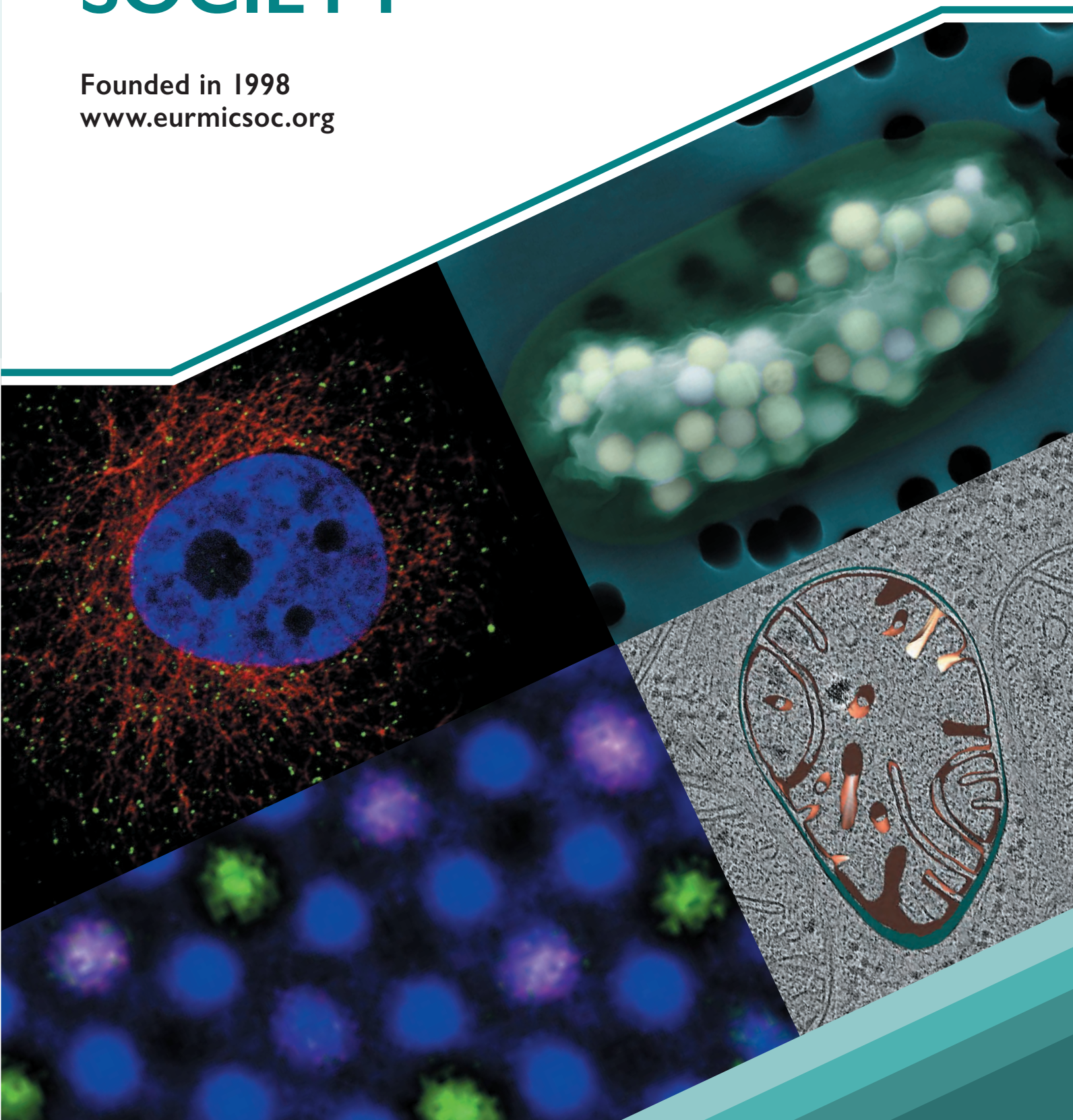


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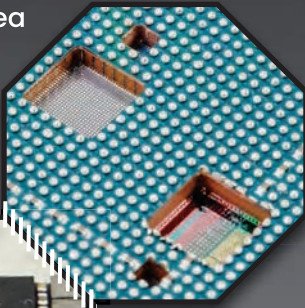
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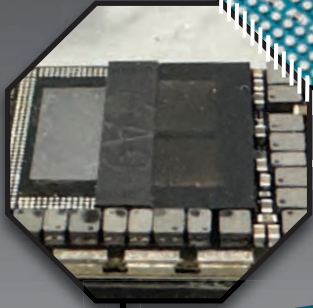


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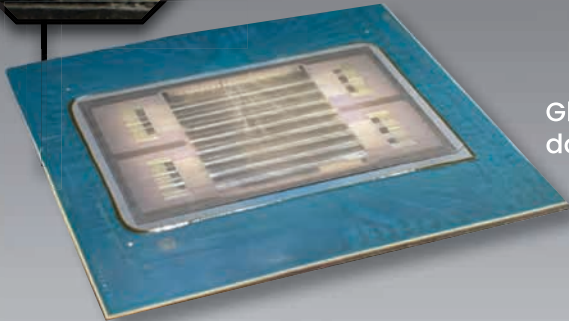
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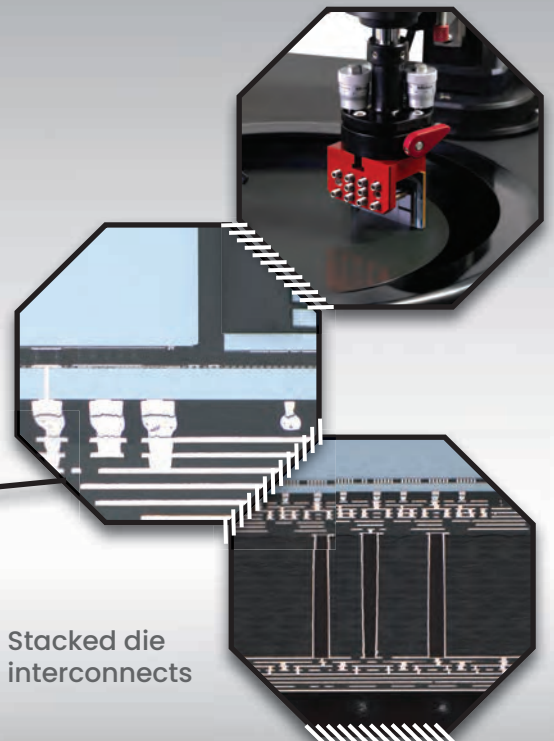
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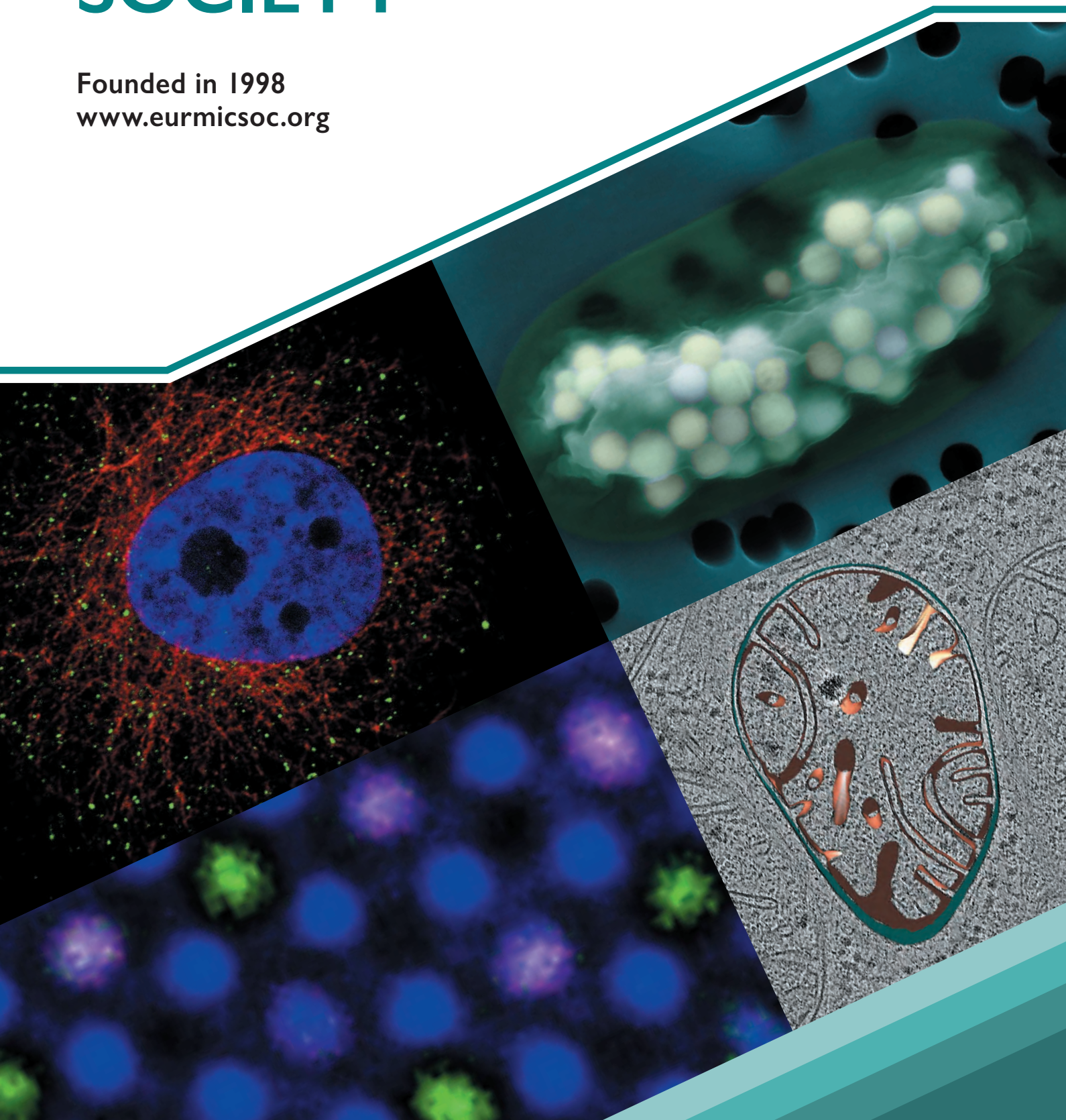
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EXPLORING AND DOCUMENTATION OF THERMAL TRANSITIONS BY HOT-STAGE MICROSCOPY

Dr. Matthias WAGNER, Mettler-Toledo Technologies 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.

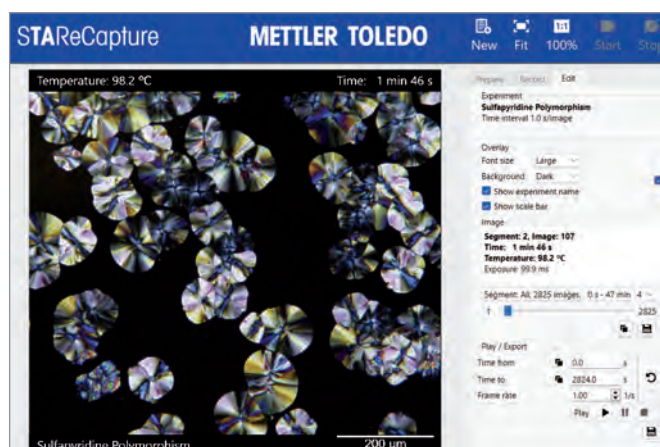


Fig. 2: Screenshot of the Edit-Tab of STAReCapture Imaging software.

Application examples

Two examples of applications will now be described:

Polymorphism of suberic acid

Suberic acid is a naturally occurring dicarboxylic acid widely utilized as a versatile backbone molecule in polyamide synthesis, as a precursor in drug development, and in the preparation of micelles functioning as drug delivery systems.

Additionally, it serves as a linking agent in the production of high-strength elastomers. Investigations into the polymorphic behavior of suberic acid are documented in the pharmacological literature [1].

Upon heating from ambient temperature, suberic acid undergoes crystallization accompanied by multiple solid-solid phase transitions. Figure 3 depicts the sample at 50 °C under polarized light, where it exists in the stable α -form. At about 133 °C (Figure 4), a morphological transformation occurs, corresponding to the β -form of the crystal. The compound ultimately melts at approximately 141 °C.

Optical cloud point determination of aircraft fuels

The determination of the cloud point of aircraft fuels is critical because it indicates the temperature at which wax crystals begin to form. These crystals can clog fuel filters and lines, potentially leading to engine malfunction or failure, especially in cold weather conditions. By knowing the cloud point, operators can ensure that the fuel remains fluid and reliable under the expected environmental temperatures.

Two DSC curves measured at a cooling rate of 5 °C/min (Figure 5) indicate the temperature at which wax formation begins but do not provide any information about the morphology of the formed particulate material. The images embedded into the evaluation show the crystals formed in the two fuels, each with a different additive package. In Fuel 1, finer particulate material is formed that can pass through filters and valves. In Fuel 3, however, plate-like particulate material has crystallized, which is likely to cause blockages and endanger the aircraft.

The images of both applications were recorded and post-processed with STARcapture software.

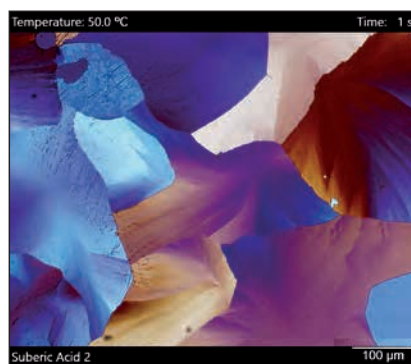


Fig. 3. Suberic acid crystals at 50 °C

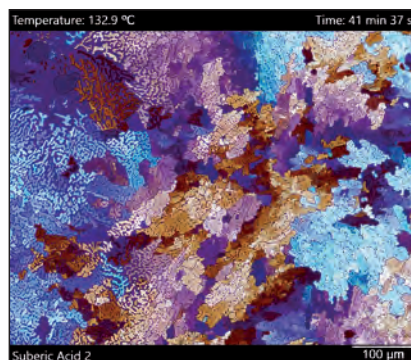


Fig. 4. Suberic acid crystals at 133 °C

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.

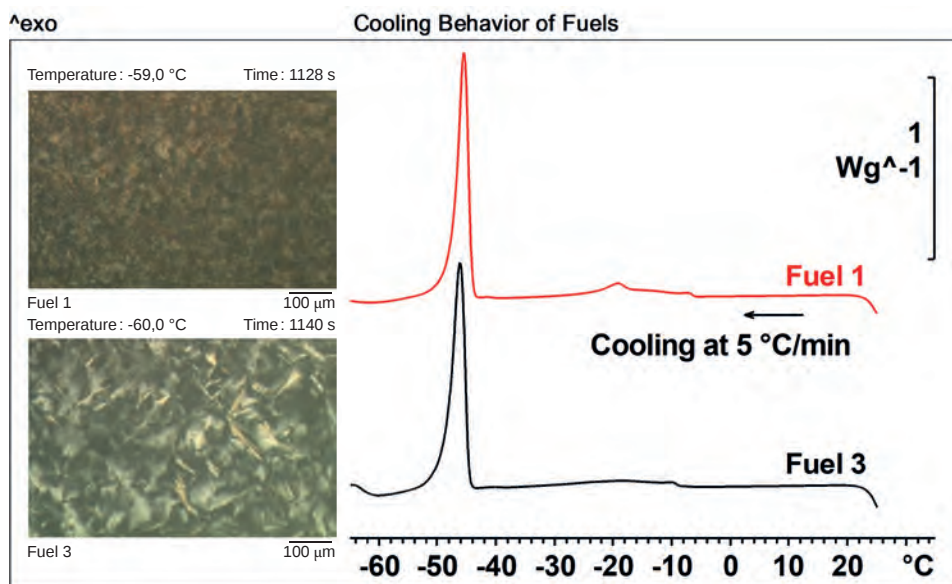


Fig. 5: DSC curves two different fuel mixtures during cooling at 5 °C/min. Hot-stage microscopy images taken at about -60 °C show that two different morphologies have formed.

Literature

- [1] Ha, J. M., Hamilton, B. D., Hillmyer, M. A., & Ward, M. D. (2009). Phase behavior and polymorphism of organic crystals confined within nanoscale chambers. *Crystal Growth & Design*, 9(9), 4766–4777
- [2] Wagner, M. *Thermal Analysis in Practice*, chapter 15: Polymorphism, 283 – 286 (2017)
- [3] Wagner, M. *Thermal Analysis in Practice*, chapter 19: Thermopometry, 314 – 323 (2017)





Preface

Dear EMS members,

Welcome to the 2025 yearbook (edition 2026) of the European Microscopy Society (EMS)!

You will find detailed information about the EMS activities, events, awards, publications, members and corporate members, as well as useful resources and opportunities for microscopy enthusiasts. As you browse this yearbook you will see that 2025 was a year full of activities dedicated to promoting international microscopy and supporting the next generation of microscopists. ...

In early April 2025, the EMS Executive Board met in Ljubljana to discuss current issues regarding outstanding Paper Awards (OPA), sponsored and patronage events, the MCM17 extension event: (<https://17mcm.si>) in Portorož and associated scholarships, and the launch of preparations for EMC-2028 in Barcelona. In addition, an update to the EMS statutes and by-laws was carried and put to a vote at the GA at Portorož. The new text is available on the EMS website. The EMS executive board met for the second time during MCM17 which took place from 7 to 12 September 2025 at the Grand Hotel Bernardin at Portorož on the beautiful Slovenian coast. During this congress, the diversity of topics discussed reflected the constant evolution in microscopy. We have awarded several EMS scholarships to support young researchers and students participating in the congress. Their reports, illustrated with photographs, are published in this yearbook and describe their enriching stay in Portorož, both in terms of discussions around their research topics and networking opportunities that will be valuable to them in preparing for the next stage of their career. The 2024 three OPA were presented during this congress, abstracts are available in the yearbook.

This yearbook also contains accounts of the seven events sponsored in 2025 as well as reports from various European microscopy societies. Based on the other chronicles, it is clear that many institutes are increasing their instrumental capabilities through new microscopes of different types; we can therefore expect to see many more interesting results at the upcoming meetings.

I highly recommend Henk Kubbinga's comprehensive article on Frits Zernike, Nobel laureate in Physics for his demonstration of the phase-contrast method and his invention of the phase-contrast microscope, particularly important in biology as it allows the study of the internal structure of cells without staining. I also recommend Brian J Ford's article on cellular intelligence. Finally, Antonio Molina-Garcia presents his interpretation of images that challenges the traditional division between life sciences and materials sciences.

In conclusion, the yearbook is full of information that will undoubtedly attest to the excellent health and dynamism of our society.

Check our recently redesigned website regularly (<https://www.eurmicsoc.org/en/>) to stay informed about events and activities supported by EMS: deadline for applications to OPA, sponsored events and scholarships. In addition, a list of job offers is available and you can read our newsletters which you can download.

We look forward to hearing about your new developments. We invite you all to join us in Liverpool for the IMC21 congress of the IFSEM (<https://www.imc21.org.uk>) for which EMS has offered scholarships for early career researchers.

In the meantime, I hope you enjoy reading this yearbook and find it informative and stimulating.

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

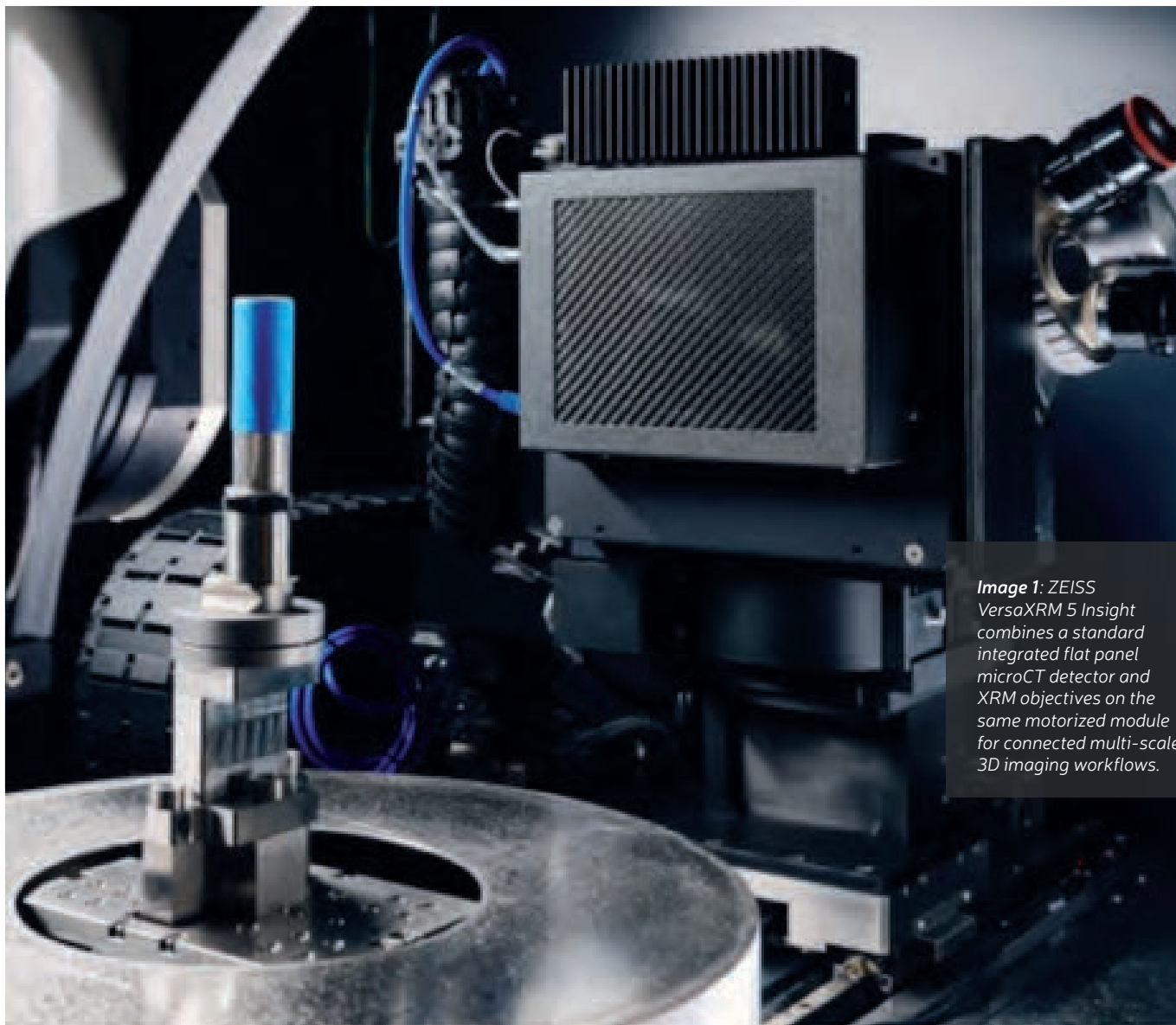


Image 1: ZEISS VersaXRM 5 Insight combines a standard integrated flat panel microCT detector and XRM objectives on the same motorized module for connected multi-scale 3D imaging workflows.

ZEISS VERSAXRM 5 INSIGHT: HYBRID X-RAY MICROSCOPY FOR NON-DESTRUCTIVE MULTI-SCALE 3D IMAGING

Research and analysis labs in industry and academic core facilities face pressure to accelerate innovation, work with diverse samples, and make the most of their budgets. Researchers often need to characterize large, complex samples while still resolving the internal features that matter most.

ZEISS VersaXRM 5 Insight™ provides efficient, non-destructive 3D imaging across a broad range of applications. The system combines a redesigned detector architecture with proven ZEISS X-ray microscopy expertise, intuitive software, and deep-learning reconstruction to deliver reliable performance across a broad range of imaging workflows.

From overview to region of interest

With a standard integrated flat panel microCT detector and XRM objectives on the same motorized module, the Insight detector architecture ensures the flexibility to address a wide range of applications and sample types.

Users can image large, complex samples using the standard integrated flat panel detector enabled with FAST mode for efficient scouting and inspection, then progress from large-scale sample inspection to targeted characterization of the region of interest without trimming samples or changing hardware configurations.

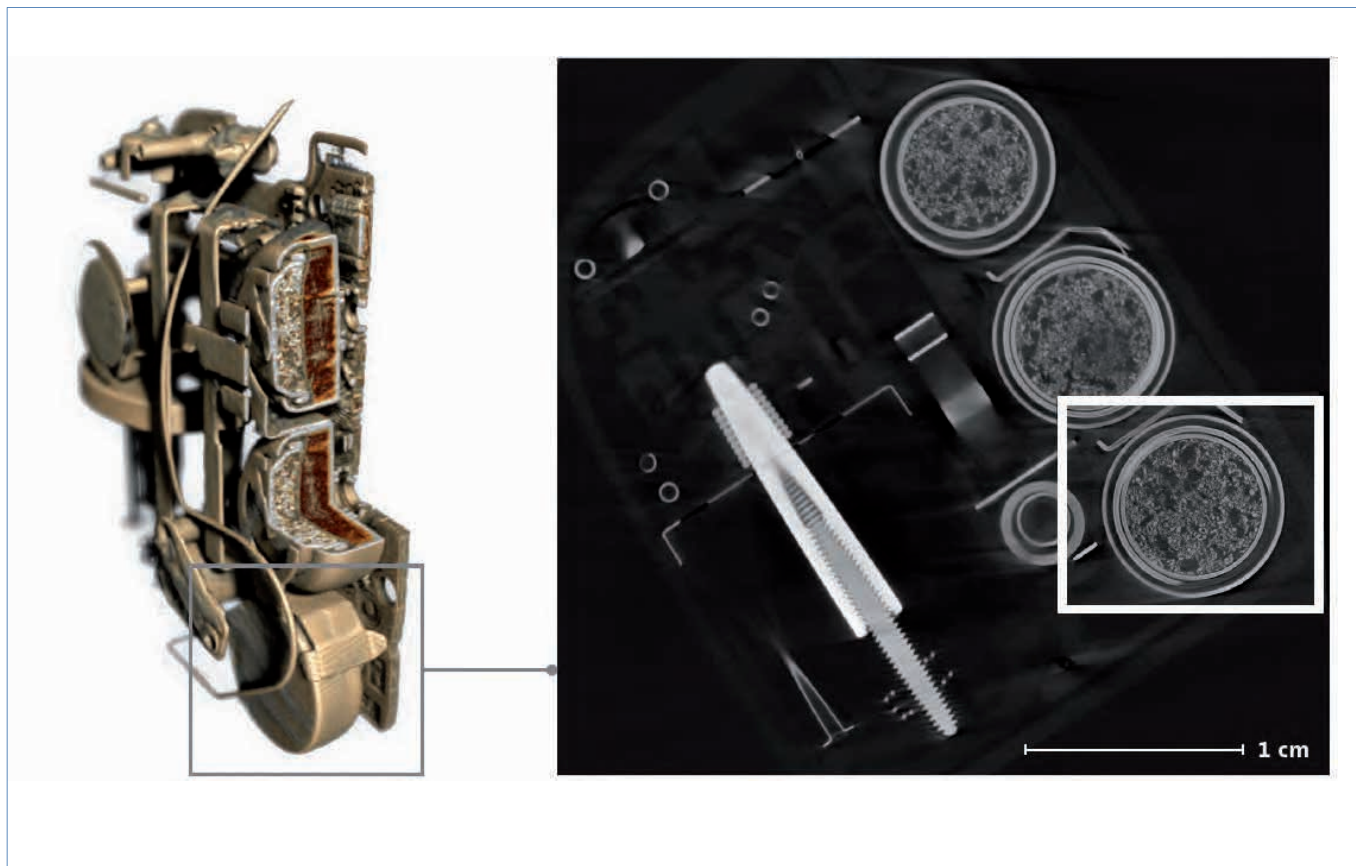


Image 2: Insulin pump imaged using flat panel detector for full-sample visualization, followed by targeted high-resolution scan of selected region to gain deeper insights into internal features non-destructively

Resolution at a Distance

Resolution at a Distance (RaaD™) enables high-resolution imaging without cutting or trimming samples. Image small features and internal defects within large samples, and keep samples intact while achieving high-resolution 3D images with RaaD.

In a 30 mm cube sample, a full-field flat panel FAST scan at $34.6\ \mu\text{m}$ for volume scouting is followed by a medium-ROI flat-panel scan with reduced field of view and intermediate resolution, and a high-resolution zoom-in scan with 4x detector at $3.5\ \mu\text{m}$ to non-destructively resolve and analyze internal features.

Flat panel imaging of a cylindrical 21700 battery shows the full cell using flat panel imaging at $70\ \mu\text{m}$, and a magnified view of a selected region acquired at high resolution, highlighting the internal layered structure for detailed, non-destructive characterization. A coin cell battery is shown with a flat panel FAST overview scan and a higher-resolution scan at $2.8\ \mu\text{m}$ voxel size.

Guided workflows and rapid imaging feedback

ZEN navx combines intelligent guidance, sample-aware navigation, and workflow support to help users operate efficiently while protecting both the sample and the system. Designed for users of all experience levels, ZEN navx supports efficient setup, reliable imaging, and confident decision-making across workflows.



Image 3: 3D rendering of an aluminum block with reconstructed slice overlays illustrating seamless multi-scale zooming capabilities for rapidly locating regions of interest in a 30 mm cube sample.

Volume Scout workflow enables precise ROI selection across the full sample using multiple projection views, colored ROI overlays, and 3D visualization. FAST mode enables rapid imaging feedback for navigation, whole-part inspection, and intermediate-resolution scans.



Image 4: Flat panel imaging of a cylindrical 21700 battery shows full cell visualization and a magnified high-resolution view of a selected region, highlighting the internal layered structure for detailed, non-destructive characterization.

In an iodine-stained mouse embryo stabilized in agarose, FAST mode with continuous rotation completed a flat panel scan at $10\ \mu\text{m}$ voxel size in 21 minutes compared with 37 minutes for STEP mode tomography. A 4x FAST mode scan at $3.5\ \mu\text{m}$ voxel size completed in 1 hour compared with 1 hour 33 minutes in STEP mode.

Application examples

Materials science: image and analyze microstructures in 3D across a range of material types and length scales to gain deeper insight into performance, failure, and changes over time. In a Cu-steel sample, flat panel FAST mode at $1.6\ \mu\text{m}$ is

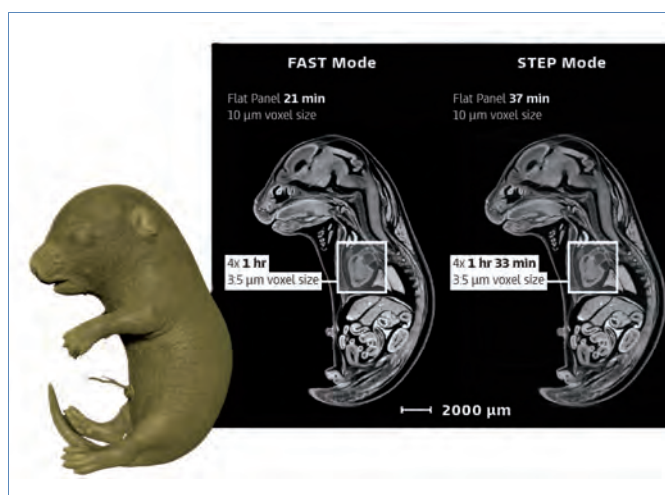


Image 5: ZEN navx with Volume Scout workflow enables precise ROI selection using multiple projection views, colored ROI overlays, and 3D visualization. FAST mode with continuous rotation is shown in the mouse embryo example.

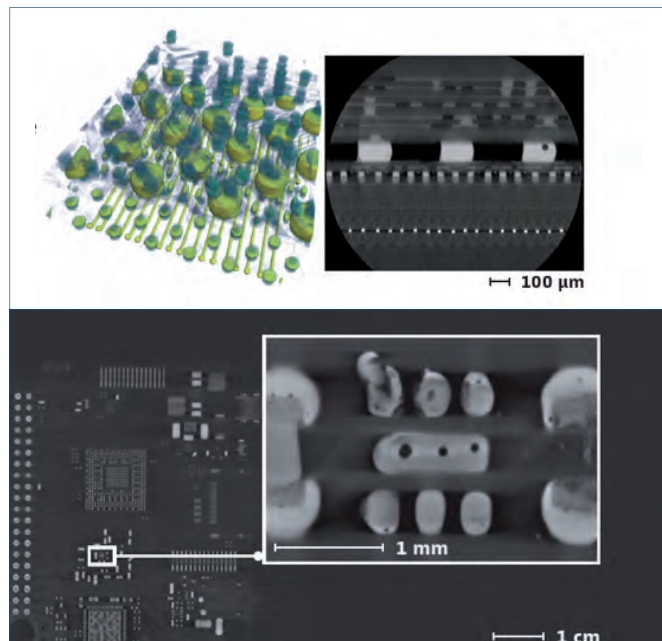


Image 6: Representative examples across materials science and industrial inspection and analysis, including Cu-steel interface characterization, 5G modem package imaging, and defective PCB analysis..

followed by a higher-resolution 20x objective scan at $0.58\ \mu\text{m}$ at the Cu-steel interface. The 20x scan was reconstructed using ZEISS DeepRecon Pro, enabling clear identification of critical submicron interfacial defects such as porosity, lack of fusion, and cracking.

Industrial inspection and analysis: image and analyze devices for failure analysis, quality assurance, and control. A 3D reconstruction of a 5G modem package on a smartphone board shows the C4 bump and microbump architecture and a reconstructed slice of the corresponding internal interconnect structure. A defective PCB is imaged at lower resolution, with the highlighted defective region scanned at higher resolution using a 4x objective and reconstructed using DeepRecon Pro to enhance feature clarity.

CONCLUSION

ZEISS VersaXRM 5 Insight combines the flexibility of microCT with the detail of X-ray microscopy. It supports efficient, non-destructive 3D imaging across a broad range of applications, helping users move efficiently from broad sample overview to precise, targeted analysis in one connected workflow.





IN MEMORIAM

Obituary for Ueli Aebi (1946–2025)



The European Microscopy Society mourns the passing of Ueli Aebi, Emeritus Professor of Structural Biology and co-founder of the Maurice E. Müller Institute for Structural Biology at the Biozentrum of the University of Basel. With his death, the Biozentrum has lost an outstanding scientist, a visionary architect of modern structural biology, and an exceptional mentor. We particularly remember his distinguished service as President of the European Microscopy Society from 2004 to 2008. During this important period, he contributed greatly to strengthening the European microscopy community,

promoting scientific exchange, and fostering collaboration across disciplines and national borders. His vision, dedication, and leadership left a lasting impact on the microscopy community, and his contributions continue to inspire colleagues and researchers around the world. ■

You can view touching obituaries by following these links:

- <https://www.biozentrum.unibas.ch/news/detail/obituary-for-ueli-aebi-1946-2025>
- <https://doi.org/10.1093/mictod/qaag033>





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Cover:

- *Top left: Human U2OS cells display the first steps of Ad5 infection (green). Guided by the red network of microtubules, the virus moves toward the blue nucleus, initiating its journey to the host takeover. Authors: Carmen San Martin and Esther Esther González-Almela, and Mr. Dario Lago (Centro Nacional de Biotecnología. CSIC. Madrid).*
- *Top right: Cyanobacterial formation of intracellular Ca-carbonates Authors: Imène Estève and Karim Benzerara (IMPMC Sorbonne University Paris)*
- *Bottom left: EELS automatically resolved chemical map with Nb (blue), Barium (Purple) and strontium (green) Author: Lluís Lopez-Conesa (Scientific and Technical Centers-University of Barcelona)*
- *Bottom right: Slice from a tomogram of a MC38 cell, acquired on a Talos Arctica 200 kV transmission electron microscope from a FIB-milled lamella. The image shows the intracellular environment, in which a mitochondrion has been segmented and overlaid to reveal its outer membrane and cristae organisation. Authors: Olivia Muriel López and Beatriz Sancho González (Centro Nacional de Biotecnología. CSIC. Madrid).*

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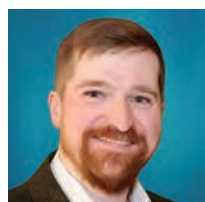
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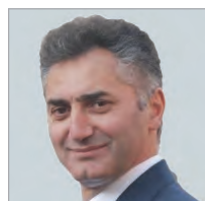
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Letter from the President

Dear EMS members,

The year 2025 has been an important one for the EMS, highlighted by the 17th Multinational Congress on Microscopy (17MCM), held from 7 to 12 September in Portorož, Slovenia. As the only EMS Extension event of the year, 17MCM provided an excellent platform for scientific exchange across all fields of microscopy. I would like to extend my sincere gratitude to the local organizing team for their outstanding efforts in making this event a success.

The 17MCM was also a significant occasion for the governance of our Society. The EMS Executive Board convened in Portorož, and the General Assembly of EMS took place there as well, giving our members the opportunity to engage with the direction and activities of the Society.

A core mission of our Society is to support scientific excellence, which we do through the annual Outstanding Paper Awards (OPA), recognizing exceptional research in Materials Sciences, Life Sciences, and Instrumentation & Technique Development. I would like to thank Prof. Igor Weber for taking on the coordination of this important activity. EMS also continued to support early-career researchers through its scholarship programme, and I am pleased to see the enthusiasm and quality of the young scientists who are joining our community.

Looking ahead, the most significant event on our horizon is the 21st International Microscopy Congress (IMC21) in Liverpool in 2026, where EMS will once again collaborate with the International Federation of Societies for Microscopy (IFSM). IMC21 is the foremost global gathering of the microscopy community, and we anticipate it will be an exceptional edition, showcasing the very best of modern microscopy across all disciplines and career levels. In Liverpool, the EMS Executive Board will meet, the General Assembly will be held, and – in an extraordinary step – the General Council will convene as well. I warmly encourage all EMS members to join us on this occasion, both for the outstanding science and to participate actively in the life of their Society.

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

Many sponsored and patronaged events are listed on the EMS website, and I invite you all to join us on these occasions. I look forward to meeting many of you in Liverpool, as well as at other microscopy-related meetings carrying 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



Financial report of EMS budget

Yearbook Financial report of EMS budget

Budget final 2025, overview budget 2026 and proposal budget 2027

Budget 2025, final

Incomings

Most incomings came from contributions of the national societies (€ 34 916.00) and the ECMA members (€ 8 640.00) with further incomings from some individual members (€ 675.00), Bank wire from Austrian account, ISFM/MCO (€ 17 183.33), and miscellaneous (€ 510.00).

In summary, an amount of € 61 924.33 was accrued.

Expenses

Six sponsored events (€ 4 388.58), scholarships for young scientists to participate to 17MCM (Slovenia) (€ 8 400.00), and EMS extension (€ 2 300) for a total for this part of expenses of (€ 15 088.58) were disbursed. Costs for Board Meetings, one GA, one GC, organization of virtual meetings and bank fees (€ 15 925.39), costs for professional secretarial support (€ 25 560.00), Three Outstanding Paper Awards (€ 3 000.00), plaques (€ 223.08) communication costs (mailjet, website hosting, flyers and X-banner) corresponding to (€ 1 063.98), other awards (€ 293.31) and miscellaneous (€ 2 182.90).

The total expenses are € 63 337.24. Thus, the annual balance for 2025 ended with a **minus of € 1 412.91**. Together with the overflow EMS had total assets of € 93 050.11 as of December 31st, 2025.

Budget 2026, running; (as of February 28th, 2026)

Incomings

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 incomings will be accrued by individual member fees and job postings for non-EMS members, and benefits from IMC17.

As of February 28th, individual membership (€ 75.00), national societies (€ 3 094.00), ECMA sponsorship (€ 0.00), wire transfer (€ 68.98) represent a total of € 3 238.98.

Together, incomings by the end of the year are expected to amount to € 48 900.00.

Expenses

EMS Extension meeting 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.

As of February 28th, the costs for the administration are € 3 052.30, the costs for communication (€ 440.81), for the awards (€ 0.00), for the miscellaneous (€ 0.00), and for the education and meetings (€ 0.00) corresponding to a current total of € 3 493.11.

The current balance is then a **minus of € 254.13**.

As of February 28th, EMS has a total asset of € 92 795.98.

Budget 2027, proposal

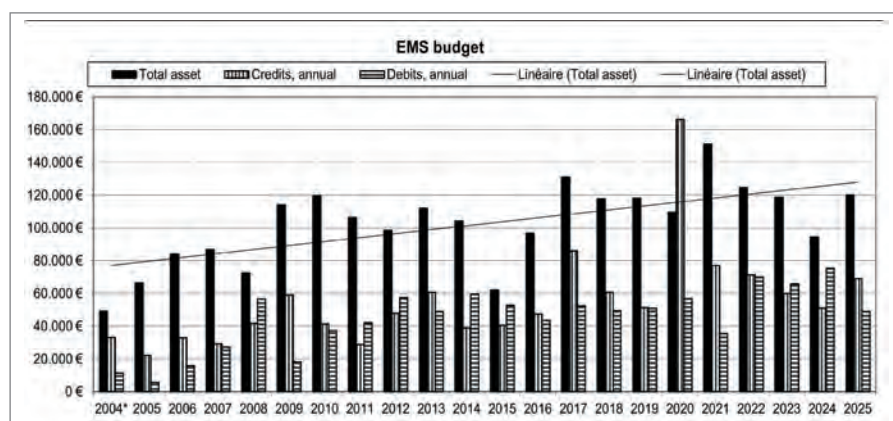
Incomings

Major incomings 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 IMC17, we can expect incomings of € 70 000.

Expenses

No EMS Extension meeting will be supported, up to 5 Sponsored meetings (€ 3 750.00) and 25 scholarships as support for congress attendance of young colleagues (€ 7 500.00) may 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 € 52 000.00.

Table EMS budget development/10 years



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.
Mons, March 10th, 2026
Treasurer EMS



EMC2028



UB Historic Building Josep Carner Building

Building the Foundations of EMC2028

As preparations for EMC2028 continue to progress, several key organizational areas are now entering an active development phase. Current efforts focus on three main pillars: the planning of the pre-conference workshops, the design of the commercial exhibition at the conference venue (Barcelona International Convention Center (CCIB)), and the establishment of the different boards and committees. Together, these elements will shape the scientific, logistical, and strategic foundations of the congress. Further updates on each of these fronts are outlined below.

With the contract between the European Microscopy Society (EMS) and the Spanish Microscopy Society (SME) already signed, we are currently focusing on the organizational aspects of the pre-conference workshops, scheduled to take place on 16th and 17th September 2028, immediately preceding the main congress activities in Barcelona. One of the key elements under evaluation at this stage is the selection of the venue for the workshops. Two locations within the University of Barcelona are being considered, each offering distinct characteristics that would suit different formats and needs. The first option is

the **historic building of the University of Barcelona**, an emblematic venue located in the city center.

As the oldest and most iconic building of the University, it provides a unique and prestigious academic atmosphere. Its architectural and historical significance would offer an exceptional setting for scientific exchange, with a variety of rooms suitable for workshops of different sizes. The second option is the **Josep Carner building**, home to the Faculty of Philology and Communication.

This building offers modern facilities and teaching spaces that may be more aligned with contemporary audiovisual and classroom requirements. Its layout provides flexibility for parallel sessions and a comfortable environment for participants, while remaining within the central campus and easily accessible. At this stage, no preference has been established between the two venues. Both options are under careful consideration, and logistical assessments are ongoing to determine their suitability in terms of capacity, infrastructure, accessibility, and overall participant experience. The final decision regarding the workshop venue will be made by the Executive Board of the



European Microscopy Society, who will evaluate the options based on the collected information and the needs of the EMC community. The organizing team remains committed to ensuring that the pre-conference workshops offer an optimal environment for learning, collaboration, and scientific exchange ahead of EMC2028.

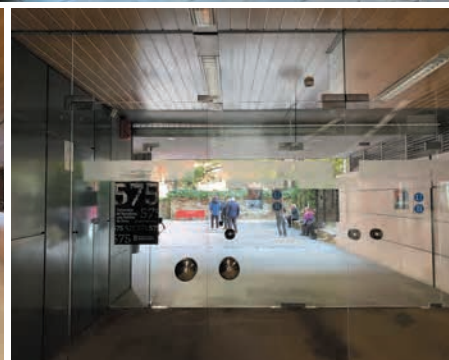
The organizational work for the commercial exhibition at the European Microscopy Congress 2028 is progressing steadily as we continue to refine the layout and logistical structure of the exhibition area. The exhibition will be held at the Barcelona International Convention Center (CCIB), an established venue known for hosting major scientific and professional events, with excellent accessibility, spacious facilities, and a privileged location by the sea. At this stage, the planning team is developing a preliminary floorplan for the exhibition area, situated on the ground floor of the CCIB, which is divided into several interconnected sections.

Three distinct layout options are being evaluated. The main differences between these alternatives involve the positioning of the poster area and the catering zones, key components that strongly influence visitor flow, visibility for exhibitors, and the overall attendee experience. Each option aims to achieve an effective balance between circulation, accessibility, and opportunities for interaction among delegates and industry partners. These drafts were discussed last 30th January 2026 during a visit to CCIB of both conference co-chairs, Raul Arenal (University of Zaragoza) and Francesca Peiró (University of Barcelona) and the PCO manager Mirtcho Savov from BCO Congresos.

The exhibition is expected to attract a broad range of companies, including major microscope manufacturers, software developers, providers of scientific instrumentation, suppliers of consumables, and emerging start-ups in fields related to microscopy and imaging. The diversity of potential exhibitors underscores the importance of a well-designed layout that supports both large-scale demonstrations and smaller, specialized interactions.

At the moment, registrations for exhibitors have not yet opened. The organizing team is currently preparing the commercial dossier, which will include detailed information on the available stand formats, sponsorship opportunities, and the structural and technical features of the CCIB exhibition space. This dossier will be shared with the EMS executive board for discussion in the coming months, once the preliminary layout has been refined and the options are ready to be presented to potential participants. As with other aspects of EMC2028, planning remains an iterative process. The final configuration of the exhibition space will be determined at a later stage, following consultation with the relevant committees and stakeholders.

We will continue to provide updates as preparations advance, and we look forward to presenting the finalized exhibition plan in future communications. Our objective remains to ensure



Courtyard of the Historic Building (top) and main hall of Josep Carner building (below).

an engaging, accessible, and dynamic commercial environment that supports scientific exchange and innovation throughout EMC2028.

Finally, work has begun on the structure and composition of the **International Advisory Board (IAB)**. This body will play a central role in guiding the

scientific ambitions, strategic priorities, and overall international outreach of EMC2028.

A first IAB was established during the bidding however, the process is currently being led jointly by the **Scientific Program Committee (SPC)**—which includes Catherine Venien-Bryan



Lecture rooms at the Historic Building (left) and at Josep Carner building (right).

(General EMS Secretary), Marc Peeters (ECMA representative), Philippe Leclère (EMS Treasurer), and Lewys Jones, together with representatives from the **Local Organizing Committee (LOC)**. This shared leadership ensures that both the broader European microscopy community and the local host institution contribute to shaping the IAB.

At this stage, the SPC and the local representatives are beginning to consider potential candidates. While no final number of IAB members has yet been established, the selection will follow several key criteria. These include achieving a balanced geographical representation across Europe, ensuring the presence of a wide range of scientific specialties and microscopy disciplines, and promoting diversity of perspectives and professional backgrounds. The intention is to assemble a board that reflects the breadth of the European microscopy landscape and that includes input from the various national microscopy societies within the European Microscopy Society network. ■



Barcelona International Convention Center (images acquired on 30th January 2026).



EMS Extension



17th Multinational Congress on Microscopy

7 - 12 September 2025 - Portorož - Slovenia

The 17th Multinational Congress on Microscopy (17MCM) took place from 7–12 September 2025 at the Grand Hotel Bernardin on the Slovenian coast. The event brought together nearly 450 participants from academia, research institutes, and industry for a week dedicated to microscopy.

The congress opened on Sunday evening with a Welcome reception, providing an opportunity for participants to meet and reconnect before the scientific programme began. Throughout the week, each day started with a plenary lecture, covering alternating topics in life sciences, material sciences, and instrumentation. These sessions attracted broad interest across the community and offered a shared starting point. This year, short video interviews with plenary speakers were also recorded and shared on the congress's

social media channels, providing additional insight into their work and perspectives.

After the plenary lectures, participants gathered in the exhibition area for the morning coffee break. The exhibition remained a central meeting point where attendees could interact with industry partners and learn about new tools and technologies. The scientific programme then continued with three parallel sessions each day. In total, 17MCM hosted 25 sessions, featuring 42 invited talks and 109 contributed oral presentations. The breadth of topics reflected ongoing developments in microscopy.

Industry participation formed an important part of the event. The Exhibitor Session, with presentations from 11 companies, gave participants a concise overview of recent technological developments. During lunch breaks,

exhibitor-led workshops offered more detailed demonstrations and practical information. In addition, sponsor showcases were recorded and published on social media for wider accessibility.

Two special sessions were also held: one organized by EuroBioImaging, highlighting European efforts in coordinated bioimaging infrastructure, and another by the IMPRESS project, presenting its activities and outcomes. Both sessions helped connect the congress to broader initiatives in the microscopy community.

The poster exhibition played a significant role in the overall scientific exchange. This year, 186 posters were presented across two extended sessions, each lasting for two consecutive days. This structure allowed participants to view the posters without time pressure and encouraged in-depth

discussions. The poster area remained active throughout the week, and many early-career scientists noted the visibility their work received. During the congress, we also hosted the EMS General Assembly Meeting and the EMC Board Meeting, which brought together representatives involved in shaping the direction of European microscopy activities.

On Wednesday morning, the congress programme included a 5 km charity run along the coastal pathway. Despite forecasts predicting rain, conditions remained favourable until the run was completed. All proceeds were donated to the Slovenian Association of Friends of Youth, adding a community-focused element to the event.

The Gala dinner, open to all registered participants, took place on Thursday evening. The programme included the announcement of the Best Poster Awards and the Best Image Competition winners, as well as a DJ dance party. The dance floor was quickly full and remained this way until the end of the evening.

Overall, feedback from participants was very positive, with many noting the balanced scientific programme, the useful interactions with exhibitors, and the opportunity to meet colleagues from different areas of microscopy. The location, with its accessible facilities



and coastal setting, also supported productive discussions throughout the week.

As 17MCM concluded, preparations and planning for future congresses were already under way. The community now looks ahead to the next Multinational Congress on Microscopy, which will be hosted by the Italian Microscopy Society in Trieste. More information about dates and programme details will follow as planning progresses.

We would like to thank all participants—speakers, poster presenters,

exhibitors, sponsors, volunteers, and attendees—for contributing to the success of 17MCM. Your engagement throughout the week made it a constructive and collaborative event. ■

Kristina Žagar Soderžnik/
Barbara Šetina
Jožef Stefan Institute, Department for
Nanostructured Materials
Jamova cesta 39, 1000 Ljubljana,
Slovenija







Reports on EMS Sponsored Events



Report for 2nd International Microscopy and Spectroscopy Congress

25 - 27 September 2025 - Istanbul - Turkey

2nd International Microscopy and Spectroscopy Congress (MSC 2025) was successfully hosted by the Department of Histology and Embryology, School of Medicine, Acibadem University, in September, 25–27 2025, under the auspices of the Turkish Society for Electron Microscopy. As a parallel event, the 27th National Congress of Electron Microscopy was organized.

The congress welcomed microscopy studies in the fields of life sciences and material sciences. We would like to extend our sincere thanks to Prof. Dr. Ahmet Şahin, Rector of Acibadem University, for providing us this excellent opportunity. MSC 2025 was kindly supported by the European Microscopy Society as 'EMS-sponsored event'. We are honored by this invaluable support of EMS.

The congresses were enriched by 1 Keynote Lecture, 3 Plenary Talks, 57 Invited Speakers, 21 parallel sessions, and 1 poster session. During the Opening Ceremony, **Prof. Vladislav Krzyzanek**, President of the European Microscopy Society delivered his inspiring keynote lecture

entitled "Unlocking the power of SEM: Quantative Imaging and 4D Diffraction Across Disciplines". Plenary lectures on the first, second and third days of the congress were presented by **Prof. Ali Ertürk (Germany)**: AI powered 3D Cell-level Imaging for Disease Studies and Therapeutic Development; **Prof. Emre Yaksi (Sweden)**: The role of Astroglia in the Generation and Prevention of Seizures; and **Prof. Aydoğan Özcan (USA)**: AI-based Advances in Biomedical Microscopy and Pathology.

On the first day of the congress, "**Microscopy School**" which included the **3D Cell Culture Workshop** and **Neurohistology Workshop** was organized in the high-tech infrastructure of the microscopy labs of the campus. The hands-on workshops were conducted in groups of about 20 participants, preceded by a theoretical session.

"Prof. Ayse Oguz and Prof. Meral Baka Best Poster Awards", "Prof. Mahmut Sağlam Best Microstructure Award" and "Prof. Türkan Erben Research Award" which is organized biennially by the Turkish Society for Electron Microscopy in honor of the Founding President, were awarded in the fields

of materials sciences and biological sciences.

MSC 2025 was organized in accordance with international and national conference standards. All accepted and presented papers in both congresses were included in the conference abstract book after undergoing a peer-review process.

The MSC 2025 Organizing Committee and the Turkish Society for Electron Microscopy provided 50 scholarships to 50 undergraduate and graduate students.

MSC 2025 has been organized with generous sponsorship from the European Microscopy Society, which enabled the Organizing Committee to invite two plenary lecturers. We deeply acknowledge this kind support provided by the EMS. We had the chance to get financial support from 20 sponsors, societies and exhibitors. We extend our deepest appreciation to all the sponsoring companies such as TEKAFOS-THERMOFISCHER SCIENTIFIC (main sponsor), ZEISS, JEOL, HITACHI and LEICA and the International Cell Death Society. Technical presentations and

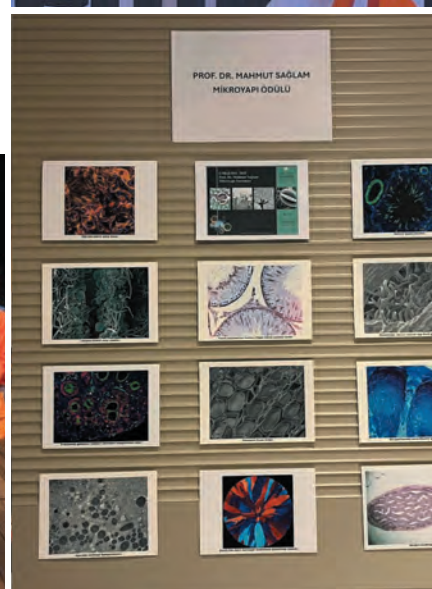
exhibitions of the sponsor companies regarding recent developments in the field of microscopy were included in the congress programme.

Our Gala Dinner was held on September, 26, 2025 as a cruise dinner on the pleasant surroundings of the Bosphorus, was a memorable highlight.

I faithfully thank the cochair of the congress -Melek Ozturk, Servet Turan, Deniz Yucel, Merve Elmas, Halime Kenar and every member of the Organizing Committee and the International Advisory Board for their hard work and dedication. On behalf of the Organizing Committee, I wish to express my warmest thanks to all our esteemed speakers, participants, and sponsors. We gratefully acknowledge the excellent support and teamwork provided by organization secretariat, FiGÜR Congress & Organization. We deeply appreciate all the student volunteers who helped us during the congress.

Overall, MSC 2025 was a successful scientific event with very lively activity and a considerable number of attendees, with many young participants. Many participants provided very positive feedback including that the congress scientific programme offered new insights and ideas. With around 300 participants and 20 sponsoring companies and societies, the congress fostered a strong atmosphere of scientific collaboration and social connection in the state-of-the-art infrastructure of Acibadem University Congress Center.

Prof. Serap ARBAK
MSC 2025 Congress Chair /
President of Turkish Society
for Electron Microscopy/ Board
Member of International Federation
of Societies for Microscopy
Acibadem University School of
Medicine, Dept. of Histology and
Embryology Istanbul TURKIYE



TEM-UCA 2025 European Workshop Transmission Electron Microscopy of Nanomaterials

14 - 18 July 2025 - Puerto Real (Cádiz) - Spain

TEM-UCA European Workshop on Transmission Electron Microscopy of Nanomaterials is devoted to review the advancements of Transmission Electron Microscopy, both imaging and spectroscopic techniques, in the characterization of a wide range of nanomaterials.

A series of conferences illustrate how S/TEM techniques as High Resolution Transmission Electron Microscopy, High Angle Annular Dark Field imaging, Electron Tomography, Electron Energy Loss Spectroscopy, and Cs

corrected S/TEM studies can be combined to obtain structural and chemical information of the analyzed materials at the atomic scale. Some examples illustrated the practical aspects of nanomaterials characterization and its applications in different fields.

TEM-UCA European Workshop Transmission Electron Microscopy of Nanomaterials was held at the Faculty of Science of the University of Cádiz in Puerto Real, Spain.

The Faculty has all the infrastructure required to host the workshop with

conference rooms and computer labs. The Electron Microscopy Division at the Faculty of Science of the University of Cádiz (DME-UCA) was created in 1989 as an instrument to boost the research in the field of Scanning/Transmission Electron Microscopy.

This division has been dedicated to continuous improvement in organizational issues, equipment resources and the qualification of technical personnel, to guarantee high quality services. DME-UCA is equipped with state-of-the-art instrumentation, among them an Ultra High Resolution



Group photo of TEM-UCA 2025 European Summer Workshop.



Double Corrected and monochromated S/TEM Thermofisher Titan Themis 60-300, a High Resolution S/TEM Thermofisher Talos F200X, and a SCIOS2 DUAL BEAM Station. Participant accommodation was organized by the “TEM-UCA European Summer Workshop”. The participants were lodged at “Colegio Mayor de la Universidad de Cádiz” located at Cadiz city center.

TEM-UCA 2025

The University of Cádiz (UCA) has successfully hosted the 2025 edition of TEM-UCA: Summer Workshop Transmission Electron Microscopy of Nanomaterials. Held at the Faculty of Sciences in Puerto Real, and after 23 editions, this event has established itself as an international benchmark in the field of nanomaterials characterisation.

This edition of TEM-UCA has exceeded expectations, with the participation of 36 students, young talents from various parts of the world, including the United Kingdom, China, Poland, Austria, Colombia, India, the Czech Republic, France, and Spain.

The main objective of the TEM-UCA school has been to review the latest advances in Transmission Electron Microscopy, covering both imaging and spectroscopic techniques, applied to the characterisation of a wide range of nanomaterials. Thus, throughout the workshop, the aim has been to provide participants with the necessary tools to understand and manipulate TEM/STEM data at a higher level.

The academic program has been intensive and high-level. Among the highlights, lectures were given by internationally renowned experts, who showed how advanced TEM techniques, such as High-Resolution Transmission Electron Microscopy (HRTEM), High-Angle Annular Dark-Field Imaging (HAADF), Electron Tomography, Electron Energy Loss Spectroscopy (EELS), and spherically-aberration-corrected S/TEM studies, can be combined to obtain structural and chemical information

of the analysed materials at the atomic scale.

Among the most important speakers participating in this edition were Raúl Arenal, with an introduction to Scanning/Transmission Electron Microscopy; Gabriel Sánchez-Santolino, who explored new perspectives in the characterization of materials with atomic resolution using 4D-STEM; Caterina Ducati, who delved into the exploration of perovskite-based devices with Scanning and Transmission Electron Microscopy; and Odile Stéphan, who focused on the applications of EELS in materials science, highlighting the new opportunities offered by electron beam monochromation.

In addition to all this, presentations on 'New Advances in TEM/STEM instrumentation' were offered by Mr. Juan Gabriel Rodríguez Madrid (Palex-IZASA) and Dr. Reza Zamani (ThermoFisher Scientific).

A fundamental pillar of the meeting has been the practical laboratories, where participants were divided into groups to receive training in the use of a variety of software applications in the field of S/TEM. The topics covered in these sessions included Image Processing, Image Simulations, Structural and Nanoparticle Modelling, Electron Energy Loss Spectroscopy (EELS), Energy Dispersive X-ray Spectroscopy (EDX), and Electron Tomography. Furthermore, sessions such as Computer-Aided Electron Crystallography, taught by José A. Pérez-Omil, and those dedicated to Electron Tomography and EDX, stood out.

The organisation of this prestigious event was supported by the *Structure and Chemistry of Nanomaterials* group at the University of Cadiz, in close collaboration with the Department of Materials Science, Metallurgical Engineering and Inorganic Chemistry, the Research Institute for Electron Microscopy and Materials (IMEYMAT) and the Distributed Spanish Unique

Infrastructure for Electron Microscopy of Materials (ICTS ELECMI).

Furthermore, this TEM-UCA 2025 edition had the fundamental support from the Vice-Rectorate for Research and Transfer of the University of Cádiz and FundUCA. The organising committee was composed by Professors José Juan Calvino, Ana Belén Hungría, Susana Trasobares, José Antonio Pérez-Omil, Juan Carlos Hernández and Miguel

**“TEM-UCA 2025:
A landmark
European workshop
at the University
of Cádiz focused
on advanced
nanomaterials
characterization.”**

López-Haro and Luc Lajaunie as well as Dr. Ramón Manzorro.

Beyond technical training, the event also fostered exchange and networking among participants. The success of this edition of TEM-UCA was possible thanks to the valuable support of its sponsors: Elecmi, ThermoFisher, Izasa Scientific, Aname, Gatan, and the European Microscopy Society.

With the closing of TEM-UCA 2025, the University of Cádiz reinforces its commitment to excellence in research and training in the field of electron microscopy of nanomaterials, contributing to unraveling the secrets of matter at the atomic scale to advance new technological applications. ■

TEM-UCA 2025 School
<http://tem.uca.es>



Women In Electron Microscopy (WEM) 2025

8 - 10 October 2025 - Forschungszentrum Jülich - Germany

The first **Women in Electron Microscopy (WeM)** event took place from October 8 to 10, 2025, at Forschungszentrum Jülich (FZJ), Germany. Conceived as a pioneering initiative, WeM set out to create a dedicated space for women in microscopy—a space for scientific exchange, networking, and empowerment. It was much more than a conference: it was a statement of commitment to diversity and inclusion in a field where women remain underrepresented.

From the outset, the atmosphere was vibrant and inspiring. The program combined high-level scientific content

with sessions addressing gender equality and career development. Keynote lectures by internationally recognized experts showcased cutting-edge research in materials and life sciences, while industry leaders presented the latest technological advances. Poster sessions and young scientist pitches provided a platform for emerging voices, and a lively panel discussion on gender equality sparked a particularly open and constructive dialogue.

The event drew **over 100 participants** from across the globe—academia, research institutions, and industry—reflecting its international dimension.

Delegates came from Germany, the UK, USA, Australia, France, Italy, the Netherlands, Israel, Japan, Croatia, Poland, Switzerland, Portugal, China, India, and beyond. This diversity enriched discussions and strengthened the sense of community that WeM aimed to foster.

“A pioneering initiative to create a dedicated space for women in microscopy.”



Audience listening to video message from Ina Brandes (Minister of Culture and Science of the State of North Rhine-Westphalia)



Prof. Dr. Kobus Kuipers (Member of the Board of Directors of Forschungszentrum Jülich and Prof. Dr. Joachim Mayer (Institute Director Ernst Ruska-Centre ER-C-2)

The scientific program was outstanding. Topics ranged from advanced electron imaging techniques such as 4D-STEM, holography, and ptychography, to cryo-electron microscopy and tomography, catalysis, and energy materials. Life science sessions explored structural biology at the molecular level, while industry talks highlighted innovations in instrumentation and data analysis. Lab and



From left to right: Prof. Dr. **Joachim Mayer** (Institute Director ER-C-2), Prof. Dr. **Astrid Lambrecht** (Chair of the Board of Directors of Forschungszentrum Jülich), Jun. Prof. Dr. **Irene Vercellino** (ER-C-3 | WeM Organizer), Dr. **Yan Lu** (ER-C-1 | WeM Organizer), Dr. **Saba Shahzad** (ER-C-3 | WeM Organizer), Dr.-Ing. **Genevieve Wilbs** (ER-C-1 | WeM Organizer), **Lidia Kibkalo** (ER-C-1 | WeM Organizer), Prof. Dr. **Rafal E. Dunin-Borkowski** (Institute Director ER-C-1), Prof. Dr. **Carsten Sachse** (Institute Director ER-C-3).

campus tours offered participants a glimpse into the world-class facilities of the Ernst Ruska-Centre and the Research Centre Jülich Campus.

Equally impactful were the sessions dedicated to empowerment and outreach. Talks addressed structural barriers for women in science, unconscious

bias, and strategies for inclusive leadership. Initiatives such as Girls' Day and STEM fatale were presented as models for engaging the next generation. The Career Pathways Workshop connected early-career researchers with mentors and industry representatives, creating opportunities that will resonate far beyond the event.

Feedback from participants was overwhelmingly positive. According to the post-event survey, **over 90% would recommend WeM to others**, and satisfaction scores for keynotes, networking opportunities, and workshops were exceptionally high. Attendees praised the openness of discussions, the quality of the scientific program, and the welcoming atmosphere. Many highlighted the event as a turning point—a safe space to share experiences, build confidence, and forge new collaborations.

Social events, including a welcome reception and a networking dinner, added to the success of the meeting. These informal settings allowed participants to connect on a personal level, strengthening bonds within the community. Childcare and dietary accommodations were provided, ensuring that everyone could participate fully—an important step toward inclusivity.

The organizers gratefully acknowledge the support of the **European Microscopy Society (EMS)**, the International Federation of Societies for Microscopy, the Deutsche Gesellschaft für Elektronenmikroskopie, Microscopy Australia, and the Royal Microscopical Society, as well as numerous industry partners (<https://er-c.org/index.php/conferences/wem/contact-sponsors-endorsement-wem/>). Their commitment made this event possible.

WeM 2025 was an outstanding success in every respect: scientifically, socially, and strategically. It demonstrated the power of bringing people together around a shared vision of equality and excellence. The seeds planted in Jülich will grow into lasting collaborations and future initiatives. Plans are already underway to make WeM a recurring event: **WeM 2027 – Highlighting Women. Open to Everyone. Empowering Every Voice in EM. – is scheduled for March 8–10, 2027.**

This next edition will build on the momentum of WeM 2025, expanding its reach and impact while continuing to champion diversity and inclusion in electron microscopy. ■



Latest Trends in in-Situ And Correlative Electron Microscopy – Conference & Workshop (ICEM 2025)

2 - 4 June 2025 - Brno - Czech Republic

The „Latest Trends in In-situ and Correlative Electron Microscopy – Conference & Workshop ICEM 2025” was held 2nd – 4th June 2025 in the lecture hall of the Institute of Scientific Instruments, the Czech Academy of Science (ISI CAS), in Brno, the world center of electron microscopy.

The conference ICEM 2025 is a thematic aimed conference combined with workshops. During the ICEM 2025 the following items were presented: new methods and instrumentation for milli-to-nano-scale correlative and 3D imagery, dynamical in-situ characterization and elementary analysis of natural and synthetic samples by SEM, STEM, ESEM, A-ESEM, TEM, ETEM, and other imaging and analytical methods in the field of biology,

material sciences, physics and chemistry. The topics of mathematical-physical simulations, nano-manipulation and in-situ measurement and AI for electron microscopy. Workshops were organized in ISI CAS scientific laboratories and demonstration laboratories of **Thermo Fisher Scientific** and **TESCAN**. **Delong Instruments**, **Alemnis**, **DENSSolutions**, **Imina Technologies**, **NenoVision**, **point electronic**, **Digital Surf**, **Global Foundries**, and **Crytur** showcased its in-situ characterization tools, solutions, and services.

The ICEM 2025 was organized according the topics in three sections: **In Situ and Correlative Transmission Electron Microscopy**, **Advanced Environmental Scanning Electron Microscopy and SW simulations**, and **In Situ**

and Correlative Scanning Electron Microscopy.

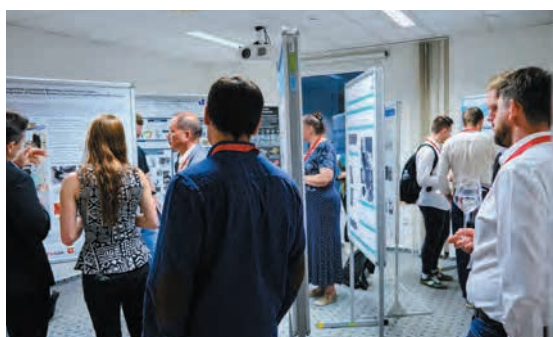
The reputable world scientists lectured within the ICEM 2025:

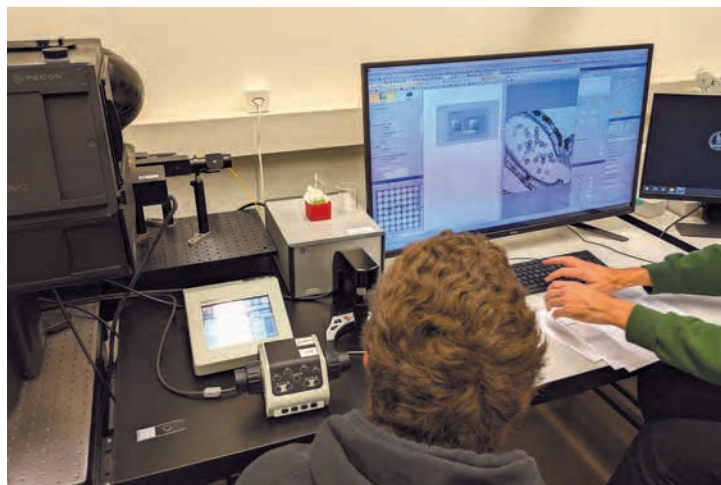
- **Prof. Karine Masenelli-Varlot**, INSA Lyon FR
- **Dr. Zahava Barkay**, Tel-Aviv University, ISR
- **Prof. Paul Verkade**, University of Bristol, UK
- **Prof. Nigel Browning**, University of Liverpool, UK
- **Prof. Thomas Loerting**, University of Innsbruck, AT
- **Prof. Gerhard Dehm**, Max Planck Institute Düsseldorf, DE
- **Dr. Peng-Han Lu**, Ernst Ruska-Centre Juelich, DE
- **Assoc. Prof. Vilem Nedela**, Institute of Scientific Instruments of the CAS, Czech Republic

The second edition of the ICEM in Brno is planned to be held in 2027. ■

Assoc. Prof. Vilem Nedela, Ph.D., Res. Prof., Institute of Scientific Instruments of the Czech Academy of Sciences, Brno, Czech Republic

Eva Soukupova, Ph.D., Institute of Scientific Instruments of the Czech Academy of Sciences, Brno, Czech Republic





Winter School 2025

20 - 24 January 2025 - Zurich - Switzerland

This advanced microscopy course is organized by the Center for Microscopy and Image Analysis of the University of Zurich and the Scientific Center for Optical and Electron Microscopy of ETH Zurich. The course is intended for PhD students and post graduates with prior experience in microscopy. The goal of the course is to teach and train fundamental knowledge and skills in a specific microscopic technique. Subsequently, students will be able to apply the knowledge in their own present and future projects. Practical work consisted of five different modules each covering a specific topic. Each practical module lasts the entire duration of the course. Students participate in one module only and use state-of-the-art instrumentation. Theoretical sessions covered basic and advanced knowledge about all the different techniques and topics. The Winter School 2025 was attended by 47 students, mainly PhD students from universities in the Zurich region and other universities in Switzerland, but also some students from Hungary, Germany, Slovenia, and the United Kingdom. More than 25 teachers and lecturers from Switzerland and abroad were involved to impart knowledge and practical skills during these five intensive days.

Advanced Light Microscopy

In this module, participants learned how to select the most appropriate advanced light microscopy technique

for their projects. Practical training comprised advanced widefield, confocal laser scanning, multiphoton, and super-resolution microscopes (STED) with cell and tissue samples for multi-color and 3D imaging, including image processing such as deconvolution.

Super-Resolution Light Microscopy

Students were taught how to identify the most appropriate super-resolution light microscopy technique to address the specific needs and sample. Numerous super-resolution or “quasi” super-resolution methods were covered including Structured Illumination Microscopy (SIM), Stimulated Emission Depletion (STED) microscopy, Single Molecule Localization (SMLM), Airy-scan, Re-scan, Super-Resolution via Optical Re-assignment (SORA), and Super-Resolution Radial Fluctuations (SRRF).

Sample Preparation for 2D and 3D Electron Microscopy

In this module, techniques to prepare biological specimens for 2D and 3D electron microscopy techniques were taught. Biological samples were processed by chemical and cryo-fixation techniques (high-pressure freezing, freeze-substitution) to preserve the ultrastructure. Subsequently, resin-embedded samples were sectioned by ultramicrotomy and imaged by transmission, scanning and focused ion beam scanning electron microscopy.

The cellular ultrastructure in the resulting micrographs was reviewed in context to preparation.

3D Correlative Light and Electron Microscopy

Correlative Light and Electron Microscopy (CLEM) combines the best of two worlds: large-scale imaging using light microscopy and high-resolution electron microscopy. This module covered the basics of methodology and preparation techniques needed to perform light and electron microscopic investigations on identical sample areas. Starting with imaging of living cells, samples were subsequently prepared for electron microscopy, and images were acquired by focused ion beam SEM and serial blockface SEM. Additionally, post-processing of volume data such as aligning the acquired light and electron microscopy data in 3D, visualizing the correlation, and creation of 3D models was performed.

Volume Scanning Electron Microscopy

In this module, scanning electron microscopy (SEM) based techniques for volume imaging were practically conducted: (1) Focused ion beam SEM, (2) serial blockface SEM and (3) array tomography. 3D data of the same sample were acquired using all three types of techniques. The practical session also covered image processing to visualize and model 3D data and structures of interest. ■



QEM 2025 - EMS Report

11 - 23 May 2025 - Port Barcarès - France

QEM2025 (6th edition) took place between Sunday, May 11, 2025 and Friday, May 23, 2025 (13 consecutive days) on the Mileade site (Estanyot) in Port Barcarès. This edition was organized in this center for the second time. We welcomed 102 students, 40 speakers and 15 engineers and technicians from partner companies/institutions (logistical help and installation of machines).

All these people (with the exception of a few engineers and technicians of private companies) were accommodated on a full-board basis at the Mileade center, whose staff perfectly managed the presence of this physicist assembly, and ensured an irreproachable support (technical, administrative, logistic...) throughout their stay.

The conference room has been designed to comfortably accommodate students (minimum 3 hours of classes per day) as well as a Transmission Electron Microscope with an energy



filter and an ultra-fast camera installed by JEOL, specifically for this event. Latest-generation TEM sample preparation facilities were installed there as well by the organization (diamond saw, polishing, provided by CEA and LMGP), an optical microscope was provided by LEICA and GATAN provided an ion milling system. Dedicated TEM sample holders were provided by PROTOCHIPS.

Separate spaces were available for remote practical sessions organized by Thermo Fisher and Tescan. Finally, they gave a live demonstration using the globally unique microscope located at the LPS laboratory in Orsay.

Three other rooms were equipped with 42 computers connected to a local network and cloned for practical data processing sessions, using a full range of free software as well as commercial software provided by GATAN and Protochips.

Communication during the conference was ensured via the website, a dedicated smartphone application and by the distribution of a daily newspaper, La Gazette, edited and printed locally on a daily basis. QEM2025 organizers feature the EMS logo on all the communications of the conference, including Smartphone Application Notification, Newspaper, etc. ■



Reports on Special News and Events



The IAMNano 2025

International Workshop on Advanced and in-situ Microscopies of Functional Materials and Devices

20 - 22 August 2025 – Chalmers University of Technology – Gothenburg - Sweden

The IAMNano 2025 International Workshop on Advanced and In-situ Microscopies of Functional Materials and Devices was organized by Prof. Eva Olsson, Dr. Alok Ranjan, Dr. Andrew Yankovich and Dr. Lunjie Zeng from the Chalmers University of Technology, Gothenburg, Sweden and held in Gothenburg from August 20 - 22, 2025.

The scientific topics were related to:

- advanced imaging with aberration-corrected TEM and STEM;
- phase and field imaging, including holography, 4D-STEM, and DPC-STEM;
- advanced spectroscopy, including EELS and EDS;
- in situ and environmental TEM and STEM;
- advanced characterization of functional nanomaterials and devices.

Following the IAMNano traditions of the previous years, this workshop succeeded by presenting outstanding and inspirational talks as well as vivid and active poster sessions, and provided an excellent opportunity to promote scientific advances and

international collaboration in a congenial atmosphere. It served as a venue for researchers and other specialists in different areas of microscopy and in the advanced characterization of functional nanomaterials and devices to discuss and exchange their latest findings and ideas with each other. Presentations of the latest developments by manufacturers interspersed in the sessions were an integral part of this program.

The program of the 3-day workshop comprised 27 invited presentations given by international speakers from Australia, Belgium, China, Czechia, Germany, Japan, Spain, South Korea, Sweden, UK and USA, poster sessions presenting the research of young scientists, vendor presentations, as well as lunch seminars.

Following the welcome addresses of Prof. Susanne Aalto, Deputy President and Deputy CEO of Chalmers University of Technology, and of Prof. Eva Olsson as Symposium Chair, the impressive scientific progress that has been made possible by the advanced imaging and spectroscopy methods of aberration-corrected electron microscopy was

shown by many of the world's leading scientists in their fields. The symposium presentations showcased novel developments and progress in different areas of microscopy, in instrumentation and instrumental methods, and in the characterization of functional nanomaterials by advanced imaging, spectroscopic and in situ TEM / STEM characterization. The contributions enabled not only assessment of the role of these methods for characterizing and understanding the properties of materials and devices relevant for many areas of materials physics and technology but also addressed future prospects and challenges.

The broad range of topics and scientific highlights covered by the invited presentations in 10 scientific sessions are summarized here, with the full program available at <https://www.chalmers.se/en/conference/iamnano-2025/programme/#programme>

Grain boundary dynamics and grain rotation in nanocrystalline Pt revealed by in situ 4D-STEM (Xiaoqing Pan, UC Irvine USA). Emerging electron diffraction techniques in crystallography



(Xiaodong Zou, Stockholm University Sweden). Twisted epitaxy and interface structures in MoSi_2 -metal- MoSi_2 twisted bilayers (Robert Sinclair, Stanford University USA). Electrochemistry in cooled and heated environments, photo illumination in gaseous environment, and methods for correlating multimodal data (David Nackashi, Protochips USA). A new TEM-STEM platform (Eric Van Cappellen, TFS USA).

In situ STEM of grain boundaries and dislocations in crystals (Yuichi Ikuhara, The University of Tokyo Japan). Strain engineering in advanced semiconductor devices (Daehong Ko, Yonsei University South Korea).

Ultrafast microscopy and diffraction of photo-driven transitions in VO_2 (Jonas Weissenrieder, The Royal Institute of Technology Stockholm Sweden). Sub-picosecond pulsed electron beams without a femtosecond laser (Ondrej Shanel, TFS Brno Czechia).

Making every electron count - strategies for, and challenges in low-dose phase retrieval (Angus Kirkland, Oxford University UK). Pushing detection limits with electron ptychography (Timothy Pennycook, EMAT Antwerp Belgium). 3D imaging of individual carbon atoms (Jianwei Miao, UCLA USA).

Atomic-level spatio-temporal analysis of structural dynamics in metal and oxide nanoparticles (Peter Crozier, Arizona State University USA). Atomic-resolution dynamic STEM imaging (Ryo Ishikawa, The University of Tokyo Japan). 4D STEM methods

and applications to beam-sensitive materials (Joanne Etheridge, Monash University Australia). Electron channeling contrast imaging for crystal defect analysis of structural materials (Antonio Casares, ZEISS Germany).

Local control of environment for quantifying in situ materials transformations (Frances Ross, MIT USA). Practical aspects of measuring electric fields of atom probe needles in combined TEM-APT instruments (Rafal Dunin-Borkowski, ER-C FZ Juelich Germany). Iliad, a new TEM-STEM platform (Eric Van Cappellen, TFS USA).

Liquid phase electron microscopy studies of nucleation, growth and nanoscale transformations in solutions (Haimei Zheng, LBNL Berkeley USA). Graphene liquid cell TEM with high resolution and msec-speed (Jungwon Park, Seoul National University South Korea).

Application of MARS and Beyond (Naoya Shibata, The University of Tokyo Japan). The TOMO Project - integrating a fully functional atom probe in an aberration corrected TEM (Joachim Mayer, RWTH Aachen / ER-C FZ Juelich Germany). Chromatic and spherical aberration correction using combined hexapole and quadrupole field design (Shigeyuki Morishita, JEOL Ltd UK).

Advancements in in situ TEM for functional materials analysis (Yoshifumi Tanaguchi, Hitachi High-Tech Corporation Japan). Infinitesimal domain formation through phonon-decoupled ferroelectricity (Si-Young Choi, POSTECH South Korea). Vibrational EELS with single-atom sensitivity: from isotope mapping to probing electron-phonon coupling at oxide interfaces (Wu Zhou, Chinese Academy of Science China). Probing the structural complexity of cerium dioxide



Min-Su Kim receiving his award

via high-loss EELS and EXELFS and exploring JEOL's evolution and emerging developments (Julius Buerger, JEOL Germany).

Measuring Kapitza interface thermal resistance via in situ STEM-EELS (Peng Gao, Peking University China). Advancing materials research with atomic-resolution 4D-STEM data analytics (Gabriel Sanchez Santolino, Universidad Complutense de Madrid Spain). From atomic insight to design: multimodal STEM for quantum matter heterostructures (Hongguang Wang, MPI Stuttgart Germany). Exploring the surface chemistry of MXenes (Per Persson, Linköping University Sweden).

The poster presentations were an essential component of the workshop, providing multiple opportunities on several occasions for discussions with young scientists on the different workshop topics, including contributions on: correlative microscopy, battery analyses, thin-film ferroelectrics, in situ TEM for probing dielectric breakdown, in situ TEM in gas adsorption crystallography, in situ S/TEM of martensitic transformations, cracking mechanisms in ceramic materials, polarization determination with electron ptychography, monitoring enzymatic desulfation of CNC surfaces, in situ TEM study of ferro-elastic domain switching, strain development and relaxation in multilayer coatings, method development for observing dislocation charges in semiconductors, sample preparation and transfer station, metal-insulator transition by twisting metallic membranes, lithiation dynamics in anodes by in situ electrochemical liquid cell

TEM, in situ EM and Raman spectroscopy of strained 2D materials, potential optimization via 4D STEM and the scattering matrix, resolving phonons in superconductors at sub-unit-cell resolution, in situ liquid TEM of organic materials for neuro-pharmaceuticals, ferroelectric domain switching, real-space mapping of magneto-structural coupling in ferromagnets, advances for temperature-dependent liquid and electrochemical in situ TEM studies, 3D interfacial structure in twisted bilayer membranes, and more.

The 'Best Poster' prizes were awarded to Xiaowen Zhang, Jingyuan Yan, Nan Wang, Aowen Li, Shun Kondo, Min-Su Kim, Jonatan Holmér and Xiaoyue Gao.

The IAMNano 2025 workshop in Gothenburg was another outstanding, successful and inspirational symposium of the IAMNano series, showcasing top-level research activity, providing ample opportunities to forge new friendships and planting the seeds for future collaborations – well represented by the scientific program, the excellent talks, the informative updates by the vendor representatives, the impressive research, the poster sessions, the vivid interactions in the poster and exhibition area, and the many lively discussions among the participants.

Most of the participants could also attend the wonderful social events which contributed to the success of this workshop, enabling them to sample some of the rich historical and cultural legacy of Gothenburg and Marstrand and to enjoy its superb hospitality with

regional delicacies and delicious seafood at a superb Conference Dinner. Entertaining dinner moderation by 'William Chalmers' (represented by Philip Ramsby and assisted by Prof. Ryo Ishikawa and Prof. Robert Sinclair in their congenial roles) as well as the marvelous presentations of regional Swedish songs by Ex-Spex made a truly enjoyable and memorable dinner evening. Professor Eva Olsson presided in her well-known enthusiastic, efficient and thoughtful manner over all proceedings and events.

The IAMNano workshop series was initiated in Krakow, Poland in 2012. The subsequent workshops were hosted in Rio de Janeiro, Brazil (2014), Hamburg, Germany (2015), Port Elizabeth, South Africa (2016), Singapore (2017), Hamburg, Germany (2018) and Duesseldorf, Germany (2019). The workshop series unfortunately had to be interrupted from 2020 to 2022 because of the Covid-19 pandemic. IAMNano 2023 in Matsue Japan kick-started the workshop again as a bi-annual event, followed in 2025 by this IAMNano 2025 in Gothenburg, the ninth in this series.

We will join forces with the In situ Electron Microscopy group so the next International IAMNano Workshop will be held in 2027 in South Korea in conjunction with the 6th In Situ Electron Microscopy workshop. It will be organized by Professors Si-Young Choi, POSTECH Korea, Jungwon Park, Seoul National University Korea, Maria Varela, Universidad Complutense de Madrid Spain, and Kate Reidy, University of California Berkeley USA.

The organizers sincerely wish to acknowledge institutional support and related company sponsors for this workshop. Please see website <https://www.chalmers.se/en/conference/iamnano-2025/> for more information. ■

**Wolfgang Jaeger on behalf
of the Members of the
Scientific Advisory Board**

**Rafal Dunin-Borkowski, Wolfgang
Jaeger, Joachim Mayer, Eva Olsson,
Naoya Shibata, Robert Sinclair**



Lunch lecture by Thermo Fisher



AFM BioMed Conference 2025

8 - 11 April 2025 - Barcelona - Spain

The Atomic Force Microscopy in Life Sciences and Nanomedicine (AFM BioMed) conference is one of the world's leading scientific meetings focused on the application of atomic force microscopy (AFM) to biology and biomedicine.

The 11th edition, *AFM BioMed 2025*, brought together 160 participants and was organized by the Institute for Bioengineering of Catalonia (IBEC) and the University of Barcelona (UB). The event was proudly hosted at the Historic Building of the University of Barcelona—an inspiring venue that fostered scientific exchange and collaboration.

The organizing committee comprised a distinguished international team, including Jean-Luc Pellequer (IBS Grenoble), Félix Rico, Lorena Redondo-Morata, and Claire Valotteau (Aix-Marseille Université, Inserm, DyNaMo), alongside the local committee formed by Núria Gavara, Annalisa Calò, and Mireia Oliva from UB, under the chairmanship of Marina I. Giannotti (IBEC, UB).

Experts from diverse fields shared insights on how atomic force microscopy can advance knowledge in

biology and health. The conference featured four main themes: *Single Molecules; From Membranes to Cells; Multicellular Systems and Biointerfaces; and AFM Developments*. Keynote and invited speakers included Małgorzata Lekka, George Heath, Georg Fantner, Filomena Carvalho, Martin Pešl, Fernando Moreno-Herrero, Nancy Forde, Delphine Sicard, and Alessandro Podestà.

Many outstanding contributions came from young researchers, both through oral and poster presentations. The Best Oral and Poster Awards were presented to Joanne Lê-Chesnais, Kassandra Gerard, Yogesh Saravanan, Nada Wahman, and Mar Alcaraz Hurtado.

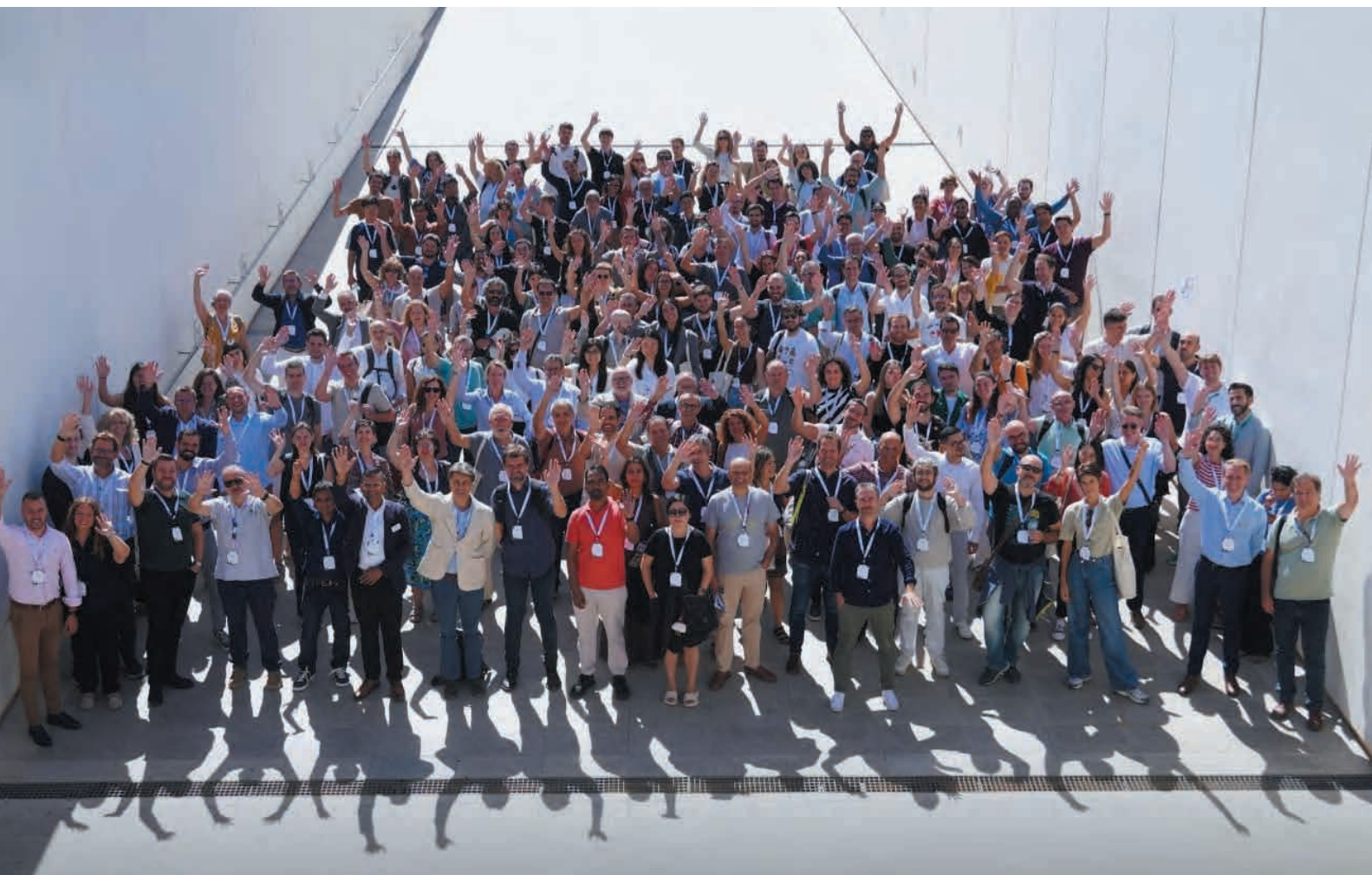
AFM BioMed 2025 played a key role in strengthening international collaboration and fostering new synergies—not only across disciplines but also between early-career and established researchers. It provided a platform to address common challenges and accelerate the development of innovative health solutions. The conference also facilitated discussions on important issues such as AFM standardization, a topic of ongoing debate that remains unresolved.



In parallel with the main event, a science outreach activity aimed at the general public was held, where science communicator Jordi Díaz-Marcos explained how AFM is transforming key sectors such as health, energy, and electronics. ■

Microscopy at the Frontiers of Science 2025

23 - 25 September 2025 - Valencia - Spain



Attendees of MFS2025 gathered for the official group photo, celebrating a successful international scientific meeting.

The 2025 edition of the “Microscopy at the Frontiers of Science” (MFS2025) conference (<https://mfs2025.com/>) was held in Valencia, Spain, from September 23rd to 25th. Co-organized by the Spanish and Portuguese Microscopy Societies (SME and SPMicros), the event brought together 213 participants from ten countries, including Spain, Portugal, France, the United Kingdom, Germany, India, Denmark, the Netherlands, Belgium, and the United States.

The scientific program was rich and diverse, featuring six plenary lectures by Sjors Scheres, Giulia Zanetti,

Manos Mavrikis, Wiebke Möbius, José Sánchez Costa, and Amadeo López Vázquez de Parga, and seven parallel sessions focused on Materials Science and Life Sciences, including CryoEM. Attendees engaged in 72 oral presentations, 22 flash talks, 35 poster sessions, and six industry-related talks.

The conference was supported by ten companies and hosted a lively exhibition area. The organizers expressed deep appreciation to all these companies and to the Generalitat Valenciana, the Scito Foundation, and the Centro de Investigaciones Príncipe Felipe for their generous support, as well as to

the technical and audiovisual teams, catering staff, session chairs, student volunteers, and all participants who contributed to the event’s success.

Several awards were presented during the closing ceremony. The PhD Thesis Awards recognized Marc Botifoll and Daniel del Pozo in Materials Science (sponsored by Thermo Fisher Scientific), Álvaro de la Gándara and María Jesús Rodríguez in Life Sciences (sponsored by ZEISS), and David Herreros and Rafael V. Ferreira in Technical Developments (sponsored by Izasa and Milexia).



Organizers and participants standing in front of the MFS2025 conference banner in Valencia, showcasing sponsors and supporters.



Paella Lunch. Participants enjoying traditional paella during the conference lunch break, highlighting the hospitality and cultural flavour of the event.



Coffee Break. Informal networking moments during the coffee break, fostering collaboration and exchange among microscopy professionals.

“MFS2025 highlighted the strength of the Iberian microscopy community and scientific excellence.”

Scientific presentation awards were given to Kevin Mamprin (Best Talk in Life Sciences/CryoEM), Enric Pérez-Parets (Best Flash Talk in Life Sciences/CryoEM), and Ángela Carrión (Best Poster in Life Sciences/CryoEM), as well as Francisco Fernández Cañizares (Best Talk in Materials), Maryam Karimi (Best Flash Talk in Materials), and Vanessa Costa-Ledesma (Best Poster in Materials).

The image contest also drew enthusiastic participation. Antonio Diego Molina-García and Aline Schneider-Teixeira (ICTAN-CSIC, Madrid) received the Best Picture in Life Sciences award, while Carmen Majano López (CNB-CSIC) and Jesús González Outumuro (UAM) earned second prize. In Materials Science, Simon Hettler (Laboratory for Electron Microscopy, KIT) won the Best Picture award, and Antonio Jesús Castro López, Elena Lima Cabello, and Juan de Dios Alché (EEZ-CSIC, Granada) received second prize in the Life Sciences category.

MFS2025 once again highlighted the strength of the Iberian microscopy community and its commitment to scientific excellence and collaboration. Both Portuguese and Spanish microscopy societies look forward to welcoming participants to the next edition of the conference to be held in Portugal, probably in the region of Algarve in 2027. ■

**Report submitted
by Paulo Ferreira
(President of SPMicros)
and Francesca Peiró
(President of SME)**



7th Joint Sino-German Symposium on Advanced and Correlative Electron Microscopy and Catalysis

11 - 14 May 2025 - Dalian - China

Novel developments in catalysis were at the focus of a meeting of scientists from leading institutions in China and Germany at the Energy College Campus of the Dalian Institute of Chemical Physics in Dalian, China. The workshop highlighted the significant potential of advanced and correlative electron microscopy methods in fundamental catalyst material research, synthesis process understanding, novel catalyst material development, and property monitoring and understanding.

This 7th Joint Sino-German Symposium was held at the Dalian Institute of Chemical Physics, Chinese Academy of Sciences and showcased over 3 days numerous examples documenting impressive progress by applying advanced and correlative methods of electron microscopy to materials research for catalysis.

The organizers of the symposium were Prof. Dr. Feng Wang and Dr. Qiang Guo, both from the Dalian Institute of Chemical Physics, Chinese Academy of Sciences, China, and Prof. Dr. Rafal E. Dunin-Borkowski and Dr. Marc Heggen, both from Forschungszentrum Jülich, Germany. The symposium continued a

series of Joint Sino-German Symposia, which were previously held at Tsinghua University in Beijing (2016, 2018), at Xi'an Jiaotong University (2017), at Beijing University of Technology (2019), at the Hong Kong Institute for Advanced Study and Shenzhen Futian Research Institute of the City University of Hong Kong (2023), and in Bad Honnef, Germany (2024).

The symposium was attended by 51 participants. Following the opening remarks by Prof. Feng Wang (DICP Dalian), Prof. Rafal E. Dunin-Borkowski (FZ Jülich), and Dr. Bo-Lun Ning (CAS Bureau of International Cooperation), 36 invited speakers from China and from Germany gave scientific presentations during 10 sessions over the following days. The topics included advanced and correlative methods of electron microscopy, including efficient cryogenic electron microscopy, and their applications to a broad spectrum of novel research for catalysis:

1 Evaluation of Electrocatalyst Activity, Stability and Selectivity - Advanced Analytical Techniques and Electrochemical Flow Cells, Karl Mayrhofer, Forschungszentrum Jülich

- Visualizing Catalytic Reactions via Environmental TEM, Yong Wang, Zhejiang University
- Hydrides for Ammonia Synthesis, Ping Chen, Dalian Institute of Chemical Physics

2 Opportunities for Phase Contrast Measurements of Charge Transfer and Defect Energy States in the Transmission Electron Microscope, Rafal E. Dunin-Borkowski, Forschungszentrum Jülich

- Electron-Crystallography-Driven Zeolite Synthesis, Peng Guo, Dalian Institute of Chemical Physics
- In-Situ Transmission Electron Microscopy Study of Nanomaterials for Green Energy, Marc Heggen, Forschungszentrum Jülich
- Synthesis of 1D MRE Zeolite and its Catalytic Application in the Isomerization of Long-Chain Alkane, Xiu-Jie Li, Dalian Institute of Chemical Physics

3 Controlled Nanostructures for Applications in Electrocatalysis, Marc Ledendecker, Technische Universität München

- Electrochemical Synthesis of High-Value Chemicals Using Membrane Electrode Assemblies, Dun-Feng



Gao, Dalian Institute of Chemical Physics

- Unveiling Degradation Mechanisms in Cathode Materials Using Combined Operando Neutron Diffraction and 4D-STEM, Ting-Ting Yang, Forschungszentrum Jülich
- Zeolite-Confined Subnanometer Metal Catalysts: Synthesis, Structural Characterizations and Catalytic Applications, Li-Chen Liu, Tsinghua University Beijing

4 Engineering Chirality of Materials for a Healthier Future, Prashant Kumar, Nanyang Technological University

- Atomic Scale Interactions Between Metal and Support in Redox Reactions, Wei Liu, Dalian Institute of Chemical Physics
- Electrostatic Potential of Latex Sphere Using Off-Axis Electron Holography, Yan Lu, Forschungszentrum Jülich
- Interface-Controlled Self-Electrification-Driven Chemistry in Microdroplets, Xiu-Quan Jia, Dalian Institute of Chemical Physics
- Visualizing Degradation of a Model Catalyst During CO₂RR Using a New Experimental Method for Identical Location (S)TEM, Robert Zandonella, Forschungszentrum Jülich

5 Single-Atom Catalysis, Tao Zhang, Dalian Institute of Chemical Physics

- Fundamental Studies of Irradiation-Induced Phenomena Utilizing Transmission Electron Microscopy, Wolfgang Jäger, Kiel University
- Atomically-Resolved Secondary Electron for Surface Studies of Nanocatalysts, Xi Liu, Shanghai Jiao Tong University

6 Insight into Organic Photocatalysis from Ultrafast Spectroscopy, Kai-Feng Wu,

- Dalian Institute of Chemical Physics
- Atomic-Scale Ionic Phenomena in Perovskite Oxide OER Catalysts and Exsolution Materials, Felix Gunkel, Forschungszentrum Jülich
- Microscopic Insights Towards Highly Efficient Hydrogen Production Catalysts, Wu Zhou, University of Chinese Academy of Sciences

7 Multi-Scale Observation of Dynamics at Reactive Interfaces, Marc Willinger, Technical University of Munich

- Surface-Sensitive Scanning Electron Microscopy (SEM) for Elucidating Gas-Solid Interface Mechanisms, Zhu-Jun Wang, ShanghaiTech University
- Catalytic Reconstruction of C-C Bonds in Lignin, Ning Li, Dalian Institute of Chemical Physics

8 Advancing Instrumentation and Workflow Towards Efficient Cryogenic Electron Microscopy, Peng-Han Lu, Forschungszentrum Jülich

- Photocatalysts for C-C Coupling, Neng-Chao Luo, Dalian Institute of Chemical Physics
- Mechanics of Intermetallic Catalysts – An In-Situ Transmission Electron Microscopy Study, Ansgar Meise, Forschungszentrum Jülich
- Titanium Based Oxides for Photocatalytic Overall Water Splitting, Gang Liu, Institute of Metal Research

9 Probing the Structural Evolution of Catalytic Materials by Multimodal and In-Situ Electron Microscopy, Christian Liebscher, Ruhr-University Bochum

- Transmission Electron Microscopy of Beta-Gallium Oxide Nanobelts, Hong-Chu Du, Forschungszentrum Jülich
- Light-Driven Catalytic Conversion of Carbon-Based Small Molecules, Si-Bo Wang, Fuzhou University

10 Challenging the Durability of Intermetallic Mo-Ni Compounds in the Hydrogen Evolution Reaction, Marc Armbrüster, Darmstadt Technical University Germany

- Observing Dynamic Structural Changes in Catalysts Using In-Situ Electron Microscopy, Peng-Fei Cao, Forschungszentrum Jülich Germany
- Fine Tuning Carbon Nanopores for Molecular Separation, Guang-Ping Hao, Dalian University of Technology China
- Phase-Selective Synthesis of Oxidations of Ethane Catalyst Mo₃VO_x by Modulating Cation Valence, Chen Fu, Dalian Institute of Chemical Physics China

In the closing remarks, Marc Heggen, Forschungszentrum Jülich, and Feng Wang, Dalian Institute of Chemical Physics, acknowledged the perfect conference organization and positive and constructive exchanges and discussions of this successful meeting and informed the participants about plans for a further Joint Sino-German Symposium in 2026.

Participants of the 7th Joint Sino-German Symposium.

The participants of the 7th Joint Sino-German Symposium experienced an exciting and intense programme, with excellent presentations of novel and impressive research. The lively and inspiring discussions among the scientists led to discussions about numerous initiatives for future collaborations. This impression was supported by the positive feedback given by the participants. Highest appreciation was expressed for the excellent and smooth organization by the local organizers, Prof. Dr. Feng Wang and Dr. Qiang Guo, and their team from the Dalian Institute of Chemical Physics (DICP). The participants enjoyed superb hospitality and a visit of the Microscopy Center in the Dalian Institute of Chemical Physics at the Xi-Shan Lake Campus, which contributed to the success of the 7th Joint Sino-German Symposium.

We gratefully acknowledge financial support by the by the Sino-German Center for Research Promotion (project number M-0304), the DICP SYMPOSIUM (project number 57), the Chinese Journal of Catalysis, and HITACHI. ■

Wolfgang Jäger (Christian-Albrechts-University of Kiel and Forschungszentrum Jülich)

Rafal E. Dunin-Borkowski, Marc Heggen (Forschungszentrum Jülich)

Feng Wang, Qiang Guo (Dalian Institute for Chemical Physics)

Strategic Advances in Microscopy Infrastructure for Barcelona

January 2025 - University of Barcelona



From left to right: Francesca Peiró (President of the Spanish Microscopy Society), Núria Montserrat (Catalan Minister of Research and Universities), Salvador Illa (President of the Catalan Government Generalitat de Catalunya), Joan Guàrdia (Rector of University of Barcelona), Maria Terrades (Director of Barcelona Scientific Parc), and Juan Fran Sangüesa (Director of CCITUB)



Lluís López from CCITUB and LENS group demonstrates the capabilities of the new high-resolution microscope during the launch event.

In January 2025, the University of Barcelona (UB) inaugurated a state-of-the-art electron microscope at the Parc Científic de Barcelona (PCB), a Jeol NeoARM 200cF, marking a major milestone for microscopy research in Spain.

The new equipment, co-funded by the European Regional Development Fund (FEDER), and the consortium University of Barcelona (CCITUB-UB), Institute for Bioengineering of Catalonia (IBEC), Bosch i Gimpera

Foundation (UB), Bellvitge Biomedical Research Institute (IDIBELL), August Pi i Sunyer Biomedical Research Institute (IDIBAPS), and Sant Joan de Déu Foundation (FHSD) was officially presented by the President of the Generalitat, Salvador Illa, and the Minister of Research and Universities, Núria Montserrat.

This advanced microscope is probe corrected, equipped with energy filter and direct electron detection camera from GATAN, IDES equipment for dose control and subframe fast acquisition, and DENSolutions sample holders for in-situ experiments.

The instrument is housed within the Centres Científics i Tecnològics de la UB (CCiTUB), the node in Barcelona of the distributed scientific and technological infrastructure ICTS-ELECMI, and enables high-resolution imaging

and analysis of materials and soft matter. It supports dynamic observation under varying conditions, including temperature control, electric polarization, and liquid environments. Its capabilities open new avenues for interdisciplinary research across biomedicine, nanotechnology, and materials science.

The inauguration event brought together institutional leaders, researchers, and media, highlighting the strategic importance of this infrastructure for Catalonia's scientific ecosystem. The microscope is part of the MERIT project (Microscopia Electrònica Avançada per a la Recerca, la Innovació i la Transferència de Coneixement), which aims to enhance innovation and knowledge transfer across disciplines. ■

Francesca Peiró

“A major milestone for microscopy research in Spain at the University of Barcelona.”

Frits Zernike and his Phase-Contrast Technique

Imaging anno 1921; Ernst Abbe

Ernst Abbe had established that the working of a microscope reduced to the combined effect of direct imaging and diffraction (Ref.1). The objective was claimed to produce, in case of skew illumination, two kinds of images in its back focal plane: a primary image of the light source on the optical axis and a series of diffraction patterns, brought about by the rim of the front lens holder.

The overall imaging was a matter of adding up, by the ocular, the direct image with the secondary images. In a few words: it was considered the interference effect of a diffraction phenomenon. The smaller the diameter of the front lens, the more pronounced the diffraction effect. The 'definition' of the object depended on the direct image, the 'resolution' was brought about by the secondary images.

The more secondary images intercepted by the ocular, the higher the 'resolution', in other words, the smaller the distinctly visible details. The illumination as such is also important: a parallel beam of light, focused on the

transparent object by the condenser, will transform each point of that object into a light source. Cones of light, then, will enter into the front lens and be brought to focus in the back focal plane of the objective. In due course it was realized that the optical structure of the object was also important: it should be thin enough to minimize diffraction by regularly oriented opaque parts. The new glasses produced by Otto Schott brought Carl Zeiss AG to the forefront of microscopy: its apochromatic objectives called the tune (**Fig.1**).

Zernike; from Rowland to Abbe

About 1929-1930 the Groningen mathematical physicist Frits Zernike (1888-1966, **Fig.2**) came in. The Groningen Faculty of Science had mounted a research programme aiming at spectral measurements with a so-called 'Rowland grating', a set of parallel rulings on a concave metallic mirror (**see Fig.3**).

Because of an inherent irregularity in the production of such mirrors they behave in fact as two superimposed gratings, each of which produces a diffraction pattern. The observer thus notices each spectral line accompanied, on its right and left, by several weaker lines; these were known at the time as 'Rowland ghosts'. In case of a perfect grating, the observer may be expected to see an evenly lighting surface in the colour of the spectral line.

In reality, then, s/he sees a *striped* surface. It had been suggested, in the spirit of Abbe's ideas, that those stripes derive from an interference effect of the principal line with its ghosts. Zernike, however, opined that it was a matter of phases: the superimposed grating produced a phase difference giving way to the ghosts, apart from the main line. While studying the surface of his Faculty's new grating, *not* with the naked eye, but, because of the distance of about 6 m, with a small telescope (**cf.**



Figure 2: Frits Zernike (1888-1966), bust in bronze by Roy Greve (2012; cf. www.roygreve.nl).

Fig.3), Zernike discovered something entirely new: normally only the stripes were visible, but when the telescope was focused *exactly* upon the grating's surface those stripes disappeared completely. The stripes apparently only showed up when the telescope was slightly out of focus; they could not but be situated in space *before* the grating.

Zernike considered the phase difference to be brought about by the small difference in light path. The problem, then, was to make those phase differences visible. The human eye is unable to register them and photography doesn't help: plates are only sensitive for intensity differences, that is, amplitude differences. Zernike though found a trick: by introducing a small difference in light path for the principal line, the difference in phase is eliminated. The trick consisted in putting a glass platelet with a shallow deepening, a 'gutter', of a depth of about $\frac{1}{4}\lambda$, on the place of the principal line in his telescope, and both the Rowland ghosts and the principal line become visible together (Ref.1). That is: the surface became evenly illuminated.

Within the context of microscopy we should realize that the object itself, too,

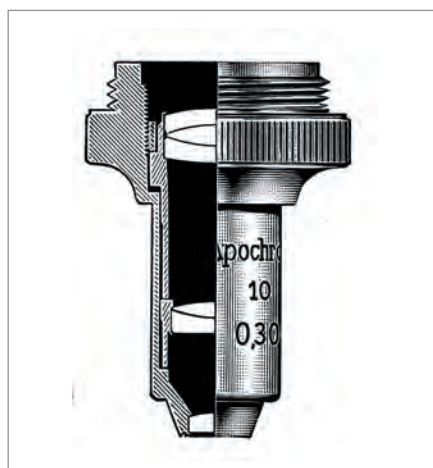


Figure 1: State-of-the-art apochromatic objective from Carl Zeiss AG, model 1921 (magnification, $\times 10$; numerical aperture 0.30). Do notice the triplet, the doublet and the front-lens-singlet, a combination that was standard since 1886; there were 6 kinds of glass in the game (courtesy: Carl Zeiss Archives, Jena).

behaves like a grating. If it consists of transparent and opaque parts, as in the case of scratches in gold foil on glass, the resulting diffraction derives from differences in amplitude. Natural objects however are thin slices the successive layers of which, though perfectly transparent, differ in composition and therefore in refractive index.

The result will be that light is retarded to various degrees, resulting in differences in phase. Zernike calls those test-plates 'amplitude-gratings' and the real specimens 'phase-gratings'. In Biology and Medicine the practitioners had always used staining to increase the visibility of details. In so doing, they had been transforming, unconsciously, their specimens from 'phase-gratings' into 'amplitude-gratings'.

The glass platelet with the shallow gutter of $\frac{1}{4}\lambda$ of a moment ago in the telescope, had the same effect. Similarly, a contrary effect may be produced by a low 'dike' of height $\frac{1}{4}\lambda$ on the platelet: the 'dike' will retard the direct image, causing its phase to change. Importantly, not *any* phase difference leads to observable interference.

Indeed, only those of 90° work, hence Zernike's emphasis on this. The phase-platelet thus turns a phase-object *without* any contrast—that is: with normally invisible details—into an amplitude-object *with* contrast, the details getting nicely expressed in shades of black-and-white. Here, by the way, is the origin of Zernike's term: "phase-contrast"; the 'dike' produces what he calls "negative phase-contrast", the 'gutter' "positive phase-contrast".

In practice the microscopist, intuitively, had always felt the problem: by subtly playing with the fine-tuner, turning the object a tiny little bit out of focus, s/he got at any rate a vague impression of the details.

Zernike's initial use of a phase-platelet was inspired by the Rowland-grating and the linear light source, mostly a gas-discharge tube with a slit parallel to the rulings. In a microscope though the light beam is circular, so the question was what shape to give to the 'gutter' or

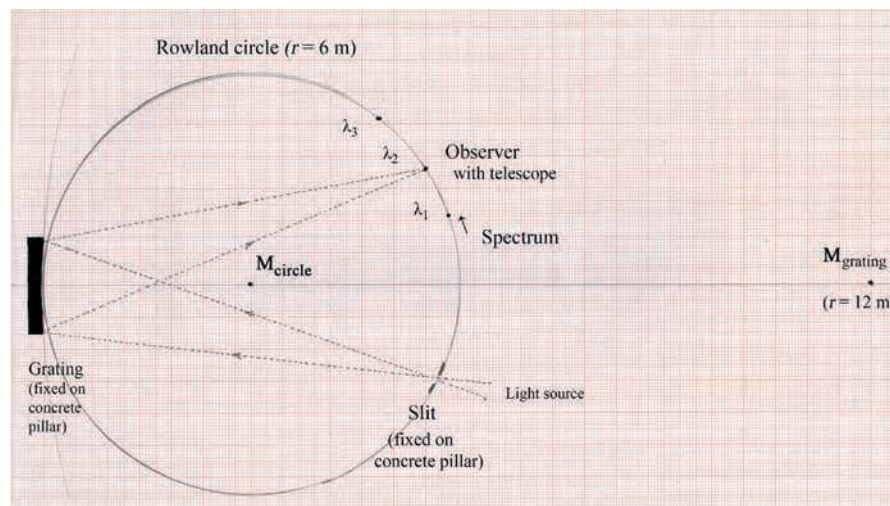


Figure 3: Rowland grating ($r = 12$ m) in a Runge-Paschen mounting. The slit with the linear light source, e.g. a Hg-gas discharge tube (lower right), is in a fixed position with respect to the grating, parallel to the rulings. The observer (upper right) moves through the spectrum produced by reflection.

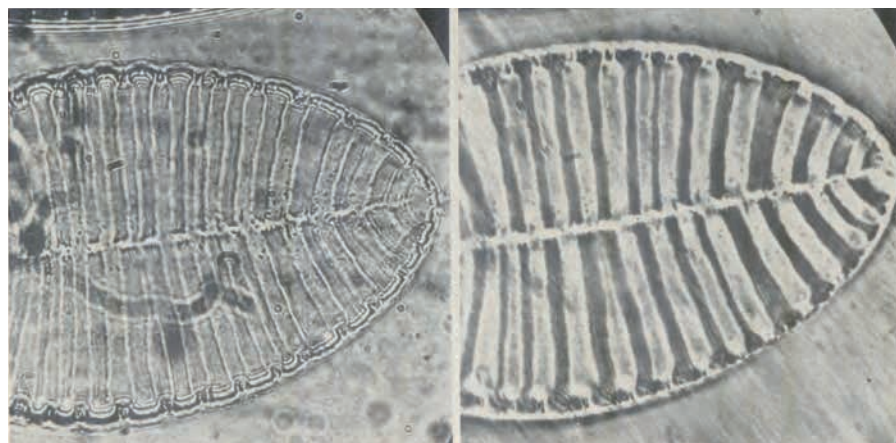


Figure 4: The oldest 'photomicrographs' made by Zernike of a diatom (1932): on the left *without*, on the right *with* a phase-platelet and thus with extra-contrast (courtesy: University of Groningen).

the 'dike'. Of these two, the 'gutter' was the easiest to produce (with the help of dilute hydrofluoric acid; Ref. 2.b). After some experimenting with various combinations of linear phase strips (**Fig.5**), Zernike found out that a *circular* 'gutter' would be the most effective in creating an evenly illuminated background.

Such a circular 'gutter', however, is hard to produce with hydrofluoric acid. So it came, it seems, that Zernike switched to *absorbing* rings which may be cut out of sheets of nitrocellulose or gelatine from 3-6 μ thick. Such rings were integrated in existing objectives of the leading European optical works: those of Carl Leitz (Wetzlar) and his son-in-law Carl Reichert (Vienna), and those of Carl Zeiss (Jena) and its associate of Polish descent Francesco Koristka (Milan).

The existing revolvers allowed an easy change of objective, that is: from one *with* a phase-ring to one *without*. In **Fig.6** we reproduced a cross-section of an objective made by Francesco Koristka (Milan), which Zernike provided with a phase ring, *Ph*, embedded in the doublet (before 1942). Just notice the functions: the front lens doublet transforms a light cone stemming from the focal point into an axis-parallel beam perpendicularly incident on the plano side of the doublet carrying the ring. The beam will come to converge to the back focal point of that second doublet. The two triplets are only there to reduce chromatic aberration to a minimum.

The dimensions of the ring were empirically optimized, so we read: the mean radius was taken from $\frac{1}{2}$ to $\frac{2}{3}$ of that

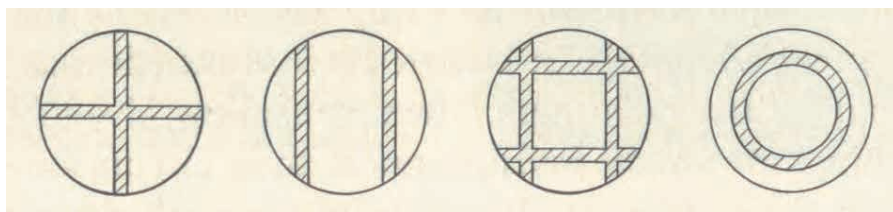


Figure 5: Combinations of linear phase strips and the circular strip (from Ref. 2.b).

of the aperture. Its optimum width appeared to be $1/15$ of the full aperture. Zernike doesn't provide any justification for these numbers, which may surprise given his bent for the mathematical aspects. Indeed, he does not refrain, elsewhere, from calling upon Legendre and Bessel functions and a Jacobian polynomial, where appropriate, but is apparently unable to calculate the dimensions of that ring or to give any reason for them (Ref.3).

By the way: he regularly claims to 'calculate' something, where the verb 'argue' would have been more to the point, since it is only a matter of words, not of numbers and formulas leading to a numerical outcome.

The absorbing (phase) ring; its effects

Indeed, there seems to be more at stake, as to that circular absorbing

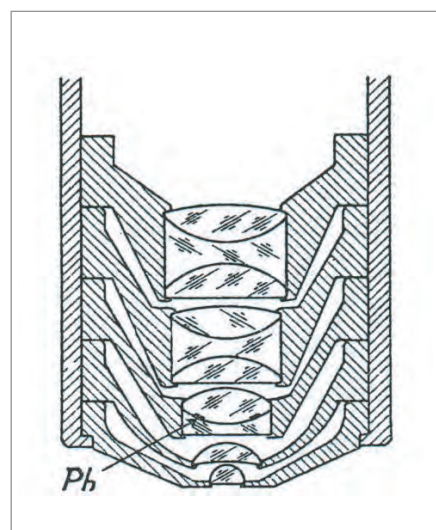


Figure 6: A Koristka objective ($f = 2$ mm; $n.a. = 1.3$) with a phase ring Ph embedded in the doublet lens. Do notice that Koristka uses two triplets to minimise chromatic aberration. The front lens is a half-sphere in the style of Amici; the meniscus lens reduces the loss of light. Such an objective was used for immersion studies, using cedarwood oil. The kinds of glass involved and their physical constants are not specified (from Ref. 2.b)

phase strip—if the word 'phase' applies—, more than even Zernike surmised. At Carl Zeiss AG, Jena, it had been established, already in the days of Ernst Abbe, that the refractive index of a particular wavelength varies as a function of the height of an incoming paraxial axis-parallel ray.

On following the path of a monochromatic light ray refracted by a spherical surface, it appeared not only that the various colours had various focal points, but, moreover, that, for each colour, the focal distance varied with the incoming height. It is true, there was nothing new in just that. Indeed, these were the two classical aberrations, spherical and chromatic, respectively.

Unexpectedly, then, that height variation appeared to be rather arbitrary, as if the refractive index *itself* varied. In **Fig.7** we reproduced a curve borrowed from a monograph by Moritz von Rohr (1868-1940), a former collaborator of Abbe (Ref.5, 1936) and still an authority in the field. It shows the light path of four incoming rays h_1-h_4 of the same wavelength. On the right we see how the focal point moves from I over II and III to IV or, on the axis, from 1 over 2 to 3 and back to F' .

By implication, each wave length manifests its own curve I-II-III-IV, the shape

of which varies from glass to glass (**Fig.8**). Von Rohr used to call this effect the 'Öffnungsfehler' (aperture error). As a consequence, the optimal focal plane for white light is that for which the various focal points lie closest to each other. It may be read out approximately from **Fig.8** to be at $5/9^{\text{th}}$ of the lens' radius. This is just what Zernike—unaware of the variation of the refractive index—had established to be $1/2$ to $2/3$ of that radius.

The width of the phase strip may also be read out from **Fig.8**: it is slightly over $1/5^{\text{th}}$ of the lens' radius or $1/10^{\text{th}}$ of the full aperture, that is: smaller than Zernike's guesstimate. It becomes evident, at once, why an axis-parallel cylindrical beam of light of an average radius of $5/9^{\text{th}}$ of that of the front lens might be very practical.

From the curves of **Figs 7** and **8** we may deduce some laboratory habits of the most-distinguished Zeiss-Schott joint venture, habits that, understandably, were carefully kept *intra muros*, at Jena. We knew already that Otto Schott AG made a regular prism from each new glass, to be used in Abbe's new 'refractometer' in view of measuring the glass's refractive index for several wave lengths and, for white light, the dispersions (cf. Ref.6). In parallel—and this is new—a standard lens was made, a plano-convex lens, big enough to follow the course of the focal point along the axis for four incoming heights.

Each kind of new glass thus got a two-fold ID: a public one, as published in the sales catalogs of Otto Schott A.G. (as of 1886), and specifying the refractive index for Na_D -light, the relevant

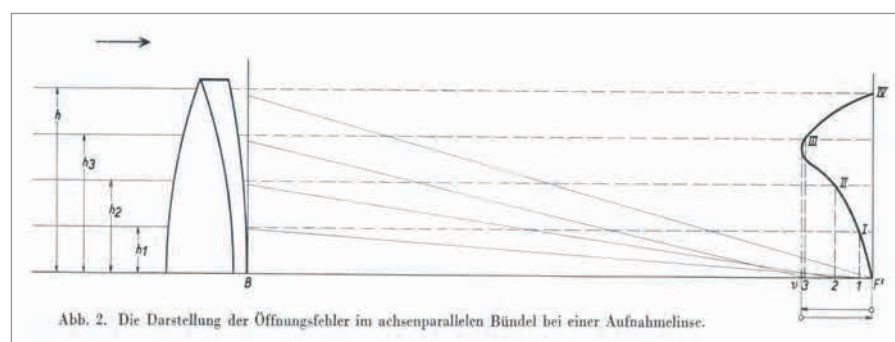


Figure 7: The back-and-forth shift of the focal point of a paraxial monochromatic light ray as a function of the distance from the optical axis (from Ref. 5, p.6).

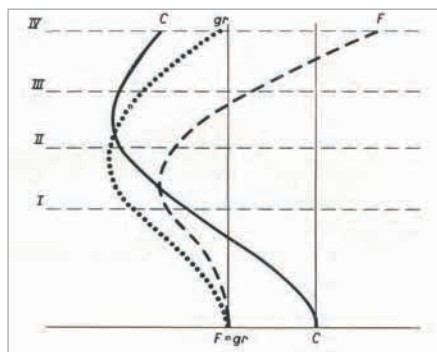


Figure 8: The shift of the focal point for three wavelengths: the C- and F-line of the Fraunhofer spectrum (red and blue, respectively) and the green line of the Hg-lamp. The optimum focal plane, for which the respective focal points lie closest to each other, thus passes slightly under level II (the numbering I-IV is not in line with Fig.6). A raw estimate of the optimal height of an incoming white light ray therefore is about 5/9 of the lens' radius (from Ref. 5, p.13).

dispersions, and the density (Ref.7); and a more detailed one—a kind of finger-print ID—kept secret by Carl Zeiss AG, which specified for each glass the refractive indexes for a few other wave lengths—think of the H α -, H β - and H γ -lines of the hydrogen-spectrum—and the graphics as reproduced, here, in **Fig.7** and **8**.

What, then, will be the effect of an *absorbing* ring, as proposed by Zernike? The foremost effect will be the reduction of the intensity—that is: of the amplitude—of the relevant wave lengths, here red, green and blue, in the

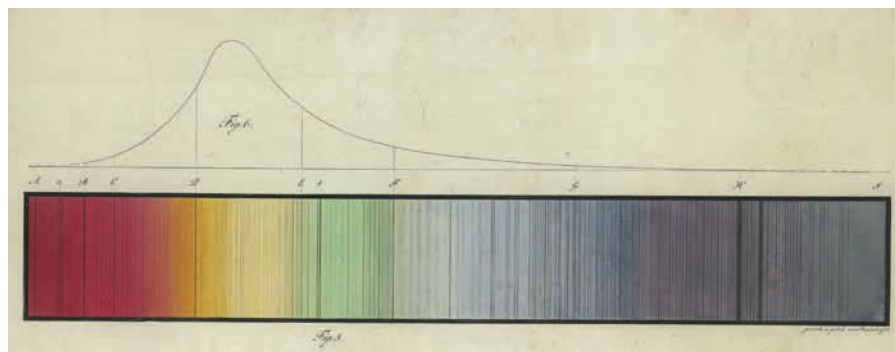


Figure 9: Fraunhofer's impression of the solar spectrum with the black lines A, B, ..., H, I (Fig.5) and, in the graphics (upper part; Fig.6), the relative intensities. Hand coloured copy—by Fraunhofer himself—of the original black-and-white version featuring in Ref.8. It is part of the collection of the Deutsches Museum (Munich; BN 43952). Courtesy Deutsches Museum (Munich).

image plane. In other words: the other colours will become relatively more distinct, will come more to the fore.

Since Fraunhofer, the opticians knew that the wavelengths between the C- and F-lines were the most intense, having the largest amplitudes (**Fig.9**). The overall effect of the absorbing ring thus will imply a reduction of those amplitudes in the optimal focal plane, or, conversely, a relative increase of the amplitudes of the other wave lengths, that is: a better expression of the other colours.

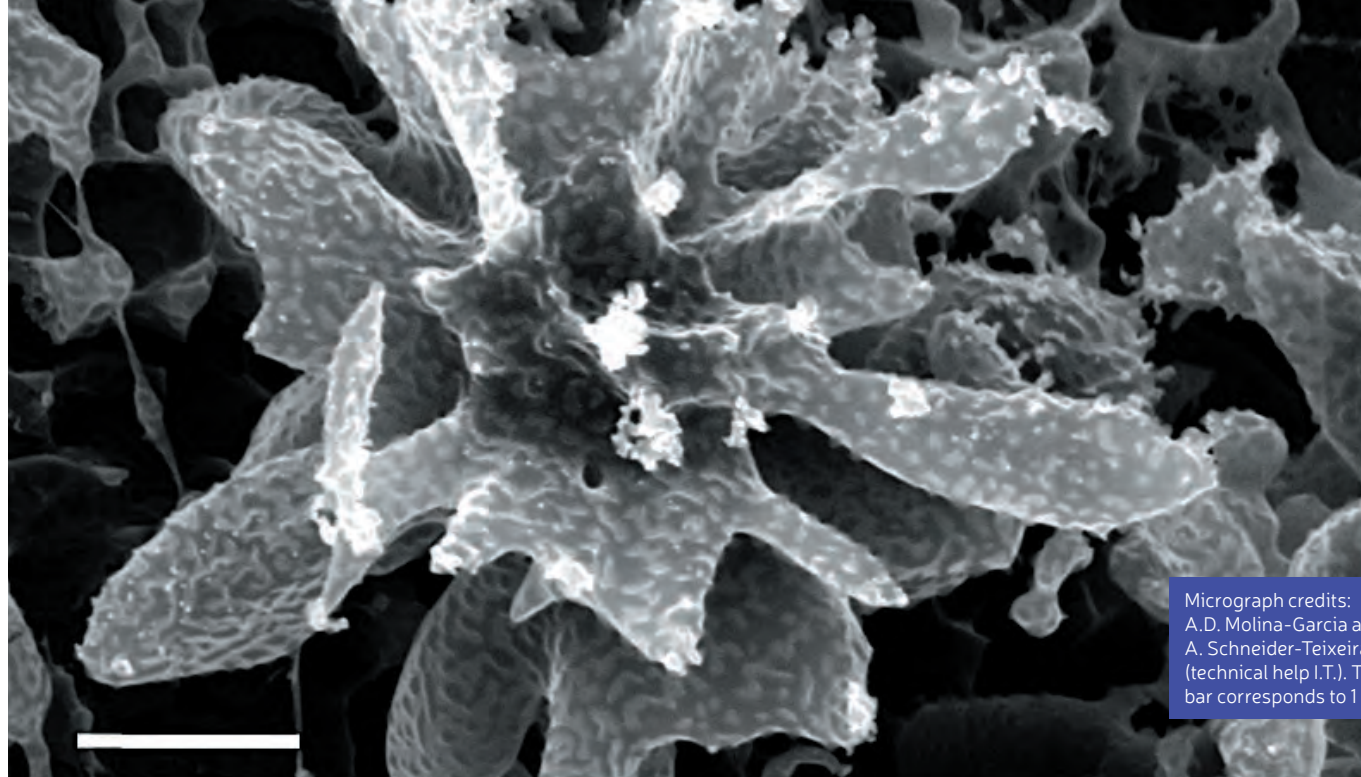
On the then-standard black-and-white 'microphotographs' this became visible as a darkening of the outer parts (A-C and F-I) of the Fraunhofer spectrum,

and a lightening of the inner CDEF-part (cf. **Fig.9**). In parallel the contrasts grew more subtle, the resolution—in the sense of Abbe—increased. The introduction, in the late 1940s, of colour photography did the rest. ■

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Micrograph credits:
A.D. Molina-García and
A. Schneider-Teixeira
(technical help I.T.). The
bar corresponds to 1 μ m.

Flowers of Another World

Microscopy, this marvelous travel to the small, essential, elementary world, underneath all the others, is itself composed of a number of worlds, parallel and complementary in a way. The different microscopic techniques, based on different physical principles, reaching diverse magnification limits and revealing a myriad of faces of the complex microworld, are often considered as separate science and technique fields. This is fairly justified by the different physical backgrounds involved and the utility of their obtained results.

However, in many microscopy contexts, other worlds division is prevalent: that between Life Sciences and Materials. Present in many microscopy meetings and congresses, publications, and even in micrograph competitions, it constitutes another segregation, orthogonal to that based on microscopy techniques, separating often even microscopists, by their backgrounds and affiliations.

Focusing on micrographs, Life Science and Material worlds introduce us in two very different and divergent microworlds. Life Science relates to biological specimens and tissues, diving into cells, organelles and microorganisms, to touch bottom (perhaps not) in biological macromolecule assemblies,

even single proteins. A world of change and movement, of flow and interactions. We (well, at least it happens to me...) are dragged to the depths of cytoplasm, and can see ourselves traversing membranes, funambulists on tubulin filaments, moving with cilia or flagella and putting a face to the more fundamental biological activities and functions.

Materials, meanwhile depict (is my imagination playing tricks again?) a rock and cliff landscape, barren and dry, hard and sharp worlds of metals, crystals, glasses and accretions. There is, of course, also change and movement in the Materials world, but, perhaps as the time scale of changes can be very wide and different from our own, we may look with different eyes these (at least in appearance) static fields, so different from those where Life flourishes.

But, what if this world division gets mystified, what if Materials subjects do a trick and sprout, into a small, minute garden? As in the case of this picture. Flowers opening their petals to the sun, or at least to the electron beam of the scanning microscope. This unexpected picture was taken with a Cryo-FEGSEM (Thermofisher Apreo 2S) equipped with a QUORUM low-temperature stage, with the technical help of Ioanna Theodorou, from the Non-destructive

Techniques Service of MNCN-CSIC, at Madrid. And far from showing a biological development, the growth of a botanical specimen, it corresponds to chitosan (the partially deacetylated chitin, a polysaccharide in the exoskeleton of crustacean and insects).

Despite its biological origin, chitosan is a plain and inert polymer, moreover when it has been disaggregated by a high hydrostatic pressure treatment. It can hardly be counted as a Life Sciences specimen, and surely a simple polymer in water may be considered as belonging to the Materials world. The tiny ice crystals formed in this chitosan solution when it is introduced into the cryo-SEM force the polymer out, and chitosan chains get associated in unexpected ways. The etching procedure applied allows us to see the ice crystals at the background as black shapes, after platinum coating.

This flower from the Materials world can be a reminder of how much of another ingredient we put into the interpretation of an image, in addition to scientific knowledge and technical experience: our own imagination. ■

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Brian J Ford and Cell Intelligence

Professor Brian J. Ford, the prominent British microscopist and advocate for whole-cell biology, has extensively explored the concept of cellular intelligence through direct observation of living cells. He has proposed that individual living cells possess autonomous sensory, interpretative, and decision-making capacities that enable them to respond adaptively to unforeseen exigencies, challenging reductionist models that view cells merely as mechanistic components.

He has studied testae constructed by amoebae like *Diffugia*. This amoeba can select particles of appropriate size and shape from the substrate, discriminating with precision to ensure compatibility. Larger grains are selected to form the rounded body, while progressively smaller ones are incorporated toward the neck and aperture, creating a tapered, vase-like form that optimizes stability and access. Spines or protrusions, when present, are meticulously assembled from minute grains, achieving symmetry and proportion that rivals engineered designs. In *Diffugia acuminata*, for instance, Ford documents selectivity where the coarsest particles are cemented into position for essential robustness, finishing to delicate edges—a spatial orchestration requiring real-time evaluation and adjustment to unforeseen material variations.

Ford compares this to human craftsmen fashioning a vase or lampshade, emphasizing aesthetic and functional finesse: ‘If you made one like this in evening classes I’d be impressed,’ he has stated. He contrasts the amoeba’s output with the rudimentary shelters of more complex multicellular organisms, such as caddis-fly larvae, noting that the *Diffugia* test is ‘delicately proportioned and carefully assembled,’ evoking the skilled selection of materials in pottery or shade-making, where artisans intuitively balance form, weight, and utility. This imitation of human craft highlights the capacity of the



Brian J Ford hon FRMS, hon FLS (left) and Professor Ray Goldstein FRS (right) at Cambridge University with a new confocal laser scanning microscope. Professor Goldstein has imaged active *Chlamydomonas* and has published widely on algal fluid dynamics. Professor Ford first celebrated the autonomous ingenuity of living cells in his revolutionary book *Microbe Power, Tomorrow's Revolution*, published in the UK, USA and Japan fifty years ago.

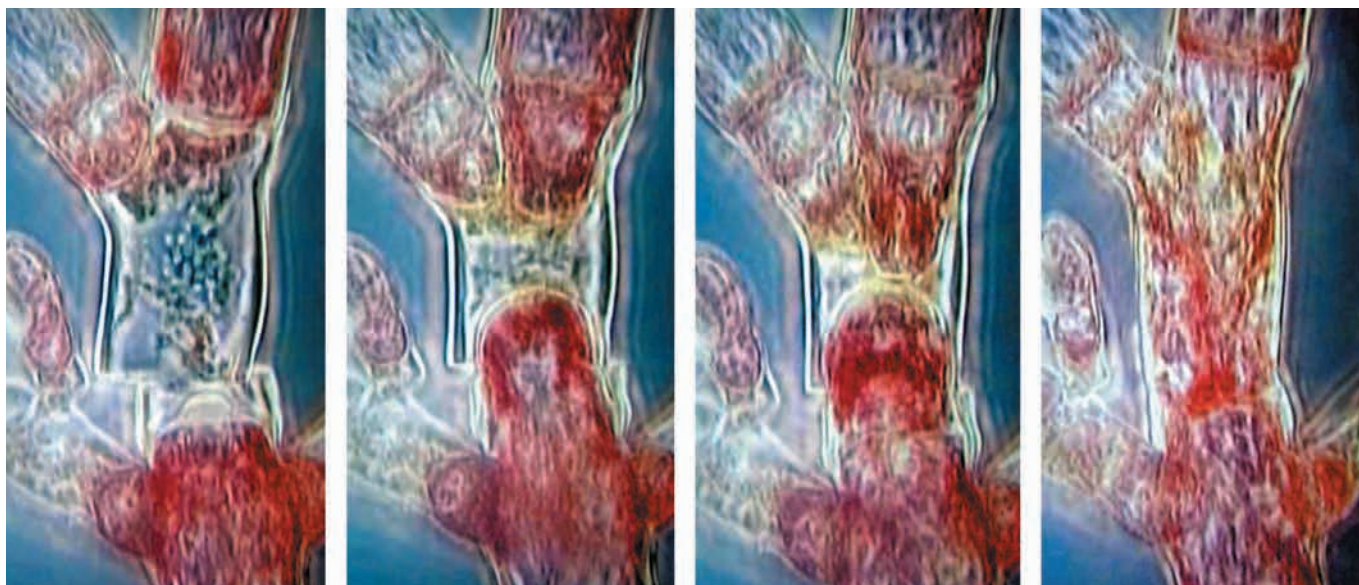
living cell for discrimination, coordination, and innovation, as the amoeba improvises solutions to environmental contingencies, such as particle scarcity, without predefined algorithms.

Such behaviors reinforce Professor Ford’s belief in cellular ingenuity, positing that these protists engage in sentient decision-making: sensing opportunities, interpreting material properties, and executing morphogenesis with creative autonomy. This challenges mechanistic paradigms, suggesting that the roots of higher cognition reside in the adaptive prowess of solitary cells, observable through direct, non-invasive microscopy.

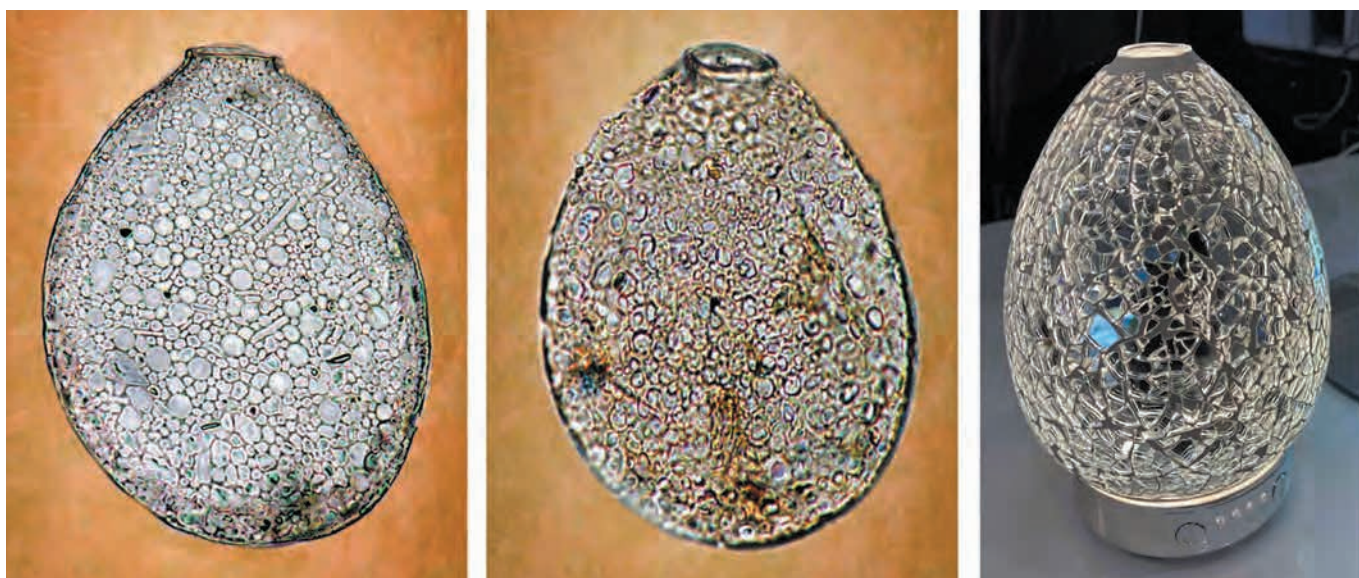
He has extended this to advance his notion of cellular intelligence. A key example he employs is the wound-healing response in the red alga

Antithamnion sparsum, where neighboring cells demonstrate coordinated repair of a damaged filament segment, illustrating emergent intelligence at the level of the single cell. Ford’s observations centre on micrography by his late colleague Dr Jeremy Pickett-Heaps, using phase-contrast, which allows real-time, frame-by-frame analysis of the algal filaments on a microscope slide.

In a controlled disruption, an intercalary cell in the filament can be disrupted using a fine steel needle, rupturing its cell wall and causing the cytoplasmic and nuclear contents to diffuse into the surrounding medium. This creates an evacuated space within the filament and the subsequent healing process, unfolding over approximately 36 hours, reveals a series of precise, adaptive actions by adjacent undamaged cells.



Problem-solving in rhodophyte algae is exemplified by the experimental destruction with a steel dissecting needle of a single intercalary cell of *Antithamnion* (left). The now empty cell wall fragments are severely misaligned. Adjacent cells detect the predicament, through senses of which we know little, and within 6 hours commence re-occupying the void. After 12 hours adjacent cells are in contact, and the disrupted cell wall is realigned. After 30 hours the cell wall has been meticulously reconstructed and reoccupied by viable cell contents,



Although we speak of amoebae as one of the simplest forms of life, the genus *Diffflugia* creates a test, or custom-built shell, in which they live. Multicellular organisms like the Trichopteran caddisflies construct a similar home for themselves, with the use of muscles, nerves, eyes, an exoskeleton, and cement glands. *Diffflugia* is a simple amoeboid cell of indeterminate shape. The specimens shown (left, centre) exemplify the complexity of the task. A remarkable coincidence (right) is the construction of a table-lamp of identical design by a skilled artisan.

Ford interprets this sequence as evidence of cellular intelligence because it involves high-order processes that transcend simple biochemical signaling. A hormone-like glycoprotein with α -D-mannosyl residue is known to act as a signaling molecule to initiate the response, but the core ingenuity lies in the cells' ability to sense the unforeseeable injury, to execute coordinated morphogenesis, including mitosis, expansion, and material synthesis of a

reinstated cell wall, adapting to environmental constraints without prior programming.

Such improvisation suggests cells operate with sentient, autonomous agency, akin to problem-solving in higher organisms. This challenges physics-based or computational models of life, as no known molecular pathway can account for the interpretive and creative elements observed.

In summary, Professor Ford's work on *Antithamnion* underscores that cellular intelligence manifests in the proactive, neighborly cooperation of cells to heal and sustain the collective, providing a microphenomenological foundation for rethinking biology as a discipline of whole-cell dynamics rather than isolated components subject simply to chemistry and physics. ■



Notes



European Microscopy Societies

European Microscopy Societies

Number of EMS Members by Societies (2025)			
National and regional societies (25)			# members
Armenian Electron Microscopy Society	(AEMS)	Armenia	
Austrian Society for Electron Microscopy	(ASEM)	Austria	239
Belgian Society for Microscopy	(BSM)	Belgium	293
Croatian Microscopy Society	(CMS)	Croatia	123
Czechoslovak Microscopy Society	(CSMS)	Czech Republic	321
Dutch Society for Microscopy	(NVvM)	Netherlands	300
Electron Microscopy and Analysis Group (Institute of Physics)	(EMAG)	United Kingdom	370
French Microscopy Society	(SFμ)	France	497
German Society for Electron Microscopy	(DGE)	Germany	438
Hellenic Microscopy Society	(HMS)	Greece	36
Hungarian Society for Microscopy	(HSM)	Hungary	108
Israel Society for Microscopy	(ISM)	Israel	241
Italian Society of Microscopical Sciences	(SISM)	Italy	130
Microscopical Society of Ireland	(MSI)	Ireland	75
Nordic Microscopy Society	(SCANDEM)	Scandinavia	57
Polish Society for Microscopy	(PTMi)	Poland	203
Portuguese Society for Microscopy	(SPMicros)	Portugal	28
Romanian Electron Microscopy Society	(REMS)	Romania	73
Royal Microscopical Society	(RMS)	United Kingdom	1323
Russian Society of Electron Microscopy	(RSEM)	Russia	
Serbian Society for Microscopy	(SSM)	Serbia	60
Slovene Society for Microscopy	(SDM)	Slovenia	114
Spanish Society for Microscopy	(SME)	Spain	190
Swiss Society for Optics and Microscopy	(SSOM)	Switzerland	109
Turkish Society for Electron Microscopy	(TEMĐ)	Turkey	130
			5458
Corporate members EMS	(ECMA)		31
Individual members	(IND)		23
Total			5512



European Microscopy Societies reports



Czechoslovak Microscopy Society (CSMS)

In May 2025, the Czechoslovak Microscopy Society (CSMS) held its annual congress, MICROSCOPY 2025, in the historic city of Liberec, Czechia. The conference took place at the Grandhotel Clarion Zlatý Lev and was a resounding success, bringing together leading scientists, students, and industry partners. The organizing committee, led by **Kamila Hrubanová** (CSMS President) and **Vladislav Krzyžánek** (EMS President), curated a high-quality scientific program covering life and material sciences.

The opening day featured the presentation of the society's annual awards, highlighting exceptional early-career research. The prestigious Thermo Fisher Scientific / CSMS scholarship was awarded to **Petr Liška** for his work on "Selective Anion Exchange in CsPbBr₃ Low-Dimensional Systems

via Focused Electron/Ion Beam Induced Deposition." The CSMS scholarship was presented to **Hana Polášek-Sedláčková**, who introduced her research titled "Quantitative AI-based DNA fiber workflow to study replication stress." Furthermore, the Best PhD thesis award sponsored by ZEISS was granted to **Miroslav Stibůrek**, who also presented his research on "Confocal microscopy through a multimode optical fibre" during the conference sessions.

A significant highlight of the 2025 congress was the CSMS Award for merit in microscopy lecture delivered by **Tomáš Čížmár**, who presented his work on "Exploring the brain with fiber optics". The interdisciplinary program was further enriched by a plenary lecture from **Rainer Heintzmann**, focusing on structured illumination microscopy.

Beyond the lecture halls, the conference fostered community spirit through a rich social program. Participants enjoyed a trip to the Jizera Mountains and a visit to the local glassworks, celebrating the region's "Crystal Valley" tradition. The Young Microscopists (yCSMS) section, led by **Eva Ďurinová**, remained highly active, organizing dedicated sessions for the next generation of scientists.

The year 2025 was marked by exceptional achievements of the society's members. A highlight was the prestigious Academic Award (Praemium Academiae) granted by the Czech Academy of Sciences to **Lukáš Palatinus** for his groundbreaking research in electron crystallography. Furthermore, the society successfully promoted microscopy to a broader audience through new formats, such as the podcast episode "Unseen Talks" on 4D-STEM featuring **Miroslav Šlouf**, **Pavla Sikorová** and **Pavel Stejskal**.

Education remained a cornerstone of CSMS activities. Beyond the traditional *Biological Specimens in Electron Microscopes 2025* in České Budějovice, the society co-organized the course "Advanced Microscopic and Spectroscopic Techniques 2025" in Brno, focusing on cutting-edge methods for life sciences research. Responding to modern scientific needs, CSMS also launched an online course on *Python for Microscopists*, helping members enhance their data analysis and automation skills.

Finally, CSMS warmly invites all colleagues to the next annual conference, MICROSCOPY 2026, which will be held at Hotel Relax in Rožnov pod Radhoštěm, Czechia, from 1 to 3 June 2026. We look forward to welcoming you to this inspiring event. ■



Kamila Hrubanová

German Society for Electron Microscopy (DGE)

The main objectives of the German Society for Electron Microscopy (Deutsche Gesellschaft für Elektronenmikroskopie e.V., DGE) is to promote knowledge of electron microscopy and other microscopical methods in research, technology and industry and to serve as an inclusive platform for electron microscopists from a variety of academic backgrounds, including physics, material science, and life sciences. The society provides support for its members, particularly young scientists, in their professional development.

The highlight of 2025 was the Microscopy Conference (MC) 2025 in Karlsruhe, Germany, which was jointly organized together with the Austrian Society for Electron Microscopy (ASEM) and the Swiss Society for Optics and Microscopy (SSOM). The conference chairs – Christian Kübel, Yolita Eggeler, Astrid Pundt and Rasmus Schröder – together with the scientific advisory board, which consisted of members of the three organizing societies, put together an amazing scientific program showcasing the latest advances in instrumentation and methods, materials science, and life sciences. A total of over 1,000 participants from 38 countries attended the plenary lectures and invited talks, as well as oral and poster presentations.



Conference Chairs Christian Kübel, Astrid Pundt, Rasmus Schröder, Yolita Eggeler (from left to right) of the MC 2025 in Karlsruhe. Image: Conventus GmbH.

In addition to the scientific program, the conference provided an opportunity to learn about the latest developments from companies at the exhibition.

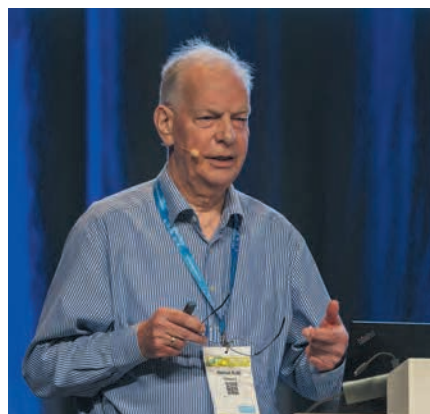
One of the highlights of the conference was the Ernst Ruska Prize ceremony. This year the Ernst Ruska Prize was awarded to Prof. Dr. Knut Müller-Caspary (Ludwigs-Maximilians-University, Munich, Germany). He was recognized for his outstanding

scientific achievements in the field of momentum-resolved scanning transmission electron microscopy and for his work transforming the method into a versatile and widely applicable imaging mode with significant impact on both material and life sciences. The next Ernst Ruska Prize will be awarded at the Microscopy Conference 2027 in Dresden, which takes place from August 29th to September 2nd, 2027. Another highlight of the conference was the presentation of the “Harald Rose Distinguished Lecture” award 2025 to Prof. Dr. Helmut Kohl (University Münster, Germany). He received the prize in recognition of his research on the fundamental treatment of image formation with inelastically scattered electrons in the TEM as well as in the STEM.

During the general assembly of the DGE, Dr. Sangjun Kang (KIT Karlsruhe/TU Darmstadt, Germany) received the society's prize (Förderpreis) for his excellent doctoral thesis. Furthermore, the DGE awards a prize (Technikpreis) for outstanding contributions to the



Left: Knut Müller-Caspary during the Ernst Ruska Prize lecture at the MC 2025 in Karlsruhe. Image: Conventus GmbH. **Right:** Helmut Kohl during the Harald Rose Distinguished Lecture at the MC 2025 in Karlsruhe. Image: Conventus GmbH.





technical development and application of microscopy by technical staff. This year, Lidia Kibkalo (Forschungszentrum

Jülich, Germany), Ronald Curticean (University Heidelberg, Germany), and Marco Hepp (University Siegen, Germany) received the prize for their excellent work.

The Microscopy Conference 2025 also provided a great opportunity to meet and network with individuals involved in the various working groups of the DGE. These working groups organize their own additional specialized meetings and practical workshops and courses, and play an essential role in the DGE. At the moment, there are eight active working groups which focus on a wide range of topics: DGE Young Microscopists (yDGE), Preparation and Imaging of Native Organic Systems (PANOS), Electron Microscopic Diagnostics of Pathogens (EMED), Scanning Electron Microscopy (SEM), the community

group of Electron Microscopy Facilities (IGEME), Differential Phase Contrast (DPC), High-resolution Transmission Electron Microscopy (HRTEM), and Energy Filtering & Electron Energy-loss Spectroscopy (EF and EELS).

Now we look forward to seeing you again during the next Microscopy Conference 2027 in Dresden, and – of course – in 2031. Here, the 22nd International Microscopy Conference, celebrating 100 years since the invention of electron microscopy, will take place in Berlin from August 25th to 29th, 2031. Make sure you mark these outstanding events in your calendars so you don't miss them! ■

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

Electron Microscopy and Analysis Group (Institute of Physics) (EMAG)

2025 has been a busy year for EMAG, the UK Institute of Physics' Electron Microscopy and Analysis Group. It started with the award of our inaugural thesis prize, which was awarded to Sabrina Yue Wang, who completed her doctorate at the University of Oxford in 2024. Her thesis, entitled "Quantum treatment of ultra-low loss electron energy loss spectroscopy with applications to molecular crystals" will, we hope, be just the first of a long line of future winners of this prize. (For further details, see here: <https://www.iop.org/physics-community/special-interest-groups/electron-microscopy-analysis-group/thesis-prize>).

In March, EMAG supported a town-hall meeting run by the EPSRC (the UK's main funding council for physical sciences) with a view to developing a roadmap for electron microscopy

in the coming years. We all recognize the critical importance that electron microscopy (EM) plays in the understanding and development of materials and devices. However, when funding is tight and equipment and running costs are high, maintaining the UK's equipment base is a challenge. We therefore support this drive towards a co-ordinated strategy for EM provision. The meeting was well attended, with representatives from across the UK research sector, including major manufacturers, industrial users and academics. Let us hope that the forthcoming roadmap will serve us well in shaping future policy.

“Maintaining the UK's equipment base remains a critical challenge.”



Dr Sabrina Wang, winner of the inaugural EMAG thesis prize, to be awarded each year for the most significant original doctoral work submitted in the field of electron microscopy in the physical sciences within the award period.

Our attention then turned to the planning of our flagship biennial conference, the Microscience Microscopy Conference, or mmc, held in Manchester in July. (link: <https://www.mmc-series.org.uk/conference/programme-overview.html>)

This is by far the largest microscopy conference in the UK and is run by the extremely competent and efficient Royal Microscopical Society (RMS <https://www.rms.org.uk> see their separate contribution elsewhere in this yearbook).

EMAG ran 10 of the 36 sessions held across 3 days and also ran a well-received workshop in the use of python in EM the day before the main conference. By coordinating with the RMS, we both benefit from the vibrant, busy atmosphere of a larger conference, which is particularly evident in a sizeable trade exhibition. It also gave our delegates an opportunity to step out of our EM-focused sessions and find synergies with the wider microscopy community.

This year, we were honoured to host Peter Crozier (Arizona State University, USA) as our plenary speaker. His talk, entitled "Seeing Atomic-Level Structural Dynamics in Materials: Managing Temporal Resolution and Electron Dose Rates" was a fabulous show-case of dynamic microscopy on



Three of the student prize winners for MMC2025. The full list of prize-winners is as follows. Best talks: Ella Greenaway (University of Oxford), Tom Stoops (EMAT, pictured, left) and Jack Fawcett Houghton (University of York, pictured, middle). Best Posters: Aidan Horne (University of Warwick), Ben Muggleton (University of Leeds) and Francesca Wilcocks (University of Leicester). Best Flash talk: Madelaine Badenhorst (Nelson Mandela University, pictured, right). Congratulations to them all!

the atomic scale. It visibly enthused delegates and undoubtedly sparked a number of conversations and, we hope, plans for future work. A highlight of the mmc conferences has always been the student presentations and this year was no exception. It has become rather difficult to discern which delegates are students and which are more seasoned researchers! The EMAG student prizes were, therefore, hotly contested and

the winners are summarised in the figure caption.

In September, EMAG supported a Workshop on the Applications of 4D-STEM, held at the University of Leeds. The purpose of this timely two-day workshop was to highlight applications of 4D-STEM across a broad range of materials classes. It featured keynote presentations from Colin Ophus (Stanford University) and Penghan Lu (Julich Research Centre) and was kindly sponsored by Tescan.

Looking forward, with the arrival of the highly-anticipated IMC-21 conference in Liverpool in September 2026, EMAG will not hold a full conference in the coming year. We have, however, plans for workshops that we will be happy to update on next year; and we will be involved in the organisation of IMC-21, so please look out for us! For full details on group activities, see: <https://www.iop.org/physics-community/special-interest-groups/electron-microscopy-analysis-group> ■

Donald MacLaren
EMAG Chair



Pr Peter Crozier of Arizona State University delivered an impressive plenary lecture at mmc2025 in July.

Hungarian Society for Microscopy (HSM)



For the HSM, the year began with an award. At the American Ceramic Society's conference held in Florida, *Balázs Csaba* received the *Mrityunjay Singh Bridge Construction Award*, which recognizes individuals outside the United States who have made outstanding contributions to the field of engineering ceramics.

ACS is a leading research association in the field of ceramics and glass research, and *Balázs Csaba* and his wife, *Balázs Katalin*, who is a board member of HSM, serve on committees with important responsibilities. In addition to the glass award, the certificate and the \$1000 prize, Csaba gave one of the plenary presentations at the conference.

Speaking of awards, the plenary speakers of our conference held in Siófok 7-9 May 2025, can also be proud of their several prestigious awards. We are honored that the internationally renowned **Valentin Nägerl** (Univ. Bordeaux / Univ. Medical Center Göttingen, Germany) has accepted our invitation.

He achieved exceptional results in neuroscience research using super-resolution microscopy and won several prestigious awards, among others, a Wellcome Trust Discovery Award and

the Synergy ERC. (Perhaps it is worth mentioning that his PhD in neuroscience was obtained at UCLA in the laboratory of a Hungarian neuroscientist, István Mody.) The title of his lecture was: *Principles and Applications for Neuroscience Research*.

Our other plenary speaker was **Krisztián Szigeti** (Semmelweis University, Budapest), winner of the János Bolyai Research Award (2015), the Semmelweis Innovation Award (2016) and the Gábor Dénes Award (2022). He was one of the founders of the Quantitative In Vivo Molecular Imaging Laboratory equipped with modern techniques (MRI, CT, SPECT, PET, OI), and his presentation was on their latest developments and results.

The Institute of Engineering, Physics, and Materials Science (as it was then known) introduced the use of in situ transmission electron microscopy in 1964.

Since not all speakers would have been able to attend the ceremony organized for the 60th anniversary, the HSM has now dedicated a special session to commemorate this significant event. Renowned invited speakers – *Paulo Ferreira* (INL Braga, Portugal), *András Kovács* (Jülich, GE), *Calliope Biazoti* (Univ Oslo, Norway)

and *György Radnóczy* (HUN-REN ER) gave presentations on the newest results achieved by the means of this technique.

The award ceremony of the *Árpád Barna Award* seems to be becoming part of the conference program. This award was established by *Technoorg Linda Ltd* in 2024 to recognize innovative contributions to the preparation and analysis of samples and to promote research, development, and educational development. This year, it was only open to Hungarian-speaking applicants, but future editions will extend eligibility to a wider European and international audience. During this second award ceremony *János Lábar*, our internationally recognized colleague, won the main prize, while *Erzsébet Dodony* won the competition for young researchers. The company's generosity and commitment to the award is evidenced by the fact that, exceptionally, not only the two winners, but all seven applicants received a cash prize in recognition of the high quality of the submitted applications.

The competition for the youngest participants of the conference, who do not yet have a PhD, was won by *Zsófia Katalin Tóth* (HUN-REN IEM) based on the votes of the audience. In addition to her certificate, she won 300 euros

to help her participation at **mcm17** held in Portorož, Slovenia, 7-12 September 2025.

Unfortunately, not many Hungarian microscopists were able to participate in this conference, which was organized by the Slovenian Society of Microscopy in a beautiful location. There were three sections with Hungarian co-chairs: *Gergely Szalay* (HUN-REN IEM),

Viktória Kovács Kis (HUN-REN ER) and *Tamás Visnovitz* (Sемmelweis University, Budapest). Tamás also gave a very successful presentation about their discovery in the field of extracellular vesicles research. There was one Hungarian invited speaker, *Péter Lőrincz* (ELTE, Budapest), and the submitted work of *Anna Jász* (BrainVisionCenter, Budapest) young researcher, was selected for a short presentation.

We should congratulate the local organizers, in particular the president of the conference, *Kristina Žagar Soderžnik*, and the co-chair, *Rok Kostanjšek*, for their excellent work, which allowed the participants to acquire remarkable new scientific knowledge and build new collaborations in very comfortable conditions and in a beautiful environment. ■

Dutch Society for Microscopy (NVvM)



The NVvM can look back on a very successful year, where we welcomed another 42 new members to our society. We have (co)organized several events that were aimed at bringing the microscopy world in the Netherlands together.

The 2nd of April was the yearly core facility day in Utrecht where core-facility staff as well as members of the NVvM both academic and industry met up together to discuss about Bioimaging, Electron microscopy, as well as ethics in publishing. The industry sponsors presented their latest developments and everyone participated in discussions about open file formats, data management and many other topics.

In June the Innovative imaging for 3D cell biology once again landed in Utrecht, this 2 day event with great speakers both nationally and internationally showed us the beautiful discoveries that can be made with microscopic techniques. A mix of

exciting lectures, the possibility of meeting with the industry and a plethora of young scientists all presenting their research during the poster sessions.

In October we were present at the NWO Biophysics meeting with an exciting program that covers a wide range of scientific topics, from microscopy and cell biology to biomedical engineering. NWO Biophysics lies at the heart of Dutch research in these fields, creating a space to explore, push boundaries, and celebrate interdisciplinary science together. Here we also

provided the poster prize this year won by Vincent Louis.

The last big event of the year were the Dutch Microscopy days where NEMI, NL-Biolmaging and the NVvM hooked up to create one big event that brought scientists, microscopy experts as well as industrial partners from all over the Netherlands to Groningen for two exciting days of knowledge exchange. Here we also changed several members of the board, so one more thank you to Ben, Eric, and Mark. Looking forward to another successful new year. ■





Polish Society for Microscopy (PTMi)

In 2025, the Polish Society for Microscopy (PSM) continued to strengthen scientific collaboration and promote modern microscopy techniques in Poland.

PSM granted its patronage to the 25th Conference on Applied Crystallography (CAC 2025), held from 7–10 September 2025 in Wisła, at the Crystal Mountain Hotel. The conference was organized by the Institute of Materials Engineering, University of Silesia in Katowice. The conference brought together researchers from Europe and beyond, featuring plenary lectures and thematic sessions devoted to advanced crystallographic and microscopic methods in materials research. The keynote lecture was delivered by Nobel Laureate Prof. J. Georg Bednorz, whose

talk attracted wide attention within the crystallography and microscopy communities.

In parallel with these scientific initiatives, Polish research infrastructure was further strengthened. At the Interfaculty Laboratory for Transmission Electron Microscopy (MLTME) of the AGH University of Krakow, instrumental capabilities were expanded with the installation of a new JEOL JEM-ARM200F NEOARMex transmission electron microscope, dedicated to advanced microstructural studies at the micro-, nano-, and atomic scale in TEM, STEM, and 4D-STEM modes. The instrument is equipped with a cold field-emission gun, a spherical-aberration (Cs) corrector, a sector STEM detector (SAAF), two JEOL

Centurio XXXL SDD-type EDS detectors, a Gatan 4D-STEM STEMx system, a Gatan METRO direct electron-detection camera, as well as a Gatan cryo-holder and a Protochips Poseidon Select liquid-cell holder for in situ experiments in liquid environments. ■



Romanian Electron Microscopy Society (REMS)

1-2 October - Poiana Brasov - Romania

The Romanian Electron Microscopy Society (REMS) has been active since 2014, gathering researchers, academics, students and technical personnel committed to the domain of electron microscopy within 11 research institutions located in the main academic cities across the country.

In an endeavour to continue the assumed mission of offering a dedicated forum to Romanian scientists using electron microscopy as their main research tool and also to create communication bridges to similar communities across Europe



and worldwide, REMS organised on October 1st-2nd, in the picturesque mountain resort of Poiana Brasov, Romania, the 6th edition of its biennial conference, CREMS 2025. With the main goal to initiate and extend the dialogue between the different research groups using electron microscopes, REMS contributes to knowledge exchange among the EM groups and the overall increase of the research quality in Romania. About 50 scientists, academics, students and professionals using EM techniques for Materials and Life Sciences attended the conference.

Along with the Romanian contributors, researchers from Universidad de Cádiz, Spain, the Max-Planck Institute for Colloids and Interfaces, Potsdam, Germany, and Ibn Khaldoun University of Tiaret, Algeria had the opportunity to present their recent scientific results, while representatives from the manufacturing companies introduced some of their latest developments in electron microscopy available on the market.

A wide range of EM techniques applied in topics such as the influence of structure and morphology on functional properties of nanostructured

materials, microstructural transformations during synthesis and processing of advanced materials, deep-learning algorithms for material science or electron microscopy in tissue regeneration and engineering have been covered by the presenting authors. The event concluded with an image contest entitled „At the confluence between science and art” based on electron microscopy images (TEM/SEM) addressed to the master and PhD students. ■

Bogdan Ștefan Vasile
(President of the Romanian
Electron Microscopy Society)

Royal Microscopical Society (RMS)



The RMS is looking back on another action-packed year across all its activities in support of the global microscopy, imaging and flow cytometry communities.

Throughout 2025, we delivered and supported some fantastic and well attended events covering the whole spectrum of techniques and applications across the sciences. As a whole, the RMS delivered more than 30 events with a total of more than 3,150 registered attendees. This included a host of courses and workshops that delivered training to 124 participants. It

was also a year in which our flagship event, the Microscience Microscopy Congress (mmc2025), further enhanced its reputation as an essential fixture in the microscopy calendar, with a great turn-out, a superb scientific programme, and a world-class trade exhibition.

Once again this year, the RMS has enthusiastically participated as an exhibitor, sponsor or invited speaker in support of external events hosted by partner organisations. These included the Scottish Microscopy Society's annual Symposium in Aberdeen, the

Cryo Microscopy Group Meeting 2025, and the Society of Electron Microscopy Technology (SEMT) annual meeting. Throughout the year, our staff have been stepping up their presence at meetings such as these, seeking in-person conversations about the benefits of RMS membership and the work that we do.

Our Outreach and Education activities have continued apace, with our Microscope Activity Kits fully booked out to primary schools and other youth settings until Spring 2026. This scheme has been running since 2011 and is a real

jewel in the RMS crown. Our members also have the opportunity to undertake outreach projects of their own, with RMS funding support. These projects are enabling children and adults of all ages and backgrounds to experience microscopy – often for the first time – which is absolutely fantastic.

The RMS Summer Studentship scheme provided financial support for six undergraduate students to complete microscopy-based projects over the summer. Meanwhile, for those already working in microscopy, we continue to offer the opportunity to study for an RMS Diploma – a great, portfolio-based qualification to hold. We currently have 10 candidates undertaking the diploma,

from countries including Croatia and New Zealand.

Our flagship publication, the *Journal of Microscopy*, continues to make great strides with the number of articles published online increasing by five per cent on the previous year, and overall submissions increasing significantly. This year the *Journal* published four special issues – on Botanical Microscopy, Microscopy Techniques, a Festschrift for Professor Paul Walther, and most recently, an issue dedicated to Ptychography. More are in the pipeline for 2026.

The Society would like to pay tribute to its brilliant volunteers, who are so

generous with their time and energy in serving the RMS. Our committee members are moving the Society forward with a raft of new ideas and initiatives for the benefit of the microscopy, imaging and flow cytometry communities. Many others also give up their time as helpers at events, as Ambassadors, or by supporting our outreach activities, and they are a huge asset to the Society.

Finally, we would like to give special thanks to all our members – wherever you are in the world. Ultimately, this is your society, and your kind contributions, membership fees and volunteering makes all of this possible. Here's to 2026! ■

Nordic Microscopy Society (SCANDEM)

11 – 13 June 2025 – Bergen – Norway

After the successful EMC2024 conference in Copenhagen, the Scandem board experienced some changes starting from 2025. Prof. Jakob B. Wagner from Technical University of Denmark was elected as President for the Nordic Microscopy Society, taking over after Prof. Kesara Anamthawat-Jónsson. Kesara will now enjoy her retirement after long and faithful service in the Nordic Microscopy Society. The new Scandem board now comprises:

Executive board:

- **Jakob B. Wagner** (President) – University of Denmark, Denmark
- **Per Persson** (Vice President and Secretary General) – Linköping University, Sweden
- **Salla Marttila** (Treasurer) – Swedish University of Agricultural Sciences, Sweden

and two representatives (Materials Science and Life Science) from each of the Scandem member states (Iceland, Denmark, Finland, Norway, and Sweden), together with our information officer and company representative.



Joakim Lajer, Scandem travel grant holder, presenting at Scandem2025

The board of Scandem, representing some of the top institutions in the Nordic region, is well-positioned to drive the society's mission forward, bringing researchers and professionals in the field of microscopy from the Nordic countries together and

promoting the development and application of microscopy in both materials science and life science. In 2025, the Scandem board granted 8 travel grants for participation in conferences and workshops. The grantees are chosen from early career researchers (PhDs and Post doc.) and technical staff.

A traditionally important promotor of the Scandem mission is the annual Scandem meeting, which circulates between the 5 member states. The Scandem 2025 meeting was hosted by University of Bergen, June 11–13, 2025.

The 2½-day program delivered an exceptional experience, featuring a dynamic lineup of high-level scientific talks from Scandem members at all career stages, complemented by renowned invited speakers from across Europe. Staying true to tradition, the microscopy conference offered two parallel tracks—materials science and life science—while fostering an inspiring level of cross-track interaction, both during presentations and in lively coffee-break discussions, to the president's delight.

The exhibition was a highlight, enriched by dedicated company presentations that allowed exhibitors to showcase cutting-edge techniques and instrumentation in depth. With over 120 participants, the event was a vibrant hub of collaboration and networking, where new connections and long-standing friendships sparked fresh ideas and opened exciting possibilities for future research. Then Nordic Microscopy Society represents all the Nordic countries. This is also evident

from the 'where are you from' map present at the Scandem 2025 meeting in Bergen. Looking forward into 2026 we are looking forward to all meeting you in Oulo, Finland for the Scandem 2026 meeting set to take place in June 2026. The meeting (nr 75 in the series) will be hosted by Oulo University and organized by Prof. Ilkka Miinalainen (University of Oulu). ■



Serbian Society for Microscopy (SSM)

Exhibition Marking 100 Years Of The Microphotographic Atlas Of Normal Histology

In 2025, a significant jubilee was marked in Serbia – the centenary of the publication of the Microphotographic Atlas of Normal Histology. Its author, Aleksandar Kostić, was the first Professor of Histology and Embryology at the Faculty of Medicine, University of Belgrade, and founded the Institute of Histology. In the history of Serbian medicine, he is also known as a pioneer of medical photography and film.

At the beginning of the 20th century – when drawings still represented the principal means of depicting histological specimens – microphotography faced numerous technical challenges and limitations and was only beginning to secure its place within medical science. In such circumstances, publishing a histological atlas composed exclusively of original microphotographs of tissues and organs constituted an extraordinary challenge and an exceptional achievement. The atlas was not only a pioneering work of Professor



Fig.1. The opening of the exhibition at the Gallery of Science and Technology of the Serbian Academy of Sciences and Arts (SASA), Belgrade, Serbia

Kostić, but also one of the earliest microphotographic histology atlases worldwide.

To mark this jubilee, an exhibition was organised at the Gallery of Science and Technology of the Serbian Academy of Sciences and Arts (SASA) in Belgrade. Visitors had the opportunity to view the original edition of the Atlas and explore its newly digitised version, done at the Audiovisual Archive and Centre for Digitisation of SASA.

Besides the Atlas, the exhibition featured a significant collection of artefacts from the Institute of Histology dating from the interwar period, along with numerous photographs showing the photographic equipment used by Professor Kostić in creating his microphotographs. Reflecting the wider educational and social context, part of the exhibition was dedicated to our students. It displayed drawings of histological specimens made during practical classes, alongside notable artistic

works, such as the oil-on-canvas representation of the cerebellar cortex. Through these pieces, some of our students demonstrated not only a keen interest in histology and medicine but also an impressive artistic talent and potential.

“ The atlas was one of the earliest microphotographic histology atlases worldwide. ”

The exhibition was curated by Nela Puškaš, Full Professor of Histology and Embryology at the Faculty of Medicine, University of Belgrade, and a board member of the Serbian Microscopy Society (SMS). Alongside her research in the field of neuroscience, Professor Puškaš has a long-standing interest in the history of medicine. This exhibition represents her third project dedicated to Professor Kostić and to the history of the Institute of Histology and Embryology, which today bears his name as the Institute of Histology and Embryology “Prof. Aleksandar Đ. Kostić”.

A comprehensive overview of the atlas can be accessed at the following link: <https://aseestant.ceon.rs/index.php/zdravzast/article/view/59486/28776> ■

PRF Nataša Nestorović,
President of the SMS

**The Institute for Biological Research
“Siniša Stanković” (IBISS)**

Prof. Milica Labudović Borović
**Institute of Histology and Embryology
“Prof. Aleksandar Đ. Kostić”**
Belgrade, Serbia

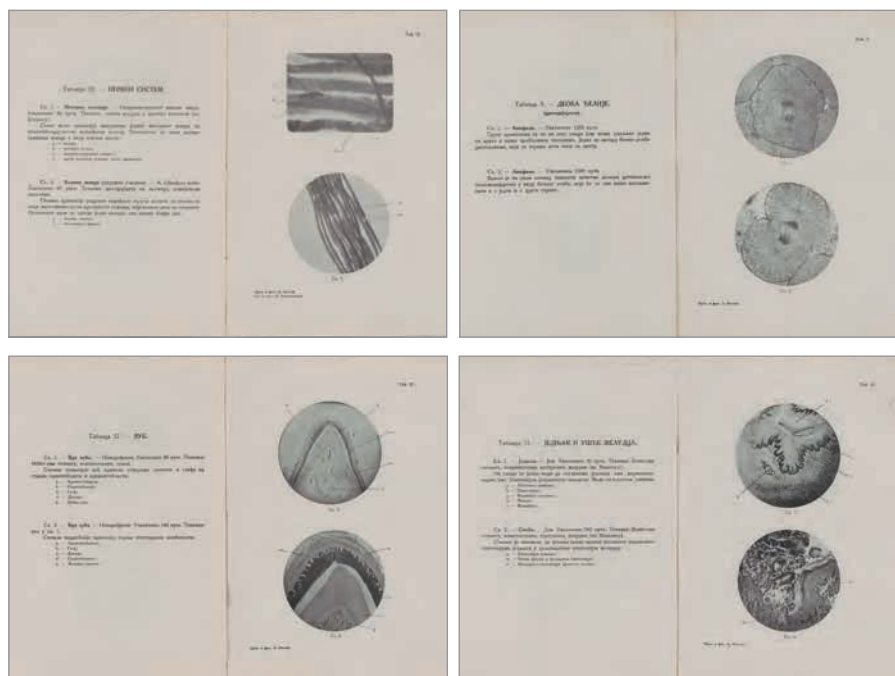


Fig. 2,a,b,c. The Microphotographic Atlas of Normal Histology (digitized in SASA AVA)





Société Française des Microscopies (SFμ)

Report on the 19th Conference of the French Society of Microscopy 30 June - 4 July 2025 - Toulouse - France

The 19th Conference of the French Society for Microscopy (SFμ) was held at the University of Toulouse, from June 30 to July 4, 2025, bringing together around 360 participants – researchers, engineers, PhD students, and microscopy professionals from France and abroad. The event served as a major platform for sharing scientific discoveries, technological innovations, and practical expertise across all microscopy fields.

The program covered a wide range of techniques, including optical, electron, and atomic force microscopy (AFM), as well as correlative and multimodal approaches. Sessions were organized around two main themes: Life Sciences (cells, tissues, microorganisms, bio-films) and Materials Science (nano-structures, polymers, composites, metals), with joint instrumental and interdisciplinary sessions encouraging cross-disciplinary collaborations.

The meeting began with hands-on workshops (June 30–July 1), offering participants the opportunity to train on advanced instruments and cutting-edge methods such as 3D high-resolution imaging, *in situ* microscopy, complex sample preparation, or quantitative image analysis.

With over 200 posters presented, the poster session was among the highlights, fostering vibrant scientific discussions and new collaborations.

A large industrial exhibition featuring more than 20 companies showcased the latest advances in microscopes, analytical tools, and sample preparation technologies – strengthening ties between academic and industrial communities.

Beyond the scientific sessions, the congress offered social events such as a welcome reception, poster aperitifs, and a gala dinner, creating networking opportunities.

During the week, the Favard Prize (recognizing outstanding doctoral research) and the Raimond Castaing Prize (honoring senior scientists for

their remarkable contributions to microscopy) were awarded, along with two Best Poster Prizes rewarding the excellence and creativity of young researchers. The SFμ also named Professor Suzanne Giorgio (CINaM, Marseille) as Honorary Member, recognizing her remarkable career and impact on the field.

Overall, the 19th SFμ Congress was a major event for the microscopy community, reinforcing Toulouse's position as a hub of excellence, fostering interdisciplinary collaboration, and highlighting the dynamism and creativity driving microscopy research today. ■



Portuguese Society for Microscopy (SPMicros)

The year of 2025 continued to drive the society's mission forward, fostering an environment of collaboration and innovation within microscopy, supporting its members in both their professional growth and scientific endeavors, as well as expanding the society's reach both nationally and internationally.

The Portuguese Society of Microscopy has taken an active role in modernizing and expanding its online presence over the past year. Significant effort was dedicated to updating and renovating the society's webpage, improving both its visual identity and functionality. The new platform provides clearer access to resources, streamlined communication with members, and enhanced visibility for national microscopy activities, strengthening the society's outreach and community engagement. The new SPMicros webpage can be found here (<https://spmicros.paletadeideias.com/>).

SPMicros, together with the International Iberian Nanotechnology Laboratory in Portugal, successfully hosted, from May 13 to May 15, the 5th International Workshop on In situ Electron Microscopy in Porto, Portugal. The conference was 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) and attracted close to 100 participants from universities, research institutes, and industry in Europe, USA, Asia and Australia. The conference served as a vibrant platform for knowledge sharing, focusing on the latest advancements in in-situ microscopy within Materials Science.

SPMicros also supported an Electron Microscopy Course, from June 30 to July 4, a program focused on developing a basic understanding of the principles and operation of electron microscopy techniques. The course covered both theoretical and practical sessions, with five days of advanced



Figure 1. 5th International Workshop on In situ Electron Microscopy in Porto, Portugal

training at INL's state-of-the-art facilities. The course was well attended by 50 researchers from universities, research laboratories and industry.

In the Fall of 2025, the Microscopy at the Frontiers of Science 2025 (MFS2025) conference, co-organized by the Spanish and Portuguese

Microscopy Societies, took place in Valencia from September 23–25 and gathered 213 participants from ten countries. The program featured six plenaries, seven parallel sessions, and a broad range of scientific contributions, including 72 oral presentations, 22 flash talks, 35 posters, and six industry talks, supported by



Figure 2. Electron Microscopy Course at INL



Figure 3. Microscopy at the Frontiers of Science 2025 (MFS2025) conference, co-organized by the Spanish and Portuguese Microscopy Societies, in Valencia, Spain.

ten sponsoring companies and local institutions. A series of PhD Thesis Awards, presentation awards, and image contest prizes recognized outstanding work in Materials Science, Life Sciences/CryoEM, and technical developments.

SPMicros extends heartfelt thanks to all who attended and contributed, emphasizing that the success of MFS2025 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. Overall, MFS2025

showcased the vitality of the Iberian microscopy community and its strong collaborative spirit, with both societies looking ahead to the next edition, planned for Portugal (likely Algarve) in 2027.

Looking ahead, the year of 2026 will mark a new chapter for the Portuguese Microscopy Society (SPMicros) with a change in leadership. Dr. Paulo Ferreira concluded his tenure as President, and Dr. Oliver Schraidt, one of the current Vice-Presidents, will assume the role of President. ■

Paulo Ferreira
(President)

“ The MFS2025 conference in Valencia highlights the strong collaborative spirit between Spanish and Portuguese scientists. ”

Turkish Society For Electron Microscopy (TEMD)

The 2nd International Microscopy and Spectroscopy Congress (MSC 2025) and the 27th National Congress of Electron Microscopy (EMK 2025) were successfully organized by the Department of Histology and Embryology, School of Medicine, Acibadem University, on September 25–27, 2025, under the auspices of the Turkish Society for Electron Microscopy. MSC 2025 has been held with the generous sponsorship of the European Microscopy Society. We extend our sincere appreciation to EMS for their invaluable support of this event.

The congresses welcomed all microscopy studies in the fields of life sciences and material sciences and were enriched by 1 Keynote Lecture, 3 Plenary Talks, 57 Invited Speakers, 21 parallel sessions, and one poster session. During the Opening Ceremony, Prof. Vladislav Krzyzanek, President of the European Microscopy Society, delivered his inspiring keynote lecture entitled 'Unlocking the power of SEM: Quantitative Imaging and 4D Diffraction Across Disciplines'. Plenary lectures on the first, second, and third days of the congress were presented by Prof. Ali Ertürk (Germany): AI-powered 3D Cell-level Imaging for Disease Studies and Therapeutic Development; Prof. Emre Yaksi (Sweden): The role of Astroglia in the Generation and Prevention of Seizures; Prof. Aydoğan Özcan (USA): AI-based Advances in Biomedical Microscopy and Pathology.

"Microscopy School", organized on the first day of MCM 2025, included the 3D Cell Culture Workshop and the Neurohistology Workshop. **"Prof. Ayse Oguz and Prof. Meral Baka Best Poster Awards", "Prof. Mahmut Sağlam Best Microstructure Award" and "Prof. Türkan Erben Research Award"**, biennially organized in honor of its Founding President, **were** presented in the fields of **materials sciences and biological sciences**.



Fifty scholarships have been provided to 50 undergraduate and graduate students. The awards and scholarships provided by TSEM supported emerging scientists and promoted excellence in microscopy research.

Technical presentations and exhibitions of 20 sponsor companies - *TEKAFOS, THERMO FISHER SCIENTIFIC as the primary sponsor* - were included in the congress programme. The Gala Dinner, held on September 26, 2025, as a cruise dinner on the Bosphorus, was a memorable social highlight of the congress.

With approximately 300 participants and sponsorship from 20 companies and societies, these congresses fostered new collaborations among researchers in life and material sciences within the state-of-the-art facilities of the Acibadem University Congress Center.

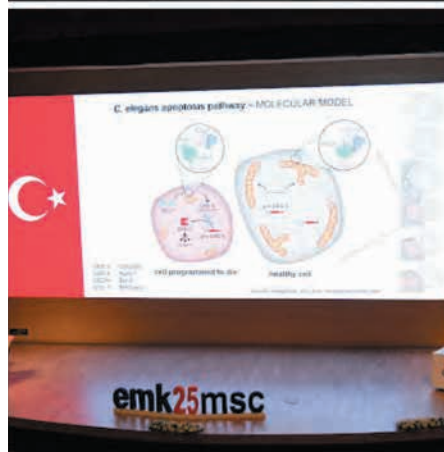
Turkish Society for Electron Microscopy was one of the organizing societies for the 17th Multinational Congress on Microscopy (MCM 2025), which took place from September 6 to 12, 2025, in Portoroz, Slovenia. The

society contributed to the organization of MCM 2025 through its representatives, who fulfilled roles such as Session Chairs—Serap Arbak, Servet Turan, Halime Kenar, and Feray Bakan Misirlioglu—and Members of the Organizing Committee & Scientific Committee, including Servet Turan, Serap Arbak, Mehtap Kutlu, and Feray Bakan Misirlioglu. Additionally, Serap Arbak and Servet Turan attended the MCM Board meeting on the fourth day of the congress.

Serap Arbak, Melek Ozturk, and Mehtap Kutlu, board members of the Turkish Society for Electron Microscopy (TSEM), attended the International Congress of Histochemistry and Cytochemistry (ICHC 2025) in Rimini, Italy, from August 26–31, 2025, as delegates. During the Delegates' Meeting, Prof. Melek Ozturk was appointed Treasurer of the International Federation of Societies for Histochemistry and Cytochemistry (IFSHC). TSEM member Sercin Karahuseyinoglu delivered an invited lecture at the congress, while Serap Arbak, serving as TSEM President, chaired a session. Additionally, a significant number of Turkish microscopists participated in ICHC 2025.

Izmir Institute of Technology Renews Electron Microscopy Facilities

The Center for Materials Research (CMR) at the Izmir Institute of Technology (IZTECH) is renewing its electron microscopy facilities by investing in a transmission electron microscope (TEM) and a dual-beam (FEG-SEM and FIB) microscope. This investment includes Thermo Fisher Scientific's Spectra 200 aberration-corrected STEM with a cold-field emission gun, 16-segment STEM detector, Ceta camera with speed enhancement, Super-X EDS system, and 4D-STEM capability. On-site acceptance tests revealed resolutions of better than 60 pm, making it the highest-resolution microscope in Türkiye. The Scios-2 Dual Beam system is also included in the package to prepare specimens for atomic-resolution (S)TEM investigations—equipped



with an Oxford Instruments Ultim Max 100 EDS and a Symmetry S3 EBSD camera. Users can select specific sites for TEM lamella preparation based on chemical and crystallographic orientation information. The center, with its new facilities, is open to national and international collaborations and offers users the opportunity to study material structures at atomic resolution.

The Turkish Society is currently represented on the Executive Committees of

IFSM by Serap Arbak, on EMS by Servet Turan, and on IFSHC by Melek Ozturk.

Serap Arbak, President of TSEM, has been appointed as representative of IFSM to the Board of Standing Committee for Gender Equality in Science (SCGES). ■

**Prof. Serap Arbak-President
of Turkish Society for Electron
Microscopy**



Notes



EMS Scholarships reports

Andrea Cheradil

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia

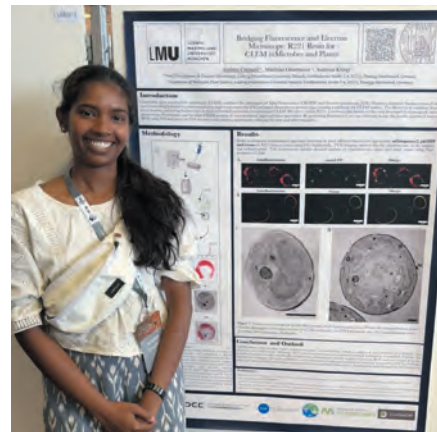
I am very grateful to have attended the 17th Multinational Congress on Microscopy (17MCM) in Portorož, Slovenia, with the generous support of the EMS travel fund. This opportunity was truly invaluable for both my scientific and personal development. Presenting my research during the poster session was a particularly rewarding experience. I received constructive feedback from experts in the field and had the chance to discuss potential solutions to some of the challenges I face in my project. These conversations not only gave me new perspectives but also helped me identify concrete steps that I can implement in my future work.

The conference brought together participants from a remarkably broad range of disciplines, creating a very stimulating environment. As someone working in the life sciences, I especially enjoyed the life sciences talks, with the sessions on volume EM and CLEM being highlights for me. These presentations

allowed me to learn about recent technological developments that could be highly relevant to my own workflow. I found it inspiring to see how advances in other areas of microscopy can be translated into new applications within life sciences.

In addition, I had the opportunity to attend the EMS General Assembly. It felt very rewarding to be part of the decision-making process of the society and to witness how the community works together to shape the future of microscopy. I also greatly appreciated the talks given by the winners of the Outstanding Paper Award, as they demonstrated both scientific excellence and creativity.

Beyond the scientific program, the conference provided excellent opportunities for networking. I was able to speak with company representatives, which gave me valuable insights into how to make better use of their equipment and software for my experiments. Informal discussions with fellow participants



also opened the door to potential collaborations, which I am excited to explore further.

Overall, attending 17MCM was an incredibly enriching experience. It broadened my knowledge, gave me new tools to advance my research, and strengthened my connection to the microscopy community. I am truly thankful to the EMS travel fund for making my participation possible.

Stjepan Dolić

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia



From September 7th to 12th, 2025, I attended the 17th Multinational Congress on Microscopy (17MCM) in Portorož, Slovenia. The congress

began on Sunday evening with an opening ceremony, where the chair gave a brief welcome speech, followed by a pleasant dinner, a beautiful sunset, and even a lunar eclipse. The scientific program opened with a plenary lecture by Prof. Mateja Erdani Kreft, PhD, titled "Microscopy-based Analysis of Biomimetic 2D and 3D in vitro Models for Preclinical Studies." She presented several examples of microscopy applied to biomimetic systems, including research on bladder cancer that compared cancerous and healthy bladder cells.

The next set of lectures focused on materials science. I particularly enjoyed the work of Aleksander Rečnik, and his presentation titled "Atomistic structure of interfaces: Where theory and

experiment meet" as I find understanding interfaces is key for researching semiconductor materials. The second poster session, held on both Wednesday and Thursday, gave me the opportunity to present my work: "Utilizing SEM thin-film measurements to deepen the understanding of perovskite solar cell performance". The discussions with colleagues provided valuable feedback and new perspectives, while the experience of presenting to an engaged audience was highly rewarding.

In the following days, I mostly joined sessions on materials science. I mostly enjoyed the research of Giorgio Divitini and his collaborators on perovskite materials, which is also the focus of my PhD thesis. Central to all of these

sessions was the role of microscopy, with frequent references to TEM, SEM, STEM, EELS, and related methods. Afternoon talks further explored microscopy applied to metals and alloys, for example nanocrystalline

titanium. Beyond the lectures, the conference was an excellent opportunity to network, exchange ideas, and form new friendships. The organization was outstanding, and the food was consistently enjoyable. I am very grateful to

the organizers for their efforts, and to the European Microscopy Society for awarding me the scholarship that made my participation possible.

Eva Durinova

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia



I was very happy to attend the Multinational Congress on Microscopy in Portorož, Slovenia. It was a great gathering of experts from a wide range of microscopy-related fields. While I was mainly interested in the life sciences sessions, as they are most relevant to my work, I also enjoyed several fascinating talks from the other

sections. I particularly appreciated the focus on volume EM, CLEM, and sample preparation for these techniques. The program was really packed with engaging presentations, both from researchers and industry exhibitors.

On Wednesday morning, I gave a 15-minute oral presentation on one of

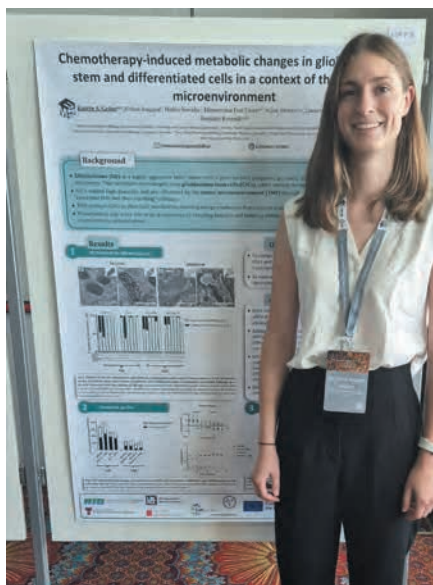
my research topics – nitrogen handling in photosynthetic algae. I was pleased that my talk sparked fruitful discussions with colleagues working in related areas and provided me with some new ideas.

The social program was also a highlight. The welcome reception, conference dinner, and coffee breaks offered great opportunities to connect with colleagues. I especially enjoyed taking part in the ITR Lab charity run – a fun and relaxing break in the middle of the conference that also raised a generous contribution for the Slovenian Association of Friends of Youth.

Overall, the event was excellently organized, and I am already looking forward to the next meeting.

Simona Katrin Galun

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia



I had the privilege to attend the 17th Multinational congress on microscopy held in Portorož, where I presented my poster titled "Chemotherapy-induced metabolic changes in glioblastoma stem and differentiated cells in a context of the tumor microenvironment." I received insightful feedback that inspired me to explore new approaches and methodologies, which I look forward to integrating into my future research.

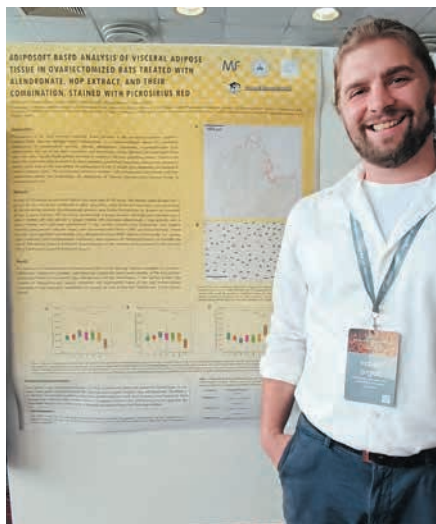
During the congress I got the opportunity to listen to a diverse program with many insightful sessions. Of particular interest were the life sciences presentations, which highlighted recent advances in multiscale and multimodal

microscopy techniques for comprehensive imaging and analysis, spanning from entire organisms to sub-cellular structures. These cutting-edge approaches enabled researchers to visualize biological samples across multiple spatial scales, providing deeper insights into cellular function, tissue architecture, and disease mechanisms.

This event provided excellent opportunities to network with leading international researchers and the exchange of ideas in a dynamic scientific community. As a stipend recipient, attending 17MCM was an inspiring and invaluable experience that greatly contributed to my professional growth and engagement within the microscopy field.

Robert Grgac

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia



Attending the 17th Multinational Congress on Microscopy (17MCM) in Portorož, Slovenia was an inspiring and memorable experience. I had the opportunity to present two posters: “Adiposoft-based analysis of visceral adipose tissue in ovariectomized rats treated with alendronate, hop extract, and their combination, stained with picrosirius red” and “Micro-CT analysis of femoral bone structure in ovariectomized rats following treatment with alendronate, hop extract, and their combination.” Sharing my work allowed me to receive valuable feedback from experts and gain new perspectives to guide the next steps of my research.

The congress offered a rich program of talks, posters, and discussions that

showcased the latest advances in microscopy and the diversity of ongoing research. Beyond the sessions, I had the pleasure of meeting peers for the first time, exchanging ideas that sparked fresh perspectives and potential collaborations.

Portorož, a sunny coastal town on the Adriatic, provided a warm and welcoming setting, making the experience even more enjoyable.

I am deeply grateful to the European Microscopy Society (EMS) and the Croatian Microscopy Society (CMS) for their generous support, and I extend my thanks to the organizers for creating such a well-executed and engaging event.

Anna Havlíčková

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia



their scholarship. Participating in this congress was a significant step in my scientific career, as it was the first international event at which I not only participated as an attendee but also had the honour of giving an oral presentation. My talk, entitled “Ultrastructural analysis of *Azotobacter vinelandii* encapsulated in alginate hydrogel using cryogenic preparation and electron microscopy techniques” gave me the opportunity to share my research with an international audience, receive valuable feedback, and engage in inspiring discussions.

The congress program was extensive and covered a wide range of topics in the field of microscopy, several of which were closely related to my own work. Among the lectures that I found especially valuable were: “Sample Preparation for Electron Microscopy” by B. M. Humbel and “Sample Preparation Strategies for Biological Electron Microscopy: Challenges and Innovations” by M. Vancová. In addition, I was also very inspired by the lectures

“Enterovirus genome release and delivery” by P. Plevka and “Bridging structure and function: Advancing CLEM workflows for organelle-level imaging” by J. Klumperman.

Participating in the 17MCM program was extremely valuable, because it not only expanded my professional knowledge, but also allowed me to establish contacts with scientists from similar fields of research. These interactions gave opportunities to exchange ideas and consider future collaborative projects.

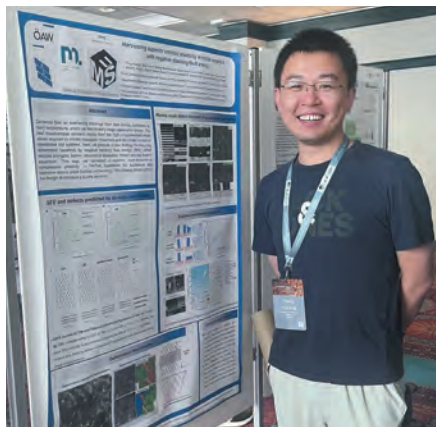
In conclusion, I can say that participating in the congress was inspiring and beneficial, providing me with new knowledge and professional opportunities. I sincerely thank the EMS for their generous support, which enabled me to participate in this event.

Anna Havlíčková, Institute of Scientific Instruments of the CAS, Brno, Czech Republic, Faculty of Chemistry, BUT, Brno, Czech Republic

I am grateful to the European Microscopy Society (EMS) for supporting my participation in the 17th Multinational Congress on Microscopy (17MCM) in Portorož, Slovenia, through

Yong Huang

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia



I am deeply grateful to the European Microscopy Society (EMS) for awarding me a scholarship, which made it possible for me to attend the 17th Multinational Congress on Microscopy (17MCM) held from 07 to 12 September 2025 in the beautiful coastal city of Portorož, Slovenia.

The first two days of the conference provided me with a valuable opportunity to present my poster and share my recent work titled “Multi-scale investigation of superior mechanical properties in nitride ceramics with negative stacking fault energy.”

It was a rewarding experience to discuss my research with leading experts and fellow researchers, from whom I gained new insights and knowledge that will undoubtedly benefit my academic development.

Throughout the conference, I was impressed by many outstanding presentations and poster displays, which broadened my understanding of the latest advancements in electron microscopy techniques and their applications. Particularly memorable was the lecture on the final day, “The combination of

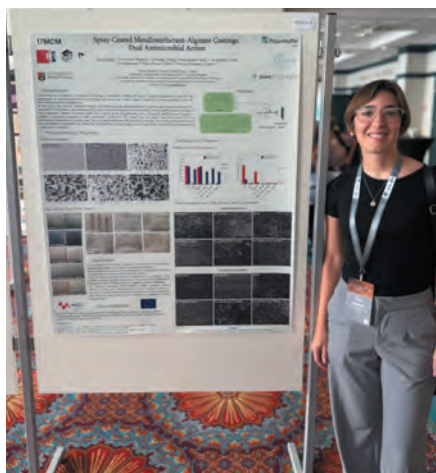
high-resolution diffraction techniques in the scanning electron microscope for statistical relevant description of crystal defects and resulting properties in metals and alloys.” This talk deepened my appreciation for multi-scale characterization methods.

As I approach the end of my PhD journey, I reflect on how electron microscopy has opened new perspectives for me to observe and understand the world. I am eager to continue using these powerful tools in my future academic endeavors.

Finally, I would like to extend my sincere thanks once again to EMS and all the organizers of 17MCM for their efforts in delivering such a flawless and inspiring conference.

Ana Ivančić

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia



From 7th to 12th September 2025, I attended the 17th Multinational Congress on Microscopy (17MCM) in Portorož, Slovenia. The first evening was reserved for the congress opening, during which the chair of the 17MCM gave a short speech, accompanied by a lovely dinner and sunset viewing, followed by the lunar eclipse.

The first plenary lecture, by prof. Mateja Erdani Kreft, PhD was titled “Microscopy-based Analysis of Biomimetic 2D and 3D *in vitro* Models for Preclinical Studies” and it featured different cases of studying biomimetic models with microscopy, one of which was focused on bladder cancer and studying bladder cancer cells in comparison to normal bladder cells.

The following materials science set of lectures was focused on ceramics and geological materials and studying them using different types of microscopy. During the first poster session, which was held on both Monday and Tuesday, I presented my work entitled “Spray-Coated Metallosurfactant-Alginate Coatings: Dual Antimicrobial Action” and received valuable ideas from the fellow scientists at the conference, as well as the invaluable experience of presenting my work to interested participants. The following days I mostly

attended the lectures in the materials science category, including magnetic and ferroelectric materials, low-dimensional and nanomaterials, such as nanocomposites and polymer-based materials, as well as materials for energy storage and conversion. Of course, the way all of these topics were tied in was microscopy and a lot of talk about TEM, SEM STEM, EELS and more. In the afternoon sessions there were talks about the use of microscopy in studying metals and alloys, such as nanocrystalline titanium. The conference helped me create new connections and build new friendships.

The conference organization was excellent and all the food very enjoyable. I had a great time and would like to thank the organizers for the excellent job they did and of course the European Microscopy Society for providing me with the scholarship to attend this congress!

František Kitzberger

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia



I had the opportunity to take part in the 17MCM International Scientific Conference in Portorož, which brought together experts and young researchers from a wide range of disciplines related to materials science, life science, as well as advanced microscopy techniques. The event served as an important platform not only for presenting new results, but also for exchanging knowledge, comparing methodologies, and building professional connections across the international scientific community.

At this conference, I contributed to an oral presentation entitled “Semi-automated Classification of Nanoparticle Signals from Opposite Surfaces of Ultrathin Sections in Low-Voltage STEM.” This talk was a direct extension of research that we had published in 2024, and it introduced an additional aspect of automation to the previously established methodology. Presenting this continuation of my work allowed me to share how the research has progressed over the past months, and it generated fruitful discussion.

In addition, I also delivered another oral presentation, “Serial Block-Face Scanning Electron Microscopy (SBEM): Comparative Analysis of Protocols for Enhancing Contrast and Reducing Charging in Mouse Brain Tissue Samples,” on behalf of a colleague who was unable to attend. I was already one of the co-authors of this study, so taking the role of presenter was both relevant and rewarding. Beyond these two talks, I also contributed as a co-author to two additional presentations included in

the conference program, which further underlined the breadth of my involvement in the research activities of our group. The conference as a whole was a highly valuable experience. It enabled me to meet experienced researchers from different institutions, exchange knowledge, and discuss current state-of-the-art methodologies and their applications. These discussions provided new insights and perspectives, some of which can be directly applied in my ongoing work. Importantly, the event also created opportunities for establishing new professional contacts and potential collaborations that may shape future projects.

Overall, my participation at 17MCM significantly enriched my academic development. It strengthened my presentation and communication skills in front of an international audience, enhanced the visibility of our research group, and provided continuity to my earlier published work while also highlighting the collaborative nature of our current research.

Bruno Komazec

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia



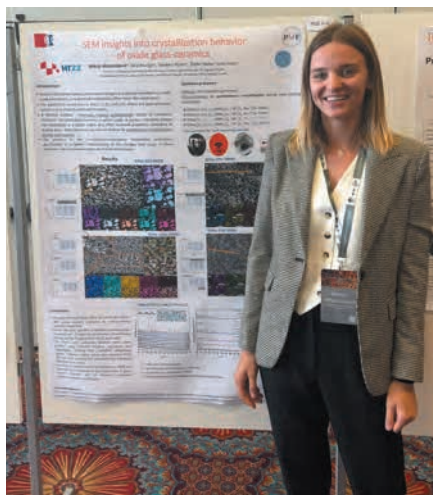
I would like to thank the European Microscopy Society (EMS) for the scholarship that enabled me to participate in the 17th Multinational Congress on Microscopy (17MCM) in Portorož, Slovenia, where I had the opportunity to present my work through a poster presentation entitled “Visualizing the algal

response on polystyrene particles: A focus on EPS production”. Participating in this congress was an extremely valuable experience for me because I had the opportunity to listen to numerous inspiring lectures and get acquainted with new techniques and approaches in the field of microscopy, to which I do not have access in my daily work. Through various lectures and workshops, I learned about new methods that can be used in my field of microalgae research, which can greatly contribute to a better understanding of their responses to environmental stresses such as various nanoparticles and the development of new research approaches in this field. The congress also provided an excellent networking opportunity as I made various contacts

with researchers from different countries and we have already arranged short visits to laboratories which are using instruments that are not available at my home institution, which will certainly enhance my future research projects and enable me to develop new ideas and collaborations. This scholarship not only enabled me to attend the congress, but also to improve my skills through the exchange of knowledge and experiences with scientists working on similar topics. I believe that the experience I gained in Portorož at 17MCM will contribute to the quality of my research in the long term, but also to strengthening cooperation between research communities. Once again, I sincerely thank EMS for its support and the opportunity.

Marija Miroslavljevic

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia



I had the pleasure of attending the 17th Multinational Congress on Microscopy (17MCM), held in Portorož, Slovenia, from 7 to 12 September 2025. The congress brought together researchers and professionals from various fields of

microscopy, creating an inspiring and stimulating environment for knowledge exchange.

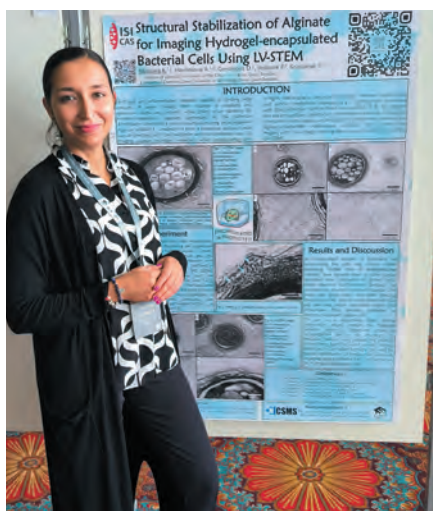
The event officially began on Sunday with an opening ceremony and welcome dinner, with a beautiful view- truly memorable and unique experience. I particularly enjoyed the plenary lectures which were both inspiring and informative, covering cutting-edge topics and presented by leading experts in the field. During a second poster session which was held on Wednesday and Thursday, I presented my work titled "SEM insights into crystallization behavior of oxide glass-ceramics", which received valuable feedback and insightful discussions with fellow researchers. In addition to the poster presentation, I participated in the Best Image Competition, with an image titled „The Living Architecture of

Tufa" which was a fun and creative way to highlight the visual and artistic side of microscopy. I also had the opportunity to visit the exhibition area and interact with company representatives presenting the latest advancements in microscopy instruments and technologies. These conversations provided useful insights into the practical applications and future directions in the field. On Thursday, I enjoyed a congress dinner with delicious food and a DJ, creating a very enjoyable atmosphere.

I would like to thank the organizers for hosting such a well-organized and engaging congress- and for the excellent food throughout the event. Finally, I am grateful for the opportunity to participate in this event and would like to thank the EMS for awarding me the scholarship that enabled my attendance.

Katerina Mrazova

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia



I would like to sincerely thank the European Microscopy Society for providing me with the scholarship to attend the 17th Multinational Congress on Microscopy in Portorož, Slovenia. This conference gave me a great opportunity to present my poster on

"Structural Stabilization of Alginate for Imaging Hydrogel-encapsulated Bacterial Cells Using LV-STEM." It was a valuable experience that allowed me to share my work, receive constructive feedback, and gather new ideas for my future research.

The conference included several inspiring lectures closely related to my research interests. I especially enjoyed the talk by prof. Judith Klumperman on "Bridging structure and function: Advancing CLEM workflows for organelle-level imaging," which was very motivating and showed me the broad potential of correlative approaches.

Another highlight for me was the presentation by Dr. Marie Vancová on "Sample Preparation Strategies for Biological Electron Microscopy: Challenges and Innovations." Her overview of alternative preparation methods not relying on uranyl acetate was

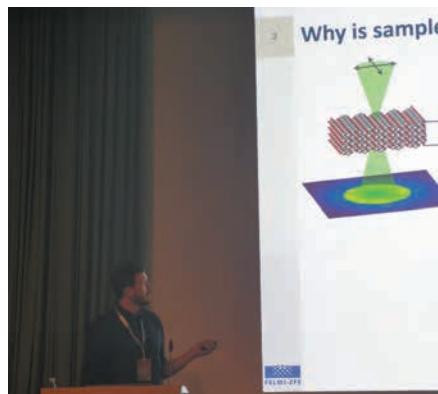
particularly relevant to my work. I also greatly appreciated the lecture by Dr. Bruno Humbel on "Sample Preparation for Electron Microscopy," which provided a clear and systematic explanation of the underlying chemistry behind fixation and processing steps, a topic often overlooked but essential for a deeper understanding of EM sample preparation.

Attending MCM2025 was very beneficial for my professional growth. I was able to learn about new developments in microscopy, gain inspiration for my own experiments, and connect with researchers working in related areas.

Overall, MCM2025 was a rewarding and motivating experience. I am very grateful to the European Microscopy Society for their support, which enabled me to attend this event and benefit greatly from it.

Michael Oberaigner

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia



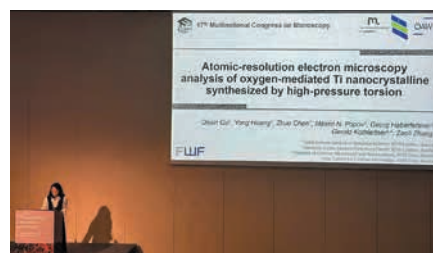
My name is Michael Oberaigner, and I had completed my PhD at the TU Graz a few months before this event. I sincerely appreciate the financial support

for young researchers from the European Microscopy Society to participate in the 17MCM in Portorož, and I would like to thank the organisers for hosting such an excellent conference. The program was full of stimulating talks and posters that covered a wide range of topics from life science to material science. The most interesting part for me were the talks and posters about 4D-STEM. It was fascinating to see the diverse achievements that many researchers have made with this method and even more fruitful were the personal discussions with these colleagues. Furthermore, it was also fascinating to see how machine learning is

becoming increasingly important in the field, with several contributions demonstrating its growing role in data analysis and interpretation. I also had the opportunity to give a talk on the automatization of thickness determination of TEM samples using convolutional neural networks. The discussion and feedback following my presentation were highly enriching, providing me with new perspectives and valuable ideas for further development. Attending this conference was a very rewarding experience, both scientifically and personally, and I am grateful for the chance to have been part of such a supportive community.

Qiulin Qu

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia



Dear EMS Secretary, I am a second year PhD student in Montanuniversität Leoben. I have participated in the 17th

Multinational Congress on Microscopy, which was held from 07 to 12 September 2025 in Slovenia.

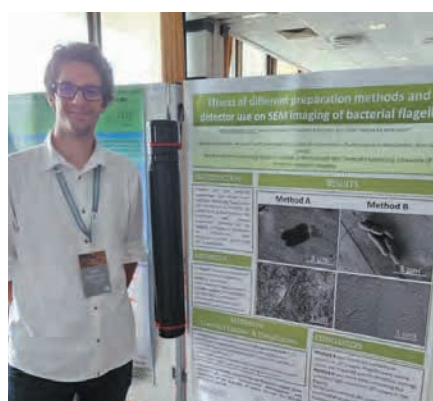
At the conference, I presented an oral presentation titled "Atomic-resolution electron microscopy analysis of oxygen-mediated Ti nanocrystalline synthesized by high-pressure torsion", and received some suggestions from other researchers. I attended all the sessions in Material Sciences.

Through this conference, I gained insight into the current research focus of materials science and the latest advancements in transmission electron microscopy equipment. Also, I broadened my horizons for future research.

I would like to sincerely thank the EMS scholarship for supporting my participation, which has greatly benefited my research and academic development.

Marko Radenković

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia



This past week (07.-12.09.2025) I attended the 17th Multinational Congress of Microscopy (17MCM) in beautiful Portorož (Slovenia). As part of my attendance, I participated in a poster presentation. My poster, titled "Effects of different preparation methods and detector use on SEM imaging of bacterial flagella", was received well by the other participants and attendees. During my presentation, I found that, due to their simplicity and cost-effectiveness, our preparation methods

were of interest not only to younger researchers and students but also to experienced researchers; moreover, for them, returning to more classical SEM sample preparation methods was even a nostalgic experience. During the five-day lecture series, I had the opportunity to attend numerous excellent presentations by the world's leading experts. From the perspective of my personal development as an SEM operator, the lectures on instrumentation were particularly informative and provided

excellent guidance. Along with the knowledge acquired I made many new connections with colleagues from countries near and far from my home nation of Serbia. These connections will undoubtedly open many opportunities for collaboration and new research

paths. In a less scientific but no less important activity I had the pleasure to join many of the other attendees in a charity run that took us from Portorož to Piran to promote sport in Slovenia. My colleagues, from BioSense institute in Novi Sad, and I participated in

the best image competition coming in third in the popular vote. In conclusion I would like to thank the EMS for supporting me in attending this conference. I truly had a wonderful time and hope to attend many more in the future. Thank you, Danke, Merci, Hvala.

David Llorens Rauret

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia



I would like to express my sincere gratitude to the European Microscopy Society for supporting my participation in the 17th Multinational Congress on Microscopy in Portorož, Slovenia.

The meeting offered an excellent scientific program, with varied plenary lectures, inspiring talks, and lively discussions that provided new perspectives on many aspects of microscopy and its applications. During the conference, I presented my work, "High-Entropy Oxide Nanoparticles as Stable and Efficient Catalysts for the Oxygen Evolution Reaction."

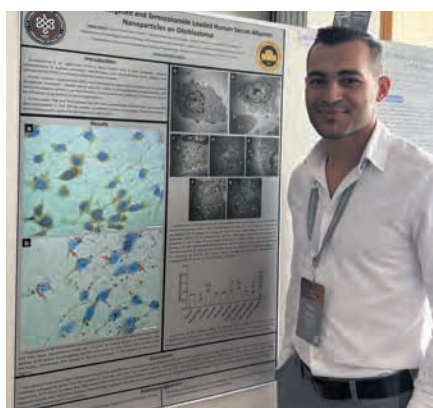
The feedback I received from experts and peers not only helped me identify and address some weak points in my research, but also gave me greater confidence in presenting my results to an international audience.

These exchanges were highly constructive and will directly contribute to the progress of my project. In addition to the science, the venue in Portorož created a warm and welcoming atmosphere, and I greatly enjoyed experiencing the beauty of Slovenia throughout the week. Overall, this congress was a truly enriching experience both professionally and personally, and I am very thankful to the European Microscopy Society for making my participation possible.

David Llorens Rauret, Doctoral Student Institut Català de Nanociència i Nanotecnologia (ICN2)

Hakan Sahin

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia



I am writing to provide my report on participation in the 17th Multinational Congress on Microscopy (17MCM), which took place in Portorož, Slovenia, from 7–12 September 2025. Attending this congress was a deeply enriching experience that combined scientific growth with personal inspiration.

The event brought together an international community of researchers, and being part of this environment reminded me of the collaborative and forward-looking spirit that defines the field of microscopy.

The scientific program was diverse and stimulating. Sessions ranging from Life Sciences to Material Sciences and Instrumentation & Methods offered not only valuable updates but also new perspectives that directly influenced the way I reflect on my own research on nanoparticle interactions with the blood-brain barrier. Several talks and discussions sparked ideas for new experimental directions that I plan to explore further. Equally meaningful were the personal interactions I had throughout the congress. Engaging with fellow researchers during poster

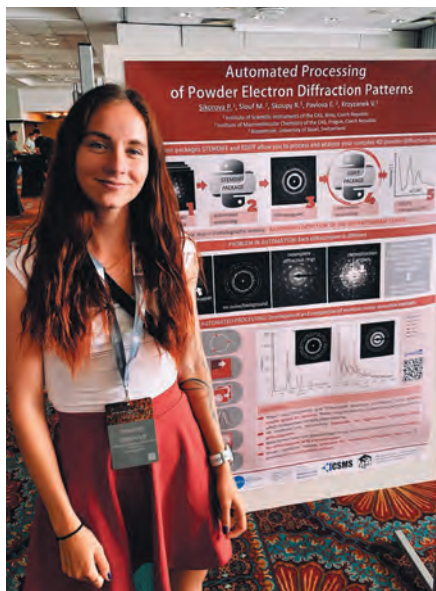
sessions, workshops, and informal gatherings provided constructive feedback, encouragement, and fresh viewpoints. These conversations reminded me that scientific progress is built on dialogue and collaboration, and they helped me see my work within a broader international context.

The overall atmosphere of 17MCM was both welcoming and inspiring. Beyond the formal sessions, activities such as community initiatives created a sense of belonging and reinforced the importance of sharing knowledge openly.

I am grateful for the opportunity to attend and confident that the knowledge and connections I gained will continue to benefit my research and future collaborations.

Pavlina Sikorová

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia



I am pleased to share my recent experience at the 17MCM International Congress in Portorož, which I was able to attend thanks to the support of the

EMS scholarship. With the help of this sponsorship, I was able to take part in this event and present my work, "Automated Processing of Powder Electron Diffraction Patterns", in person (the figure shows me in front of my poster at the Hotel Bernardin, where the congress was held).

Presenting my study to such an experienced audience was a truly rewarding experience. I had the opportunity to exchange ideas with experts in the field, to receive valuable feedback, and to engage with researchers working on related topics. These interactions were both inspiring and encouraging, and I hope they may lead to future collaborations.

The congress offered a rich scientific programme. I found the second day particularly relevant, as it included sessions on 4D-STEM, ptychography,

image processing, and machine learning—topics that closely connect to my own research interests. I especially enjoyed the invited lectures in the instrumentation session, "Quantitative imaging in SEM/STEM, electron diffraction, 4D-STEM and ptychography", by Lothar Houben and Benedikt Haas, both of whom use 4D STEM in their research. Their work was highly inspiring to me.

Overall, attending the 17MCM was an extremely valuable experience. I am confident that the knowledge gained and the contacts made will have a lasting impact on my scientific development.

I am sincerely grateful for the opportunity and for the EMS scholarship that made my participation possible. I sincerely appreciate the chance. Thank you.

Elena Unterleutner

17th MULTINATIONAL CONGRESS ON MICROSCOPY (17MCM). 7-12 September 2025 - Portorož, Slovenia



17MCM was my first conference outside of Austria. Therefore, I would like to express my sincerest gratitude to the

European Microscopy Society (EMS) for their generous support, which allowed me to attend the 17th Multinational Congress on Microscopy in Portorož, Slovenia from September 7 to 12, 2025.

My name is Elena Unterleutner and I have been a PhD student at the Institute of Electron Microscopy and Nanoanalysis (FELMI-ZFE) at Graz University of Technology since 2023. I had the opportunity to present my ongoing research titled "Advanced STEM of Point Defect Clusters in Doped STO" in an "Instrumentation and Methods" session.

In addition to presenting my research, I attended interesting and inspiring

presentations, including topics like 4D-STEM, ptychography, EELS and machine learning. These sessions expanded my knowledge of cutting-edge microscopy techniques and introduced me to novel applications that I can incorporate into my own research.

Beyond the scientific aspects, attending 17MCM allowed me to network with fellow researchers, building connections that may lead to future collaborations. These interactions will contribute greatly to my academic and professional growth.

Last but not least, I would like to thank the organisers for hosting such a wonderful conference.



Outstanding Paper Awards for 2024

Instrumentation and Technique Development

While all materials scatter light, the minuscule scattering from individual molecules has remained invisible to holographic techniques. Holography offers advantages in information content, tunability and post-processing over intensity-based approaches, yet its sensitivity has limited progress in label-free single-molecule studies. Our work on *single-protein optical holography* addresses this limitation by enabling direct, quantitative measurement of individual proteins through light scattering. We developed an interferometric method with the sensitivity required to detect and distinguish single proteins while retaining the full quantitative advantages of holography.

The technique combines dark-field scattering microscopy with a Mach–Zehnder-type interferometer in total internal reflection geometry (**Figure 1**). By splitting the reference and scattered light into four synchronised detection channels with defined phase shifts, the system performs *optical quadrature detection*, separating amplitude and phase information of the scattered field. This implementation improves sensitivity by approximately five orders of magnitude compared with previous holographic approaches.

The resulting measurements allow us to detect single proteins (**Figure 2**) as small as 90 kDa and resolve discrete oligomeric states up to 540 kDa with a mass resolution of about 28 kDa. From the retrieved amplitude and phase information, we determined the specific polarizability of single proteins ($239 \pm 4 \text{ \AA}^3 \text{ kDa}^{-1}$) and inferred a refractive index of 1.47, values consistent with established ensemble measurements.

These results constitute the first direct optical determination of the polarizability of individual proteins. Retaining full holographic information enables post-acquisition numerical refocusing, wavefront reconstruction, and focus optimisation, allowing three-dimensional analysis of molecular scattering

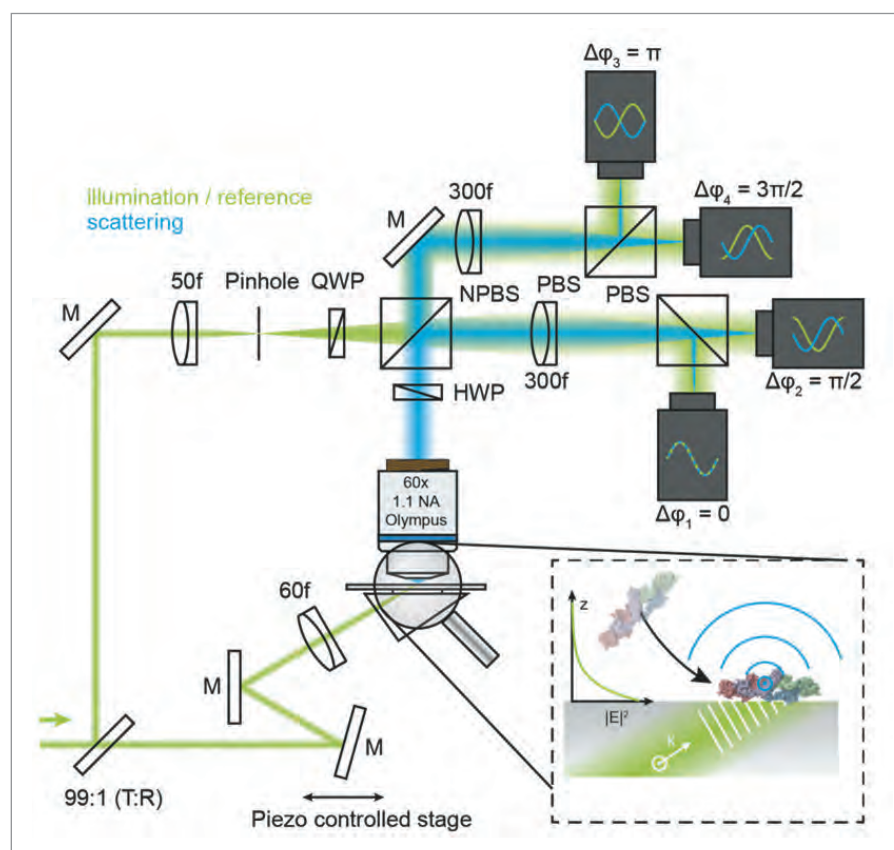


Figure 1: Schematic of the holographic microscope showing the Mach–Zehnder configuration and quadrature phase detection

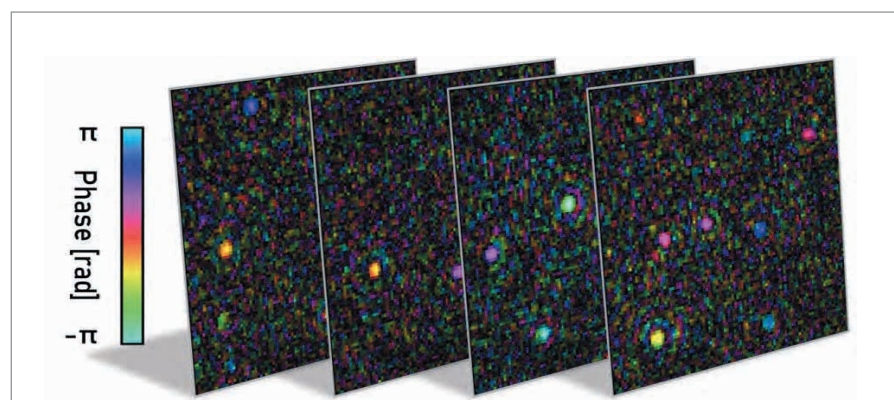


Figure 2: Selected frames from a measurement showing single-protein events

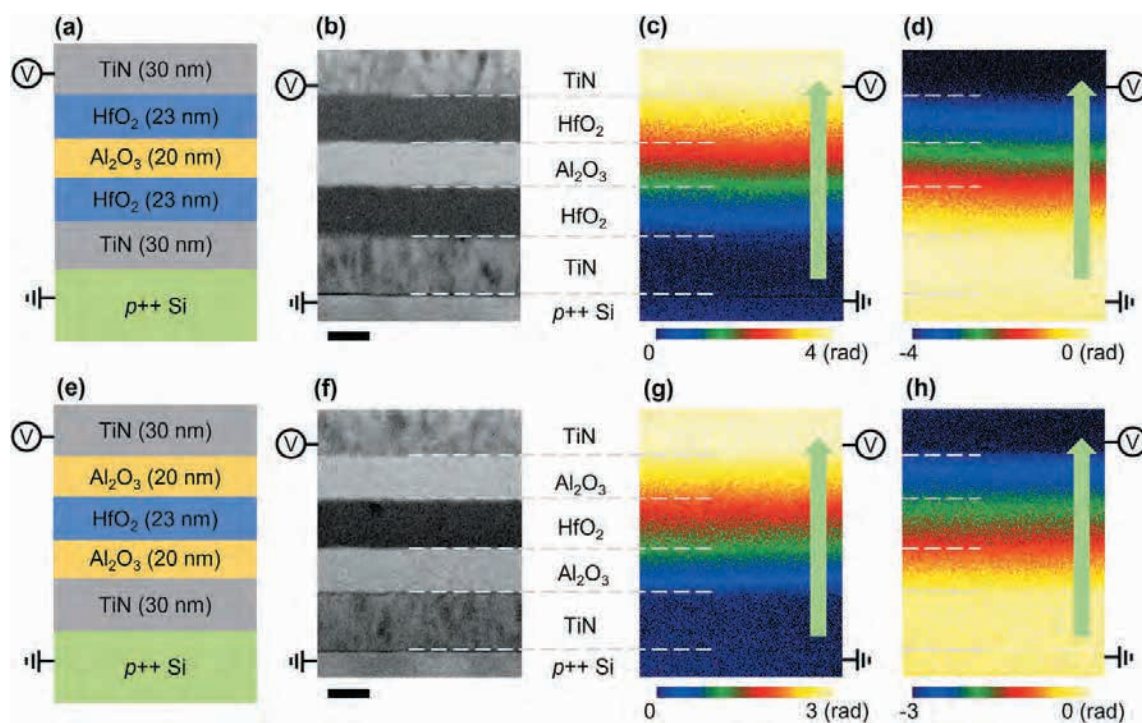
events. This establishes single-protein holography as a genuinely quantitative and adaptable platform for label-free studies at the single-molecule level. The approach can be extended to other nanoscale systems such as viruses, extracellular vesicles, or small synthetic nanoparticles. ■

J. C. Thiele, *E. Pfitzner

*J. C. Thiele, *E. Pfitzner and P. Kukura. Single-protein optical holography. *Nature Photonics* 18, 388–395 (2024). <https://doi.org/10.1038/s41566-024-01405-2>

Reference: *Nature Photonics* 18, 388–395 (2024). <https://doi.org/10.1038/s41566-024-01405-2>

Materials Sciences



Sketches, amplitude, and phase images of the twin trilayer nanocapacitor devices containing high- k Al₂O₃ and HfO₂ dielectrics. a,e) Sketches of stack A: HfO₂/Al₂O₃/HfO₂ and stack B: Al₂O₃/HfO₂/Al₂O₃. b,f) Amplitude images respectively showing the different layers of the nanocapacitors A and B. c,g) Phase maps of projected electric potential on the same area obtained by electron holography for the nanocapacitors A and B with an applied bias of +6 V. d,h) Phase maps for the nanocapacitors A and B with an applied bias of -6 V. Scale bars are 20 nm in (b) and (f).

It was a great honor for me to attend the 17MCM conference this year, where I listened to many presentations and engaged in discussions with numerous scholars. During the conference, I mainly shared with the attendees our work that received the OPA 2024 award in the field of materials science last year. Our work introduces a groundbreaking approach using the *in-situ* electron holography technique in TEM to measure the internal electrical potential and interface charge for the working devices, which is traditionally difficult.

Our work focuses on high- k dielectric oxides, which play an important role in many advanced nanoelectronic devices, such as volatile flash memory and non-volatile resistive random-access memory, ferroelectrics-based and field-effect transistors (FETs). In all these devices, localized charge trapping occurs at the interface (between dielectrics or dielectric/metal), which determines the electrical response.

As detailed in our article, in combination with the finite element modeling simulation, we have successfully quantified interfacial charges and studied the electric field distribution under electric bias in twin nanocapacitors, namely, TiN/HfO₂/Al₂O₃/HfO₂/TiN and in TiN/Al₂O₃/HfO₂/Al₂O₃/TiN structures. These results provide a deeper understanding of the behavior of these electronic materials. Moreover, our introduced technique shows great promise for application to a wider range of other nanostructured materials and devices, especially interesting for the study of interfacial phenomena.

The ability to link experimental observations with theoretical models also increases the relevance of the article for both academia and industry, offering a deeper insight into material behavior at the atomic scale. We hope that it will make an invaluable contribution to shape the future of nanoelectronics and energy technologies. Our paper was

nominated by Nikolay Cherkashin from CEMES-CNRS lab and we acknowledge him as well as the jury committee.

The reference of our article is as below: Leifeng Zhang, Muhammad Hamid Raza, Rong Wu, Kilian Gruel, Catherine Dubourdieu, Martin Hÿtch and Christophe Gatel. Quantification of interfacial charges in multilayered nanocapacitors by operando electron holography. *Advanced Materials* **37**(4), 2413691 (2025)*. Doi: <https://doi.org/10.1002/adma.202413691>. (*first published online: November 25, 2024)

Besides, I had a deep discussion with Rafal Dunin-Borkowski and Paul Klar. And we think that, in future, the combination with AI will surely help the advancement of advanced microscopy. ■

Leifeng Zhang

Life Sciences

Malaria parasites, especially *Plasmodium falciparum*, infect human red blood cells. This can lead to anemia, respiratory distress, and kidney failure, among other symptoms. According to estimates of the *World Malaria rReport 2024*, the 21st century has seen more than 2 billion malaria cases, 13 million of which were fatal. As part of the parasite's metabolism, hemoglobin is digested and toxic heme released. Detoxification is achieved through the crystallization of hemozoin, also known

as the malaria pigment. These biogenic crystals are an important target for anti-malarial drugs.

Previous models of hemozoin analyzed a synthetic analogue by X-ray diffraction, assuming a centrosymmetric distribution of hemozoin dimers. However, cryo-electron tomography (CET) of hemozoin crystals in their native environment, i.e. in the digestive vacuole of the parasite, clearly revealed a polar crystal shape, which is not expected for centrosymmetric structures. A large

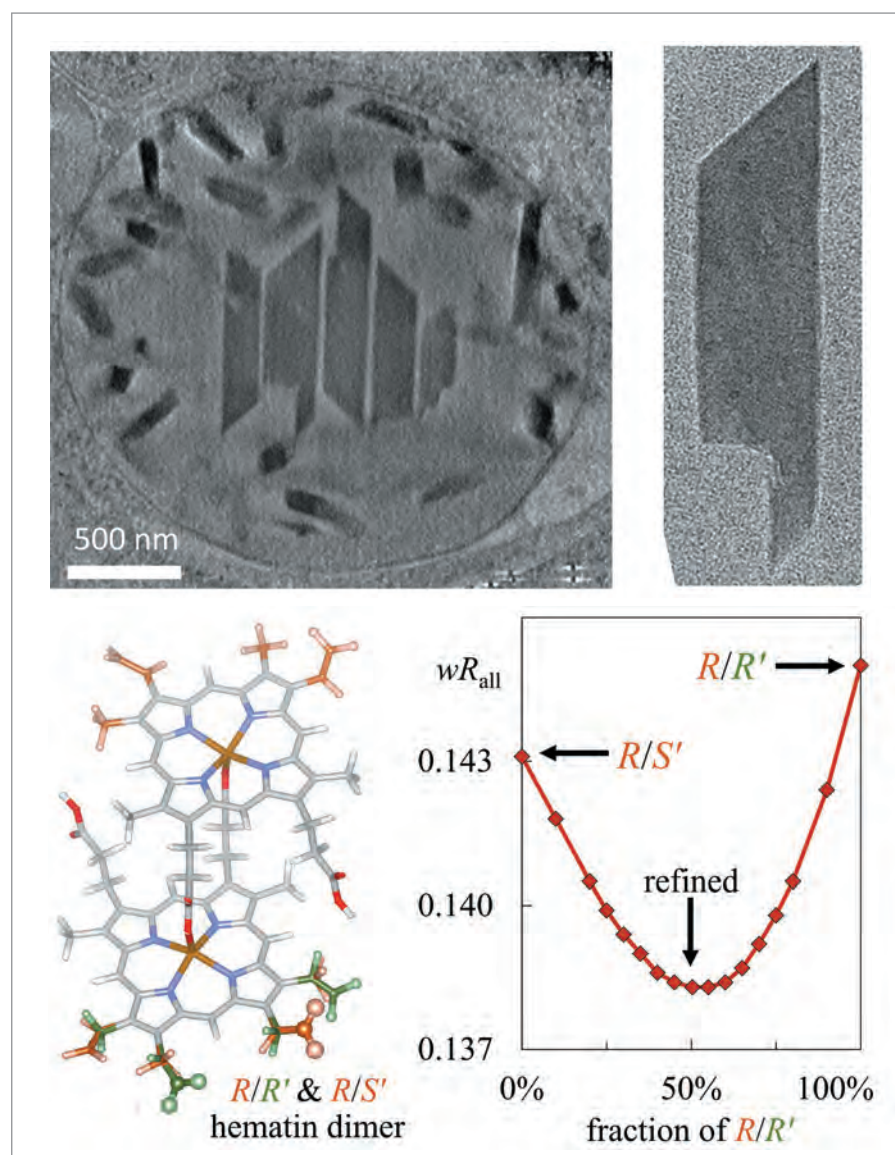
number of hemozoin crystals from ruptured parasite cells were then investigated with 3D electron diffraction (3D ED). Structural refinement resulted in a model consisting of a mixture of one centrosymmetric and one chiral dimer. These results were further supported by density functional theory (DFT) calculations, which confirm the stability of a crystal made of such a mixture of stereoisomers. Furthermore, both 3D ED and DFT consistently identified one vinyl group (out of eight) as being in a *trans* rather than a *cis* orientation, which further supports the developed structure model.

This model is consistent with the asymmetric growth and polar morphology of the crystals. Further analysis using high-resolution transmission electron microscopy, specifically exit-wave reconstructions from a focal series, was used to identify the handedness of the chiral dimer. This assignment means that the crystal shows isomeric disorder on its (010) and (00-1) faces, and no disorder on its smooth (101) faces.

This work establishes a new absolute structure model, laying the foundation for understanding hemozoin and its surface structure. This detailed knowledge is crucial for the rational design of anti-malarial drugs that target the inhibition of hemozoin crystal growth. ■

Paul B. Klar

*P. B. Klar, *D. G. Waterman, *T. Gruene, D. Mullick, Y. Song, J. B. Gilchrist, C. D. Owen, W. Wen, I. Biran, L. Houben, N. Regev-Rudzki, R. Dzikowski, N. Marom, L. Palatinus, P. Zhang, L. Leiserowitz and M. Elbaum. Cryo-tomography and 3D electron diffraction reveal the polar habit and chiral structure of the malaria pigment crystal hemozoin. *ACS Central Science* **10**(8), 1504–1514 (2024). <https://doi.org/10.1021/acscentsci.4c00162> *equal contribution



Crystals of hemozoin in the intact digestive vacuole of the malaria parasite *Plasmodium falciparum* show a polar shape. The top end of a representative crystal is smooth, while the other end is irregular. The average structure model consists of approximately equal fractions of the two isomers R/S' and R/R' .



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EMS Calendar 2026

EMS Calendar 2026

Information available here: <https://www.euremicsoc.org/meetings-courses/>

Condensed Matter and Quantum Materials 2026		30 June to 4 July 2026	Loughborough, United Kingdom
Biophotonics and Imaging Summer School 2026 BIGSS X		3 to 7 August 2026	Galway, Ireland
Methods and Applications in Fluorescence (MAF) 2026		9 to 12 August 2026	Copenhagen, Denmark
The 18 th International Conference on Near-Field Optics, Nanophotonics and Related Techniques – NFO18		31 August to 3 September 2026	Brno - Czech Republic
IMC21		31 August to 4 September 2026	ACC Liverpool, UK
Conference on Electron Microscopy of Nanostructures – ELMINA2026		7 to 11 September 2026	Belgrade, Serbia
European Focused Ion Beam Network Workshop 2026		8 to 11 September 2026	Marseille, France
NanoInnovation 2026		14 to 18 September 2026	Rome, Italy
5 th Croatian Microscopy Congress 2026		16 to 18 September 2026	Osijek, Croatia
Materials Science and Engineering congress (MSE-2026)		29 September to 1 October 2026	Hybrid Congress in Darmstadt - Germany & Online
Microscopy Characterization of Soft-Hard Interfaces symposium (C04)		29 September to 1 October 2026	Hybrid Congress in Darmstadt - Germany & Online
PHASE in Brno		12 to 15 October 2026	Brno - Czech Republic
ECHO (EleCtron Holography in Optics) seminar		8 to 10 December 2026	Forschungszentrum Jülich - Germany
XXXI SIBPA-IVSLA International School of Pure and Applied Biophysics		18 to 22 January 2027	Venice, Italy
Women in Electron Microscopy (WeM) 2027		8 to 10 March 2027	Campus of Forschungszentrum Jülich - Germany
Microscopy of Semi-Conducting Materials 2027		22 to 24 March 2027	Cambridge - UK
Top Analytica's 6 th Microscopy and Microanalysis Workshop		14 to 16 April 2027	Turku - Finland
20 th French Microscopy Society Congress (co-organized with SSOM)		28 June to 2 July 2027	Grenoble - France
18 th European Microscopy Congress		17 to 22 September 2028	Centro Convenciones Internacional de Barcelona (CCIB)



Application for membership



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The Green and Cultural Note

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



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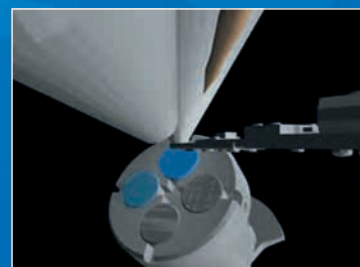
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