

**The Racah Institute of Physics  
&  
Applied Physics Department**

**THE HEBREW UNIVERSITY OF JERUSALEM**

**Report of the Review Committee**

**November 2007**

**Presented to Prof. Haim D. Rabinowitch, Rector**

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## **EXECUTIVE SUMMARY**

**REVIEW COMMITTEE**  
***The Racah Institute of Physics &***  
***Applied Physics Department***

**Executive Summary**  
**Thursday, November 15, 2007**

The Racah Institute is the oldest physics department in the country and has constantly maintained its high national and international standing. It should continue to function at the highest level and should strive to remain excellent. Future hiring should be guided by this pursuit of excellence; the overriding consideration being the quality of the candidate, with the field of research playing a secondary role.

The committee commends the recent hirings in the Racah Institute that are based on a broad coverage of existing research activities and early entry into new fields such as biophysics and quantum information. The committee encourages the Racah Institute to continue the trend of increasing the number of experimenters relative to theorists. At the very least half of the Faculty members should be experimenters.

With no applied scientist on the Committee we are unable to judge the academic standard of the research in the Department of Applied Physics. However, an activity of this type linking the University to high-tech industry may be a significant asset.

The overall research in the Racah Institute is very strong. The astrophysics and the high-energy theory groups stand out as excellent, followed by the condensed-matter group. These strengths of the Racah Institute should be maintained and reinforced. Given the breadth of the current and recommended research activity and the size and quality of the student body, we recommend that the Racah Institute should optimally have 50 faculty members, but certainly no less than 40. The ratio of staff to advanced students in Applied Physics is smaller than in the Racah Institute and may need amelioration.

The research excellence and leading status of the Racah Institute are seriously endangered by the severe decline in the technical and administrative support available for faculty members both in research and in teaching. The administrative staff is much too small. The technical staff formerly assigned to individual labs has been abolished. The machine shop personnel has been significantly reduced. There is a single electronic technician who is going to retire soon. There is only one computer support person.

The past high level of instruction in the Department has deteriorated over the last years due to budgetary cuts. The number of teaching assistants has been dramatically reduced, resulting in large classes which prevent essential personal student-lecturer interaction and important feedback. This situation also affects the graduate students who have lost an essential source of income. The financial cuts have also affected the teaching labs. They suffer from lack of new equipment, modern experiments cannot be offered and the students cannot perform independent and original projects.

We have found similar serious problems in the Department of Applied Physics.

The committee urges the University administration to find the resources to immediately remedy this catastrophic situation in teaching and research.

The number of elective courses, particularly in the M.Sc. and Ph.D. curricula, and the flexibility in their choice by the students are restricted. This should be changed. Moreover, a biophysics course at the undergraduate level should be introduced. However, extended training in biophysics should not come at the expense of rigor. The issues relating to teaching have been addressed recently in detail in the report of the Council of higher Education's Physics Teaching Evaluation Committee, which we have read and strongly endorse.

Currently the Racah Institute is spread over five different buildings. This leads to a serious lack of cohesion. Useful communication between people in different groups, which is absolutely essential in stimulating new ideas, is curtailed. The committee encourages the University to provide a building which will house the entire Racah Institute. To encourage fruitful interactions between the disciplines, a building located close to other science buildings would be desirable.

### Recommendations

- To strengthen the two excellent groups in Astrophysics and high-energy physics, a Center for Astroparticle Physics should be formed, a continuation or even extension of the current Einstein center. The sizes of these groups should be at least maintained, requiring new hiring in view of forthcoming retirements. The addition of a phenomenologist in the high-energy group is strongly recommended. If an excellent candidate is available, hiring another astrophysicist is recommended.
- The newly formed biophysics group, currently only two faculty members, should be expanded to a “critical mass” of 4-5 members. A high priority should be assigned to the development of biophysics courses within the curriculum, at both elementary and advanced levels. Collaborative ties with the life sciences department are strongly encouraged.
- Immediate addition of an electronic support person and at least 1/2 of a computer support person are strongly urged. The administrative and machine shop staff should also be enlarged.
- The number of teaching assistants in the physics courses should be increased so as to allow the marking of weekly assignments and to keep recitation classes to a size of 30-35 students at most.
- The number of elective courses, particularly in the M.Sc. and Ph.D. curricula, should be increased to allow for a larger flexibility in the choice of courses.
- The entire Racah Institute should reside in a single building.

## **COMMITTEE'S REPORT**

# Report of the International Review Committee on Physics

## Introduction

The evaluation committee on Physics at the Hebrew University consisted of the following members:

Prof. Hans Weidenmüller, Max-Planck-Institut für Kernphysik, Heidelberg, Germany (chair),

Prof. Moshe Deutsch, Bar-Ilan University, Ramat Gan, Israel,

Prof. Albert Libchaber, Rockefeller University, New York, USA,

Prof. Donald Lynden-Bell, University of Cambridge, Cambridge, UK,

Prof. Nathan Seiberg, Institute for Advanced Study, Princeton, USA.

The evaluation committee met from Sunday, Nov. 11, 2007 till Thursday, Nov. 15. The committee was asked to evaluate the academic level in teaching and research in all physics-related activities at the Hebrew University and their positions within their field, both in Israel and internationally. This mandate was specified in the letter of invitation by the Vice-Rector, and was further clarified in meetings with Prof. Miri Gur-Arye, Vice-Rector, Prof. Kobi Metzger and Prof. Eli Friedman, Heads of Academic Review in the Humanities and Sciences, respectively, and with Prof. Hermona Soreq, Dean of the Faculty of Sciences. Prior to Nov. 11, the committee members received two self-evaluation reports, one for the year 2006 by the Racah Institute of Physics, and one by the Applied Physics Department written in the summer of 2007. During the three days from Nov. 12 till Nov. 15, the committee met with the present and former heads of the Racah Institute, with the chairman of the School of Engineering, with the chairman of the Department of Applied Physics, with senior, junior, and newly recruited faculty members in both Physics and Applied Physics, and with select undergraduate and graduate students. The committee also visited several research labs and teaching labs.

Research and teaching in physics are carried out in two units of the Hebrew University, the Racah Institute of Physics and the Department of Applied Physics which is part of the School of Engineering. Both were subject to this review. However, with no applied physicists on the committee we were unable to evaluate the academic standard of research in Applied Physics. We believe, however, that an activity of this type, which links the University to high-tech industry, may be a significant asset to the University.

## General Comments

The Racah Institute of Physics is the oldest physics department in the country and has maintained a high reputation for the quality of its research ever since. Its high national and international standing can be seen both from the frequent participation of its members in the organizing committees of international conferences and from the high quality of visitors to the Institute. Many of the Faculty have very strong records of research publications which attest to their continued generation of new ideas. A number of the Faculty have been awarded national and international prizes for their achievements.

The Racah Institute should strive to remain excellent; its future hiring should be guided by the pursuit of excellence. The overriding consideration should be the quality of the candidate with the field of research playing a secondary role. The committee commends the recent hirings in the Racah Institute that are based on a broad coverage of existing research activities and early entry into emerging new fields such as biophysics and quantum information.

Whereas experimental physicists originally outnumbered theorists by almost two to one, this ratio gradually drifted to a lower value which is currently below one, and may further decrease due to retirement in the next few years. Despite the high costs of experimental laboratories the Institute has been taking steps to stop this decrease: the recent appointments in experimental physics have brought this ratio close to one. The committee strongly believes that since physics is an experimental science, this ratio should be maintained and, optimally, even increased to a value somewhat above one. Thus, the committee encourages the Racah Institute to continue the trend of increasing the number of experimenters relative to theorists.

The overall research in the Racah Institute is very strong. The astrophysics and the high-energy theory groups stand out as excellent. The condensed-matter group is also very strong. These strengths of the Racah Institute should be maintained and reinforced. Given the breadth of the current and recommended research activity and the size and quality of the student body, we recommend that the Racah Institute should optimally have 50 faculty members, but certainly no less than 40.

The research excellence and leading status of the Racah Institute are seriously endangered by the severe decline in the technical and administrative support available for faculty members both in research and in teaching. The technical staff formerly assigned to individual labs has been abolished. The machine shop personnel have been significantly reduced. There is a single electronic technician who is going to retire soon. There is only one computer support person. The administrative staff is much too small. These facts put a heavy burden on the shoulders of the advanced students and the Faculty, deflecting their attention and energy from their research work, and seriously delay the research work.

The issues relating to teaching have been addressed recently in detail in the report of the Council of higher Education's Physics Teaching Evaluation Committee, which we have read and strongly endorse. We will, therefore restrict our comments concerning the teaching to a few important issues only.

One of the outstanding features of the teaching at the Racah Institute has been the possibility of good B.Sc. students designing and carrying out their own experiments in the first and second year laboratories. This is almost unique to the Racah Institute and greatly adds to the enthusiasm of the students. It has been commended in earlier reports and we too believe this to be very important to the education of physics students. Unfortunately the recent budget cuts and consequent reduction in the number of teaching assistants mean that fewer students can participate in this program. Moreover, the lack of modern equipment severely restricts the types of experiments that can be carried out. The high standard of teaching achieved in past years is now in jeopardy. The reduction in the number of teaching assistants has also led to larger exercise classes

and has caused graduate students to seek employment outside the University, reducing the time dedicated to research, and seriously degrading their research productivity. The lack of money to pay graders has led to an almost total elimination of feedback on the weekly homework assignments handed in by the undergraduates. This is extremely detrimental to the ability of the student to judge his/her progress and understanding of the course material, as well as to the teacher's ability to evaluate how the class is progressing and what adjustments need to be done in the material and/or method of the course.

The committee urges the University administration to find the resources to immediately remedy the catastrophic situation in research (lack of technical support) and teaching (the shortage of teaching assistants and its consequences) discussed above.

We have found similar serious problems in the Department of Applied Physics. The number of graduate students per staff member is even higher in Applied Physics than in the Racah Institute, reducing the extent of personal interaction of the advisor and the research student. This situation may need amelioration.

The number of elective courses, particularly in the M.Sc. and Ph.D. curricula, and the flexibility in their choice by the students are restricted. This should be changed. Moreover, a biophysics course at the undergraduate level should be introduced, to be followed later by a graduate course and, eventually, several graduate courses. However, extended training in biophysics should not come at the expense of rigor. The Racah Institute has already recognized that the feedback from lecturers on the actual execution of the syllabus is too low, and needs to be increased to ensure a seamless coverage of the curriculum. One way of doing this, practiced by other universities, is to carry out examinations in the basic courses by an (inside or outside) faculty member other than the course lecturers, and base these examinations on the published syllabus. A mandatory periodic written report by the lecturer on the material actually covered in class, and its conformation to the syllabus, may also help in preventing lacunae in the material covered.

Currently the Racah Institute is spread over five different buildings. This leads to a serious lack of cohesion. Useful communication between people in different groups, which is absolutely essential for stimulating new ideas, is curtailed. The committee encourages the University to provide a building which will house the entire Racah Institute. To encourage fruitful interactions with other disciplines (life sciences, chemistry, nanoscience etc.), a building located close to other science buildings would be desirable.

We turn now to the research activities of the individual groups.

## 1. Astrophysics and Cosmology

The astrophysics research group is small but very effective and is highly regarded internationally. Currently all the members are theorists. The possibility that Israel will become a member of ESO, the European Southern Observatory, is already under discussion at governmental level. Particularly if Israel joins, the astrophysics group must consider appointing observational astronomers alongside theorists. This should be subject to the over-riding considerations of quality. A particular opening of great

promise would be for an observer in millimeter astronomy who could use the ALMA telescope array high in the Atacama Desert of northern Chile. This extremely powerful instrument will start operations within the next three years and reach its full capability in about five. Access to ALMA is automatic for members of ESO.

The two senior members who founded the excellent astrophysics group are in their late fifties while another who was attracted to the group somewhat later is in his sixties. Thus despite two good recent appointments there should be three new appointments during the coming decade to keep the group up to strength. Despite its prominence this group is still smaller than those at the Technion and Tel Aviv University. Expansion of the group should be subject to the availability of outstanding candidates.

Currently there are too few graduate courses in astrophysics so it is hard for M.Sc. and Ph.D. students to get a balanced training in astronomy. Recent appointments have helped to give balance to the existing faculty but this is not yet reflected in the courses offered.

There is growing interaction between particle physics and cosmology. The unexpected discovery of the acceleration of the Universe hints at the existence of new fields of force which will be of importance to both disciplines. We recommend the creation of a Center for Astroparticle Physics within the Racah Institute which should be composed of members of the string theory group, those studying General Relativity, and members of the Astronomy group.

Issues like dark matter, dark energy, the big bang singularity and others call for such joined efforts by members of the two groups. The Center will replace the existing Einstein Center which is going to expire in 2009. It will provide the essential funding for the operation of these groups (hiring graduate students and postdoctoral fellows, inviting visitors, arrange conferences, etc.) and will increase the interactions between them. Such interdisciplinary activity will be crucial in the future.

## 2. Condensed-Matter Physics

The condensed-matter group was for a long time the backbone of the Institute. It is still one of the strongest and largest groups within the Institute, and includes currently 12 members. One of the strengths of this group is its high fraction of experimenters: 2/3. However, three experimenters are retiring in the next 1-2 years. Considering the strength of this group the committee feels that this group should be kept at its present size, replacing the retiring members by new hiring.

The group as a whole is attractive to students, with a total of 44 research students working in the group, albeit with a highly non-uniform distribution among the faculty members. While the latter point is not necessarily negative, care should be taken to prevent too large a number of students for any given advisor.

The experimental activity in the group is broad, including both established areas like hard condensed matter, high-temperature superconductivity (HTSC), and nanoscience. Recent hires branch out to the more modern subjects of optical science and quantum information. In the last field, in particular, there have been two new hires over the last two years (Eisenberg and Katz) which, together with Rapaport, should provide a strong

nucleus for the formation of a group in this emerging and very active field. This move into more modern fields is viewed very favorably by the committee. The publication record of the experimental condensed matter group as a whole over the last 5 years is very good both in quality and quantity, considering the number of faculty and research students involved. The fields of HTSC and nanoscience seem to be particularly productive. The last-mentioned program undoubtedly benefited also from the recent establishment of the Nanocenter and from the general government-backed increase in the activity in this field, as well as from active collaborations with the strong nanochemistry group in the School of Chemistry.

The theoretical activity within the group parallels in subject that of the experimental activity, but branches out also into neighboring areas like low-dimensional physics, disordered systems etc. The new recruit in mathematical physics (Bettelheim) will undoubtedly strengthen and diversify the activity of this group. A theorist in statistical mechanics seems to be lacking within the group and the Racah Institute in general. Hiring one would benefit the activity of the Racah Institute as a whole, and in particular that of the condensed matter, the non-linear, and the multidisciplinary physics groups. The publication record of the group's theorists indicates that although the activity within the group is of high quality, that subgroup is somewhat less productive than expected, considering the number of faculty and research students involved. This could perhaps be remedied by encouraging a larger interaction of the theorists with the experimenters within the group, as well as with those of the other groups within the Racah Institute, perhaps with biophysics, where there is no theorist at present.

### 3. Non-Linear Physics

The non-linear physics group includes 5 members, two experimenters and 3 theorists, two of whom have been doing mostly plasma physics in the past. There are also 16 research students in the group of whom 9 are experimenters.

The experimental work done in the group addresses subjects like surface waves (Fineberg), crack formation and propagation (Fineberg, Sharon), Faraday instability (Fineberg), sheet buckling and wrinkling (Sharon) and leaf rippling (Sharon). This work is of a very high caliber and originality, has a high international impact, and has been published in high-profile journals. The continued excellence of this group attracts research students and visitors alike.

The theoretical group works on subjects like granular matter, viscous fingering (Meerson), plasma physics (Friedland), non-linear hydrodynamics and mode-mode interactions in lasers (Gat). The overall productivity of the group is high, both in quality and quantity. The work of theorists as a group seems to be less coherent than that of their experimental counterparts. Moreover, there is practically no collaboration between the theorists and experimenters within the group. Such collaborations should be encouraged.

There are several other research activities within the Racah Institute which involve a single researcher each. Two examples are neural networks and laser-matter interactions. The work in neural networks (Sompolinsky and 10 research students) is done in close collaboration with faculty from Life Sciences. This work is internationally known, and

of the highest caliber. The high-intensity laser-matter interaction research (Ziegler and 8 students) is also very productive, highly successful, and well cited.

## 4. Biophysics

### Introduction

Biology is today in a transition state from a descriptive science to a quantitative one. This was heralded by the genome project that will ultimately decode the genetic information of the main species. At the same time quantitative tools were developed to measure messenger RNA and proteins produced in a cell (DNA chips, Protein chips). Thus not only the genetic information became available but also the phenotypic output. Also numerous experimental tools appeared to study phenomena at the cell level and molecular level (micro-fluidics, multiple tweezer techniques, high resolution fluorescence imaging).

These efforts resulted in an extraordinarily large amount of data. Mathematicians and physicists are needed to reduce, organize and model this flow of information. This fact might explain the extraordinary increase in the number of quantitative scientists in biology. Beautiful single-molecule experiments became possible. Models became useful, as complete sets of data were available.

This situation calls for competent experimental physicists who can exercise their technical abilities to invent new tools (two-photon microscopy, near-field optics, for example). At the same time profound theoretical problems open up: evolution, molecular network organization, origin of the genetic code, just to cite a few. It is thus evident that the creation of a biology group at the Racah Institute is fully justified.

### Present state of the group

The biophysics group started at the Racah Institute about 5 years ago. At present it includes two researchers and four graduate students. It took 2 years to have a molecular biology laboratory ready and this is much too long a time. (We observe that in general the time scale to build a laboratory at the Racah Institute is much too long. 6 months should be sufficient to build a laboratory once the set-up is decided!) The young researchers should be commended for their courage to start a new group at this early stage of their career. The laboratory set-up is very well structured and functioning. This was far from evident, as molecular biology techniques must be taught to young physicists. The support from the department was excellent, and the start-up money generous.

The group wants to develop an experimental and theoretical framework for the quantitative study of variations in populations of single cells starting from bacteria. As a start they study the mechanism behind the non-uniform response of bacteria to antibiotic treatment (bacterial persistence).

A new research development is on bacteria chemotaxis (response of bacteria to chemical signals). The focus will be on the bacterial molecular network responsible for chemotaxis.

The Racah Institute should be commended for this excellent start of a new group for physical studies in life sciences.

#### Recommendation for future developments

- The group is subcritical and the optimal size should be 4-5 faculty members. The methods of molecular biology are quite different from those of physics. Therefore a technical assistant is necessary.
- A structure linking the group to the biology department is necessary. The physicists must remain in contact and interact with biologists, go to seminars and be aware of all of the fast developments in the biological sciences. At the same time they should remain excellent physicists, and this is quite a task.
- It is necessary to develop a teaching curriculum in biophysics both at the undergraduate and graduate levels. It will be useful to study what American universities have done recently in this respect (a large effort by the Princeton physics department for example under Professor Bill Bialek). Biophysics is very attractive today and this should lead to an increase of physics students.

## 5. Nuclear and Elementary-Particle Physics

Theoretical high-energy physics has enjoyed a golden age during the past half a century. During this time many elementary particles were discovered and the Standard Model describing their interactions was constructed. In addition to constructing this model the high-energy theorists have also explored the dynamics of quantum field theory, uncovering many interesting phenomena. They also proposed various possible extensions of the Standard Model. Some of these might be corroborated experimentally in the near future when the Large Hadron Collider (LHC) will start operating. During the past two decades many of the theoretical high-energy physicists have also studied more fundamental issues associated with quantum gravity and string theory bringing us closer to finding a comprehensive theory of space and time. There is no sign that this exciting chain of developments is going to slow down. In particular, it is quite likely that a new wave of activity will circle around the upcoming LHC.

The Israeli theoretical high-energy physicists have played a central role in all these developments. The Israeli groups are widely considered among the best in the world and the Israeli scientists are among the world leaders. The group at the Racah Institute should be viewed in this national and international context. This group is the youngest in the country. When Rabinovici joined the Hebrew University, established and mature groups existed already at the other Israeli institutions of higher learning. Yet, in a relatively short time the Racah Institute group has played an important role in the country. At times it was by far the leading group within the whole high-energy activity in Israel. This achievement is particularly impressive given the international status of the various Israeli groups whose research is of the highest quality by any standard.

The researchers in the high-energy group have made landmark discoveries in the study of quantum field theory and string theory. Their leadership role both in Israel and the world is widely appreciated. For example, in the seventies Elitzur and Rabinovici have obtained fundamental results about the phases of gauge theories. By now these are

classic text book results. Their work in the eighties about the two-dimensional black hole was groundbreaking. Their understanding in the nineties with Givon about the interplay of gauge theory and string theory dynamics has opened many new directions. Most recently Kol joined the group and added a new research activity on the interface of string theory, quantum gravity, and cosmology.

The current age distribution of the group members is quite healthy. However, soon, when Elitzur and Rabinovici retire the group's size will significantly shrink. In order to maintain the group's excellence and its leadership role, two high-quality candidates should be hired.

In nuclear physics, the Racah Institute once played a leading role internationally, both experimentally and theoretically. With only a few new hires over the past decades, the role of nuclear physics in the Racah Institute and its international impact waned. This process is likely to continue, with several faculty members close to retirement. This fact and the lack at the Racah Institute of experimenters in elementary-particle physics would cause a gap in the entire field of experimental subatomic physics at the Institute.

In about a year's time the LHC, the world largest experiment, will start operating in CERN. This accelerator and its four detectors will explore nature at shorter distances than have ever been studied. This is expected to shed new light on many deep questions such as the structure of matter and forces, the origin of mass, the identity of the dark matter in the Universe, and the nature of space and time.

At the moment the Racah Institute does not participate in the experimental aspects of the LHC. Nor does it have any research activity in many of the important theoretical questions which circle around it. These phenomenological questions are of two general kinds. First, the analysis and the interpretation of the data from the LHC are extremely challenging and require new tools which have to be developed. Second, serious model-building work will have to take place in order to understand the new concepts that the LHC will point to.

It is strongly recommended that at least one LHC phenomenologist be hired. This will allow the Racah Institute group to participate in this very exciting international effort. This expansion to LHC physics will also positively impact other activities at the Racah Institute because an LHC phenomenologist will interact both with the nuclear physicists and with the astrophysicists. Hiring an experimental physicist working in subatomic physics should also be considered to fill the above-mentioned gap. Of course, such hirings should be subject to the excellence requirements which the Racah Institute should strive for.

We repeat here our recommendation made under the heading "Astrophysics and Cosmology" to establish a Center for Astroparticle Physics. Such a Center would support and strengthen research in particle physics and in astrophysics. The suggested expansion in astrophysics and in particle physics, and in particular the hiring of an LHC phenomenologist, will go along very well with such a center.

## Summary and Recommendations

In conclusion, the Racah Institute is a very strong physics department. The research performed here has been of the highest quality and the teaching has been very effective. However, the recent financial crisis has adversely affected the ability to perform first rate research and has led to a deterioration of the teaching.

The Committee congratulates the Faculty for being able to carry out outstanding research and maintain a high standard of teaching under these very adverse conditions. However, this catastrophic situation has to be remedied as soon as possible before the situation becomes irreversible, and drastic correcting measures have to be implemented immediately.

In view of the facts stated above, the Committee makes the following

### Recommendations:

- To strengthen the two excellent groups in Astrophysics and high-energy physics, a Center for Astroparticle Physics should be formed, a continuation or even extension of the current Einstein Center. The sizes of these groups should be at least maintained, requiring new hiring in view of forthcoming retirements. The addition of a phenomenologist in the high-energy group is strongly recommended. If an excellent candidate is available, hiring another astrophysicist is recommended.
- The newly formed biophysics group, currently only two faculty members, should be expanded to a “critical mass” of 4-5 members. A high priority should be assigned to the development of biophysics courses within the curriculum, at both elementary and advanced levels. Collaborative ties with the life sciences department are strongly encouraged.
- Immediate addition of an electronic support person and at least 1/2 of a computer support person are strongly urged. The administrative and machine shop staff should also be enlarged.
- The number of teaching assistants in the physics courses should be increased so as to allow the marking of weekly assignments and to keep recitation classes to a size of 30-35 students at most.
- The number of elective courses, particularly in the M.Sc. and Ph.D. curricula, should be increased to allow for a larger flexibility in the choice of courses.
- The entire Racah Institute should reside in a single building.

## **APPENDICES**

## **APPENDIX A**

### **RESUMES OF COMMITTEE MEMBERS**

1. Prof. Hans Weidenmueller, Max Planck Institute for Nuclear Physics (Chair)
2. Prof. Moshe Deutsch, Bar Ilan University
3. Prof. Albert Libchaber, Rockefeller University
4. Prof. Donald Lynden-Bell, University of Cambridge
5. Prof. Nathan Seiberg, Institute for Advanced Study

## **Curriculum vitae: Prof. Hans A. Weidenmüller**

(Last update: 2006)

Born on July 1933 in Dresden

School education in Dresden, final examination (Abitur) 1951

- 1951-1954 - Physics studies in Bonn
  - 1954-1957 - Physics studies in Heidelberg
  - 1955 - Diploma
  - 1957 - Ph.D. Thesis in theoretical nuclear physics
  - 1957-1958 - Research Assistant in Heidelberg
  - 1958-1959 - Research Associate, Dept. of Physics, University of Minnesota, Minneapolis  
Minnesota
  - 1959-1960 - Research Assistant, Dept. of Physics and Astronomy, California Institute of  
Technology, Pasadena, California
  - 1960-1962 - Visiting Assistant Professor, Dept. of Physics and Astronomy, California Institute  
of Technology, Pasadena, California
  - 1962-1963 - Visiting Professor, University of Heidelberg
  - 1963-1972 - Full Prof. of Theoretical Physics, University of Heidelberg since 1968
- Scientific Member, from 1972 Member of the Kollegium and Scientific Director at The Max-Planck  
Institute for Nuclear Physics in Heidelberg since 1972
- Full Professor ad personam of Theoretical Physics at the University of Heidelberg since 2001  
Emeritus

Professorship offers (declined)

- 1962 Full Prof. of Theoretical Physics, University of Marburg
- 1965 Staff member, Oak Ridge National Laboratory
- 1967 Full Prof. of Theoretical Physics, ETH Zürich
- 1969 Full Prof., Yale University

### **Honors and Awards**

- 1953-1957 - Fellow of the “Studienstiftung des Deutschen Volkes”
- 1969 - Corresponding Member of the Societè Royal des Sciences de Liège
- 1970 - Fellow of the American Physical Society
- 1973 - Member of the Heidelberg Academy of Sciences
- 1975, 1988 - Fellow of the Japan Society for the Promotion of Science
- 1977-1978 - Visiting Fellow of Balliol College, Oxford
- 1982 - Max-Planck Medal
- 1985 - Fairchild Distinguished Scholar, Caltech, Pasadena, USA
- 1991 - Honorary Doctorate at the Weizmann Institute of Science
- 1992-1993 - Fellow at the Institute for Advanced Study in Berlin 1993
- 1993 - Order of Merit of the Federal Republic of Germany
- 1993 - Nuclear Physics A, Vol. 560, 617 pages: Festschrift on the occasion of the 60th  
birthday
- 1995 - Humboldt/South African Award Space (University of Witwatersrand,  
Johannesburg, South Africa)
- 1997 - Member of the German Academy of Natural Scientists Leopoldina
- 2000 - Honorary Doctorate at the University of Rostock
- 2000 - Capes Prize, Brazil

### **Positions and membership**

Referee for Nuclear Physics A, Physics Letters, Physical Review Letters, Physical Review B, C and  
E, Europhysics Letters

- since 1959 - Member of the American Physical Society
- since 1986 - Member of The European Physical Society
- 1973-1974 - Chief Editor of the Zeitschrift für Physik

- 1975-1988 - Chief Editor of the Zeitschrift für Physik A, Atoms and Nuclei
- 1989-1994 - Co-Editor of the Zeitschrift für Physik A, Hadrons and Nuclei
- 1973-1994 - Member of the Minvera-Committee
- 1976-1978 - Member of the Scientific Advisory Board of the Institute of Nuclear Physics, Research Center in Jülich
- 1979-1980 - Member of the ad hoc-Committee Nuclear Physics of the German Ministry of Research and Technology
- 1981-1984 - Member of the Selection Board for the Heisenberg Fellowship Program
- 1981-1987 - Chairman of the Minerva-Fellowship-Committee
- 1982-1984 - Executive Director of the Max-Planck-Institute for Nuclear Physics in Heidelberg
- since 1983 - Member of Board of Governors of the Weizmann Institute of Science in Rehovot
- 1987-1991 - Member of the Board of Governors of the German-Israeli Foundation (GIF)
- 1988-1993 - Chairman of the German-Israeli Committee (Minerva)
- 1988-1991 - Chairman of the Chemical-Physical-Technological Section of the Max-Planck Society
- 1990-2000 - Member of the the Selection Board for the Max-Planck Research Award and its Chairman 1995-2000
- 1990-1993 - Member de Comité Scientifique de la Division de Physique Théorique de IPN a Orsay
- 1991 - Member of the Panel on Nuclear and Particle Physics, Review Committee on Physics in Denmark
- 1993 - Member of the search committee for the president of the Max-Planck-Society
- 1993-1999 - Member of the Board of Directors of the Studienstiftung des Deutschen Volkes
- 1993-1999 - Senator of the Max-Planck Society
- 1993-1999 - Member of the Scientific Board at the Institute for Advanced Study in Berlin, since 1995 Chairman
- 1994-1999 - Member of the Advisory Board for the Minerva Center for Physics of Complex Systems at the Weizman Institute, Rehovot, Israel
- 1995-2001 - Member and Chairman of the Advisory Board for the Minerva Center for mesoscopic physics, fractal und neuronal networks at the Bar-Ilan University, Ramat Gan, Israel
- 1995-1997 - Member, Advisory Board, National Institute for Nuclear Theory, University of Washington, Seattle, WA, USA
- 1998-2002 - Chairman of the Committee for the Max-Planck-Medal
- since 1998 - Member of the German Physical Society (DPG)
- 1999-2004 - Member of the Board of the Studienstiftung des Deutschen Volkes and its Chairman
- Since 2000 - Co-chair of the scientific and academic advisory committee, Weizmann Institute of Science
- 2001 - External Member of the Selection Committee for a chair for Theoretical Physics University of Innsbruck
- 2001 - Member of the search committee for the Director of Collegium Budapest
- 2003 - Chair, ETC Review Committee
- 2004 - Member, Review Committee German-Israeli Project Finding Research Collaborations at foreign Universities and Research Institutions
- 1963 Lawrence Berkeley Laboratory (3 months)
- 1964 California Institute of Technology (4 months)
- 1967 MIT (4 months)
- 1968-1969 Yale University (10 months )
- 1972 ETH ( 4 months )
- 1985-1986 University of Paris in Orsay ( 6 months)
- 1986 California Institute of Technology (6 months)
- 1992-1993 Institute for Advanced Study, Berlin (10 months)
- 1996 University of the Witwatersrand, Johannesburg (2 months)

# ***Moshe Deutsch***

CV 30/10/2007

## **Address**

Mail: Physics Dept., Bar-Ilan University, Ramat-Gan 52900, Isreal

Phone: +972-(0)3-5318476, FAX: +972-(0)3-7384054, E-mail: deutsch@mail.biu.ac.il

## **Education**

B.Sc., Physics, Tel-Aviv University, 1968; M.Sc., Physics, Bar-Ilan University, 1973

(Magna Cum Lauda); Ph.D., Physics, Bar-Ilan University, 1979 (Magna Cum Lauda).

## **Appointments**

Present: Professor, Physics Dept., Bar-Ilan University.

Past: Physics Dept., Brookhaven National Lab, U.S.A.; DEAS, Harvard University, U.S.A.;

Physics Dept., Manchester University, U.K.; Physics Dept., King's College, London, U.K.

## **Professional activities**

### ***Bar-Ilan University***

#### Present:

Member of the University Senate, Appeals Committee for Students' Disciplinary Action, Steering Committee of the Minerva Center for Superconductivity.

Past: Supreme Promotions & Nominations Committee, Chairman of the Physics Department, Steering Committee of Interdisciplinary Studies.

### ***National***

Present: Division of Exact Sciences & Technology, Israel Science Foundation, (Head); National Physics Programs Evaluation Committee, Israel Council for Higher Education; National Synchrotron Committee, Israel Academy of Sciences (Chair); Committee for Senior Immigrant Scientists, Planning and Budgeting Committee, Israel Council for Higher Education; Rotshchild Fellowships Committee, "Yad Hanadiv" Foundation; Exact Sciences Committee (Chair) & Board Member, Clore Scholarship Programme, Clore Israel Foundation.

Past: Israeli SESAME Committee, Ministry of Science and Technology, State of Israel (Chair); ISRACERT certifying body, Israel National Association for Non-Destructive Testing ; Advisory Committee on User Facilities at the Israeli FEL Laboratory, Israel Academy of Sciences (Chair); Israeli UNESCO Committee, Ministry of Education, State of Israel; Board of the Israel Crystallography Association; Advisory Committee to the Minister of Commerce and Industry, State of Israel, on The Israel National Physical Laboratory; Israel National Physical Laboratory, Review Committee, Ministry of Commerce and Industry, State of Israel.

***International:***

Present:

Hard X-Ray Expert Group, European Strategy Forum on Research Infrastructures, EU.

Past: European Synchrotron Radiation Facility, Council Member for Israel; UNESCO Advisory Board on a Middle East Synchrotron Facility; SESAME (Synchrotron Light for Experimental Science and Application in the Middle East), Council Member for Israel.

**Research Interests**

Experimental soft condensed matter physics, liquids, liquid surfaces, thin films, x-ray physics, x-ray spectroscopy, x-ray radiography, perfect crystal x-ray optics, crystal nucleation and growth, applications of synchrotron radiation, mathematical methods in physics.

**Publications**

Over 220 peer-reviewed publications in various fields of liquid surfaces, thin films, condensed matter physics, x-ray optics, atomic physics, x-ray radiography, crystal nucleation and growth, mathematics, etc.

**Conference participation**

Over 80 invited and contributed talks in international and national conferences, and workshops.

**Albert Joseph Libchaber**  
**CURRICULUM VITAE**

Date of Birth: October 23, 1934  
Birth Place: Paris, France  
Marital Status: Married, 3 children

**Education:**

June, 1956 Bachelor's Degree in Mathematics, University of Paris  
June, 1958 Ingénieur des Télécommunications, Ecole Nationale Supérieure des Télécommunications  
Oct. , 1959 Master's of Science Degree in Physics, University of Illinois  
June, 1965 Ph.D. in Physics, Ecole Normale Supérieure, University of Paris

**Employment:**

10/1959 - 1961 Military Service. Atomic Division of the Army, Technical Section  
1962 Attaché de recherche CNRS, Ecole Normale Supérieure  
9/1965 - 9/1966 Member of Technical Staff, Bell Telephone Laboratory  
1/1967 Maitre de Recherche CNRS, Ecole Normale Supérieure  
7-9/'67, '68, '69, '70, '72 Bell Telephone Laboratory  
1974 Directeur de Recherche CNRS  
10/1983 Professor, University of Chicago, Department of Physics and James Franck and Enrico Fermi Institutes  
5/1987 Paul Snowdon Russell Distinguished Service Professorship, University of Chicago  
9/1991 Professor, Department of Physics, Princeton University  
9/1991 - 2003 Fellow, NEC Research Institute, Princeton  
7/1993 James S. McDonnell Distinguished University Professor, Princeton University  
8/1994 Professor of Physics, The Rockefeller University  
6/1995 Detlev W. Bronk Professor, The Rockefeller University

**Honors:**

|           |  |
|-----------|--|
| 1968      | Silver Medal of the CNRS for the work in metal physics   |
| 1979      | Grand Prix de Physique, Société Française de Physique, Prix Ricard   |
| 1982      | Corresponding Member of the French Academy of Science  |
| 1986      | Wolf Prize in Physics  |
| 1986-1991 | MacArthur Fellowship   |
| 1986      | Member of the American Academy of Arts and Sciences  |
| 1993      | Chevalier de l'ordre national de la Légion d'Honneur   |
| 1999      | Prix des Trois Physiciens, Fondation de France   |
| 2001      | The Raman Chair, Indian Academy of Sciences, Bangalore, India  |
| 3/2003    | Doctor Honoris Causa by The Weizmann Institute of Science, Rehovot, Israel.  |
| 12/2004   | Member of the Board of Governors for a five-year term and of the Scientific and Academic Advisory Committee for a three-year term. The Weizmann Institute of Science, Rehovot, Israel. |
| 6/2005    | Nomination as Honorary Doctor of Science (doctor scientiarum honoris causa) in natural sciences, in year 2005, from the University of Copenhagen, Copenhagen, Denmark.                 |
| 5/2007    | Member of the National Academy of Sciences, Washington, D.C.   |

**Distinguished Lectures:**

|         |   |
|---------|---|
| 3/ 1999 | Harvard University: The 1998/1999 Morris Loeb Lectures in Physics   |
| 2/ 2001 | Penn State University: Marker Lectures  |
| 5/ 2001 | Boston University: Edmonds Lecture  |
| 1/ 2002 | Racah Institute of Physics, The Hebrew University, Jerusalem, Israel: The Cohen/Offer Distinguished Lectures in Physics |
| 2/ 2002 | The Institute for Genomic Research (TIGR), Rockville, MD: Distinguished Lecture Series                                  |
| 11/2003 | The Weizmann Institute, Rehovot, Israel: The 44 <sup>th</sup> Annual Memorial Lectures                                  |
| 10/2004 | Bethe Lectureship at Cornell University, Ithaca, NY.  |

**DONALD LYNDEN-BELL**  
CURRICULUM VITAE

|                |  |
|----------------|--|
| Date of birth: | 5 April 1935   |
| Education:     | Marlborough College  |
| 1953 – 1957    | BA and MA University of Cambridge, Clare College<br>Mathematics tripos pt. II<br>Natural Sciences tripos pt. II (theoretical) physics<br>Murgoci Prize, Clare College.<br>Mathematics tripos pt. III (with distinction).<br>Honorary Scholar, Clare College. |
| 1957 – 1960    | Ph.D. in Theoretical Astronomy, Cambridge.   |
| 1960 – 1962    | Research Fellow, Clare College.  |
| 1960 – 1962    | Harkness fellow of the Commonwealth Fund held at California<br>Institute of Technology and Mt. Wilson & Palomar Observatories.   |
| 1962 – 1965    | Assistant Lecturer in Mathematics, U. of Cambridge.<br>Fellow & Director of Studies in Mathematics, Clare College.   |
| 1965 – 1972    | Principal Scientific Officer, Royal Greenwich Observatory<br>Herstmonceux, later Senior Principal Scientific Officer<br>(special merit).   |
| 1969 – 1970    | Visiting Associate, California Institute of Technology.  |
| 1970 – 1972    | Visiting Professor of Astronomy, University of Sussex.   |
| 1972 – Present | Professor of Astrophysics, University of Cambridge and<br>Professorial Fellow of Clare College.  |
| 1978           | Fellow of the Royal Society.   |
| 1972 – 1977    | Director Institute of Astronomy, University of Cambridge.  |
| 1982 – 1987    |  |
| 1992 – 1994    |  |
| 1979           | Fairchild Distinguished Scholar, California Institute of Technology.   |
| 1982 – 1984    | Member of SRC Astronomy II Committee.  |
| 1983           | Schwarzschild medal of the Astronomische Gesellschaft.   |
| 1984           | Eddington medal of the Royal Astronomical Society.   |
| 1983 – 1985    | President Cambridge Philosophical Society.   |
| 1985 – 1987    | President Royal Astronomical Society.  |
| 1985           | Hon. Foreign Member American Academy of Arts & Sciences,<br>Boston.  |
| 1986           | Chairman Review Committee Mt. Stromlo & Siding Springs<br>Observatory.   |
| 1987           | Visiting Astronomer at Mt. Stromlo Observatory, Canberra, Australia.   |

1987 Hon. D.Sc. Sussex University.

1990 Einstein Fellow of the Israeli Academy.

1990 Foreign Associate of the U.S. National Academy of Sciences.

1990 Brouwer Prize of A.A.S.

1990 Review of Astronomy in South Africa (with R.D. Davies, FRS).

1991 Visiting Astronomer, California Institute of Technology.

1992 Oort Professor of Leiden University (1 month).

1992 – 1994 On Funding for Research Development National Astronomy Facilities Board (South Africa).

1992 – 1994 On Advisory Council of Inter-University Centre for Astronomy & Astrophysics, Pune, India.

1993 Gold medal of the Royal Astronomical Society.

1994 Foreign Associate of the Royal Society of South Africa.

1995 Chairman Review Committee School of Cosmic Physics Dublin Institute for Advanced Studies.

1996 – 1999 PPARC Senior Research Fellow.

1996 – 1999 Visiting Professorial Fellow, The Queen's University, Belfast.

1998 Bruce Medal, Astronomical Society of the Pacific.

1999 John J. Carty Award for the Advancement of Science, National Academy of Sciences, Washington DC.

2000 Henry Norris Russell Lectureship, American Astronomical Society.

2000 Commander of the Most Excellent Order of the British Empire.

2001 Honorary member of the American Astronomical Society.

2003 Sir David Bates Lecturer, The Queen's University, Belfast.

2004 Honorary fellow of IUCAA (The Inter-University Centre for Astronomy and Astrophysics, Pune, India.)

2004 Distinguished Lecturer, Institute for Theoretical Physics, Technion, Haifa, Israel

2007 Blaauw Professor Rijksuniversiteit of Groningen.

# NATHAN SEIBERG

## Curriculum Vitae

### PERSONAL INFORMATION

Born: September 22, 1956, in Israel

Nationality: Israel, USA

### EDUCATION AND PROFESSIONAL EXPERIENCE

|                       |  |
|-----------------------|--|
| 1997-:                | Prof., Institute for Advanced Study            |
| 1994-1995:            | Visiting member, Institute for Advanced Study  |
| 1990-1997:            | Prof. II, Rutgers University                   |
| 1989-1990:            | Prof., Rutgers University                      |
| 1989-1991:            | Prof., Weizmann Institute                      |
| 1986-1989:            | Assoc. Prof., Weizmann Institute               |
| 1985-1986:            | Senior Scientist, Weizmann Institute           |
| 1984-1985, 1987-1989: | Long-term member, Institute for Advanced Study |
| 1982-1984:            | Member, Institute for Advanced Study           |
| 1978-1982:            | Ph.D. Weizmann Institute of Science, Israel    |
| 1977-1982:            | Military Service                               |
| 1975-1977:            | B.Sc. High Distinction, Tel-Aviv University    |

### HONORS

|            |  |
|------------|--|
| 2002:      | Wolfgang Pauli Lectures, ETH, Switzerland                                |
| 2001:      | Fellow, American Academy of Arts and Sciences                            |
| 2000:      | Emmy Noether Lectures, Bar-Ilan University, Israel                       |
| 2000:      | Distinguished Lecture Series, Technion, Israel                           |
| 2000:      | Biedenharn Lecture, University of Texas                                  |
| 1999:      | Buhl Lectures, Carnegie Mellon University                                |
| 1999:      | Distinguished Lecture, Stanford University                               |
| 1998:      | Dannie Heineman Prize of the American Physical Society                   |
| 1998:      | Simons Lectures, University of New-York at Stony Brook                   |
| 1998:      | Racah Lecture, Hebrew University, Jerusalem, Israel                      |
| 1997:      | Amos de-Shalit Lecture, Weizmann Institute of Science, Rehovot, Israel   |
| 1997:      | The Morris Loeb Lectures in Physics, Harvard University                  |
| 1996:      | The John D. and Catherine T. MacArthur Foundation Fellowship             |
| 1996:      | New Jersey Pride Award of New Jersey Monthly Magazine                    |
| 1996:      | Board of Trustees Award of Rutgers University for Excellence in Research |
| 1996:      | Distinguished IFT Lectures in University of Florida                      |
| 1995:      | Oskar Klein Lecture and Oskar Klein Medal                                |
| 1985:      | Racah Lecture, Weizmann Institute of Science, Rehovot, Israel            |
| 1982:      | J. F. Kennedy Prize, Rehovot, Israel                                     |
| 1981:      | Michael Landau Prize, Israel   |
| 1979:      | Mifal Hapais Prize, Israel   |
| 1976:      | Israel Physical Society Prize  |
| 1976:      | Amos de-Shalit Foundation Scholarship                                    |
| 1975-1977: | Dean's List of Honors, every year  |

## **APPENDIX B**

### **List of People who Met with the Committee**

The President, Prof. Menachem Magidor  
The Rector, Prof. Haim Rabinowitch  
The Vice-Rector, Prof. Miri Gur-Arye

Head of Academic Review for the Sciences, Prof. Eliahu Friedman  
Head of Academic Review for the Humanities, Prof. Jacob Metzger

Dean of the Faculty of Science, Prof. Hermona Soreq

Former Head of the Department of Physics, Prof. Jay Feinberg  
Current Head of the Department of Physics, Prof. Shmuel Elitzur  
Chairman of Physics Studies, Prof. Bill Glaberson

Chairman of the School of Engineering, Prof. Michael Ben-Or  
Chairman of Applied Physics, Prof. Aharon Agranat

#### Evaluation Committee (Physics):

Prof. Oded Millo, Prof. Avi Schiller, Prof. Avishai Dekel, Prof. Amit Giveon

Head of 1st Year Teaching Lab – Prof. Israel Felner  
Admin. Head of Nano Center – Mr. David Shafranek

#### Senior & Emeriti Faculty (Physics):

Prof. Eliezer Rabinovici, Prof. Jacob Bekenstein, Prof. Oded Agam, Prof. Ami Leviatan,  
Prof. Zvi Ovadyahu, Prof. Ofer Biham, Prof. Haim Sompolsky, Prof. Avraham Gal,  
Prof. Tsvi Piran, Prof. Michael Paul, Prof. Itzhak Balberg, Dr. Amir Sa'ar

#### Junior Faculty (Physics):

Dr. Hagai Eisenberg, Dr. Eran Sharon, Dr. Dror Orgad, Dr. Omri Gat,  
Prof. Nir Shaviv, Prof. Barak Kol, Dr. Natalie Balaban

#### Newly Recruited Faculty (Physics):

Dr. Eldad Bettelheim, Prof. Ronen Rapaport, Dr. Nadav Katz, Dr. Ady Vaknin

#### Faculty of Applied Physics:

Prof. Yuri Feldman, Prof. Aaron Lewis, Prof. Nissim Ben-Yosef, Dr. Dan Marom,  
Dr. Uriel Levy

Students from Talpiot/Amirim Programs - 6

Meeting with BSc. students in Physics – 5

Meeting with MSc. students in Physics – 5

Meeting with PhD students in Physics – 8

Meeting with Msc. students in Applied Physics – 6

Meeting with PhD students in Applied Physics - 7