WELCOME

Welcome to MNE 2015, the 41st International Conference on Micro and Nano Engineering - welcome to The Hague, the International City of Peace and Justice!

We are very happy that you join us for three days of scientific discussions, exchange of latest technology developments, and cultivating personal and professional friendship.

MNE was started in Cambridge (UK) in 1975 and since then was annually held at different locations in Europe. It is the conference that brings together engineers and scientists from all over the world to discuss recent progress and future trends in the fabrication and application of micro- and nanostructures and devices. Applications in electronics, photonics, electro-mechanics, environment, life sciences and biology are also discussed.

MNE 2015 continues this tradition and will present an attractive technical program that features 6 plenary, 14 invited, and 419 contributed papers of which about 2/3 will be presented as posters. The poster session is split in two, such that also presenters have the time to visit other posters. All posters will be on display during the entire conference. The oral presentations are given in four parallel sessions, spread over three consecutive days. For the first time, we will offer a 'late and hot news' session, which will feature both posters and 3 oral presentations. At the moment of print, it was not clear how you, dear participants of MNE, react to this opportunity and we are very curious about your response.

We are proud that this year we could once more engage prominent experts as teachers in our short courses. These courses precede the conference and cover the topics: "Moving Nano from Lab to App" and "Life on a chip". Both courses take up recent trends and provide an excellent opportunity to profound your knowledge in the field.

MNE is a conference covering the transition of basic scientific and engineering knowledge into instrumentation and device applications and commercialisation. The industrial exhibition forms therefore an integral part of the conference, and we are very pleased that we can announce an interesting show exhibiting all the important companies in the field. These companies support the conference through their participation and sponsorship for which we are very grateful. We also thank our non-technical sponsors for their contribution to MNE. Without their help, the conference could not take place!

Since a few years, the International Steering Committee awards a prize, the MNE Fellow Award, to recognise the work of a person and his contributions to the field of MNE. We are very happy that this year's award, sponsored by ASML, will be presented to Dr. Emile van der Drift (Delft University of Technology). Please join his award lecture on Thursday morning. Since 2014, Elsevier is sponsoring the MEE Young Investigator Award, a prize to recognise researchers in their early career for their contributions to the field of the journal Microelectronic Engineering (MEE). This year's prize will be awarded to Stephan S. Keller. He will present his award lecture as invited talk on Thursday morning as well.

Finally, we thank the local organizing committee members, the international program committee and the international steering committee for their support in organizing this event, and we hope that you all will have a successful memorable meeting!

Kees Hagen	Urs Staufer
Conference Chair	Program Chair

MNE2015 ON THE WEB – BOOK OF ABSTRACTS – programme App

Up-to-date information on all aspects of MNE2015 can be found at www.mne2015.org

A searchable pdf file containing all the abstracts can be downloaded from the website.

A programme **App** named **mne2015** is available for Apple and Android devices.

VENUE

The Hague is the international city of peace and justice and the third largest city in the Netherlands. It is also the official seat of the Crown and government, home to hundreds of international organisations and multinationals and one of the world's top three UN cities.

The conference will be held in the World Forum, the leading International Convention Centre in The Hague. World Forum is centrally located between the city centre and the beach. The scientific activities and industrial exhibition will all be held in World Forum as will the conference opening reception, which will be held on Monday 21 September.

Address:
World Forum:
Churchillplein 10
2517 JW The Hague
The Netherlands
www.worldforum.nl

Registration opening hours
Registration desk – Ground Floor of the World Forum in the Pangea area

Monday, September 21	12.00 – 19.00 hrs.
Tuesday, September 22	07.30 – 18.00 hrs.
Wednesday, September 23	08.30 – 18.00 hrs.
Thursday, September 24	08.30 – 15.30 hrs.

Exhibition opening hours
Industrial exhibition area – First floor of the World Forum

Monday, September 21	17.00 – 19.00 hrs.
Tuesday, September 22	08.30 – 18.00 hrs.
Wednesday, September 23	08.30 – 18.00 hrs.
Thursday, September 24	08.30 – 15.30 hrs.

Parking
The World Forum is easily accessible and has its own parking facilities: http://www.worldforum.nl/world-forum/information .

GENERAL INFORMATION

Name Badges
Participants will be handed their badges at the registration desk. All participants and accompanying persons must wear their badges at all times to access the conference sessions, exhibits, receptions and social events. Participants (white badges) will be admitted to the sessions; Accompanying persons (badges with a coloured dot) may attend the Welcome Reception and the Conference dinner at Madurodam, but will not be allowed to attend sessions and exhibitors without a full pass are not allowed to attend the sessions and the dinner.

Official language
The official language of the conference is English. It will be used for all presentations and printed material.

No smoking
Smoking is prohibited except in designated smoking areas or outside the conference venue.

Camera and Filming policy

Please refrain from taking any photos or video during any of the conference sessions and poster presentations. Please respect the author rights of the presenters!

Cell Phones and Alarms

As a courtesy to our speakers and all other attendees, please turn off, or switch to silent mode, any cellular phone, pager, computer or watch alarms during the sessions. In case you need to make a phone call, leave the lecture hall before starting to talk.

Internet/Wifi

Wifi is available in the conference area on level 1 (including the lecture rooms) and on the ground floor.

Network: MNE-2015
Password: MNE-2015

Information/Message Board; Job Market Board

Information will be provided on a board on the stairs in the central lobby, where you may also post messages and job offers.

Breaks/Refreshments

Coffee breaks will be between 10.30 and 11.00 and between 15.00 and 15.30 around the exhibition area. Lunch will be served during the break from 12.30 and 13.30, also around the exhibition area.

SOCIAL EVENTS

Sponsored by

EVG

Welcome Reception

Monday 21 September 2015, 17.00 – 19.00

All participants and accompanying persons are invited to the Welcome Reception in World Forum, First Floor. Drinks will be served, together with a selection of typical Dutch food, the perfect setting to catch up with old friends and make new ones.

Sponsored by

SPTS

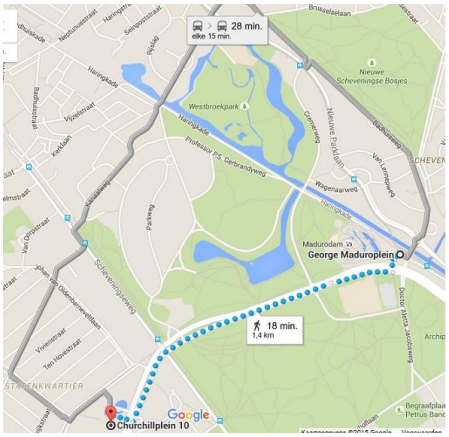
An orbotech Company

Conference Dinner Madurodam

Wednesday 23 September 2015, 19.00 – 24.00

The conference Banquet takes place at Madurodam in The Hague, the miniature town where you can discover Holland's Highlights & Heritage. The doors open at 18.00, Dinner will start at 20.00, and the end of the event is at 24.00. There will be no transportation organised to and from Madurodam as it can be reached by public transportation or by foot from the Word Forum.

- For Directions from World Forum to Madurodam see map below



- Additional banquet tickets can be bought at the registration desk as long as there is seating available.

There will be no entry into Madurodam without your conference badge, so please do not forget to bring your badge with you!

The address is:
Madurodam
George Maduroplein 1
2584 RZ The Hague
Phone: +31 (0)70 416 24 00
Web: http://www.madurodam.nl/

Micro&Nano-graph contest

Wednesday 23 September 2015, approx. 21.30

John Randall from Zyvex will announce the winner of the most strange or most beautiful micro- or nano-art work.

Tourist information The Hague
Please visit the Tourist Information Office near the registration desk on the ground floor. For more information you can visit also their website: Tourist Office The Hague

TECHNICAL PROGRAM

Oral program: Key to session / paper numbers

The program has been divided into four clusters, and subdivided into sessions, as follows:

Cluster A: Micro- and Nanopatterning

Session number	Session name
A1	Photo Lithography
A3	Electron and Ion Beam Lithography
A4.1	Soft Lithography 1
A4.2	Soft Lithography 2
A5	Materials for lithography, resists and resist processing
A6	Directed Self Assembly
A7	Stencil and Tip Based Patterning
A9	Novel Techniques

Cluster B: Micro- and Nanofabrication

Session number	Session name
B1	Pattern Transfer
B2	Plasma Etching
B3	Electron/Ion Beam deposition, related technologies, applications
B4	3D Micro Manufacturing and Micro Printing
B7	Metrology
B8	Self Aligned Processes

Cluster C: Micro/Nano devices and systems

Session number	Session name
C1.1	MEMS/NEMS Sensing 1
C1.2	MEMS/NEMS Fabrication and Reliability
C1.3	MEMS/NEMS for Energy Harvesting
C1.4	MEMS/NEMS graphene devices
C2	Micro and Nano Fluidic Systems
C3	Meta Materials and their Fabrication
C5.1	Micro and Nano devices for Physical Science – Computing
C5.2	Micro and Nano devices for Physical Science - Nano Tubes and Nano Wires
C5.3	Micro and Nano devices for Physical Science

Cluster D: Micro- and Nanotechnology/engineering for Life sciences and Biology

Session number	Session name
D1.1	Mechanical Sensing Elements
D1.2	Sensing Systems
D1.3	Optical Sensing Elements
D2	Lab on Chip
D3	Organ on a Chip
D5	System Design and Fabrication
D6	Applications

An oral contribution will be indicated in the program as **Day-Session-c#**. For instance **Tue-A3-c4** is the 4th contribution in session A3 on Tuesday.

Plenary speakers

1. **Pieter Kruit** - Delft University of Technology
2. **Horacio Espinosa** - Northwestern University
3. **Michael Morris** - University college Cork
4. **Roland Zengerle** - University of Freiburg and 'Hahn-Schickard Gesellschaft für Angewandte Forschung'
5. **Aaron Franklin** - Duke University

A keynote lecture will be indicated in the program as **Day-Keynote-#**, # corresponding to the order in the above list of plenary speakers.

Invited speakers

- **Stefano Cabrini** - Lawrence Berkeley National Laboratory
- **Leo DiCarlo** - Delft University of Technology
- **Jenny Emnéus** - Technical University of Denmark
- **Michael Huth** - Goethe-Universität
- **Matthias Irmscher** - Philips
- **Armin Knoll** - IBM Research-Zürich
- **Takahiro Kozawa** - Osaka University
- **Adrie Mackus** - Stanford University
- **Christelle Prinz** - Lund University
- **Junsuk Rho** - Pohang University of Science and Technology
- **Martin Stelzle** - University of Tübingen
- **Jian Sun** - Japan Advanced Institute of Science and Technology
- **Niels Tas** - University of Twente

An invited lecture will be indicated in the program as **Day-session-inv,** for instance **Thu-A4-inv.**

Instructions for oral presenters

Oral presentation slots are 45 minutes long for Plenary papers, 30 minutes for invited and 15 minutes for contributed papers. These include time for discussions. Session Chairs will enforce these times strictly, in order to allow time for members of the audience to switch sessions between presentations.

An LCD projector & computer (Windows 7, MS Powerpoint 2010 & Adobe Acrobat X) will be available in every session room for regular presentations. Neither Overhead projectors, 35mm slides projectors, VHS videotape player nor a DVD player will be available.

Speaker-Ready Room: Volga 1
PLEASE NOTE THAT PRESENTERS MUST BRING A USB MEMORY STICK CONTAINING THEIR PRESENTATION and up-load their files to local PCs in the Speaker-Ready Room.
For morning sessions, speakers must up-load their presentation files at the latest at 8.00 in the morning on the day of the presentation; for afternoon sessions, speakers must up-load their presentation at the latest before 13.00, during the break between the sessions. Technical staff will be available for assistance.

To avoid software compatibility problems (MS Powerpoint), speakers are advised to save their Powerpoint presentation as a **Powerpoint Show (.pps or .ppsx) AND bring also a .ppt or .pptx and a PDF-version of their presentation. Please use MP4 format for movies.**

Slide lay-out considerations

- Slides are preferred in a 4:3 aspect ratio.
- Leave space, at least the height of a capital letter, between lines of text.
- All fonts, including that on graphs, should be 20 point or larger.
- Graphs and charts should have bold lines and symbols that contrast sharply with the background. Thin, light lines can be lost on some projectors.

Poster program: Key to session / paper numbers
There are two poster sessions, one on Tuesday (even-numbered posters) and one on Wednesday (odd-numbered posters). The posters are grouped according to the clusters A, B, C, and D. In the program a poster will be indicated as **Day-session-p#**, for instance **Wed-B-p34** means poster number 34 in cluster B on Wednesday.

Instructions for poster presenters

- Poster size is A0 portrait (84 cm wide, 119 cm high). We will supply material for mounting the posters. The size specification must be strictly adhered to in preparation of your poster.
- Posters should be mounted on Monday after registration or Tuesday morning. They will stay on display during the entire conference
- Even number (2, 4, 6 ...) posters will be presented on Tuesday afternoon (15.30 - 18.00), odd number (1, 3, 5 ...)posters on Wednesday afternoon (15.30 - 18.00)
- Each poster board will have a poster identification number. Please leave them on display and do not block them in order to provide a means for orientation of visitors to the poster session.
- Posters should be removed by Thursday 13.30. Posters that are not removed by that time risk to be destroyed and dumped.

SPECIAL EVENTS

Special sessions

MNE Special session: Single Nanometer Manufacturing (SNM)

Tuesday 22 September 17.00 – 19.00

This session is open to all MNE attendees

The aim of the project "**S**ingle **N**anometer **M**anufacturing beyond CMOS devices" (SNM) is to both investigate and develop novel technologies for single nanometer manufacturing, capable of opening new horizons in the

emerging world of nanotechnology. Sustainable competence and excellence in the project is secured by a collaboration between 16 institutions from industry, academia and research institutes, led by Prof. Ivo W. Rangelow, Technische Universität Ilmenau, to establish new paths for manufacturing ultimate nanoscale electronic, optical and mechanical devices. The SNM project is an EC-funded integrated project (IP), which is on track to achieve the following ambitious goals, which have not previously been attempted:

- Pushing the limits of nanomanufacturing down the single digit nanometer-scale
- Developing nanolithographic methods for nanometer-size features, overlay placement, inspection and integration in novel nanoelectronic devices
- Enabling novel ultra-low power electronics, quantum devices and manipulation of individual electrons to be made
- Opening new horizons for beyond CMOS technology by novel cost-effective, global, nanolithographic technologies

The project combines different scanning probe lithography (SPL) techniques (field-emission SPL, thermal SPL and oxidation SPL) and focused electron and ion beam lithography with nanopatterning techniques from Oxford Instruments and Imec to yield beyond CMOS device templates with sub-10nm resolution for nanoimprint lithography by EVG. To gain high-throughput cost effective fabrication, the SNM team develops Nanoimprint lithography to generate the actual beyond CMOS devices in wafer-scale. Additionally, the SNM project addresses the metrology issues, to achieve beyond CMOS devices with critical dimensions below 10nm.

The purpose of this special SNM session is to inform experts in lithography techniques, pattern transfer and metrology, as well as other interested scientists, about how nanoscale manufacturing is becoming a reality.

MNE Special session: Chemistry for Electron-Induced Nanofabrication (CELINA)

Tuesday 22 September 17.00 – 19.00

This session is open to all MNE attendees

The aim of the European network COST Action CELINA is to develop a **maskless lithography nanotechnology platform** based on **direct-write / direct-erase** with volatile functional molecules being dissociated locally by focused electron beams with the outstanding performance in achieving **sub-10 nm lateral resolution, 3D additive and subtractive feature geometries, and high purity material**.

The EU-funded CELINA COST Action, led by Prof. Petra Swiderek from the University of Bremen, networks about 60 expert scientists and their groups all over Europe with competence and excellence in i) electron-induced reactions with molecules, ii) synthesis of volatile inorganic and organo-metallic compounds, iii) various applications in nano-optics, nano-magnetics, nano-sensors, nano-electronics, as well as Europe's leading SEM and SEM equipment manufacturers.

Amongst the ambitious objectives of CELINA are to-date non-resolved fundamental challenges:

- Establish quantitative criteria on how the electron -driven molecule dissociation reactions depend on the chemical properties of the precursor molecules
- Establish approaches towards the synthesis of superior precursors and synthesise new classes of precursors including novel bimetallic compounds
- Enable unsurpassed resolution on a routine basis; sub-10 nm range
- Substantially improve the "direct-write" materials portfolio: pure metals, alloys, oxides, and nitrides

This special session about CELINA features two expert overview talks on direct-write nanofabrication and fundamentals and two dedicated talks on lateral resolution and nano-magnetics. The session is open to all

interested scientists, who would like to know how Focused Electron Beam Induced Processing (FEBIP) is becoming a reality.

MNE Awards 2015

Sponsored by ASML

MNE 2015 Fellowship Award

To promote micro- and nano-engineering in Europe, the MNE Steering Committee recognise every year a researcher or engineer who has made outstanding contributions to fields addressed by the MNE conference. The aim is to honour a researcher or engineer who has strong research roots in Europe by having worked in Europe for an important part of his or her career. The successful candidate must have inspired the MNE community by his or her leadership or outstanding work. This could, for example, be through leadership in the successful development and commercialization of a technology, the pioneering of a method or development of a tool with significant impact on current research or manufacturing methods, or an outstanding invention.

The MNE steering committee is honoured to announce that

the 2015 MNE Fellowship

will be attributed to

Dr.ir. Emile van der Drift
Delft University of Technology, The Netherlands

in recognition of his outstanding contributions in the field of nano-structuring and the application of nanotechnology

Dr. van der Drift will present a Plenary Lecture at MNE 2015 and will receive a commemorative plaque accompanied by a monetary prize **sponsored by ASML, Veldhoven, The Netherlands**.

The award ceremony will take place during a Plenary Session at 8.30 on Thursday 24 September in the World Forum Theatre, immediately followed by Dr. van der Drift's lecture "Quantitative technology, a joy forever"

Prior to Dr. van der Drift, the MNE Fellowship was bestowed to :

- Dr. Haroon Ahmed (University of Cambridge, founder of Microengineering conference, which became the Micro & Nanoengineering conference) at MNE 2003, Cambridge
- Dr. Peter Vettiger (IBM Research – Zurich) at MNE 2005, Vienna
- Dr. Mike Hatzakis (NCSR Demokritos Athens) at MNE 2006, Barcelona
- Dr. Bruno Murari (ST Microelectronics) at MNE 2010, Genoa
- Dr. Luc Van den Hove (IMEC) at MNE 2011, Berlin
- Dr. Hans Löschner (IMS Nanofabrication AG) in Austria at MNE 2012, Toulouse
- Prof. Dr. Dieter Kern (the University of Tübingen) at MNE 2014, Lausanne

MEE Young Investigator Award

Sponsored by ELSEVIER

Honoring and Promoting a Young researcher active in the fields of Nanofabrication and Nanotechnology for Electronics, MEMS and Life Sciences

Microelectronic Engineering (MEE) is proud to continue the series of Young investigator Awards and MEE Lectureships for a second year. The Lectureship will be

presented at the MNE2015 Conference.

Following the internationally publicised call for applications, nominations for 18 outstanding candidates were received and evaluated by a committee of 8 international judges recruited from the MEE Editorial Board and previous award winners. Main ranking criteria were

- the overall accomplishment of the candidates
- the originality and relevance of their work
- the degree of independence they have gained.

Based on this evaluation the committee decided that

the 2015 Young Investigator Award

will be awarded to

Dr. Stephan Sylvest Keller
Senior Researcher at the Technical University of Denmark (DTU Nanotech)

in recognition of his outstanding contributions to the science and technology of polymermicrofabrication for applications in life science

The award ceremony will take place in a Plenary Session at 8.30 on Thursday September 24 in the World Forum Theatre. After the ceremony the laureate will present his research as an invited lecture in a parallel session at 9.30 in the World Forum Theatre.

Best Poster Awards **Sponsored by**

RAITH
NANOFABRICATION

Prizes will be awarded to the best poster in each of the four clusters A, B, C, and D. The posters will be judged on visual impact, design and scientific content. The judges will be drawn from the international steering committee and the local program committee. The four winners will be presented with their prizes and a commemorative certificate during the conference dinner.

TRAVEL INFORMATION/GETTING AROUND IN THE HAGUE

Up-to-date information on this aspect can be found at http://mne2015.org/venueaccomodation/travel/

MICROELECTRONIC ENGINEERING: SPECIAL ISSUES

As in previous years, all presenters are kindly asked to publish their contribution in one of the four special issues to appear after peer-reviewing in the Journal of Microelectronic Engineering.

Manuscript submission deadline: 23 October 2015

More information: www.mne2015.org

Guest editors for the Special Issues of Microelectronic Engineering

Micro/Nano devices and systems

Remco J. Wiegerink (University of Twente)
Urs Staufer (Delft University of Technology)

Micro- and Nano-Patterning
Cornelis W. Hagen (Delft University of Technology)
Paul Alkemade (Delft University of Technology)

Micro- and Nano-Technologies for Biology and Life Sciences
Luigi Sasso (Delft University of Technology)
Marko Blom (Micronit Microfluidics BV)

Micro/Nano Fabrication 2015
Ageeth Bol (Eindhoven University of Technology)
Harm Knoops (Oxford Instruments Plasma Technology and Eindhoven University of Technology)

COMMITTEES

MNE2015 Organizing Committee

- Kees Hagen (Conference Chair), Delft University of Technology
- Urs Staufer (Programme Chair), Delft University of Technology
- Frank Dirne, Delft University of Technology
- Paul Alkemade, Delft University of Technology
- Remco Wiegerink, University of Twente
- Luigi Sasso, Delft University of Technology
- Ageeth Bol, Eindhoven University of Technology
- Harm Knoops, Eindhoven University of Technology
- Marko Blom, Micronit Microfluidics B.V.
- Patrick de Jager, ASML
- Hans Mulders,FEI Company
- Lucienne Dado, Ab-Initio, PCO
- Inge van Marion, Ab-Initio, PCO

MNE International Steering Committee

- Anja Boisen, Technical University of Denmark – Denmark
- Hubert Brückl, Danube University Krems – Austria
- Michel Despont, CSEM – Switzerland
- Zahid Durrani, Imperial College London – United Kingdom
- Massimo Gentili (Chair), Centre for Materials and Microsystems – Italy
- Evangelos Gogolides, NCSR Demokritos Athens – Greece
- Gabi Grützner, micro resist technology GmbH – Germany
- Jean-Francois de Marneffe, IMEC Leuven – Belgium
- J. Alexander Liddle, NIST Gaithersburg – USA
- Shinji Matsui, University of Hyogo – Japan
- Francesc Pérez-Murano, CNM-CSIC Barcelona – Spain
- Urs Staufer, Delft University of Technology – Netherlands
- Christophe Vieu, LAAS-CNRS Toulouse – France

MNE International Programme Committee

A list of members of the International Programme Committee can be found here