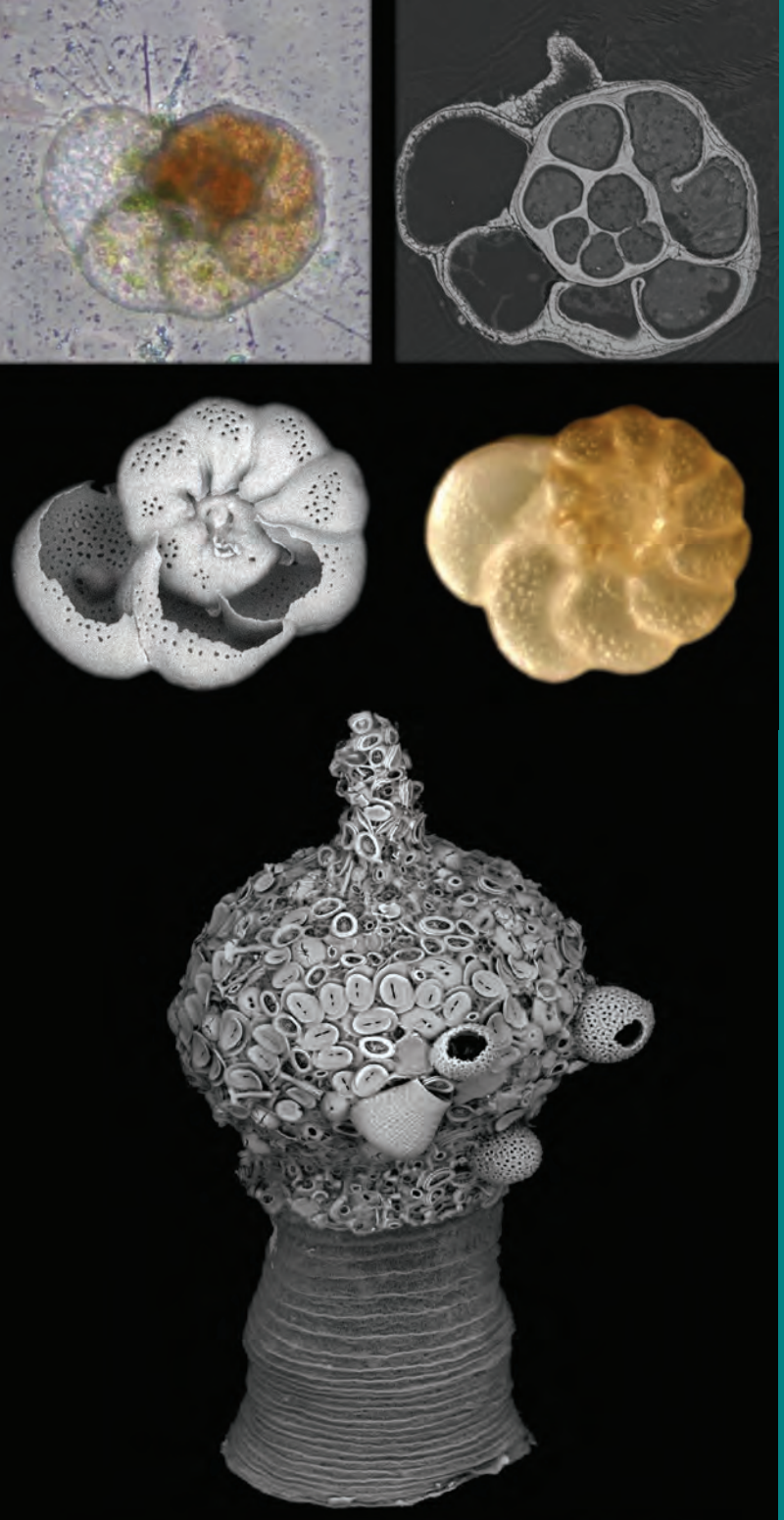
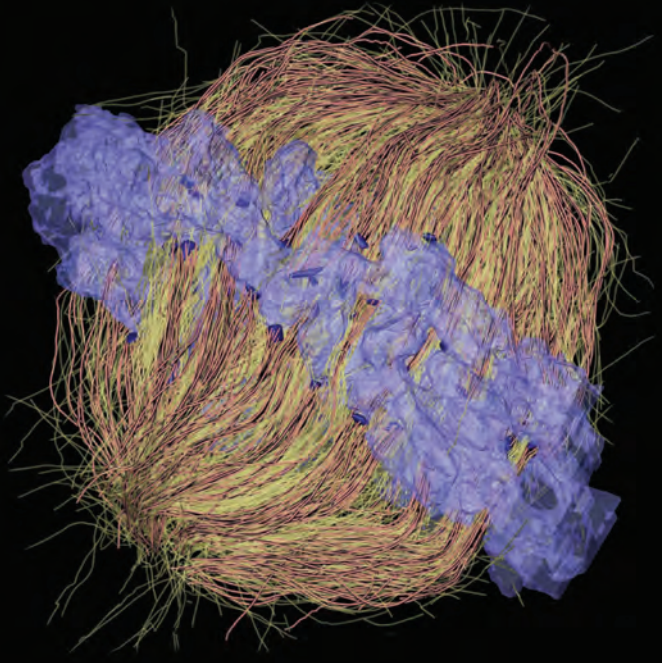


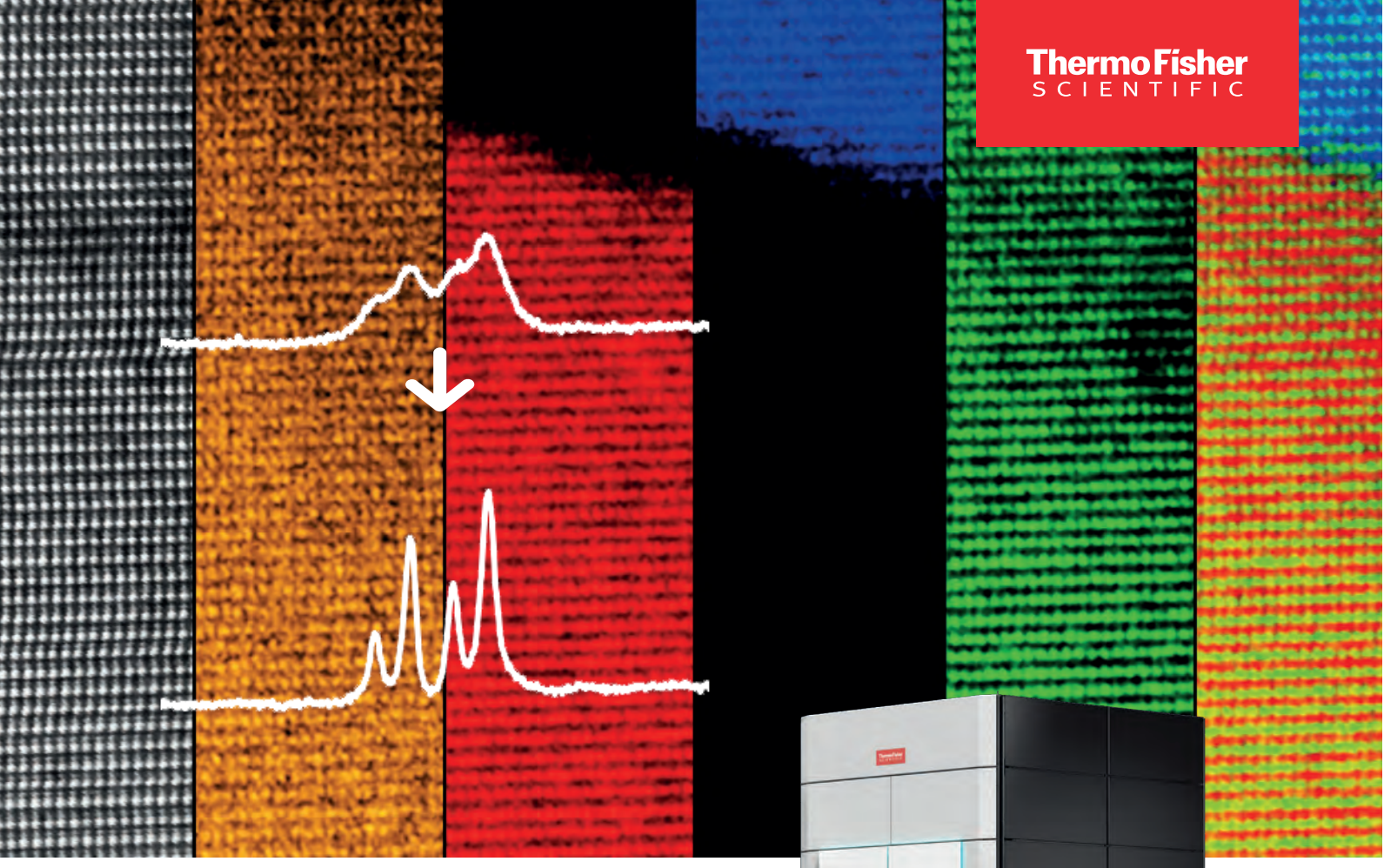


YEARBOOK 2025

EUROPEAN MICROSCOPY SOCIETY

Founded in 1998
www.eurmicsoc.org

ThermoFisher SCIENTIFIC



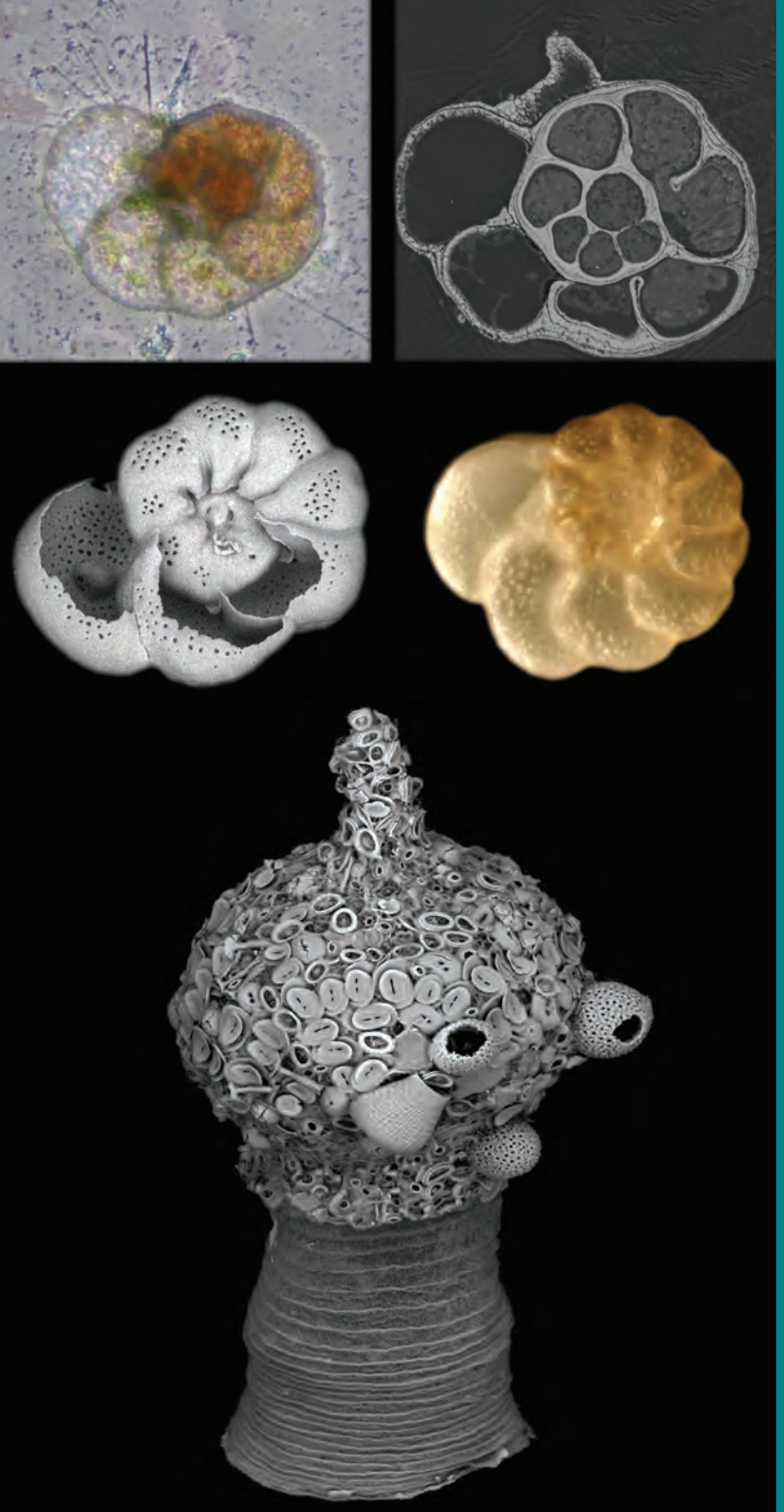
Iliad S/TEM:

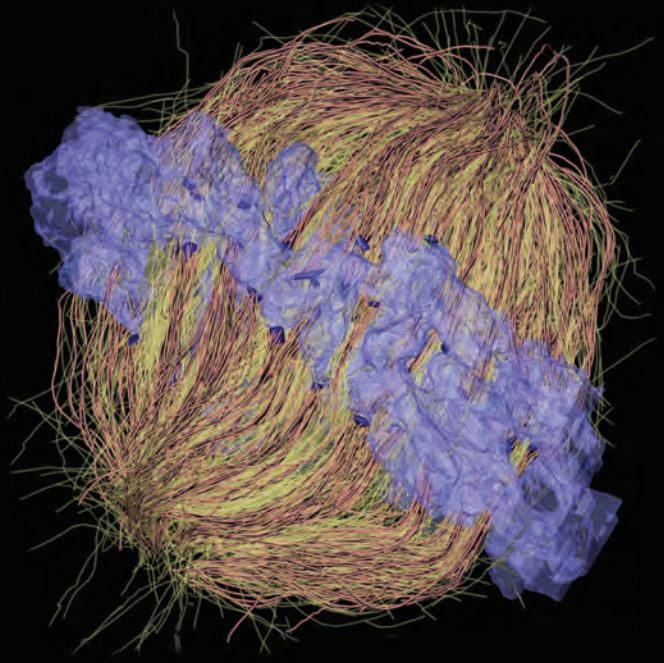
Seamlessly integrated EELS and EDS

- Unique integration of superior hardware
- One software for complete and intuitive control
- State-of-the-art (S)TEM with future proof capabilities
- Advanced (S)TEM control and automation

Learn more at **thermofisher.com/iliad**

thermo scientific





YEARBOOK 2025

EUROPEAN MICROSCOPY SOCIETY

Founded in 1998
www.eurmicsoc.org

ELUCIDATION OF THERMAL TRANSITIONS BY HOT-STAGE MICROSCOPY

Dr. Matthias WAGNER, Mettler-Toledo GmbH, Heuwinkelstrasse 3, 8606 Nänikon-Greifensee

Hot-stage microscopy is a technique that is widely used for the characterization of thermal transitions. The possibility of directly observing the morphological change of the sample as it is heated or cooled makes it much easier to interpret a Differential Scanning Calorimetry (DSC) curve, which can be recorded simultaneously with our HS84 hot stage DSC. Changes in the shape and structure of crystals are seen, as well as their size and number. Hot-stage microscopy also has the advantage that the sensitivity of the system is not influenced by different heating rates.

Measurement techniques

Today, it is essential that the information obtained from hot-stage microscopy is documented in digital form. This means that the still and video images must be saved on a PC system. It is also essential to document other parameters such as the sample temperature, the magnification or scale, the sample name, and the time and date, besides the actual images themselves.

For this reason, a new imaging package is now available for the METTLER TOLEDO HS82 hot-stage and the HS84 hot-stage DSC.

The Imaging Package (HS) STAReCapture is an economical and intuitive solution for standard applications and consists of a HQ industrial camera ready to connect to C-mount adapters, a 3-meter long USB-connection cable and the image recording software STAReCapture. A picture of the hardware setup is displayed in ***Figure 1***, a screenshot of the software in ***Figure 2***.

The program makes use of the latest PC video recording technology and allows the user to observe images of the sample on the hot-stage on the PC screen and to save moving and still images directly to the hard disk of the computer. The program can read the sample temperature and overlay it onto each image and video frame.

The new imaging package has the following advantages:

- Imaging possibilities – use visual information to aid material characterization
- Intuitive user interface – for simple and easy-to-learn operation
- Seamless process – efficient, step-by-step guidance through the visual analysis
- Quick and Easy Upgrade – add a high-quality imaging system in just minutes

It is suitable for the following industries/applications:

Table 1: Industries and applications where Hot-Stage Microscopy could be applied

Industry	Application
Pharma	Polymorphism studies Dry and immersion solvate studies Phase diagrams Eutectic melting
Chemical	Liquid crystalline transitions Visualization of thermochromism
Polymer	Melting behavior Multilayer film melting Crystallization kinetics
Petro	Cloud point of fuels

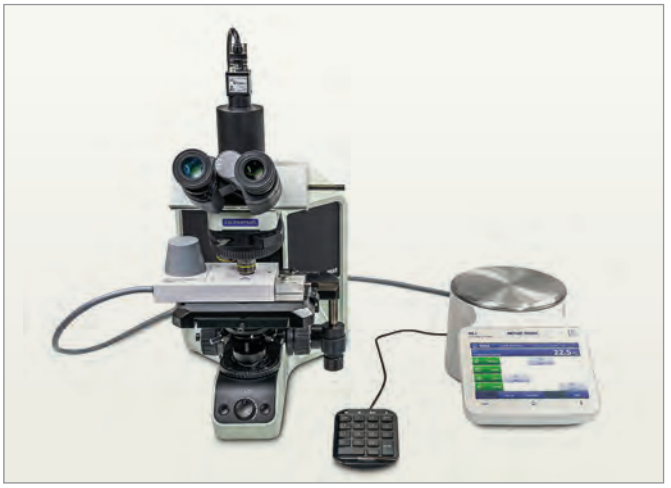


Fig. 1: HS82 Hot-stage System and HQ digital camera mounted on a microscope.

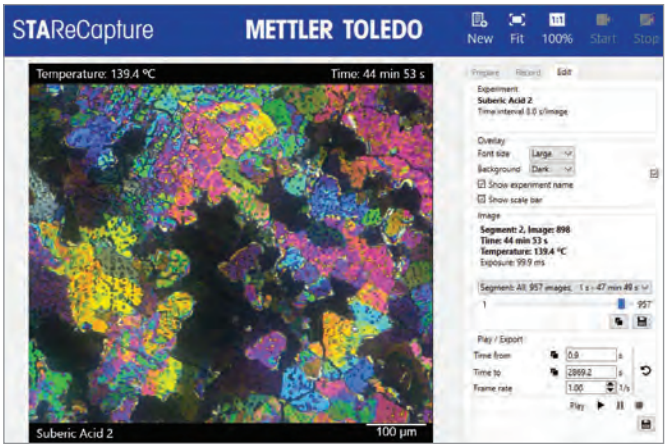


Fig. 2: Screenshot of the Edit-Tab of STAReCapture Imaging software.

Application examples

Two examples of applications will now be described:

Polymorphism of sulfapyridine

Sulfapyridine belongs to a class of drugs known as sulfonamides that exerts a powerful antibacterial action. The most well-known form in which it is used today is sulfasalazine, a substance with a structure consisting of sulfapyridine and salicylic acid. It is used to treat rheumatoid arthritis. Studies of the polymorphism of sulfapyridine can be found in the pharmacological literature ***[1]***.

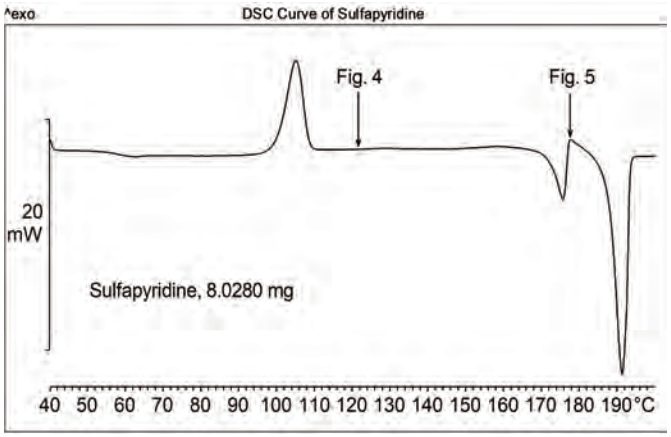


Fig. 3. DSC curve of sulfapyridine measured with a heating rate of 5 K/min.

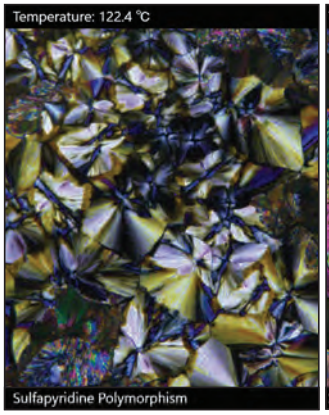


Fig. 4. Sulfapyridine crystals at 122.4 °C.

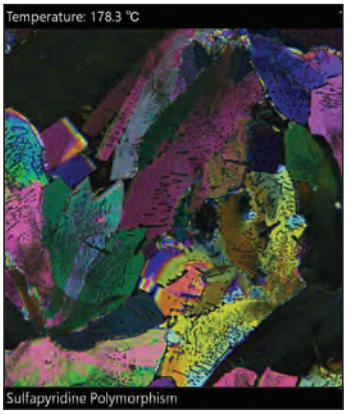


Fig. 5. Sulfapyridine crystals at 178.3 °C.

Sulfapyridine exhibits crystallization and several solid-solid transitions as soon as it is heated from the glassy state. These polymorphic transitions *[2]* can be easily recognized in the DSC curve *(Figure 3)*, but it is not possible to know which transition is actually occurring at any moment. If one uses an HS82 with imaging package, it is possible to identify the individual process that corresponds to each of the DSC peaks. *Figure 4* shows the sample at 122.4 °C. Spherulite crystals have grown out of the glassy phase. At 178.3 °C *(Figure 5)*, the spherulites have changed through melting and recrystallization to the new rhombic modification.

Crystallization of iso-tactic polypropylene

Another important point is to investigate the crystallization behavior of materials as a function of cooling rate. Samples of molten polypropylene were cooled with different controlled cooling rates in the hot-stage HS82.

Crystals of different morphology form depending on the cooling profile.

Figure 6 shows two different cooling curves measured at 1 K/min on top and 5 K/min at the bottom. The cooling rate influences both the size and the number of crystals. At a low cooling rate, nucleation rate is low and crystal growth rate high so that a small number of large crystals is formed. A higher heating rate leads to a higher nucleation rate and smaller crystal sizes. Crystallization kinetics can also be investigated by analyzing spherolite growth as a function of temperature.The images of both applications were recorded and post-processed with STAReCapture software.

SUMMARY

Hot-stage microscopy is an extremely valuable tool for the characterization of polymorphic forms and the study of melting and crystallization processes. Combination with modern image and video recording technologies significantly enhances the advantages of this technique. The documentation and exchange of image data in electronic form then becomes a very simple matter.

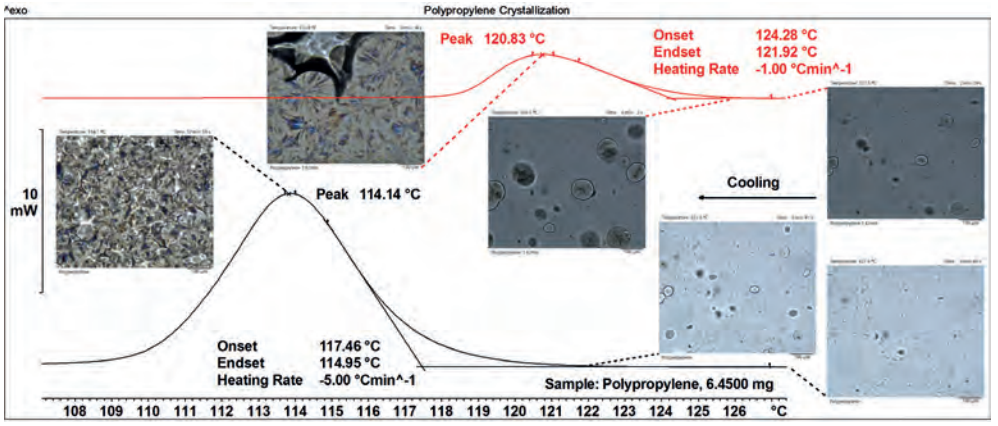


Fig. 6: DSC curves of polypropylene during cooling at two different cooling rates. Hot-stage microscopy images at start temperature, beginning of crystallization, and peak temperature of the DSC curve.

Literature

[1] Burger, K. Schulte and R. Ramberger:
(in German). Aufklärung thermodynamischer Beziehungen zwischen fünf polymorphen Modifikationen von Sulfapyridine mittels DSC.
(Study of themodynamic relationships between five polymorphic modifications of sulfapyridine by DSC.)
J. Therm. Anal. 19, 475 - 484 (1980)

[2] Wagner, M. Thermal Analysis in Practice, chapter 15: Polymorphism, 283 – 286 (2017)

[3] Wagner, M. Thermal Analysis in Practice, chapter 19: Thermoptometry, 314 – 323 (2017)

METTLER TOLEDO GmbH, Analytical
CH-8606 Nänikon, Switzerland

METTLER TOLEDO

www.mt.com/ta-hotstage

Preface

Dear EMS members,

Welcome to the 2024 yearbook, (edition 2025) of the European Microscopy Society (EMS)!

It is a pleasure for me to write my first preface for the EMS yearbook. Indeed, our dear colleague Prof. Virginie Serin, former EMS secretary for 8 years, has entrusted me with the exciting task of replacing her and continuing the activities, actions and development of EMS. I am honored and delighted to be part of such a mission. Alongside our new President, Dr Vladislav Krzyzanek, and with the backing of a motivated executive board and the effective support of our partner MCO, I will do my utmost to promote all aspects of the use and quality of advanced microscopy throughout Europe.

Our yearbook begins with a particularly moving tribute to Peter Hawkes, the founder of our European Society. Peter will be remembered by all who knew him as a remarkable scientist, who made fundamental and ground-breaking progress in the world of electron optics, aberrations and digital imaging. We will miss his wonderful "round up" of leading papers in the world of microscopy, and key talks that had been given at major microscopy conferences.

As you browse through our yearbook, you will discover that 2024 has been a rewarding year for the EMS and the Microscopy Society, culminating with the 17th European Microscopy Congress, EMC2024 (https://emc2024.eu/), held in Copenhagen. In addition to a top-tier international and multidisciplinary conference, EMC2024 featured Europe's largest exhibition dedicated to microscopy. Early-career researchers who received EMS scholarships to attend the meeting wrote interesting and enjoyable notes, illustrated with photos, about their experiences in Copenhagen. A chapter is dedicated to the European Microscopy award ceremony and EM award winning lectures. The EMS Outstanding Paper Award (OPA) ceremony is also illustrated in this yearbook.

EMS has organized and sponsored several events mentioned in the yearbook.

The field of microscopy is constantly evolving and expanding, with new techniques, applications and challenges emerging every day. In this yearbook, you will find a selection of short reports, articles and journals covering some of the most exciting and relevant topics in microscopy, such as nanoscopy, correlative microscopy, cryo-electron microscopy, super-resolution microscopy, time-resolved cathodoluminescence, artificial intelligence, a fascinating report on the *seventeenth-century Microscopy*, a reflection on *artifacts* and much more…

You will find information on EMS activities, events, awards, publications and members, as well as useful resources and opportunities for microscopy enthusiasts.

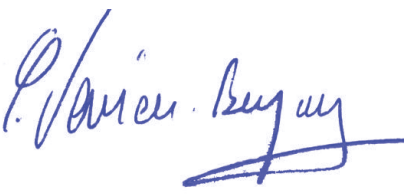
The upcoming conference season promises to be just as exciting starting with the EMS Extension event: 17th Multinational Congress on Microscopy, to be held from September 7 to 12, 2025, in Portorož, Slovenia (https://17mcm.si).

Many sponsored and patronaged events are listed in the EMS web site (https://www.eurmicsoc.org/en/).

We invite you all to join us on these occasions. In the meantime, I hope you enjoy reading this yearbook and find it informative and inspiring.

Finally, I would like to thank all the authors, editors, publishers, sponsors and partners who have contributed to the production and distribution of this yearbook.

Your General Secretary and friend



Catherine Vénien-Bryan
EMS General Secretary

IN MEMORIAM

In Memory of Peter HAWKES

It is with a great sadness that we learned that Peter Hawkes passed away at his home in Toulouse, France, he was 87 years old. This loss resonates all the more for the EMS as Peter was the founder of our European Society.

Peter will be remembered by all who knew him as a remarkable scientist, communicator and educator who made fundamental and ground-breaking progress in the world of electron optics, aberrations and digital imaging.

Peter's first foray into electron microscopy and into electron optics in particular was when as a fresh graduate student in 1959 he joined the 'Electron Microscopy Group' headed by Ellis Cosslett in the Physics Department of the University of Cambridge. At that time the Physics Department was still occupying the historic Cavendish Laboratory in the middle of Cambridge, where both the electron and neutron were first discovered (by Thomson and Chadwick, respectively).

Peter's interest and expertise in both physics and mathematics made him an ideal PhD candidate to study the fundamentals of electron optics. Cosslett gave Peter a series of papers by the mathematician Peter Sturrock – who had completed his PhD with Cosslett a few years previously – and told him to apply Sturrock's eikonal methods to the aberrations of quadrupoles and related multipole lenses. Peter focussed in particular on the relationship between system symmetry and permitted aberrations, with the ultimate goal of proposing ways to correct for lens aberrations, and, in particular, the dominant spherical aberration of round lenses. He discovered that whilst quadrupoles have an unwanted linear focussing effect, sextupoles have no linear focussing effect and have aberrations of exactly the same nature as the

spherical aberration of round lenses. Unfortunately sextupoles do suffer from second-order effects and that was sufficiently problematic that Peter did not pursue the sextupole design further. Of course, some years later, first Beck and then Crewe, Rose and others, showed that sextupole doublets could indeed provide correction.

After his PhD, Peter remained in Cosslett's group as a post-doctoral Research Fellow funded through a number of different institutions. Peter has written of his time both at Peterhouse and Churchill College, two of the Cambridge colleges where Peter was a Fellow, with great affection. He revelled in college life, mixing with other academics across many disciplines, not just in Physics or Mathematics, but also biology, philosophy, history and archaeology. He would tell of his time on the wine committee at Churchill, with the 'demanding' job of tasting and buying quantities of wine to lay down in the college's large wine cellars.

Peter continued to work in the area of electron optics with Cosslett and his group throughout the 1960s and the first half on the 1970s. His work was stimulated through breakthroughs, for example, by Deltrap, showing quadrupoles and octopoles can correct spherical aberration, and by Hardy demonstrating the correction of chromatic aberration.

In 1966, together with other experts in electron optics from around the world, Peter spent a month at Argonne National Laboratory in the US, at a workshop organised by Albert Crewe. The workshop was there to design a high voltage aberration-corrected microscope, which led to a proposal to the US government. Unfortunately, the proposal was not funded – perhaps it was too far ahead of its time.

During the 1960s computers were beginning to make their mark in the world of electron microscopy, initially in the design of new electron optical systems. Towards the end of that decade Peter proposed to Cosslett that the group needed to also embrace the ideas of computer-based digital image processing (of electron micrographs) and consider purchasing a mini-computer to enable this. Cosslett suggested Peter apply for funds, which he duly did; the proposal was successful and a PDP-8 was acquired. The PDP-8 computer had 20 kilobytes of memory – tiny by today's standards - and was about as large as a family fridge! Using this computer, Owen Saxton, who joined the Cosslett group in 1970, together with Ralph Gerchberg, devised the Gerchberg-Saxton algorithm to solve the 'phase problem' by using an image and diffraction pattern from the same specimen area; this remarkably successful approach has now spread across many scientific fields.

By 1974 the Physics Department in Cambridge was due to move out of town to a new building, the 'New Cavendish', in west Cambridge. Also, Cosslett was due to retire in 1975 and

so there was a great deal of uncertainty as to how the Electron Microscope group would evolve. At that time, Peter received a letter from Bernard Jouffrey inviting him to join the CNRS Laboratory of Electron Optics (now CEMES) and set up a new research area in image processing. Toulouse was the home of the world's first high voltage electron microscope and remains an important centre for electron microscopy development to this day. Peter took up the invitation, his application to the CNRS was successful, and he left Cambridge for Toulouse in 1975. He remained at the Toulouse Laboratory, becoming Director in 1987, until his retirement in 2002, when he became Emeritus Director of Research.

Throughout his career, Peter was a prolific writer of articles, books and reviews. His first book, on 'Quadrupole Optics' was published in 1966, with many others published over the next 50 years or so. Peter's collaboration with John Spence led to the books 'Science of Microscopy' and 'Springer Handbook of Microscopy'. In the 1980s Peter began work on his seminal multi-volume book, with Erwin Kasper, 'Principles of Electron Optics', published first in 1989 with a second edition in 2017, the book's name paying homage to Wolf's 'Principles of Optics', a book which Peter thought to be one of the very best. He has written extensively on the history of electron microscopy and electron optics, including the history and development of aberration-corrected microscopes.

In addition to his own research papers Peter would regularly publish wonderful 'round-ups' of key papers from the microscopy world, and key talks that had been given at major microscopy conferences. These were published in the journal Ultramicroscopy with Elmar Zeitler as its Founding Editor-in-Chief. One of Peter's early publications in that journal was a poem in response to a call for a better journal title! Peter kept a strong connection with the journal throughout his career, and with its Editors (following Zeitler there was Kruit, Midgley and now Kirkland) and his 'round-ups' were always entertaining and keenly anticipated.

Peter was also, from 1982, the Editor-in-Chief (more recently joint Editor) of Advances in Electronics and Electron Physics (now known as Advances in Imaging and Electron Physics) – a highly successful book series that has highlighted, through substantial review articles, the key developments across a wide range of subject matter. He served on the Editorial Boards of many journals including Ultramicroscopy, Journal of Microscopy and Journal of Mathematical Imaging and Vision.

Peter had many awards and prizes bestowed upon him over the years including a Doctor of Science from University of Cambridge in 1980, honorary membership of the French Microscopy Society, Fellowship of the Optical Society of America, Fellowship of the Microscopy Society of America and Fellowship of the Royal Microscopical Society. He was awarded the CNRS Silver Medal in 1983.

Peter's desire to bring communities together is reflected in other activities. In 1980, together with Hermann Wollnik and Karl Brown, he established the quadrennial International Congress on Charged Particle Optics, bringing together scientists from the worlds of electron optics, accelerator science and spectroscopy. He was involved in a number of international microscopy congresses and three Pfefferkorn conferences.

It seems fitting to end though by highlighting Peter's extraordinary influence on European microscopy as a whole. In 1998, it was recognised that a new pan-European society should be established and Peter became the Founding President of the European Microscopy Society. Since those times, the Society has gone from strength to strength but it owes a great debt of gratitude to Peter and those on the Executive Board at the time for their vision and founding principles.

Beyond all his professional achievements, Peter was known for his kindness, humility, and unwavering commitment to scientific excellence. His legacy will continue to inspire future generations of scientists and researchers.

Peter Hawkes will be deeply missed, but his contributions to science and his impact on those who knew him will live on.

The European Microscopy Society extends its condolences to Peter's family and loved ones. ■

Yearbook 2025 - Contents

Cover:

- *Top figure (gallery of 4): Foraminifera fixed with glutaraldehyde and placed in resin, optical and electron images (Zeiss Ultra55 SEM) of the shell, and backscattered electron SEM view of a section made by cold ion polishing using a Leica TIC 3X. I. Estéve SEM-FIB core facility at IMPMC - Sorbonne University, Paris France*
- *Middle figure: Codonellopsis orthoceras SEM Machouk/Bachy Charles CNRS SEM-FIB core facility at IMPMC - Sorbonne University, Paris France*
- *Bottom figure: 3D-reconstructed mitotic spindle in a human (HeLa) cell. R. Kiewisz. Core Facility Cellular Imaging (CFCI) Faculty of Medicine Carl Gustav Carus Technische Universität Dresden Germany.Credits: Teresa Hungria - UAR R. Castaing Toulouse; Felipe Quiroga-Suavita, Lise-Marie Lacroix and Bruno Chaudret - LPCNO Toulouse*

Executive Board

Dr.Vladislav KRZYZANEK

President

Institute of Scientific Instruments of the Czech Academy of Sciences
Kralovopolska 147, CZ-61200 Brno, Czech Republic
eMail: krzyzanek@isibrno.cz

Prof. Dr. José Maria VALPUESTA

Past-president

Centro Nacional de Biotecnologia (CNB-CSIC)
Darwin 3 - 28049 Madrid, Spain
eMail: jmv@cnb.csic.es

Prof. Dr. Catherine VENIEN-BRYAN

General Secretary

Sorbonne Université - Institut de Minéralogie, Physique des Matériaux et Cosmochimie
IMPMC (UMR7590) - 4 place Jussieu, F-75252 Paris CEDEX 05, France
eMail: secr@eurmicsoc.org

Prof. Dr. Philippe LECLERE

Treasurer

University of Mons (UMONS) - Laboratory for Physics of Nanomaterials & Energy - LPNE - Research Institute for Materials Science and Engineering
Place du Parc, 20, B - 7000 Mons, Belgium
eMail: philippe.leclere@umons.ac.be

Marc PEETERS

ECMA representative

Achtseweg Noord 5 - Building AAE-III-365 - 5651 GG Eindhoven, The Netherlands
eMail: marc.peeters1@thermofisher.com

Prof. MD PhD Klaus QVORTRUP

EMC Chair 2024

University of Copenhagen - Department of Biomedical Sciences
Microscopy Core Facility, CFIM
The Panum Institute, 3 Blegdamsvej - 2200 Copenhagen N, Denmark
eMail: Qvortrup@sund.ku.dk

Prof. Dr. Francesca PEIRÓ MARTÍNEZ

EMC Chair 2028

LENS - Laboratory of Electron Nanoscopy (LENS)
MIND - Micro-Nanotechnology and Nanoscopies for Electrophotonic Devices
IN2UB - Institute of Nanoscience and Nanotechnology
Physics Faculty - c/Martí Franquès, 1 - 08028 Barcelona, Spain
eMail: francesca.peiro@ub.edu

Prof. Dr. Lewys JONES

Member

Advanced Microscopy Laboratory (AML), School of Physics, CRANN & AMBER
Trinity College Dublin, the University of Dublin - Dublin 2, Ireland
eMail: lewys.jones@tcd.ie

Dr. Agnes KITTEL

Member

Hungarian Academy of Sciences - Institute of Experimental Medicine
Pf. 67, 1450 Budapest, Hungary
eMail: kittel@koki.hu

Prof. Dr. Thomas MÜLLER-REICHERT

Member

Core Facility Cellular Imaging (CFCI) - Faculty of Medicine Carl Gustav Carus
Technische Universität Dresden - Fiedlerstraße 42 - 01307 Dresden, Germany
eMail: mueller-reichert@tu-dresden.de

Prof. Saso STURM

Member

Jozef Stefan Institute - Department for nanostructured materials
Jamova 39 - SI-1000 Ljubljana - Slovenia
eMail: saso.sturm@ijs.si

Prof. Dr. Servet TURAN

Member

Eskisehir Technical University, Materials Science and Engineering,
Tepebasi, 26555 - Eskisehir - Turkey
eMail: sturan@eskisehir.edu.tr

Prof. Dr. Paul VERKADE

Member

School of Biochemistry
Biomedical Sciences Building - University of Bristol - University Walk - Bristol BS8 1TD, United Kingdom
eMail: p.verkade@bristol.ac.uk

Prof. Dr. Igor WEBER

Member

Ruder Boskovic Institute - Division of Molecular Biology
Bijenicka cesta 54 - 10000 Zagreb - Croatia
eMail: iweber@irb.hr

Letter from the President

Dear EMS members,

The year 2024 was truly a remarkable one for the EMS, highlighted by the European Microscopy Congress 2024 (EMC2024), the flagship event of our community. Held in Copenhagen, this congress marked a long-awaited success after an eight-year gap since the planned EMC2020 had to be cancelled. I would like to extend my deepest gratitude to Prof. Klaus Qvortrup and his dedicated team for their outstanding efforts in organizing such a fantastic event. EMC2024 once again proved to be a key platform for scientific exchange, showcasing cutting-edge developments across all fields of microscopy.

During EMC2024, the new EMS Executive Board for the term 2024-2028 was elected. I would like to take this opportunity to sincerely thank the outgoing Executive Board members for their dedicated service to the EMS. In particular, my deepest gratitude goes to Prof. José María Valpuesta for his leadership as President, Prof. Virginie Serin for her unwavering commitment as Secretary over the past eight years, and Prof. Christian Schöfer for his invaluable work as Treasurer. Additionally, I extend my appreciation to Prof. Josef Zweck, Kornelia Weidemann, Prof. Cristiano Albonetti, Prof. Lucy Collinson, and Prof. Randi Holmestad for their significant contributions to the previous EMS Executive Board. Their dedication has been instrumental in shaping the society's direction and supporting the microscopy community.

Another highlight of EMC2024 was the selection of the next EMC venue. I am pleased to announce that EMC2028 will take place in Barcelona, organized by the Spanish Microscopy Society under the leadership of Prof. Francesca Peiró Martínez. We look forward to another remarkable event that will continue the tradition of bringing together leading experts and early-career researchers in microscopy.

A core mission of our Society is to support scientific excellence, which we do by organizing the annual Outstanding Paper Awards (OPA) which recognize exceptional research in Materials Sciences, Life Sciences, and Instrumentation & Technique Development. I would like to extend my sincere thanks to Prof. Randi Holmestad, who has successfully coordinated this activity in recent years. As she now hands over this responsibility, I wish Prof. Igor Weber much success in taking on this important role.

Looking ahead, the next major microscopy gatherings where EMS will play a crucial role include the 17th Multinational Congress on Microscopy (17MCM) in Portorož this September, which will be the only EMS Extension event in 2025, and in 2026, the 21st International Microscopy Congress (IMC21) in Liverpool, where EMS will once again collaborate with the International Federation of Societies for Microscopy (IFSM) to contribute to the success of this global congress.

I would also like to express my heartfelt appreciation to our current EMS General Secretary, Prof. Catherine Vénien-Bryan, and the new Treasurer, Prof. Philippe Leclère, for their dedication to co-leading the EMS. Another warm thanks goes to EMS PCO Liaison, Marina Vita, for her excellent work in administration and managing the Society's operations, including her efforts in coordinating this yearbook.

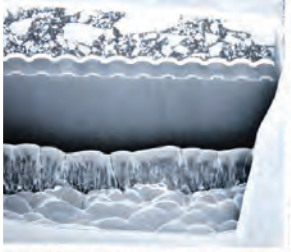
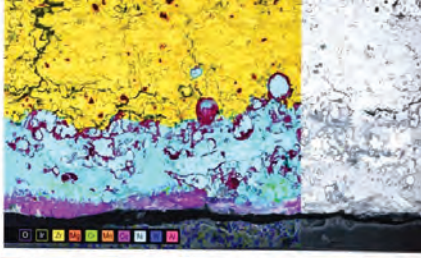
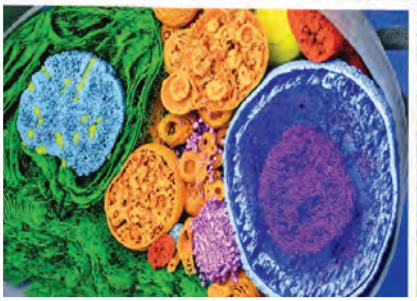
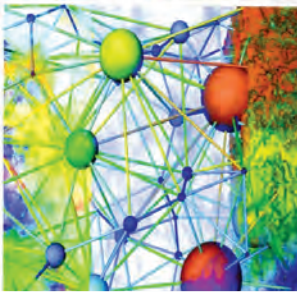
Finally, I would like to pay special tribute to Prof. Peter Hawkes, a founding member of EMS, who sadly passed away last year. His annual highlights on microscopy were always eagerly awaited, and his contributions to our field leave a lasting legacy. He will be deeply missed.

I look forward to meeting many of you at these upcoming events, as well as at other microscopy-related meetings, some of which carry the EMS Extension or EMS Patronage label. I am excited about the future of microscopy and the continued collaboration within our vibrant community.

With best regards,

Vladislav Krzyžánek
EMS President

EMC2024

17th European Microscopy Congress (EMC2024)

The 17th European Microscopy Congress (EMC2024) took place at the Bella Center in the Danish capital Copenhagen, August 26-30, 2024, with an attendance of 2,500 registrants from at least 51 countries, who had the opportunity to hear from researchers at various career levels from both academia and industry.

Eight years have passed since the latest EMC (Lyon, 2016); in the meantime, the Covid pandemic most regrettably caused a last-minute cancellation of the attempted organized EMC2020 in Copenhagen. Accordingly, EMC2024 was planned in the wake of the pandemic at a time where we did not know whether physical conferences would ever happen again – at least to the same extent we have grown used to in the past. Fortunately, in Copenhagen 2024 it seemed as if all the unpleasant memories of the past pandemic were almost forgotten, even though most of the world was in lock-down less than 3 years before. Some prayers must have been taken into consideration, because even the late August weather was perfect for outdoor social activities.

The 1,310 submitted abstracts for the three main symposia complemented the impressive number of registrants and paved the road for an extensive and dynamic conference program spanning advances in Life Science, Physical Science, and Instrumentation & Methodology. Accordingly, EMC2024 featured six parallel tracks with 35 scientific sessions giving room for 422 oral presentations, 50 invited speakers, and 5 plenary and 775 poster presentations.

Approximately 250 registrants decided to arrive early and attend one of the seven pre-conference workshops offered on the Sunday before conference kick-off. However, not only pre-conference workshop students had decided to arrive in good time, because the welcome reception Sunday evening welcomed more than 1,300 conference delegates for a truly memorable event.

The spacious conference hall – shaped to host all EMC2024 scientific activities for the five full days – consisted of a plenary lecture theater seating 1,500 delegates, five breakaway theaters with a capacity of 350 pax each, and a generous poster area with a capacity of 400 posters. The trade exhibition was the centerpiece of the hall, featuring many of the world's leading companies in the field. More than 500

registrants from the attending companies were on hand to show-case their latest cutting-edge instrumentation and accessories, and EMC2024 warmly welcomed a total of 105 exhibitors including 10 Open Science contributions and the two EMC2028 bidders, Brno and Barcelona. During the lunch breaks the five breakaway theatres were generously booked by the vendors for introduction and presentations of new technologies.

Thursday evening, the Conference dinner at the Bella Center was jam-packed to capacity with 800 seated guests, who enjoyed a 3-course dinner accompanied by a full jazz big band in Sinatra style. The dance floor was quickly fully packed with happy conference delegates.

Numerous feedbacks indicate that all attendants – academia and vendors – had a great, busy, and productive time at EMC2024. Taking into consideration that the pandemic with lock-down precautions had just been left behind us, my personal outstanding memory would probably be the great pleasure of seeing the buzzing activity in the conference hall. Colleagues finally catching up in person, the impressive activity with all the vendors' booths, and four days of truly amazing activity in the poster-sessions – handshakes and even hugs – who would have believed this possible again just three years ago.

The 18th European Microscopical Congress (EMC2028) will be organized by the Spanish Microscopy Society in Barcelona, September 18-22, 2028 – we are all looking forward to the continuation of this important cornerstone in the microscopy scientific world. ■

Klaus Qvortrup
EMC2024, Conference Chair
University of Copenhagen
Department of Biomedical Sciences
Microscopy Core Facility, CFIM
The Panum Institute, 3 Blegdamsvej
2200 Copenhagen N, Denmark
Tel: +45 2875 7251
eMail: Qvortrup@sund.ku.dk
Website: www.cfim.ku.dk

EMC2028

Right: National Catalan Art Museum (MNAC) -Left: Barcelona International Convention Center (CCIB).

Next EMC2028 in Barcelona

At the last meeting of the EMS General Council, held in Copenhagen in August 2024, **Barcelona was elected as the host city for the 18th European Microscopy Congress (EMC 2028)**. This prestigious event, organized by the European Microscopy Society (EMS), has a rich history and we are confident that Barcelona is an ideal location to continue this legacy.

The Barcelona's bid was presented by **Prof. Raul Arenal, from the University of Zaragoza and Prof. Francesca Peiró, from the University of Barcelona, co-chairs of the EMC2028**, on behalf of the Spanish Society of Microscopy (a society established in 1956) and the Singular Scientific Technical Infrastructure (ICTS) for Electron Microscopy of Materials (ICTS-ELECMI)-Spanish Ministry of Science, Innovation and Universities (MICIU), that provides access to state-of-the-art equipment for both national and international researchers and industry. The bid was supported by a strong committee with backing from national and local entities, including the Spanish Ministry of Science, Innovation and Universities, the Spanish National Research Council (CSIC), the Catalan and Aragon Government, and the Mayors of Barcelona and Zaragoza. Key scientific institutions such as the Nanoscience and Nanotechnology Institute (In2UB) and the Institute of Nanoscience and Materials in Aragon (INMA), are also committed to ensuring the success of EMC 2028.

The Barcelona Convention Bureau (BCO), the city's official tourism office, played a crucial role in promoting Barcelona's bid during EMC 2024 in Copenhagen by decorating a dedicated booth in the exhibition hall. Their full support was instrumental to Barcelona's success, not only through organizing a delightful reception featuring Catalan products but also by covering the entire cost of the venue for the congress dinner and providing public transportation tickets for attendees. Additionally, a tourist information desk at the exhibition or registration areas will assist delegates and accompanying

Public session of presentation of Barcelona's bid. Raul Arenal (University of Zaragoza) and Francesca Peiró (University of Barcelona) will co-chair EMC2028.

persons with touristic brochures, hop-on hop-off tickets and city cards.

The vision for EMC 2028 is to showcase the vital role of microscopy in addressing global challenges and achieving Sustainable Development Goals, in line with European policies and the United Nations development program. Microscopy research is central to many of these challenges, and the EMC provides an excellent platform to bring cutting-edge laboratory research closer to society. The Congress will be organized into three main sections: instrumental developments and innovations, applications of microscopy in addressing global challenges, and future trends in microscopy. Additionally, EMC 2028 aims to highlight the value of interdisciplinarity by integrating multiple perspectives in cross-disciplinary symposia to achieve significant goals in these areas.

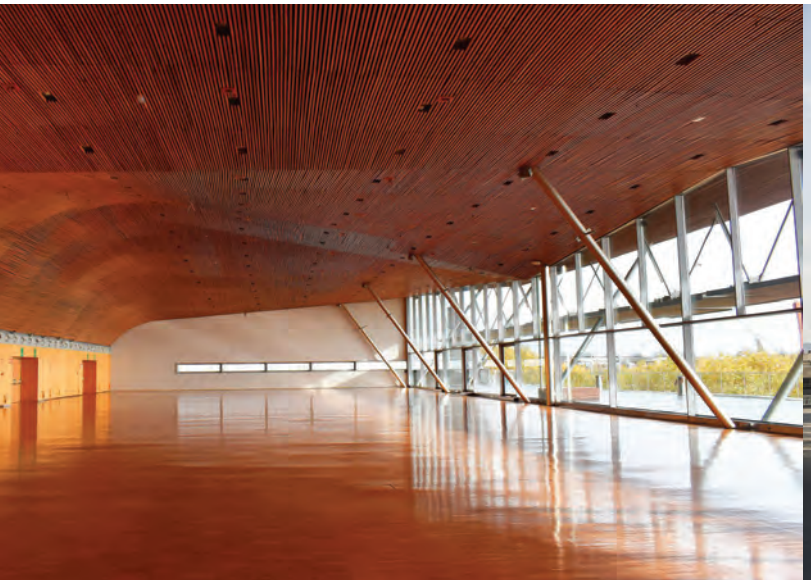
Barcelona booth at EMC2024 in Bella Center: From left to right: Raul Arenal (U. Zaragoza), Anna Bueno (Barcelona Convention Bureau), Francesca Peiró (U. Barcelona, new member of EMS executive board) and Marisa Solana (Barcelona International Convention Center).

A local organizing committee has been formed to ensure an optimal balance between life and material sciences, as well as between electron, optical, scanning probe, and X-ray microscopies. Special attention has been given to gender balance and inclusion. Additionally, an international advisory board has been established, focusing on life and material sciences, instrumental developments, and frontiers on microscopy. International reputed researchers have already accepted to participate as plenary speakers and pre-conference work-shops will be organized covering different fields. Further details can be seen in the bid book accessible via the QR code below.

EMC2028 will be highly committed with the **participation of young scientists**, offering up to 200 free registrations depending on the number of delegates attending the congress. Moreover, a reduced fee for the conference dinner is also planned to facilitate the networking with other attendees. A meeting hub will be included in the official Congress App to be a pre-congress meeting point where the students will be able to connect and share information regarding travel, accommodation, and other information that will encourage and facilitate their participation in the EMC 2028, aimed to generate a nurturing environment for the next generation of microscopy experts.

Another key objective of EMC 2028 is to raise **public awareness** about the importance of microscopy techniques. To achieve this, EMC2028 will organize educational, communication, and artistic activities alongside the Congress. These initiatives will be tailored for a non-expert audience, with a special focus on engaging teenagers and children, to make the Congress content accessible and relevant to the broader community.

The venue will be the Barcelona International Convention Center (CCIB), with two main buildings, the Convention Center and the Forum Auditorium, linked together by an underground walkway. The buildings boast great architectural flair, cutting-edge technology and a great location in the new Diagonal Mar urban development nearby the sea. Enjoying a privileged location in modern, cosmopolitan Barcelona, the CCIB can be found within the city's new business and technology district, known as 22@. With its easy access, excellent links to public transport and the airport and more than 4,500 hotel rooms in its immediate vicinity, the CCIB is a first-class reference point within the business tourism sector, highly committed to sustainability. Furthermore, all the spaces of the CCIB are accessible for disabled persons. The Levant and the Nova Mar Bella beaches are just 10 minutes walking from the CCIB and the Forum Port is 14 minutes. Participants will be able to enjoy the atmosphere of the sea and the great weather of September on the coast of Barcelona after the Congress sessions. Registration fee includes morning and afternoon coffee breaks, lunch boxes, welcome reception and farewell cocktail at CCIB, in order to create a relaxed atmosphere, where participants can talk and share impressions. A total surface of 6.793 sqm has been reserved for exhibition hall and poster sessions. This area can be further extended 3000 sqm if needed. This multipurpose room for industrial exhibitors, posters and networking space provides a vaste all-under-one-roof space which complements the auditorium for plenary sessions, with capacity for more than 3000 delegates, and the breakout rooms of variable capacity situated in the first floor. The CCIB banquet hall is a superb space for the **social programme** and the congress dinner will



Banquet hall of the Barcelona International Convention Center (CCIB).

be organized in the Museu Nacional d'Art de Catalunya (MNAC), one of the most emblematic buildings with majestic architecture in Barcelona.

BCO Congresos is the Professional Congress Organiser (PCO) of Ávoris Corporación Empresarial (Barceló Group) fully dedicated to the planning and management of meetings and events. BCO team of experts has positioned itself as one of the worldwide leaders. Its proven track record, with more than 1200 conferences to date, and the full set of services they will provide are a guarantee of a successful organization.

Save the dates

The EMC2028 is scheduled **from 16th to 22nd September 2028**. Following the congress, delegates have the opportunity to experience La Mercè, Barcelona's grand festival honoring its patron saint. This vibrant event features a variety of activities including music, dance, circus, and street arts, during the full week, making it one of the city's most anticipated celebrations, which concludes with a spectacular fireworks display and music show at Montjuïc mountain. All events are free, offering something for everyone.

Barcelona offers exceptional connectivity and accommodation infrastructure. In addition to its logistical advantages, Barcelona's unique charm and vibrant atmosphere promise an unforgettable experience for all attendees. Participants will also have the opportunity to explore nearby historical cities such as Zaragoza, Tarragona, and Girona.

Last but not least, the **EMC 2028 brand** identity features a logo inspired by the 'Panot,' a tile adorned with a flower, which is a distinctive symbol of Barcelona. This design offers a convenient alternative to the city's skyline. We invite you to explore the final pages of Barcelona's bid, accessible via the attached QR code, to learn more about the origins of this iconic pavement that has become emblematic of the city.

Barcelona, with its blend of history and innovation, is ready to host EMC 2028 and make it a landmark event in the field of electron microscopy.

See you all in Barcelona in 2028! ■

Raul Arenal and Francesca Peiró

EMC 2028 BARCELONA

Download our bid book

National Catalan Art Museum (MNAC)

Reports on EMS sponsored events

7th edition of the BIST (Barcelona Institute of Science and Technology) Symposium on Microscopy, Nanoscopy and Imaging Sciences

20 February 2024 - Castelldefels, Spain

The 2024 BIST Symposium on Microscopy, Nanoscopy and Imagining Sciences took place at the ICFO Auditorium. Showcasing presentations were presented by eight invited experts from European institutions, bringing together international experts and members of the BIST Community.

The event included a series of talks and discussions on new advances and techniques in electron microscopy, optical microscopy and its use in nanoscale cell biology, new insights from deep learning, and use of AI in imaging, among others. BIST Master's students also had the opportunity to present their research at the symposium, as the event is part of the BIST Master's curriculum.

The four morning talks focused on electron microscopy and discussed some of the latest advances and applications for this technique. Gabriel Sanchez-Santolino (Universidad Complutense de Madrid) and Sara Bals (University of Antwerp) discussed new developments and uses of transmission electron microscopy, while Cristina Africh (CNR-IOM) discussed combining state-of-the-art microscopy techniques to design and characterise innovative synthesis protocols for 2D materials. The morning finished with Ismael Diez Perez from King's College London talking participants through the chemistry of single-molecule circuits.

In the afternoon, Mike Heilemann (University of Frankfurt) and Alessandra Cambi (University Radboud) discussed imaging in nano-scale cell biology, while Carlo Manzo (Universitat de Vic-Universitat Central de Catalunya) presented new insights from deep learning. Finally, Estibaliz Gomez de Mariscal from Instituto Gulbenkian de Ciência presented on the use of artificial intelligence in microscopy imaging.

An opportunity for BIST Master's students to share their research

The symposium is part of the curriculum of the BIST Master of Multidisciplinary Research in Experimental Sciences. It is the final event of the BIST Master's Winter School on Microscopy, Nanoscopy, and Imaging Sciences, a two-week training event coordinated by ICREA research professors **Maria García Parajo** (ICFO) and **Jordi Arbiol** (ICN2). The symposium gives BIST Master's students the opportunity to present their research to the community, get valuable feedback on their work, and make important new contacts. The students' poster presentations were evaluated by a panel, which then awarded the top three posters. A fourth awardee was chosen by the public. This year's winners are:

- Elia López, supervised by Xavier Trepat at IBEC (1st Place)
- Iphigénie Goux, supervised by Núria Montserrat at IBEC (2nd Place)
- Mohmed Abdalfttah, supervised by Eduard Batlle at IRB Barcelona (2nd Place)
- Asli Ceren Simsek, supervised by Elvan Böke at CRG (Public's Choice)

The symposium is an important event for master's students as it is often the first time. They present their work in such a setting, and provide invaluable opportunities to learn about cutting-edge techniques and meet researchers with many different backgrounds. On this occasion, the students were also involved in introducing the speakers in the oral sessions.

The 2024 BIST Symposium on Microscopy, Nanoscopy and Imaging Sciences is organised in collaboration with ICFO and ICN2, and sponsored in part by the Sociedad de Microscopia de España, the European Microscopy Society, and ThermoFisher Scientific. ■

LE2AP+LEELIS 2024 CONFERENCE

Low Energy Electron Applications in Patterning (LE2AP) + Low Energy Electron Lithography, Imaging and Soft Matter (LEELIS)

9-11 September 2024 - IMEC, Leuven, Belgium

About LE2AP+LEELIS: LE2AP+LEELIS is an initiative that aims to merge the communities of researchers from initial Training Networks ELENA (https://elena.hi.is/) and SIMDALEE2 (https://cordis.europa.eu/ project/ id/606988), both Marie Sklodowska - Curie EU-funded initiatives, and from the LEELIS conference series (held bi-yearly since 2015).

Scope: Fundamental research on the generation of low energy electrons and their interaction with molecules and thin films towards **applications for patterning and imaging** both at small scale and at high volume manufacturing: focused e-beam induced processing (FEBIP), electron beam lithography (EBL), extreme ultraviolet lithography (EUVL), ion/atom beam lithography, X-ray lithography, low-energy electron microscopy (LEEM), low-voltage (scanning) electron microscopy.

Goals:

- Advancing the **understanding of low-energy electron related phenomena** by gathering experts of all relevant disciplines.
- Recognizing **future applications** both at the lab scale and industrial level.
- Addressing **the fundamental needs for implementation** in patterning via synergy between academia and semiconductor industry.
- Creating new opportunities and attract **early-stage researchers** to pursue their career in the field.
- Stimulating **collaboration** among researchers and engineers to enable future patterning applications.

Scientific significance: It has been long known that low energy electrons have a key role in the reaction during patterning and cause damage in high-resolution microscopy, but research in this field has been scattered due to the great variety of research fields, including electron beam lithography, low-voltage electron microscopy, ion beam and extreme ultraviolet lithography. Such lack of understanding has led to difficulties in imaging and patterning soft, organic materials at the highest resolution and designing next-generation photo- and electron-sensitive materials to advance performance (i.e., resolution, sensitivity).

Moreover, few scientific events and meetings are dedicated to the topic of low energy electrons in patterning and imaging applications. This conference aims at bridging this gap and gathering researchers in various disciplines to develop a broader understanding and push frontiers in imaging and nanofabrication.

Conference Topics: The conference covered the patterning and the imaging of materials both at small scale and at high volume manufacturing. Topics

in scope: focused e-beam induced processing (FEBIP), electron beam lithography (EBL), extreme ultraviolet lithography (EUVL), ion/atom beam lithography, X-ray lithography, low-energy electron microscopy (LEEM), low-voltage (scanning) electron microscopy (SEM), photon / electron sensitive materials.

LE2AP+LEELIS offered more than 50 papers spread over 2.5 days, including 2 keynote, 10 invited talks, 16 contributed talks and 23 poster presentations. The participants were 126 from 17 different countries. The success of the conference is due in large part to the many individuals who have devoted their time to making an excellent technical program and arranging the venue for the conference. ■

Danilo De Simone
Scientific director, imec, Belgium
Chair of the LE2AP+LEELIS 2024 conference
https://www.le2ap-leelis.org/

EBeam

1-13 September 2024 - Aussois, France

Over the past 20 years, advancements in electronic optics and instrumentation for electron microscopy and spectroscopy have significantly broadened the scope of these techniques to nano-optics. Achievements such as monochromaticity of a few meV, the ability to image individual atoms, the shaping of electron wave functions, fs pump-probe experiments, and the efficient coupling of light with samples have become a reality. This has enabled the study of a variety of excitations (plasmons, phonons, excitons, etc.) with extreme spatial, temporal, and spectral resolutions. Consequently, new theories have emerged to explain the exciting results obtained through electron energy loss spectroscopy (EELS), cathodoluminescence (CL), and photon-induced near-field electron microscopy (PINEM). Additionally, central concepts of nano-optics and quantum optics have proven applicable to electron-based spectroscopies.

This is why it was high time to establish a school dedicated to disseminating knowledge on these new concepts and techniques and to spark interest in this rapidly growing field among a new generation of academics. Such was the goal of the first edition of the eBEAM school in 2022, focusing on electron spectroscopies for nano-optics. The success of this inaugural event motivated us to organize it again in 2024. To better meet the expectations of the community, we carefully analyzed the survey results collected from the students of the 2022 edition. This led us to modify the format, extending it from one week to two weeks, and to enrich the content with additional courses, practical workshops, and demonstrations.

In a relaxed atmosphere in Aussois, France *(see photo next page)*, the 11 courses offered combined the experience of well-established figures in our community with the energy and fresh perspectives of young scientists. The aim was to blend the expertise of relatively separate communities, whether divided by scientific domains—photonics, materials science, quantum optics, quantum materials, instrumentation—or by the techniques used (EELS, cathodoluminescence, PINEM, TEM or SEM, imaging or diffraction, etc.). We were fortunate that our lecturers did a remarkable job of presenting a dense program, which included lectures, seminars on the speakers' recent research, tutorials on data analysis and simulations, and demonstrations of cutting-edge experiments.

Lectures

Rachel Grange kicked off on Monday, September 13, with a general introduction to nano-optics, filling a gap from the first edition. Daniel Ugarte delivered the first course on electron microscopy, introducing its instrumentation. This course was taught two years ago by Peter Kruit, who is now enjoying a well-deserved retirement! Gerald Kothleitner followed with an overview of the main imaging and spectroscopy techniques.

On Thursday, we delved into the core topics with lectures by Sean Collins and Demie Kepaptsoglou on EELS measurements of excitations in optical materials (e.g., excitons) and phonons. Andrea Konecna closed the week with a presentation on other types of excitations measured in EELS and cathodoluminescence, such as photonic excitations (plasmons and phonon-polaritons, for example).

(continued on next page)

(continued from previous page)
After a well-deserved weekend filled with hiking (in the rain…), billiards, and other activities, two new courses were on the agenda for Monday, September 9, and Tuesday, September 10. Lucia Reining presented the theory and ab-initio calculation techniques for understanding electron-based optical spectroscopies. Gwénolé Jacopin followed with the use of cathodoluminescence to probe optoelectronic systems.

The next two days focused on the use of quantum properties of fast electrons to explore nano-optical phenomena: Axel Lubk concentrated on aspects of spatial coherence, and Hugo Lourenço-Martins on quantum and temporal aspects. On Friday morning, Walter Pfeiffer gave a course on a technique related to TEM and SEM electron microscopies: ultra-fast photoemission electron microscopy (PEEM). We take this opportunity to thank and congratulate them all again!

Practical Workshops

To complement the lectures, this edition included hands-on workshops, one on data analysis and another on nano-optical simulations. The data analysis workshops focused on using Hyperspy and Lumispy and were organized by Jonas Laehnemann and Sean Collins. Andrea Konečna and Hugo Lourenço-Martins supervised the workshops on MNPBEM simulations of EELS and cathodoluminescence experiments on plasmonic structures.

The workshops were conducted in groups of about ten participants, preceded by an introductory session. In practice, our instructors went above and beyond, organizing several additional sessions, some specifically for beginners and others for advanced users. Many thanks to all four of them!

Demonstrations

In the first edition, Demie Kepaptsoglou did not deliver a seminar but presented a video of a phonon spectroscopy experiment, which she commented on in real-time. Her presentation was highly praised. This format, where a state-of-the-art experiment was pre-recorded and commented on live, offered numerous advantages: access for students to exceptional experiments without the logistical challenge of transporting microscopes on-site; no risk of microscope or connection bugs; and the ability to interact in real time with the operator, free from the stress of executing the experiment.

We replicated this approach with Saskia Fiedler (time-resolved cathodoluminescence in an SEM), Gerald Kothleitner (corrected and monochromated microscopy), Demie Kepaptsoglou (phonon spectroscopy), Florian Castioni and Yves Auad (ns-resolved coincidence EELS/cathodoluminescence experiments), Johan Verbeeck (phase sculpting in a TEM), Axel Lubk (holography), and Armin Feist (PINEM). A huge thanks to all of them for their efforts!

Finally, from the very beginning of the school, participants were already asking about the next edition. While this remains to be decided, given the momentum, it shouldn't be later than 2027. We would like to extend our heartfelt thanks to all our sponsors: the FET-OPEN EBEAM project, Sfμ, and EMS, as well as our laboratory (LPS). We also received significant support from our industrial partners: ASI, Quantum Detectors, Adaptem, Thermo Fisher, Dectris, Delmic, Attolight, and CEOS. We sincerely thank them all!

Lastly, we would like to thank the local organizing committee: Sabine Hoarau, Jean-Denis Blazit, Yves Auad, Xiaoyan Li, Florian Castioni, Alissa Freilinger, and Malo Bézard. ■

Luiz Tizei and Mathieu Kociak

Winter School 2024 - Practical course in advanced microscopy

22-26 January 2024 - Zurich, Switzerland

The Scientific Center for Optical and Electron Microscopy (ScopeM, ETH Zurich) and the Center for Microscopy and Image Analysis (ZMB, University of Zurich) once again joined forces to host their annual **Winter School: Practical Course in Advanced Microscopy.**

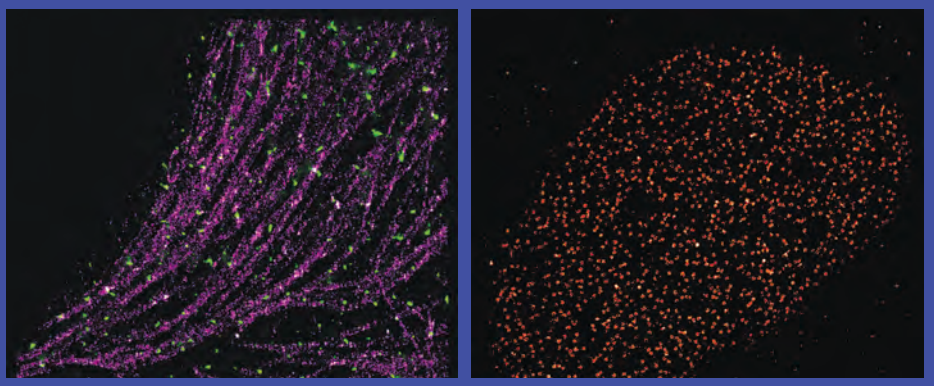
This intensive course is designed to equip PhD students and postgraduates with prior microscopy experience with a strong foundation in advanced techniques. While a series of theoretical sessions cover both fundamental and advanced topics across a variety of methods, the course places significant emphasis on hands-on training. Participants select one of the following specialized tracks for practical work:

- **Advanced Light Microscopy**
- **Super-Resolution Light Microscopy**
- **Sample Preparation for 2D and 3D Electron Microscopy**
- **3D Correlative Light and Electron Microscopy**
- **Volume Scanning Electron Microscopy**

In 2024, approximately 50 participants—primarily from academia in Switzerland and across Europe (including Germany, Sweden, and Italy)—engaged in the course. Their active involvement, combined with the expertise of numerous instructors, contributed to making the Winter School 2024 a resounding success. ■

EXAMPLES OF DATA COLLECTED DURING THE COURSE

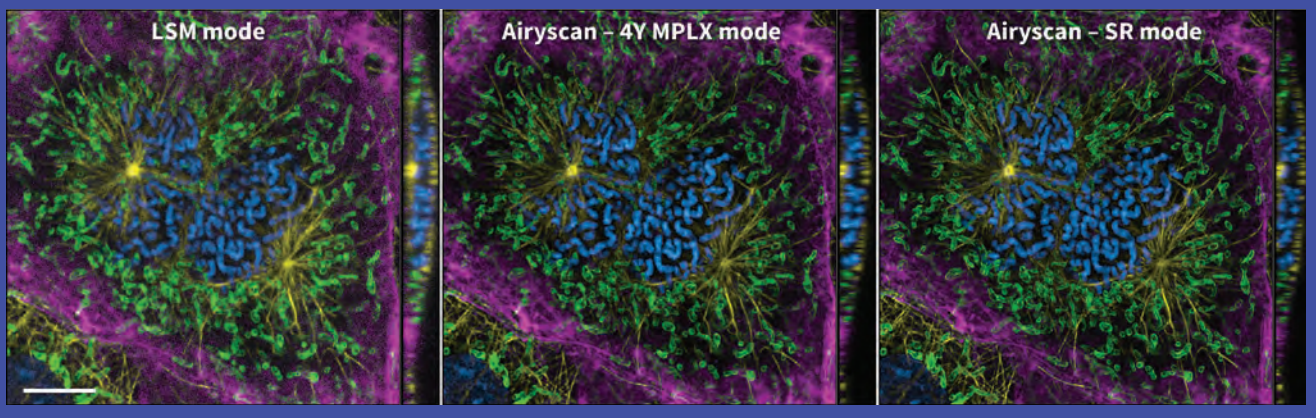
• Images acquired with a Nikon NSTORM super-resolution microscope, with a 100x TIRF objective in TIRF mode, at the Scientific Center for Optical and Electron Microscopy (ScopeM):



a) Microtubules (magenta) and clathrin (green) immunostained and labelled with organic dyes (AF647 and AF568) in human osteosarcoma U2OS cell lines imaged with STORM. Scale bar: 500 nm.

b) HeLa cells with the protein NUP96 labelled with antiGFP nanobody and AF647 and imaged with STORM. Scale bar : 1um

• Images acquired on a Zeiss LSM980 Airyscan with 63x/1.4 oil immersion objective (Center for Microscopy and Image Analysis):



Cos-7 cells; targets labelled: Nucleus – DAPI (blue), outer mitochondrial membrane TOMM20 – AF 488 (green), Microtubules – AF555 (yellow), Actin – SiR (magenta). Scale bar 10 um.

Electron Microscopy of Nanostructures (ELMINA2024)

9-13 February 2024 - Belgrade, Serbia

ELMINA2024 was organized by: Serbian Academy of Sciences and Arts (SASA) and Faculty of Technology and Metallurgy (FTM), University of Belgrade, Serbia and held at SASA, Student Square 1, 11000 Belgrade, Serbia, from 9. 9. 2024 to 13. 9. 2024. The conference was opened by: Professor Dr Velimir Radmilović, SASA member and ELMINA2024 Conference chair, Professor Dr Zoran Knežević, SASA President and Professor Dr Robert Sinclair, ELMINA2024 International Advisory Board Chair. Number of participants at ELMINA2024 was 114, out of which 80 were presenting authors. The program consisted of nine (9) plenary, four (4) oral and three (3) poster sessions. Twenty-four (24) plenary talks were given by some of the most renowned world experts in the field of theory and application of electron microscopy in characterization of nanostructures, including:

Jordi Arbiol (Spain), **Florian Banhart** (France), **Thomas Burg** (Germany), **Wah Chiu** (USA), **Gerhard Dehm** (Germany), **Peter Denes** (USA), **Rafal Dunin-Borkowski** (Germany), **Rolf Erni** (Switzerland), **Hamish Fraser** (USA), **Sarah Haigh** (UK), **Moritz Helmstaedter** (Germany), **Randi Holmestad** (Norway), **Yuichi Ikuhara** (Japan), **Lewys Jones** (Ireland), **Gerald Kothleitner** (Austria), **Joachim Mayer** (Germany), **Andrew Minor** (USA), **Eva Olsson** (Sweden), **Quentin Ramasse** (UK), **Robert Sinclair** (USA), **Eric Stach** (USA), **Kazu Suenaga** (Japan), **Sandra Van Aert** (Belgium), **Jian-Min Zuo** (USA).

Additionally, forty-two (42) posters were presented. It is noteworthy that most posters were presented by young researchers.

Based on the quality of plenary talks and poster presentations as well as the fact that the conference was attended by a large number of young researchers (more than 60), most of who were from Serbia, it was concluded that the ELMINA2024 conference was very successful. It was also concluded that, due to interest from young researchers as well as plenary speaker suggestions, ELMINA should continue as a biennial event in Belgrade, Serbia, with the next ELMINA2026 being held from 7. 9. 2024 to 11. 9. 2026.

We would like to take this opportunity to thank first and foremost ThermoFisher Scientific as well as vitroTEM, Tescan, Dens Solutions, JEOL/Scan LLC, Ministry of Science, Technological Development and Innovation of the Republic of Serbia, Analysis LLC, Dectris AG, as well as the European Microscopy Society, without whom this conference would not have been possible. ■

Vuk Radmilović
ELMINA Conference Manager
(Website: http://elmina.rs/)

Molecular Diagnostics Training School & Digital Pathology and Image Analysis Training School MDTS and DPIATS 2024

25 February - 2 March 2024 - Vienna, Austria (hybrid)

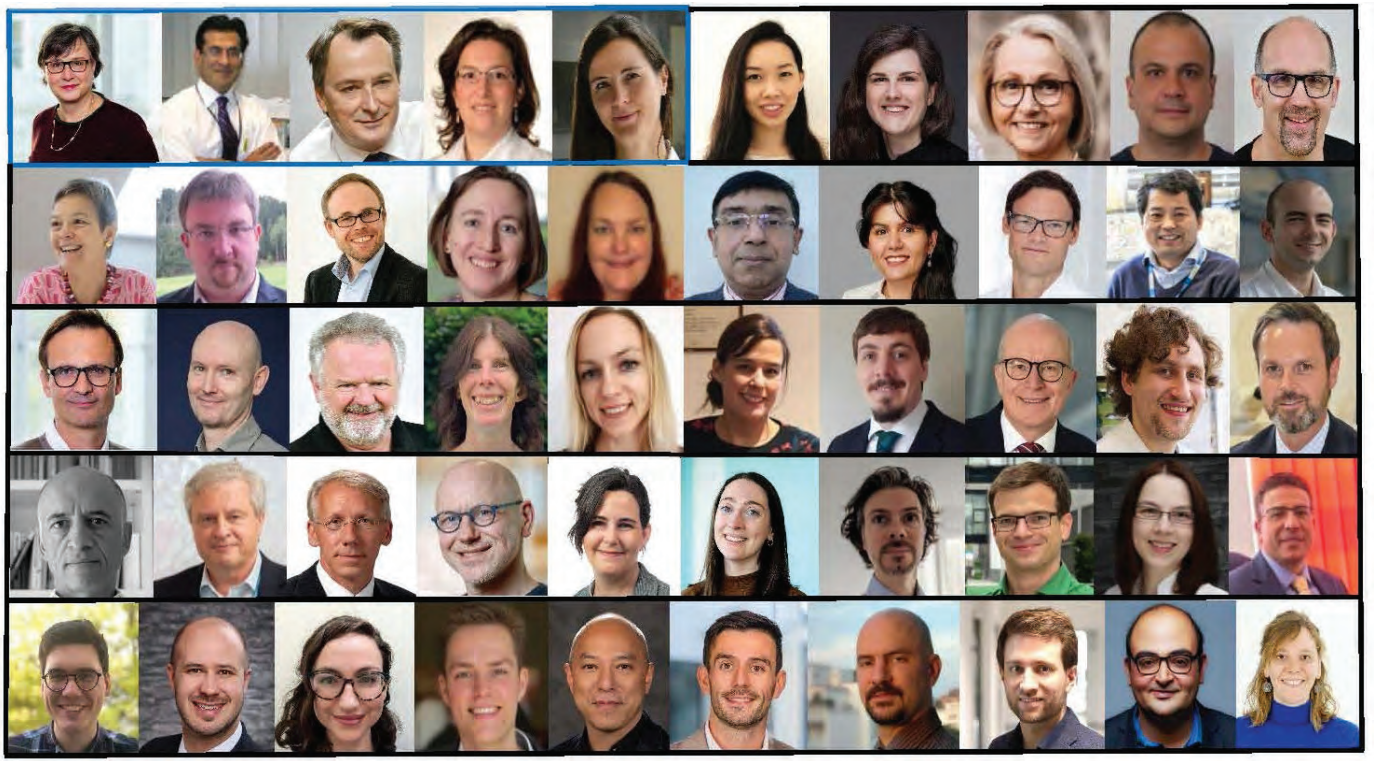
This year the sixth *Molecular Diagnostics Training School (MDTS, 26-28 Feb 2024)* and the fifth *Digital Pathology and Image Analysis Training School (DP & IATS, 29 Feb – 02 Mar 2024)*, being a joint venture of the Department of Pathology (Medical University of Vienna, Austria) and the Nottingham Molecular Pathology Node (University of Nottingham, United Kingdom), were – for the second time - hosted as **hybrid** events.

However, covering ever-increasing and rapidly evolving fields, both Training Schools have now become too short to give all the novel and exciting topics the space they deserve. We therefore decided to cover the basics of molecular diagnostics, digital pathology and image analysis in pre-recorded lectures that provide the foundation for those who have little or no experience in either biological background or technical/methodological approaches. These pre-recorded lectures were made available to attendees before the beginning of the Training Schools and were the basis for the specialized lectures on recent developments in technological approaches as well as worked examples

Albeit being a great challenge, this global health crisis has also acted as a potent catalyst in the shift from the analogue to the digital space, not only in the academic educational setting. The second year in a row post-pandemic, it was a delightful experience for delegates to be able to meet the speakers in person again, ask questions or have interesting discussions with them during breaks. Hence, the current events put a new complexion and depth of meaning on one of our main themes of the *training school (TS):*

'Digital Pathology and Image Analysis: Prepare, the future is here!'

Being aware of the importance of introducing these new and emerging technical methodologies, the *TS* also aimed at providing sound post-graduate education in molecular diagnostics which was encapsulated in the second main theme of the *TS*:



Top left-hand corner: The Chair of the MDTS, DP & IATS 2024, the following images constitute a subset of the speakers who gave consent to use their photographs for this report.

'Applying Molecular Diagnostics is important, not a miracle!'

In line with this statement, lectures on basic methodologies, quality assessment/assurance as well as the implementation of molecular diagnostics that shall be performed on a daily basis, on an organ system level, were given by a number (*n = 50*) of world-renowned experts in these fields.

After six days of intense lectures (~8.30 am – 6 pm) and lively discussions with a daily average **online** attendance of 41 attendees (MDTS: range: 39-42; DP & IATS: range: 31-49), and an average attendance **on site** of 20 attendees (MDTS: range: 20 each day) and 13 attendees (DP & IATS: range: 09-16), we were delighted by the feedback from attendees (representative feedback statements were as follows):

- *"Excellent quality of the presentations" (MDTS)*
- *"Great presentations with actual data" (MDTS)*
- *"Good illustrations. slow explanation of the theory, intermediate outputs and even better –*
- *some take-home messages" (MDTS)*
- *"The information is very innovative and high quality" (MDTS)*
- *"Great speakers" (DP & IATS)*
- *"I will make efforts to implement AI in my lab" (DP & IATS)*
- *"Very diverse presenters" (DP & IATS)*

The majority of attendees noted that the sessions offered new insight or ideas that they could take back and apply to their jobs.

Hosting these TS on our dedicated event platform (Webex) also added to the success of this hybrid event, which is reflected by the feedback and the consistent and animated engagement of attendees. We are looking forward to next yeaŕ s *MDTS, DP & IATS,* which we plan to hold as hybrid events again over several days, to meet the demand from delegates and also provide a platform for the latest developments arising in this fast-paced and dynamic environment of molecular diagnostics and digital pathology. ■

Chair:

- **Univ. Prof. Dr. Renate Kain, PhD[1]**
- **Prof. Mohammad Ilyas BSc, MBChB, DPhil, FRCPath[2]**
- **Ao. Univ. Prof. DDr. Leonhard Müllauer[1]**
- **Assoc. Prof. Priv.-Doz. Dr.med.univ. Ana-Iris Schiefer[1]**
- **Assoc. Prof. Priv.-Doz. Dr.med.univ. et scient.med. Zsuzsanna Bago-Horvath[1]**

Organising Committee:

- **Mag. Gertrude Krainz[1]**
- **Maximilian Köller, MD[1]**
- **Maximilian Gletthofer, BSc[1]**

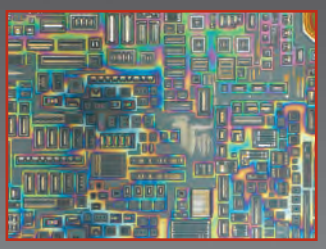
[1]*Medical University of Vienna, Department of Pathology, Austria*

[2]*University of Nottingham, Division of Cancer and Stem Cells, United Kingdom*

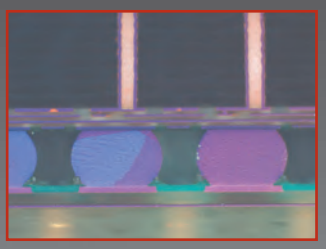
The MultiPrep™ System

The **MultiPrep™ System** enables precise semiautomatic sample preparation of a wide range of materials for microscopic (optical, SEM, FIB, TEM, AFM, etc.) evaluation. Capabilities include parallel polishing, angle polishing, site-specific polishing or any combination thereof. It provides reproducible sample results by eliminating inconsistencies between users, regardless of their skill.

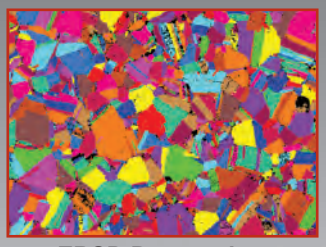
Common applications include parallel circuit delayering, cross-sectioning, substrate thinning, serial/3-D preparation, wedge polishing and more.



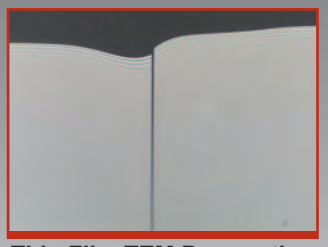
IC Delayering



Cross-Sectioning



EBSD Preparation

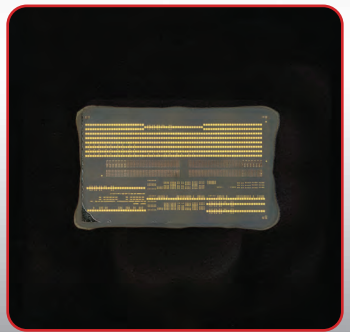


Thin Film TEM Preparation

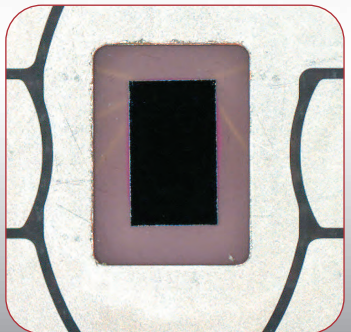
Unequalled Sample Preparation Results

The X-Prep®

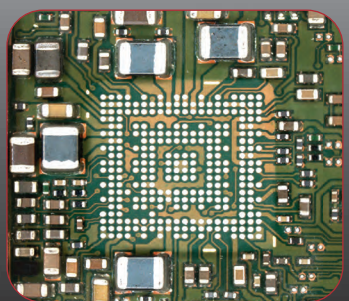
The **X-Prep®** is a specialized 5-axis CNC-based milling/grinding/polishing machine designed to support electrical and physical failure analysis techniques and other applications requiring high precision sample preparation.



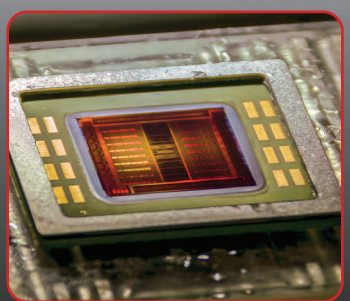
TSV Exposure



Smart Card Security Chip Exposure



Mobile Phone Chip-Off Component Removal



Uniform silicon thinning to less than 2 µm

ALLIED HIGH TECH PRODUCTS, INC.

info@alliedhightech.com
www.alliedhightech.com

The Green and Cultural Note

This informative note fights against the preconceived ideas of paper use and its environmental impact.

ECO RESPONSIBILITY — ECO RESPONSIBILITY —

Did you know?

Sources : ADEME - Greenliving National Geographic - EVEA Conseil - Digital power group - Cepi Sustainable Report - IDEP - FAO - WWF

500,000 ha in 10 years

In France, the forest has gained nearly 500,000 hectares (the equivalent of a department like the Bouches du Rhône) over the last 10 years.

1 invoice = 15 invoices

One invoice sent by internet releases 242 grams of CO_2, which represents the production and sending of 15 invoices in paper format.

1 page = 3 minutes on

The display of a page on a screen for 3 minutes uses more energy than the production of its printed version.

+ 30% of Europan forests

The area occupied by European forests has increased by more than 30% since 1950, which represents about 5 times the area of Paris.

99% of the wood in Europe is sustainably managed

99% of the wood used for paper production in Europe comes from sustainably managed forests.

vs

A person uses an average of 212 kg of wood per year, i.e. 500 Kw/h of energy consumption, while a traditional computer uses an average of 800 Kw/h over the same period.

Agence ERI
La communication 360

Tel. : +33 (0)1 55 12 31 20
Email : contact@eri-editions.com
www.eri-editions.com

163 avenue Charles de Gaulle
92200 Neuilly-sur-Seine - France

Reports on special news and events

Dear Readers,

The landscape of the world is evolving at a rapid pace, and the publishing industry is no exception. For many years, Wiley has been serving the microscopy community with two esteemed publications: *Imaging & Microscopy* and Mi*croscopy and Analysis*. With a vision to deliver the utmost value to our readers, we are excited to announce the amalgamation of these publications into a single, robust periodical starting in 2025.

After careful consideration, we have chosen to retain the name *Microscopy and Analysis*, honoring its legacy of over 38 years in the market. This consolidation will not only preserve but also enhance the publication by integrating the most acclaimed features of *Imaging & Microscopy*. Furthermore, *Microscopy and Analysis* will proudly serve as the partner publication of the European Microscopy Society (EMS). Starting next March, all EMS members will receive the new edition of *Microscopy and Analysis*. Our collaboration with the Royal Microscopy Society will continue, and we have also forged new partnerships. You can look forward to new insights from Global Bioimaging and the Global BioImage Analysts' Society, who will be collaborating more closely with us from 2025.

The inaugural issue of the revamped *Microscopy and Analysis* is set to debut in March 2025, and we invite you to anticipate a fresh design and enriched reading experience. The magazine will continue to be an essential resource, providing a comprehensive mix of scientific and industry news, event updates, society information, profiles, interviews, application stories, and expert articles from international contributors from science and industry, ensuring you remain thoroughly informed about all facets of microscopy.

Our esteemed external editors, Chris Parmenter, Rebecca Pool, and Martin Friedrich, will maintain their commitment to delivering compelling content, leveraging their specialized knowledge to captivate our audience.

We are enthusiastic about the opportunity to keep you abreast of the cutting-edge advancements in microscopy in the forthcoming years. Additionally, we aim to provide our customers with a valuable platform to effectively reach their target audience and engage with 50,000 readers worldwide, both in print and digital formats.

See you in 2025!
Birgit Foltas

Workshop on Advanced Precession-Assisted 4D-STEM and 3D-ED

19-20 June 2024 - Forschungszentrum Jülich, Germany

Precession electron diffraction was introduced by Vincent and Midgley 30 years ago and recently entered a new era because of developments in fast direct electron detectors, fast electron beam precession units, advanced processing algorithms and automated instrument control and alignment. In view of these developments, the Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons (ER-C) and TESCAN Group jointly organized a workshop on this subject on 19 and 20 June, 2024 in Forschungszentrum Jülich, Germany. The workshop was a forum for researchers to exchange their experience and share their insight into new methods and applications of precession-assisted 4D-STEM and 3D-ED.

The program comprised 17 invited talks and 6 contributed flash presentations. Several of the presentations showcased results and further potential of the recently launched TESCAN TENSOR, the world's first dedicated 4D-STEM platform optimized for these application use cases. The operation of the TENSOR STEM and the use of the open-source LiberTEM software package were also presented and demonstrated.

A wide range of applications of precession electron diffraction were covered during the workshop, including crystallographic orientation/phase mapping, strain mapping, electron crystallography, electromagnetic field mapping and electron ptychography. These applications were demonstrated for a broad range of materials systems, including low-dimensional materials, minerals and reticular compounds, metals and alloys, battery materials and solar cells, semiconductor and magnetic devices, organic crystals and soft matter. During panel discussions, the speakers and audience expressed their wishes for tackling future challenges using precession-assisted 4D-STEM and 3D-ED. Proposed future directions included the application of *in-situ* and environmental devices, smart dose control, data management, on-the-fly data compression and analysis and customized workflow scripting to specific scientific problems.

The workshop was held in hybrid format, allowing for both on-site and online participation. It attracted more than 250 registrants from 31 countries and 129 organizations. More than 50 colleagues attended the workshop in person, while about 130 participants joined online.

During and after the workshop, the organizers received positive feedback from the attendees about the high quality of the presentations, the deep insight gained from the discussions, the smooth organization and the overall welcoming atmosphere. Many participants suggested that this workshop could become a series in the future.

The next such meeting will be hosted by the University of Leeds, again jointly with TESCAN Group. We look forward to meeting many colleagues there next year! ■

Peng-Han Lu and
Rafal E. Dunin-Borkowski (ER-C)
Daniel Němeček and
Ondřej Šulák (TESCAN Group)

The yDGE (Deutsche Gesellschaft für Elektronenmikroskopie) increased its Outreach in 2024

Group photo of the Electron Microscopy Spring School in Berlin, Germany, taking place in March 2024. (The Image was taken by Simone Rey.)

We are a working group in the German Society for Electron Microscopy (DGE), focused on enhancing the exchange between young microscopists. To do so, we organize scientific as well as social events regularly and offer a platform for early-career researchers to present their work, exchange ideas, and get help from peers.

Our efforts are aimed at doctoral and early-career post-doctoral researchers, as well as master students.

Our activities in 2024

Electron Microscopy Spring School in Berlin, March 2024

Our first event in 2024 was the Electron Microscopy Spring School in Berlin. We dedicated the yDGE's second term to preparing the Spring School to create an exciting and engaging program for our peers in both material science and life science.

The 3.5 days-long in-person event took place in early March at the Integrative Research Institute for the Sciences (IRIS) at the Humboldt-Universität zu Berlin (HU Berlin) in Berlin-Adlershof, Germany.

45 participants, mostly from Germany but also from Italy and England, attended the school and 24 lecturers, lab managers, and helpers ensured a smooth event.

The program featured a lively Pizza-science slam at the welcome day with 4-minute flash talks to get to know each other and each other's work related to electron microscopy. The slam's final was preceded by a qualifying round in small groups of 5-6 with these winners competing in the plenum for sponsored prizes.

The first and second day featured 6 lectures in the morning about 4D-STEM, cryo-EM, in-situ EM, sample preparation, and spectroscopy. The afternoon of both days was dedicated to elective lab courses, where the participants could choose in total two of the 9 courses in cyro EM, EELS, diffraction methods, and imaging techniques.

Most of the lab courses took place close to the main venue in Berlin-Adlershof, while 3 were distributed over electron microscopy labs in Berlin. The second day concluded with a barbecue at the IRIS Adlershof.

The third day was dedicated to 5 elective programming and data analysis courses in basic Python programming, creating figures in Python, image simulation with abTEM, data analysis with HyperSpy for EELS & EDX spectra, and tomography reconstruction from tilt series.

The detailed program is available at: https://ydge.de/em-spring-school-2024/.

We want to thank all lecturers, lab managers, and helpers again for their invaluable contributions as well as the sponsors for their financial support: Berlin University Alliance (BUA), BMBF, Senatsverwaltung Berlin, Freie Universität Berlin, Humboldt-Universität zu Berlin, Technische Universität Berlin, Charité - Universitätsmedizin Berlin, European Microscopy Society, Protochips, Nion, Carl Zeiss Microscopy Deutschland GmbH, Bruker Nano GmbH, DENSsolutions, Thermo Fisher Scientific, IRIS Adlershof, Center for the Science of Materials Berlin, and AI-SKILLS of Humboldt-Universität zu Berlin. We want to especially thank the DGE for the administrative support.

Presence at the EMC2024

Conferences are great to catch up with your network and grow it. But early in our careers, most of us don't have a network yet to build on. At our shared booth with the yCSMS in the Open Science area at the EMC2024, we promoted our efforts to grow a community and make it easier for early-career researchers to get in touch with each other. Many early-career researchers were interested in our and yCSMS' activities, and we exchanged ideas and discussed future events while enjoying some sweets. On Wednesday evening, we invited our peers to join us at the Reffen street food market to get to know each other and network over delicious food and drinks.

We want to thank the EMC organizing committee for the opportunity to present the yDGE at the EMC2024 and for providing the booth.

Science Pitch

Electron microscopy has a broad application range, and there is a need to practice scientific presentation in an easily understandable and concise manner. To address both, we decided to host an online science pitch event to give early-career researchers an opportunity to present their research in front of a larger audience. The event took place in October and consisted of 3-minute flash presentations with topics from material- and life science, bridging the gap between the two categories. Getting a glimpse into fields that are not related to one's own work is unfortunately rare but fascinating.

International Microscopy Student Mixers

A regular event that we organize is the online student mixer, which we either host ourselves or together with our international partners, like the yCSMS and MSA StC. Also in 2024, we invited early-career microscopists to chat, meet old and new friends, and play games. Typically, we start with a round of "rapid networking" (the mixer), followed by different team games to engage together in fun activities. If you want to join future events, feel free to subscribe to our platforms below, where we advertise upcoming events. Stay tuned!

An online forum for early-career researchers: yDGE Discord server

With the goal in mind to connect early-career researchers across the disciplines, we decided to set up a Discord server for our peers to engage in scientific discussions, share experiences and ask for help, for instance about data analysis, programming, scholarships, thesis writing, and more. We are currently establishing this platform and are excited to fill it with life together with our community to grow it in the future. If you are interested, you are welcome to join the Discord server already using this link: https://bit.ly/ydgediscord.

Stay in the loop with the yDGE and our future events by joining and following us on the platforms below for news, events, and more:

- Website: https://ydge.de/
- Discord: https://bit.ly/ydgediscord
- LinkedIn: https://bit.ly/ydgelinkedin
- Twitter/X: https://x.com/_ydge
- Mailing list: bit.ly/ydgemailinglist ■

Johannes Müller, Simone Rey, Miquel Vega

Group photo at the EMC2024 with yDGE and yCSMS members at our joined booth. (The image was taken by Lydia Daum.)

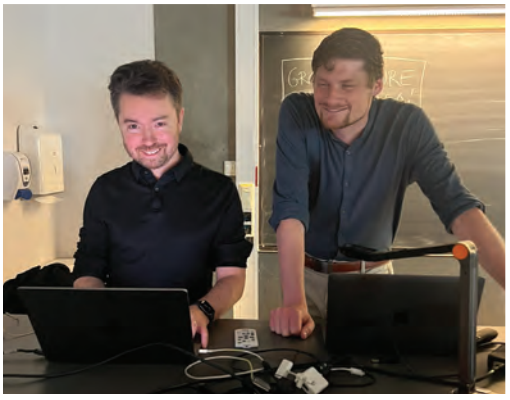
NordTEMHub workshop

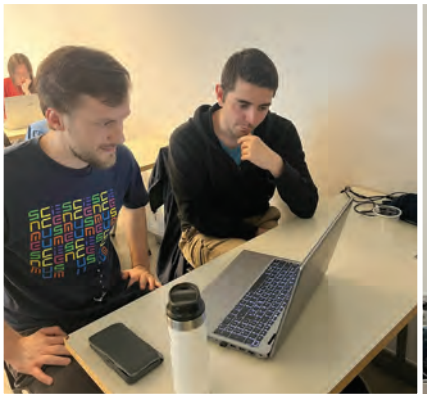
Data analysis of 4D STEM

11-13 June 2024 - Trondheim, Norway

NordTEMhub is a network project sponsored from NordForsk to facilitate Nordic research cooperation. In June 2024, NTNU organised a workshop on data analysis of 4D STEM, sponsored by this network. In total, the workshop had 63 participants from 11 different countries (Norway, Germany, Sweden, US, UK, Finland, Denmark, France, Switzerland, Belgium, Czech Republic).

The workshop lasted for 3 full days and contained a comprehensive hands-on training in use of open-source Python packages (HyperSpy and Pyxem) and coding to analyse different types of 4D STEM data for various applications. Lectures included big data analysis, Machine learning in STEM, S(P)ED data analysis, Data processing on the Linux cluster, Electron Ptychography and Magnetic STEM-DPC. They were given by Magnus Nord (NTNU), Carter Francis (University of Wisconsin-Madison, USA), Timothy Pennycook (EMAT, Antwerp University, Belgium), Tina Bergh (NTNU), Gregory Nordahl (NTNU) and Ruben Bjørge (SINTEF) with local forces helping with the coding. Notebooks with codes were handed out during the workshop, something that was very well received by the participants. ■



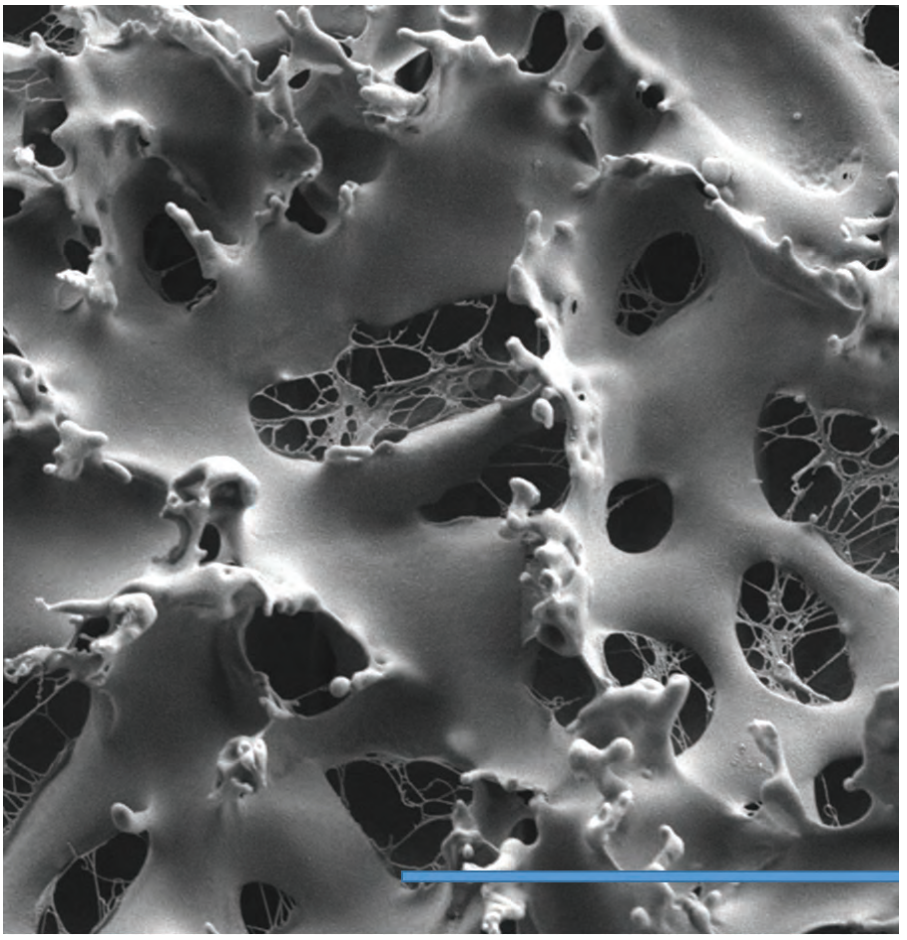


Art-ifacts?

The development of complexity out of simpler systems is often admitted as an identity proof of what we call life. We, living beings, counterintuitive, rebellious little space-time regions that, at least apparently and/or temporally, defy thermodynamic inexorable laws, manage to create complexity out of plain and simple, inert matter. Is life, then, what takes place in the long road to the cold, to the isothermal, entropy maximum? But, it may be that not only life, as we understand it, is able to create inhomogeneities and patterns, and low-entropy landscapes, complexity. Simple, inert matter, as a diluted biopolymer in solution, combined with the random crystal nucleation and growth of the aqueous solvent turned into ice...

A few years ago, I was speaking here about the fate of the microscope and the microscopist, at the CSIC Centro de Ciencias Medioambientales. After a decade of lacking a proper instrument so useful as a low-temperature scanning electron microscope, now we researchers in Madrid have a new and even more powerful microscope, a Cryo-FEGSEM, a brand-new Field Emission instrument (*Thermofisher Apreo 2S*), working in high and low vacuum modes and equipped with a QUORUM low-temperature stage, that can yield even more precise images in a even less invasive way. The microscope, within the *Non–destructive Techniques Service* of MNCN-CSIC, the *Natural Sciences Museum*, not only a museum but also an institute belonging to the Spanish *Consejo Superior de Investigaciones Científicas*, is under the technical and helpful hands of Laura Tormo, Marta Furió, Ioanna Theodorou and Cristina Paradela.

Chitosan is a fairly simple polymer. A linear, not too polydisperse in nature, polysaccharide, derivative of chitin, the second more abundant biopolymer and present in seafood and insect shells, some microorganisms and fungi. The partial deacetylation of the N-acetyl glucosamine monomers, allows the creation of positive self-repelling charges in acidic medium (here, 0.1 M sodium acetate). Not a complex sequence and intricate branching, or a rich functionalized polymer. Rather a simple molecule.



Micrograph credits: A.D. Molina-Garcia and A. Schneider-Teixeira (technical help acknowledged to L.T., M.F., I.T. and C.P.). The bar corresponds to 10 µm.

Freezing is extremely quick, when a droplet of 3% chitosan solution is immersed into reduced pressure liquid nitrogen, as a part of the standard sample introduction in the cryo-microscope. The fracture of the frozen droplet, and an etching procedure followed by a platinum metallization stage, all under low pressure and temperature, is, in this case, rather than revealing, creating structures as complex and rich as those shown in the picture. The darker sections in it would correspond to the sublimated ice crystals empty holes...

And the external leathery aspect material, does it correspond to a thick chitosan gel, formed by interaction of the acetylated not charged subunits, when the polymer is expelled from ice, forced by the crystallization process? And the waves, the rippling and fluttering waves of this layer? Does the distinct sparse network at the background correspond to individual chitosan filaments?...

You see, such a complexity, wealth and drama, out of a water drop with some crab shell scratchings... ■

Antonio Diego Molina-García
ICTAN-CSIC
Madrid-Spain
e-mail: antoniom@ictan.csic.es

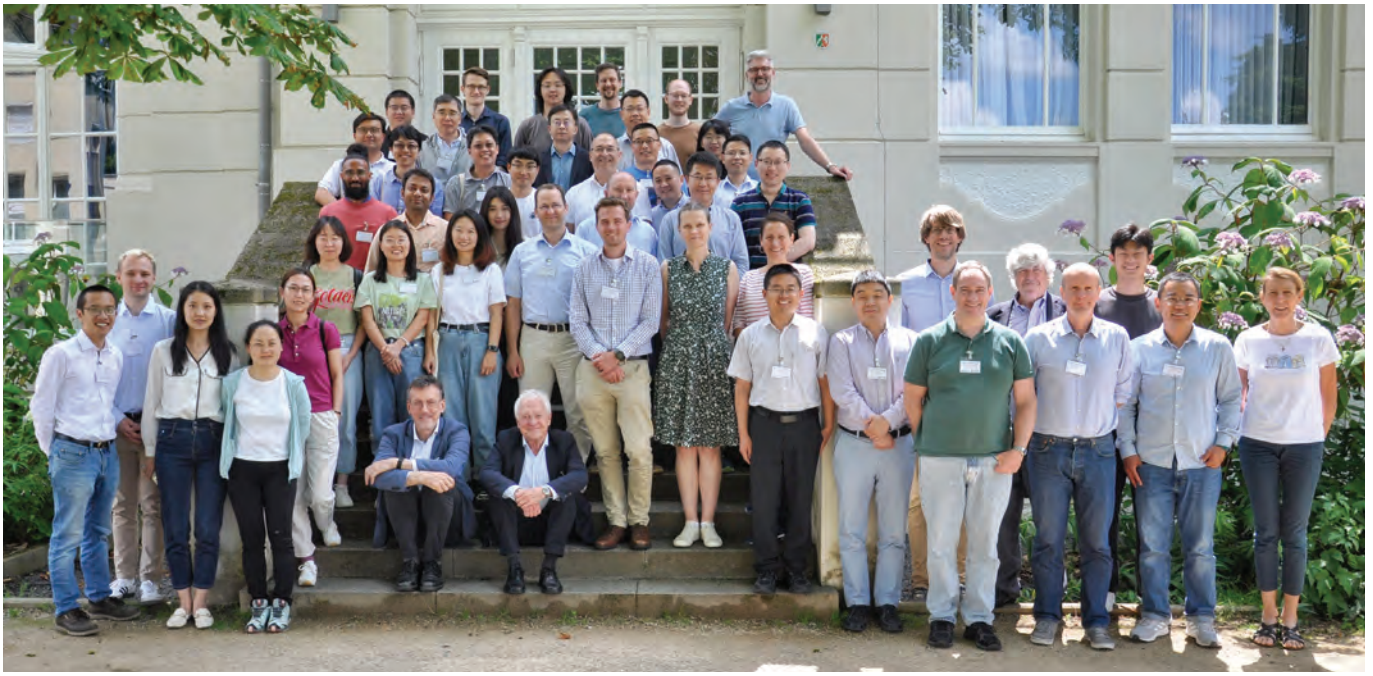
Advanced and Correlative Electron Microscopy of Catalysts, Quantum Phenomena and Soft Matter

8-12 July 2024 - 6th Joint Sino-German Symposium 2024, The Yard Hotel, Bad Honnef, Germany

This 6th Joint Sino-German Symposium was organized by the Ernst Ruska-Centre for Microscopy and Spectroscopy (ER-C-1) of the Forschungszentrum Jülich (FZ Jülich), Germany and by the City University of Hong Kong, Dalian Institute of Chemical Physics (DICP), Chinese Academy of Sciences (CAS). The 5-day symposium showcased numerous examples documenting the impressive progress in the research for catalysis, quantum phenomena and soft matter by applying advanced and correlative methods of aberration-corrected electron microscopy. The symposium was attended by 65 scientists in total, and 9 students. 16 scientific sessions included 56 presentations given by invited speakers from Hong Kong SAR, China, Austria, France, Sweden, the USA and from Germany.

Chairs of the symposium were Prof. Dr. Rafal E. Dunin-Borkowski and Dr. Marc Heggen, both from the Forschungszentrum Jülich, Prof. Dr. Wolfgang Jäger, Christian-Albrechts-University zu Kiel, Kiel, Germany, Prof. Dr. Fu-Rong Chen and Prof. Dr. Xiaoyan Zhong, both from the City University of Hong Kong, and Prof. Dr. Feng Wang and Dr. Qiang Guo, both from the Dalian Institute of Chemical Physics (DICP), China Academy of Sciences, China. The symposium continued the series of Joint Sino-German Symposia held before at Tsinghua University Beijing (2016, 2018), at Xi'an (2017), at Beijing University of Technology (2019) and at the Hong Kong Institute for Advanced Study and Shenzhen Futian Research Institute of the City University of Hong Kong (2023). Further Sino-German Symposia are planned.

The participants - Part 1 of the JSGS 2024 symposium. © Photo Courtesy Marie Göcking, Marc Heggen



The participants - Part 2 of the JSGS 2024 symposium. © Photo Courtesy Marie Göcking, Marc Heggen

A first part (Monday and Tuesday) focused in 8 sessions on ultrafast electron microscopy, correlative light and electron microscopy, advanced instrumentation and quantum electron microscopy, electron microscopy of soft matter and orbital imaging. Topics were:

- ultrafast electron microscopy: instrument development and applications (*Xuewen Fu Nankai University*), nanobeam ultrafast electron diffraction of structural phase transformations at megahertz rates (*Till Domröse Max-Planck-Institute Multidisciplinary Sciences Göttingen*), dynamics of semiconductors studied with an ultrafast transmission electron microscope (*Sophie Meuret CNRS Toulouse*);
- towards orbital imaging with atomic plane resolution (*Xiaoyan Zhong City University Hong Kong*), atomic scale mapping of magnetic moments in a probe-corrected scanning transmission electron microscope (*Hasan Ali Uppsala University*), design of electron optical components towards a quantum resonator with pulsed electrons (*Yu-Chun Hsueh City University Hong Kong*);
- tailoring the electron wave for 3D imaging and electric field mapping (*Changlin Zheng Fudan University Shanghai*), ultrafast Kapitza-Dirac effect (*Hao Liang Max-Planck-Institute Physics of Complex Systems Dresden*), improving quantification accuracy and precision of magnetic moments in electron magnetic chiral dichroism (*Xiaoxiao Fu Chongqing University*);
- advancing instrumentation and workflow for cryogenic and low dose phase contrast imaging and crystallography (*Penghan Lu FZ Jülich*), new concepts and directions for studies of light-electron-matter interactions in the transmission electron microscope (*Amir Tavabi FZ Jülich*), in situ and time-resolved cryo-electron microscopy for life science (*Fei Sun Chinese Academy of Sciences Beijing*), atomic-plane resolved electron energy-loss spectroscopy with parallel illumination and its applications (*Bin Lin City University of Hong Kong*), resolving lateral component of magnetic stray field in conventional SEM (*Qi Liu City University of Hong Kong*);
- ultrafast transmission electron microscopy: from instrumental developments to applications (*Sascha Schäfer Regensburg University*), femtosecond electron-transfer dynamics across interfaces between solvated alkali ions and metal surfaces (*Uwe Bovensiepen Duisburg University)*, high-resolution electron microscopy imaging of highly beam-sensitive materials (*Yu Han South China University of Technology Guangzhou*);
- spin resonance spectroscopy with a transmission electron microscope (*Philipp Haslinger TU Vienna*), understanding functionalities of carbon nitrides using operando transmission electron microscopy (*Nadezda Tarakina Max-Planck-Institute Colloids and Interfaces Potsdam*), atomic structure of twin boundaries in monoclinic oxides (*Hongchu Du FZ Jülich*), quantitative comparison of long-range electric fields and potentials measured using off-axis electron holography and 4DSTEM (*Janghyun Jo FZ Jülich*);
- unveiling degradation mechanisms in layered Li-rich cathode materials using combined in operando neutron diffraction and 4DSTEM (*Tingting Yang FZ Jülich*), advancing in-situ sample preparation for MEMS-based (S)TEM characterization (*Vesna Srot Max-Planck-Institute Solid State Research Stuttgart*), charge quantitation on metal-oxide and organic nanoparticles using off-axis electron holography (*Yan Lu FZ Jülich*);
- momentum-resolved electron energy-loss spectroscopy of phonons, excitons, plasmons, and core-electrons in pure and hybrid materials (*Christoph Koch Humboldt University*

Berlin), cathodoluminescence spectroscopy of quantum materials *(Nahid Talebi CAU Kiel University*), application of CLEM in biomedical research (*Yalin Wang Westlake University Hangzhou*), optimize event processing for hybrid pixel detectors (*Liang Jin Bioland Laboratory Guangzhou*).

A second part (Wednesday - Friday) focused in another 8 sessions on in-situ and operando electron microscopy, catalyst synthesis, nanoparticle catalyst evolution and degradation, strong metal support interaction, electrocatalysis and photocatalysis. Topics were:

- active catalysts and associated dynamics at phase boundaries: insights from operando electron microscopy (*Marc Willinger TU München*), probing the heterogeneity and complexity in electrocatalysts under reaction conditions through operando microscopy (*See Wee Chee Fritz-Haber-Institute of MPG Berlin*), TEM studies of twisted epitaxial gold nanodiscs in twisted molybdenum di-sulphide bilayers (*Robert Sinclair Stanford University*);
- catalytic biomass refinery to separate lignin from lignocellulose (*Feng Wang Dalian Institute of Chemical Physics*), atomic imaging and spectroscopy of dynamic metal-oxide interfaces for electrocatalytic reactions (*Lin Gan Tsinghua Shenzhen International Graduate School*), ceria based catalysts for the C-C coupling of small molecules (*Qiang Guo Dalian Institute of Chemical Physics*), heat treatment effects on the activity and stability of Mo/Rh-doped PtNi octahedra as catalysts for the oxygen reduction reaction (*Paul Paciok FZ Jülich*);
- single-site and single-atom catalysts for energy applications (*Regina Palkovits RWTH Aachen*), electron microscopy to elucidate the structure of ultra-small metal nanoparticles (*Matthias Epple Essen University*), catalyst dissolution – the main challenge in low Ir loading PEMWE (*Serhiy Cherevko FZ Jülich*);
- exploring nanoparticle dynamics: in situ TEM techniques for noble metals (*Kateryna Loza University of Duisburg-Essen*), revealing the SMSI of heterogeneous catalyst: from ex-situ to in-situ study (*Wen Shi FZ Jülich*), electro-catalyst restructuring during electrochemical degradation (*Marc Ledendecker TU München*), in-situ transmission electron microscopy study of nanoparticle catalysts (*Marc Heggen FZ Jülich*);
- In situ mechanical straining of magnetic materials in the TEM (*Andras Kovacs FZ Jülich*), role of in-situ electron microscopy for improving solid oxide fuel cell materials (*Shibabrata Basak FZ Jülich*), direct imaging of electrified solid-liquid interfaces in reaction with liquid cell electron microscopy (*Xingli Wang TU Berlin*);
- in situ STEM observation of thermoelectric materials under heating and biasing conditions (*Siyuan Zhang Max-Planck-Institute Sustainable Materials Duesseldorf*), mechanisms of self-activation process in catalysts for methane dry reforming: insights into Ni exsolution on LaNiO3 catalysts via In Situ TEM (*Pengfei Cao FZ Jülich*), electrochemical CO2 reduction using silver-based catalyst in a direct coupled photovoltaic and electrochemical cell under realistic ambient condition: effective solution for long term energy storage (*Therese Cibaka FZ Jülich*), reactive metal-support interaction of zinc palladium nanoparticles on zinc oxide: an environmental scanning transmission electron microscopy study (*Ansgar Meise FZ Jülich*), direct atomic-scale investigation of the coarsening mechanisms of ex-solved catalytic nanoparticles (*Dylan Jennings FZ Jülich*);
- highly dynamic intermetallic compounds in methanol steam reforming (*Marc Armbrüster TU Chemnitz*), visualization of interface polarization and electrostatic potential through Off-Axis Electron Holography (*Qianqian Lan FZ Jülich*), the surface/interface structure and mechanism investigation of catalysts for photoelectrochemical application (*Pengyi Tang Shanghai Institute of Microsystem and Information Technology*);
- advanced transmission electron microscopy for the development of high-efficiency solar cells (*Wolfgang Jäger CAU Kiel University*), imaging mechanism and contrast separation in low-voltage scanning electron microscopy imaging of arrayed single-wall carbon nanotubes wafers (*Chuanhong Jin Zhejiang University Hangzhou*), controllable synthesis of ceria-based catalysts and their catalytic applications (*Zhixin Zhang Dalian Institute of Chemical Physics*).

The participants of the Symposium 2024 experienced an exciting program with excellent presentations of impressive and novel research by leading experts and specialists, initiating numerous lively and inspiring discussions among the participants and creating initiatives for future collaborations. This impression was supported by the exclusively positive feedback given by many of the participants. Highest appreciation has been expressed also for the excellent and smooth organization of this 5-day symposium by the local organizers, Prof. Rafal Dunin-Borkowski, Dr. Marc Heggen and Marie Göcking and their team from the ER-C-1 of the FZ Jülich. The participants could not only enjoy the superb hospitality with regional delicacies in the conference hotel but could continue their conversations during the evening hours, sometimes also as an enjoyable social open air meeting near the Rhine River. An excursion and a guided tour to the Drachenfels (dragons rock) and the Drachenburg Castle, followed by a conference dinner, contributed to the success of this symposium and enabled the participants to sample some of the local cultural highlights of Bad Honnef and its environments. ■

Rafal E. Dunin-Borkowski, Marc Heggen, Wolfgang Jäger Feng Wang, Qiang Guo, Fu-Rong Chen, Xiaoyan Zhong

We acknowledge financial support by the Sino-German Center for Research Promotion, a joint institution established by the German Research Foundation (DFG) and the National Natural Science Foundation of China (NSFC) under the project numbers M-0304 and M-0265.

SOLARIS Cryo-EM Facility in Poland – Celebrating 5 Years of Operation

The SOLARIS Cryo-EM Facility, operating at SOLARIS National Synchrotron Radiation Centre, is a modern and extensive research unit established in 2018 in Krakow, Poland. It was a joint initiative of a consortium comprising 18 of the best Polish scientific institutions and R&D organisations conducting research in structural biology. The consortium that helped in the Facility's foundation was led by Prof. Sebastian Glatt (Malopolska Center of Biotechnology, Jagiellonian University, Kraków) and Prof. Marcin Nowotny (International Institute of Molecular and Cell Biology, Warsaw).

SOLARIS Cryo-EM Facility was officially opened on the 1st of March 2019 during the first Cryo-EM Consortium Meeting. This year, 2024, we celebrate 5 years of operation, enabling scientists to perform state-of-the-art basic and applied research in many fields, e.g. life sciences, biotechnology, chemistry, and materials science. Our priority research area revolves around structural biology, where the usual goal is to understand the spatial structure of biologically relevant organic and inorganic molecules, as well as their dynamics and interactions.

At present, our Facility provides access to two high-end cryo-electron microscopes, both Thermo Fisher Scientific: Krios G3i (300 kV, X-FEG emission, K3 direct electron detector and BioQuantum Energy Filter (Gatan), with the standard high throughput of nearly 800 movies per hour) and Glacios (200 kV, X-FEG, Falcon4 direct electron detector, primarily used for sample screening and MicroED). The microscopes are fully dedicated to measurements at cryogenic temperatures.

In experiments, we mainly use single particle analysis (SPA), cryo-electron tomography (CET), and microcrystal electron diffraction (MicroED) techniques allowing us to analyse specimens at near-atomic resolution.

The above mentioned experimental setup turned out to be very flexible and high throughput in case of sample preparation, screening and high-resolution data acquisition. The Facility allows its users to bring their molecules like proteins, RNAs, DNAs etc, in liquid form and plunge freeze the specimens with Vitrobot MKIV, prepare them for usage (so-called clipping) with Thermo Fisher Scientific Autoloaders and do the screening and preliminary data collection. Grids marked for further Hi-Res data collection can be safely stored in the Facility storage system allowing to keep frozen grids safely for at least one year in LN2.

With the rate of nearly 800 images per hour ~10TB of data can be generated within a single day just with one microscope. SOLARIS Cryo-EM Facility offers the whole data storage and processing pipeline. Raw datasets are stored for at least 6 months. It is also possible to do pre-processing like Motion Correction and CTF estimation, as well as particle picking on-site, to reduce the amount of data to be downloaded or copied to an external drive. This approach is especially effective when quick and robust data analysis and structure reconstruction are needed. The Facility utilizes two GPU computational servers, one

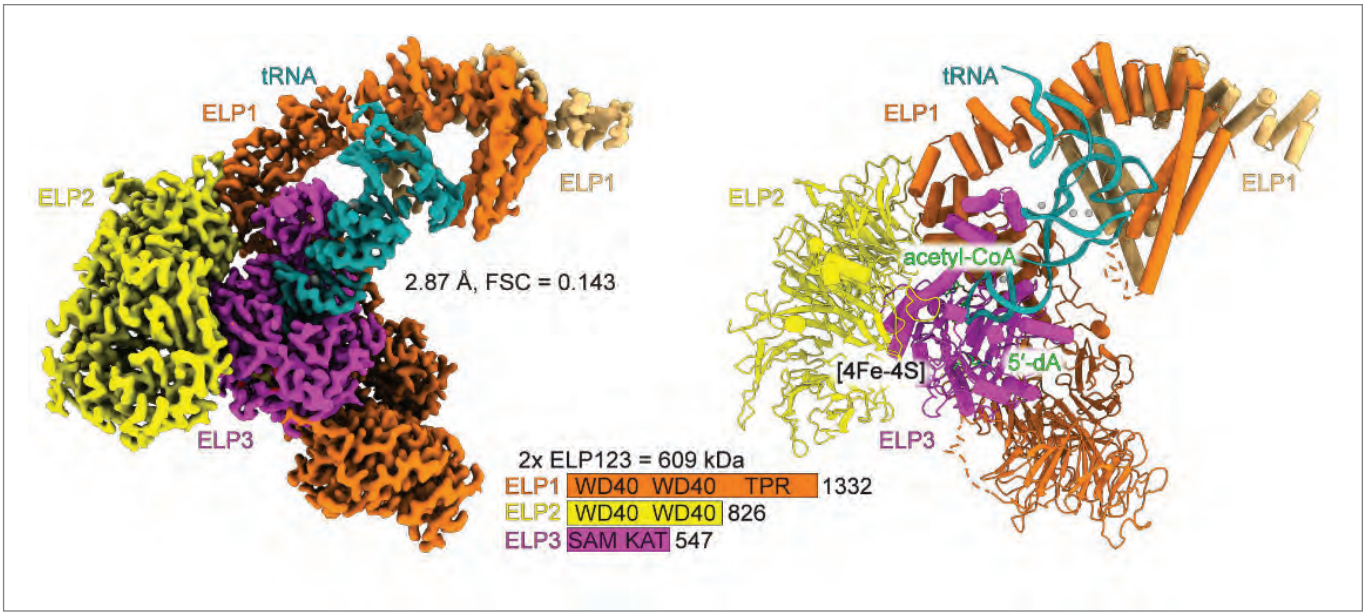


Figure 1. Human ELP123 cryo-EM structure. From Nature Communications, Abbassi et al., (2024).

with NVIDIA Tesla V100 with 32GB of memory, 72 CPU cores and 760 GB of RAM for larger box reconstructions and tomography, and the second with 6x NVIDIA RTX 4090 with 24GB of memory each, 64 CPU cores and 256BG of RAM for parallel data processing and smaller box reconstructions.

Over this 5-year time, the Facility participated in determining several very informative molecular structures, most recently instrumental in the science that led our co-founder to the Foundation for Polish Science 2024 Award (recognized as the most prestigious scientific award in Poland). Prof. Sebastian Glatt received the prize in the field of life and earth sciences **for the determination of the structure and function of the Elongator complex, which affects the accuracy of protein biosynthesis.**

Although every cell in the body has the same genetic material, different cell types produce completely different sets of proteins. Which genes and when become expressed, i.e., proteins produced based on information stored in them, is very tightly controlled and regulated by cells. A great many elements, structures, and protein complexes are involved in this regulation. One of them is the Elongator complex. This complex found in all eukaryotic cells (animals, plants, fungi, and protists) is responsible for certain chemical modifications of transfer RNA (tRNA) molecules. The tRNAs are crucial in the process of translation - they carry specific amino acids to ribosomes, where protein biosynthesis takes place, to enable their incorporation into newly formed proteins. Cryo-EM studies made it possible to determine the biochemical activity and mechanisms of action of this complex, as well as to determine the function of its components.

Moreover, knowledge of the spatial architecture of the protein allows to predict how various perturbations of this structure caused by mutations, can affect the functioning of the cell and, consequently, the entire organism. In the case of the Elongator complex, its mutations occurring in humans are known to be associated with various neurodevelopmental and neurodegenerative diseases, as well as with cancer. This makes the Elongator complex a very interesting target for novel drugs.

SOLARIS Cryo-EM Facility offers two ways of access to cryo-microscopes: (i) rapid (on-demand) access to Glacios microscope which can be finalized within 2 weeks from the request (paid) and (ii) Titan Krios access, based on applications reviewed by the International Reviewing Committee (twice a year, free of charge for academic users). We are also open to any kind of formal collaboration. ■

SOLARIS Cryo-EM Facility Team
Paulina Indyka, Michał Rawski, Marcin Jaciuk, Grzegorz Ważny and Artur Biela

Jagiellonian University
in Krakow, POLAND

Contact: artur.biela@uj.edu.pl / industry.solaris@uj.edu.pl

JEELS 2024

2-4 July 2024 - CEMES, Toulouse, France

The 13th EELS days were organised in Toulouse, jointly by the Castaing centre and CEMES. The event, held from 2 to 4 July 2024, was attended by around 80 students, postdocs and scientists interested in spectroscopies coupled with electron microscopy.

The poster session organised at the Castaing centre provided an opportunity for a wide range of discussions and a much-appreciated tour of the centre. During this session, 2 posters were chosen to receive prizes.

The scientific contributions were divided into 7 symposia, each with an invited presentation, 3 contributions and 1 industrial presentation. This format encouraged lively discussion during breaks in the sunshine! Two oral contributions received awards, once again underlining the high quality of the doctoral students' presentations at this year's event. ■

Fig 1: The 300th anniversary of the death of Antony van Leeuwenhoek was marked by a commemorative lecture by Professor Brian J Ford for an audience aboard the Seabourn Voyager. He demonstrated several videos showing the comparison between the views generated by single lensed microscopes, and those that are obtained with present-day instrumentation.

Prof. Brian J Ford recreates seventeenth-century Microscopy

In Cambridge, England, Prof. Brian J Ford is reviving the microscopy of the 1600s in a remarkable series of experiments. He has selected specimens identical to those portrayed by the pioneers, including Robert Hooke and Antony van Leeuwenhoek, and imaged them through a range of microscopes ancient and modern. The oldest he used is a microscope attributed to van Leeuwenhoek and dating from around 1690, the newest being the Hitachi scanning electron microscopes at the Cavendish Laboratory, University of Cambridge.

In order to ensure the images were precisely correlated, Photoshop was used where necessary to ensure that the orientation of features in the modern micrographs matched the original published illustrations.

Prof. Ford, who was made an Honorary Fellow of the Royal Microscopical Society in recognition of his research, has demonstrated the views obtained by pioneering microscopists in his lectures at Cambridge University, the Royal Society, and in public presentations ***(Fig 1)***. He points out that historians of science are rarely microscopists, and his latest programme of research is intended to answer the enduring question in the history of microscopy, namely, what exactly did the pioneers observe, and are their published portrayals truly representative of reality?

His first correlated historical micrographs were published in the *British Journal of Photography* in 1972, when he imaged living, unstained squamous epithelial cells with a modern Leitz instrument and also captured exactly the same specimens through a single lensed Wilson screw-barrel microscope manufactured around 1720 and thus contemporaneous with van Leeuwenhoek. This was the first time such correlated images had been obtained with microscopes old and new, and Prof. Ford's research attracted much interest.

His investigations in 2024 address how the earliest microscopical studies were rendered for publication. It

Fig 2: Robert Hooke relied on a single lensed microscope for his detailed studies. The human head-louse *Pediculus capitis* was illustrated in his book *Micrographia* of 1665 (top). Using Photoshop we can adjust the orientation of the front claw to match that of a permanent preparation imaged with a single lens of spinel made by Horace Dall of Luton, England, magnifying 400x.

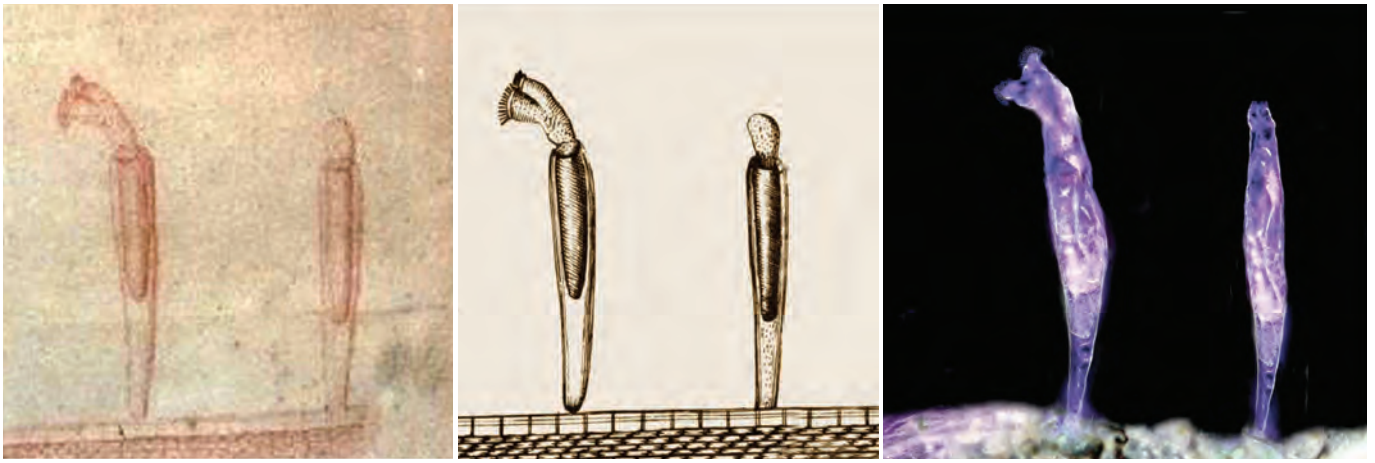


Fig 3: Red crayon was used to illustrate rotifers, likely of the genus Otostephanos, in a letter written by Antony van Leeuwenhoek in 1702 (left). Skilled engravers created a remarkable rendition for publication in Proceedings of the Royal Society, and we can compare this with the living organism under phase-contrast in a micrograph by Canadian microscopist Robert Berdan (right).

has often been stated by scholars that the process of engraving (with a steel needle on copper plates) must surely have prevented microscopical images from being rendered accurately, and the early microscopists have been thought to have consistently exaggerated their illustrations prior to publication.

In previous investigations, Prof. Ford had already shown that Hooke's well-known compound microscope was incapable of the high resolution shown in the original illustrations published in Robert Hooke's *Micrographia* of 1665. In the Preface to his great book, Ford showed that Hooke reveals that he utilised a single lensed microscope for detailed microscopy, and the results now being obtained prove the point ***(Fig 2)***.

The results show that the published images are faithful renditions of microscopical reality. Prof. Ford compared the hand-drawn images of aquatic microorganisms sent to London by van Leeuwenhoek in the 1600s with the engraved versions formally published in *Proceedings of the Royal Society*. Alongside these images he has now placed correlated photomicrographs taken with contemporary light microscopes ***(Fig 3)***.

Similarly, Prof. Ford imaged seventeenth-century hand-cut sections prepared by van Leeuwenhoek alongside contemporary scanning electron micrographs. In October 2024 he took Robert Hooke's celebrated study of the nettle *Urtica dioica*, and correlated those with modern micrographs of identical specimens ***(Fig 4)***.

There are no prior publications that compare the precise appearance of identically oriented specimens viewed by the pioneers, with the result we can now see through antique instruments. These have now been correlated with the appearance that present-day microscopists would obtain. Several papers are currently appearing in print, and for the first time in the history of microscopy they will enable scholars to comprehend how accurate were those pioneering studies, and how faithfully they were reproduced through the skill of the seventeenth century craftsman engraver.

The lesson is that the earliest observations were made with exemplary attention to detail, and the results were interpreted for publication with extraordinary precision. For all the limitations of engraving in the 1600s, the essence of the microscopical world was conveyed with remarkable realism. We owe those first microscopists a debt of gratitude, and also of admiration. ■

Fig 4: Scheme XV of Hooke's Micrographia shows the microscopical appearance of the nettle Urtica dioica (left) shown here without annotations. Scholars ascribe the dramatic appearance of Hooke's illustrations to exaggeration. Ford's 2024 micrographs reveal the nature of the living leaf (right) and we can finally substantiate the accuracy of the published illustration.

Notes

European Microscopy Societies

European Microscopy Societies

Number of EMS Members by Societies (2024)			
National and regional societies (25)			**# members**
Armenian Electron Microscopy Society	AEMS	Armenia	
Austrian Society for Electron Microscopy	ASEM	Austria	143
Belgian Society for Microscopy	BSM	Belgium	314
Croatian Microscopy Society	CMS	Croatia	100
Czechoslovak Microscopy Society	CSMS	Czech Republic	314
Dutch Society for Microscopy	NVvM	Netherlands	261
Electron Microscopy and Analysis Group (Institute of Physics)	EMAG	United Kingdom	370
French Microscopy Society	SFμ	France	439
German Society for Electron Microscopy	DGE	Germany	438
Hellenic Microscopy Society	HMS	Greece	36
Hungarian Society for Microscopy	HSM	Hungary	87
Israel Society for Microscopy	ISM	Israel	311
Italian Society of Microscopical Sciences	SISM	Italy	130
Microscopical Society of Ireland	MSI	Ireland	85
Nordic Microscopy Society	SCANDEM	Scandinavia	62
Polish Society for Microscopy	PTMi	Poland	205
Portuguese Society for Microscopy	SPMicros	Portugal	38
Romanian Electron Microscopy Society	REMS	Romania	77
Royal Microscopical Society	RMS	United Kingdom	1323
Russian Society of Electron Microscopy	RSEM	Russia	
Serbian Society for Microscopy	SSM	Serbia	74
Slovene Society for Microscopy	SDM	Slovenia	114
Spanish Society for Microscopy	SME	Spain	190
Swiss Society for Optics and Microscopy	SSOM	Switzerland	98
Turkish Society for Electron Microscopy	TEMD	Turkey	60
			5269
Corporate members EMS	ECMA		52
Individual members	IND		31
Total			5352

European Microscopy Societies - reports

Czechoslovak Microscopy Society (CSMS)

In May 2024, the Czechoslovak Microscopy Society (CSMS) hosted its annual congress, MICROSCOPY 2024, in Nový Smokovec, Slovakia. The conference was a great success, largely thanks to Dušan Chorvát and his team, who acted as the main organizer on the Slovak side. The CSMS organizing program committee, under the leadership of Vladislav Krzyžánek and Kamila Hrubanová, arranged high-quality speakers and a rich social program.

The conference and exhibition attracted 120 participants and received approximately 60 contributions, making it one of the society's most successful meetings. On the opening day, CSMS presented its annual awards. The winner of the scholarship competition awarded by Thermo Fisher/CSMS, Jan Hajduček, introduced his work entitled "Comprehensive magnetic analysis from electron diffraction patterns in Transmission Electron Microscopy". In another category, Tomáš Hrbek was awarded the CSMS scholarship for his work: "Electrochemical atomic force microscopy as a tool for the study of degradation of iridium-ruthenium catalyst for the anode of a proton exchange membrane water electrolyser".

This year's most distinguished award, the CSMS Award for Merit in Microscopy, was granted to Miroslav Šlouf from the Institute of Macromolecular Chemistry of the CAS, in recognition of his significant contributions in the field of electron microscopy diffraction techniques.

The following two days continued with a plenary lecture by Jiří Materna who enriched the conference program with the latest advancements in artificial intelligence, and by a series of lectures and workshops in various areas of microscopy techniques. A highlight of the event was a joint hike in the High Tatras, which saw enthusiastic participation from over 70 participants. We believe that all participants had a very enjoyable experience of the whole event.

Another important activity of CSMS in 2024 was its active participation in the European Microscopy Congress (EMC2024) in Copenhagen, Denmark. CSMS was among the societies bidding to host the next EMC2028 in Brno, Czechia.

The Brno bid was presented through a booth located in the exhibitor zone staffed mainly by members of the Young Microscopists (yCSMS) Kateřina Mrázová and Pavlína Sikorová, the CSMS President Vladislav Krzyžánek, the bidding Congress chair Kamila Hrubanová, and a representative of the professional agency C-In. Strong support was also provided by the city of Brno. The Brnoregion Microscopy booth showcased "Microscopic Brno" and was visited by notable guests, including the Czech Deputy Ambassador to Denmark, Vilma Anýžová, and other representatives of Brno and the South Moravian Region. Although the bid was unfortunately unsuccessful, CSMS deeply appreciates the efforts of all the supporters involved; it was a strong and very valuable experience for CSMS.

Together we could celebrate other achievements of Czech scientists at EMC2024—long-time president of the CSMS, Vladislav Krzyžánek, was appointed President of the European Microscopy Society, and Tomáš Čižmár received the prestigious EMS Award for excellence in scientific work, the European Microscopy Award (EMAward). Congratulations again and together we enjoy these important moments.

Finally, CSMS warmly invites all microscopists to attend its upcoming annual conference, MICROSCOPY 2025, which will be held in Liberec, Czechia, from 19 to 21 May 2025. We look forward to welcoming you to this inspiring event. ■

German Society for Electron Microscopy (DGE)

75th anniversary of the German Society for Electron Microscopy

The beginning of 2024 marks the 75th anniversary of the founding of the German Society for Electron Microscopy (Deutsche Gesellschaft für Elektronenmikroskopie e.V., DGE). On February 16th, 1949, the DGE was founded in Düsseldorf, one of the three centers for electron microscopy in the Federal Republic of Germany after World War II alongside Berlin and Mosbach. During that meeting, Ernst Ruska was elected as the first President of the newly formed society, Hans Mahl as Vice President, Bodo von Borries as Secretary, and Fritz Jung, Walter Kikuth and Otto Scherzer as other committee members. Soon after, the very first conference of the DGE took place in Mosbach on April 23rd-24th, 1949.

Ever since, the DGE has organized regular conferences that serve as a forum for electron microscopists from diverse academic fields, mainly physics, material science and life sciences. In general, the DGE aims to advance knowledge in electron microscopy as well as other microscopical methods in research, technology and industry. By organizing conferences, smaller meetings and workshops, the society supports its members in their professional development and enables interaction with industrial partners who provide microscopes and other equipment as well as devices for sample preparation. The DGE also extends its support to include funding, especially for early career scientists.

Conferences

Over the years, a regular conference schedule has been established with a national, biennial conference. Every second time, this event is jointly organized together with the Austrian Society for Electron Microscopy (ASEM) and the Swiss Society for Optics and Microscopy (SSOM), and has taken place in one of the three countries since

1985. These conferences alternate with the quadrennial European Microscopy Conference organized by the European Microscopy Society (EMS) and the quadrennial International Microscopy Conference hosted by the International Federation of Societies for Microscopy (IFSM) in the intermediate years.

One highlight during our national conferences is the award of the highly prestigious "Ernst Ruska Prize" by the DGE to a scientist for outstanding achievements in the field of electron microscopy. The prize recipient is chosen by internationally renowned scientists who constitute the independent Ernst Ruska Prize committee.

The "Harald Rose Distinguished Lecture" is another national conference highlight. This prize is awarded to a person for their outstanding achievements in the field of particle optics to honor the work of Harald Rose. Both awardees have the privilege of giving a plenary talk during the award ceremony.

Working groups

The DGE supports a range of working groups within the society that have been established by active members over the years and cover specialized areas in the field of electron microscopy. Since these working groups organize additional, specialized meetings and practical workshops and courses, they are an essential part of the DGE. At the moment, there are a total of five active working groups which focus on a wide range of topics: Preparation and Imaging of Native Organic Systems (PANOS), Electron Microscopic Diagnostics of Pathogens (EMED), and Workshop Scanning Electron Microscopy (WS-SEM). The working group "Association" of Electron Microscopy Facilities (IGEME) serves as a forum to discuss and exchange ideas on how to operate an electron microscopy facility. The newest DGE working group was initiated by a group of motivated early-career microscopists two years ago: The DGE Young Microscopists (yDGE).

Upcoming events

Our next national meeting, Microscopy Conference 2025, is jointly organized with our colleagues from Austria and Switzerland and will be held in Karlsruhe from August 31st to September 9th, 2025. We are pleased

that the EMS has granted patronage over MC 2025. Further details about the conference can be found on the homepage and will be continuously updated (https://www.microscopy-conference.de/).

Another major event is planned for the future: The 22nd International Microscopy Conference will take place in Berlin from August 25th - 29th, 2031 where we will be celebrating 100 years since the invention of electron microscopy in this fascinating city. Mark your calendars today so as not to miss this outstanding event.

We look forward to seeing you all at the upcoming events and cordially invite you to participate in future DGE conferences. ■

PD Dr. Katharina Hipp,
President of the German Society for Electron Microscopy

Polish Society for Microscopy (PTMi)

On June 2-12, 2024, in Zakopane (Poland), the XVIIIth International Conference on Electron Microscopy was organized by the Institute of Metallurgy and Materials Science of the Polish Academy of Sciences and the Polish Microscopy Society. The conference's broadest thematic scope includes electron microscopy methods and techniques in the study of material properties, ranging from traditional engineering materials to the study of biological materials.

The conference was attended by 120 participants, including PhD students, scientists and representatives of companies supplying microscopy equipment to global markets. The invited lecturers were Duncan Alexander (Switzerland), Jack Donoghue (United Kingdom), Paria Gharavi (USA), Janos Labar (Hungary), Carol Trager-Cowan (United Kingdom), Christian Turquat (France), Marek Niewczas (Canada), Angus Kirkland (United Kingdom), Sebastian Glatt (Poland), Aimo Winkelmann (Poland), Jan Dusza (Slovakia). More details are on our site: www.ptmi.agh.edu.pl. ■

Hungarian Society for Microscopy (HSM)

The highlight of the conference of HSM held in Siófok, at the Lake Balaton between 15-17, May 2024, was the first presentation of the **award founded by Technoorg Linda Ltd. in memory of Árpád Barna**.

The company is one of the sponsors of our society. It always pays attention to meeting the highest needs of the scientific world and engages in pioneering work to search for future solutions. As a result of unparalleled, 30 years experience and continuous development, its instruments represent state-of-the-art technology.

Dr. Árpád Barna (1935-2021) was one of the best known collaborators of Technoorg Linda Ltd., an internationally recognized authority especially in the field of electron microscopic sample preparation. He is credited with developing the practice of sample preparation using ion sputtering for electronmicroscopy, which is nowadays a worldwide known and applied method.

The **Árpád Barna Award** was founded in 2023 to acknowledge and reward researchers and developers who demonstrate outstanding performance and to promote scientific and technological advancement in the field of electron microscopy and technology. Besides, the award aims to inspire emerging researchers and support the development of the scientific community, to keep and acknowledge the pioneering spirit and innovative approach embodied in the life and career of Árpád Barna.

The winners received the Árpád Barna Award at the 2024 conference of the Hungarian Microscopy Society (MMT) during a ceremonial award presentation.

The 3 winners of Árpád Barna Prize

The first winner of the Open Category was **András Kovács** (*Ernst Ruska-Centre, Jülich Research Centre, GE*). His prize included a certificate of honor, a plaque, and 7,000 € award. (His project entitled *Quantitative Measurement of Magnetic Properties* in TEM was presented following the acceptance of the 3 awards.)

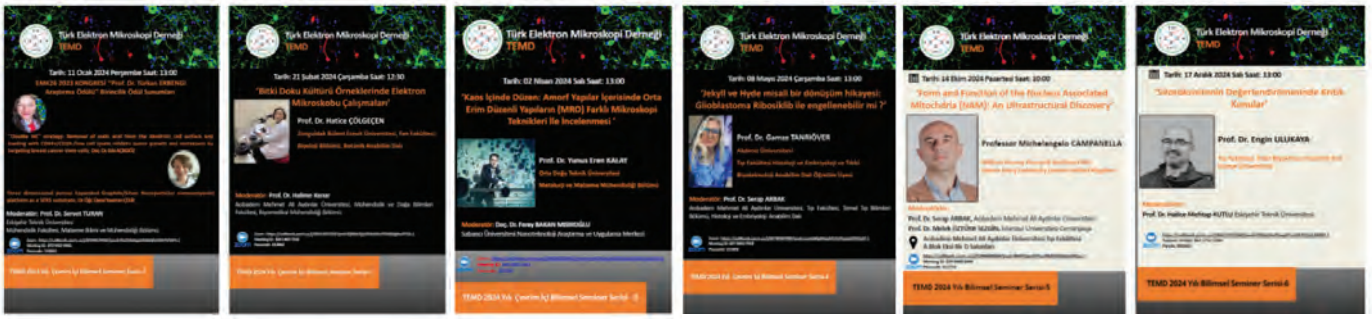
Tamás Zagyva (*Imperial College London, United Kingdom*), winner of the Student Category, was awarded a certificate of honor, a plaque and 3,000 € award. His presentation was entitled: *Study of Electron Beam-Induced Recrystallization as a Function of Temperature and Electron Flux*.

In recognition of his excellent work, a Special Prize (diploma and 1500 €) was awarded to **György Sáfrán** (HUN-REN CER). The title of his project was "*Application of microcombinatorial techniques for solving materials science problems in thin films*".

The founders hope that the new award will not only help to preserve the memory of Árpád Barna and the significance of his achievements, but also enhance the reputation and international recognition of Hungarian microscopists. ■

Turkish Society for Electron Microscopy (TSEM)

During 2024, 6 webinars both on biological sciences and material sciences were organized by Turkish Society for Electron Microscopy.



The PhD student Hakan Şentürk from Istanbul University-Cerrahpasa and Yasemin Akyol from Sabancı University were supported by TSEM to participate to EMC 2024 congress.

TSEM is one of the 10 organizing societies of the 17th Multinational Congress on Microscopy (17MCM), which will be held in Portoroz-Slovenia on September, 7-12, 2025. TSEM has a large role in the organisation as member of Advisory Board and Scientific Committees, as well as session chairs.

The next congresses of TSEM "**2nd International Microscopy and Spectroscopy Congress and 27th National Congress of Electron Microscopy**" will be held in Istanbul, Acibadem Mehmet Ali Aydinlar University, on the 25th to 27th September, 2025. The web page will be open soon. ■

Royal Microscopical Society (RMS)

As we approach the end of 2024, the RMS can reflect on another action-packed year in which we delivered a wide range of high-profile events and a host of other activities in support of the microscopy, imaging and flow cytometry communities.

This year the Society hosted a total of more than 30 meetings, courses and conferences, covering all branches of microscopy, imaging and flow cytometry. We continued to offer a range of virtual and in-person events, with a view to making these as accessible as possible to a diverse, global audience. Guided by the RMS Corporate Advisory Board, the Society hosted a series of well-attended webinars in partnership with corporate member companies – an initiative we hope to build on next year. We also continued to host the Expansion Microscopy Meeting Series alongside our partners in North America and Australia.

This year's stand-out RMS event was ELMI 2024 (The European Light Microscopy Initiative), held in Liverpool, UK, in June. It was the first time the Society had staged ELMI as an in-person event since 2018, and once again the meeting lived up to its reputation as one of the most highly regarded in the microscopy calendar. We would like to thank all our attendees, sponsors and volunteers for supporting elmi2024 – as well as all our other events this year.

Throughout 2024 the RMS has been reaching out to partner societies and other organisations – both in the UK and internationally, by attending a wide range of non-RMS events as an exhibitor, and supporting other events through sponsorship. Notably, the Society took exhibition stands to emc2024 in Copenhagen and M&M 2024 in Ohio, USA, and exhibited for the first time at a number of UK-based events including the Advanced Materials Show and the Oxford Biomedical Imaging Festival. At the time of writing we are looking forward to hosting the Virtual European Flow Core Meeting 2024 in December. This will be the meeting's second instalment, and we hope to make this a regular annual fixture – enabling those working within the Flow community across the whole continent (and beyond) to come together, discuss shared challenges and learn from each other.

The Society continues to play a key role in supporting the careers of those working in microscopy, imaging and flow cytometry. In addition to our annual programme of courses covering all branches of microscopy, we now deliver a highly successful mentoring programme, offering both skills-based support and general mentoring opportunities. Meanwhile our Technical Specialist Job Shadowing scheme, hosted in partnership with BioImaging UK, took on its second cohort of participants in 2024, following a successful

pilot scheme last year. As proud supporters of the **Technician Commitment**, the Society also continues to offer technical **training subsidies** to support members of the technical community taking part in RMS training events. All these initiatives continue to deliver valuable professional experiences and support for RMS members and the wider microscopy community.

Earlier this year we were delighted to award Summer Studentships to six undergraduates completing microscopy-based projects. Together with our Microscopy Activity Kits for primary schools, and the Hitachi STEM outreach project bringing portable SEMs to secondary schools, these initiatives continue to offer valuable experiences to children and young people from primary to tertiary education. Our Diploma programme – the equivalent of a Masters Degree – also attracted new candidates in 2024.

Our flagship publication, The Journal of Microscopy (JoM), made great strides in 2024, with increased paper submissions and a growing proportion of papers published under 'Open Access' agreements between institutions and our publisher, Wiley. These enable authors to publish their work without any direct cost to them, and help bring Journal content to a wider audience. We hope to see these trends continue in 2025 and would encourage prospective authors to submit their papers to the world's oldest journal dedicated to the science of microscopy!

We were delighted to announce a number of prestigious awards this year, in recognition of outstanding achievements in microscopy, imaging and flow cytometry. These included our Science Section Awards (decided by each RMS Scientific Committee), Outstanding Achievement Awards, Early Career Award and the Chris Hawes Award for Outreach and Education. Congratulations to all our winners, about whom you can read more on our website.

Finally, the RMS is looking forward to a very busy 2025 – in which we will be hosting the Microscience Microscopy Congress (mmc) 2025, as well as planning for IMC21, taking place the following year.

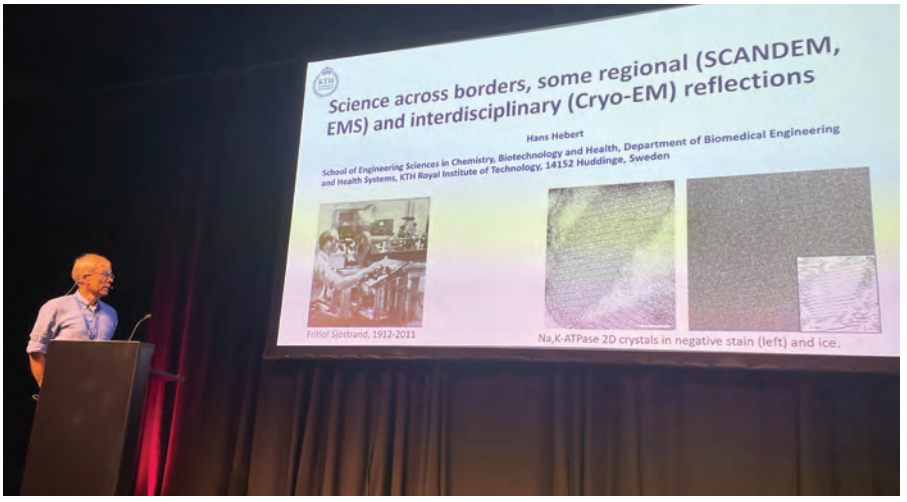
Please make sure to save the dates:

- mmc2025, Manchester, UK: 1 - 3 July 2025
- IMC21, Liverpool, UK: 28 August – 5 September 2026

A very happy New Year to everyone from the RMS! ■

www.rms.org.uk

The Nordic Microscopy Society (SCANDEM)



Finally, the 17th European Microscopy Congress (EMC 2024) became a reality, after eight years of preparation since SCANDEM won the bid during the 16th EMC in Lyon in 2016. We in SCANDEM are very proud and honoured to have this opportunity to be the local organizer of EMC 2024, which took place at the Bella Center in Copenhagen from 25th to 30th August. We are grateful for the trust the European Microscopy Society (EMS) has given us and for the unfailing support throughout the whole process. We thank all European microscopy societies for approval and advice. We also appreciate the cooperation with the International Federation of Societies for Microscopy (IFSM). This 17th EMC is in fact the largest microscopy event in the history of SCANDEM. It is the second time EMC is held in the Nordic region – the first time being the first meeting in Stockholm in 1956, known as the 1st European Regional Conference on Electron Microscopy. Indeed, this is a huge gap of 68 years.

First and foremost, we would like to thank all the participants who made the EMC 2024 a huge success. The EMC chair Klaus Qvortrup is making a summary report on the 17th EMC independently for this EMS yearbook of 2024. On behalf of the SCANDEM Board comprising representatives from Sweden, Denmark, Norway, Finland and Iceland, I praise the Local Organizing Committee led by Klaus Qvortrup, for the dedication and commitment to the big task in putting together an excellent scientific programme and in coordinating with all parties involved, despite the difficulty during the pandemic close-down in 2020 when the 17th EMC was just about to take off. I praise the team for its endurance. I would like to thank our PCO, MCI Copenhagen A/S, led by Per Ankær, for the thorough and effective organization of the congress itself, from securing the venue, architecting the organization of scientific presentations and trade exhibitions, to running the onsite activities including registration, catering and various kinds of problem solving. I would like to use this opportunity to thank the Royal Microscopical Society (RMS) for being our PCO during the first round of organization, towards EMC 2020. Thank you for laying all the groundwork essential for the EMC 2024. I wish RMS the very best for the organization of the 21st International Microscopy Congress (IMC21) in Liverpool in 2026.

This year 2024, SCANDEM organized a special session within EMC 2024 in Copenhagen to mark the 76th Anniversary of the Nordic Microscopy Society, since its founding in 1948 in Stockholm. The session took place on Monday 26th August, 10:30-12:30, followed by the General Assembly of SCANDEM. One of the most significant moments in the GA meeting was the formal announcement that Eva Olsson of Chalmers University of Technology, current president of IFSM, was elected by SCANDEM Board to be an honorary member. Eva Olsson is therefore the first female honorary member of SCANDEM. Previously, three of our five honorary members passed away in

recent years: Elmar Zeitler, Jon Gjønnes and Arvid Maunsbach. Their invaluable contribution to SCANDEM is always remembered.

The anniversary session was organized by the Icelandic team and chaired by Unnar Arnalds, University of Iceland. There were about 80 participants attending the session. The session began with a brief presentation by Kesara Anamthawat-Jónsson, SCANDEM president, showing the hand-typed minutes of the founding meeting (Protokoll vid sammanträde den 16 october 1948) at Manne Siegbahn laboratoriet (Nobelinstitutet för Fysik) in Stockholm, chaired by K. Siegbahn and signed by Fritiof S. Sjöstrand, appointed Secretary. The purpose of the meeting was to establish Scandinavian collaboration on electron microscopy. The keynote speaker of the session, Hans Hebert from KTH Royal Institute of Technology from Sweden, gave his talk entitled "*Science across borders, some regional (SCANDEM, EMS…) and interdisciplinary (CryoEM) reflections*". Following the leading lecture there were four contributed talks: Randi Holmstad from NTNU – Norwegian Institute of Science and Technology in Trondheim talked on "*Electron diffraction in physical science in Norway – past, present, and future*". Varpu Marjomäki from University of Jyväskylä presented an overview of "*Molecular mechanisms of infection revealed by microscopy*". Jakob Birkedal Wagner from DTU – Technical University of Denmark gave a talk on *"(In situ) electron microscopy in Denmark – what have we learned and what is next?*". And lastly, Kristján Leósson of DTE – Advanced Metal Composition Analysis in Reykjavík presented the topic "*Iceland Spar – the Mineral that transformed Microscopy, Physics, Chemistry, and more*". SCANDEM thanks all the speakers of this anniversary session and all the participants. ■

Kesara Anamthawat-Jónsson,
SCANDEM president.
Reykjavík

Slovene Society for Microscopy (SSM)

The participants are enjoying lively lectures.

Poster session and part of the exhibition at 5th Slovene Microscopy Symposium.

The main event of the Slovene Society for Microscopy in 2024 was the 5th Slovene Microscopy Symposium. After four years on the coast, we decided it was time for a change of venue, and this year's event took place in Rogla, a charming destination nestled in the stunning Pohorje mountains. By May, the snow had just receded, revealing lush, green forests.

The symposium was opened by the President of the Slovene Society for Microscopy, Assist. Prof. Dr. Kristina Žagar Soderžnik. Participants had the opportunity to hear from two remarkable plenary speakers: Prof. Dr. Marko Kreft from the University of Ljubljana, who presented "Measuring Astrocyte Energy Metabolism Using Genetically Encoded FRET Nanosensors," and Prof. Dr. Andreja Benčan Golob, Jozef Stefan Institute, who spoke on "In Situ STEM Investigation of Perovskite Ferroelectrics: Structural Defect Dynamics Down to the Atomic Level." This topic aligns with Andreja's research, for which she received Slovenia's prestigious Zois Award for important achievements in the electron microscopy of environmentally friendly ferroelectrics. Prof. Dr. Andreja Benčan Golob's research has significantly advanced the development of environmentally friendly materials for energy conversion and storage.

By employing electron microscopy to investigate the atomic-level structure of lead-free ferroelectric materials, her work has deepened the understanding of their properties and contributed to enhancing the performance of devices utilizing these materials.

The program also included seven invited lectures: four from materials science, four from life sciences, and one from a researcher in the Slovenian aluminum industry. We were thrilled to have several industry researchers present, underscoring the Society's reach beyond academia and reinforcing the symposium's role as a bridge between industry and research. Additionally, participants enjoyed talks from 14 other speakers, and a lively poster session showcased 56 contributions. Since the first Slovene Microscopy Symposium, talks have alternated between life sciences and materials science rather than running parallel sessions. This format fosters collaboration across fields, bringing together microscopists who work with diverse techniques, materials, and sample types. This year's symposium also drew a notable number of

industry researchers—from pharmaceuticals to steel plants—highlighting the Society's success in integrating academia with industry.

Every year, the symposium attracts more exhibitors and sponsors, whose support is invaluable. The highlight of this year's event was undoubtedly the microscopy image competition. More than 50 contributions were received, so the jury had a really hard work picking out the best 3! Of course, the networking continued into the evening, complete with post-dinner drinks and a dance party.

The Slovene Microscopy Society boasts around 150 active members, with over half attending this symposium, resulting in a final participant count of 130. One of the aims of the society is also introducing younger colleagues into the field – to this end, the Society also awarded eight scholarships to students who otherwise would not have had the financial means to attend, covering both conference fees and accommodation.

Looking ahead, the Slovene Microscopy Society is gearing up for a major event—the 17th Multinational Congress on Microscopy, which will take place from September 7–12, 2025, in Bernardin on the Slovenian coast. As this will also serve as the "EMS Extension 2025" event, we are committed to making it a memorable experience for all participants. We invite microscopists, researchers, and industry professionals from around the world to join us in Bernardin – for more information, scan the code or visit www.17mcm.si. ■

Portuguese Society of Microscopy (SPMicros)

2024 marked a new chapter for the Portuguese Microscopy Society (SPMicros) with a change in leadership. Dr. Erin Tranfield concluded her tenure as President, and Dr. Paulo Ferreira, a professor and researcher affiliated with both the University of Lisbon and the International Iberian Nanotechnology Laboratory (INL), assumed the role. This transition continues society's initiatives in fostering an environment of collaboration and innovation within microscopy, as well as supporting its members in both their professional growth and scientific endeavors. The new SPMicros board now comprises:

- **Paulo Ferreira** (President) – University of Lisbon & INL
- **Oliver Schraidt** (Vice President for Life Sciences) – International Iberian Nanotechnology Laboratory
- **Sonia Simoes** (Vice President for Materials Science) – University of Porto
- **Maria Luisa Jordao** (Treasurer) – National Health Institute Dr. Ricardo Jorge
- **Leonard Deepak Francis** (Secretary) – International Iberian Nanotechnology Laboratory

The leadership team, representing some of Portugal's top institutions, is well-positioned to drive the society's mission forward, enhancing collaboration among researchers and expanding the society's reach both nationally and internationally.

Figure 1. SPMicros Meeting

SPMicros also successfully hosted its annual conference, **SPMicros2024**, on September 13th, drawing participants from universities, research institutes, and industry ***(Figure 1)***. The conference served as a vibrant platform for knowledge sharing, focusing on the latest advancements in microscopy within **Materials Science** and **Life Sciences**.

The event featured insightful sessions and discussions, with two keynote talks that captured significant attention given by Dr. Daniela Gomes, an Assistant Professor at NOVA FCT's Department of Materials Science and a member of CENIMAT/I3N and Dr. Antonio Pedro Matos from the Egas Moniz Center for Interdisciplinary Research. The former delivered an impactful talk on how advanced microscopy techniques are transforming our understanding of materials at the nanoscale. She highlighted groundbreaking discoveries and applications, showcasing how nanoscale microscopy unveils new properties that drive innovation in materials science. The latter presented a thought-provoking lecture on the sustained importance of conventional electron microscopy within modern life sciences. He emphasized how these time-tested techniques continue to be indispensable for addressing today's research challenges, bridging past methodologies with future breakthroughs.

SPMicros extends heartfelt thanks to all who attended and contributed, emphasizing that the success of SPMicros2024 was a collective achievement. The active participation of researchers, students, and industry professionals fostered meaningful dialogues, supporting the growth of the microscopy community in Portugal. The Society looks forward to welcoming even more participants in future events.

Looking ahead, SPMicros is excited to announce the upcoming **5th International Conference on In-Situ Electron Microscopy**, set to take place in May 2025 ***(Figure 2)***. Organized by Dr. Paulo Ferreira (University of Lisbon & INL), Dr. Andrew Minor (University of California at Berkeley), and Dr. Naoya Shibata (The University of Tokyo), this conference will be a landmark event for the global electron microscopy community. The organizers aim to bring together leading scientists and practitioners to explore in-situ electron microscopy's current advances and applications across diverse scientific domains. ■

Paulo Ferreira (President)

Electron Microscopy and Analysis (EMAG)

EMAG is the Electron Microscopy and Analysis Group of the UK's Institute of Physics - with members from research students to retired-still-researchers, across the physical and biological sciences. We hold annual conferences (in odd-numbered years, these are held jointly with the RMS as 'MMC'). Since the last EMS yearbook, we've had a rather busy year!

We held our annual conference in Belfast in July, with a 'Focus on Functional Materials' under the lead and guidance of organising committee chair, Dr Miryam Arredondo. This event included invited talks from a wide cross-section of organisations: national facilities and institutes (Prof Amy Gandy - UK Atomic Energy Authority and Dr Chris Allen - ePSIC), academia (Prof Richard Beanland - University of Warwick, Dr Leo Molina-Luna - TU Darmstadt and Dr Joerg Jinschek - DTU Nanolab), and industry (Michelle Langan - Seagate Technology)

In addition to the invited talks, and contributions from across our community - we were once again very pleased with the particularly strong range of contributions from students and early career researchers. In particular, we'd like to take this opportunity to highlight our student prize winners: Best talk Lukas Worch - Imperial College London, Runner up talk Maixent Cassagne - Trinity College Dublin and Best Poster Matthew Mosse - Imperial College London. Further information on their presentations and the overall event is available here: https://iop.eventsair.com/emag2024/ - our international colleagues are always wholeheartedly invited to our events.

Student prize winners at the EMAG2024 conference, held in Belfast in July 2024. (Left image) Best talk: Lukas Worch, from Imperial College, London. (Middle image) Runner up talk: Maixent Cassagne, from Institut National des Sciences Appliquées (INSA) de Toulouse and Trinity College Dublin. (Right image): Best poster Matthew Mosse from Trinity College Dublin. Prizes presented by Prof. Donald MacLaren, EMAG Chair (University of Glasgow).

In 2024, the EMAG community were also very pleased to be able to once again take part in an in-person EMC after a long break since the 2016 event in Lyon. These events are always particularly impactful for research students - illustrated in the short report below from Ella Kitching, a PhD student at Cardiff University:

"As a PhD student, EMC2024 gave me the opportunity to experience not only my first EMC, but also my first international conference. Copenhagen was a beautiful location for this conference! I had previously attended and presented a poster at MMC2023 in Manchester, within the Electron Microscopy and Analysis (EMAG) sessions. MMC2023 was the one of the best experiences in my first year as a PhD student, further

confirmed my interest in academia, and gave me confidence in my own work. So, I was greatly looking forward to experiencing another microscopy conference on a larger scale! Attending EMC2024 as both a volunteer and a poster presenter (title: "*Simulating iDPC tomography of CeO2 nanoparticles with experimentally realistic parameters and conditions*") made it a very busy conference for me, and equally, an incredibly interesting one! I can recall many productive conversations about research related to my own interests, which enabled me to see topics from new perspectives. Thanks to the parallel sessions, I was always able to attend talks that were of interest to me, whether they were within the Physical Science sessions, or the Instrumental sessions. Talks within the Tomography and Phase Methods sessions were personal highlights! It was inspiring to attend presentations by many individuals whose work I have read countless times, whose software I use, and who I look up to within the field of microscopy. It was wonderful to meet other early career researchers, and I feel I have become a part of the European microscopy community. I would like to thank EMAG for providing a bursary towards my attendance, and I hope to attend future EMC conferences." Ella Kitching, PhD student, Cardiff University.

In addition to these established meetings, we recently introduced one-day hot-topic meetings - with an inaugural event run jointly between ourselves and the IOP Biophysics group, an event superbly led by Dr Emanuela Liberti of the Rosalind Franklin Institute at Harwell. exploring the intersection of microscopy in important, but dose-restricted conditions - across a wide range of samples and length scales.

Alongside these many meetings and conferences - with many opportunities for student presenters to be celebrated - we realised there were perhaps fewer opportunities to celebrate the brilliant research of our students in other environments. As a response to this, we were very pleased to launch our inaugural EMAG Thesis Prize this year. From hereon in, this will be an annual prize - and at the time of going to press, our committee are keenly reading the submissions, and debating to whom this inaugural prize will go.

After a successful 2024, we are now looking to the bright future ahead: in 2025 our annual meeting will again combine with the RMS meeting for the biannual MMC (Manchester, 1st-3rd July 2025) and then further ahead we look forward to the UKs hosting of IMC in 2026 (28th August-5th Sept 2026), where we hope to see many of you in sunny Liverpool. ■

Dr Laura Clarke, EMAG Vice-Chair, University of York, UK

Photos courtesy of Sarah Harper, of our EMAG 2024 conference in Belfast

Notes

EMS Scholarships reports

Marc Botifoll Moral

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

I would like to express my deepest gratitude to the European Microscopy Society for its support which gave me the opportunity to participate in the European Microscopy Congress 2024, held in Copenhagen, Denmark. It was a wonderful congress with the latest development in microscopy, specially focused on electron microscopy. The balance between methodological development and the applied science it allowed was great, also finding room for the latest developments of artificial intelligence and data science, which were particularly interesting given my research topics.

The most interesting part to me was devoted to high-energy resolution spectroscopy, for which there were specific seminars during the whole conference, which I personally appreciate, and I acknowledge the organisers and the scientific committee of the conference for that. In addition, as said, the part regarding artificial intelligence, machine learning and generally emerging data science methods were particularly useful, giving crazy ideas to try on my own research problems.

Thanks to the EMS scholarship, I was able to present a poster introducing my recent research where we are able to map the band gap at sub-nanometre resolution by a novel methodological development based on theory and experiment comparison, through high-energy resolution electron energy loss spectroscopy.

Importantly, the poster session led to interesting discussions and new colleagues with which to collaborate in the future to bring the developments to the next level, hopefully, to be presented in the next edition of EMC!

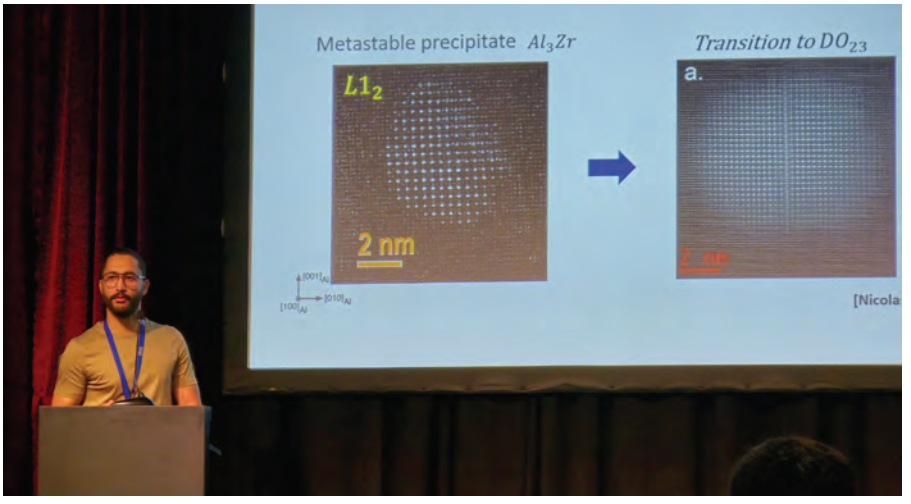
For all the above, I believe EMC2024 was a great success, at least at a personal level, in which EMS had a key role which should be acknowledged and supported to ensure the future generations of microscopists will be able to benefit from it.

Omar Boukir

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

I had the opportunity to attend the EMC Conference 2024 held in Copenhagen (Denmark) on 26-30 August. This conference brought together experts, professionals, and researchers from various fields to discuss the latest advancements and trends in microscopy. The event included keynote speeches, panel discussions, workshops, and networking sessions.

- My Session: Metals and Alloys. PS-02 (1)
- Presentation title: TEM Investigations on the Impact of Hydrogen on Phase Transformations in Aluminum Alloys



Wei Chao

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

My name is Wei Chao, and I am writing to express my sincere gratitude for the scholarship that allowed me to attend European Microscopy Congress 2024 in Copenhagen. This was my first experience at the EMC and trip to Europe, making it a truly memorable occasion for me.

The conference offered a wealth of knowledge across a diverse range of research topics. I particularly enjoyed the sessions on diffraction techniques and structural analysis and phase-related methods, which resonated deeply with my own research interest. Having the honour of presenting my work in the Phase related methods session was a pivotal moment for me, as it not only allowed me to share my findings but also to engage in meaningful discussions with esteemed colleagues in the field. Attending EMC 2024 has broadened my perspective and sparked new ideas for my ongoing research. The opportunity to connect with experts and fellow researchers has inspired me to delve deeper into my work.

I am truly grateful for the support from the European Microscopy Society, which made this enriching experience possible. Warmest regards

Andrea Cheradil

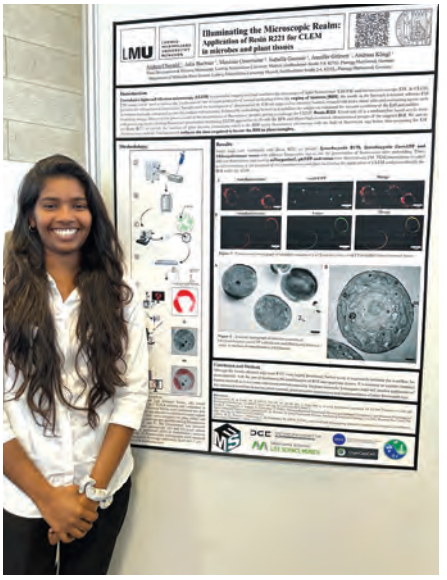
17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

I recently had the privilege of attending EMC2024 in Copenhagen, a memorable experience that offered invaluable insights and connections within the field of electron microscopy. From the moment I arrived, I was immersed in a dynamic community of scientists, each passionate about advancing microscopy research. Presenting my poster at the conference was a highlight; it allowed me to share my work with a diverse audience and receive invaluable feedback from seasoned electron microscopists. Their constructive input has given me new perspectives and ideas that will directly shape and strengthen my research going forward.

The conference itself created an ideal setting for networking and learning. Each session was packed with groundbreaking discoveries, and it was inspiring to see firsthand the latest advancements in electron microscopy. In particular, I had the opportunity to engage with numerous companies displaying their most recent technological innovations. This exposure to cutting-edge tools and equipment broadened my understanding of the technical capabilities in our field and helped me envision new possibilities for my own research.

I am deeply grateful to the EMS for the scholarship that enabled me to attend this conference. Without their support, I would have missed out on the wealth of knowledge, professional connections, and hands-on exposure that EMC2024 offered. The experience has been invaluable for my growth, both professionally and personally, and I am excited to apply the insights I gained as I continue my journey in electron microscopy.

This transformative experience was made possible by a scholarship from the European Microscopy Society (EMS), and I am deeply grateful for their support. Without it, I would have missed out on the knowledge,



connections, and hands-on exposure that EMC2024 offered. This opportunity has been instrumental in my professional and personal growth, and I look forward to applying these insights as I continue my journey in electron microscopy.

Hannah Cole

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

Firstly, I would like to thank the European microscopy society for an EMS scholarship, helping me to attend and participate in the 17th European microscopy Congress. This was my first international conference that I have attended, and it was very rewarding to see the range of research that was going on across Europe and further. I am a first year PhD student at the University of Cambridge based in the Department of Materials science and Metallurgy, my research focuses on using TEM to investigate the local atomic structure of metals.

It was interesting to engage and learn from what other people were doing in similar research areas to my own, such as the metals and alloy symposia and diffraction techniques and structural analysis symposia. In addition, it was rewarding to learn from other talks and posters on various different areas, allowing me to see the amazing things that can be done with electron microscopes in a range of scientific fields.

On Wednesday afternoon I was fortunate enough to be invited to speak in the metals and alloys symposia with a presentation entitled "The nature of diffuse scattering in fcc alloys – investigation by 3D-ED and 4D-STEM". I was grateful to be able to share my and my co-authors research and get experience of presenting at an international conference. It was also helpful discussing this research and others research in tea breaks throughout the day. In addition, the poster presentation session we're particularly good for engaging

in discussion about other people's research one on one.

I would like to thank EMS again for helping support my attendance of the EMC 2024 in the wonderful city of Copenhagen.

Sivert Dagenborg

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

My heartfelt thanks for being awarded the EMS scholarship, which made it possible for me to attend the European Microscopy Congress 2024 in Copenhagen this August.

Now that I've set the stage, let me introduce myself. My name is Sivert Dagenborg, a PhD student at the Norwegian University of Science and Technology in the northerly Trondheim. I'm embarking on my fourth and final year in my project, which is about magnetic imaging in the TEM – primarily using STEM-DPC.

I was accepted to give a talk in the Phase-Related Methods symposium. This was the first talk I've ever given at a major conference, so while admittedly the nerves were there, things did end up going quite smoothly. I presented my recent work in characterising the optimal orientations for magnetic imaging of monocrystalline ferromagnetic thin films. Beyond my own work, I received invaluable insights in symposia on all from diffraction to magnetic materials to machine learning. We also had a successful workshop on using the Python packages HyperSpy and Pyxem, where I helped with instructing.

One of the top highlights for me was reconnecting with the international microscopy family, greeting many familiar and new faces from other conferences, universities and laboratories. Copenhagen saw us visiting their famous restaurants and bars, generating discussion and memories late into the day. And let it be known, Copenhagen was a grand host for our scientific shenanigans, offering quality cuisines and perennial parties!

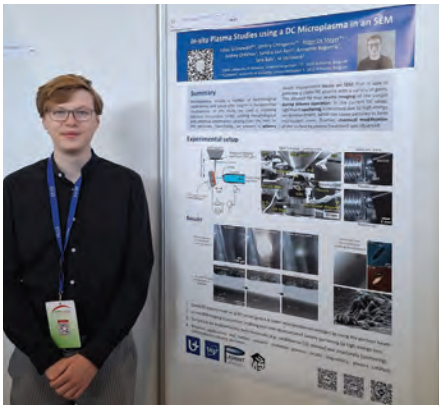
Thank you for all the good memories – and to the EMS for making them possible!

Robin de Meyer

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

From August 26th to 30th, I attended the European Microscopy Congress (EMC2024) in Copenhagen. This was the first conference on microscopy I attended and I was pleasantly surprised by how broad the topics were, while also offering exciting insights on the latest developments in the various fields. Coming from an electron microscopy and materials science background, I was really looking forward to the recent advancements in the technology and new applications in the physical sciences. I was thrilled to learn about the newest detectors and measurement techniques, as well as novel insights in new materials. However, I was also happy to learn more about the amazing microscopy being done in the life sciences. Although I am not familiar with this field, I very much enjoyed the plenary talks that opened up this new and exciting world for me.

During the congress, I also presented a poster on the work we did in our group on "*In-situ plasma studies using a DC microplasma in an SEM*". It was a pleasure to be able to discuss this exciting work with various attendees, both scientists and company representatives. These discussions enabled me to gain new insights in relevant work being done elsewhere, and helped me make new connections to people within academia and industry. The presence of many vendors was also a very valuable addition to the congress, as it allowed me to discover new technologies and products, while also being able to discuss them with the representatives present.



In short, I very much enjoyed EMC2024 and feel like it has broadened my view on the field and has allowed me to make various new connections. I would like to thank the European Microscopy Society for providing the financial support for me to attend this exciting event.

Thomas Demuth

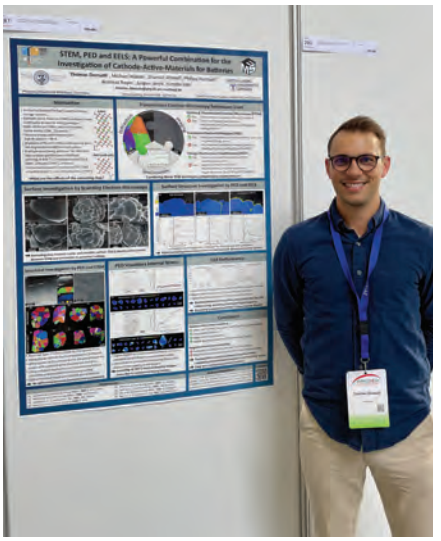
17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

From the 25th till 30th of August, I had the opportunity to attend the European Microscopy Conference (EMC) together with more than 2000 other scientists and representatives from industry in Copenhagen, Denmark.

During the poster session, I presented my latest research results about the influence of different preparation routines on the performance, morphology and structure of $LiNiO_2$ cathode active material particles, which I investigated using various transmission electron microscopy techniques, like scanning transmission electron microscopy, scanning precession electron diffraction, and electron energy loss spectroscopy. The subsequent discussions provided valuable input for the publication of the data and future experiments.

Moreover, during the poster sessions, I got to engage with other researchers from all over the world that work on similar topics or techniques, whose experiences will guide me in my future research. Besides the poster sessions, the scientific lectures were very inspiring and I attended many great talks. Moreover, the possibility of meeting vendors and getting to know their latest products was a highlight of the conference for me. The best part, however, was connecting with other researchers and arranging potential future collaborations. Lastly, I was able to explore the city of Copenhagen in my spare time, which impressed me as very worth living.

Hence, I thank the European Microscopy Society for the financial support, enabling these great experiences.

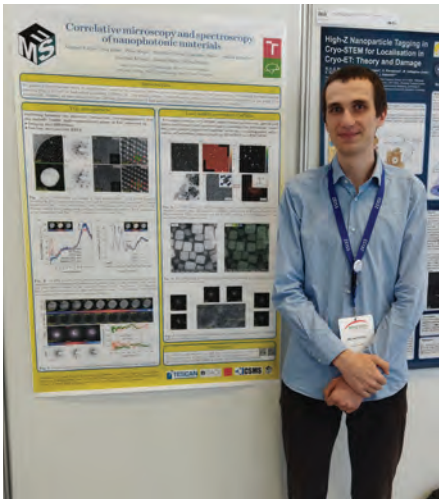


Michael Foltýn

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

The European Microscopy Congress 2024 held in Copenhagen was the largest microscopy conference I have ever attended. For this reason, I was on pins and needles when arriving at the Bella Centre where the EMC took place. Fortunately, my slight nervousness was soon dispelled and replaced by the joy of seeing familiar faces as well as several new ones. Further on, the interesting talks given by charismatic speakers, such as Ondrej Krivanek, Eva Olsson, Colin Ophus and many others, allowed me to get in touch with the newest trends and techniques.

During the EMC, I presented two posters. The one titled "Correlative microscopy and spectroscopy of nanophotonic materials" was dedicated to the study of phase transitions in VO_2 nanoparticles and to the analysis of lead-halide perovskites by STEM EELS, AFM, optical spectroscopy and a new 4D-STEM-in-SEM recently developed by Tescan. The initially regrettable placement of the poster next to the Life science section (despite it belonging to the Instrumentation section) meant that the people asking me questions regarding our results were mostly unfamiliar with the studied materials and some of the techniques. However, the great atmosphere of the place, along with the assistance of a good Danish beer, helped us bridge the differences in our fields of expertise and resulted in cheerful heartwarming discussions. My presentation of the second poster titled "Influence of the deposition parameters on properties of gold plasmonic antennas" was of a different nature, as the lower number of similarly specialised researchers interested in plasmonics allowed us all to engage in long and thorough discussions, bringing invaluable insights.



I am thankful to the European Microscopy Society for the support given to me in the form of a scholarship. It allowed me not only to present the results of my research and to listen to the talks of many leading researchers but also to meet many enthusiastic people. For the next 4 years, the EMC 2024 will stay with me in the form of a fond memory, which will be then renewed with the arrival of EMC 2028. Hopefully, we all will see each other again, this time in Barcelona!

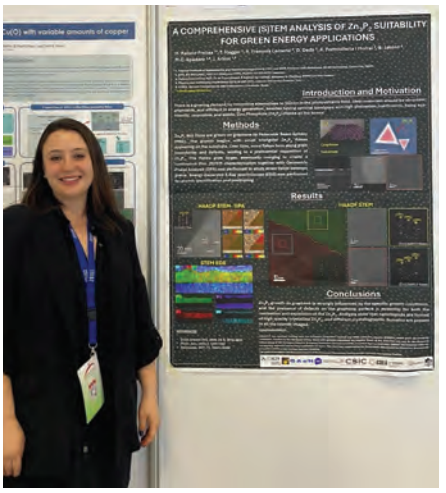
Helena Freitas

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

It was a great pleasure to attend the 17th European Microscopy Congress (EMC2024) in Copenhagen, Denmark, held from the 25th to the 30th of August, 2024. I would like to thank the European Microscopy Society (EMS) for the financial support, as well as the organizers of EMC2024 for hosting such an excellent event. The conference brought together scientists from various fields of microscopy to share their expertise and present the latest developments in the field. It was a fantastic opportunity to meet and engage in discussions with many outstanding scientists and microscopists, and to listen to their presentations live in the conference hall.

Additionally, I had the chance to explore the vast exhibition area and speak with representatives from numerous microscopy-related companies about the latest advancements in instrumentation. It was incredibly exciting to get a glimpse of the newest developments in electron microscopy equipment through live demos offered by the companies.

At EMC2024, I presented a poster entitled "A Comprehensive (S)TEM Analysis of Zn_3P_3's Suitability for Green Energy Applications." This work was conducted as part of the European Project SOLARUP, in which seven European institutions collaborate on the growth, analysis, modeling, and device design of Zn_3P_{23}as a promising solar cell absorber. During the presentation, I had the opportunity to discuss my results with many researchers, both experienced and early-career, which will be immensely helpful for further improving my work.



Once again, I would like to express my gratitude to the EMS and the EMC2024 organizers for this incredible opportunity. I am already looking forward to EMC2028 in Barcelona!

Isabella Gantner

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

In this report I would like to thank the European Microscopy Society for supporting my participation at the EMC 2024 in Copenhagen (August 25th-30th) by granting me the scholarship and in this way giving me the opportunity to make new experiences as a young scientist.

As a PhD student at the Ludwig-Maximilians University Munich with the research focus on the ultrastructure of plant- microbe interactions, it was a unique pleasure to join the EMC for the first time. During the conference, I especially prioritized attending scientific talks related to life sciences, correlative microscopy and sample preparation techniques, as these areas are closely aligned with my research. The talks provided deep insight into the latest advancements and methodologies in electron microscopy and highlighted the current hot topics and trends in this research field, especially in regard to the importance of 3D modelling. Furthermore, the discussions that followed these sessions and continued during coffee breaks, were very interesting and valuable for my own research.

One of my highlights of the conference was the chance to present my PhD project. My talk, titled "The ultrastructural analysis of plant-microbe interfaces," offered me the opportunity to showcase my research to a global audience of scientists. As one of the few plant scientists presenting their work, I was particularly eager to demonstrate the relevance and application potential of TEM and FIB/SEM in plant science to my peers. I hope that my presentation contributed to broadening the understanding of how advanced microscopy techniques can be applied to a wide research field.

Connecting with other scientists at the conference was another major benefit. I had the opportunity to meet and network with researchers from around the world, gaining insights into their work and discussing potential collaborations. The chance to engage with so many scientists, learn about their research and see the diversity of

microscopy applications besides life science was impressive. Furthermore, I enjoyed the exhibition by companies, which were presenting different types of microscopes and were open for conversations regarding their products and their developed solutions for problems appearing in daily lab work.

All these impressions and experiences contributed to a great first journey at the EMC 2024. I am very grateful for the opportunity to join the conference and I am looking forward to a visit to a similar event in the future.

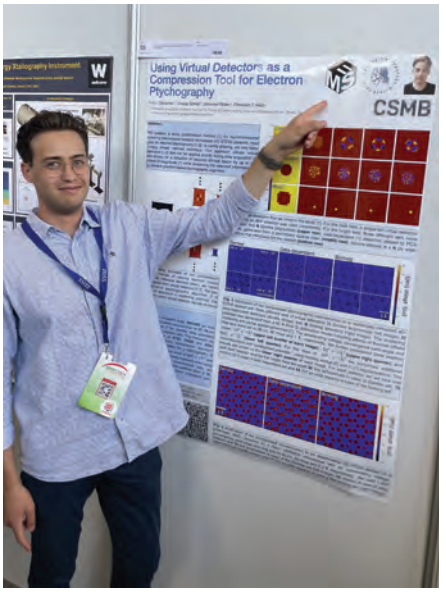
Anton Gladyshev

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

I was honored to present the latest results from my research at the 17th European Microscopy Congress (EMC24) and very thankful to the European Microscopy Society (EMS) for awarding me a scholarship to attend. The congress was a wonderful chance to reconnect with collaborators from around the world and to make new professional connections.

I am currently entering a PhD program in the Structure Research and Electron Microscopy (SEM) group at Humboldt-Universität zu Berlin. At the conference, I shared two parts of my research. My first contribution was a poster presentation "Using Virtual Detectors as a Compression Tool for Electron Ptychography," based largely on my bachelor's thesis. In this project, we used virtual detectors—a feature of modern pixelated electron detectors—to compress large 4D-STEM datasets (usually requiring gigabytes of storage) down to just a few megabytes. These compressed signals were then used for phase retrieval through iterative ptychography. This method saves a lot of storage space while keeping enough information to produce high-resolution images at the atomic scale.

My second presentation, based on my master's thesis, was an oral talk entitled "Vibration-Corrected Electron Ptychography." In this work, we adjusted the mathematical model of



standard ptychographic algorithms to include effects of incoherent scattering coming from vibrations of the sample. This adjustment led to enhanced phase reconstructions for both monolayer MoS_{23} and bulk hBN crystals. By incorporating incoherent scattering into the ptychographic model, we not only improved reconstruction quality but also unlocked an additional information channel—revealing correlations between atomic column displacements.

Throughout the congress, I attended many insightful talks on phase retrieval from data in both far- field and near-field regimes. I was particularly impressed by advancements within the transmission electron microscopy community, including innovations in wavefront shaping with phase plates and phase retrieval from Large-Angle Rocking-Beam Electron Diffraction.

A big thank you to the EMC24 organizers and EMS for this amazing experience and the chance to explore the beautiful city of Copenhagen.

Maja Groll

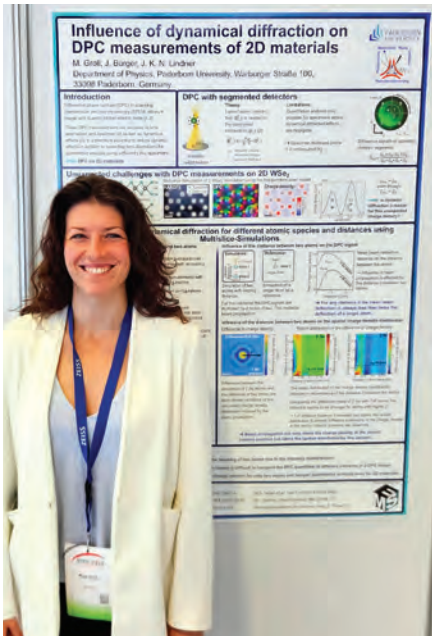
17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

The European Microscopy Congress (EMC2024) in Copenhagen was a valuable experience that offered insights into a range of fascinating topics in the field of microscopy. The conference was held at the Bella Centre in Copenhagen, which proved to be an excellent venue for the event.

Over the course of the week, there were six parallel sessions covering different areas of microscopy, including methodology and instrumentation, as well as life and physical sciences. The arrangement of the session rooms was very convenient. They were situated close to each other, which made it easy to switch between sessions without having to seek for a room or to walk long distances. It was therefore a great pleasure to immerse ourselves in the various presentations on the different topics and to gain an insight into the variety of approaches and work that is and can be done with state-of-the-art (electron) microscopes.

The number of talks within the sessions was perfectly suited for focused participation without too many lectures during one session. I found this structured programme to be a very enjoyable experience.

From Monday to Thursday, the talks were followed by the poster sessions, which are always one of my favourite parts of conferences, as they provide a great opportunity for networking with other young scientists and to discuss new ideas in an informal way. Not only during my own poster presentation, but also during the others, I received many tips and hints about my research and some new opportunities for collaboration. It was a pleasure to attend this conference, and it really gave me some new ideas for my research. Last but not least I want to highlight the Conference dinner. Thanks to the pleasantly large tables, it was possible to chat to the other participants in a relaxed atmosphere.



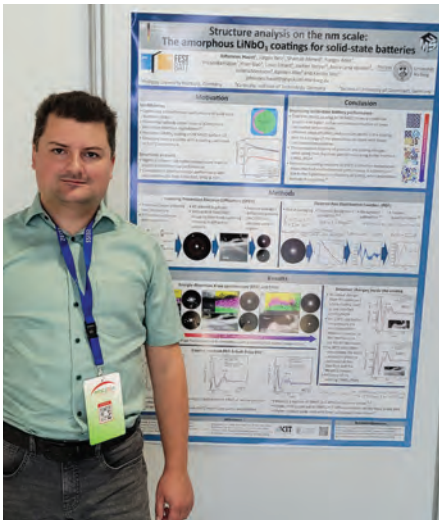
Overall, EMC 2024 was a successful conference and a great experience for me. I would like to thank the EMS for the scholarship to attend this conference.

Johannes Haust

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

Due to the support of the EMS, I could attend the *European Microscopy Congress* 2024 (EMC 2024) in Copenhagen, Denmark. The conference started for me with the pre-conference workshop *HyperSpy For Electron Microscopy Data Analysis*. It covered a broad range of multi-dimensional data visualization and analysis ranging from energy dispersive X-ray and electron energy loss spectroscopy to 4D-STEM through the open-source Python library *HyperSpy*. This opened for me new ways to improve my data analysis workflow and gave me the opportunity to connect with the developers of HyperSpy as well as other users worldwide to stay in contact about new developments and experiences.

The congress itself had many interesting scientific contributions out of the Physics and Life Sciences as well as New Techniques & Methods topics. It helped to keep me up to date with the progress and evolutions in my specific research area while also giving valuable insights in other fields and new developments. I also had the opportunity to present my research subject *Structure analysis on the nm scale: The amorphous LiNbO3 coatings for solid-state batteries* in the form of a poster and get in touch with other people doing similar work. The following fruitful discussions which went in the late evening continuing in the local bars of Copenhagen gave us all valuable information and new ideas for our current research and follow up experiments and collaborations.



Next to the scientific topics and discussions there was also some time to explore Copenhagen together visiting numerous sightseeing places and making some great memories.

In the end I want to thank the EMS for the scholarship giving me the opportunity for new experiences and a memorable time at the EMC 2024 in Copenhagen.

Changjie Huang

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

I would like to express my gratitude to the European Microscopy Society (EMS) for awarding me the travel grant that supported my participation in 17th European Microscopy Congress (EMC2024), held in Copenhagen, Denmark, August 25 -30, 2024. It was both exciting and an honor to participate in the biggest microscopy event in Europe and listen to the presentations from eminent speakers, especially in the fields of low-dimensional materials and *in situ* studies.

As a second year PhD student, I had a wonderful opportunity to share my research findings through a poster presentation, which focused on *in situ* closed cell microscopy study of $Ti_3C_2T_z$ MXene. During the poster sessions, I had a chance to interact and discuss the research topics with fellow attendees, which greatly expanded my perspectives and professional network.

Attending EMC2024 was an incredibly rewarding experience that allowed me to learn about the latest technological developments in the microscopy field and explore new *in situ* tools of potential relevance to my work.

Visiting the fantastic exhibition, which included live demonstrations of the latest TEM instrumentation, broadened my understanding of the state-of-the-art technology.

I truly appreciate the opportunity to participate in the congress which

infused me with new ideas and motivation for my future work.

Franziska Hüppe

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

From August 25th to 30th, I had the privilege of attending the European Microscopy Conference (EMC) in Copenhagen.

The conference featured highly interesting talks and posters covering topics in Instrumentation & Methodology, Life Science and Physical Science. Some presentations were closely aligned with my own research, offering valuable opportunities for knowledge exchange and workflow improvements that will benefit future experiments. On the other hand, exploring unfamiliar research provided a valuable opportunity to expand my knowledge and perspective. Additionally, the presence of industry representatives engaged in productive discussions about current machinery, workflows, and future possibilities.

I had the opportunity to present my research through a talk on *PFIB-Preparation and STEM-Characterization of Electrochemically Plated Lithium at the Interface to the Solid Electrolyte Li6PS5Cl*. The discussions and contributions that followed were highly fruitful, especially conversations with scientists who work in the same field or use similar equipment. These insights will be valuable for enhancing my future experiments.

Outside of the scientific sessions, it was a pleasure to connect with researchers from around the world, sharing insights not only about our work but also about our diverse cultures and lifestyles. Additionally, exploring Copenhagen after the conference was a wonderful experience. Copenhagen is a beautiful city with numerous sightseeing opportunities that made the trip even more memorable.

I am sincerely grateful to the European Microscopy Society for their financial support, which made this enriching experience possible.

Mohammed Ilhami

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

The European Microscopy Congress (EMC24) took place in Copenhagen, Denmark, from August 25 to 30, 2024. The congress was organized around three main themes: Life Science (LS), Physical Science (PS), and Instrumentation and Methodology (IM), with each theme comprising multiple sessions. The congress began with pre-conference workshops on August 25, followed by the official sessions.

I attended the pre-conference workshop on "AI in Microscopy," which introduced tools like QuPath, Python, and ChatGPT for image analysis. The workshop covered image processing, object segmentation, and AI-assisted microscopy tools. I found the session on QuPath's deep learning module particularly valuable for improving object segmentation accuracy.

During the congress, I had the chance to connect with Professor Colin Ophus, an expert in 4D- STEM. We discussed his py4DSTEM tool and its application to my work on electric field mapping. Professor Ophus showed interest in collaborating on developing a Python module for processing 4D-STEM data.

On August 26 and 27, I presented my poster, "Understanding Field Evaporation Sequences by In-Situ Correlative Microscopy and Simulation," as part of the IM-01 session. The discussions with participants provided useful feedback and ideas for improving my research.

Suzana Inkret

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

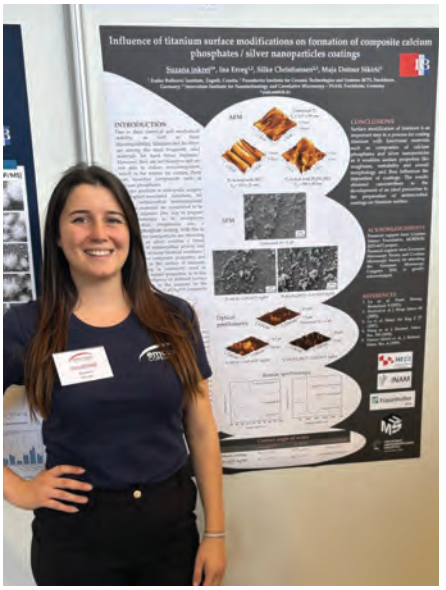
I attended the 17th European Microscopy Congress, which took place from 25.08.2024 to 30.08.2024 in Copenhagen, Denmark, to learn about the state-of-art in the application of various methods and instruments in microscopy. I learned a lot about the use of microscopy in the characterization and analysis of various samples from the fields of biology, chemistry and material science. During the congress I learned a lot about different methods of microscopy that are developed for complex samples.

I also had the chance to present part of my research in the form of a poster presentation entitled

„Influence of titanium surface modifications on formation of composite calcium phosphates / silver nanoparticles coatins“. After the presentation, I met many researchers who are interested in my research and are working on similar topics, which could potentially lead to new collaborations. As I was a volunteer at the congress, I had the chance to get a small insight into the organisation of such a big event and meet many other PhD students from different countries, which was a great learning opportunity and could potentially lead to some new collaborations as well.

Overall, this was a great opportunity to further my education in the field, but also to make connections for new collaboration. I am very grateful that I could be a part of this international meeting of scientists.

Best regard
Suzana Inkret, Assistant/PhD student
at Ruđer Bošković Institute



Abdelali Khelfa

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

I am Abdelali Khelfa, a postdoc working in the STEM group of the LPS Orsay at Université Paris-Saclay in France. During the “HyperSpy for Electron Microscopy Data Analysis” workshop, I gained valuable insights into various Python programs for EDX, EELS, cathodoluminescence, big data, and 4DSTEM analysis. The knowledge I acquired will be highly beneficial for analyzing my postdoctoral data.

At the “Spectroscopy and Hyperspectral Imaging of Hard and Soft Matter” symposium, I had the opportunity to give an oral presentation on my research, which focuses on understanding Mott insulator properties and phase transitions at the nanoscale. My work aims to explore the origins of different electronic phases and how different parameters influence the temperature-driven transitions between these phases using time-resolved in situ monochromatized STEM/EELS.

I received numerous questions and comments, sparking insightful discussions. The diverse presentations, demonstrations, and posters expanded my knowledge of methods and experiments that could be applied to my research. Notably, the “Machine Learning-based processing and analysis of microscopy data” allows me to expand the number of tools for data analysis and processing.

Attending EMC24 was an incredibly rewarding experience, and I highly recommend it to new researchers looking to connect with the microscopy community. I am deeply honored to have received the EMS scholarship and look forward to sharing more results at the next conference.

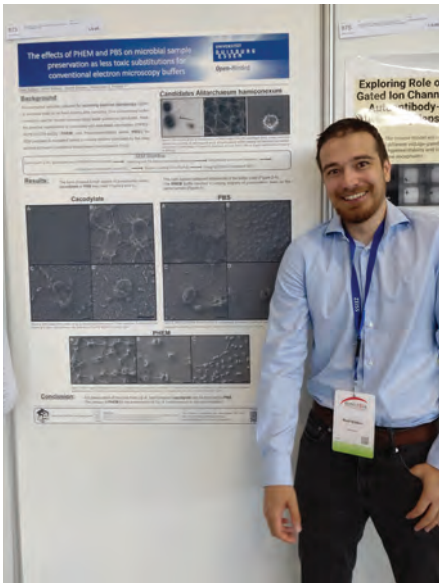
Noel Kleber

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

First, I want to thank the European Microscopy Society for the scholarship for the European Microscopy Conference in Copenhagen from August 25th to August 30th, 2024, which was the first conference I have ever attended. I am a master's student currently working on my master's thesis at the University of Duisburg-Essen in Germany. As a master's student, this was a captivating experience. I learned a lot by talking to researchers from all over the globe.

During my poster presentation on August 27th, I got a lot of tips and advice on how to advance my research. Although I am a life scientist, it was also fascinating to gain some insight into material science. The talks were all great and inspiring. Seeing so many motivated researchers of all ages reminded me again why I fell in love with science and microscopy back in school.

Not to mention how interesting the exhibitions were. Experiencing new microscopy tech was really eye-opening, showing how fast technology is progressing. I also learned at the conference that an electron microscopy museum is in progress, which I plan to visit when it is complete. Copenhagen is a beautiful city and exploring it with people I met at the conference was really fun. I thank the European Microscopy Society again for the opportunity to finance this conference!



Inga Dahlen Konow

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

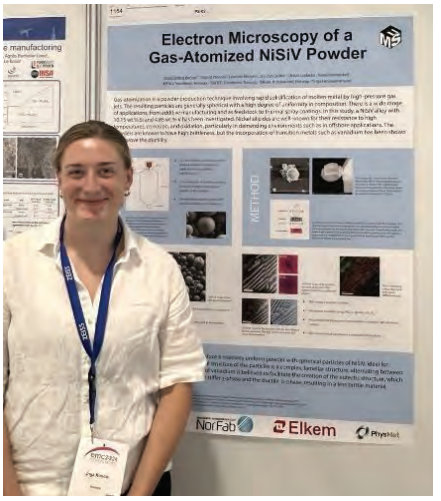
As a first year PhD student, the 17th European Microscopy Congress marked the beginning of my career as a young scientist. I would like to thank the European Microscopy Society for the financial support to attend EMC24, from 25th to 30th August 2024.

The congress offered a variety of different talks, from machine learning to metallurgy to life sciences. Both the sessions and the plenary talks gave an interesting insight into both new and well-known topics.

I would also like to recognize the amount of work that has gone into organizing the poster session. It was truly a good opportunity to see others work and have fruitful discussions.

Beside all the valuable knowledge on microscopy and physics, the congress also provided plenty of opportunities for both making new acquaintances and for rekindling old ones.

I also had the pleasure to be invited to the 75th anniversary of JEOL, who hosted a great party! The congress dinner on Thursday, with live music and good food, was also a mentionable highlight.



Grigory Kornilov

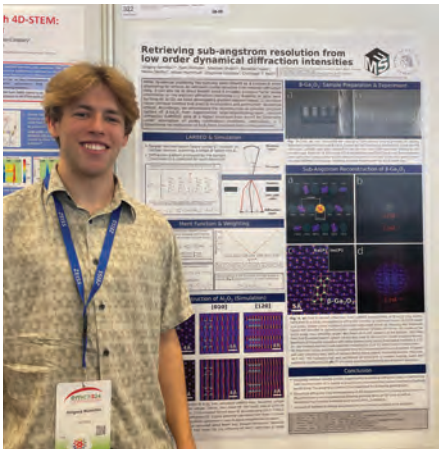
17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

It was an honor to present my research at the 17th European Microscopy Congress (EMC24) in 2024, and I am sincerely grateful to the European Microscopy Society (EMS) for awarding me a scholarship to attend. The congress offered a fantastic opportunity to connect with researchers in my field and gain a deeper understanding of the latest advances in analytical and experimental microscopy techniques.

I am a student in the Structure Research and Electron Microscopy (SEM) group at Humboldt University in Berlin. This was my second international conference, following the IMC20 last year in Busan. My contribution to EMC24 was a poster presentation titled "Retrieving Sub-angstrom Resolution from Low-order Dynamical Diffraction Intensities," in which I described a new method for structure retrieval from diffraction intensities collected using Large-Angle Rocking-Beam Electron Diffraction (LARBED). This method can leverage the dynamical scattering effects produced by thicker crystalline samples, thereby overcoming one of the hurdles of comparable kinematical structure refinement methods. It was rewarding to discuss these results with some of the scientists whose work was foundational for my own research and establish paths for future collaboration.

During the week, I also attended a variety of insightful talks in areas of microscopy not directly related to my own research. A highlight were the numerous advancements in Ultrafast Transmission Electron Microscopy (UTEM) and their applications, such as the study of coherent light-electron interactions. Additionally, it was a pleasure to observe the progress that vibration-corrected and three-dimensionally resolved ptychography has made in the past year.

Alongside presenting my work, I assisted in staffing the booth for the



FAIRmat project, which aims to develop a findable, accessible, interoperable, and reusable data infrastructure for condensed-matter physics and the chemical physics of solids.

Thank you once again to the EMC24 organizers and EMS for this invaluable experience and the opportunity to explore the beautiful city of Copenhagen.

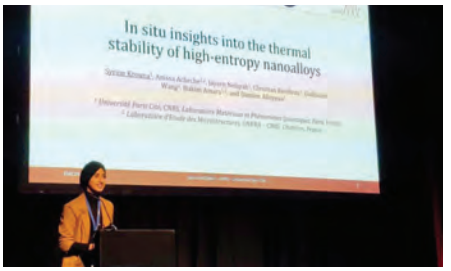
Syrine Krouna

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

I am Syrine Krouna, second year PhD student in nanomaterial design and their structural characterization by transmission electron microscopy at Materials and Quantum Phenomena (MPQ) laboratory of Univeristé Paris Cité in France.

First of all, I would like to thank the European Microscopy Society, the French Microscopy society and the French network GDR HEA for granting me a scholarship to attend the 17th European Microscopy congress 2024 that was held last August in Copenhagen. This was my first participation at a European Microscopy congress and I was impressed by the significant number of attendees. The multiple conferences and presentations were very enriching. The topics discussed were various and yet very specific which allowed me to deepen my knowledge in my own field of expertise as well as having an insight into new fields. The invited speakers' presentations were of a great quality, by covering both their current work and future perspective they gave us an overview about the various work opportunities and collaborations in Europe Besides, the exhibitions were very instructive. We were given the opportunity to do some demonstrations of the latest generation of equipment and also to discuss and exchange with industrialists about some specific practical issues and the possible solutions.

During this conference I had the great pleasure to contribute with two oral presentations on *"the reactivity and thermodynamics of High Entropy NanoAlloys (HENA)"* in the following

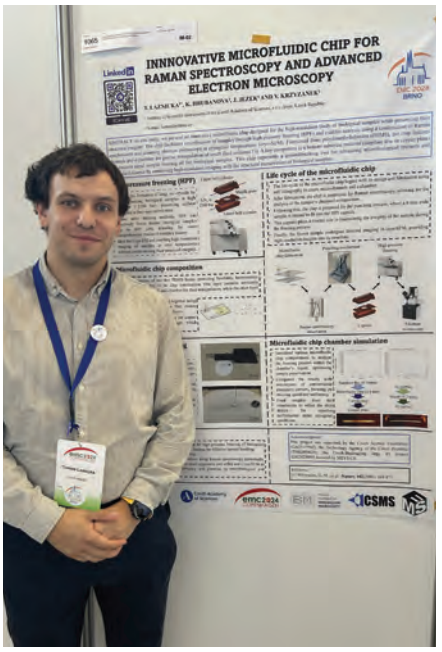


symposia: *"Nanoparticles and catalysis"* and *"metals and alloys"*. It was an opportunity to share my latest findings but also to exchange with other experts of my field about possible direction for future works.

As I am starting my third year of PhD, it was crucial for me to develop my network and to bond with scientists sharing close scientific interest. This will highly contribute to building my professional career.

Tomáš Láznička

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen



I am pleased to provide a report on my participation in the EMC 2024 held at the Bella Center in Copenhagen. The European Microscopy Congress is one of the biggest conferences focused on microscopy (particularly electron microscopy), where lectures were given by experts especially in this field.

Participation in such a top event was a valuable experience for me and contributed significantly to my professional growth. I gained a lot of helpful information during the event.

During the conference, I had the opportunity to attend several lectures and sessions directly related to my dissertation topic. If I had to single out one lecture, it would be "*Prospects of nanofluid cavities for cryo-EM sample preparation*" by Arjen J. Jakobi from TU Delft. Furthermore, the other lectures broadened my knowledge of current trends and advances in microscopy techniques, particularly those relevant to my research. The presentation of my poser, titled "*Innovative microfluidic chip for Raman spectroscopy and advanced electron microscopy*", allowed me to network with experts and, participating in the discussions provided new insights that I plan to incorporate into my work.

The conference atmosphere encouraged discussions that inspired future directions and improvements to my research. I am grateful to the European Microscopy Society for providing me a scholarship and the opportunity to participate in this conference.

Weilun Li

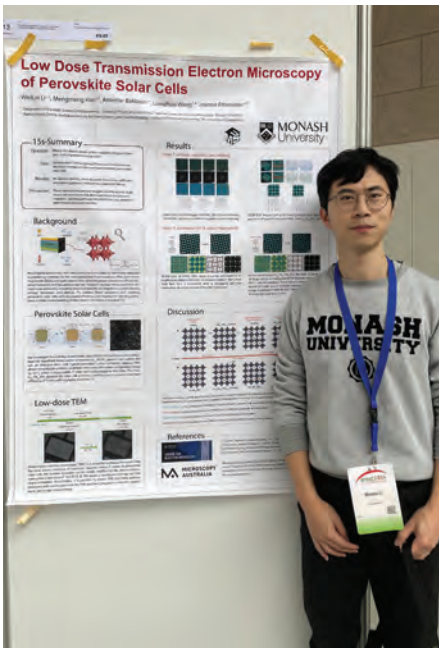
17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

Attending the European Microscopy Conference 2024 was a highly enriching experience for me. The conference provided a platform to delve into the latest innovations and breakthroughs in microscopy, a field I am deeply passionate about. I was particularly drawn to sessions on low-dose electron microscopy, event-based detectors and in-situ experiments, where I gained new perspectives on how these techniques can be applied to my research.

One of the highlights for me was the opportunity to present my work on low-dose TEM in halide perovskites. The positive feedback and interest from the audience were encouraging, and it was rewarding to see my research contribute to the broader discussions within the community. The questions and insights from fellow researchers have inspired new ideas and potential directions for my future work.

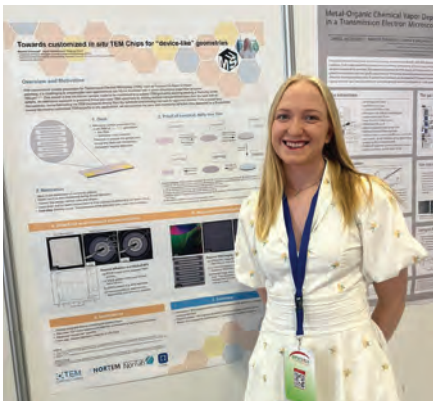
Beyond the sessions and presentations, I had the chance to network with other experts in the field, discussing common challenges and exploring potential collaborations. These interactions were invaluable, as they not only broadened my professional network but also provided fresh ideas for my ongoing research.

Overall, my participation in the European Microscopy Conference 2024 was a significant milestone in my academic journey, leaving me both inspired and motivated to continue pushing the boundaries of what can be achieved with microscopy.



Marthe Linnerud

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen



I had the pleasure of receiving the EMS Scholarship to attend EMC 2024. I travelled with a delegation from the TEM Gemini Centre in Trondheim, Norway. We had a blast! The congress was very exciting, with interesting presentations and fruitful discussions among colleagues. Long days absorbing knowledge from experienced microscopists were followed by friendly dinners with friends and colleagues in the evenings. One of the highlights was of course the JEOL 75th Anniversary.

I was happy to present a poster on my ongoing work. I was lucky enough that there were many people interested in discussing my work. There were rarely any silent moments - within a few minutes, there were new people to talk to. It was great receiving feedback and advice from experienced fellow microscopists.

Thank you for an outstanding, well-organized and successful congress. Looking forward to 2028!

Mairi McCauley

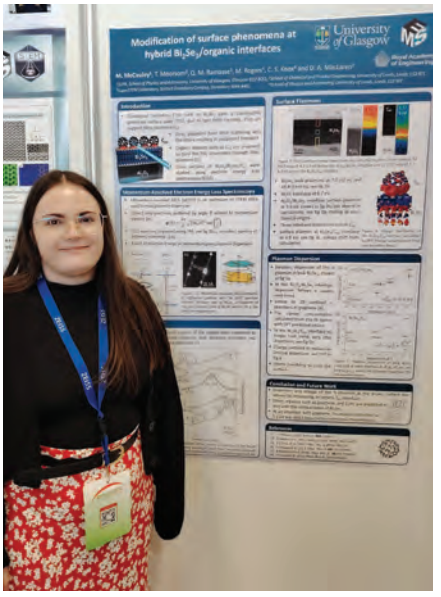
17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

Firstly, I am grateful to the European Microscopy Society for funding my attendance at the European Microscopy Congress in Copenhagen, which took place from the 25th to the 30th of August. This event marked my first international conference experience, and it was a truly enriching and educational week.

During the congress, I had the opportunity to present my poster titled 'Modification of Surface Phenomena at Hybrid Bi2Se3/Organic Interfaces'. The poster session allowed for engaging discussions with other researchers and provided valuable insights, guiding the future direction of my research. The opportunity to network with researchers in similar fields was invaluable.

I attended a wide array of talks which broadened my understanding of different electron microscopy techniques, recent developments and their applications across varied fields. I particularly enjoyed the sessions on EELS which sparked my interest and gave inspiration for my own work. These sessions have significantly broadened my understanding of electron microscopy and its diverse applications, leaving me inspired and more informed about the potential paths my future career could take.

In conclusion, attending EMC was a very enjoyable experience and I look forward to attending future conferences. I am very grateful to the EMS and EMC organisers for the opportunity to attend and contribute to the congress.



Ana-Marija Milisav

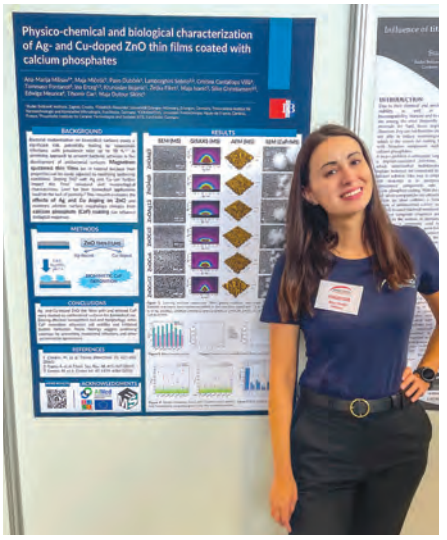
17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

I attended the European Microscopy Congress 2024 in Copenhagen, Denmark, from August 25 to 31, 2024, where I had the opportunity to present my poster titled 'Physico-chemical and biological characterization of Ag- and Cu-doped ZnO thin films coated with calcium phosphates.' The poster attracted attention, and I have received valuable feedback. This feedback helped me consider new methods and ideas, which I plan to integrate into my future research.

The congress was very well organized, with experts from all over the world who gave engaging presentations. I must admit that this was the first congress I attended that had such a huge exhibition area, where I could see the state of the art of microscopy techniques development. The exhibition offered an opportunity to explore cutting-edge instruments, which sparked new ideas for enhancing my research methodology. I was particularly impressed by the possibility of interactive demonstrations and the range of advanced equipment showcased.

In addition to presenting the poster, I volunteered during the event, which gave me a deeper insight into the organization of such conferences and provided a valuable networking experience.

During the congress, I had the opportunity to listen, meet and exchange experiences with experts from various fields of microscopy, which gave me new perspectives on techniques and tools in modern microscopy.



I am grateful to the European Microscopy Society for making this valuable experience possible.

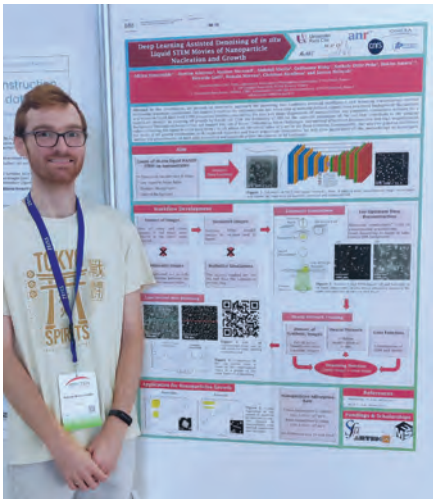
Adrien Moncomble

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

The 17th edition of the European Microscopy Congress (EMC) was held in Copenhagen from the 25th to the 30th of August and was hosted by SCANDEM, the Nordic Microscopy Society. During five days, PhD students, postdoctoral fellows, researchers, professors and professionals from across the world presented their recent advancements in microscopy from a wide range of fields. Thanks to the financial support of the European Microscopy Society (EMS) and the French Microscopy Society (SFμ), I also had the opportunity to attend and to present my PhD work to the community.

As a second-year PhD student working on the implementation of deep learning for the data acquisition and analysis of environmental in situ transmission electron microscopy of nanoparticles, three sessions were of particular interest for me. First, the session on dynamic studies using micro-nano labs offered a view on the progress in the field of liquid cells and electrochemical labs, opening access to a rich variety of processes with a new perspective or that were completely unknown until now. Then, the session on nanoparticles and catalysts was more focused on the study of the evolution of nanoparticles and crystals in different environments. Finally, the machine learning session demonstrated the power of artificial intelligence to simplify and accelerate data acquisition and analysis in different microscopies.

During the congress, I had the opportunity to present two posters on my research at the Matériaux et Phénomènes Quantiques laboratory of Université Paris Cité. In the first, I presented recent results on the denoising of in situ liquid STEM experiments of the growth of gold nanoparticles using neural networks. I showed that we are now able to completely denoise full videos and extract all structural information of interest for a full understanding



and quantitative description of the formation and growth of nanoparticles in liquid media. The second demonstrated the possibility to use neural networks to create quantitative elemental maps of bimetallic gold-copper nanoparticles at atomic scale using a single HAADF-STEM image. This would give us access to chemical composition of individual

atomic columns of nanoparticles as an alternative to energy dispersive X- ray spectroscopy measurements.

The experience of attending this congress was extremely valuable. The wide range of talks that I attended, and discussions provided me not only a deeper understanding of electron microscopy but also broadened my perspective by exposing me to new ideas and expert viewpoints. For all this, I would like to thank the EMS and SFμ for awarding me a scholarship.

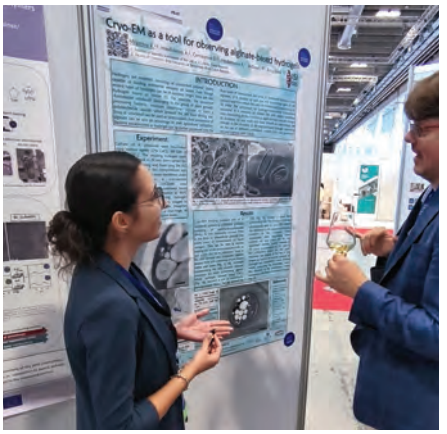
Kateřina Mrázová

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

I would like to sincerely thank the European Microscopy Society for providing me with the scholarship to attend EMC2024 in Copenhagen. This conference gave me a great opportunity to present my poster on "Cryo-EM as a tool for observing alginate-based hydrogels." It was a valuable experience that allowed me to learn about the latest advancements in microscopy and I got the chance to share and discuss my research with a larger audience, which gave me new ideas and suggestions for my future experiments.

The conference had several sessions related to my research interests, especially in volume electron microscopy and cryo-electron microscopy. One of the most interesting parts for me was the lecture by Arjen J. Jakobi on "Prospects of nanofluidic cavities for cryo-EM sample preparation." This talk gave me new insights into cryo-EM techniques, which I found very relevant and motivating for my own work.

Attending EMC2024 was very beneficial for my professional growth. I was able to network with other researchers, share ideas, and explore possible collaborations. The exhibition area was also very interesting, as I could see the latest products and technologies from different companies.



Overall, EMC2024 was a rewarding experience that helped me to expand my knowledge and professional network. I am very grateful to the European Microscopy Society for their support, which made it possible for me to attend this event and gain so much from it.

Kateřina Mrázová, Institute of Scientific Instruments of the CAS, Czech Republic

Hannah Nickles Jakel

17th European Microscopy Congress (EMC 2024), September 25-30 2024, Copenhagen, Denmark

I would like to thank the European Microscopy Society (EMS) for granting me a scholarship and financially supporting my participation in the 17th European Microscopy Congress 2024 in Copenhagen.

My name is Hannah Nickles Jäkel and I have been a PhD student in the European Project "OPINCHARGE" at the Jean Rouxel Institute of Materials in Nantes since 2023. My research focuses on alternative scanning methods in Scanning Transmission Electron Microscopy to advance battery research.

At the conference, I attended a Hyperspy workshop that helped me improve my EELS analysis. I also had the exciting opportunity to present my research with an oral presentation entitled 'Mitigating radiation damage in beam sensitive battery materials by adapting scanning parameters'. In my presentation, I showed that alternative scanning patterns can mitigate damage in LiF, a radiation sensitive battery material. I really enjoyed the discussions I had with other scientists about alternative scanning methods in the days following my talk.

The conference was a great opportunity to meet other scientists and learn from presentations on recent advances in electron microscopy. I particularly enjoyed the talks on in-situ microscopy, which gave me insights into the current state of liquid phase electron microscopy, which I will be focusing on in the coming months.

In conclusion, the conference was a valuable experience and I look forward to future events.

Jaromír Novák

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

First, I would like to thank the European Microscopy Society (EMS) for granting me a scholarship and allowing me to attend the European Microscopy Congress 2024 (EMC2024) held in Copenhagen, Denmark. Being a fourth-year PhD student (almost) at the end of my university journey, and attending the conference bringing together early-career researchers, senior scientists, and leading-edge technology companies, I had the opportunity to present the results of my postgraduate project to a general audience, sharing my passion and interesting results we collected as well as receiving the feedback and inspiration for my future science endeavours.

As a cancer biologist with an interest in mitochondria, I enjoyed most of the time at lectures and poster sessions dedicated to recent discoveries and technologies devoted to life sciences. I had the opportunity to be inspired by various ways to use both light and electron microscopy, and especially a combination of both in the form of correlative approaches, for the investigation of biological processes on scales ranging from Ångström details to whole living organisms. It was a career-advancing experience to have the opportunity to present our work by means of a short talk entitled "Role of Miro1 adaptor protein in mitochondrial mobility between cancer and stromal cells" and I have enjoyed fruitful discussions together with built up new connections after the presentation.

On top of the life sciences dedicated lectures and sessions, I keenly visited plenary talks and got inspired by the paradigm-shifting work of Emma Lundberg and Moritz Helmstaedter and

many other presentations on imaging methods which offered me interesting insights into topics beyond the field of my work. Finally, I would like to thank the organizers of the conference who gave me the opportunity to present my work and successfully put together the meeting, which was full of inspirational presentations and a collaboration-fostering social programme, all in a vivid atmosphere of beautiful Copenhagen.

Noa Olluyn

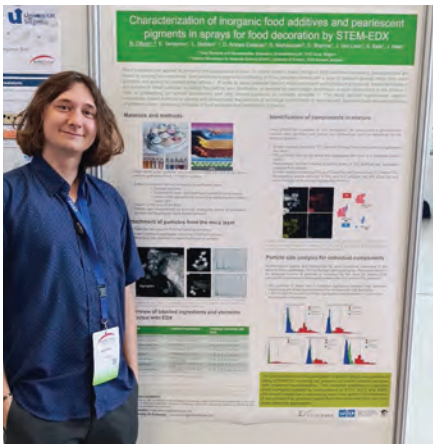
17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

During the EMC24 congress, I had the opportunity to present my research, learn about ongoing research in the field, talk to fellow scientists and visit the beautiful city of Copenhagen.

During the poster sessions, I presented the results from my research on the characterization of inorganic food additives and pearlescent pigments in sprays for food decoration by STEM-EDX. I met a lot of other scientists working in a broad spectrum of fields and had several interesting discussions about the correct labeling of novel food additives, the importance of nano-specific risk assessment for materials applied in consumer products, and about automatic segmentation of transmission electron microscopy images of highly aggregated particles.

I also had the opportunity to view the posters of other junior scientists and PhD students, and discuss materials and methods, image analysis, and the use of AI. Besides the fascinating talks I followed on image processing, spectroscopy at the nanoscale, in-situ microscopy and three-dimensional imaging, I also had the opportunity to follow the plenary sessions given by esteemed researchers on their results and methods. Although these weren't always directly applicable to my research, the experience still expanded my understanding of the field of microscopy as a whole.

During the breaks, I visited the exhibitor booths and talks, and attended the reveal of the new, fully integrated and advanced Thermo Scientific Iliad (S)TEM, and two workshops on the TALOS and SPECTRA (S)TEMs. Furthermore, I also followed a workshop at Delong Instruments on their LVEM 5 benchtop electron microscope, and at Zeiss on the use of virtual reality during image segmentation.



Overall, EMC24 was a truly fascinating experience with many opportunities to invest myself in the research landscape, talk to fellow scientists, and broaden my understanding of advanced materials and the many ways to study them.

Noa Olluyn, Sciensano – University of Antwerp
Noa.olluyn@sciensano.be

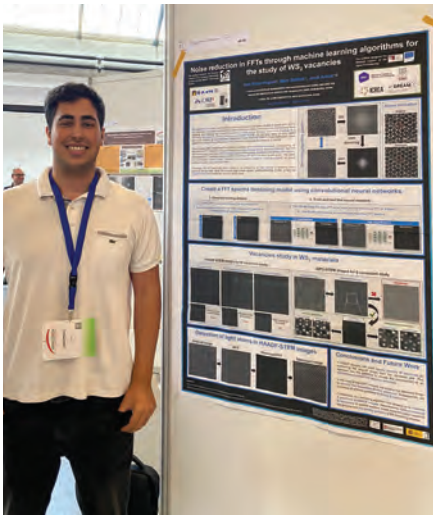
Ivan Pinto-Huguet

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

I am Ivan Pinto-Huguet, a PhD researcher in the Group of Advanced electron Nanoscopy (GAeN) at the Catalan Institute of Nanoscience and Nanotechnology (ICN2). I would first like to express my gratitude to the European Microscopy Society for supporting my attendance at the 17th European Microscopy Congress (EMC2024), held in Copenhagen, Denmark, from August 25th to 30th, 2024.

At this conference, I presented one of my latest results in quantum computing materials and machine learning (ML) methodologies applied to electron microscopy data. My presentation was a poster titled "FFT Denoising Methodology through CNN for the Study of WS_3 Vacancies," in which we detect W and S vacancies in HAADF-STEM and iDPC images.

Beyond sharing my research, this conference has been an invaluable opportunity to broaden my knowledge on recent advances in electron microscopy and its applications in materials science. It has also allowed me to explore new collaborative opportunities and expand my professional network. These experiences will undoubtedly contribute to the advancement of my career as a researcher.



Merjem Purelku

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

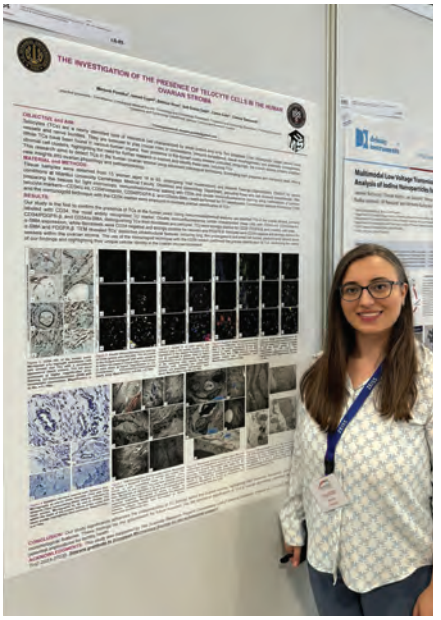
I had the privilege of attending the 17th European Microscopy Congress (EMC2024) in Copenhagen, Denmark, from August 25 to August 30, 2024, where I presented my poster titled "The Investigation of Telocyte Cells in the Human Ovarian Stroma."

During the congress, I engaged with a diverse group of scientists and researchers, discussing the latest advancements in microscopy and cell biology. My poster presentation attracted attention from experts interested in telocyte research, providing me with valuable feedback and new perspectives on my work. It was a productive opportunity to exchange ideas, especially in exploring the role of telocytes in ovarian physiology and pathology.

The congress also allowed me to attend numerous sessions and talks, broadening my knowledge of cutting-edge techniques in microscopy and related fields. The interactions I had with other attendees have sparked new ideas and potential collaborations for future research.

I am grateful to the European Microscopy Society (EMS) for supporting my attendance through their scholarship, and I made sure to acknowledge this in my presentation. The experience has been immensely enriching, and I look forward to applying the insights gained in my future work.

Kind regards,
Merjem Purelku



David Llorens Rauret

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

I would like to express my sincere gratitude to the European Microscopy Society for the opportunity to attend EMC2024 in Copenhagen. The conference was an inspiring experience that immersed me in the latest advances in microscopy, with talks and posters that showcased the incredible diversity of research happening in this field.

One of the highlights was presenting my work, *"TEM Exploration of High-Performance Non-Noble Metal Catalyst for OER,"* to an audience of experts. This was a valuable opportunity to share my research and receive feedback from leaders in the community. Beyond the presentations, reconnecting with colleagues and meeting new researchers in Copenhagen added so much to the experience, giving me fresh perspectives and ideas for future work.

Copenhagen itself was an exciting and vibrant setting for the conference, making the overall experience even more memorable. I am very grateful to the Society for this enriching experience and am already looking forward to the next conference. Thank you again for

the support and the chance to be part of such an inspiring event.

Hakan Sahin

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

I had the privilege of attending the European Microscopy Congress 2024 (EMC2024), where I presented a poster titled "Investigating nanoparticle interactions with the human blood- brain barrier in vitro". This event provided an invaluable opportunity to engage with leading researchers and professionals from diverse fields of microscopy and nanotechnology.

During the congress, I was able to discuss my research with experts, receiving valuable feedback that will inform the next steps of my project. The sessions on advanced imaging techniques were particularly beneficial, as they directly relate to the methodologies I am employing in my work. Furthermore, I participated in workshops that expanded my knowledge of emerging technologies, which I plan to incorporate into my research.

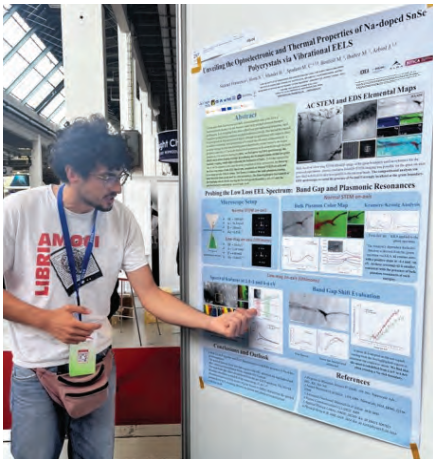
Beyond the scientific aspects, attending EMC2024 allowed me to network with fellow researchers, building connections that may lead to future collaborations. I am extremely grateful to the European Microscopy Society for awarding me the scholarship, which made my participation in this event possible.

Francesco Salutari

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

My name is Francesco Salutari and I am a PhD student at ICN2 in Barcelona. My PhD focuses on applying advanced electron microscopy tools and related spectroscopies to unveil the physical properties of inorganic materials for energy applications. On the occasion of the EMC2024 held in Copenhagen from the 25th to the 29th of August, I presented a poster in which case study revolves around the characterization of Tin Selenide polycrystals doped with Na for thermoelectric applications. Overall, the conference was a blast: the sense of community was very palpable, and the level of fruitful discussions was unprecedented. Many oral talks and poster presentations are still stuck in my mind and were all sources of strong inspiration for my own work.

I would like to send a big thank you to the EMS for supporting my attendance at the conference. Also, I would like to acknowledge the organizers of the event for their hard work and constant availability throughout the conference. Finally, my gratitude goes to my group leader and colleagues for sharing this wonderful experience with me.



Léon Schmidt

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

My name is Léon Schmidt and I am a 2nd year PhD student at the Institute of Physics and Chemistry of Materials in Strasbourg (IPCMS), France. From August 25 to August 30, 2024, I participated in the 17th European Microscopy Congress EMC2024 in Copenhagen, Denmark.

During this congress, I had the pleasure to share my work titled "**Correlative study of hematite-based photoanodes for solar water splitting by transmission electron and X-ray microscopies**", in session topic PS-04 (Materials for Energy Conversion and Storage), in the form of a poster presentation. The poster sessions allowed for very enriching interactions with other researchers, allowing me to come back to the laboratory with a lot of new insights and ideas regarding my project but also microscopy in general.

Similarly, I enjoyed the very well varied and balanced symposia where a lot of interesting talks were held, ranging from studying applied materials with complex compositions, to cutting-edge instrumental development revealing new horizons for what we can do with the microscopes, as well as talks highlighting the developments that have been going on in the last few decades, showcasing how far this field has come.

Finally, I would like to thank the congress organizers for their work setting up such a successful event, and especially for **European Microscopy Society** (EMS) as well as the French National Microscopy Society, **Société française des Microscopies** (SFμ) for their financial support allowing me to take part in EMC2024.

Ioannis Sciachos

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

Dear EMS secretary and Treasurer Prof. Dr. Christian Schöfer,

I would like to thank you for the opportunity you gave me to attend the 17th European Microscopy Congress (EMC2024) held in Copenhagen from August 25-30, 2024. This event brought together leading experts, researchers, and professionals from around the world to discuss the latest developments in electron microscopy and its applications.

During the congress, I had the opportunity to present my work titled "In-situ (S)TEM Investigation of Phase Transformation in Ni-Rich Cathodes during Li de-intercalation" in the consortium of "Materials for Energy storage and Conversion". I received significant interest and engagement with researchers, also I found the questions extremely fruitful as the presented work will be the main chapter of my thesis so they will get me more prepared for my PhD thesis defence. Undoubtedly my experience from the conference would enhance the quality and impact of my work.

In addition to presenting my research, I attended a number of keynote lectures, based on energy materials, 4D-STEM, EELS workshops. These sessions expanded my knowledge of cutting-edge microscopy techniques and introduced me to novel applications that I can incorporate into my own research.

The networking opportunities at EMC2024 were invaluable. I established connections with several

well-established researchers, some of whom have expressed interest in potential future collaborations or even hiring me in their groups, as I am about to submit my thesis. These interactions will contribute greatly to my academic and professional growth.

Thank you once again for this opportunity. Best regards, Ioannis

Charlotte Seydel

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

From August 25 to August 30, 2024, microscopists from all over the world gathered in Copenhagen, Denmark for. The conference was opened by Eva Olsson (Chalmers University of Technology, Gothenburg, Sweden), followed by an interesting first plenary by Carolyn Larabell (University of California, San Francisco, USA) about the use of soft X-ray tomography in life sciences, enabling imaging in a near native state.

The number of women in the opening ceremony, plenary talks and as (invited) speakers and chairs was very motivating. As a young woman pursuing her PhD at a university where the majority of professorships is held by men, it is encouraging to see so many successful women of all ages represented in the conference. The variety of presented topics showcased how versatile and powerful electron microscopy can be. Many talks also touched upon the application of artificial intelligence to process large datasets, for example from volume EM, and showed how AI has gained a lot of traction within the community in the last years. It was quite inspiring to see how many different workflows and software solutions were used to deal with the increasing amounts of generated data efficiently. Within the life science sessions, it became apparent that also advances in sample preparation and imaging techniques will fuel new discoveries, enabling imaging closer to the natural state, not only of small particles, but whole organisms. Implementing correlative approaches was covered by many talks as well, and not only the classical combination of fluorescent and electron microscopy, but also establishing techniques like time-of-flight secondary ion mass spectrometry as imaging method, as presented by Claire Seydoux (Laboratoire Modélisation et Exploration des Matériaux, Grenoble, France).

This conference helped broaden my horizon and made me aware of many new approaches in (electron) microscopy, as well as providing a perfect environment for networking with other scientists and companies. I am very grateful to the EMS for supporting my attendance at the EMC2024 and the organisers of the congress for the opportunity to participate and present my own work.

Zehra Sezer

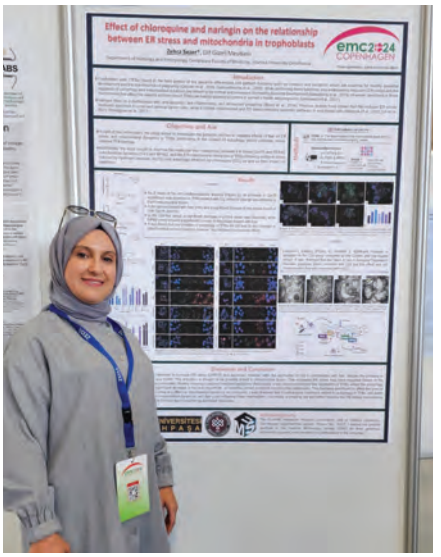
17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

I had the honor of participating in the 17th European Microscopy Congress (EMC17) in Copenhagen, Denmark, between August 25 and 30, 2024, a privilege made possible by a scholarship generously provided by the European Microscopy Society (EMS). This congress provided me the opportunity to connect with fellow researchers, present my work, and stay updated with the latest advancements in microscopy. It also facilitated the exchange of knowledge regarding the common challenges faced in laboratory work, primarily through the multitude of microscopes and promotional materials showcased.

The conference kicked off on Sunday, August 25th, with a series of workshops leading up to the grand opening ceremony. I had the privilege of participating in a workshop entitled "AI in Microscopy," led by Prof. Jon Sporring. The workshop provided a comprehensive understanding of using QuPath and Python tools for image analysis, specifically designed for life scientists involved in microscopic research. The insights gained from the workshop significantly enhanced my understanding of the potential applications of artificial intelligence in imaging and scoring techniques, offering fresh perspectives for my research.

Throughout the congress, the agenda was filled with presentations from scientists and demonstrations from companies specializing in microscopy. During the poster session on August 27th, I had the privilege of presenting my work entitled "Effect of Chloroquine and Naringin on the Relationship between ER Stress and Mitochondria in Trophoblasts." Despite the large attendance, making the session quite intense, I received precious feedback on my work, particularly on the methodology and potential applications, and got new ideas for future directions.

My participation in the EMC17 in Copenhagen was an incredibly



enriching experience that significantly contributed to my growth as a researcher. I am grateful to the European Microscopy Society for their generous support, which made this experience possible. I look forward to continuing our professional relationship in the future.

Pavlína Sikorová

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

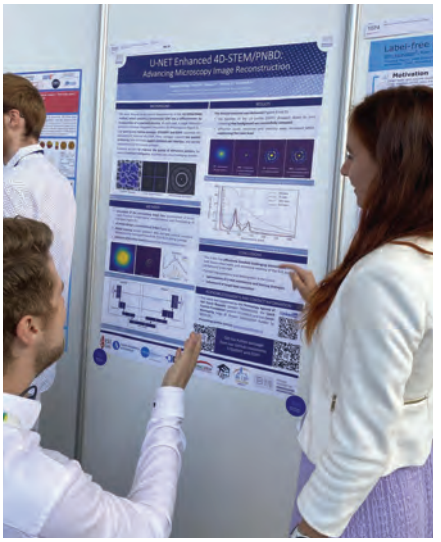
Let me share my recent experience at the EMC24 International Congress in Copenhagen, which I was able to attend because of the EMS scholarship.

With the help of this sponsorship, I was able to take part in this important event and present my work, "U-NET Enhanced 4D-STEM/PNBD: Advancing Microscopy Image Reconstruction", in person (the on the next page shows my conversation about the poster with one of the participants who was interested in this topic).

It was a highly satisfying experience to present my study to an experienced audience. I got the chance to share my research with other experts in the field. Meeting and getting to know others working on related subjects was also a terrific experience that hopefully may result in future partnerships.

There were plenty of fascinating sessions at the conference. The latter two days were especially interesting to me since they covered topics that are directly connected to my study, such as image processing and machine learning.

I was happy to see that the research of Ms. Karina Ruzaeva (her talk took place on the 28th of August with the title “Unsupervised Machine Learning-based STEM diffraction pattern denoising for enhanced grain visualization in phase change materials“) somewhat overlaps mine, in terms of having the same goal but doing it differently and for a different purpose. Seeing her



work broadened the possibilities and ideas for my own research, it was very inspiring.

The previous life sciences sessions were intriguing despite being a bit unrelated to my primary topic of study and provided me with a more comprehensive insight into various applications of microscopy.

I had a great time at the EMC24 overall, being it my first large congress during my PhD studies. I am sure I will benefit greatly from being able to learn from others, share my work.

I sincerely appreciate the chance. Thank you.

Yours faithfully,
Pavlína Sikorová

Tigran Simonian

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

First and foremost, I would like to express my sincerest gratitude to the European Microscopy Society (EMS) for the generous support, which allowed me to attend the 17th European Microscopy Congress in Copenhagen, Denmark. It was an amazing conference, packed with many wonderful talks, posters, and activities.

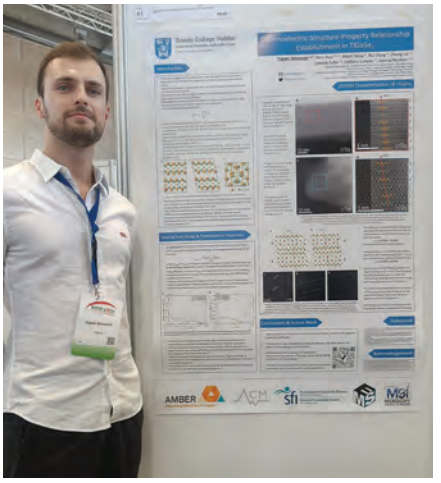
There was a wonderful range of presentations, ranging from material science, to ptychography, to cryo-EM advances. The presentations were also of exceptional quality.

I was particularly intrigued by the new developments in instrumentation that were announced at the conference, such as performing near-atomic resolution EELS mapping at accelerating voltages as low as 30 kV.

Held between August 25th - 30th, 2024, EMC 2024 was a great chance to discuss microscopy with researchers from around the world in the lovely Danish sunshine, and to catch up with friends that I've made over the course of my studies.

As I am nearing the end of my PhD studies, it was an excellent opportunity to showcase some of my research that I worked hard on over the years. I presented my work on "thermoelectric structure-property relationship establishment in $TlGaSe_2$" and was delighted by the amount of interest and engaging discussion I had on the topic.

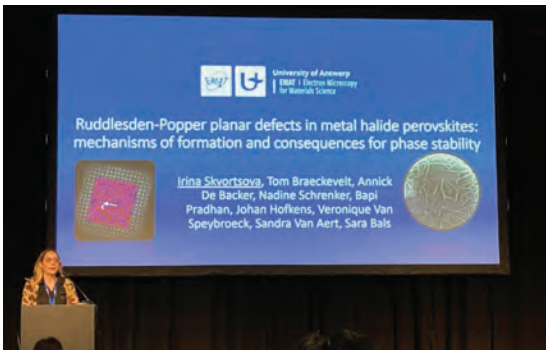
Attending EMC 2024 was an excellent opportunity, which I enjoyed greatly, and I wish to thank EMS again for the support.



Irina Skvortsova

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

EMC2024 was my first conference outside Belgium. I saw not only plenty of interesting talks related to the microscopy techniques but also about metal halide perovskites, materials, which I have been working with for several years. Of course, I devoted a lot of attention to low-dose TEM techniques and imaging with direct electron detectors since perovskites are beam sensitive materials. My colleagues from EMAT visited this conference as well and it was nice to become closer with them. In addition, we communicated a lot with people from the other countries/groups to establish possible collaborations in the future. My presentation was on the last day in the PS-01 section, but it was great to see some enthusiastic people with questions. Overall, I was surprised how nicely the conference was organized, I liked that there were so many participants from different scientific fields.



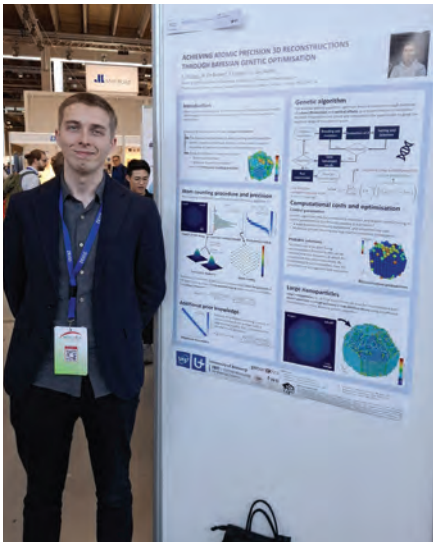
Tom Stoops

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

My name is Tom Stoops, and I'm a PhD student at the University of Antwerp working in the electron microscopy for material science (EMAT) group. My daily research revolves around the quantification of STEM images to study the 3D characteristics and dynamics of nanoparticles. I want to thank the European Microscopy Society (EMS) for financially supporting my participation in the 17th European Microscopy Congress (EMC2024) held from August 25th to August 30th of 2024 in Copenhagen, Denmark.

Attending EMC2024 provided a unique opportunity for me to connect with fellow researchers and experts in our field. The week was filled with inspiring talks. Some closely related to my topic, in particular, the lectures on 4D-STEM were inspiring and stimulating. Other lectures broadened my horizon; highlighting the diversity in the field of microscopy. Each day concluded with inspiring poster sessions where the knowledge and ideas were exchanged as fluidly as the accompanying drinks.

Another valuable point of the conference to me, as a more theoretically inclined researcher, was the exhibition area where vendors showcased the latest advancements in microscopy equipment. I greatly appreciated the close contact with these vendors, who were always eager to teach me more about their products and how they contribute to the data my colleagues acquire. Simultaneously broadening my technical knowledge and bridging the gap between theory and practical applications. This gave me an even deeper understanding and appreciation for the experiments performed in our lab.



In conclusion, my participation in the conference was an invaluable experience. I am sincerely grateful to the EMS for generously supporting my attendance.

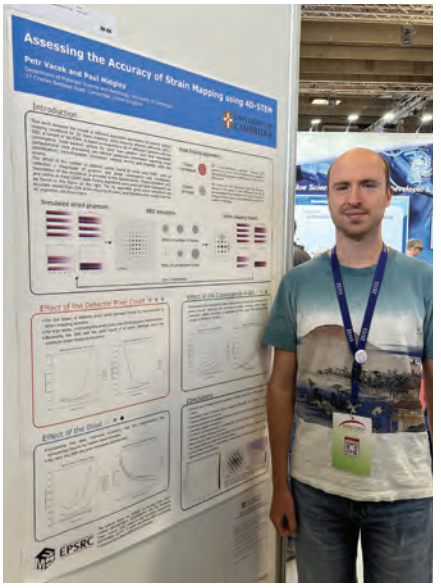
Petr Vacek

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

The European Microscopy Congress (EMC24) brought together scientists and researchers not only from Europe, but also from all across the world. Held in Copenhagen, Denmark, the conference featured an extensive lineup of talks, seminars, and workshops led by leading experts in microscopy. These sessions covered a broad spectrum of topics, ranging from advances in electron microscopy to emerging techniques in sample preparation and data analysis. EMC24 serves as a valuable platform for identifying current hot topics and trends in electron microscopy. The presentations and discussions revealed several areas of interest, including machine learning and image analysis, cryo-electron microscopy, and 4D-STEM techniques, including ptychography.

I was particularly interested in recent developments in strain mapping using 4D-STEM. There were many presentations that included strain mapping, so there were many opportunities to see the recent applications and new possibilities of this technique. My own contribution was a poster presentation titled Assessing the Accuracy of Strain Mapping using 4DSTEM. It was about the influence of experimental parameters on the accuracy of strain mapping, and the goal was to give guidelines on how to acquire high-fidelity strain mapping dataset. I also enjoyed the opportunity to meet with my collaborators from different countries and to see the latest developments in electron microscopy instrumentation.

EMC24 provided a platform for knowledge exchange, insightful talks, exposure to the latest trends in electron microscopy, and the opportunity to present research findings. I thank the European Microscopy Society for supporting my attendance.



Sara Villa

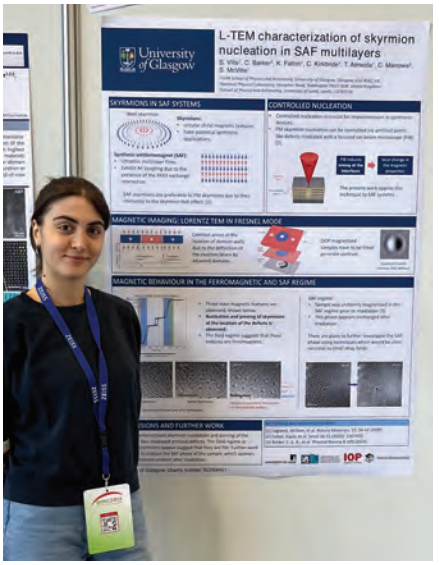
17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

The European Microscopy Congress (EMC) took place in Copenhagen from August 25th to August 30th, 2024, bringing together researchers and industry experts from all over the world to discuss all aspects of microscopy. The symposia covered a wide range of topics, from materials science to instrumentation design and development. I particularly enjoyed the symposium titled "Magnetic, Ferroelectric, and Spintronic Materials", which included talks on magnetic imaging techniques central to my PhD research.

With the support of the European Microscopy Society (EMS), I had the opportunity to present my work titled "Lorentz TEM characterization of skyrmions in synthetic antiferromagnetic multilayers". This work, conducted within the Materials and Condensed Matter Physics Group at the University of Glasgow, investigates the possibility of controlling the nucleation of magnetic skyrmions by creating artificial defects using a focused ion beam (FIB) microscope. I was grateful to share my findings with fellow researchers and PhD students: their questions and insightful comments offered me new perspectives on my research.

EMC also provided a great opportunity to learn about the current landscape of electron microscopy research and have a first-hand look at the latest state-of-the-art microscopes shown at the exhibition. It allowed me to explore fields of microscopy I am unfamiliar with while also networking with fellow researchers in my field. Aside from the conference itself, it was great to spend some time in Copenhagen, which is a beautiful and lively city, and the perfect location for an international conference such as this one.

I would like to thank EMS and the Royal Microscopy Society (RMS) for supporting my attendance at the conference. I am sure that the knowledge and insights I gained will be of great helps as I approach the end of my PhD.



Sara Villa, University of Glasgow

Jing Yu

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

My name is Jing Yu, and I am currently working at the Catalan Institute of Nanoscience and Nanotechnology (ICN2) and the Catalan Institute for Energy Research (IREC), where I specialize in battery material science combined with advanced microscopy techniques, including AC-TEM. I had the honor of delivering an oral presentation titled *"Cation Vacancies Regulate the Electron Spin Configuration of Cathode Catalytic Additives Towards Robust Li-S Batteries"* at the 17th European Microscopy Congress 2024. The symposium, held in a seminar room with over 200 attendees, provided an excellent platform for engaging with researchers and experts in the field. It was a great experience to share my latest work and discuss its broader implications with such a diverse and knowledgeable audience.

I would like to express my sincere gratitude to the European Microscopy Society for their generous scholarship, which enabled my participation in this impactful conference. The event offered a unique opportunity to deepen my understanding of cutting-edge developments in microscopy and materials science, and I look forward to applying the insights gained to further advance my research.

Yucheng Zou

17th European microscopy congress (EMC2024); 25-30 August, 2024; Copenhagen

First of all, I would like to thank the European Microscopy Society (EMS) for the scholarship which supported me to attend the 17th European Microscopy Congress on 24-30 of August 2024 in Copenhagen. This congress was so amazing and impressive.

My name is Yucheng Zou, a PhD student in the Juelich research center. This was my first time attending an international congress, I was shocked by the scale, there were so many researchers from all around the world and gave so many interesting communications. Many companies also participated in this congress, with many new and interesting products, especially using VR glasses to analyze data I found in Zeiss, that is so amazing.

Everyday there has many different small lecture theaters for different topic talk, I was also having a talk in Thursday afternoon, the lecture theater's topic was "diffraction techniques and structural analysis", the first talk in this lecture theater was gave by Colin Ophus, who is a very famous researcher in 4DSTEM field. My topic is "Simultaneous nanoscale mapping of strain and electromagnetic field in semiconductor and magnetic structures using 4DSTEM".

In this work, I map the electric/magnetic field only from the dark field disk simultaneously. This method is extremely suitable for low dynamic range detectors with in-situ 4DSTEM experiments. I first showed how I can do that with a diagram, then I proved that the electric field calculated from the bright field is equal to the electric field calculated from the dark field. Besides, map the strain from the dark field. After that, I applied this method with an in-situ straining 4DSTEM experiment with a low dynamic range detector, so that I can map strain and field only from

strain setting dataset. I received some very useful questions and suggestions after my talk. Many helpful discussions gave me more ideas to update my work, and promote my results.

This conference really helped me a lot with my work. Besides the formal meeting, I also attended the preworkshop about Hyperspy, which gave me many useful analyses of python code about EELs and EDX.

Notes

Outstanding Paper Awards for 2024

Report on the Outstanding Paper Award – Instrumentation and Technique Development

J. F. Ortas, Pierre Mahou, S. E., C. Stringari, N. N. B. David, L. Bally Cuif, N. Dray, M. Négrerie, W. Supatto, E. Beaurepaire, Label-free imaging of red blood cells and oxygenation with color third-order sum-frequency generation microscopy, *Light: Science & Applications*, **12**, 29, 2023. https://www.nature.com/articles/s41377-022-01064-4

Biological tissues and organisms rely on red blood cells (RBCs) for oxygen delivery. High-resolution mapping of hemodynamics and blood oxygenation is essential for accurate analysis of tissue metabolism. Microscopy techniques such as those based on two-photon excitation, require the use of external labels and often face limitations in imaging depth and temporal resolution. To overcome these challenges, we introduce a novel, label-free imaging technique.

Our method, called color third-order sum frequency generation (color TSFG), consists of wavelength mixing of two infrared femtosecond laser pulse trains in the sample and the simultaneous detection of several third-order signals resulting from third-harmonic generation (THG) and TSFG processes ***(Figure 1a)***.

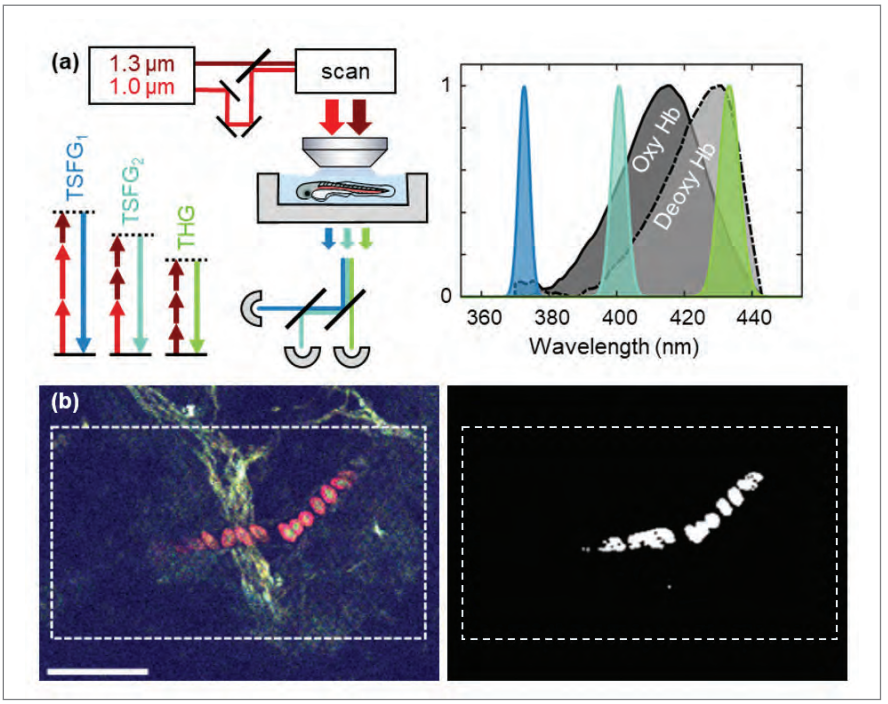


Figure 1. (a) Principles and experimental setup scheme of TSFG microscopy. (b) TSFG image of RBC flowing through a small capillary (left) and the automatic segmentation allowed by TSFG imaging (right). Scale bar: 50 µm.

THG microscopy is typically used to visualize tissue morphology by highlighting interfaces and optical heterogeneity, complementing fluorescence imaging of labeled structures. However, a less generalized feature of THG imaging is the enhancement of the signal in the presence of strong absorbers, such as hemoglobin, the oxygen-carrying molecule in RBCs.

In our study, we analyzed the spectral dependence of THG and TSFG signals from isolated human and zebrafish RBCs. We observed a strong resonance enhancement in these signals near hemoglobin's absorption peak in the 415–430 nm range, known as the Soret band. This three-photon resonance shifts depending on RBC oxygenation levels.

We further demonstrated that the spectral properties of color TSFG images can effectively detect RBCs in live zebrafish embryos with high specificity. By calculating the ratio of a resonance-enhanced image to a simultaneously acquired non-resonant image, RBCs are selectively highlighted and can be automatically detected ***(Figure 1b)***.

Additionally, we discovered that the ratio between two images obtained at different wavelengths within the hemoglobin-resonant part of the THG spectrum can be used as an oxygenation probe. This approach allowed us to monitor RBC oxygenation changes in live zebrafish embryos with pixel times in the microsecond range.

Finally, we showed that color TSFG can be seamlessly integrated into a three-photon (3P) microscope using an optical parametric amplifier (OPA) laser source operating at 1 MHz. 3P microscopy offers greater imaging depth compared to two-photon microscopy. Using color TSFG, we achieved label-free, RBC-specific contrast at depths exceeding 600 µm in the brain of a live adult zebrafish.

In conclusion, this work introduces a new multiphoton imaging modality that enables high-resolution probing of RBC distribution and oxygenation. Compatible with 3P microscopy, this technique broadens the range of observable parameters in deep tissue imaging. ■

Júlia Ferrer Ortas

1. Reference: Ferrer Ortas, Júlia, et al. "Label-free imaging of red blood cells and oxygenation with color third-order sum-frequency generation microscopy." Light: Science & Applications 12.1 (2023): 29.

Report on the Outstanding Paper Award – Material Science

M. Monai*, K. Jenkinson*, A. E. M. Melcherts*,J. N. Louwen, E. A. Irmak, S. Van Aert, T. Altantzis, C. Vogt, W. van der Stam, T. Duchoň, B. Šmíd, E. Groeneveld, P. Berben, S. Bals, and B. M. Weckhuysen, Restructuring of titanium oxide overlayers over nickel nanoparticles during catalysis, Science **380**, 644–651, 2023. https://www.science.org/doi/epdf/10.1126/science.adf6984

Understanding the dynamic behavior of catalysts under reaction conditions is crucial for developing next-generation materials with improved performance. The paper, *"Restructuring of Titanium Oxide Overlayers over Nickel Nanoparticles during Catalysis"*, presents an important study that exploits operando Scanning Transmission Electron Microscopy (STEM) to reveal the real-time evolution of strong metal support interactions at catalyst surfaces.

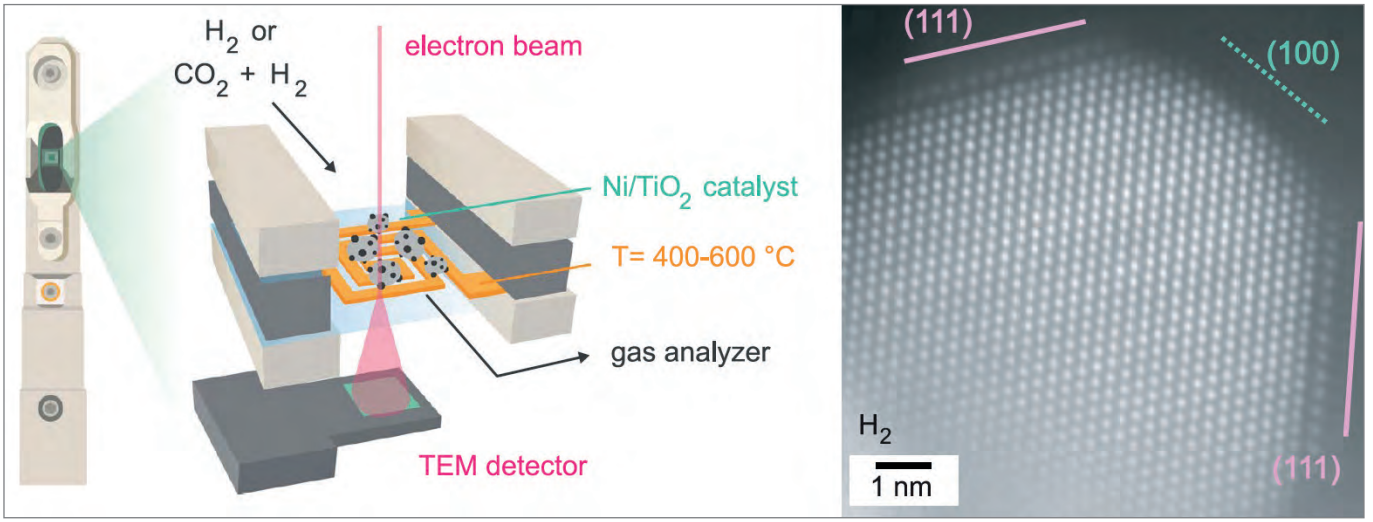
Using a combination of in-situ STEM, operando infrared spectroscopy, and density functional theory (DFT) calculations, the study investigates how TiOx overlayers on Nickel catalysts restructure under catalytic conditions. The results demonstrate that these overlayers, formed during high-temperature reduction, can dynamically reconfigure depending on the reaction environment, leading to changes in catalytic activity and selectivity.

A major advancement in this study is the use of operando STEM in a gas-cell environment, allowing to observe structural changes at the single-particle level under realistic reaction conditions. This pushes the boundaries of electron microscopy, enabling real-time tracking of atomic-scale transformations in nanocatalysts. The study also introduces advanced image processing techniques, including neural network-assisted data restoration and statistical parameter estimation, which improve resolution and quantitative analysis of dynamic interfaces.

These findings challenge the traditional static model of Strong Metal-Support Interactions (SMSI) and highlight the necessity of operando electron microscopy for accurately describing catalyst behavior. The insights gained not only advance our understanding of metal-support interactions but also open new possibilities for designing high-performance catalysts for applications such as CO_2 hydrogenation and sustainable chemical conversion.

By setting a new benchmark in TEM-based catalyst characterization, this study exemplifies how cutting-edge microscopy techniques continue to transform materials science and catalysis research. ■

Sara Bals

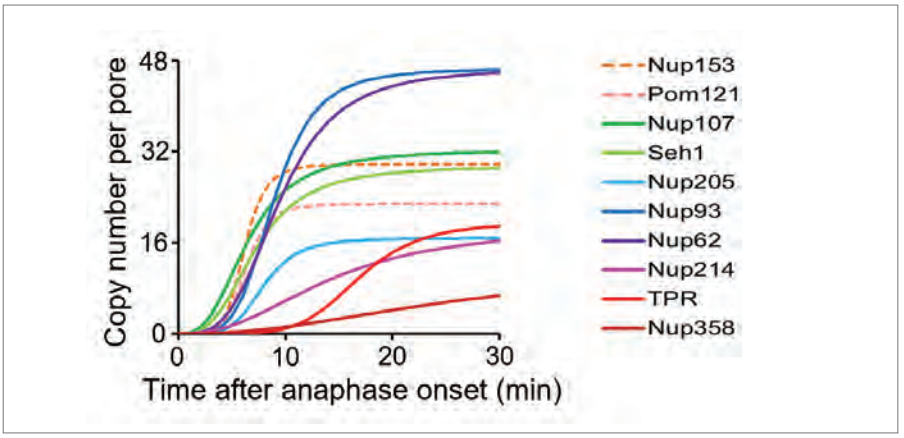


Left: illustration of the gas cell system using in the study. Right: TiOx overlayers on Nickel catalysts, which were found to be present in a facet-depending manner.

Report on the Outstanding Paper Award – Life Science

S. Otsuka,J. O. B. Tempkin, W. Zhang, A. Z. Politi, A. Rybina, M. J. Hossain, M. Kueblbeck, A. Callegari, B. Koch, N. R. Morero, A. Sali & J. Ellenberg, A quantitative map of nuclear pore assembly reveals two distinct mechanisms, *Nature* **613**, 575-581, 2023. ***https://www.nature.com/articles/s41586-022-05528-w***

Most of our genetic material is contained in the nucleus within our cells. Nuclear pore complexes (NPCs) are the gateways that mediate all transport in and out of the nucleus. How the individual components assemble into a functional NPC is not understood. In this paper, we for the first time provide a step-by-step guide to NPC assembly. We approached the scientific question by applying quantitative live imaging and modelled the results with a previous set of data, originating from a correlative light-electron microscopy study (CLEM).



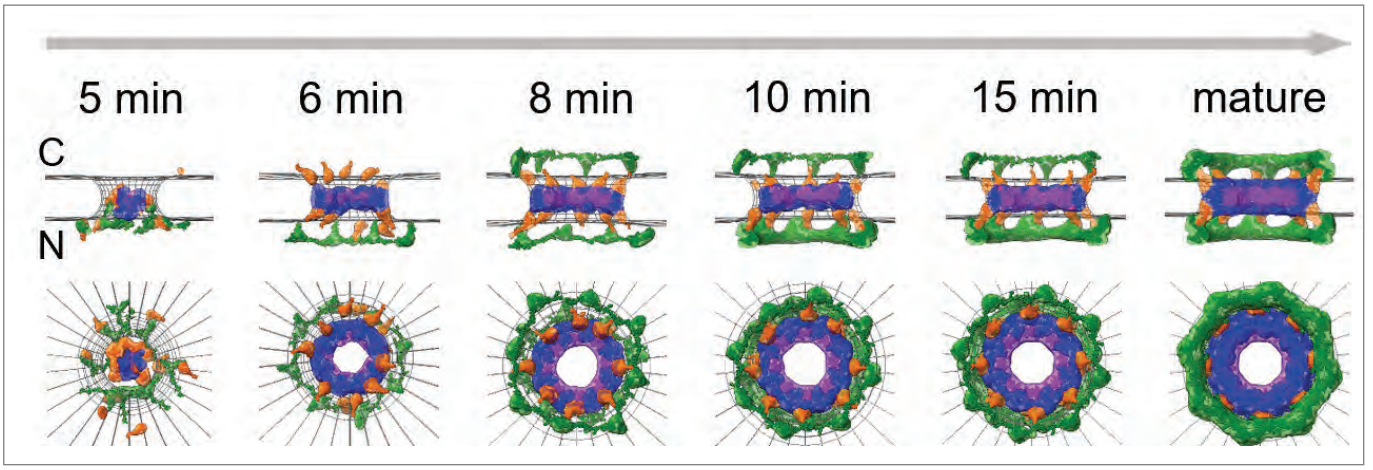
The average copy number per nuclear pore computed from mathematical modelling for interphase assembly

The NPCs consist of 8-48 copies of over 30 different proteins. Hundreds of individual proteins are required to build just one NPC, of which there are thousands embedded in the nuclear envelope of a single cell.

Due to the complexity of NPCs and the fleeting nature of the assembly events, it has been technically challenging to study the assembly of these structures. To overcome the challenges, we utilized a quantitative fluorescence imaging approach (fluorescence correlation spectroscopy-calibrated live cell imaging). This method allowed us to count the absolute number of proteins involved in a specific process in the cell over time.

We started by fluorescently tagging nucleoporins, the basic building blocks of NPCs, using genome editing. With the quantitative imaging approach, we were able to quantify how the protein's copy numbers change during the assembly of NPCs. We had also previously obtained structural models of NPC assembly through correlative light-electron microscopy, which we then integrated with this new live data using computational modelling tools. Utilizing the quantitative information on protein copy numbers over time, we were able to propose a detailed structural model of NPC assembly post cell division. Beyond the NPC, our "hybrid" approach—integrating quantitative fluorescence live-cell imaging with existing structural data—could serve as a promising strategy for advancing our understanding of the assembly mechanisms of other molecular machines within the cell. ■

Shotaro Otska



The best-scoring model of the postmitotic assembly pathway (top and side views). The uncertainty of each Nup localization is indicated by the density of the corresponding colour. The Y-complex is shown in green; an isolated fraction of Nup155 that is not forming a complex with Nup93, Nup188 and Nup205 is shown in orange; Nup93–Nup188–Nup155 and Nup205–Nup93–Nup155 complexes are in blue; and the Nup62–Nup58–Nup54 complex is in purple.

EM awards

Report on the 2024 European Microscopy Award Recipient: Prof. Tomáš Čižmár (Life Sciences)

Tomáš Čižmár, Institute of Scientific Instruments of CAS, Brno, Czech Republic and from Friedrich-Schiller University Jena, Germany. Category Life Sciences. Awarded for his pioneering developments in the realm of deep-tissue endo-microscopy in vivo that have had a strong impact in medical imaging and neuroscience research.

Deep brain imaging has long been constrained by tissue scattering and absorption, limiting resolution and depth in microscopic imaging. Recently, holographic endo-microscopy has emerged as a promising approach, leveraging ultra-thin multimode fibres (MMFs) and wavefront shaping to achieve sub-cellular resolution with minimal invasiveness. This technique enables detailed visualization of neurons, blood vessels, and intracellular signalling at unprecedented depths, providing critical insights into brain functions and offering transformative possibilities for neuroscience research.

The principle of MMF-based endo-microscopy harnesses the linear, deterministic nature of light transmission through MMFs, and it involves coupling highly precise spatial distributions of light into a multimode fibre. Imprinting the appropriate wavefront by a spatial light modulator (SLM), produces a diffraction-limited focus behind the fibre's output extremity[1]. Generating rapidly alternating sequence of such foci across the chosen focal plane is exactly

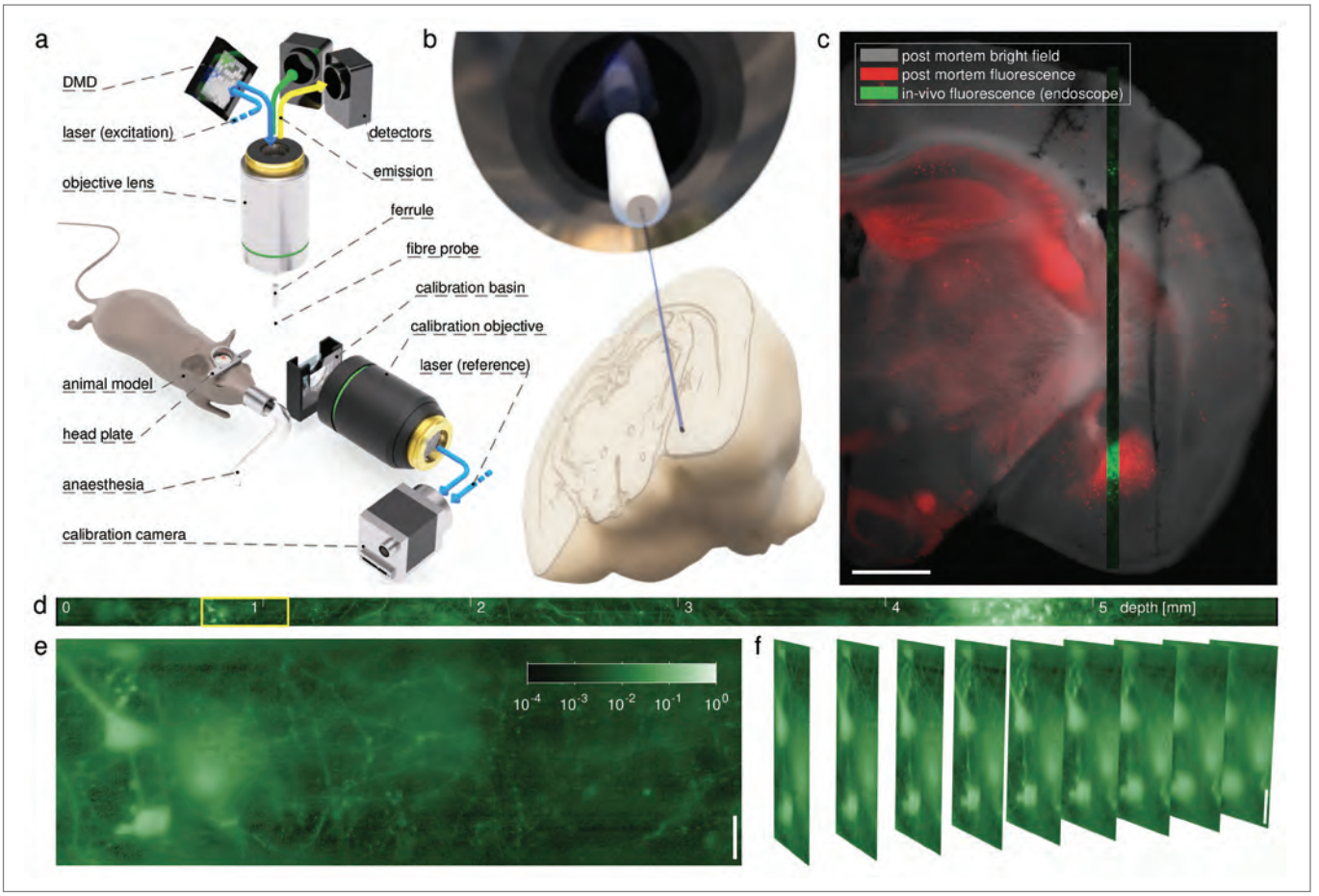


Figure 1: State of the art holographic endoscope. a, Simplified geometry of a MMF-based holographic endoscope for use in anaesthetised head-fixed animals. b, To scale 'sideview' fibre probe. c, Post-mortem section overlayed with imaging record obtained in-vivo. d, Record of the whole brain depth extent (single axial plane shown). e, Full resolution segment of the record yellow-bordered in d. f, Z-stack for to left part of e. Scale bars: d, 1 mm; e-f, 20 µm. a-f were reproduced from [6].

analogous to laser scanning microscopy[2,3]. The technique has been shown to achieve remarkably detailed in-vivo views without requiring bulky lenses or causing significant tissue disruption.

There are several recent technological advancements which have enabled the high-performance levels. Ensuring thermal stability of the digital micro-mirror device (DMD), maintains imaging fidelity for extended imaging periods without deterioration[4]. Another important recently introduced innovation is the side-view imaging configuration[5] that allows lateral visualization, further reducing tissue trauma and mechanical artifacts. This geometry permits greater flexibility and stability in long-term experiments, enhancing imaging quality across various brain regions and depths.

Applications of this technology have already demonstrated considerable promise[6]. The endo-microscope captures live, high-resolution images of brain structures, including individual neurons and vasculature, in head-restrained mice. We are now able to monitor intracellular calcium activity and blood flow dynamics, essential for understanding neural signalling and vascular functions. Custom scanning trajectories allow significant sampling acceleration, which supports a wide range of experimental protocols in both anesthetized and, prospectively, awake animal models.

Despite its achievements, MMF-based holographic endo-microscopy does have current limitations. The technique's effectiveness decreases with fibre bending, which can distort light transmission and limit applications in freely moving subjects. However, ongoing research is exploring advanced algorithms and fibre materials that could accommodate these challenges, opening the door to future applications in behavioural neuroscience and chronic studies.

The outlook for holographic endo-microscopy is promising. Its capabilities for minimally invasive, high-resolution imaging position it as a valuable tool for studying complex brain processes, from synaptic signalling to neural-vascular interactions. By facilitating cellular-level analysis in deep brain structures, this technology addresses a critical gap in neuroscience, potentially transforming our understanding of neurological function and disorders. With further development, holographic endo-microscopy is poised to be integral to the study of brain connectivity, neurovascular coupling, and the dynamics of deep brain structures. ■

Hana Uhlířová[1], Miroslav Stibůrek[1], Tomáš Pikálek[1], André Gomes[2], Sergey Turtaev[2], Petra Kolbábková[1], Tomáš Čižmár[1,2,3]

Affiliations:
[1]Institute of Scientific Instruments of the Czech Academy of Sciences, [2]Leibniz Institute of Photonic Technology, [3]Friedrich Schiller University Jena

REFERENCES

1. Čižmár, T., & Dholakia, K., Shaping the light transmission through a multimode optical fibre: complex transformation analysis and applications in biophotonics. Optics express, 19(20), 18871-18884 (2011).
2. Čižmár, T., & Dholakia, K., Exploiting multimode waveguides for pure fibre-based imaging. Nature communications, 3(1), 1027 (2012).
3. Turtaev, S., Leite, I. T., Altwegg-Boussac, T., Pakan, J. M., Rochefort, N. L., & Čižmár, T., High-fidelity multimode fibre-based endoscopy for deep brain in vivo imaging. Light: Science & Applications, 7(1), 92 (2018).
4. Rudolf, B., Du, Y., Turtaev, S., Leite, I. T., & Čižmár, T., Thermal stability of wavefront shaping using a DMD as a spatial light modulator. Optics Express, 29(25), 41808-41818 (2021).
5. Silveira, B. M., Pikálek, T., Stibůrek, M., Ondráčková, P., Jákl, P., Leite, I. T., & Čižmár, T., Side-view holographic endomicroscopy via a custom-terminated multimode fibre. Optics express, 29(15), 23083-23095 (2021).
6. Stibůrek, M., Ondráčková, P., Tučková, T., Turtaev, S., Šiler, M., Pikálek, T., Jákl P, Gomes A, Krejčí J, Kolbábková P, Uhlířová H. & Čižmár, T., 110 $_3$m thin endo-microscope for deep-brain in vivo observations of neuronal connectivity, activity and blood flow dynamics. Nature Communications, 14(1), 1897 (2023).

Report on the 2024 European Microscopy Award Recipient: Prof. Quentin M. Ramasse (Material Sciences)

Quentin Ramasse, University of Leeds, UK,
Category Physical/Materials Sciences and Optics. Awarded for his contributions to the development of novel technologies in TEM, especially in the field of STEM-EELS.

Prof. Ramasse has dedicated his career to advancing the capabilities of **scanning transmission electron microscopy (STEM)** and **electron energy loss spectroscopy (EELS)**. His work has led to fundamental insights into the structure and behavior of complex oxides, two-dimensional materials, and a range of nanoscale systems.

A significant part of his scientific leadership has been exercised through his role as **Director of the SuperSTEM Laboratory**, the UK National Research Facility for Advanced Electron Microscopy. Under his guidance, the facility has undergone several successful national evaluations and major infrastructure enhancements, notably the implementation of **monochromated, aberration-corrected instrumentation**. These tools have enabled pioneering research at atomic resolution, particularly in **high-energy-resolution EELS**, and the development of methods capable of probing phonons and vibrational properties at the atomic scale.His groundbreaking work on **phonon spectroscopy with atomic resolution** stands out as a recent milestone, and has opened new avenues for exploring energy transfer, structural dynamics, and coupling phenomena in functional materials.

In addition to his research achievements, Prof. Ramasse holds a **Chair in Advanced Electron Microscopy** at the **University of Leeds**, where he contributes to both the School of Physics and Astronomy and the School of Chemical and Process Engineering. He has demonstrated a long-standing commitment to mentorship and education, supervising PhD students across Europe and participating in numerous thesis committees at international institutions.

The European Microscopy Society warmly congratulates Prof. Ramasse on this well-deserved award. His scientific rigor, collaborative spirit, and dedication to the advancement of microscopy represent the highest standards of the field. This recognition celebrates not only his achievements to date but also his ongoing contributions to shaping the future of microscopy in Europe and beyond. ■

Financial report of EMS budget

Yearbook Financial report of EMS budget

Budget 2024 and proposal budget 2025

Budget 2024, final

Incomes

Most incomes came from contributions of the national societies (**€ 36 365.00**) and the ECMA members (**€ 10 837.17**) with further incomes from some individual members (**€ 1000.00**), interest rates, and miscellaneous (**€ 2 744.75**). In summary, an amount of **€ 51 085.24** was accrued.

Expenses

Three Supported meetings (**€ 2 500.00**) and 21 scholarships for young scientists for participating to EMC17 were disbursed **(€ 22 100.00**). Costs for two board meetings, one GA, one GC, organization of organization of virtual meetings, costs for professional secretarial support, for three Outstanding Paper Awards and further costs (banking, web hosting) added up to total expenses of **€ 75 293.44**.

Thus, the annual balance for 2024 ended with a **minus of € 24 208.20.** Together with the overflow from 2022 (€ 117 419.22) EMS had total assets of **€ 94 463.02** as of December 31st, 2024.

Budget 2025, running; (as of January 31st, 2025)

Incomes

The major revenues will again be accrued by the annual contributions of EMS members via the national societies and of ECMA members. Invoices to national societies and ECMA members had already been sent out; eventual reminders to members will be sent out later this year. Further incomes will be accrued by individual member fees and job postings for non-EMS members, and benefits from EMC17. Together, incomes are expected to amount to **€ 48 900**.

Expenses

EMS Extension meetings will be supported (**€ 1 500.00**). EMS will support up to 6 Sponsored meetings (€ 4 500.00). Further expenses will include the Outstanding Paper Awards, costs for professional secretary, two board meetings and bank costs, amounting to a total of estimated **€ 68 650.00**.

It is thus calculated to end the year 2024 with a **minus of € 19 750.00**. A compensation of this amount via EMS-dedicated share of the congress fee for EMC attendance can be expected for 2025.

Budget 2025, proposal

Incomes

Major incomes will be as usual accrued by the annual fees of EMS members via the national societies and of ECMA members. Together with interest rates of the savings account and advertising for non-EMS members and revenues from EMC17, we can expect incomes of **€ 68 900**.

Expenses

One EMS Extension meeting (€ 1 500.00), up to 5 Sponsored meetings (€ 3 750.00) and 25 scholarships as support for congress attendance of young colleagues (€ 7 500.00) will be provided. Further expenses will include the Outstanding Paper Awards (€ 3 000), costs for professional secretary, two board meetings and bank costs, amounting to a total of estimated **€ 48 900.00**.

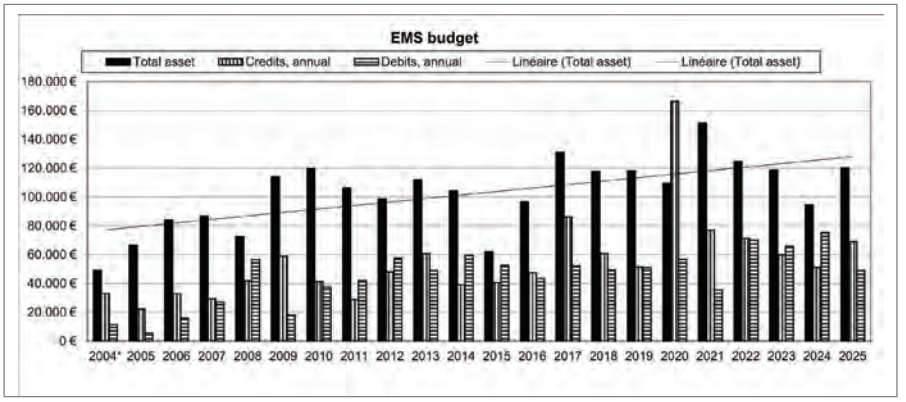
It is thus calculated to end the year 2025 with a **surplus of € 20 000.00,** partly compensating for the minus at the end of 2024.

Annotation:

In 2020 the savings were merged with the giro account (Credits); note that Credits and Debits depict annual budget figures without overflow; Total asset includes overflows and shows figures at the end of the year. ■

Prof. Dr. Philippe LECLERE.
EMS Treasurer

Table EMS budget development/10 years



European Corporate Member Assembly (ECMA)

Corporate members 2024

PLATINUM MEMBERS

- Diatome Ltd
- JEOL Europe
- Thermo Fisher Scientific
- TESCAN

GOLD MEMBERS

- Andor Technology
- DELONG INSTRUMENTS a.s
- Hitachi High-Technologies
- TVIPS - Tietz Video and Image Processing Systems

SILVER MEMBERS

- AMETEK B.V.
- Bruker Nano GmbH
- Carl Zeiss Microscopy GmbH
- CEOS
- Dectris Ltd
- DENSsolutions
- Electron Microscopy Sciences
- IMS Nanofabrication GmbH
- Intelligent Imaging Innovations GmbH
- Maerzhaeuser Wetzlar GmbH&Co. KG
- NanoMEGAS
- PNDetector
- Protochips Inc.
- Quorum technologies
- SPI Supplies
- Ted Pella, Inc.
- Wiley-VCH GmbH
- XEI Scientific Inc.

BRONZE MEMBERS

- Advanced Microscopy Techniques
- AdvaScope
- Agar Scientific Ltd
- Deben UK Ltd
- Digital Surf
- EMSIS GmbH
- Euclid Techlabs
- Fischione Instruments
- Gammadata Instrument AB
- ISS Group Services Ltd
- Klocke Nanotechnik
- MICROS Austria Produktions- und Handelsges.m.b.H
- Micro to Nano
- NANOVIZZ
- NenoVision
- Protochips
- RaySpec
- Renishaw
- Safematic GmbH
- Schaefer Technologie GmbH
- Science Services GmbH
- SenseAI
- SmarAct GmbH
- SYNTEK Co
- Systron EMV GmbH
- Telight

Please find more information about the corporate membership fees:
https://www.eurmicsoc.org/en/organisation/corporate-members-ecma/concept-constitution-fees/

EMS Calendar 2025

EMS Calendar 2025

Information available here: **https://www.eurmicsoc.org/en/meeting-calendar/calendar/**

The 13th Asia Pacific Microscopy Congress 2025	02 to 07 February 2025	Brisbane, Australia
Virtual Flow Cytometry Data Analysis Course	03 to 06 March 2025	Virtual
20th European Molecular Imaging Meeting – EMIM 2025	11 to 14 March 2025	Bilbao, Spain
6th International Workshop on Electron Probe Micro-analysis	24 to 27 March 2025	Virtual
Electron Microscopy Spring School	31 March to 04 April 2025	Leeds, United Kingdom
Forum des microscopies à sondes locales 2025	31 March to 04 April 2025	Belgium
European Workshop on Battery Interfaces	03 and 04 April 2025	Cordoba, Spain
18th Cryogenics 2025	07 to 11 April 2025	Prague, Czech Republic
Annual conference of Hungarian Society for Microscopy (HSM2025)	05 to 09 May 2025	Siófok, Hungary
IMPRESS School on Operando and Correlative Experiments	05 to 09 May 2025	Barcelona, Spain
Top Analytica's 5th Microscopy and Microanalysis Workshop	07 to 09 May 2025	Turku, Finland
5th International Workshop of In Situ Electron Microscopy	13 to 15 May 2025	Portugal
CONFERENCE CSMS MICROSCOPY 2025	19 to 21 May 2025	Liberec, Czech Republic
Quantitative Electron Microscopy 2025 EMS Sponsored	11 to 23 May 2025	Port Barcares, France
Latest Trends in In-situ and Correlative Electron Microscopy – Conference & Workshop ICEM 2025 EMS Sponsored	02 to 04 June 2025	Brno, Czech Republic
Innovative Imaging for 3D Cell Biology	17 and 18 June 2025	Utrecht, Netherlands
19th Meeting of the French Microscopy Society	30 June to 04 July 2025	Toulouse, France
Electron Microscopy Course 2025	30 June to 04 July 2025	Braga, Portugal
Salamanca Summer International Course on Advanced Biophysics and Structural Biology	30 June to 05 July 2025	Salamanca, Spain
TEM-UCA: Transmission Electron Microscopy of Nanomaterials EMS Sponsored	14 to 18 July 2025	Cádiz, Spain
MC2025 EMS Patronaged	31 August to 04 September 2025	Karlsruhe, Germany
17th Multinational Congress on Microscopy EMS Extension	07 to 12 September 2025	Portorož, Slovenia
14th European Congress for Stereology and Image Analysis (ECSIA 2025)	15 to 18 September 2025	Prague, Czech Republic
27th National Congress of Electron Microscopy (EMK 2025) and the 2nd International Microscopy and Spectroscopy Congress (MSC 2025) EMS Sponsored	25 to 27 September 2025	Istambul, Turkey
Conference of the Romanian Electron Microscopy Society - C.R.E.M.S.	30 September to 03 October 2025	Poiana Brașov, Romania
Women in Electron Microscopy – Breaking Barriers and Building Networks 2025 EMS Sponsored	08 to 10 October 2025	Germany
PANAM Advanced Electron Microscopy Autumn School	08 to 14 October 2025	Université Paris Cité and Sorbonne Université, France
CV4MS: Computer Vision for Materials Science	19 and 20 October 2025	Honolulu, Hawaii, USA
SPAOM 2025 - Spanish Portuguese Meeting for Advanced Optical Microscopy	05 to 09 November 2025	Braga, Portugal
Cryo Microscopy Group Meeting 2025	12 November 2025	Nottingham, United Kingdom

Application for membership

Notes

EUROPEAN MICROSCOPY SOCIETY (EMS)
Individual Member Subscription form

Individual membership of the European Microscopy Society is open to all microscopists for €25 per year. Note that the membership fee is €7 for members of European National Microscopy Societies. Please complete and return the following form* to:

Prof./Dr./Mr./Ms.: _____ Last Name: _____

First Name: _____

Institute: _____

Department: _____

Address: _____

Zip code: _____ City:

Country: _____

Tel.: _____ Fax.: _____

E-mail address: _____

Website: _____

I will transfer 25 € in favour of account:
SAS/MCO EMS - VILLA GABY
285 PROMENADE CORNICHE KENNEDY
13007 MARSEILLE FRANCE
IBAN: FR76 1460 7002 2600 2625 5950 955 SWIFT
(BIC): CCBPFRPPMAR

Philippe LECLERE, University of Mons (UMONS)Laboratory for Physics of Nanomaterials & Energy - LPNE, Research Institute for Materials Science and Engineering, Place du Parc, 20, B - 7000 Mons, Belgium
eMail: philippe.leclere@umons.ac.be

Date / Signature: _____
* please print for clarity

Catherine VENIEN-BRYAN
Sorbonne Université, Institut de Minéralogie, Physique des Matériaux et Cosmochimie, IMPMC (UMR7590), 4 place Jussieu, F-75252 Paris CEDEX 05, France eMail: secr@eurmicsoc.org

EUROPEAN CORPORATE MICROSCOPY ASSEMBLY (ECMA)

Subscription form

Prof./Dr./Mr./Ms.: _____ Last Name: _____

First Name: _____

Representing the Company: _____

Address: _____

Zip code: _____ City:

Country: _____

Tel.: _____ Fax.: _____

E-mail address: _____

Website: _____

We select the following category (thick one)

- ○ Platinum minimum 1.000 €
- ○ Gold 500 €
- ○ Silver 250 €
- ○ Bronze 100 €

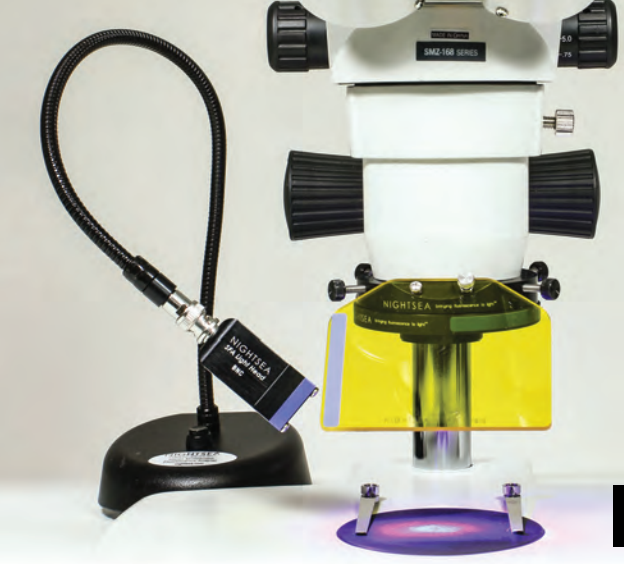
and will transfer the corresponding amount in favour of account:

SAS/MCO EMS - VILLA GABY
285 PROMENADE CORNICHE KENNEDY
13007 MARSEILLE FRANCE
IBAN: FR76 1460 7002 2600 2625 5950 955
SWIFT (BIC): CCBPFRPPMAR

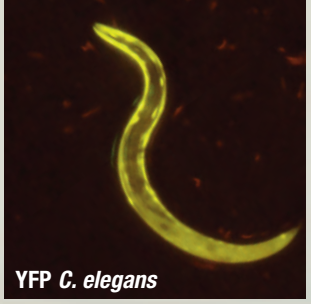
Philippe LECLERE, University of Mons (UMONS)Laboratory for Physics of Nanomaterials & Energy - LPNE, Research Institute for Materials Science and Engineering, Place du Parc, 20, B - 7000 Mons, Belgium
eMail: philippe.leclere@umons.ac.be

Date / Signature: _____
* please print for clarity

Catherine VENIEN-BRYAN
Sorbonne Université, Institut de Minéralogie, Physique des Matériaux et Cosmochimie, IMPMC (UMR7590), 4 place Jussieu, F-75252 Paris CEDEX 05, France
eMail: secr@eurmicsoc.org




Zebrafish larva


YFP *C. elegans*


Crack feature, fluorescent penetrant

Adapt your **existing** lab stereo microscopes for fluorescence.

NIGHTSEA Fluorescence Viewing Systems

The Model SFA Stereo Microscope Fluorescence Adapter is a complete solution for adding fluorescence to **existing** stereo microscopes. It includes everything you need for adapting (not converting) just about any stereo microscope. The modular design lets you easily switch between several different excitation/emission combinations to work with a variety of fluorescent proteins and other fluorophores. Light heads and filters can be removed or switched in seconds. There are now six different excitation/emission combinations available, plus white light.

The **NIGHTSEA System** has shown an ever-increasing range of applications.

FIND OUT MORE >>>

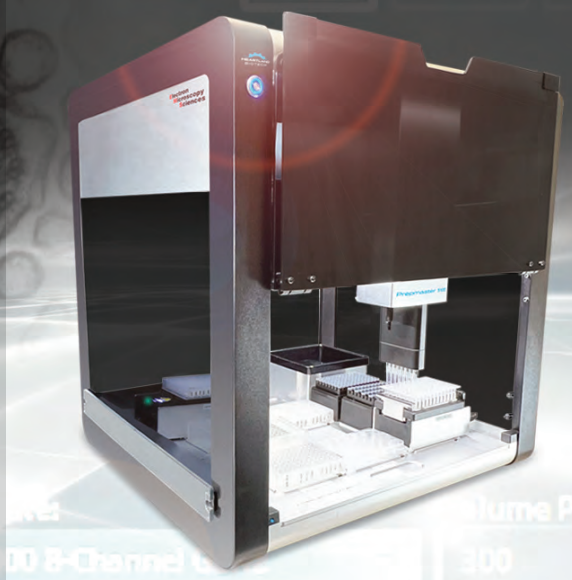
Prepmaster™ 5100
Specimen Preparation Robot

Simplified Workflow. Maximized Productivity. Optimized, Reproducible Results.

Precision meets efficiency

Increase your productivity and eliminate hours spent handling toxic chemicals with the help of the Prepmaster 5100 Specimen Prep Robot.

The Prepmaster 5100 is a tissue and cell processor for TEM and SEM. It frees your time from performing boring and repetitive tasks, increasing consistency in your specimen preparation, giving you confidence in your results.



virtual demo

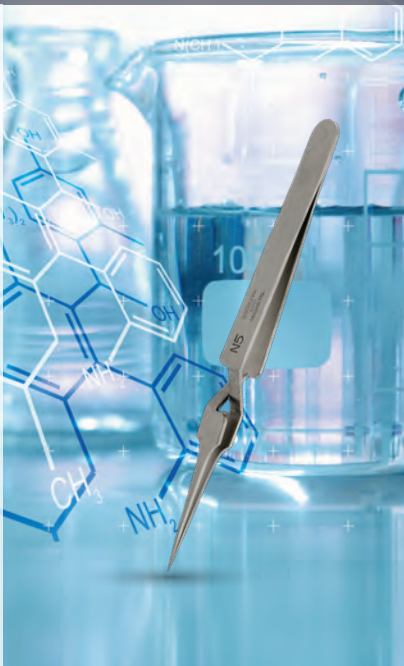
We have your workflow covered.

When it comes to Specimen Preparation for TEM, SEM, and Light Microscopy, *Electron Microscopy Sciences* has everything a lab could need. From chemicals to grids and everything inbetween, including:

- A comprehensive selection of buffers, fixatives, dyes & stains, adhesives, and more.
- All the basic lab supplies and consumables that you rely on every day.
- World-class instruments such as DiATOME Diamond Knives and Dumont Tweezers.
- TEM Grids in a wide variety of configurations, including different materials, mesh sizes, and support films.

Chemicals Your Way...

We will customize chemicals to best fit your lab's unique protocols and recipes. Our lab can follow your specific formulas, or generate one to meet your needs.



Electron Microscopy Sciences

POWERED BY BIOLYST

1560 Industry Rd., Hatfield, PA 19440
email: info@emsdiasum.com • www.emsdiasum.com

JEOL

Scientific/Metrology Instruments

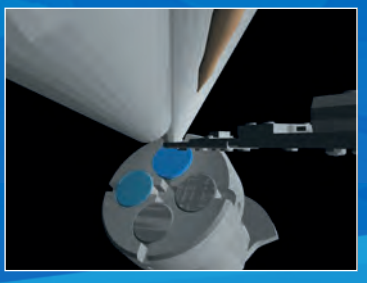
FIB-SEM System

JIB-PS500i

High Performance FIB-SEM from JEOL technologies

- Automatic TEM sample preparation
- 3D acquisition (imaging, EDS, EBSD)
- New EOS design with dual mode operation
- Check & Go directly from FIB to TEM
- Omniprobe integrated inside GUI

STEMPLING 2



New stage design

Check & Go directly from FIB to TEM

Large specimen chamber

www.jeol.com