Committee for the Evaluation of Physics Studies

Tel-Aviv University

The School of Physics and Astronomy

Evaluation Report

December 2007

Contents

Chapter 1- Background

At its meeting on March 8, 2005 the Council for Higher Education (CHE) decided to evaluate study programs in the field of Physics during the academic year 2005-2006.

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

- ***Prof. Hanoch Gutfreund*** - The Racah Institute of Physics, The Hebrew University, Committee Chairman.
- ***Prof. Daniel Ashery*** - School of Physics and Astronomy, Tel-Aviv University.
- ***Prof. Moshe Deutsch*** - Department of Physics, Bar Ilan University.
- ***Prof. James Langer*** - Department of Physics, University of California Santa Barbara, U.S.A.
- ***Prof. Stephen Lipson*** – Faculty of Physics, the Technion, Haifa.

Ms. Alisa Elon- Coordinator of the committee on behalf of the Council for Higher Education.

Within the framework of its activity, the committee was requested to:

1. Examine the self-evaluation reports, which were submitted by institutions that provide study programs in Physics, and hold on-site visits to those institutions.
2. Present the CHE with final reports for the evaluated academic units and study programs - a separate report for each institution, including the committee's findings and recommendations, together with the response of the institutions to the reports.
3. To submit to the CHE a report regarding its opinion of the examined field of study within the Israeli system of higher education. The committee will submit a separate report to the CHE in this matter.

The committee's Terms of Reference document is attached as **Appendix 1**.

The first stage of the quality assessment process consisted of self-evaluation by the institutions. This process was conducted in accordance with the CHE's Guidelines for Self-Evaluation (of October 2005) and on the basis of the committee's specific instructions, as set forth in their letter to the institutions dated December 21, 2005.

Chapter 2-Committee Procedures

The committee held its first meeting on March 26, 2006 during which it discussed fundamental issues concerning Physics study programs in Israel and its quality assessment activity.

During the period June-July 2006 the committee members received the self-evaluation reports.

In November 2006, the committee members conducted a full-day visit to each of the institutions offering study programs in the field under examination. During the visits, the committee met with the relevant officials within the organizational structure of each institution, as well as faculty and students.
In order to prevent the appearance of a conflict of interests, committee members did not participate in visits to institutions in which they were faculty members. Therefore, Prof. Daniel Ashery did not take part in the committee's visit to Tel-Aviv University.

This report deals with the School of Physics and Astronomy at Tel-Aviv University.

The committee's visit to Tel-Aviv University took place on November 20, 2006. The schedule of the visit, including the list of participants representing the institution, is attached as **Appendix 2**.

The committee members thank the management of Tel-Aviv University and the School of Physics and Astronomy for their self-evaluation report and for their hospitality towards the committee during its visit.

Chapter 3- Evaluation of the School of Physics and Astronomy at Tel-Aviv University

I. University Policy and Goals

Tel-Aviv University was established in 1956 and fully accredited by the Council of Higher Education in 1969. It has about 29,000 students, 9 faculties and 70 departments. There are four faculties in science and technology – Exact Sciences, Life Sciences, Medicine, and Engineering.

The University has operated in the last five years with severe budgetary deficits resulting in significant reductions of academic and administrative staff positions. Because of this situation, the scope of courses offered has decreased, class sizes have increased, and support for graduate students (positions, fellowships) has been reduced throughout the University.

In its strategic plan for coping with this financial situation, the University has outlined the following goals for the near future, which will directly affect all its teaching programs:

- Reduce the size of faculty – This process started several years ago, with the goal of reducing the faculty from 1400 to 1000.
- Increase the numbers of students in higher degree programs – The University has set this as a strategic goal despite its shortage of sufficient funds for scholarships.
- Decrease the numbers of undergraduate students.
- Shorten the times required to complete studies.
- Promote the direct Ph.D. track.
- Increase the funds available for research.
- Improve student services.

The University has launched a New Horizons program in which it has selected a number of interdisciplinary initiatives to be developed, expanded, and become targets for special investments. Nanoscience and biophysics are included in this program.

Our Committee's meeting with the leadership of the University and of the School of Physics and Astronomy focused on the implications of these goals and policies for the Physics programs and for the way in which the School perceives its future.

II. The School of Physics

The School of Physics and Astronomy was founded in 1963 as a Department of Physics that granted M.Sc. degrees in physics. The academic staff consisted solely of a theory group in particle physics. In its formative years, the school went through a process of rapid development. Undergraduate studies were introduced in 1964. In a very short time groups in experimental high-energy physics, in nuclear physics, in condensed matter physics, in astronomy and astrophysics, medical physics, applied physics, and in plasma physics were established. Observational astronomy received a serious boost with the establishment of the Wise Observatory in Mitzpeh Ramon in 1971. The fast growth in the 1960's resulted in a large faculty marked by a narrow age distribution. In the middle 1990's, there were more than 60 scholars on the senior academic staff.

At present the School is organized in three departments – Condensed Matter Physics, Astronomy and Astrophysics, and Particle Physics. There is also a small Medical Physics group. The senior academic staff consists of 46 members (19 experimentalists and 27 theorists). At the present rate of retirement, without new recruitment, the faculty will be reduced to 36 within three years. (See table 4.1 of the written report.)

The School is part of the Faculty of Exact Sciences (FES), together with the Schools of Chemistry, Mathematics, Computer Science, and the Department of Geophysics and Planetary Sciences. The administration of the undergraduate and M.Sc. programs is the responsibility of the FES student office; the Ph.D. programs are fully managed

within the School. All academic aspects of the teaching programs are controlled, respectively, by the Undergraduate Studies Committee (USC), the Graduate Masters Committee (GMC), and the Graduate Doctoral Committee (GDC).

The Head of the School is assisted by three Committees:

- Advisory Committee – composed of the heads of the three departments.
- Promotion Committee – consists of five faculty members including the Head of the School as Chair.
- Long Range Planning Committee – consists of senior faculty members appointed by the Head of the School, is entrusted with the role of providing advice on future developments.

III. Long Range Planning

The rapid reduction of the senior academic staff over the last few years is the most significant problem faced by the School. This reduction already has had a clear effect on the quality of teaching programs as reflected in the scope of courses, the size of classes, and the ability to accommodate more graduate students. If no immediate measures are adopted, the faculty will be reduced in 2010 to 36. The University and the School would then be compelled to review the scope of the teaching programs now offered to the Physics students, as well as those offered to students of other disciplines as parts of joint degree programs or as service courses. The School would also have to review the scope of its research, which will have a direct effect on its ability to contribute to the University's goal of increasing the numbers of M.Sc. and Ph.D. students. In the latter context, we emphasize the deleterious effects of the current reductions in M.Sc. and Ph.D. fellowships and in junior staff positions.

We would have expected that the School and its Long Range Planning Committee would have acted with a sense of emergency to explore plans for coping with this situation. However, at the time of our visit, we saw no indication of such a planning process. Long-range planning is an essential task and a challenge for every academic

department and for leadership of every institution. This is especially true at times of diminishing resources, budgetary cuts, and accelerated rates of retirement.

We were told that the School's aim is to reach an equilibrium size of 40-42 faculty members, but it is not clear to us how and when this goal will be achieved. In a discussion with the Head of the School on his perception of the future, he expressed the hope for a faculty of 45 members, including appointments within the New Horizon programs. He claimed that no dramatic changes will have to be made if this goal can be achieved. On the other hand, he argued that a faculty size of 40 will require reconstruction of present activities including reduced diversity of undergraduate programs and fewer elective courses.

Our committee urges the School to initiate a serious assessment of its situation and to launch a bold planning process. In reference to the anticipated retirement rate, the basic questions are: Will the current balance between the sub-disciplines be maintained in the future? If not, how will a new balance affect the School's educational needs and research opportunities? What are the challenges and opportunities posed by the New Horizons programs?

In the past, the School's leaders have responded to changing conditions by closing or merging programs, thus using the available resources more efficiently. Some results of such planning within the last five years have been the merging of Nuclear Physics and High Energy Physics into the Department of Particle Physics, the reduction of B.Sc. programs in Physics from 10 to 6, and a number of curriculum revisions at the B.Sc. and M.Sc. levels following recommendations of an ad-hoc committee in 2002. Similar steps might be necessary to counteract the deterioration that is bound to occur upon reduction in the number of faculty members in the coming years.

IV. Undergraduate Teaching Programs

The School offers six undergraduate programs granting a B.Sc. in Physics (as a major discipline). These programs are the following. (Rounded-off numbers of weekly semester hours, accumulated over the entire program, are given in parentheses.)

1. B.Sc. in Physics (150)
2. Joint B.Sc. in Physics and Mathematics (185)
3. Dual B.Sc. in Physics and Electrical Engineering (230)
4. Dual B.Sc. in Physics (major) and Mathematics (minor)(165)
5. Dual B.Sc. in Physics and Computer Science (160)
6. Dual B.Sc. in Physics (major) and a discipline from another faculty (80-85)

Programs granting a B.Sc. in Physics (minor) together with majors in Chemistry, Mathematics and Geophysics are conducted and managed by the respective Schools. The students enrolled in these programs take some of the same courses offered by the six programs listed above.

Except for program (3), which is designed for four years, all other programs are planned for three years. The six programs are based on the same courses covering the basic topics of physics and mathematics. The less fundamental physics courses in program (1) are replaced by courses from the other discipline. Thus the diversity of the programs does not significantly increase the faculty teaching load.

The number of frontal hours in all programs is rather high. This is especially the case in the joint Physics and Mathematics program. The first semester consists of 44 hours (including two basic mandatory courses - Topics in Classical Physics and Introduction to Probability - for which students do not get credits). We understand that it is almost impossible for the students to complete this program in the designated three years. It seems that there is a general agreement among faculty and students that the undergraduate programs are too structured, leaving little room for elective courses. At the same time, the scope of such courses has been significantly reduced because of declining faculty. There is a feeling among students that the load of the mandatory courses could be reduced if overlap and repetition of topics between different courses can be avoided. The committee recommends that the Undergraduate Study Committee examine this issue.

All the basic mandatory courses are accompanied by exercise classes which constitute an essential element of the teaching program. Because of the severe reduction in junior faculty, the School has great difficulties in providing this part of the program at a reasonable level. In the written report we find that the exercise classes have reached an almost unacceptable size of 50 students, but that the homework handed in by the students is checked, graded and returned to them (p. 33). However, in our meetings with faculty and students we were told about exercise classes of 70 students, and that the checking of homework is very superficial, not providing the students with sufficient response and guidance. We were told that the School intends to use advanced information technology to improve teaching, to assist in the management of exercise classes and to provide better communication with students. This effort is already in process; there is computerized presentation of some lectures, videotaped lectures available to students, the university network is being used for homework assignments, etc..

V. Teaching Laboratories

A committee appointed in 2005 to investigate the status of the teaching laboratories recommended that the School buy enough copies of the laboratory equipment that experiments can be coordinated with lectures. That committee also complained about poor maintenance of the teaching laboratories. At our meeting with the leadership of the School, we heard that a process of improving the laboratories and renovating old equipment has begun but that the budget allocated to this end is very small.

Talking to the students, we heard from undergraduate and graduate students the same criticism about the "cookbook" nature of most experiments. Especially the graduate students whom we met told us that the experiments have not been changed for a decade, that there is no room for initiative, that the equipment is old and therefore everything takes more time (cooling down the superconductivity experiment takes ages). The undergraduate students complained that the experiments are too technical, and that in many cases the relevant theoretical background is not taught before the experiment (especially in second year).

Keeping all this criticism in mind, on the whole, our committee was favorably impressed by the visits to the various teaching laboratories. The physical working space is appropriate and the technical support is professional and adequate. Although most of the equipment is indeed rather old, the laboratory staff seems to be able to make the most of it.

The first year laboratories (three) serve 700 students from Physics, Chemistry and Engineering, and are maintained by three technicians. Most experiments are set up on a bench. Students sometimes put pieces together, but in most cases everything is set up for them. The emphasis is more on teaching the students to measure and to analyze their measurements, and not on the physics itself. For example, in the cooling curve experiment, everything is set up in advance; the students calibrate the sensors, and a computer collects the data, which the students then analyze.

The second year laboratory focuses on electronics. This laboratory serves also students from Engineering and is maintained by one technician. The laboratory offers a course on "Measurement, data acquisition and analysis". The committee was shown two projects in this laboratory - a project on data acquisition in which a laser point moving on a board is tracked by taking a video film and subtracting successive frames. The students are basically required to do some programming. Another project, on noise reduction by subtracting sine-waves at major frequencies in the spectrum, was demonstrated to us by two students. The committee was well impressed by the students and by the working facilities.

The third year Physics laboratory contains 19 different experiments, and every student has to do six of them. The laboratory is maintained by one technician. The students are guided by teaching assistants, each of whom is responsible for three experiments. About half of the experiments are based on equipment that is over ten years old. Some of the experiments (micro-lensing, muon lifetime, radio telescope, X-ray fluorescence and molecular spectroscopy) use equipment purchased or refurbished within the last five years. Although most projects do not teach the students how to design an experiment, they do teach them interesting and important physics. For example, the NMR is a ready-made experiment bought from "Teach-Spin Inc", but the samples are unknown to the students. They have to learn the theory before seeing the experiment

manual, and they have to summarize their work, as in other experiments, by writing a a "paper" reporting their results.

VI. Teaching of Mathematics and of Computational Methods

At the opening meeting with the academic leadership of the University and of the School, the committee was specifically asked to address the issue of courses in mathematics within the physics programs. Mathematics is an essential element of physics education and there are many different ways to incorporate mathematics into a physics curriculum. For example, courses may be designed and taught by the department of mathematics, courses may be tailored for physics students and taught by physicists, special topics in mathematics may be included in specific physics courses, etc...

The School of Physics offers a number of courses in mathematics, some of them taught by mathematicians and some by physicists. The courses in Calculus and Probability Theory are taught by the School of Mathematics in order to expose the students of physics to a more rigorous mathematical thinking. The basic first-year course in mathematics, Linear Algebra for Physicists, has been taught for many years by the School of Mathematics. In the Physics program (1) it has been eliminated and the relevant topics are now included in another first-year course, Mathematical Introduction for Physicists, which is taught by the School of Physics. The effect of this change is not clear to us. We heard from students that those who do not participate in a combined Physics-Mathematics program do not acquire sufficient training in linear algebra. The programs 2, 3, and 4 still offer a special course tailored for these students which is given by the School of Mathematics and includes Linear Algebra. Methods of Theoretical Physics I and II are taught by Physicists and their curriculum is developed in the School of Physics.

In our discussions with faculty and students, we did not hear any criticism of the program in mathematics. It seems to us that the School is providing a comprehensive and well coordinated mathematical background to its students in the different programs.

Computational aspects of physics as an auxiliary tool and as a research approach are demonstrated in a number of courses: Numerical Methods in Physics, Methods of Theoretical Physics I and II, and an elective course Introduction to Computational Physics. Computational skills are also practiced by use of PC's and computer software packages in the laboratories and in homework assignments. Homework problems assigned in the second year courses Numerical Methods in Physics and Thermal Physics, and the third year course Quantum Mechanics II, require such computational skills.

VII. Service courses

The School of Physics conducts an extensive program of service courses for other units at TAU. The bulk of the service teaching is within the Faculty of Engineering, the Faculty of Life Sciences, the Faculty of Medicine and the School of Architecture. The teaching load of the service program exceeds one half of the entire class-room teaching load of the School of Physics. The curriculum and academic management of these courses is controlled by the receiving academic units.

The Physics faculty perceives these service courses as an essential element of the education of non-Physics students, and it assigns to these courses experienced and effective teachers. However, there is a sense that the quality and scope of this educational channel is gradually deteriorating. The shortage of supporting junior staff is even more apparent here than in the programs administered by the School. Moreover, the client units are constantly pressing for reducing the demands in these courses. At our meetings with faculty (we did not meet with students outside of the School) we heard the consistent opinion that these courses are now given at high-school level and below. The extreme case is that of the students in the MD program and in Physical Therapy, who are now completing their studies without a single course in physics.

VIII. Masters Degree Programs

At the graduate level, the School offers programs in six areas of specialization, which lead to M.Sc. or Ph.D. degrees in Physics:

- Applied physics
- Astronomy and astrophysics
- Condensed matter physics
- Material science
- Medical physics
- Particle physics

The students can choose between two tracks leading to the M.Sc. degree:

- A research oriented track including submission of a thesis based on independent research.
- A multi-disciplinary track in materials science, offered jointly with the School of Chemistry and the Faculty of Engineering, in which students have a choice between writing a thesis or doing a project.

All students are required to take a core curriculum consisting of three mandatory courses: Thermodynamics and Statistical Mechanics I, Quantum Physics I, and Advanced Electromagnetism. Students who choose theoretical work for their dissertations are also required to take either Quantum Physics II or Thermodynamics and Statistical Physics II. Students who are doing experimental work for an M.Sc. thesis have to take a course on Laboratory Safety and a course on Measurement Methods, Data Acquisition and Data Analysis. In addition to the mandatory part of their course work, the students have to take 3-4 elective courses.

The multidisciplinary track in materials science is relatively new. It was introduced as an alternative to a special track in Applied Physics, which included an industrial

project instead of a dissertation. The latter was eliminated for lack of students. The fate of the new interdisciplinary track is still not clear, for the same reason.

Students are expected to complete their studies and research for an M.Sc. degree in two years (theoretical) or two and a half years (experimental). Extension of the program beyond these limits is granted, if needed, but very seldom exceeding a total of three years. We note that the load of frontal classes in the M.Sc. program has recently been reduced to allow more time for research work and for writing the dissertation. This is enabling more students to complete their M.Sc. studies within the designated period. We draw attention to our remark on this issue in the context of the undergraduate programs.

IX. The Ph. D. Program

Ph. D. students are required to take graduate courses beyond those of the M.Sc. program at a scope of 8 weekly semester hours and to actively participate in a weekly seminar in their field of specialization. They must submit a written research proposal within a year after admission to the Ph.D. program, and they have to defend it before a committee of senior faculty and demonstrate that they are ready to undertake the proposed research.

There are two tracks in the Ph. D. program: the traditional track for students who have completed a research thesis for the M.Sc. degree, and the direct track in which students are exempt from such a thesis and go directly from a B.Sc. to a Ph.D. degree. Graduate students who achieve a grade of at least 85 in Quantum Mechanics, in Advanced Electromagnetism, and in Thermodynamics and Statistical Physics are entitled, if they so wish, to enter the direct Ph.D. track. At present the ratio between M.Sc and Ph.D. students is 2:1. Although, the School would like to encourage the direct Ph.D. track, in line with one of the university's strategic goals, it does not want to eliminate the M.Sc. track, leaving options for those who plan a career outside of academia.

X. Summary

On the whole, the education provided by the School of Physics at Tel-Aviv University at all levels is strong and attractive. It is based on a faculty containing world class scholars covering a broad range of research areas. They are highly qualified lecturers for a variety of courses and programs in physics – basic and specialized, theoretical, experimental and computational. They attract good students for the graduate programs.

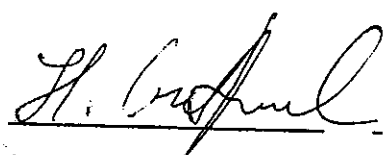
The School has developed an effective academic management system of its teaching programs. The three committees on undergraduate, masters and doctoral studies, plan, coordinate and implement the different programs. They have monitored their effectiveness and, from time to time, have introduced changes. They have been responsive to constraints imposed by administrative and contextual developments and also to remarks by faculty and students. In our meetings with students we did not hear any critical remarks about their relations with the School establishment or with individual faculty members.

The educational goals of the University – hiring outstanding new faculty, increasing the ratio of graduate to undergraduate students, reducing the length of time to complete degree programs, improving student services -- are compatible with those of the best universities in the world. However, they are not compatible with the present realities of sharp reductions in all the resources needed to achieve and maintain such goals. We point out that the efforts to increase the number of graduate students continue at a time when the graduate students-to-faculty ratio is already very high. This is the most serious problem that the School is facing. We have expressed in this report our concern about the imminent dangers of this situation for the quality and scope of a very good teaching program maintained by a very good research group.

We are not talking about something that may happen in the future. As we point out in this report, certain aspects of the educational process have already been seriously affected. Some of this may be alleviated by planning for more efficient use of resources, by more advanced use of information technologies, by assistance (which already plays a significant role) of emeriti, but not by additional increase of the teaching load and of other educational assignments of the faculty. Such measures will have a destructive effect on the quality of research and teaching alike.

Thus, we strongly encourage the leadership of the School to involve its faculty in a serious assessment of the situation and to launch a planning process and dialogue with leadership of the University, as articulated in chapter III of our report.

Signed By:



Prof. Hanoch Gutfreund
Chairman
On behalf of the committee

APPENDICES

APPENDIX 1

Terms of Reference of the Committee

COUNCIL FOR HIGHER EDUCATION
המועצה להשכלה גבוהה

18 October 2006

To:
Prof. Hanoch Gutfreund - The Racah Institute of Physics, the Hebrew University
Prof. Daniel Ashery - School of Physics and Astronomy, Tel Aviv University
Prof. Moshe Deutsch - Department of Physics, Bar Ilan University
Prof. James Langer - Department of Physics, University of California Santa Barbara, U.S.A.
Prof. Stephen Lipson- Faculty of Physics, the Technion, Haifa
Esteemed Gentlemen,

I hereby appoint you as members of the Council for Higher Education's (CHE) Committee for the Evaluation of Physics Studies within institutions of higher education in Israel.

You are kindly requested to operate in accordance with the Appendix to the Terms of Reference of Evaluation Committees (study-programs), which is attached to this Terms of Reference document.

The Committee is requested within the framework of its activity to:
1. Examine the self-evaluation reports which shall be submitted by the institutions that provide study-programs in Physics, and hold on-site visits to those institutions.
2. Present the CHE- by January 2007- with final reports regarding the evaluated academic units and study-programs- a separate report for each institution including the Committee's findings and recommendations, together with the institutions' responses to the reports.

Within the framework of the final reports, the Committee is requested to refer to the following topics, among others, in relation to each of the study-programs:
1. The goals and aims of the evaluated academic unit and study-programs.
2. The study-program and its standard.
3. The academic staff.
4. The students.
5. The organizational structure — both academic and administrative - of the academic unit and study-program.
6. The broad organizational structure (school/faculty) in which the academic unit and the study-program operate.
7. Physical and administrative infrastructure available to the study-program.
8. Internal mechanisms for quality assessment
9. Conclusions of the academic unit and the study-program.
10. Other topics to be decided upon by the Evaluation Committee.

In addition to its final reports concerning each study program under examination, the committee shall submit to the CHE the following documents:

1. A report regarding Physics Studies within the Israeli system of higher education.
2. A proposal concerning standards for Physics Studies.

Professor Hanoch Gutfreund shall preside over the Committee as Chairman.
Ms. Einav Broitman shall coordinate the Committee's activities.

Yours sincerely,

Yuli Tamir
Minister of Education
Chairperson of the Council for Higher Education

cc: Ms. Riki Mendelzvaig, Secretary of the Council for Higher Education
Ms. Michal Neumann, in charge of the Quality Assessment Unit
Ms. Einav Broitman, coordinator of the committee

Enclosure:
Appendix to the Terms of Reference of Evaluation Committees (study-programs).

November 2005

Appendix to the Terms of Reference of Evaluation Committees (Study-Programs)

1. General

On June 3, 2003 the Council for Higher Education (CHE) decided to establish a system for quality assessment and assurance in Israeli higher education. Within this framework, study-programs are to be evaluated once in six years and institutions once in eight years. The quality assessment system came into effect in the academic year of 2004-2005.

The objectives of the quality assessment activity are:

- To enhance the quality of higher education in Israel;
- To create an awareness within institutions of higher education in Israel of the importance of this subject and to develop internal mechanisms for the evaluation of academic quality on a regular basis;
- To provide the public with information regarding the quality of study programs in institutions of higher education throughout Israel;
- To ensure the continued integration of the Israeli system of higher education in the international academic arena.

It is not the CHE's intention to rank the institutions of higher education according to the results of the quality assessment activity. The evaluation committee is requested not to make comparisons between the institutions.

2. The Evaluation Committee

2.1 The CHE shall appoint a Committee to carry out quality assessment of the study-programs.

2.2 A senior academic figure in the examined field shall be appointed as Chairman.

2.3 The Committee shall include 3 to 5 senior academic figures in the field from leading institutions in Israel and abroad. In exceptional cases, and in cooperation with the committee chairman, an authoritative figure who is not on the academic staff of an institution of higher education may be appointed as a committee member.

2.4 In the event that a member of the committee is also a faculty member in an institution being evaluated, he will not take part in discussions regarding that institution.

3. The work of the Evaluation Committee

3.1 The Committee shall hold meetings, as needed, before visiting the institution, in order to evaluate the material received.

3.2 The committee shall visit the institution and the academic unit being evaluated within 3-4 months of receiving the self-evaluation report. The purpose of the visit is to verify and update the information submitted in the self-study report, clarify matters where necessary, inspect the educational environment and facilities first hand, etc. During the visit the committee will meet with the heads of the

institution, faculty members, students, the administrative staff, and any other persons it considers necessary.

3.3 In a meeting at the beginning of the visit, the committee will meet with the heads of the institution (president/rector, dean), the head of the academic unit and the study-programs, in order to explain the purpose of the visit. At the end of the visit, the committee will summarize its findings, and formulate its recommendations.

3.4 The duration of the visits will be coordinated with the Chairman of the Committee according to the issue, and in any event will not be less than one day.

3.5 Following the visit, the committee will write its final report, including its recommendations, which will be delivered to the institution and the academic unit for their response. The institution's and the academic unit's response will not result in changes to the content of the Committee's report, unless they point out errors in the data or typographical errors in the Committee's report. In such cases, the committee will be able to make the required corrections in its final report.

4. The Evaluation Committee's Report

4.1 The final report of the evaluation committee shall address every institution separately.

4.2 The final report shall include recommendations on the subjects listed in the guidelines for self-evaluation, and in accordance with the Committee's Terms of Reference.

4.3 The recommendations can be classed as one of the five following alternatives:

4.3.1 ***Congratulatory remarks and minimal changes recommended, if any.***

4.3.2 ***Desirable changes recommended*** at the institution's convenience and follow-up in the next cycle of evaluation.

4.3.3 ***Important/needed changes requested for ensuring appropriate academic quality*** within a reasonable time, in coordination with the institution (1-3 years).

4.3.4 ***Essential and urgent changes required, on which continued authorization will be contingent*** (immediately or up to one year).

4.3.5 ***A combination of any of the above.***

4.4 The committee's report shall include the following:

4.4.1 **Part A — General background and an executive summary:**

4.4.1.1 General background concerning the evaluation process, the names of the members of the committee, a general description of the institution and the academic unit being assessed, and the committee's work.

4.4.1.2 An executive summary which will include a description of the strengths and weaknesses of the academic unit and program being evaluated, according to the subjects listed in the body of the report and a list of recommendations for action.

4.4.2 **Part B — In depth description of subjects examined:**

4.4.2.1 This part will be composed according to the topics examined by the evaluation committee, in accordance with the committee's Terms of Reference and the report submitted by the institution, and at the discretion of the committee.

4.4.2.2 For each topic examined - the report will present a summary of the findings, the relevant information and an analysis thereof, and conclusions and recommended actions.

4.4.3 **Part C — Summary and recommendations:**

4.4.3.1 A short summary of every one of the topics described in detail in Part B, including the committee's recommendations.

4.4.3.2 Comprehensive conclusion/s and recommendation/s regarding the evaluated academic unit and the study-programs.

4.4.4 **Part D- Appendices:**

The appendices shall contain the committee's Terms of Reference, relevant information about the institution and the evaluated academic unit, the schedule of the on-site visit.

4.5 The final report will be delivered to the institution, with the deadline for its and the academic unit's response noted.

4.6 The Committee's final report together with the response of the institution and the academic unit will be brought before the CHE.

4.7 The CHE will discuss these documents and formulate its decisions within (approximately) a year from the time the guidelines for self-evaluation were sent to the institutions.

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APPENDIX 2

The schedule of the visit

Tel-Aviv University – School Of Physics & Astronomy
Visit of the Committee for the Council for Higher Education
20/11/06
Kaplun Building Room 324

Time	Subject	Participants	Venue
09:00-09:30	Opening session with heads of the institution, the senior staff appointed to deal with the quality assessment and the heads of the academic unit	1. Prof. Dany Leviatan, Rector 2. Prof. Raanan Rein, Vice Rector 3. Prof. Saul Abarbanel, Head, Academic Quality Assessment Unit 4. Prof. Marek Karliner, Quality Assessment committee member 5. Prof. Haim Wolfson, Dean, Faculty of Exact Sciences 6. Prof. Yaron Oz, Head, School of Physics & Astronomy	Kaplun Building Room 324
09:30-11:30	Meeting with the school's academic and administrative leadership - the decision makers of the academic unit	1. Prof. Yaron Oz, Head, School of Physics & Astronomy 2. Members of the School of Physics & Astronomy Committee who dealt with the Quality Assessment: (a) Prof. Yoel Rephaeli (b) Prof. David Bergman 3. Prof. Dan Maoz, Chairman, Undergraduate Teaching Committee 4. Prof. Shimon Yankielowicz, Chairman, Graduate Teaching Committee 5. Prof. Elia Leibowitz, Chairman, Research Students Committee 6. Prof. Victor Fleurov, Head, of Dept. Condensed Matter Physics 7. Prof. Marek Karliner, Head of Dept. of Particle Physics 8. Prof. Amiel Sternberg, Head of Dept. of Astronomy & Astrophysics	Kaplun Building Room 324

11:30-13:00	Tour of Teaching laboratories, meeting with Teaching Assistants (labs' instructors)	1. Prof. Dan Maoz, Chairman, Undergraduate Teaching Committee 2. Prof. Erez Etzion, Member of the Teaching Committee	Teaching Labs.
13:00-14:00	Lunch	Committee members only	
13:45-14:45	Meeting with senior academic staff	Prof. Yakir Aharonov, Prof. Solange Akselrod Prof. David Andelman Dr. Yoram Dagan Prof. Erez Etzion Prof. David Horn Prof. Tzvi Mazeh Prof. Shmuel Nussinov	Kaplun Building Room 324
14:45-15:45	Meeting with graduate students (MA and PhD) and Teaching Assistants	Ilan Gabay, MSc. student Dr. Roi Beck, graduated Dan Glück, PhD. student Smadar Naoz, PhD. student	Kaplun Building Room 324
15:45-16:45	Meeting with undergraduates	Ran Vardimon, 2nd year Ron Rosenthal, 2nd year Mor Verbin, 2nd year Yair Arcavi, 3rd year Nadav Benedek, 3rd year	Kaplun Building Room 324
16:45-17:30	Summary meeting with the head of the academic unit and the person in charge of quality in the institution	1. Prof. Dany Leviatan, Rector 2. Prof. Raanan Rein, Vice Rector 3. Prof. Saul Abarbanel, Head, Academic Quality Assessment Unit 4. Prof. Marek Karliner, Quality Assessment committee member 5. Prof. Haim Wolfson, Dean, Faculty of Exact Sciences 6. Prof. Yaron Oz, Head, School of Physics & Astronomy	Kaplun Building Room 324
17:30-18:00	Closed meeting		Kaplun Building Room 324