

MESA+



INSTITUTE REVIEW REPORT 2002 - 2007

**REPORT OF THE INTERNATIONAL
REVIEW COMMITTEE
FOR EVALUATION OF MESA+**

AT THE UNIVERSITY OF TWENTE

**SUBMITTED BY
PROFESSOR DR. NICO DE ROOIJ
CHAIR OF THE REVIEW COMMITTEE**

DECEMBER 15, 2008

MESA+

Institute for Nanotechnology



University of Twente
Enschede - The Netherlands

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REVIEW OF MESA+ AT THE UNIVERSITY OF TWENTE

The Review Committee¹ was provided with three documents: Scientific Overview for 2002-2007; Self-Evaluation Report 2002-2007; and Strategic Plan 2009-2014 in advance of the visit and with Student Guide MSc Nanotechnology 2008/2009 during the visit.

The Committee visited University of Twente and MESA+ on November 20 and 21, 2008 and met with the administrative leaders of the University and the Institute as well as selected research Chairs, researchers, and representatives of companies².

The Committee had ample opportunity to explore most of the elements of the performance of the Institute and to discuss in detail the future plans for the Institute. The Committee members also had the opportunity to discuss their individual opinions and reach agreement on their evaluation of MESA+.

This report focuses on the future direction for MESA+ and therefore follows the format of the Strategic Plan 2009-2014. It represents the consensus opinion of the Committee.



1 See Appendix A for Membership of the Review Committee
2 See Appendix B for the detailed schedule

GENERAL COMMENTS

MESA+ is a very strong research Institute with national and international stature. It has benefited over the years from very strong leadership and support from the University of Twente. It stands as an outstanding example of how focus on research excellence leads both to high quality research and to effective commercialization.

MESA+ has successfully transitioned to new leadership over the last couple of years and the Committee is convinced that this new leadership will ensure that the future is as bright as the past.

MESA+ is a critical element of the University of Twente that should be nurtured and developed as far as possible.

It was a pleasure to participate in this review. We hope our evaluation will be helpful to both the Institute and the University.

1 RESEARCH

The research performance of MESA+ as an organization is outstanding. The research contributions from members of the Institute have positioned MESA+ as a leader nationally and internationally and most of the researchers have established strong international reputations in their respective fields. The evidence is in the consistently high quality and quantity of publications, in the number of citations, and in the number of national and international awards. Moreover, members of MESA+ play leadership roles at the national level in strategic deliberations, such as creation of NanoNed and its transformation into Netherlands Nanotechnology Initiative (NNI). The University of Twente's reputation is clearly enhanced by the performance of the members of the Institute. This is recognized by the University leadership.

The Institute has chosen to focus on building expertise in several key research areas. Currently they are NanoFabrication, NanoElectronics, NanoFluidics, BioNanoTechnology, NanoPhotonics and Technology Assessment. These serve as platforms for which the institute develops specific programs such as the Strategic Research Orientations (SROs). This focus has served the Institute well over the years and all areas have developed strength. The Institute is proposing to continue this focus for the next five years in the areas of NanoStructured Materials, BioNanotechnology, Nanofluidics, NanoElectronics, and NanoPhotonics and are developing corresponding SROs.

While it is evident that the overall performance of the Institute is outstanding, the information provided did not allow an assessment of the relative performance in the five areas of focus.

Recommendation 1.1: MESA+ should continue its focus on research excellence

Recommendation 1.2: MESA+ should continue its focus in the proposed areas of nanoscience and nanotechnology

2 THE STRATEGIC RESEARCH ORIENTATIONS

The Strategic Research Orientations (SRO) were created in 2000 to serve three functions:

- 1) to develop young talent
- 2) to explore new research directions
- 3) to coalesce or coordinate research projects among several of the research Chairs

The presentation of the SROs was confusing to the Committee and it would be helpful to consider presenting the chairs, programs and SROs in some form of matrix diagram (see for example diagram on page 53 of the Student Guide). There were five SRO programs during the period from 2000-2004 (overlapping with the key research focus) and seven from 2005-2009 (including two bionanotechnology programs and the new area of technology assessment). In all, 12 individuals have served as SRO Coordinators. Those in the first group have moved on to permanent positions as Chairs or tenured professors at Twente or elsewhere. Those in the second group appear to have bright futures as well, although not all of them have secured permanent positions to date. The SRO programs have been very successful at developing new talent.

The series of subjects in the past SRO programs have led to research Chairs in new areas, such as nanofluidics and nanostructured materials, which have become key to the success of MESA+. These new research directions have proven valuable for the continued development of MESA+ and have enhanced its research reputation significantly.

The SRO coordinators have successfully coordinated research activities from a number of research Chairs and have stimulated cooperation between research groups from different fields. It is clear from the Self-Evaluation Report that there are numerous doctoral students and post-doctoral fellows who have been brought together to work in these strategic research orientations. Unfortunately, the data provided did not allow an assessment of the research impact of the individual SRO projects relative to each other or relative to the core programs of the research Chairs. Nevertheless, the committee was very impressed by the documented activities.

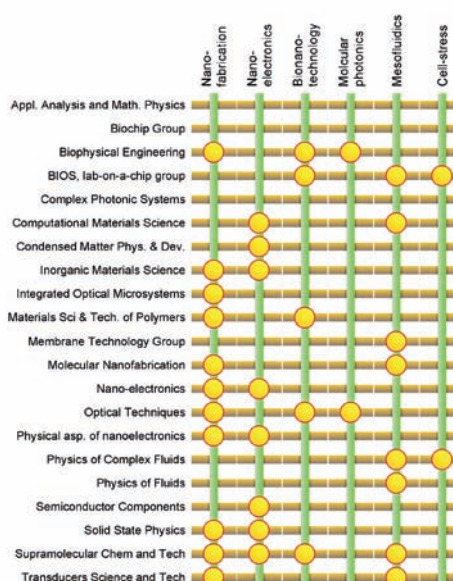
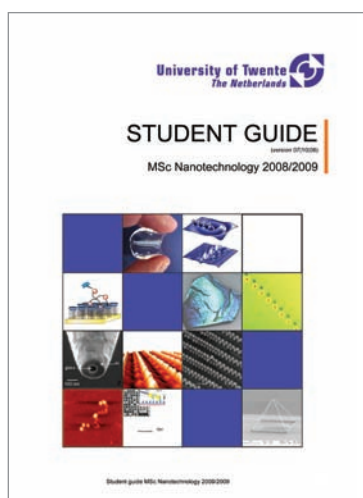
Recommendation 2.1: MESA+ should continue the highly successful SRO programs and strengthen the support for these programs if possible.

The Strategic Plan described the proposed SRO's for the 2009-2014 period as NanoMedicine, Materials for Energy, Applied NanoPhotonics, Enabling Technologies, and Technology Assessment and Risk Analysis. The Committee was concerned that no details were provided in the written material about these areas and felt that they were too broad to assess. For example, the Committee could not see the successful development of a broadly based NanoMedicine program without additional strong ties to biological and medical expertise which is currently not available in the region. During the visit, it became clearer that there were more specific plans for each of these proposed SRO programs and that there have been extensive planning involving all of the researchers in the Institute. The Committee was also told that the development of the new SRO's was slowed by uncertainty about the funding available for this set of SRO's.

The Committee heard some concerns from the Chairs about ensuring a smooth transition from the current SRO programs to those proposed and the need for the Chairs to participate in the shaping of the new SRO programs.

Recommendation 2.2: MESA+ should pursue the proposed SRO topics within the caveat that in each area the SRO must build on the strength and expertise of MESA+ and that the titles reflect this focus.

Recommendation 2.3: The University of Twente should recognize the value of the SRO programs and provide the necessary support.



3 (INTER)NATIONAL POSITION AND COLLABORATIONS

Members of MESA+ have been drivers of nanotechnology activities in the Netherlands and have correspondingly brought benefit to the Institute and the University through increased funding and participation in the building of infrastructure. This appears to continue and the Institute is poised to take advantage of the NNI as well as European Framework initiatives.

The Institute has forged strong international links that appear to bring value to the organization and recognition to the University. Nevertheless, the processes associated with applying, managing, monitoring and reporting on EU programs are significant burdens to the researchers.

Recommendation 3.1: MESA+ should continue to strive for national and international leadership roles through strategic engagement and effective collaborations.

Recommendation 3.2: MESA+ or The University of Twente should allocate resources that can optimize the success in getting and executing EU programs

4 INFRASTRUCTURE

MESA+ has developed excellent facilities over the years, but they are aging and the Institute will clearly benefit from a move into the new NanoLab building. One of the key benefits of the Institute is the centralized management of expensive and sophisticated equipment and facilities. These appear to be very well managed and in good shape and are used by a significant fraction of the members of the Institute. The open access policy has facilitated development of the research programs, the training of students, and the creation and growth of new companies. The diversity of equipment is impressive and illustrates the needs of the nanotechnology community where multiple disciplines converge.

The move into the new facilities will need to be managed carefully to minimize the disruption to research programs and the impact on the function of the small companies imbedded in the Institute facilities. The Committee was assured that the planning is well in hand.

The Committee was concerned that the trend to increasing activities in nanobiology and nanomedicine will place unanticipated demands on the new facilities – for example for biotechnology facilities.

Recommendation 4.1: MESA+ should anticipate and plan for equipment and facilities that can accommodate the demands of nanobiology and nanomedicine research programs

5 COMMERCIALIZATION

The Committee was extremely impressed with the role of MESA+ in nurturing the formation of new companies and their survival. The entrepreneurial spirit and culture in the Institute is evident. The young people who are driving the new companies clearly understand the value that MESA+ provides and lauded the flexibility of access to facilities and expertise. Specifically, they noted that the shared use of facilities and expertise within MESA+ created a network among the entrepreneurs that ensured their success. They fully support the focus of the Institute on research excellence.

The formation of the Technology Accelerator is evidence that the University of Twente continues to support the need to capture and develop new research outcomes. It is too early to tell whether this enterprise will be successful, but it has started well.

The concept of using the soon to be vacated MESA+ nanofabrication facilities as a new High Tech Factory is brilliant. The plan is strongly endorsed by the local companies and it provides for a superb opportunity to enhance the local capacity for manufacturing of micro and nanotechnologies at a relatively low capital investment. However, even with the presence of the High Tech Factory, it is important that MESA+ retains the policy of open access to its infrastructure and continue to maintain its contact with the small, emerging companies. MESA+ must encourage the transfer of methodology from their facility to the High Tech Factory.

The Committee was told that there are ongoing issues related to IP protection which complicates the formation of companies. It was suggested that this issue should be more explicit in the MESA+ Commercialization Strategy. Moreover, the Committee was informed that the mechanisms available for establishing non-disclosure agreements or joint development agreements were limited to the extent that it hindered the timely engagement of industry in collaborations.

Recommendation 5.1: MESA+ should continue its policy of easy and open access to facilities since this appears to be a key factor in the success of many small companies

Recommendation 5.2: MESA+ should articulate a clear policy on IP protection and technology transfer to support the new activities of the Technology Accelerator

Recommendation 5.3: The University of Twente should strengthen the entities that deal with industrial or other private sector contracts from both legal and financial perspectives

6 EDUCATION

MESA+ has been an active participant in the formation of bachelor's, master's and doctoral students through the research programs in the Institute. The number of doctoral students graduating annually is very large and speaks to the success of the Institute as both a research engine and a training environment. The Committee heard anecdotal evidence that the quality of the PhD theses is very high.

MESA+ has supported the development of a Master's of Nanotechnology within the Faculty of Science and Technology. The initial efforts in 2003 were not successful, but since 2005 the program has been defined more precisely and a small number of students have been recruited. The Committee was provided with program enrolment numbers of 4, 5, 9 and 10 for each of the first four years (2005-2008). This is far below the target of about 20-25 students.

The student guide is an excellent document that provides a very clear picture of the program and the structure and content of the program appears to be excellent. It is therefore surprising that the enrolment is lower than the target. The Committee considered the possibility that the program is seen by students only as a path to doctoral studies in MESA+, which may be too limiting since many other routes are possible.

A number of universities in other parts of Europe have introduced Nanotechnology Master's programs with much greater enrolment success.

Recommendation 6.1: The Master's Program Director and Coordinator should examine other programs in Europe to understand the basis for their success

Recommendation 6.2: MESA+ should re-examine its role in the Master's Program to ensure the broadest possible appeal to students

Recommendation 6.3: The Master's Program Director and Coordinator should consider avenues whereby access to the program could be broadened to more students with biological and engineering backgrounds

The Committee was introduced during the visit to the possibility that the University of Twente will create a Graduate School. No details were provided so it is difficult for the Committee to comment on the possible positive or negative impact on the research institutes in general and MESA+ specifically. However, the Committee expressed concerns that the Graduate School should not introduce a third layer of matrix management.

7 GOVERNANCE AND FUNDING

The matrix organization of the University of Twente is unique and potentially very powerful. One may argue that the success of MESA+ as a research institute derives precisely from its ability to draw human and physical resources from three Faculties into a common set of research objectives focused on nanotechnology. The need for the Faculty Deans and the Institute Director to cooperate to achieve success provides tremendous opportunities for developing innovative approaches and to reinvent the strategic directions of the University of Twente.

Within the matrix organization the Chairs must respond both to educational and research needs of the University. The Chairs therefore have two reporting lines as well as two funding lines. This appears to lead to confusion and uncertainty, particularly during periods of fluctuating funding to the University as a whole. The Committee heard from several individuals of the need for longer term planning and funding stability. It appears that changes in both the funding level to University of Twente and in the formulas used for dispersing funds to the Faculties and Institutes, and hence to the Chairs, have exacerbated the planning uncertainty in the last year or so.

Recommendation 7.1: The University of Twente should clarify the respective roles of the Deans and the Directors and communicate these roles clearly to the academic staff

Recommendation 7.2: The University of Twente should stabilize the mechanisms whereby Faculties, Institutes and Chairs are funded so long term (four year) planning is possible

The Committee was informed on several occasions that the recent transfer of funds at the national level from education to research funding agencies had a significant and unexpected impact on the research institutes at University of Twente. There was a strong feeling among many that the reduction of funding was disproportionately and negatively affecting the research programs that were the most successful. The Committee does not have enough information to assess whether

this is in fact true. The Committee does, however, endorse the principle that success should be rewarded since this ultimately leads to improved performance by individuals, by the institutes, the faculties and the University.

Recommendation 7.3: The University of Twente should ensure that funding mechanisms reward success, however measured, and that these mechanisms are transparent

8 EVALUATION PROCESS

The Committee was provided with excellent documentation which provided a good background for the assessment of the Institute. The Committee was also provided with additional useful information during the visit. The Committee appreciates the tremendous amount of work needed to provide a clear picture of the performance of a research institute and is grateful for the information provided.

Nevertheless, there were several issues raised during the visit that should be considered for future evaluation exercises:

- 1) The written material should be provided earlier in the process
- 2) The written material should provide some context of the research institute within the university framework (e.g. what fraction of the university is contributed by the institute)
- 3) The written material should reflect the value of the institute to the university in addition to the value to the research community
- 4) The written material should refer to national or international benchmarks (e.g. how does the funding or publication rate per faculty compare to other organizations)
- 5) The written material should provide performance measurements at the level of research programs (e.g. SRO's) so that it is possible to weigh the relative performance of individual programs within the institute

In addition, the Committee would suggest that the order of the visit be reorganized so that the Committee meets with the Institute management immediately after the meeting with the University Executive Board, and that the Institute management provides a brief overview of the Institute performance. This would allow the Committee to clarify key points with management at the beginning of the process.

APPENDIX A – MEMBERS OF THE REVIEW COMMITTEE

Nico de Rooij (chair),

Professor at the University of Neuchâtel, Switzerland and Vice-President of the CSEM SA, Neuchâtel, Switzerland; IEEE Fellow and Corresponding Member of the Royal Netherlands Academy of Sciences; Key expertise in Microsystems Technology.

Tord Claeson,

Professor of Physics at Dept of Microtechnology and Nanoscience, Chalmers University of Technology, Göteborg, Sweden.

Key expertise in superconducting tunneling, nanoelectronics, and high frequency detectors.

Reinder Coehoorn,

Research Fellow at the Philips Research Laboratories, Eindhoven, The Netherlands; Part-time professor Physics and Application of Nanosystems, Eindhoven University of Technology, The Netherlands; Member of the Royal Netherlands Academy of Sciences;

Key expertise in solid state physics and nanophysics.

Christoph Gerber,

Director for scientific communication of the National Center of Competence for Nanoscale Science (NCCR) at the Institute of Physics, University of Basel, Switzerland and Research Staff Member emeritus in Nanoscale Science at the IBM Research Laboratory in Rüschlikon, Switzerland

Key expertise in Scanning Probe Microscopy, Scanning Tunneling Microscope (STM) and the Atomic Force Microscope (AFM).

Nils O. Petersen,

Director General for the National Institute for Nanotechnology and Professor of Chemistry at the University of Alberta, Edmonton, Canada.

Key expertise in bionanotechnology.

Secretary: Patrick Hoetink,

Staff Officer Research, Office of the Executive Board (Strategy & Communications office), University of Twente.

APPENDIX B – PROGRAM OF THE SITE VISIT

Thursday November 20th 2008	
Meeting	Interviews
Executive Board University of Twente	Henk Zijm Anne Flierman
MESA+ chairs	Vinod Subramaniam Hans Hilgenkamp Julius Vancso
Program directors SRO's	Albert van den Berg Jurriaan Huskens Wilfred van der Wiel
Lunch temporary staff	PhD's, PostDocs, assistant and associate professors
Spin off companies	Micronit (Ronny van 't Oever) MedSpray (Jeroen Wissink)
NanoLab including tour	Gerard Roelofs
Governing board MESA+	Jan Mulderink Gerard van der Steenhoven (Dean faculty S&T) Gert-Jan Jongerden
Drink	Various MESA+ researchers (professors etc.)

Friday November 21st 2008	
Meeting	Interviews
Education – Research master NanoTechnology	Martin Bennink Jaap Flokstra
Management MESA+	Dave Blank Miriam Luizink
Technology Accelerator	Paul Nederkoorn
Internal commission meeting	
Feedback from the commission to the Board of the university and the MESA+ management.	Henk Zijm Anne Flierman Dave Blank Miriam Luizink
Internal commission meeting	

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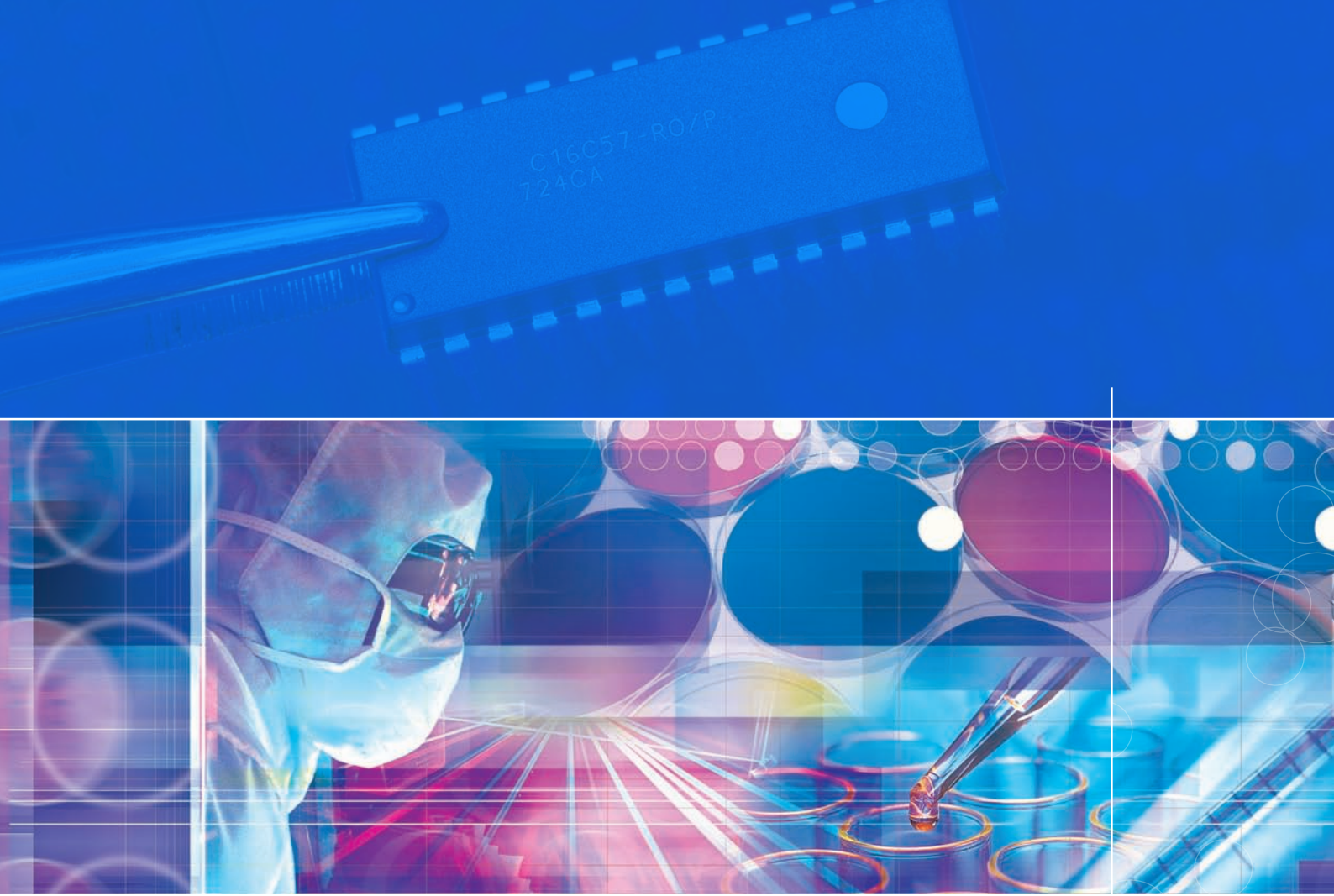
Secretary of the committee: Patrick Hoetink,
Staff Officer Research, Office of the Executive Board
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