

INSTITUTE ASSESSMENT 2008-2014



MESA+
INSTITUTE FOR NANOTECHNOLOGY

UNIVERSITY OF TWENTE.

Report by the International
Assessment Committee
on MESA+ at the
University of Twente

Assessment Committee
Members:
Prof. Dr. Harald Fuchs
Dr. Leon Gielgens (Secretary)
Dr. Frank de Jong
Prof. Dr. Nico de Rooij (Chair)
Prof. Dr. Dag Winkler

June 2, 2015

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Approach

The assessment committee^[1] visited the University of Twente and the MESA+ Institute for Nanotechnology on March 23 and 24, 2015.

During its two-day visit,^[2] the committee met with a representative of the University of Twente's Executive Board, the MESA+ management team, and junior, intermediate and senior research staff and PhD students. The committee also exchanged views with the deans of several university faculties, knowledge leaders and technology transfer experts, representatives of MESA+ spin-off companies, and experts on education, EU funding, and responsible research and innovation. The program further included a visit to the MESA+ NanoLab and cleanroom facilities.

Prior to the site visit, the committee members received four documents: the 2009 - 2014 Strategic Plan, the 2008 - 2013 Self Evaluation Report including an addendum for 2014, the 2008 - 2013 Scientific Overview, and a draft version of the 2015 - 2020 Strategic Plan.

The committee had the opportunity to discuss its findings and to formulate a draft of first observations and recommendations. The committee examined the institute's past performance and focused on observations and recommendations important for the future direction of MESA+.

At the end of the visit, the committee presented its preliminary findings to the representative of the University of Twente's Executive Board and the MESA+ management team, followed by a short public statement to the members of the MESA+ community.

^[1] See Appendix A for information on the members of the assessment committee.

^[2] See Appendix B for the detailed program.



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Accomplishments

The committee was impressed by the world-class quality of MESA+.

The people at MESA+ are a tremendous asset. They all exhibit outstanding quality, and they are very open and enthusiastic. Each of them is a true MESA+ ambassador. MESA+ has managed to create a fantastic work atmosphere and a vibrant culture of cooperation.

The research at MESA+ is excellent, as exhibited by powerful results that move science a significant step forward. MESA+ research is on the global cutting edge.

The institute's laboratory and cleanroom facilities are impressive, providing an environment where researchers can make a significant and concrete contribution to science and to society.

The number of spin-off companies originating at MESA+ is above average, thanks in part to the entrepreneurial spirit surrounding the University of Twente.

MESA+ is a crucial institute at the University of Twente, with an outstanding reputation that should be nurtured and capitalized upon for the benefit of all.



OBSERVATIONS AND RECOMMENDATIONS

MESA+ INSTITUTE ASSESSMENT 2008 - 2014





Observations and Recommendations

1. MISSION STATEMENT

Observations

It is important to describe what makes MESA+ unique, and what drives the institute's strategic direction. This clarity will help the institute make choices on future research and infrastructure, as well as help distinguish MESA+ from comparable institutes around the world. One excellent example of an extremely important value for MESA+ is the collaborative atmosphere. The mission statement proposed in the 2015–2020 Strategic Plan has shifted compared to earlier versions. Helping to solve societal challenges is justly mentioned as part of the institute's mission; however, the new mission statement is still quite generic. In addition, in some places it is less a mission statement and more a description of the core values that characterize the institute.

Recommendations

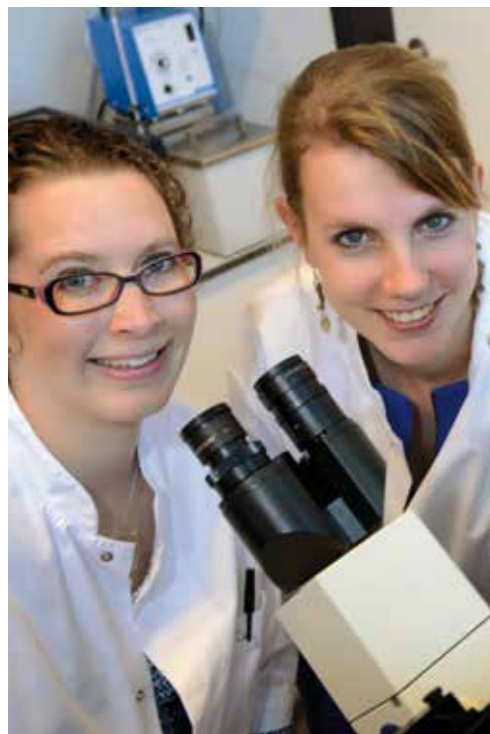
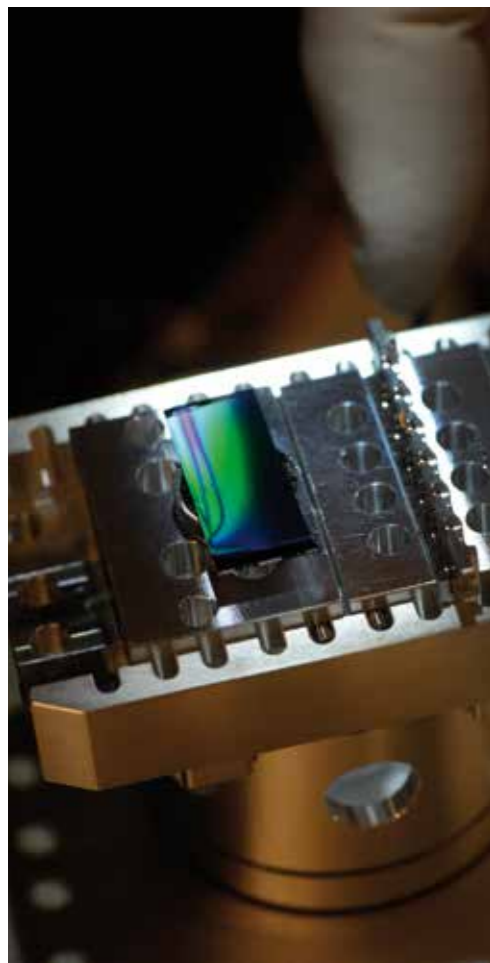
- The committee recommends further discussion on the institute's values and mission statement, to identify those values that truly reflect the institute's unique strengths and clarify its direction for further development:
- Formulate MESA+'s number one mission, to excel in its research areas, to clearly identify which research area has priority (e.g., nanotechnology). This mission can also be strengthened by stating that the institute will explore novel applications in the chosen research area.
- Define MESA+'s unique values in a separate section; e.g., collaboration, excellent research, embedded in the region, in open dialogue with industry and the business community, and so forth.
- Compare MESA+'s mission statement and strengths with those of comparable international institutes and departments.
- Clearly identify the areas where MESA+ will focus its contribution to solving societal challenges, coupled with a clear view of the institute's strengths and abilities.
- Emphasize more strongly that career development includes education.

2. PAST RESEARCH

Observations

Viewed in an international context, the scientific output of the MESA+ scientist is excellent. While it is difficult to judge the individual achievements of the people contributing to the institute's results (such as their numbers of citations, the journals in which they appear, and their h-indexes), the institute as a whole reports a growing number of citations since 2009: In 2014, 476 scientific papers were published, more than half of them in leading journals. This corresponds with an average annual output of about ten papers per MESA+ professor (of whom there are 44 in total). The institute's citation count of 15,000 is also very good. MESA+ has also been extremely successful in acquiring external research grants, including





EU, European Research Council, and national funding (such as income from the country's natural gas resources and the NanoNextNL research program).

In the 2008–2014 period, an average of 1.5 doctoral theses per year were completed per professor. Nine patents filed in 2014 alone indicate the merit of the institute's chosen research direction and its ability to successfully identify concepts for novel potential applications arising from this research.

Recommendations

- To shape the institute's profile, MESA+ should identify more specific topics of focus within its research areas. This will avoid statements that are too general and thereby make the topics appear to be mainstream or follow-up activities.
- MESA+ could take a leading role in organizing international conferences, to help generate multipliers abroad who convey information on the institute's merits to the outside world.
- To demonstrate the institute's uniqueness to the public, MESA+ should display recent research highlights that top the international standard in national and international arenas.

3. FUTURE RESEARCH

Observations

Nanotechnology has typically been a field that combines several basic scientific disciplines—among them physics, electronics, chemistry, biology, and medicine—in order to serve as an enabling technology to solve a variety of societal and industrial challenges in fields ranging from security, healthcare, and energy to the circular economy and inclusive societies. This breadth of scope complicates decisions regarding the institute's organizational structure and new research areas to explore. In previous years, MESA+ has used the instrument of strategic research orientations (SROs) to explore new areas. This approach has been successful, as most of these have resulted in new chairs. However, the institute has grown to such a size that additional structure is required to organize and nurture future directions. The 2009–2014 Strategic Plan mentions four new instruments to complement the SROs: focus areas, application areas, tenure tracks, and areas of expertise. Finally, MESA+ has worked with the university's MIRA institute to further develop the important field of nanobiotechnology for life science and healthcare applications.

Recommendations

- Organize the selected application areas as programs, at the MESA+ level or at the university level, possibly involving external partners. These programs could be quite large, thus offering greater flexibility compared to separate smaller research projects; they would serve as the primary vehicles for entering into collaborative projects in the EU and elsewhere and are potentially very important for interaction with industry. These programs can also serve as flagship projects for the university as a whole.
- Set up a limited number of application-area programs, and make sure they are well aligned with the institute's mission to help solve societal grand challenges. Examples of possible programs are a joint Human Disease Model (HDM) program with MIRA, an energy materials research program, and a printing technology and materials program.
- The tenure-track positions should be the instrument of choice to explore and initiate new research areas. They should be largely embedded in one of the institute's focus areas, but might also explore the boundaries of one or two of these.
- The instruments to stimulate cooperative efforts—SROs, focus areas, and application areas—should be limited in number and need clear and distinctive goals.

4. EDUCATION

Observations

MESA+ hosts students with a variety of backgrounds (such as applied physics, chemical engineering, electrical engineering, and nanotechnology). Within the University of Twente's matrix organization, the educational programs are the responsibility of the individual faculties and are evaluated separately. Good communication between these faculties and the institute is valued, and is essential to productively align research and educational activities. During the past twelve years, the institute has developed a competitive MSc program in nanotechnology. In general, the recruitment of both national and international students (MSc and PhD) requires special attention. For the Twente Graduate School nanotechnology specialization, which includes the PhD program, the faculties involved and the institute share responsibility for student recruitment and program quality.

Recommendations

- Develop dedicated strategies to attract more students in each target group (MSc, PhD, national, international).
- Improve the Twente Graduate School's profile, and explore ways to develop it into a true graduate school that would improve its appeal to international students.
- Explore further MESA+ involvement in educational program profile development, curriculum development and marketing activities.
- Display a stronger and more prominent advertisement for the MSc program in nanotechnology on the University of Twente's website.
- Look critically at the tuition fee for students from outside the European Union.
- Communicate a clear division of responsibilities between the faculties and institutes.

5. INFRASTRUCTURE

Observations

The MESA+ NanoLab - and especially the cleanroom - offer a world-class, top-notch nano-fabrication laboratory. This facility forms a center of gravity at MESA+, and is well used by both students and companies (the latter consume 25 percent of the facility's time and provide 40 percent of its budget).

The NanoLab is an excellent enabler for the creation of spin-offs and technology transfer, and undoubtedly can serve as an infrastructure role model for other University of Twente institutes and also other universities. At the same time, the facility is a crucial element in the education of MSc and PhD students. Through its three intertwined units, including the BioNanoLab, the MESA+ facility addresses both "classic" nanotechnology and new directions.

Recommendations

- Find sustainable cost models that support an open infrastructure; this is important to include in grant applications, especially EU applications.
- Market the NanoLab facility as a resource in EU partnerships and activities.
- Address the coexistence of increasing industrial use and academic use.
- Foster cooperation with clinical research at universities.
- Guarantee that students maintain substantial access to the cleanroom facilities at a level sufficient for nanotechnology research skills education.
- Use the NanoLab facility to help brand the University of Twente.



6. TECHNOLOGY TRANSFER AND COMMERCIALIZATION

Observations

MESA+'s technology transfer is predominantly measured by the number of spin-outs created. In that respect MESA+ has an excellent track record compared to other Dutch universities. It is also an endeavor that focuses on stimulating high-tech economic activity in the Twente region. Less prominent are the institute's collaborative ventures with established companies (these are not measured or highlighted), though there are a few good examples (such as gas fluid dynamics for Canon printing technology and XUV mirror development for Zeiss/ASML). These activities appear to be more a coincidental occurrence than a strategically important MESA+ priority.

Recommendations

- Take a more systematic approach to exploring - in addition to the excellent regional activities already occurring - opportunities to collaborate with established national and international industry.
- Develop a more systematic way to establish links with a chosen set of companies (which will naturally vary by topic), including long-term goals for collaboration, such as in national or EU projects, or even through direct funding for MESA+ and the NanoLab.
- Make existing collaborations with established industries more visible.
- Strengthen MESA+'s profile as an excellent partner for collaboration.
- The application-driven programs recommended in point three could be an excellent vehicle to publicize MESA+ among future industrial partners.

7. BENCHMARKING / INTERNATIONAL POSITIONING / BRANDING

Observations

MESA+ is doing world-class research: generating strong scientific output that is subsequently successfully monetized by startups. MESA+'s visibility and reputation as a leading institute for nanotechnology are extremely high. However, the University of Twente's visibility as a whole does not correspond to this scientific and technological prowess. This disjoint is reflected in international rankings, which are all at the university level.

To attract more international students to the MSc program in nanotechnology, the university's ranking must be improved.

Recommendations

- The University of Twente should benchmark itself in order to increase its international ranking.
- MESA+ should assume leadership in collaborative EU projects to generate greater visibility and a stronger position for both MESA+ and the University of Twente brand.
- The institute should continue recruiting tenure-track assistant professors from around the world, which will also guarantee high scientific output and visibility.

8. FUNDING

Observations

MESA+ is politically and economically well-positioned in the national funding landscape. The

institute is extremely successful and well financed by the Dutch government through the Economic Structure Enhancement Fund (FES), which provides funding from Dutch natural gas revenues. However, the government is phasing out FES funding, and it will stop after 2016.

MESA+ has a large number of European Research Council grants but relatively few collaborative projects at the EU level. The University of Twente needs to more thoroughly address the EU playground.

At the same time, there is a desire to fund pure curiosity-driven research and enable "late Friday afternoon experiments." Funding for tenure-track positions is also a concern, as is the perception that funding provided by the University of Twente is immediately reclaimed to cover the costs for the premises; in other words, that it is purely virtual financing.

Recommendations

- Coach researchers to join collaborative EU projects and to take leadership as coordinators.
- Participate in agenda-setting EU working groups.
- Identify potential partners for EU projects.
- Provide incentives or rewards for entering the EU playground.
- Have the University of Twente assume the full cost for the EU-Office and formulate and implement an EU strategy for the institutes and the university.
- Look into larger industry consortia with established companies.
- Address how to strengthen curiosity-driven research ("without Gantt charts") into basic science problems and how to use its results to help select future themes.
- Finance startup packages for tenure-track positions.

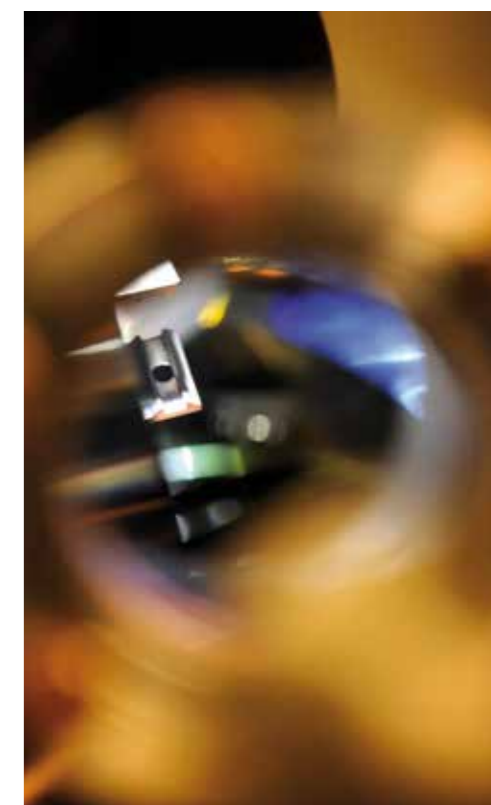
9. GOVERNANCE

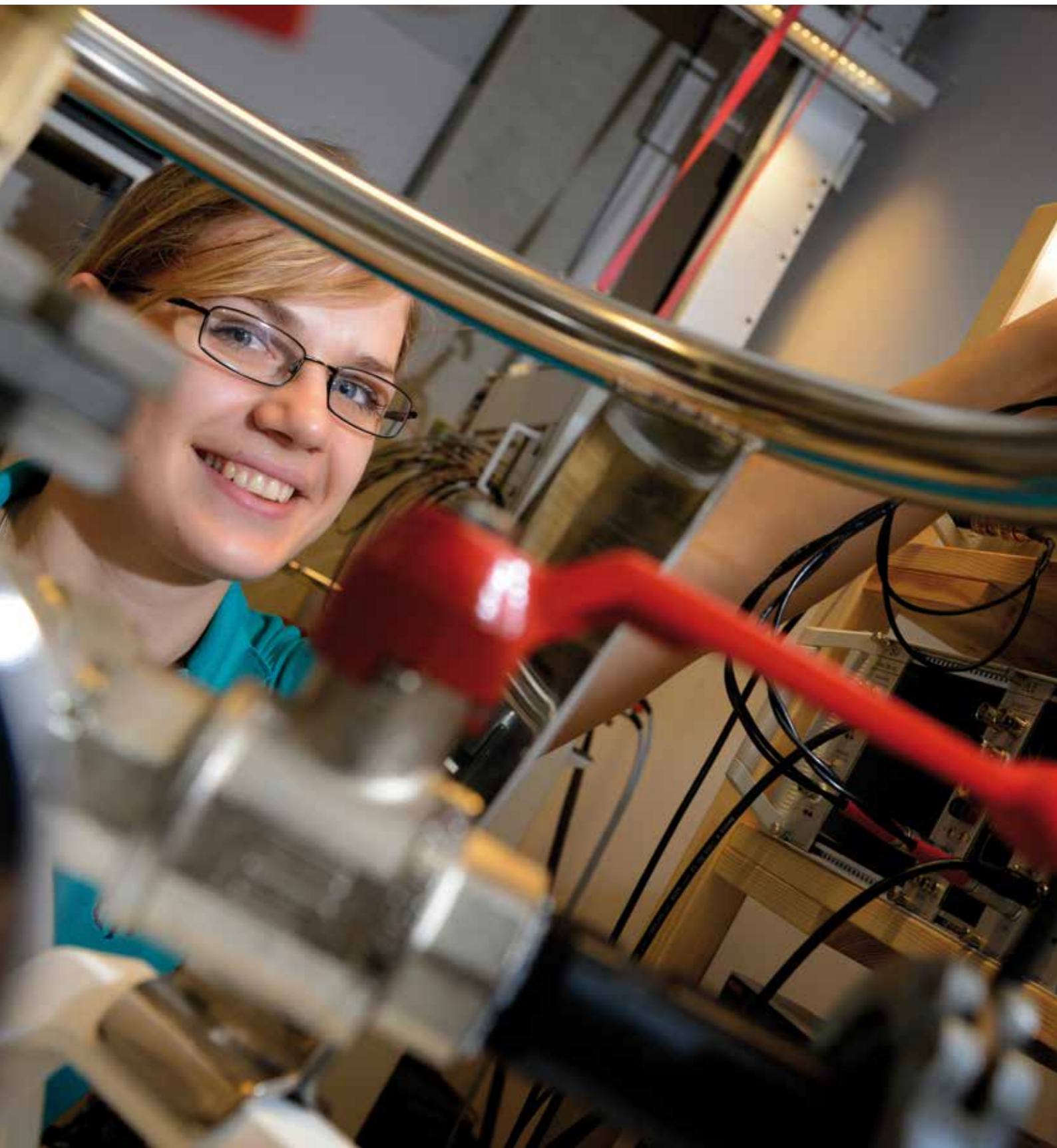
Observations

The MESA+ management team and the faculty deans work together very efficiently to define and implement policy that enables the institute and university to excel in both research and educational activities.

Recommendations

- Ensure that institute management and faculty deans make regular, coordinated decisions to initiate new research activities and discontinue existing ones in order to foster new talent and pursue new research directions.
- The University of Twente should provide a sufficient financial framework to enable the institute's management team and the faculty deans to successfully implement those decisions.
- Strengthen the institute's management team by adding in the heads of the focus areas.





Final Remarks

The committee greatly appreciated the site visit's excellent organization and especially the very open attitude of all the people with whom the committee spoke. The documentation the committee received was of high quality. The committee recognizes the tremendous effort and energy that was put into the institute's self-evaluation, the scientific overview, the strategic plans, and the organization of the site visit itself.

Future assessments could be further improved by providing the documents at an earlier stage and giving the assessment committee the opportunity to discuss these in more detail before the meeting. In addition to enabling an even more efficient site visit, this would give the committee the opportunity to ask for clarification or, if needed, additional information. Regarding the current assessment, this might have assisted the committee in understanding the organizational structure of the university and institute, the financial situation and the financing framework, national and international benchmarking, and key performance indicators even better.

It was a pleasure for all of us to take part in the assessment. We hope that the results will be helpful to MESA+, to the University of Twente, and to all the people involved.





APPENDIX A

Members of the Assessment Committee

Prof. Dr. Nico de Rooij (Chair)
Vice President, CSEM SA
Full Professor, École Polytechnique Fédérale de Lausanne (EPFL)

Prof. Dr. Harald Fuchs
Full Professor, University of Münster
Director of the Physical Institute
Director of the Center for Nanotechnology (CeNTech), Münster

Dr. A. Frank de Jong
Director of Technology Partnerships, FEI Company

Prof. Dr. Dag Winkler
Full Professor, Chalmers University of Technology
Head of the Department of Microtechnology and Nanoscience (MC2)

Dr. Leon Gielgens (Secretary)
Program Director for Nanotechnology, Technology Foundation STW





APPENDIX B

Site Visit Schedule

MONDAY, MARCH 23, 2015

MEETING	INTERVIEWS
NanoLab tour	Gerard Roelofs
University of Twente Executive Board	Ed Brinksma
MESA+ management team <i>Introduction and presentation of 2015–2020 Strategic Plan</i>	Dave Blank Janneke Hoedemaekers
MESA+ chairs (senior staff) <i>Cohesion and strengths at MESA+</i>	Julius Vancso Guus Rijnders Willem Vos Detlef Lohse Albert van den Berg
Infrastructure and NanoLab	Gerard Roelofs Guus Rijnders Jurriaan Schmitz Wilfred van der Wiel Han Gardeniers
Lunch with MESA+ PhDs	Guillaume Lajoinie, PoF group Krzysztof Trzaskus, MST group Prosper Ngabonziza, ICE group Rick Elbersen, MnF group Sander Haase, SFI group
<i>Knowledge and technology transfer policy and activities at MESA+ and the University of Twente</i>	Miriam Luizink Roy Kolkman
MESA+ spin-off companies <i>Experience of spin-off support and collaboration with MESA+</i>	Tide-microfluidics (Wim van Hoeve) Satrax (Paul van Dijk) Solmates (Arjen Janssens)
Professors <i>Focus areas and areas of expertise within MESA+</i>	Alexander Brinkman Guido Mul Jeroen Cornelissen Mireille Claessens
SRO program directors Tenure track <i>Opportunities for career development and the role of strategic research orientations</i>	Mark Huijben Pepijn Pinkse Sonia Garcia Blanco
MESA+ management team <i>Introduction and presentation of 2015–2020 Strategic Plan</i>	Dave Blank Janneke Hoedemaekers

TUESDAY, MARCH 24, 2015

MEETING	INTERVIEWS
Deans of the university's faculties (members of the MESA+ Governing Board) <i>The role of the university faculties in MESA+</i>	Hans Hilgenkamp Peter Apers
Education experts (MSc, TGS) <i>Education and nanotechnology</i>	Harold Zandvliet Martin Bennink Ben Betlem
Responsible research and innovation	Mieke Boon Kornelia Konrad Stefan Kuhlmann
EU funding experts <i>Internationalization and EU funding strategy</i>	Rolf Vermeij Janneke Hoedemaekers
Recap and toward the future of MESA+	Dave Blank Janneke Hoedemaekers
Internal committee meeting	
Presentation of first observations and recommendations	Ed Brinksma Dave Blank Janneke Hoedemaekers
General statement on assessment process and findings	MESA+ community



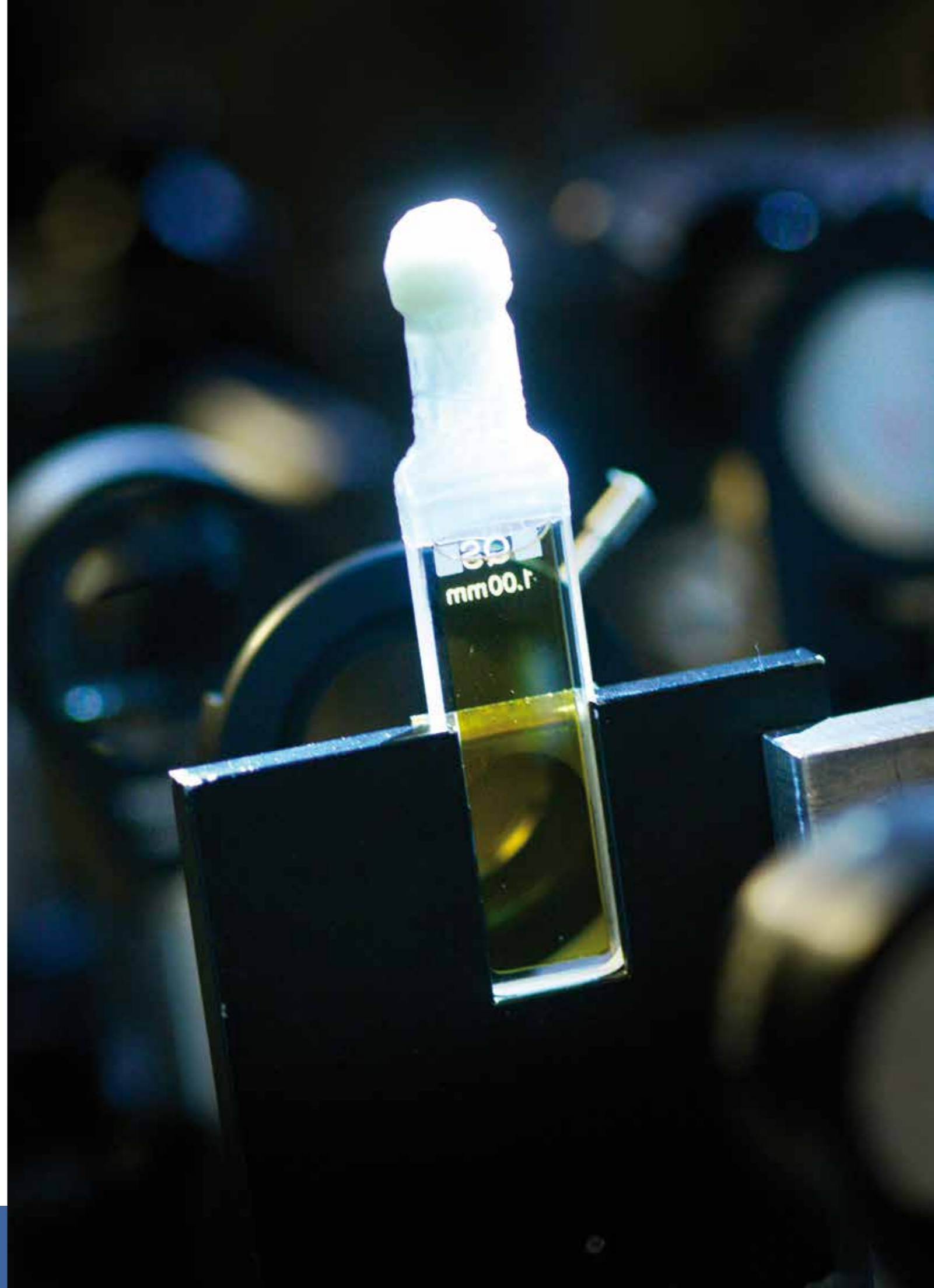
Secretary of the committee:

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