

A bold undertaking in private-public partnerships

Like the other NWO institutes, ARCNL has been evaluated according to the Standard Evaluation Protocol (SEP) of NWO, KNAW, and VSNU. The evaluation committee described ARCNL as ‘a bold undertaking in private-public partnerships’, a new approach in the Netherlands.

Both research quality and viability were rated as ‘very good’ and relevance to society even as ‘world-leading/excellent’. The committee indicated that they felt uneasy about passing a ‘numerical judgment’ on ARCNL’s performance, due to lack of a steady-state (scientific) track record over the full evaluation term. According to the committee, ARCNL is performing well and it has the potential to grow to excellent status by the time of its next review.

[Read more.](#)



SEP panel visiting Stefan Witte’s lab

Peter Kraus starts new group on High-Harmonic Generation and EUV Science

On May 1st, Peter Kraus started as a tenure-track group leader at ARCNL. Kraus leads a program to develop extreme ultraviolet (EUV) sources from high-harmonic generation and apply them to ultrafast spectroscopy and nanoscale metrology experiments with relevance to nanolithography.

Kraus performed his PhD work at ETH Zurich (Switzerland) followed by a position at the University of California, Berkeley (USA) as a postdoctoral fellow of the Swiss National Science Foundation (SNSF).

[Read more.](#)



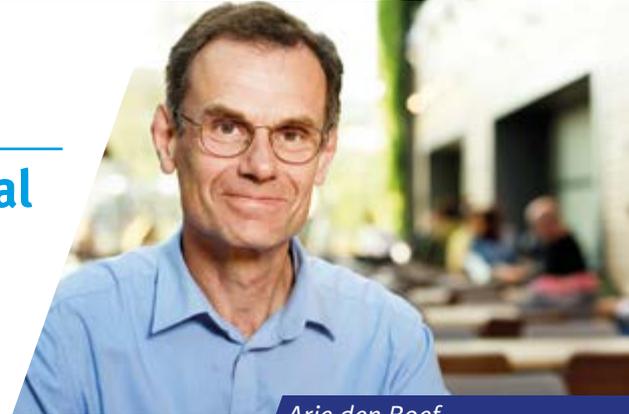
Peter Kraus



Arie den Boef heads the Computational Imaging group at VU/ARCNL

At Amsterdam's VU University, Arie den Boef is developing relatively simple optics to make fast, high-quality images for metrology applications with sub-nanometer precision. Den Boef is a Senior Fellow of ASML and an extraordinary professor in Amsterdam, where he performs his ARCNL-research with postdoc Vasco Tenner and PhD student Christos Messinis. Chip manufacturers use so-called optical metrology techniques to measure and control the quality of the patterning steps, such as lithography. As the patterns continue to get smaller, the quality of the optical metrology also needs to improve.

[Read more](#)



Arie den Boef

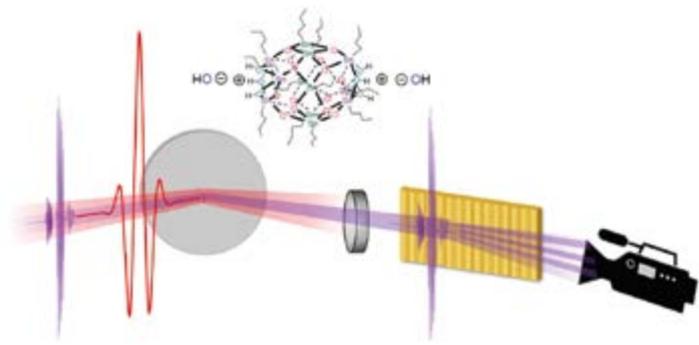


Illustration of the core concept in experiments planned by Peter Kraus and his team: a first laser pulse initiates modifications of the material, and a second pulse interrogates the dynamics on different time-scales.

Veni Grant for Peter Kraus

ARCNL group leader Peter Kraus has been awarded a Veni grant from the Netherlands Organisation for Scientific Research (NWO) for his proposal 'Shining ultrafast light on ultrasmall chips.' A key element of this project is formed by the development of femtosecond to attosecond time-resolved spectroscopy and its application to materials relevant to nanolithography, such as photoresists.

[Read more](#)

ERC Starting Grant for Oscar Versolato

ARCNL group leader Oscar Versolato has received a Starting Grant of 1.5 million euros from the European Research Council (ERC) for his project 'EUVPASMA'. The project addresses the complex physics of the laser-produced tin plasma sources of EUV light that are used in the latest generations of photolithography tools.

[Read more](#)



Oscar Versolato



ARCNL video

NWO took the initiative to portray each of its institutes in a short video for the general public. In ARCNL's video, Oscar Versolato gives an insight into EUV light and how his research group manages to produce the light using tin droplets. The second part of the video contains an introduction of ARCNL by Joost Frenken.

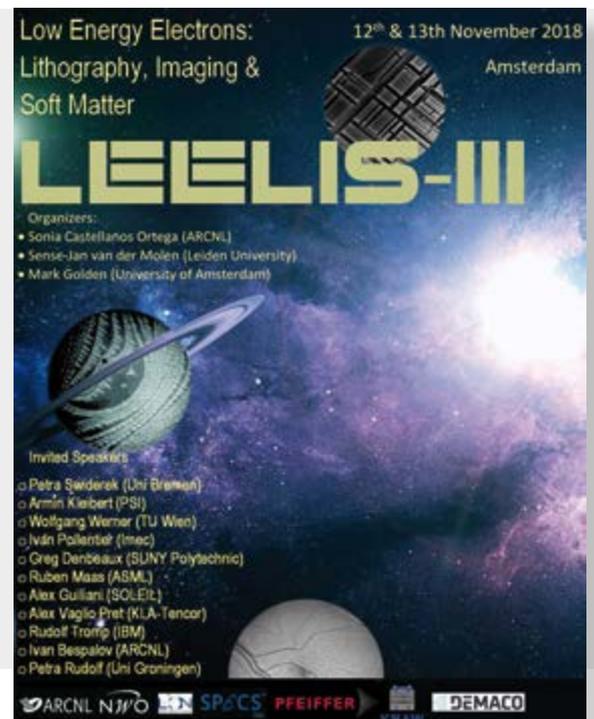
[Watch the video](#)

LEELIS-III

On November 12th and 13th 2018, ARCNL organizes the symposium LEELIS-III, a unique platform to focus on the role of low-energy electrons in imaging, nanolithography and soft matter.

Following the success of the first and second LEELIS workshops, this year's program addresses the interactions between low-energy electrons and soft matter from different perspectives. The symposium brings together experts from complementary fields, such as condensed matter physics, EUV lithography, low-energy electron microscopy and engineering, to come to novel insights on the physics of low-energy electrons and the chemistry they induce.

[More information and registration](#)



ASML Introduction Day

On May 28th, 17 ARCNL researchers traveled to Veldhoven for their ASML Introduction Day. The group met with counterparts from ASML Research and worked on a challenging research case. The participants were excited to see how their own projects fit into the overarching goal of improving key technologies in nanolithography.

ARCNL Strategy Day

On June 22nd, ARCNL organized its first Strategy Day. The meeting was attended by senior staff members of ARCNL, representatives of ARCNL's stakeholders, NWO, UvA, VU and ASML, and a number of direct research colleagues from the stakeholders, mostly from ASML. ARCNL will organize such a meeting annually, with the purpose to communicate its detailed research plans to its partners and align them optimally with the developments and interests at ASML and at the universities. This first meeting set the stage for a mutually inspiring process that strengthens the ties between ARCNL and its partners.



Matrix-VII: ARCNL's long-term housing

Since the previous newsletter, in December 2017, the construction activities on ARCNL's new housing have progressed rapidly. On 21 March, we celebrated reaching the highest point of the building. By now, Matrix-VII is close to completion. Formal delivery is scheduled for the 1st of November and we are preparing the Grand Opening on Wednesday, December 12th: save the date!

[Click here, to see Matrix-VII progress](#)

Vacancies

- PostDoc, *Repetition-rate limits of X band accelerator technology* (EUV Plasma Processes)
- Internship: *Advanced Metal Organic Frameworks for EUV lithography* (EUV Photoresists)
- Internship: *Optimisation of Surface Anchored Metal Organic Frameworks (SURMOF) layer by layer growth for nanolithography studies* (EUV Photoresists)
- Internship: *Unravelling the fundamental puzzle of friction with application to industrial nanolithography* (Contact Dynamics)
- Postdoc: *Pushing the limits of EUV emission from dense laser-produced plasmas* (EUV Plasma Processes)
- Postdoc: *Computational Imaging for Nanolithography* (EUV Generation & Imaging)
- Internship: *Quartz crystal microbalance: applications nanolithography* (EUV Photoresists)

Recently published

All ARCNL publications can be downloaded from our [website](#)

A. Stodolna, R. de Faria Pinto, F. Ali, A. Bayerle, D. Kurilovich, J. Mathijssen, R. Hoekstra, O.O. Versolato, K.S.E. Eikema and S. Witte, *Controlling ion kinetic energy distributions in laser produced plasma sources by means of a picosecond pulse pair*, J. Appl. Phys **124**, 053303:1-7 (2018)

S.A. Reijers, D. Kurilovich, F. Torretti, H. Gelderblom and O.O. Versolato, *Laser-to-droplet alignment sensitivity relevant for laser-produced plasma sources of extreme ultraviolet light*, J. Appl. Phys **124**, 013102: 1-7 (2018)

G.S.M. Jansen, A. de Beurs, X. Liu, K.S.E. Eikema and S. Witte, *Diffraction shear interferometry for extreme ultraviolet high-resolution lensless imaging*, Opt. Express **26**, 10:12479-12489 (2018)

F. Fallica, J. Haitjema, L. Wu, S. Castellanos, A.M. Brouwer and Y. Ekinci, *Absorption coefficient of metal-containing photoresists in the extreme ultraviolet*, J. Micro/Nanolith. MEMS MOEMS **17**, 2: 023505: 1-7 (2018)

A. Bayerle, M.J. Deuzeman, S. van der Heijden, D. Kurilovich, R. de Faria Pinto, A. Stodolna, S. Witte, K.S.E. Eikema, W. Ubachs, R. Hoekstra and O.O. Versolato, *Sn ion energy distributions of ns- and ps-laser produced plasmas*, Plasma Sources Sci. Technol. **27**, 045001:1-8 (2018)

L. Freisem G.S.M. Jansen, D. Rudolf, K.S.E. Eikema and S. Witte, *Spectrally resolved single-shot wavefront sensing of broadband high-harmonic sources*, Opt. Express **26**, 6: 6860-6871 (2018)

B. Weber, T. Suhina, T. Junge, L. Pasewka, A.M. Brouwer and D. Bonn, *Molecular probes reveal deviations from Amontons' law in multi-asperity frictional contacts*, Nature Commun. **9**, 888:1-7 (2018)

F. Torretti, R. Schupp, D. Kurilovich, A. Bayerle, J. Scheers, W. Ubachs, R. Hoekstra and O.O. Versolato, *Short-wavelength out-of-band EUV emission from Sn laser-produced plasma*, J. Phys. B **51**, 045005:1-9 (2018)

D. Kurilovich, M.M. Basko, D.A. Kim, F. Torretti, J.C. Visschers, R. Schupp, J. Scheers, R. Hoekstra, W. Ubachs and O.O. Versolato, *Power-law scaling of plasma pressure on laser-ablated tin microdroplets*, Phys. Plasmas **25**, 012709:1-10 (2018)