cameras
  - Cabled underwater video camera – with cables to shore labs and u/w lighting system

Chapter 7- Self-Evaluation Process, Summary and Conclusions

7.1. Please describe the way that the current Self-Evaluation process was conducted, including methods used by the parent unit and the department/study programs in its self-evaluation process, direct and indirect participants in the process etc. What are your conclusions regarding the process and its results?

The head of the program together with the core faculty members of the oceanography program led the efforts to conduct this self-evaluation.

7.2 Describe the consolidation process of the Self-Evaluation Report, including its preparation and final approval (including a description of the contributions of staff members to the process).

The oceanography program faculty members, as well as a broader group of faculty members who are marginally involved in the oceanography program, were contacted and asked to provide relevant details and suggestions.

The core members who prepared this self-evaluation conducted several meetings and divided the different secions of this document so that each member prepared a preliminary draft of one of the chapters. The results were then critically reviewed by the rest of the members and after another round of suggestions and corrections, all the chapters were consolidated into one document, which was again reviewed and revised by the members.

A major gap in the preparations was retrieving the various statistical details such as student numbers, dropout rates, etc. These details proved very challenging to reconstruct, a task that also required immense efforts by the secretary of academic studies and an undergraduate student who was hired to compile this data.

7.3 If a mechanism/structure has been decided upon for the future treatment of weaknesses that were highlighted by the self-evaluation activity, please specify it while referring to those within the institution who would be responsible to follow up on this activity. Please refer to the question: how do the institution and the parent unit intend to deal in the future with quality assessment and its implementation?

The underlying weakness of the oceanography graduate studies program at HUJI, as outlined in this document, is that it lacks any institutional support of any form, such as administrative manpower, teaching facilities, and student fellowships, along with the fact that its faculty members are primarily associated with other academic units. These structural flaws require fundamental brainstorming at the university and faculty level, and we recommend that the oceanography program be upgraded to become an independent unit within HUJI in order for the unique strengths of this program to be fully realized (i.e., highest quality of oceanography researchers in Israel, accessibility to state of the art research facilities).

The parent unit (IES) has been taking the following neasures:

(1) As stated in the report, currently most of our core oceanography courses (chemical, biological, physical oceanography) as well as practical oceanography courses at the IUI in Eilat are graduate courses, which leaves undergraduates with much less exposure to oceanography than there once was. However, in the past few years, we have made efforts to ameliorate this situation. We instituted three new courses that are required courses for all undergraduates majoring in climate-atmospheric sciences-oceanography (CAO), namely, Fundamentals of Fluid Mechanics for Earth Science Applications; The Changing Ocean; and Introduction to Practical Oceanography. In addition, the undergraduate required course Thermodynamics of the Atmosphere was changed to Thermodynamics of the Atmosphere and Oceans, and the content was adjusted accordingly. Likewise, the course Environmental Remote Sensing was changed to Principles of Remote Sensing of the Atmosphere, Oceans, and Land and became a required course for all undergraduates majoring in CAO.

(2) In order to increase the population of high quality undergraduates who could be potential graduate students in oceanography, in the past few years, we built three new structured double majors: computer sciences-CAO; physics-CAO; and physics-geology. These complement the already

existing structured double majors: CAO-environmental sciences; geology-environmental sciences; geology-CAO; and life sciences-geology.

(3) In the past year, we instituted efforts to encourage undergraduates majoring in physics, chemistry, or computer sciences and who are not satisfied with their major to try earth sciences. A few such students have already joined our undergraduate program.

(4) We encourage graduates of the undergraduate major in physics seeking a more applied field to apply to our masters programs in oceanography, in atmospheric sciences, and in geology. One way we do this is via the course Environmental Physics, revived two years ago, offered in the physics department, and taught by faculty members from the Institute of Earth Sciences.

(5) The Faculty as a whole is enhancing its outreach to potential students. We have joined their efforts enthusiastically, improving the look of our academic programs on-line and participating in more elaborate Open Day programs for potential students.

7.4 Is the full Self-Evaluation Report accessible? If 'yes' - to whom it is accessible and to what extent?

At the time of finalizing this document it has been circulated by email from the head of the program to all faculty teachers and selected IES officers.

Additional required materials (Links)

- Syllabi
- CVs
- Thesis