

Evaluation 2005 – 2010

FOM Institute for Atomic and Molecular Physics (AMOLF)

The Hague, 2011

Netherlands Organisation for Scientific Research

Contents

1	Introduction	5
1.1	Scope and context of this evaluation	5
1.2	The evaluation committee	5
1.3	Data supplied to the committee	5
1.4	Procedures followed by the committee	6
1.5	Aspects and assessment scale	6
2	AMOLF	7
2.1	Mission	7
2.2	Research	7
2.3	Organisational structure	8
3	Assessment of the Institute	11
3.1	Answers to the Standard Evaluation Protocol	11
3.2	Productivity	14
3.3	Relevance	14
3.4	Vitality and feasibility	15
3.5	Additional questions posed to the panel by NWO and FOM	16
4	Research programme Assessments	19
4.1	Research programmes Nanophotonics	19
4.2	Research programme Ultrafast molecular dynamics/Molecular Biophysics	20
4.3	Research programme Physics of biomolecular systems	21
4.4	Exploratory/Transition programme	23
5	Conclusions and Recommendations	25
6	Appendices	27
6.1	Curricula vitae of the committee members	27
6.2	Standard Evaluation Protocol 2003-2009	33
6.3	Programme of the site visit	34
6.4	List of PDs and PhDs interviewed	35

1 Introduction

1.1 Scope and context of this evaluation

The Netherlands Organisation for Scientific Research (NWO) and the Foundation for Fundamental Research on Matter regularly evaluate the scientific performance of its research institutes. As part of this evaluation scheme, the FOM-institute for Atomic and Molecular Physics (AMOLF) has been evaluated by an international committee. The aims of the assessment system are:

- Improvement of research quality based on an external peer review, including scientific and societal relevance of research, research policy and research management.
- Accountability to the board of the research organisation, and towards funding agencies, government and society at large.

The committee is asked to produce a reasoned judgement on the mission, strategy and performance of the institute. The evaluation contains retrospective and prospective elements. The assessment is based on the Standard Evaluation Protocol 2009-2015 (SEP) (FOM-11.0317), which calls for an evaluation both of the research institute itself and of the research programmes it conducts. The research institute submitted details of the results that have been achieved in each research programme over the previous six years (including quantitative data about staff input, key publications and a list of publications), a short outline of the mission statement of each programme, and details of developments anticipated in the context of the research profile of the institute. Important elements of this review are a site visit, which includes interviews with the management and the programme directors, and a tour of the facilities.

1.2 The evaluation committee

The evaluation committee was appointed by the Governing Board of NWO following consultation with FOM. Its members are:

Prof. Jean-Francois Joanny	Institut Curie, Paris (chair)
Prof. John B. Pendry	Imperial College, London
Prof. Søren Keiding	Aarhus University, Aarhus
Prof. Harald Giessen	4. Physikalisches Institut, Stuttgart
Prof. Erwin Frey	Ludwig-Maximilians University, München
Prof. Martha Merrow	Rijksuniversiteit Groningen

A short curriculum vitae of each of the members is included in an appendix to the report.

The committee was supported by FOM staff (Christa Hooijer). All members of the committee declared that their assessment had been free of bias, personal preference or personal interest, and that it had been reached without undue influence from the institute, the programme directors or other stakeholders. Any existing professional relationships between committee members and programmes under review were brought to the attention of the committee. The committee concluded that there were no conflicts of interest.

1.3 Data supplied to the committee

The documentation included all the information required by the SEP, as well as answers to the additional questions addressed to AMOLF by NWO and FOM. It included:

- The self-evaluation report 2005-2010 by AMOLF.
- The strategic plan AMOLF 2011-2016
- A bibliometric study on the FOM institute AMOLF performed by CWTS in Leiden, the Netherlands

During the site visit, the following additional information was made available:

- a USB stick with and handouts of all the presentations held during the site visit
- a diagram indicating the first positions after AMOLF PhD
- an overview of the Monday morning seminars at AMOLF of the past year

1.3.1 Jargon

AMOLF uses terms different from those used by the SEP. In this report we will use the AMOLF terminology. The expression 'management team' refers to the director, the department heads, and the institute manager.

For convenience, the following abbreviations are used:

- PhD = graduate student (oio, promovendus).
- PD = postdoctoral researcher.
- FTE = full-time equivalent (labour contract of 38 hours/week).

1.4 Procedures followed by the committee

The committee proceeded in accordance with the Standard Evaluation Protocol 2009-2015 (see Appendices 6). The assessment was based on the documentation provided by the institute (self-evaluation report, strategic plan and bibliometric study), the selected key publications, and the interviews conducted during the site visit on 6-8 April 2011. The programme of the site visit is included in appendix.

The self-evaluation report, the selected papers and an explanatory letter were sent to the committee one month before the site visit. The chair and the secretary of the committee established a timetable for the site visit (see Appendix 6.3).

The committee was installed on the first day by Prof. Ben de Kruijff, member of the General Board of NWO in the presence of the director of FOM, Dr. Wim van Saarloos. Professor Polman, director of AMOLF, gave a short introduction to his institute. Afterwards the panel met in closed session to finalize the division of tasks and the agenda for the site visit on day two and three.

On April 7, the panel interviewed individually the three programme leaders and all the group and project leaders who are expected to be at AMOLF in the coming years as well as the two group leaders who recently obtained director positions in external Institutes. The panel wrote their reports on that evening.

On April 8, the strategic plan was presented to the panel by the director, the department heads and the institute manager. The panel then was given a lab tour. The panel had lunch with PhD students and a postdoc who were interviewed in the absence of their supervisors. The afternoon was devoted to writing the main part of the report and formulating together the panel's conclusions. At the end of the afternoon, the conclusions of the panel were presented to the FOM director, the director of AMOLF and to the AMOLF group leaders.

1.5 Aspects and assessment scale

The committee used the scale provided in the Standard Evaluation Protocol.

2 AMOLF

2.1 Mission

AMOLF is one of the three research laboratories of the Foundation for Fundamental Research on Matter that is part of the Netherlands Organisation for Scientific Research. The mission of AMOLF has been defined as follows: “to initiate and to perform leading fundamental research on novel strategically important complex molecular and materials systems, in partnership with Dutch academia and industry”.

2.2 Research

2.2.1 Past research

During the period 2006-2010, the research programmes of AMOLF focused on two lines of research, ‘Physics of biomolecular systems’ and ‘Nanophotonics’.

- The research line on ‘Physics of Biomolecular systems’ was organized into two programmes ‘Biomolecular systems’ with 6 research groups and ‘Biomolecular Nanophysics’ with 5 research groups
- The research line on ‘Nanophotonics’ comprised 5 groups in 2011

In addition there was also a ‘Transition programme’.

2.2.2 Future research

For the period 2011-2016, the research at AMOLF will be organized into 2 lines of research: ‘Nanophotonics’ and ‘Biomolecular Physics’.

1. The line of research on ‘Nanophotonics’ will be organized in two programmes.

The aim of the ‘Nanophotonics’ programme is the control of light at lengths smaller than its wavelength. It will aim at finding new ways to generate, guide, direct, focus, concentrate and slow down light, to control light at the quantum level and to explore the magnetic components of light. It will have many possible applications in solid state lighting, nanomaterials and devices. This programme will include 6 research groups including a group located at Philips in Eindhoven and one vacancy. The programme comprises 55 researchers.

The new ‘Photovoltaics’ group is a focus group that will work on novel nano-structuring strategies leading to strongly enhanced light matter interactions and to the application of these strategies for light collection and charge separation. This programme is built on the insight on the concentration of light at the nanoscale and on the expertise on biomolecular self-assembly gained by AMOLF. The programme will be initiated by the hiring of three project leaders.

2. The line of research on ‘Biomolecular Physics’ will also be organized in two programmes.

The ‘Systems Biophysics’ programme aims at studying experimentally and theoretically the functional modules that dictate the behaviour of living cells. It will focus on active cytoskeleton components, regulation networks and the interactions between them. It will be composed of 5 experimental groups and 2 theoretical groups and it comprises 48 researchers.

The 'Molecular Biophysics' programme aims at understanding the fundamental interactions between biomolecules in their environment: membranes, proteins and their surrounding water layers. It will be mostly based on ultra-fast spectroscopic techniques that allow a detailed study of these interactions at the nanoscale and at the relevant time scales. The programme will have contacts with industrial partners such as Wetsus, Danone and Unilever. It comprises 32 researchers.

2.3 Organisational structure

Research at AMOLF is organised in research groups lead by a group leader or a project leader. The groups are relatively small with between 5 and 10 students or post-docs around a single staff scientist. The group leader has full responsibility for running the group, raising the research funds and carrying out the research projects.

The research groups are organised into 3 departments:

- Nanophotonics
- Systems biophysics
- Molecular biophysics

A new Photovoltaics department is currently being created.

The department head coordinates the research activities, the collaborations and the grant applications within the department.

AMOLF also has extensive technical facilities that are essential for the research done in the various groups. The technical support division is organised in 4 groups: Mechanical engineering, Mechanical workshop, Electronics engineering, Software engineering.

The technical and administrative support within the institute is managed by the Institute manager who directly reports to the director.

2.3.1 Location

Since 2009, AMOLF has been located in a new building in the Science Park in Amsterdam. Neighbouring buildings include the faculty of science of the University of Amsterdam including the Physics Department, the FOM-institute for Subatomic physics (NIKHEF) and CWI, a NWO mathematics institute. The move to the new building was accomplished with little delay and little cost overrun. Productivity was minimally – if at all – impacted by this process. The new building is very successful by all standards, delivering improved working conditions and facilities.

2.3.2 Financial matters

The budget of AMOLF is made of a fixed mission budget and of contracts financed on open competition by FOM projects or third parties. The mission budget was 6.783 M€ in 2010. The budget obtained on FOM projects fluctuated during the period between 3 and 4M€ with a peak of 5.6M€ in 2006 due to a large grant intended to finance the 'Center for Nanophotonics'. Funding from third parties also fluctuated between 3 and 4 M€. The total budget of AMOLF was 14.272 M€ in 2010.

2.3.3 Current staff

AMOLF employs a scientific staff of about 129 FTE. Each of the 16 research groups is composed of PhD students, post docs, undergraduate students, guests, and one leading staff member (typically 5-10 group members). The scientific groups are led by 12 group leaders with a permanent position, and 4 project leaders who are appointed at AMOLF to initiate and carry out a 5-year project, with the possibility of tenure afterwards. Group technicians are linked to the experimental research groups to develop and support equipment that is specific for the group. Central technical support at AMOLF is provided in four engineering groups: Mechanical Engineering, Mechanical Workshop, Electronics Engineering and Software Engineering. The total technical support staff is nearly 47 FTE. Administrative support and general facility management is provided by another 22 FTE.

3 Assessment of the Institute

The panel grades the institute as indicated in the table below. The section numbers refer to the sections where these grades are argued.

Assessment on	Grade	Section
Quality		
Quality and scientific relevance of the research	5	3.1.1
Leadership	5	3.1.2
Academic reputation	5	3.1.3
Resources	4	3.1.4
PhD training	5	3.1.5
Productivity		
Productivity strategy	5	3.2.1
Productivity	5	3.2.2
Relevance		
Societal relevance	5	3.3
Vitality and feasibility		
Strategy	5	3.4.1
SWOT-analysis	not graded	3.4.2
Robustness and stability	4	3.4.3

3.1 Quality

3.1.1 Quality and scientific relevance of the research 5

AMOLF is a Dutch center for fundamental research in physics of outstanding quality. In all areas of research -Nanophotonics, systems biophysics and biomolecular physics- AMOLF is at the frontier of the respective fields nationally as well as internationally. This is well documented in the bibliometric study on AMOLF done by the Center for Science and Technology Studies at Leiden University. This study shows that in terms of scientific productivity and impact AMOLF shows an outstanding performance compared to world-wide standardized impact levels.

Several other indicators support these conclusions: AMOLF permanent staff members have received some of the most prestigious personal grants (ERC advanced, VICI, VIDI, Human Frontiers, etc). Two AMOLF staff members were recently recruited to directorships at leading research institutions in Europe, and AMOLF staff members have a very high number of invited presentations at international conferences and meetings. From the panel's interviews, it is also evident that AMOLF is able to recruit new tenure track staff members from among the best and most talented young scientists. This contributes to the unique and dynamic scientific atmosphere at the AMOLF institute, enabling the institute to follow and develop new lines of research very rapidly and with very high quality.

The quality of the institute is evident from the large number of collaborative projects either based at, or with participation from AMOLF. A large part of these collaborative efforts are with industry in the form of IPP programmes. The renewal of these, and the initiation of new IPP programmes, again bears evidence for the quality of the scientific work from AMOLF, not only in fundamental science but also in applied science.

Many factors contribute to the outstanding quality of the AMOLF institute, and the panel acknowledges the importance of the technical infrastructure at AMOLF. Thus, academic quality is greatly supported by the creative, original and efficient use of the excellent technical infrastructure. It will be essential to maintain this structure at the top level in the coming years.

Also the management structure and practice serves to enforce the quality of the scientific contributions from AMOLF. The panel assesses that having a manager and managerial team consisting of scientists of international reputation is a key factor in the outstanding quality achieved at AMOLF in all areas of relevance.

3.1.2 Leadership 5

The AMOLF institute is managed through a flat and non-hierarchical organisation that is considered appropriate for an institute of its size. The structure assures that responsible independent scientific management within the research groups is encouraged while at the same time maintaining a focus on the overall research strategies. This also favours mobility between subjects and turnover of staff and ideas.

The ability to change research direction and to start new research groups is central to the mission and tradition of AMOLF. The panel assesses that the present director is a strong driver of this process. He has instigated a consensus driven process where the individual group leaders contribute to discussion of future scientific activities. This contributes to a good atmosphere favouring collaborations and creativity. It is noted by the panel that these consensus driven processes did not prevent the management of taking difficult decisions where scientific activities were terminated.

On the national scene AMOLF has taken leadership in a substantial number of new research initiatives and thus continues to play a key role in disseminating new research fields into Dutch society.

The present leadership of AMOLF have brought the institute to a stronger position during the last 5 years. They have delivered what they set out to do in their strategic plan five years ago. In addition they have formulated a new strategic plan for AMOLF, carefully balanced to address fundamental issues in science and society, and to allow for new research fields to be discovered.

3.1.3 Academic reputation 5

As concluded in the bibliometric analysis mentioned above, the scientific output from AMOLF is of an exceptionally high level on a world wide scale. This is confirmed by the high international reputation held by the institute and its researchers.

Researchers from AMOLF are repeatedly recruited to highly profiled positions in Europe and the USA, they are invited to conferences, and they serve on editorial boards of high profile journals.

AMOLF has a similar reputation of having an inspiring and dynamic scientific atmosphere that is able to initiate and follow new paths while maintaining a solid foundation in basic physics. This reputation is one of the key factors in their ability to constantly attract very good and talented new group leaders, postdocs, and PhD students.

3.1.4 Resources 4

AMOLF is a small institution that works with small research groups and has groups and has a large turnover among its staff scientists. For example, new hiring procedures are currently under way in the 'Molecular biophysics' group to replace the two group leaders who recently obtained a director position in large Institutes in Germany and the 'Imaging Mass Spectroscopy' will be discontinued at AMOLF aiming at its transfer to a biomedical environment.

The laboratories are shared between the various groups. This allows having very high level facilities in a rather small institute. The panel insists on the absolute necessity of maintaining facilities and technical support at this top level as they are an essential element of the quality of the experimental research at AMOLF.

AMOLF has moved in 2009 in a new building. The new building is wonderful and perfectly adapted to the research done in AMOLF. The move has gone in due time, rapidly and very efficiently. It also appears that the move has created only small delays in the experiments.

The group and project leaders at AMOLF have had good success in raising money from FOM and third parties and the 'open competition' budget is a large part of the AMOLF budget. The panel has been explained in details the request of increases in the mission budget in particular to cover the salaries of all group leaders on the mission budget. It recommends an increase of the budget at least as large as that proposed by the director so that the financial situation of the Institute be equilibrated in the next years. If this is not the case AMOLF will have to reduce the number of its group leaders, which does not appear desirable for maintaining a strong focus on the mission.

Several AMOLF members have received large prestigious grants in the recent years such as an ERC Advanced Grant (Polman), several VICI-grants and VIDI-grants or Human Frontier grants.

3.1.5 PhD training 5

AMOLF hosts on average 50 PhD students. The theses are successful but the average duration of a PhD at AMOLF is 4.7 years instead of the 4 planned years. The panel encourages the ambition of the Institute to shorten this length in the coming years. Most of the PhD students continue in academia and science but a rather large number (30%) go to industry or start up companies.

The panel has met 6 of the PhD students during lunch. Most students feel happy to work at AMOLF and decided to come there because of the reputation of the Institute. They are in particular very happy with the offer of courses on project planning. Some students though find that they do not know many people outside of their own group. A possible solution would be to organise a common retreat of the Institute that would create strong links between the various groups. AMOLF also hosts a large number of undergraduate students and has an interesting programme to host in their laboratories Physics high school teachers.

AMOLF has very strong links to Dutch universities as most of the group leaders hold positions in different Dutch universities where they teach regularly.

3.2 Productivity

3.2.1 Productivity strategy 5

The group leaders in AMOLF have a strategy to publish their research results in high profile journals. The result is that a very high proportion of the papers published by AMOLF appear in journals with a citation index higher than Physical Review Letters, the journal that serves as the reference journal in Physics.

AMOLF researchers have an internal review system such that any new publication and any grant application is internally reviewed prior to submission. They also have 'grill' sessions before grant interviews.

The last review committee had pointed out the small number of patents filed by the AMOLF researchers. The situation has significantly improved and 20 patents have been filed since then. The panel suggests that they have a strict policy to not maintain patent portfolios, to file the patent immediately with a company and/or to sell it quickly.

The AMOLF researchers also have applied to and obtained prestigious grants (ERC, Vidi, Vici). They are also leading a number of national FOM projects.

3.2.2 Productivity 5

AMOLF publishes every year a high number of well read and well cited scientific publications. More than 30% in top journals, which is exceptional.

72 PhD theses have been completed during the period 2005-2010.

The strategic plan proposes to install sabbatical programmes for professors of Dutch Universities.

The panel strongly supports this initiative.

One of the important facilities of AMOLF is the cleanroom of the Nanocenter. It is well used also by users from outside AMOLF (academia and industry).

3.3 Relevance

3.3 Societal relevance 5

An important impact and outreach factor is the presentation of results in scientific journals and conferences, as well as through articles in the press and on TV.

Also, value to society is generated through technology transfer and valorisation of patents as well as by a spinoff company and the industrial partnership programmes.

In particular, the photovoltaics focus programme on alternative energy generation, the solid state lighting projects and the fundamental research on the cytoskeleton are the basis of future potential applications in cancer and protein aggregation diseases, the modelling projects on biological networks with possible applications to pharmaceutical research are very relevant for society.

The panel welcomes the institute's choice of programmes with high societal impact. Very favourable and extraordinary is the high school physics teacher programme.

3.4 Vitality and feasibility

3.4.1 Strategy 5

The panel points out that AMOLF possesses a very flexible structure able to adapt to new subjects and to new people, which should be maintained.

It would be beneficial to point out how to identify new projects. AMOLF needs to maintain an exploratory strategy. The many external collaborations and the high number of papers together with outside researchers of all groups on a worldwide scale is of tremendous importance and should be kept.

Common activities could strengthen the interaction and ideas exchange between the two research areas of biology and nanophotonics. There are plentiful opportunities at the link and at the interface between these two research fields. Experimental photonic methods could be used to answer biological questions, and awareness of the current problems in biology would trigger the physicists towards thinking of experimental solutions.

It might be very beneficial for the future to think about setting up a common workshop with both the biologists and nanophotonics people participating and reporting on their individual research.

The committee sees also some opportunities in the field of nonlinear plasmonics and THz plasmonics for interaction between the nanophotonics groups, in particular with regards to fabrication, and the molecular biology group, namely with respect to the THz and nonlinear spectroscopy.

The photovoltaics group is seen as excellent activity for the future, particularly to link the three groups together and unleash synergetic potential. It has a high physical as well as societal impact.

Nanophotonics should be developed further and grow evolutionarily. It is quite difficult to predict the future for 'Molecular biophysics' due to recent departures of very strong group leaders. There are many striking applications of ultrafast spectroscopy. The new group on self-assembly brings a novel, very complimentary perspective.

It would be extremely beneficial and add very much to its flexibility if AMOLF had the budget and the opportunity to invest into new start-up groups that are not yet established within the present research fields. The panel encourages AMOLF to look for as many ways as possible to hire new staff

AMOLF should reserve a small budget (10k€) a year for international guests, and set up dedicated office space for international guests.

3.4.2 SWOT-analysis not graded

The panel approves and agrees with the AMOLF SWOT analysis. AMOLF has an opportunity to increase the number of women at the group leader level (to even higher than 20%) due to the quite high turnover rate and fluctuation of personnel.

Regarding gender equality and family issues, the panel suggests to increase and facilitate hires of qualified women and families by asking the city to install a dedicated science park daycare center.

3.4.3 Robustness and stability 4

The panel points out that AMOLF benefits exceptionally and tremendously from its very strong technical support divisions. In particular, this includes the high quality laboratories and the nano center clean room. Also, there is excellent management and organisation of these divisions. The AMOLF Management team is outstanding, engaging, energetic, competent, and well ahead of their fields.

3.5 Additional questions posed to the panel by NWO and FOM

Five questions were put by NWO and FOM in addition to the Standard Evaluation Protocol.

- *Is the mission still correct and fitting? Considering the mission of the institute, is there a proper balance between the research, R&D and research facilities (their development and use)?*

The mission is ambitious, challenging, and important. It looks to the future, providing through fundamental physics research the groundwork for important societal questions such as energy and health. We believe that it is absolutely necessary to have such an Institute at the National level.

- *What is the national and international importance of the institute, now and in the near future? Is the institute's policy ready for new challenges?*

The Institute has several strengths:

- Its structure comprising several small groups favours tackling new challenges in timely topics.
 - The director gives a strong strategic direction that favours the formation of new groups.
 - It possesses very strong facilities that allow rapid growth of competitive groups that function as seeds within academia and industry.
 - The institute is able quickly to select emerging topics staffed by excellent young people.
 - The new photovoltaics group is meeting a societal challenge.
 - We found very strong international recognition of the Institute.
- *Should NWO continue to support the institute, if so, for what reasons? Are there more effective alternatives for NWO for supporting the same type of research and/or facility?*

AMOLF serves as a focal point for physics research in the Netherlands nucleating national collaborations and major collective grant applications, an activity that would be difficult to replicate in a university. Impact per euro spent is exceptionally high making AMOLF an efficient means for the government to invest in science.

We found very high quality research in part a consequence of constantly finding new areas of creative activity. High quality combined with this renewal process has resulted in a large flux of excellent people who, having served their time at AMOLF, export their research activities to Universities. Also the staff of AMOLF lead several of FOM's programmes. This helps to nucleate new fields within The Netherlands.

- *Does the institute use sufficiently any opportunities for co-operation with organisations outside the academic world?*

We believe so and cite the following evidence:

- Patents numbers have increased whilst maintaining a substantial output of highly recognised publications in refereed journals.
- There is good contact with industry through IPP programmes.
- The AMOLF group located at Philips has been very successful and another group is planned for Unilever. (This is an excellent development but perhaps not a universal model for groups).
- There are collaborations with high school teachers.

Not only do AMOLF staff use opportunities, they also create them!

- *How is FOM AMOLF fulfilling its national (facilitating) role? How does the committee rate FOM AMOLF's strategic choices and activities in this regard?*

AMOLF is an internationally recognized and leading institute in two timely topics namely nanophotonics and biophysics, which are setting the agenda internationally.

A large number of national and international collaborations exist with groups in universities and other institutes.

AMOLF initiates and coordinates many national programmes.

The strategic plan of AMOLF is well adapted to maintain their international leading role in the future and attract talented young scientist at all levels.

The new programme on Photovoltaics is building on the strength of AMOLF, and creating synergy within the institute to address the scientific challenges of this field with applications of benefit to Dutch industry.

4 Research programme Assessments

4.1 Research programmes Nanophotonics

Current research programme leader: Prof. dr. L. Kuipers
Tenured staff: Polman, Lagendijk, Gómez Rivas
Staff on tenure track: F. Koenderink
Former tenured staff: Vos
Other personnel (2010): 7,6 postdocs, 20 PhD-students, 2 fte guests
Publications (2005-2010): 226 journal papers, 21 PhD-theses, 19 patents, 124 invited talks

Programme assessment

Quality	5
Productivity	5
Relevance	5
Vitality	5
Overall	5

4.1.1 Overall assessment

We have rated this programme as of outstanding quality based on the rich adventurousness of its research programme and the recognition that this has achieved through publications in high quality journals and the citation record. Amongst a rich choice of excellence we were particularly impressed with the wavefront shaping work which brings the prospect of an extremely novel approach to super resolution. The UV negative index structure is another archetypical work combining innovation with the technical wizardry available within the AMOLF environment. A development that we welcome is the close collaboration with Philips which opens a broad communication channel for the flow of fundamental concepts into the business environment, and a backflow of challenges to the scientists.

Having achieved a high level of excellence the challenge of the coming years will be to maintain it. We see two challenges.

The workshops and skilled technical staff lay the foundations for success. These should be carefully husbanded if present excellence is to be maintained. International competition in nanophotonics is fierce. The USA in particular makes generous investment in facilities.

Part of the mission of AMOLF is to seek out and recruit the most talented individuals, and even on the publication evidence alone we can recognise that this has been achieved. Nevertheless we do note that a high proportion of recruits are graduates of AMOLF group leaders. We trust that AMOLF will continue to search widely for its new talent, even though excellent candidates are present on its own doorstep.

It is striking that as well as reaching heights of academic excellence, the 'NanoPhotonics' group has taken to heart the last reports message on patents. These are now emerging in satisfactory numbers with many filed jointly with companies thus saving the considerable expense of patent maintenance. Overall collaboration with industry is extensive recognising the prospect of many commercial spin offs from this area of research.

Future plans include exploitation of the light concentrating properties of some nanostructures to enhance nonlinear effects. Nonlinearity, nano lasers and quantum optics, will undoubtedly be hot areas of research in the coming years and the NanoOptics groups is well placed to exploit the new challenges.

4.2 Research programme Ultrafast molecular dynamics/Molecular Biophysics

Programme leader: Prof. dr. H.J. Bakker

Tenured Staff: Bonn, Heeren

Staff on tenure track: Leunissen (appointed 1-1-2011)

Former non-tenured staff: Herek

Other personnel (2010): 11,6 postdocs, 13,9 PhD-students, 4,7 fte guests

Publications (2005-2010): 222 journal papers, 20 PhD-theses, 1 patent, 119 invited talks.

Programme assessment

Quality	5
Productivity	5
Relevance	5
Vitality	4
Overall	5

4.2.1 Overall assessment

The research programme in Ultrafast Molecular Dynamics is central to the core of the FOM-AMOLF mission using and developing advanced experimental techniques in the unravelling of the molecular mechanisms underlying macroscopic behaviour of liquids, surfaces and biological material. In the evaluation period, the research programme consisted primarily of three main activities. Two groups were focussing on the ultrafast dynamics of liquid water and its detailed influence of protein dynamics and surface dynamics. As compared to their previous work, they have in the evaluation period gradually shifted their research focus from the dynamics of water alone to the functional interplay between water and proteins, surfaces and simple salts. The research contributions from the two groups are at an outstanding international level as evidenced by their publications in prestigious journals and the impact of their work. Furthermore, the two groups are actively involved in collaborative efforts both internationally and within AMOLF. The panel considers the mastering of advanced optical techniques as a key asset of the groups as it is often disseminated throughout the AMOLF institute, and thus serves as an important driving factor for the evolution of new research activities at AMOLF. This is also seen in the breadth of new subjects that have evolved from the two groups, in particular the 'Biosurface Spectroscopy' Group that has expanded its activities from biosurfaces to microfluidics, CARS-Microscopy, and nanophotovoltaics. The departure of the biosurface group leader to a prestigious position as director of a Max Planck Institute in Mainz thus at the same time serves as a testimony of the outstanding quality of the work and a challenge for the AMOLF management to replace the vacancy with groups of similar potential. Both groups are well aligned with the overall strategy of AMOLF and are, as mentioned, well knit into the collaborative web of the institute. The panel does see additional scientific opportunities for collaborations with some of the nanophotonic activities investigating the possibilities of non-linear optical sources and IR/Thz-spectroscopy based on plasmonics antennas.

The 'Biomolecular Imaging Mass Spectrometry' group has developed a series of unique instruments that provide mass spectroscopic information with sub- μm spatial resolution. These instruments are quite unique and a good example of the AMOLF tradition of excellence in mass spectroscopy and the unique potential for experimental research provided by the very strong research infrastructure present at AMOLF. The ability to build advanced equipment, electronics and data acquisition software is considered by the panel to be one of the secrets behind the continued success of

FOM-AMOLF. As the technique is now well developed, this field of research will gradually shift from its previous focus on the development of advanced experimental techniques toward more problems-based research with its primary focus in the biomedical area. So, although the work is of high quality, the committee supports the management decision to find a new home for this activity in a biomedical environment better suited for utilizing the unique instrument.

With two prominent groups leaving this research programme, new activities must be initiated. Recently, a new research activity started on 'Supramolecular Interactions'. This research group will initiate work on membrane functional dynamics and the role of specific and unspecific chemical bonding in the interactions between biomaterials. The group is both experimental and theoretical and is linked to key scientific groups supporting the activities. The panel notes that the new group leader is a non AMOLF graduate and wants to emphasize the importance of maintaining a policy of hiring new group leaders both from within the AMOLF community and from outside, in order to, at the same time, maintain and challenge the scientific atmosphere at AMOLF.

At the presentations, the panel was briefly presented with plans to continue two of the research activities in 'Biosurface Spectroscopy' with new group leaders. One of these activities will be moved to the envisaged new AMOLF group at Unilever as part of an IPP programme and the other will stay at the Institute.

Recommendations

This research programme is central to the AMOLF mission and of outstanding quality. Consequently, the panel recommends that it is continued, and that it continues to serve as a source of new research groups at AMOLF.

4.3 Research programme Physics of biomolecular systems

Programme leader: Prof. dr. M. Dogterom

Tenured staff: Mulder, ten Wolde, Tans

Staff on tenure track: G. Koenderink, Shimizu

Other personnel (end 2010): 10 postdocs, 16,5 PhD-students, 2,6 fte guests

Publications (2005-2010): 127 journal papers, 16 PhD-theses, no patents, 115 invited talks.

Programme assessment

Quality	5
Productivity	5
Relevance	4
Vitality	5
Overall	5

Overall assessment

The Systems Biophysics group consists of experimental and theoretical groups that are at the top of their fields internationally. They have focussed the power of the individual groups onto a set of cohesive problems that allow each group respectively to aspire to new, higher levels. The group represents 'focus and mass' for this topic in the Netherlands. Although the work is fundamental, it will lead to medical and pharmaceutically relevant applications. The team here will definitely set the research agenda in their area in the coming decade, on the national level if not also at the international level. We expect the 'Systems Biophysics' group to play an internationally leading role in exploring the physical principles underlying functional biological modules.

The 'Systems Biophysics' initiative is a new organisation within the AMOLF that allows development of established AMOLF researchers with respect to an emerging topic in international research. This is viewed as a positive move. The team has been supplemented with fresh hires, with both Shimizu and Koenderink coming from outside the AMOLF lineage. All new tenure track staff

come from top research environments (e.g., Koenderink and Shimizu from world-beating labs at Harvard and Van Zon from MIT starting in 2012). Natural collaborations emerge in the process of positioning the research to become a world-class international hub for the intersection of physics with biology. These are obvious in the many collaborations between group leaders to create strong focus groups/topics. Certainly on the national level, the 'focus and mass' of this programme is unique and extremely powerful. It dovetails in an excellent way with various industries.

The composition of the group leaders in 'Systems Biophysics' is worth some additional description. The composition exemplifies the concept that diversity leads to excellence. Women are best represented in this division of AMOLF; there are senior, junior and mid-career level researchers, most at a world-class level; theoretical scientists meet experimental ones. Amongst the group leaders, Dogterom and ten Wolde emerge as natural leaders of experimental and theoretical aspects of systems biophysics, respectively.

With an impressive collection of publications that are cited well above international averages, the 'System Biophysics' group is in an excellent position on the international and national stage. Specific fields where AMOLF researchers are at the top of their fields internationally are microtubule dynamics, computational biophysics methods, and the biophysics of molecular function. Novel numerical methods like forward flux sampling and Green's function reaction dynamics have opened new doors for investigating stochastic spatio-temporal dynamics of biochemical networks. Innovative experimental setups have led to fundamental new insights into the regulation of microtubule dynamics by forces and regulatory proteins. Cleverly designed experiments using single-molecule techniques and genetic engineering have created new insights in the role of chaperones for protein folding and architectural constraints on the evolution of molecular interactions. Computer simulations have identified entropy as a main player in the spatial organization of the bacterial chromosome. The junior groups have during their postdoctoral studies made major contributions to the physical understanding of cytoskeletal networks and bacterial chemotaxis, respectively. This scientific success is supported by the astounding success of all staff in procuring outside funding for projects.

The past and future choices of research topics address key problems in cellular biophysics and cell biology. The move from single components to multi-component cellular systems is timely and strategic. With the existence of broad experimental and theoretical expertise in cytoskeletal systems and regulatory networks and the newly hired staff the 'Systems Biophysics' group is excellently prepared to take on the challenge of unravelling operational principles of functional cellular modules. Expertise in cytoskeleton and regulatory networks has been translated to focus on integrating the understanding of self-organising principles with regulatory mechanisms. A common roadblock in interdisciplinary collaborations is the inability to effectively communicate. This is not at all the case here. To the contrary, the scientists are scientifically bilingual, having outstanding track records showing the ability to perform trans-disciplinary research.

The research performed in the 'Systems Biophysics' group also has potential relevance for biotechnological and medical applications. Their scientific output is anticipated to make discoveries in the fields of protein aggregation disease and sensory systems. The novel algorithms that have been developed and will continue to be developed to understand interactions between genetic and metabolic networks are suitable for application by the pharmaceutical industry.

The excellent facilities at AMOLF are an invaluable asset for the experimental researchers, and have made it possible for them to achieve internationally leading roles in their respective sub-fields. The building is new and it is equipped with state of the art machines. It is set up with much sharing to maximise usefulness and efficiency. It is furthermore supported with a set of shared, core, expert technicians that facilitate evenly high-quality technical work. As a result, a unique synergy (between groups) is in evidence, showing that the philosophy of the AMOLF is largely if not overwhelmingly successful. For example, the work of Tans includes excellent research in the field of protein dynamics and physics of evolution with a focus on the role of chaperones for

protein folding pathways and design constraints on regulatory networks. It is impressive to see how Tans in his research combines single-molecule techniques, single cell microscopy and genetic engineering in innovative experimental setups. This example demonstrates that the methods that are used by these scientists are innovative and uniquely possible at AMOLF. This environment is the guarantee for young (tenure track) researchers to compete on an international scale and become leading scientists in their sub-fields.

Recommendations

This research programme is central to the AMOLF mission and of outstanding quality. The 'System Biophysics' group is an outstanding collection of scientists who fulfil the ideal of focus and mass for the developing field of biophysics in The Netherlands. They have grown from a collection of disparate groups into a cohesive force, attacking relevant biological problems with a combined theoretical and experimental approach. Their status should most certainly be continued with ample support for upcoming talented new group leaders. In the long run, their vitality would be enhanced by the location of a similar, high-level biology institute very nearby.

4.4 Exploratory/Transition programme

The people who were in the transition programme in the evaluation period 2005-2010 have nearly all left. Professor Vrakking is now in transition to the Max Born Institute in Berlin.
Publications (2005-2010): 103 journal papers, 1 patent, 10 PhD theses and 85 invited talks.

Research programme assessment

Quality	–
Productivity	–
Impact	–
Vitality	–
Overall	–

Recommendations

The exploratory/transition programme has been an important vehicle for change and innovation within the institute and should remain so.

5 Conclusions and Recommendations

AMOLF is an internationally recognised and leading institute in two timely topics namely nano-photonics and biophysics, which are setting the agenda internationally.

A large number of national and international collaborations exist with groups in universities and other institutes.

AMOLF initiates and coordinates many national programmes.

The strategic plan of AMOLF is well adapted to maintain their international leading role in the future and attract talented young scientist at all levels.

The new programme on Photovoltaics is building on the strength of AMOLF, and creating synergy within the institute to address the scientific challenges of this field with applications of benefit to Dutch industry.

AMOLF's mission is "to initiate and to perform leading fundamental research on novel strategically important complex molecular and materials systems, in partnership with Dutch academia and industry". The mission is ambitious, challenging, and important. It looks to the future, providing through fundamental physics research the groundwork for important societal questions such as energy and health. We believe that it is absolutely necessary to have such an Institute at the National level. The Institute has several strengths:

- Its structure comprising several small groups favours tackling new challenges in timely topics.
- The director gives a strong strategic direction that favours the formation of new groups.
- It possesses very strong facilities that allow rapid growth of competitive groups that function as seeds within academia and industry.
- The institute is able quickly to select emerging topics staffed by excellent young people.
- The new photovoltaics group is meeting a societal challenge.

We found very strong international recognition of the Institute.

AMOLF serves as a focal point for physics research in the Netherlands nucleating national collaborations and major collective grant applications, an activity that would be difficult to replicate in a university. Impact per euro spent is exceptionally high making AMOLF an efficient means for the government to invest in science.

We found very high quality research in part a consequence of constantly finding new areas of creative activity. High quality combined with this renewal process has resulted in a large flux of excellent people who, having served their time at AMOLF, export their research activities to Universities. Also staff of AMOLF lead many of FOM's programmes. This helps to nucleate new fields within The Netherlands.

The institute uses all opportunities for collaboration with organisations outside the academic world. The panel cites the following evidence:

- Patents numbers have increased whilst maintaining a substantial output of highly recognized publications in refereed journals.
- There is good contact with industry through IPP programmes.
- The AMOLF group located at Philips has been very successful and another group is planned for Unilever. (This is an excellent development but perhaps not a universal model for groups).
- There are collaborations with high school teachers.

Not only do AMOLF staff use opportunities, they also create them!

Excellent management by the director of the institute, while maintaining a first-class research group. The management team is well-chosen and filled with visionary scientists leading the department.

Recommendations

- Strong support for at least the requested increase in mission budget to maintain the excellent research infrastructure and support by technicians.
- The panel applauds the initiative to form a focus group on Photovoltaics and encourages the institute to further strengthen collaboration between all research lines in the institute (e.g. by institute retreats)
- The panel encourages AMOLF to keep the current flat management structure, with a management team formed of the research leaders.

6 Appendices

6.1 Curricula vitae of the committee members

Curriculum Vitae: Jean-François Alfred Octave Joanny

Professional address

Physicochimie Curie Institut Curie Section Recherche
26 rue d'Ulm, 75248 Paris Cedex 05 France
Telephone: 01 56 24 67 54, Email: jean-francois.joanny@curie.fr

University Degrees

1978 Thèse de 3eme Cycle 'Problèmes de démixtion dans les polymères' advisor
P.G. de Gennes defended october 23rd 1978
1985 Thèse d'état 'Le mouillage : quelques problèmes statiques et dynamiques' advisor
P.G. de Gennes defended March 21st 1985

Professional activities

1975-1980 Studies at the Ecole Normale Supérieure Paris
1978-1979 Research Associate Physics Department University of California Los Angeles
(advisor P. Pincus)
1980-1985 Chargé de Recherche 2nd Class at the 'Laboratoire de Physique de la Matière
Condensée' Collège de France Paris
1985-1987 Chargé de Recherche 1st Class at the Materials Department Université Claude
Bernard Lyon
1987-1989 Chargé de Recherche 1st Class at the Physics Laboratory Ecole Normale
Supérieure Lyon
1989-2003 Professor of Physics at the Université Louis Pasteur Strasbourg
2003- Professor of Physics at the Université Pierre et Marie Curie Paris VI

Responsibilities

1994-1998 Head of the research group 'Physique des milieux dispersés' Institut Charles
Sadron Strasbourg
1996-2002 Deputy director of Institut Charles Sadron
1996-1999 Director 'Ecole doctorale Physique' Université Louis Pasteur Strasbourg
1997-2006 Member of the administration council 'Les Houches school'
1999-2004 Member Comité national du CNRS section 15
1998-2001 Coeditor of Europhysics Letters
2001-2005 Advisory editor of Europhysics Letters
2000-2005 Editor in Chief European Physical Journal E
1993-1997 Member Editorial Board Journal of Physics C Liquids
Member Editorial board Advances in Polymer Science
2003- Director 'Physico-ChimieCurie' laboratory Institut Curie
2004-2008 Member council of Scientist HFSP foundation
2007- Chair of the Scientific board Ecole Normale Supérieure de Lyon
2008 Member Scientific Board Max Planck Institute for Polymer Science Mainz

Awards

Bronze medal of the CNRS 1985
Prize of the French Polymer group 1986 shared with L. Leibler
Junior member of the Institut Universitaire de France 1991-1996
Langevin Prize of theoretical Physics of the French Physical Society 1993
Senior Member of Institut Universitaire de France 2007-
Prize of the Del Duca Foundation of the Institut de France shared with J. Prost 2007
CNRS Silver medal 2008

Research Areas

Past

polymer solutions, polymer adsorption, copolymers, polyelectrolytes, polymer gels, colloidal suspensions, foams and emulsions, liquids at interfaces, thin liquid films, capillarity, wetting phenomena, spreading, Langmuir monolayers, membranes, soapfilms.

Current and future

out of equilibrium membranes for biology, molecular motors, cytoskeleton motors
self-organization, cell motility and dynamics, cell adhesion, restriction
enzymes, cytokinesis.

Curriculum Vitae: Erwin Frey

Person information

Born 07.06.1960 in Beilngries, Germany

Education

1996 Habilitation in Theoretical Physics, TU München
1989 Doctoral degree in Physics, TU München
1986 Diploma in Physics, TU München

Academic Career

Since 12/2004 Chair for Statistical and Biological Physics at the Ludwig-Maximilians-Universität München
2002-2004 Head of the Theoretical Physics Department at the Hahn-Meitner-Institut Berlin
2001-2004 Full Professor at the Freie Universität Berlin
1999-2000 Visiting Professor at the Ludwig-Maximilians-Universität München
1998-2001 Visiting Scholar at Harvard University
1998-2001 Heisenberg Fellow of the Deutsche Forschungsgemeinschaft
1992-2001 Research Fellow at the Institute for Theoretical Physics, TU München
1990-1992 Postdoctoral Research Fellow at Harvard University
1986-1990 Research Assistant at the Institute for Theoretical Physics, TU München

Research Interests

- **Biological Physics:** evolutionary dynamics; stochastic models of motor proteins; cooperativity in intracellular transport; nanoscale mechanics and 'soft mesoscopics'; physics of DNA; active networks and cytoskeletal organization; viscoelasticity of composite materials; statistical physics of regulatory networks.
- **Soft Condensed Matter:** semiflexible polymers; biopolymer solutions and networks (F-actin, cytoskeleton); colloidal crystals and colloidal suspensions.
- **Nonequilibrium Dynamics:** percolation; driven non-equilibrium lattice gases; non-linear diffusion reaction models.

Publications

see http://www.theorie.physik.uni-muenchen.de/lsfrey/members/group_leaders/erwin_frey/publications.html

Short Curriculum Vitae: Prof. dr. Harald Giessen

Harald Giessen graduated from Kaiserslautern University with a diploma in Physics and obtained his M.S. and PhD in Optical Sciences from the University of Arizona in 1995. After a postdoc at the Max-Planck-Institute for Solid State Research in Stuttgart he moved to Marburg as Assistant Professor. From 2001-2004, he was associate professor at the University of Bonn. Since 2005, he holds the Chair for Ultrafast Nanooptics in the Department of Physics at the University of Stuttgart. He was guest researcher at the University of Cambridge, and guest professor at the University of Innsbruck and the University of Sydney. He is a fellow of the Optical Society of America.

Curriculum Vitae: Søren Rud Keiding

Education

- | | |
|-----------|--|
| 1980-1986 | Cand. scient. (Master's Degree in Chemistry, University of Aarhus.)
Lic. scient. (PhD in Physics), from University of Aarhus. |
| 1998 | Dr. scient, Faculty of Natural Sciences, University of Aarhus. |

Affiliations

- | | |
|-----------|--|
| 1986-1988 | Danish Natural Science Research Council Fellowship, Institute of Physics, University of Aarhus, Denmark. |
| 1988-1990 | IBM World Trade Postdoctoral Fellow, IBM Thomas J. Watson Research Center, Yorktown Heights, NY. USA. |
| 1990-1994 | Assistant Professor (Adjunkt), Institute of Physics, University of Odense, Denmark. |
| 1994-2003 | Associate Professor (Lektor), Department of Chemistry, University of Aarhus |
| 2003-2007 | Director, Center for Applied Sciences, Univ. of Aarhus and Aarhus University College. |
| 2003-2010 | Professor, Department of Chemistry, University of Aarhus |
| 2011- | Professor, Department of Engineering, Aarhus University |

Research interests

Ultrafast laser spectroscopy, molecular spectroscopy, dynamics of chemical reactions, non-linear fiber optics, and THz spectroscopy and sources.

Professional memberships and awards

- Fellow of the Academy of Technical Science, 2005-
- Fellow of the Danish Natural Science Academy, 1993-
- Awarded the 'Industrial Price' from Danish Natural Science Academy, 2003

Curriculum vitae: Martha Merrow, PhD, habil.

Degrees

Bachelors degree 1979	Middlebury College Biology
PhD 1991	Tufts University Medical School Immunology
Title of thesis:	rIL-4 differentially regulates rIL-2-induced murine NK and LAK killing in CD8+ and CD8- precursor cell subsets
Habilitation 2001	University of Munich Chronobiology and Medical Psychology
Title of thesis:	The Molecular Mechanism of Circadian Rhythmicity

Academic Employment

1991-1996	Research Associate (Department of Biochemistry, Dartmouth Medical School)
1996-2002	Scientific Staff (Institute for Medical Psychology, University of Munich)
2002-2004	Associate Professor (University of Munich)
2004-2008	Auxiliary Medical Psychology teaching staff (University of Munich)
2004-	Rosalind Franklin Research Fellow (University of Groningen)
2006-	Full Professor, Molecular and Genetic Chronobiology (University of Groningen)

Awards and Distinctions

1988	Charlton Lecture Scientific Research Competition, Sackler School of Biomedical Sciences
2004	Aschoff's Rule' Prize for research in Chronobiology (SRBR meeting, Whistler, Canada)
2004	Rosalind Franklin Research Fellowship, University of Groningen
2005	VICI award, NWO (Dutch Science Organisation)

Professional Service and Management

University of Groningen

Coordinator: Women in Science Lunches, Biology Department

Chair: hiring committee for five Rosalind Franklin Research Fellowships (tenure track) and committee member for two CBN tenure track positions

Nominated: Scientific Director Brain Cognition and Neurosciences Graduate programme (declined)

Advisory Committee: selection of Vice-Dean, Faculty of Mathematics and Natural Sciences, University of Groningen

Mentor: tenure track faculty

Board of Directors: CBN (Research Institute)

Faculty representative: preparation of 1st stage Systems Biology proposal (granted)

International Scientific Networks and Organisations

Coordinator networks: TWOCLOCKS, EuroNeuro 2003, SYSTIME, Timex

Deputy Coordinator network: EUCLOCK

Society for Research on Biological Rhythms: Executive Committee, Secretary

Editor Special Chronobiology Issues: FEBS Letters, Handbook of Experimental Pharmacology, Progress in Brain Research

National Scientific Networks and Organisations

Board of Directors: Lorentz Center (Biological Sciences), Leiden; Dutch Center for Timing Research (Dutch chronobiology researchers)

Coordinator network: ONTIME

Committee member, chair: MEERVOUD, Veni (domain panel), NWO (Dutch Science Foundation)

Review for granting agencies

BBSRC (UK); BSF (Israel); ERC (EU); Helmholtz Society (DE); Lorentz Center (NL); MRC (UK); NIH (USA); NSF (USA); NWO (NL); SNF (CH); University of Padua (IT); VW Stiftung (DE); Wellcome Trust (UK); Fondazione (IT); Isaac Newton Trust (UK)

Review for journals

Forty journals including Nature and Science

Review for promotion (Professorial level: external advisor or examiner)

University of Zurich; Max Planck Society; CNRS (Strasbourg); University of Utah; Ohio State University; Temasek Life Sciences Laboratory (Singapore); JNCASR (Bangalore); Technical University Braunschweig

Teaching

Courses taught (40% time teaching)

Post graduate and medical students

Chronobiology; Medical Psychology; Neurology, Molecular and Cellular Neurosciences; Genes, Brain and Behaviour; Cell Biology

Undergraduate students

Genes and Behaviour; Chronobiology; Genetic model organisms: *C.elegans*; Neurobiology Research; Chronobiology Research

PhD External Examiner and Reading Committees

Imperial College London; University of Munich; University of Tartu; University of Groningen; Humboldt-Universität; NIOO (Ecology Institute of the Netherlands); University of Utrecht

Research

Publications

Cumulative impact factor for peer reviewed publications (as of July 2010): 440

Invited seminars

Approximately 10 per year

Curriculum Vitae: J.B. Pendry

Address

Department of Physics, Imperial College London, Prince Consort Road, London SW7 2AZ, UK
Telephone: 020-7594-7606, Email: j.pendry@imperial.ac.uk

Date of Birth

4th July, 1943

Degrees

1965	BA, Cantab (Physics)
1969	MA, PhD, Cantab (Solid State Theory)
1962-65	Scholar of Downing College, Cambridge
1965-66	Part III Mathematics – postgraduate course
1966-69	Research student, Cavendish Laboratory, Cambridge
1969-73	Research Fellowship in Physics, Downing College, Cambridge
1969-71	ICI post-doctoral Fellow
1972-73	Member of Technical Staff in the Theoretical Physics Department, Bell Laboratories, Murray Hill, USA
1973-75	Senior Assistant in Research, Cavendish Laboratory, Cambridge
1973-75	Fellow in Physics and Praelector, Downing College
1975-81	Senior Principal Scientific Officer: Head of Theory Group, SERC Daresbury Laboratory
1981-	Professor of Theoretical Solid State Physics, Imperial College of Science and Technology, and Head of the Condensed Matter Theory Group
1983-85	Head of Experimental Solid State Physics Group
1984	FRS
1984	F. Inst. P.
1984-92	Associate Head of Physics Department
1992-93	Member, SERC Science Board, SERC Nuclear Physics Board
1992-94	Member of Council, Royal Society.
1993-96	Dean, Royal College of Science
1996-2002	Editor, Proceedings A of the Royal Society
1996-97	Leverhulme Trust Senior Research Fellowship
1997-1998	EPSRC Senior Research 5-Year Fellowship (resigned April 1998)
1998-2001	Head of Physics Department, Imperial College London
1998-2002	Member of Particle Physics and Astronomy Research Council
1998-2000	Commonwealth Scholarships Commissioner
2001-2002	Principal, Faculty of Physical Sciences, Imperial College London
2003-	EPSRC Senior Research 5-Year Fellowship
2004	Knight Bachelor (for services to science)
2005	Honorary Fellow, Downing College Cambridge
2005	Chairman Physics sub panel of RAE 2008
2005	Fellow Optical Society of America
2005	Descartes prize for 'Extending Electromagnetism through Novel Artificial Materials'
2006	Royal Medal
2007	Member of Council, Institute of Physics
2007	Chairman, Institute of Physics Publishing

Prizes and medals

1994	British Vacuum Council Prize and Medal
1996	Institute of Physics Dirac Medal and Prize
1996	International Surface Structure Prize
2003	Appleton Lecture
2004	Celsius Lecture, University of Uppsala, Sweden
2005	Royal Society Bakerian Lecture
2005	Larmor Lecture (Belfast)
2005	Fröhlich Lecture (Liverpool)
2005	EU Descartes prize for 'Extending Electromagnetism through Novel Artificial Materials'
2006	Royal Medal
2009	Centenary Kelvin lecture – Institute of Engineering and Technology
2009	Fellow American Association for the Advancement of Science
2009	UNESCO-Niels Bohr gold medal
2010	W.E Lamb Medal for Laser Science and Quantum Optics

6.2 Standard Evaluation Protocol 2003-2009

The present evaluation has been prepared in accordance with the Standard Evaluation Protocol (SEP). The institute wrote a self-evaluation report, which was accepted by the Governing Board of NWO and then sent to the members of the evaluation committee.

The committee met for a two-day site visit, starting at 5 p.m. on 6 April 2011 and ending at 7 p.m. on 8 April 2011. The evaluation report was written during and after the site visit. Around 7 p.m. on Friday, a preliminary draft of the evaluation document was presented.

The chair together with the secretary then edited this further and a week later sent a second draft to the committee members with a request to provide comments within two weeks. Based on this input, a third draft was prepared by the chair and this was sent on 26 April 2011 to the director of AMOLF to be checked for factual errors. His remarks were received on 23 May 2011 and a final draft was then prepared. The report was sent to the Governing Board of NWO on 8 July 2011. The Governing Board accepted the report on 21 September 2011.

6.2.1 Additional questions put by NWO and FOM

The following additional questions were asked by NWO and FOM

- Is the mission still correct and fitting? Considering the mission of the institute, is there a proper balance between the research, R&D and research facilities (their development and use)?
- What is the national and international importance of the institute, now and in the near future? Is the institute's policy ready for new challenges?
- Should NWO continue to support the institute, if so, for what reasons? Are there more effective alternatives for NWO for supporting the same type of research and/or facility?
- Does the institute use sufficiently any opportunities for co-operation with organisations outside the academic world?
- How is FOM AMOLF fulfilling its national (facilitating) role? How does the committee rate FOM AMOLF's strategic choices and activities in this regard?

The answers to these questions can be found in section 3.5.

6.3 Programme of the site visit

Wednesday, 6 April 2011

Location: **NH Grand Hotel Krasnapolsky**

- | | |
|---------------|--|
| 17.00 – 18.00 | Installation by Prof. dr. B. de Kruijff, member General Board NWO and Dr. ir. W. van Saarloos, director of FOM. Introduction by Prof. dr. A. Polman, director of AMOLF |
| 18.00 – 19.00 | Internal discussion of panel, division of tasks |
| 19.30 | Dinner at d'Vijf Vlieghe, panel with De Kruijff |
-

Thursday, 7 April 2011

- | | |
|---------------|--|
| 08.30 – 09.00 | Taxi from NH Grand Hotel Krasnapolsky to AMOLF |
| 09.00 – 09.15 | Welcome |
-

NANOPHOTONICS

- | | |
|---------------|---|
| 09.15 – 09.30 | Introduction by panel discussion leader: Prof.dr. J.B. Pendry and Prof.dr. H. Giessen |
| 09.30 – 09.45 | Department head – Prof. dr. L. Kuipers |
| 09.45 – 10.00 | Prof. dr. A. Polman |
| 10.00 – 10.15 | Prof. dr. A. Lagendijk |
| 10.15 – 10.30 | Prof. dr. J. Gómez Rivas |
| 10.30 – 10.45 | Dr. A.F. Koenderink |
| 10.45 – 11.00 | Prof. dr. L. Kuipers |
| 11.00 – 11.15 | Panel discussion |
| 11.15 – 11.30 | Break |
-

SYSTEMS BIOPHYSICS

- | | |
|---------------|--|
| 11.30 – 11.45 | Introduction by panel discussion leader: Prof. dr. M. Merrow and Prof. dr. E. Frey |
| 11.45 – 12.00 | Department head – Prof. dr. M. Dogterom |
| 12.00 – 12.15 | Prof. dr. S.J. Tans |
| 12.15 – 12.30 | Prof. dr. P.R. ten Wolde |
| 12.30 – 13.30 | Lunch |
| 13.30 – 13.45 | Prof. dr. B.M. Mulder |
| 13.45 – 14.00 | Prof. dr. G.H. Koenderink |
| 14.00 – 14.15 | Dr. T. Shimizu |
| 14.15 – 14.30 | Prof. dr. M. Dogterom |
| 14.30 – 14.45 | Panel discussion |
| 14.45 – 15.00 | Break |
-

MOLECULAR BIOPHYSICS

- | | |
|---------------|---|
| 15.15 – 15.30 | Introduction by panel discussion leaders: Prof. dr. S. Keiding and Prof. dr. H. Giessen |
| 15.30 – 15.45 | Department head – Prof. dr. H.J. Bakker |
| 15.45 – 16.00 | Prof. dr. M. Bonn |
| 16.00 – 16.15 | Prof. dr. R.M.A. Heeren |
| 16.15 – 16.30 | Dr. M.E. Leunissen |
| 16.30 – 16.45 | Prof. dr. H.J. Bakker |
| 16.45 – 17.00 | Panel discussion |
-

Thursday, 7 April 2011

TRANSITION PROGRAMME

17.00 – 17.15	Prof. dr. M.J.J. Vrakking
17.15 – 17.30	Internal discussion and report writing
17.30	Work discussion
18.00	Taxi to NH Grand Hotel Krasnapolsky
18.30 – 21.00	Working Dinner in Reflet, restaurant of hotel, report writing at the hotel

Friday, 8 April 2011

08.30 – 09.00	Taxi from NH Grand Hotel Krasnapolsky to AMOLF
09.00 – 09.15	Welcome
09.15 – 10.00	Presentation by prof.dr. A. Polman, director AMOLF
	Also attending:
	Prof. dr. L. Kuipers
	Prof. dr. H.J. Bakker
	Prof. dr. M. Dogterom
	Drs. B.I.A. van Leijen
10.15 – 11.00	Labtour I
11.00 – 11.30	Prof.vdr. J. Knoester, chair Scientific Advisory Board AMOLF
11.30 – 12.00	Lab Tour II
12.00 – 12.45	Lunch with PhD-students and postdocs
13.00 – 13.30	Panel discussion (to determine main conclusions and formulate open questions as the need arises sooner or later)
13.30 – 14.00	Possible meeting with prof.dr. A. Polman, AMOLF director, and Drs. B.I.A van Leijen, Institute Manager
14.00 – 17.15	Internal Discussion and Report Writing
17.15	Taxi from AMOLF to restaurant De Kas
17.30	Presentation of main conclusions at AMOLF to director FOM and AMOLF permanent staff
18.00 – 21.30	Dinner at restaurant De Kas

6.4 List of PDs and PhDs interviewed

Attendees at lunch with panel

Ramy El Dardiry (PhD student group Ad Lagendijk)
 Marjon de Vos (PhD student group Sander Tans)
 Jose Alvarado (PhD student group Gijsje Koenderink)
 Ymkje Huismans (PhD student group Marc Vrakking)
 Sietse van der Post (PhD student group Huib Bakker)
 James Parsons (postdoc group Albert Polman)