

Electron microscopy core facilities

Building capability that supports scientific output and long-term impact

thermo scientific

Core facilities as research infrastructure

Core facilities have become critical research infrastructure, underpinning scientific output, collaboration, and institutional competitiveness.

They support a wide range of applications across life sciences, materials science, and interdisciplinary research.

Few facilities are built in a single step. Most evolve, shaped by scientific demand, infrastructure decisions, staffing, data requirements, and long-term operational needs as capacity expands.

As demand increases, facilities balance utilization, data quality, and user access while ensuring that investments continue to deliver consistent scientific impact. Sustaining that impact depends on how effectively platforms, workflows, data flow, service, and user capability are aligned over time.

Thermo Fisher Scientific supports facilities across this wider environment through advanced electron microscopy technologies, workflows, software, training, service, and planning support.

Explore **electron microscopy**

High-performing facilities do more than provide access to technology. They attract leading researchers, support high-impact science, and play a central role in shaping institutional reputation and funding outcomes.



More than access:

How facilities create value

The facilities featured in this eBook vary in size, focus, and operating model. Some support national research communities, and others serve a specific institution or scientific discipline. Some are built around cryo-EM, while others support a broad range of imaging workflows in biology and materials science.

Facilities create value not only through the technology they provide, but also through the expertise, workflows, and support that help researchers succeed.

Access to technology

Advanced instrumentation, reliably available



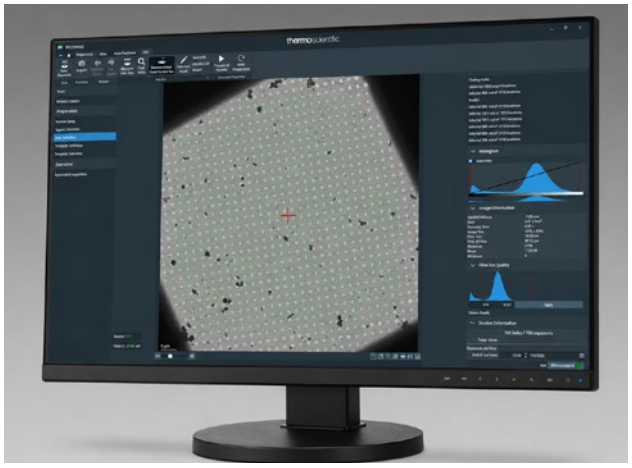
Expertise

Specialist knowledge and hands-on guidance



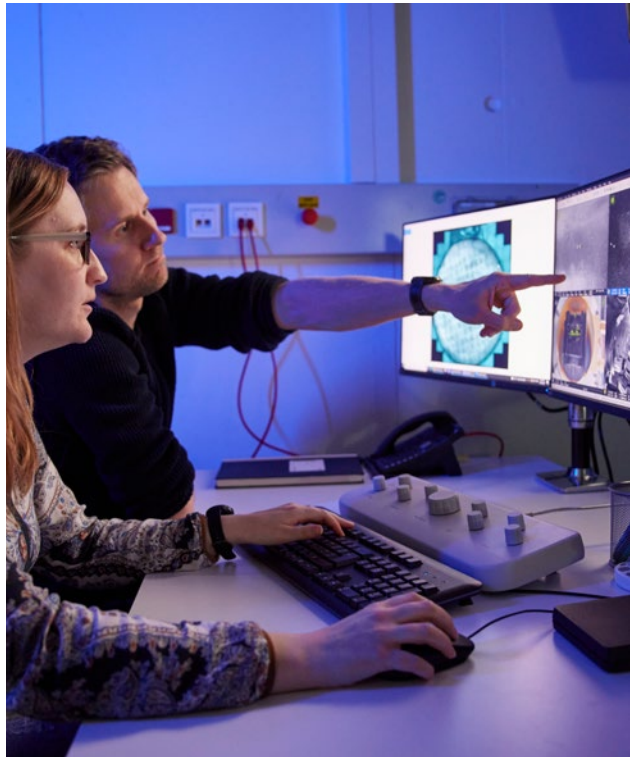
Workflow support

Streamlined workflows and imaging expertise



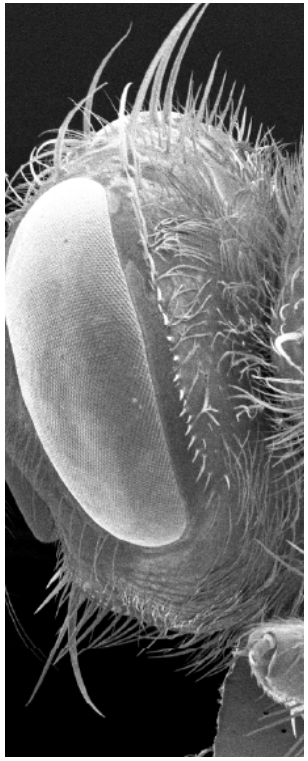
User development

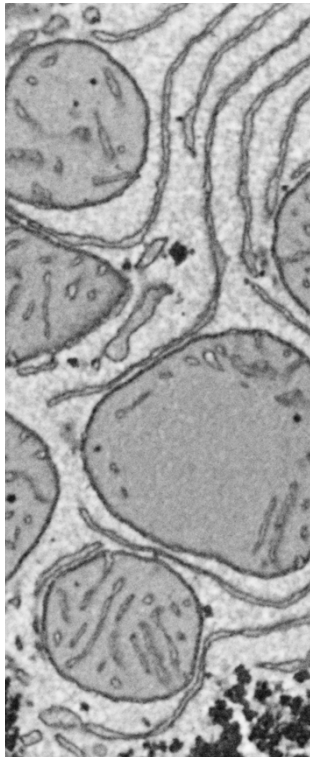
Training, resources and community support



Data & analytics

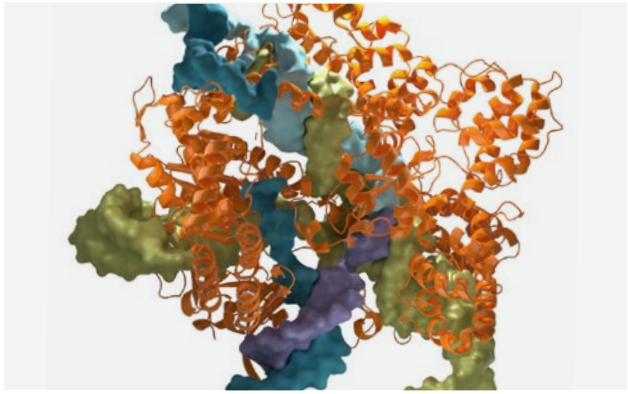
High–quality data and rigorous analysis pipelines

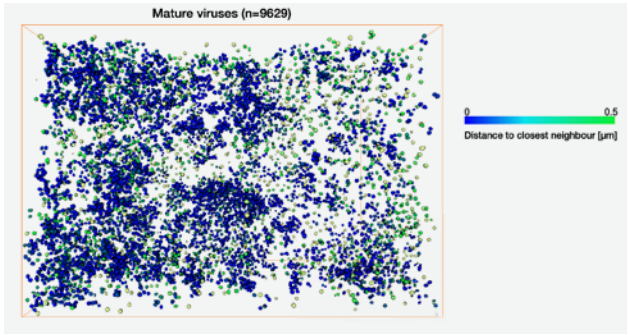




Scientific output

New biological insights and scientific impact





Facilities provide access to expertise as well as technology, helping researchers navigate complex workflows, develop new skills, and move projects from preparation to scientific output.

Facilities must also balance practical realities. Instrument time is valuable, users have different levels of experience, and data volumes continue to grow. Facilities need to support day-to-day operation while also planning for future capability, new applications, and evolving scientific priorities.

The stories that follow highlight different approaches to these challenges and illustrate how facilities continue to build capability, support their communities, and create scientific impact.

Growing capability one step at a time

UCSC Biomolecular Cryo-Electron Microscopy Facility

Led by Vitor Hugo Balasco Serrão

The UCSC Biomolecular Cryo-Electron Microscopy Facility was built around a clear goal: to create a productive cryo-EM resource that can support researchers early in their projects and grow in line with user demand.

Rather than trying to replicate the role of larger regional or national centers, the facility began by supporting screening and project development, with high-resolution data collection performed at external 300 kV cryo-TEM facilities, mainly focusing on single-particle analysis (SPA). This allowed UCSC to build trust with users, support projects at an early stage, and demonstrate value before expanding its capabilities.

As operations developed, the facility continued to enhance its capabilities through targeted upgrades. Components that could not be included in the initial purchase, including the detector and fringe-free imaging capability, were added as funding became available. Upgrading the Thermo Scientific™ Glacios™ Cryo-TEM with the Thermo Scientific™ Falcon 4i Direct Electron Detector expanded in-house data collection, reducing the need for some projects to be completed elsewhere.

The facility also developed specialist expertise in microcrystal electron diffraction (microED), creating a distinctive role within the wider cryo-EM ecosystem.



Fun fact

Vitor had to introduce the cryo-EM therapy session at UCSC:

Step 1: Gather former X-ray crystallographers and NMR spectroscopists

Step 2: Spend months convincing them that not everything needs to be better than 3 Å

Step 3: Celebrate all the incredible biology hiding in “imperfect” maps

Because in cryo-EM, your sample has a lot to say — even before atomic resolution.

Facility snapshot

69 users across **28 labs**	**3+ PB** of data processed
Support for 15+ companies	Specialist **SPA** and **microED** expertise
20+ **external academic collaborations**	**$21M+** **in associated funding to date**



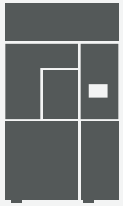
Explore the facility

Learn more about cryo-EM access, screening, microED capabilities, and facility services on the UCSC website.

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Vitrobot IV System



Glacios Cryo-TEM



"Building a successful facility starts long before installation. You need a plan to understand your users, your role in the research ecosystem, how demand will grow, and how the facility will remain sustainable over time."

—Vitor Hugo Balasco Serrão,
Facility Director, UCSC
Biomolecular Cryo-EM Facility

Scaling cryo-EM for a national community

New York Structural Biology Center

Led by Ed Eng

Established in 1999 and opened to users in 2002, the New York Structural Biology Center (NYSBC) has grown from a specialist facility into a national cryo-EM resource supporting researchers, institutions, and facilities across a broad structural biology community.

Today, the NYSBC operates one of the most advanced cryo-EM infrastructures in the world, with nine Thermo Scientific™ Titan™ Krios™ Cryo-TEMs and four Thermo Scientific™ Glacios™ Cryo-TEMs. The center has also expanded beyond its original NMR and cryo-EM foundations to include cryo-FIB-SEM, a dedicated beamline at NSLS II, and research computing capabilities. Reaching this scale has required more than adding instruments. The center has developed the infrastructure, training, and collaborative frameworks needed to support a large and distributed user community.

For Ed Eng, a senior scientist at the NYSBC, scale is not only measured in microscope capacity. It is measured in how effectively users, samples, workflows, and expertise move through a connected ecosystem. Researchers may prepare samples at a local core, screen them at one center, and collect data at another, making collaboration and standardization increasingly important.

The NYSBC has helped shape the training approaches and collaborative practices that enable this wider cryo-EM network to function effectively, supporting scientific output at a national scale.



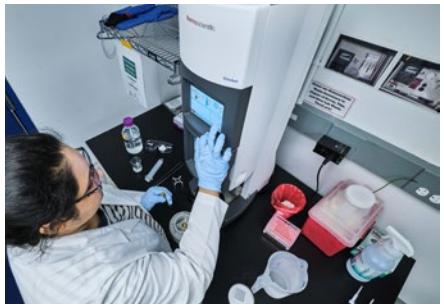
Fun fact

Ed is an Eagle Scout, and the original cryo-EM merit badge program framework was inspired by his time in Scouting.

Facility snapshot

Established in 1999 (opened to users in 2002)	**3 cryo-FIB-SEMs** (including 2 PFIB systems)
National center since 2018	**6.9 PB research** computing infrastructure communities
9 Titan Krios Cryo-TEMs and **4 Glacios Cryo-TEMs**	**Strong links** with national, regional, and local cryo-EM centers







Explore the facility

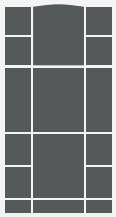
Learn more about the NYSBC's cryo-EM resources, training opportunities, and access routes on the NYSBC website.

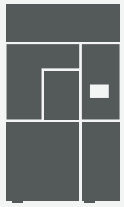


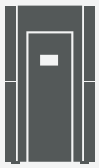
"Ecosystem and teamwork is vital. Collaboration across facilities, users, service teams and technology partners benefits everyone."

— Ed Eng, Senior Scientist,
New York Structural Biology Center

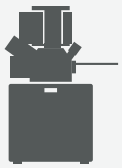
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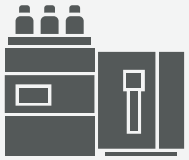

9 Titan Krios Cryo-TEMs


4 Glacios cryo-TEMs


Tundra™ Cryo-TEM


Aquilos™ 2 Cryo-FIB


Hydra™ Bio Plasma-FIB


Orbitrap Exploris™ 480 Mass Spectrometer


Vitrobot IV System

Staying close to where the science is going

SOLARIS National Synchrontron Radiation Centre, Jagiellonian University

Led by Artur Biela and Michał Rawski

The SOLARIS cryo-electron microscopy facility was established to provide the Polish scientific community with access to state-of-the-art cryo-EM as part of a wider national research infrastructure that supports structural biology in Poland and Central Europe.

The facility grew from a coordinated effort across the Polish structural biology community into a national access point for advanced cryo-EM. Located within the SOLARIS National Synchrotron Radiation Centre at Jagiellonian University, it sits alongside complementary techniques available through the synchrotron.

Fun fact

Through ice thickness battles and embracing frozen chaos, the team shows that anything random, when averaged enough, eventually becomes clarity.

For the cryoEM Team and the SOLARIS facility, installing the microscopes was only the beginning. Cryo-EM continues to evolve rapidly through developments in detectors, data-collection strategies, software tools, and AI-driven approaches. Keeping the facility at the highest level of proficiency requires not only access to technology but also the expertise to evaluate new developments, understand user needs, and decide which innovations will have the greatest impact. All while maintaining efficient operation.

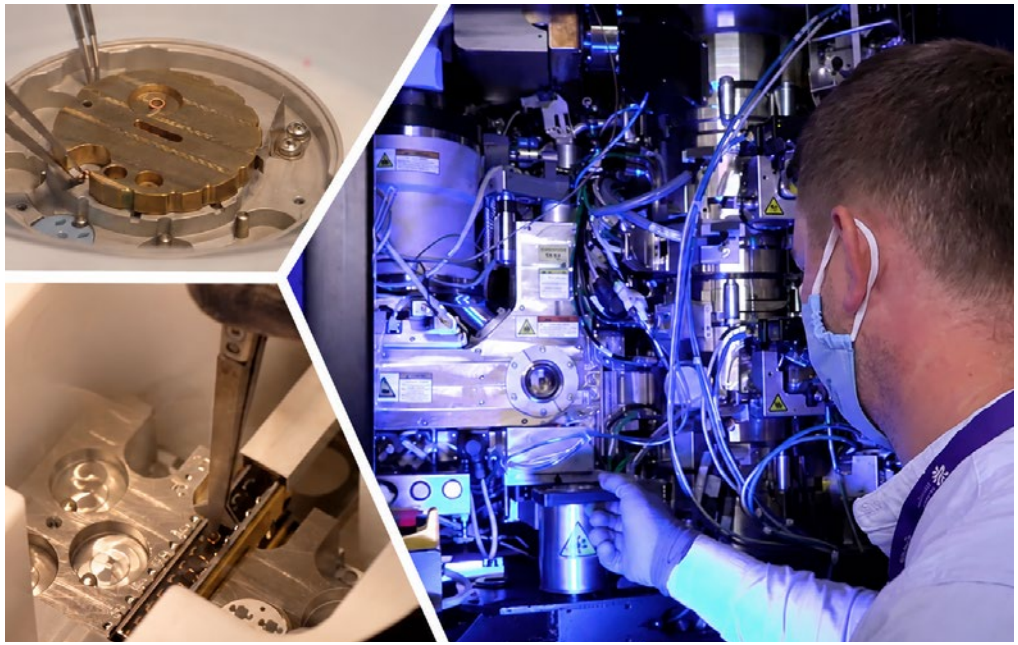
The SOLARIS cryo-EM facility includes experts in physics, structural biology, biochemistry, materials science, and related fields. Workshops, conferences, and collaborations help the team stay aligned with developments in the field while continuing to support structural biology and expand into soft and bio-inspired materials research.



From left: Marcin Jaciuk (structural biologist), Michał Rawski (physicist and science facilitator), Paulina Indyka (materials scientist), Artur Biela (chemist, biochemist, structural biophysicist) and Grzegorz Ważny (physicist)

Facility snapshot

Operational since October 2019 supporting both science and industry	**Complete workflow,** final 3D reconstructions, model building and interpretation
Titan Krios G3i (300 kV) and **Glacios** (200 kV) **Cryo-TEMs**	**Growing** structural biology and soft materials communities
~100 applications per year	**Expanding** international collaborations



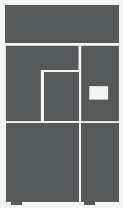
Explore the facility

Learn more about cryo-EM access, facility capabilities, and research opportunities on the SOLARIS website.

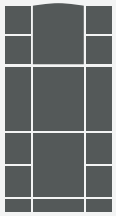
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2 Vitrobot IV Systems



Glacios Cryo-TEM



Titan Krios Cryo-TEM

"It does not matter when your facility was established. You need to plan for the future and stay close to where the science is going."



— Michal Rawski, SOLARIS Cryo-EM Facility Manager, SOLARIS National Synchrotron Radiation Centre



— Artur Biela, Head of Macromolecular Research Section, Cryo-EM Research Coordinator, SOLARIS National Synchrotron Radiation Centre

Enabling discovery across biological EM

Electron Microscopy Core, Frederick National Laboratory for Cancer Research

Led by Ru-ching Hsia

The Electron Microscopy Core (EMC) at the Frederick National Laboratory for Cancer Research supports researchers across cancer biology, virology, microbiology, and related life sciences disciplines, helping them apply electron microscopy to complex biological questions.

Projects arrive in many forms, including tissue samples, virus-infected cells, nanoparticles, and plant specimens, to name just a few. Each requires different preparation methods, imaging approaches, and expertise.

Fun fact

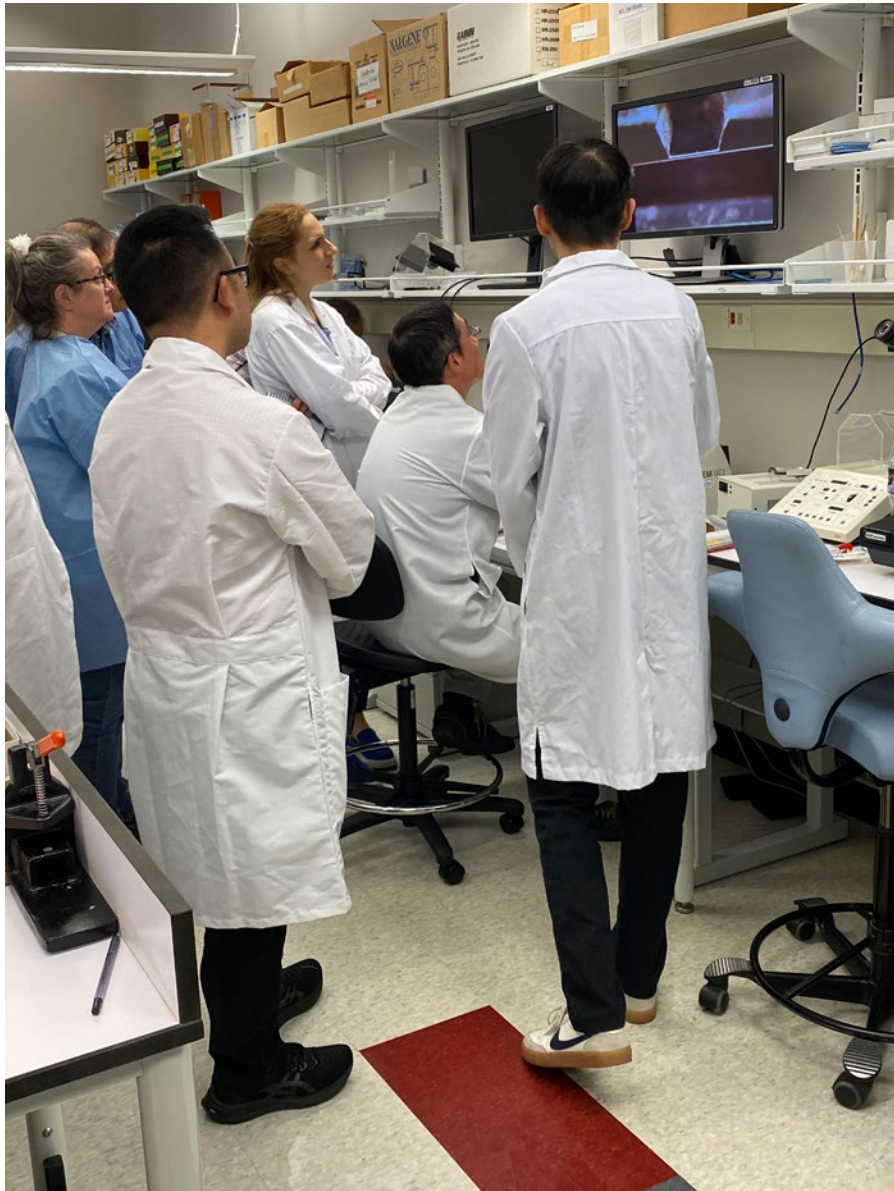
Ru-ching has a unique connection to EM history: One of her predecessors at NCI captured the first TEM image of the AIDS virus in the United States, while earlier in her career she worked with the microscopist at the Pasteur Institute who captured the first TEM image of the AIDS virus.

For Ru-ching Hsia, the EMC's principal scientist, the role of the facility is not simply to provide access to instrumentation. It is to help researchers identify the most appropriate route from a scientific question to meaningful insight.

Researchers rarely arrive with a microscopy question. More often, they arrive with a scientific challenge. Through consultation, specimen preparation, and imaging expertise, the team helps determine the most appropriate workflow for the question being asked.

The facility supports a broad range of biological EM approaches, including resin-based EM, correlative light and electron microscopy, transmission electron microscopy, scanning electron microscopy, and other multimodal imaging applications. By combining technical expertise with scientific collaboration, the team helps researchers identify the right approach for their work.

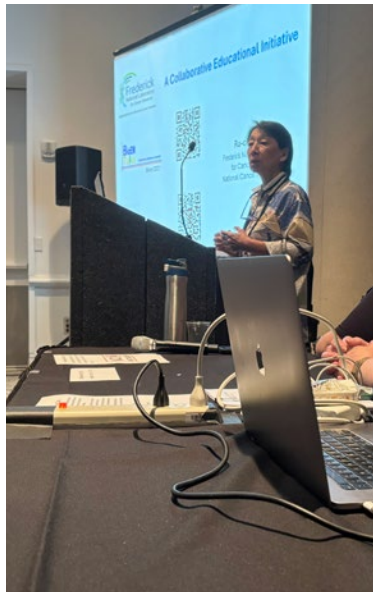
Beyond research support, Ru-ching also contributes to microscopy education through workshops, the BioEM talk series, and outreach activities that help build future expertise in the field.



Facility snapshot

Supporting cancer research Basic and clinical applications	**Research-focused services** Built around scientific needs
Building the EM community BioEMTalks webinar series	**Advancing EM education** Training and outreach
Modernizing traditional EM Automation and advanced workflows	**Enabling exploratory research** Subsidized EM services

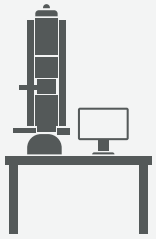




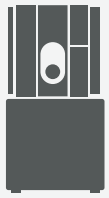
Explore the facility

Learn more about biological EM workflows, microscopy education, and facility capabilities on the EMC website.

Supported by Thermo Scientific™ Instruments



Tecnai™ 12 TEM



Talos™ L120C TEM



Apreo™ ChemiSEM™ System

"The goal isn't to promote equipment or solutions. It's to listen to user needs, share feedback and work together to develop better approaches. Whether academia or industrial partners, in the end, we all promote science."



— Ru-ching Hsia
Principal Scientist Electron Microscopy Core
Frederick National Laboratory for Cancer Research

Continuous optimization in a changing field

Max Planck Institute of Molecular Physiology, Dortmund

Led by Daniel Prumbaum, Oliver Hofnagel, Karolina Kubat, and Sebastian Tacke

With a long history in cryo-EM research, the Max Planck Institute of Molecular Physiology has witnessed the field's transformation from a specialist technique into a widely adopted structural biology tool. Over that time, the facility's capabilities and instrumentation have helped attract leading researchers while supporting the institute's growing cryo-EM community. Throughout that evolution, one principle has remained constant: identifying bottlenecks and finding ways to overcome them.

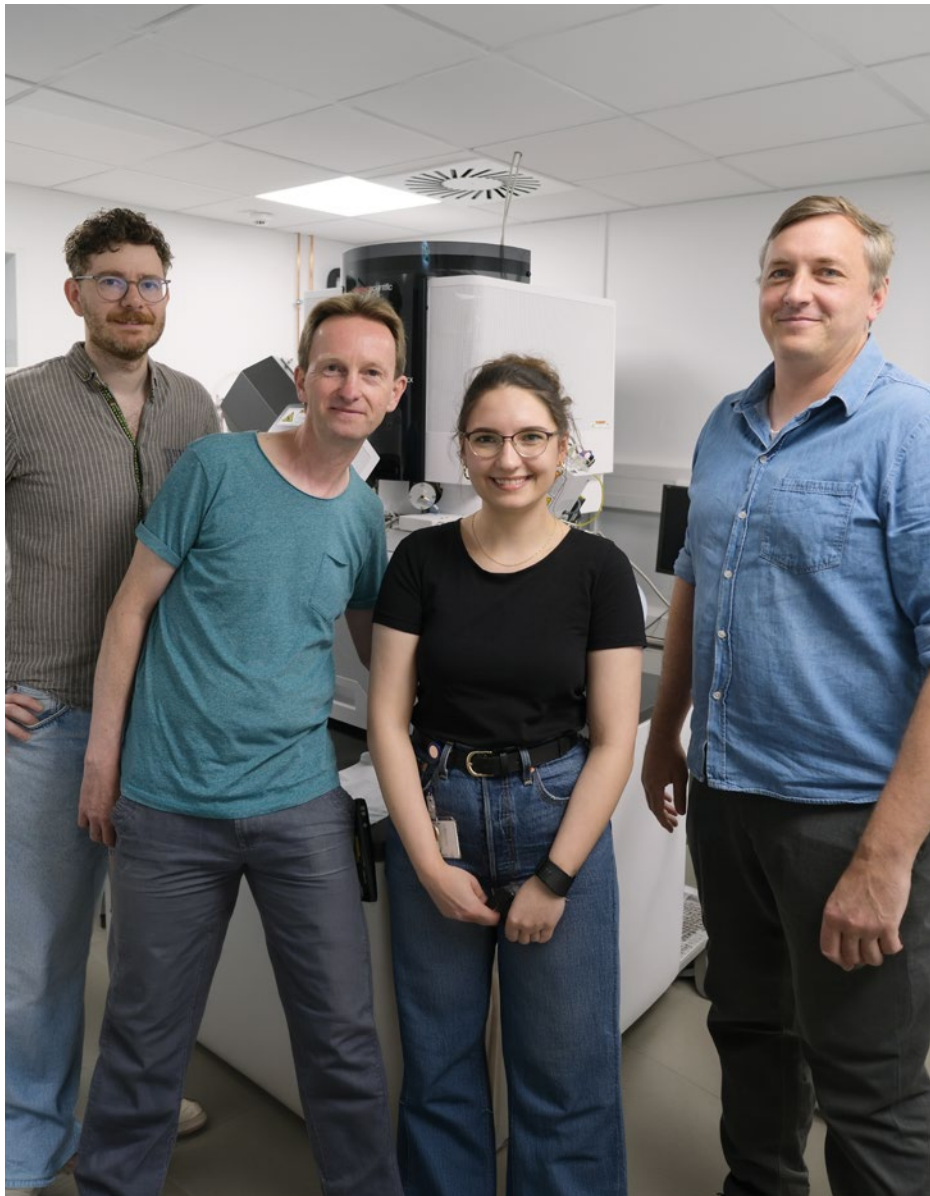
Fun fact

A 35-year-old cryo-plunger built in 1981 at the Max Planck Institute in Dortmund can be seen at the Electron Microscopy Museum in Nuremberg, Germany.

Embedded within an active cryo-EM research environment, the facility continually adapts its infrastructure and workflows to support increasing demand, growing data volumes, and more complex projects. This focus extends beyond generating high-quality data to helping researchers move efficiently from sample preparation to scientific results.

As workflows have become more data-intensive, that optimization effort has expanded beyond the microscope itself. Automated acquisition with Thermo Scientific™ EPU Software, the Thermo Scientific™ CryoTomo Software Suite, and data management solutions, including Thermo Scientific™ CryoFlow™ Software, support data collection, project organization, and the movement of datasets through the facility's computing environment.

For the team, efficiency is not defined by a single workflow or technology, but by an ongoing process of refining systems, removing barriers, and helping researchers make the most of the facility's capabilities.



From left: Daniel Prumbaum, Oliver Hofnagel, Karolina Kubat, and Sebastian Tacke.

Facility snapshot

Long-established cryo-EM research environment	**270 tomography datasets** collected over the last two years
High instrument-to-user ratio: ~45 users, 3 facility staff, 8 high-end TEMs and SEMs	**94 single particle datasets** collected per year on average over the last five years
An average of **10.8 publications** per year use data from the facility	**Active method and hardware development** by different groups



Explore the facility

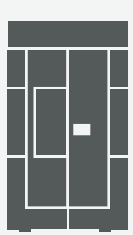
Learn more about cryo-EM access, facility capabilities, and research opportunities on its website.

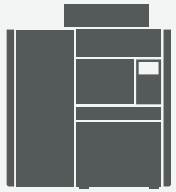


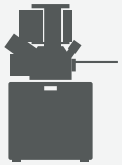
"Efficiency depends on more than technology alone. Clear communication and transparency help researchers move more effectively through the workflow and make the best use of facility resources."

— Sebastian Tacke

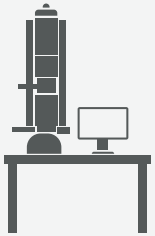
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2 Krios Cryo-TEMs


Talos Arctica™ Cryo-TEM


2 Hydra Bio Plasma-FIBs


2 Aquilos 2 Cryo-FIBs


Tecnai Spirit TEM


Vitrobot™ System

No two facilities are the same

The facilities featured in this eBook differ significantly in scale, scientific focus, user communities, and operating models.

Each has developed around its own research priorities and the needs of the community it serves.

Yet common themes emerge. High-performing facilities combine technology with expertise, support researchers through increasingly complex workflows, and continue to adapt as scientific priorities evolve.

Different facilities and different priorities. A shared focus on long-term scientific impact.

Because no two facilities work in the same way, support needs to be flexible, too.



Talk to us about the **right solutions for your facility**

Building capability beyond the microscope

High-performing facilities depend on more than advanced instrumentation. Long-term capability is shaped by how planning, workflows, people, software, service, and future growth come together around the microscope.

Thermo Fisher Scientific supports this broader facility environment through technologies, expertise, and resources that help facilities build capability, maintain productivity, and adapt as scientific priorities evolve.

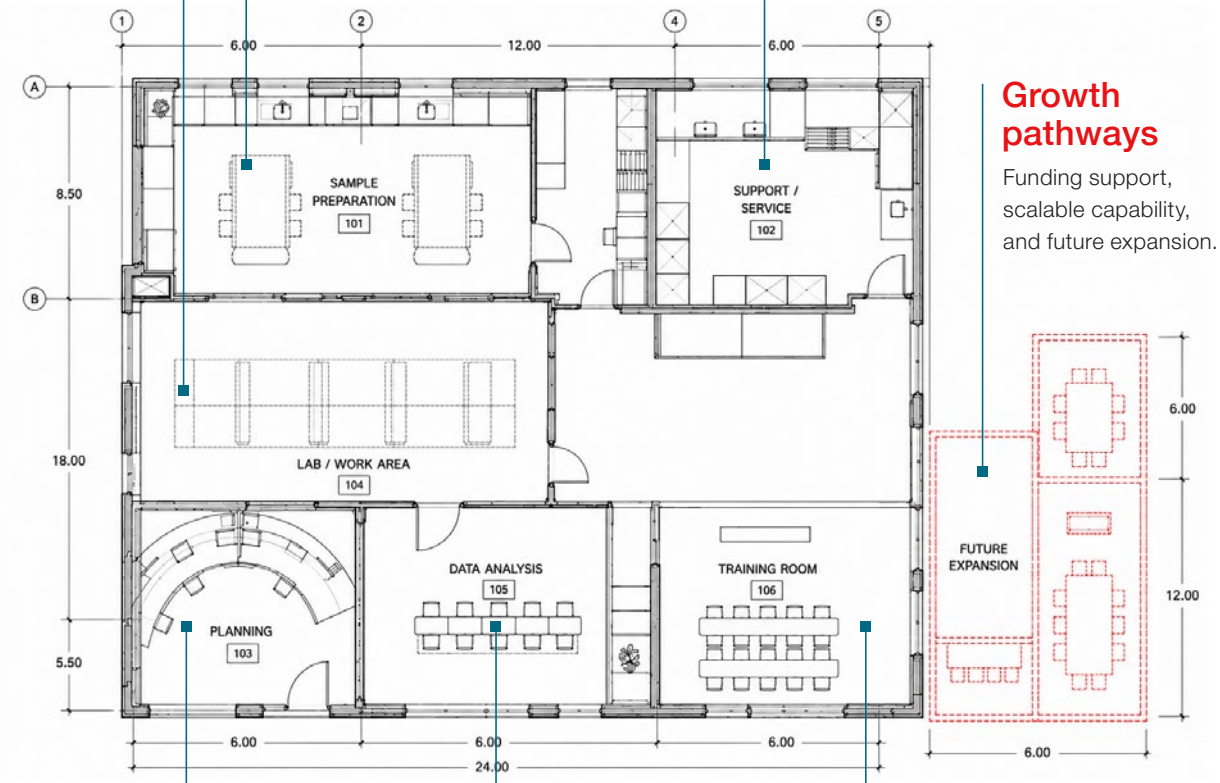
Advanced instrumentation is one part of a high-performing facility. The wider operating environment determines long-term value.

Workflows

Connected preparation, acquisition, processing, and analysis.

Support and service

Technical expertise, remote diagnostics, and operational continuity.



Growth pathways

Funding support, scalable capability, and future expansion.

Planning

Infrastructure, site readiness, and long-term capability planning.

Software and analysis

Tools that help users assess, manage, visualize, and interpret data.

People and training

User development, application expertise, and training resources.

From acquisition to insight

Instrument time only becomes scientific value when data becomes usable insight.

Keeping data moving

As detectors improve and datasets grow larger, data flow and analysis have become increasingly important parts of facility operation. Delays in processing, disconnected workflows, or slow feedback during collection can reduce throughput and make it harder for projects to progress efficiently.

Supporting different research needs

Different applications create different requirements. Some users need rapid feedback during acquisition. Others require reconstruction, visualization, segmentation, or quantitative analysis before conclusions can be drawn.

Connecting acquisition to interpretation

For many facilities, the challenge is no longer simply collecting data. It is moving efficiently from acquisition to interpretation.

Adaptable to the way your facility works

Thermo Fisher Scientific software and workflow tools are designed to integrate with existing facility infrastructure and support different operational models, helping connect acquisition, processing, and analysis.



Acquire → Assess → Organize → Process / reconstruct → Visualize / segment → Quantify → Interpret → Usable scientific output

Thermo Fisher Scientific electron microscopy software ecosystem

Smart EPU Software:
Automated single particle analysis data acquisition and live insights

Smart EPU Software with Embedded CryoSPARC Live:
Live data assessment during acquisition

CryoFlow Software:
Data organization and workflow management

CryoTomo Software Suite:
Tomography acquisition and reconstruction

Thermo Scientific™ Maps Software:
Imaging and correlative workflow software suite

Thermo Scientific™ Amira™ Software
Visualization, segmentation, and quantitative analysis

Explore **Thermo Scientific EM software**

Creating space for flexibility

Scientific priorities rarely stand still. New applications emerge, workflows evolve, and researchers continue to ask new questions of electron microscopy.

Facilities need to support established workflows while retaining the flexibility to explore new methods, specialized applications, and emerging areas of research.

Flexibility helps facilities adapt as scientific needs change. Open interfaces, scripting capabilities, compatibility with community-developed tools such as SerialEM and fibsemOS, and tailored workflows can help extend capability, automate specialized tasks, and explore new approaches when required.

Open, programmable platforms help facilities adapt workflows around their own scientific priorities



Scripting and automation
Use Python scripting to customize acquisition logic, automation, and data processing.

Custom acquisition workflows and facility-specific solutions
Create workflow templates tuned to specific experiments and instruments.

EPU software open API
Access instrument control and metadata through a documented open API.

SerialEM compatibility for all cryo–TEMs
Run community-developed acquisition workflows.

Correlative workflows
Link light microscopy and electron microscopy data for richer biological insight

fibsemOS compatibility for all FIB-SEMs
Create a bespoke FIB-SEM workflow.

Some facilities focus on automating established workflows to maximize productivity. Others integrate community-developed tools or develop specialized methods to support emerging applications. Many combine both approaches as their scientific priorities evolve. Thermo Fisher Scientific supports all three through an ecosystem of technologies, software, and workflows designed to adapt to different operational models.

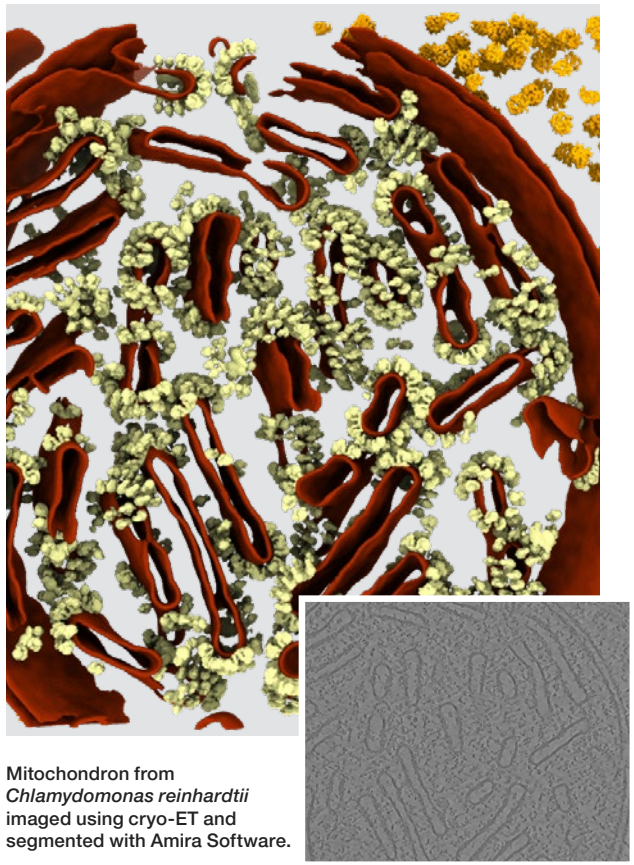
Learn more about **open workflows**

See your science

With a range of available techniques, core facilities can help you investigate a variety of aspects in your samples. This gallery showcases just a few examples of visualized data from different analytical approaches.

Biomolecular structure in context

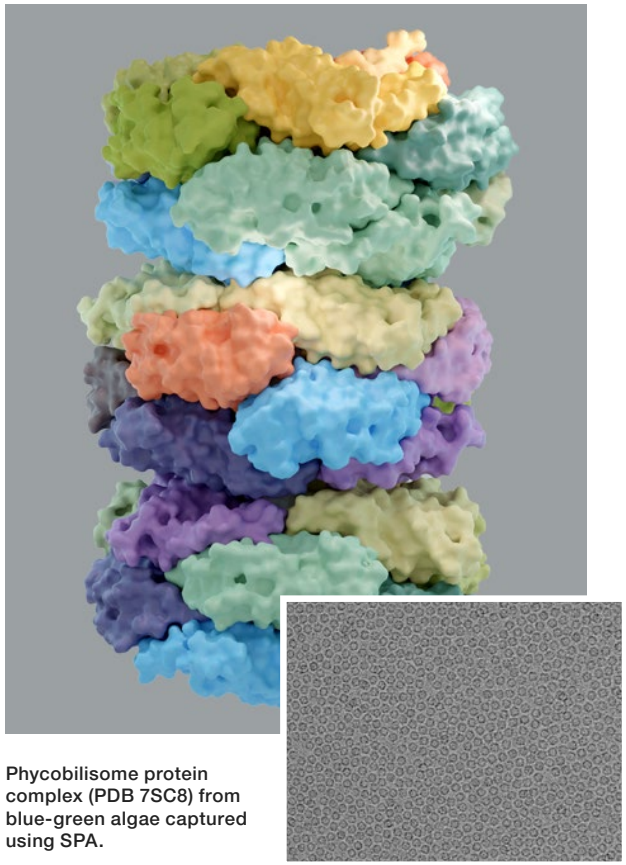
Cryo-electron tomography (cryo-ET)



Mitochondron from *Chlamydomonas reinhardtii* imaged using cryo-ET and segmented with Amira Software.

Isolated protein and biomolecular structure

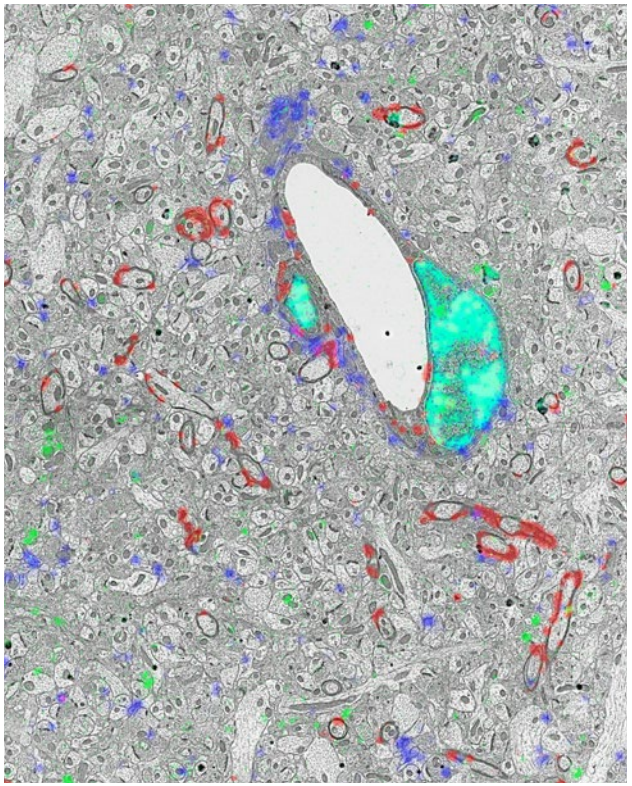
Cryo-EM single particle analysis (SPA)



Phycobilisome protein complex (PDB 7SC8) from blue-green algae captured using SPA.

Multidimensional data fusion

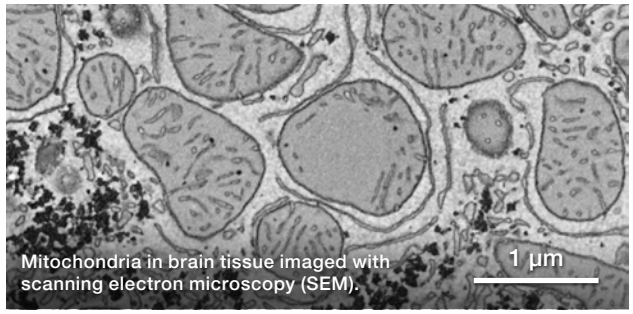
Correlative and multimodal imaging



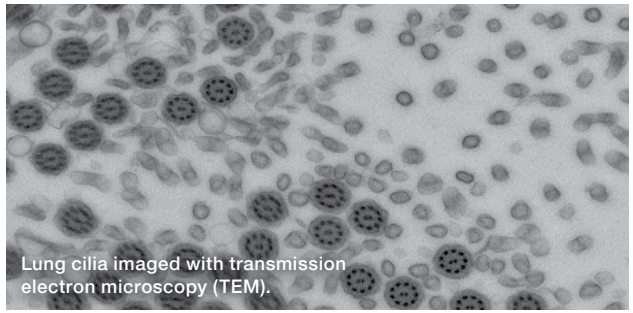
Mouse brain imaged with widefield fluorescence microscopy and SEM. Sample courtesy of Kristina Micheva, Stanford University.

Cellular ultrastructure and surface imaging

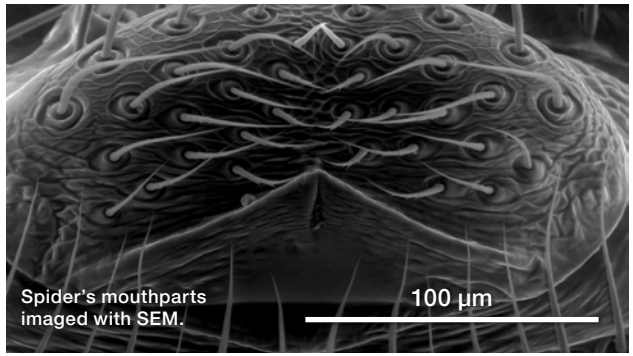
Traditional biological electron microscopy



Mitochondria in brain tissue imaged with scanning electron microscopy (SEM).



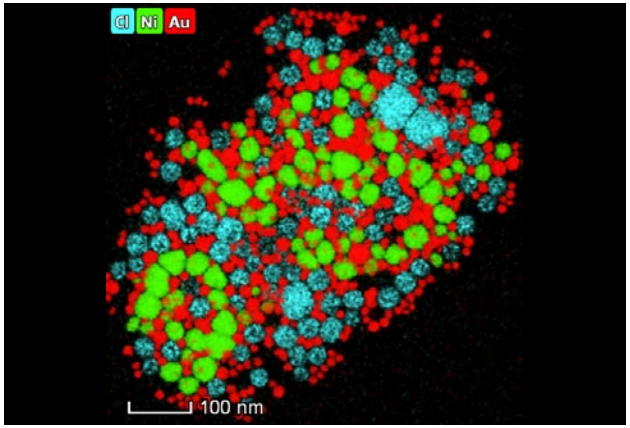
Lung cilia imaged with transmission electron microscopy (TEM).



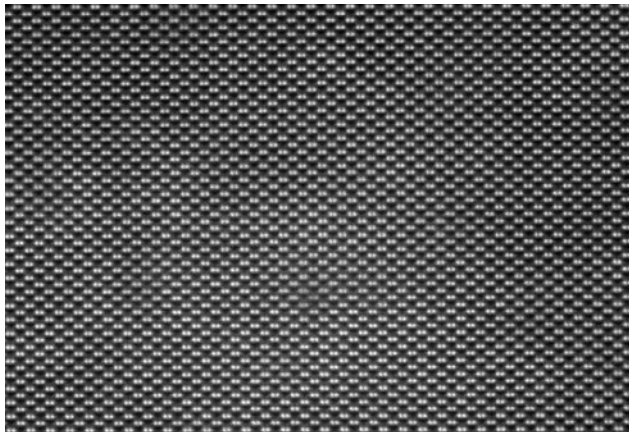
Spider's mouthparts imaged with SEM.

Materials science imaging and elemental analysis

SEM, TEM, EDS, and STEM



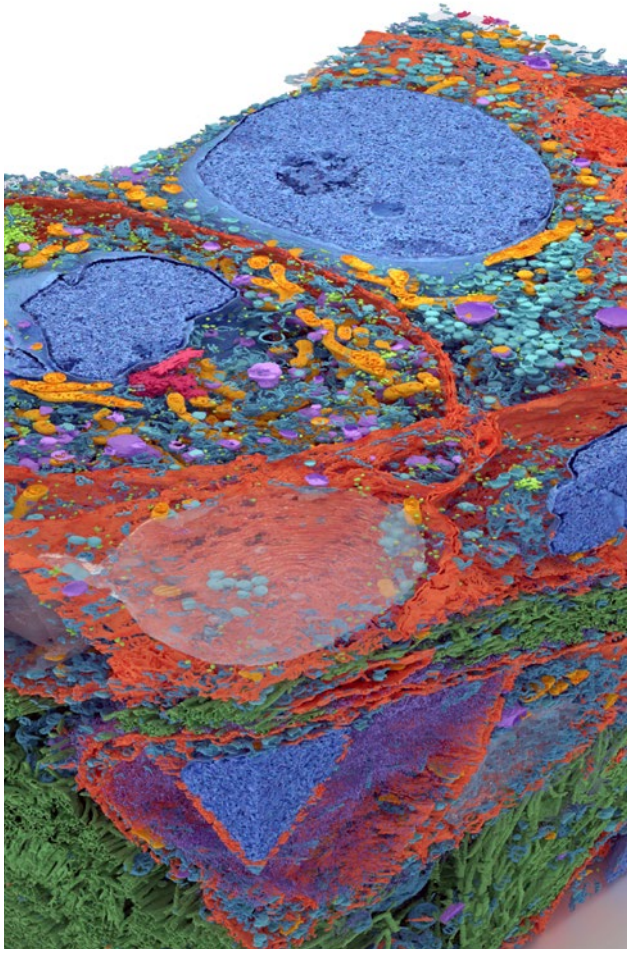
EDS mapping of gold-nickel nanoparticles. Sample courtesy J. Bursik, Institute of Physics of Materials, Brno.



Atomic-scale TEM, atomic lattice.

3D cell and tissue ultrastructure

Volume electron microscopy (vEM)



Cowpox virus-infected cells imaged using serial blockface SEM and segmented with Amira Software.

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Explore service and support

Connecting workflows
Connecting sample preparation, acquisition, data management, and analysis helps reduce workflow gaps, improve efficiency, and make better use of instrument time and staff expertise.

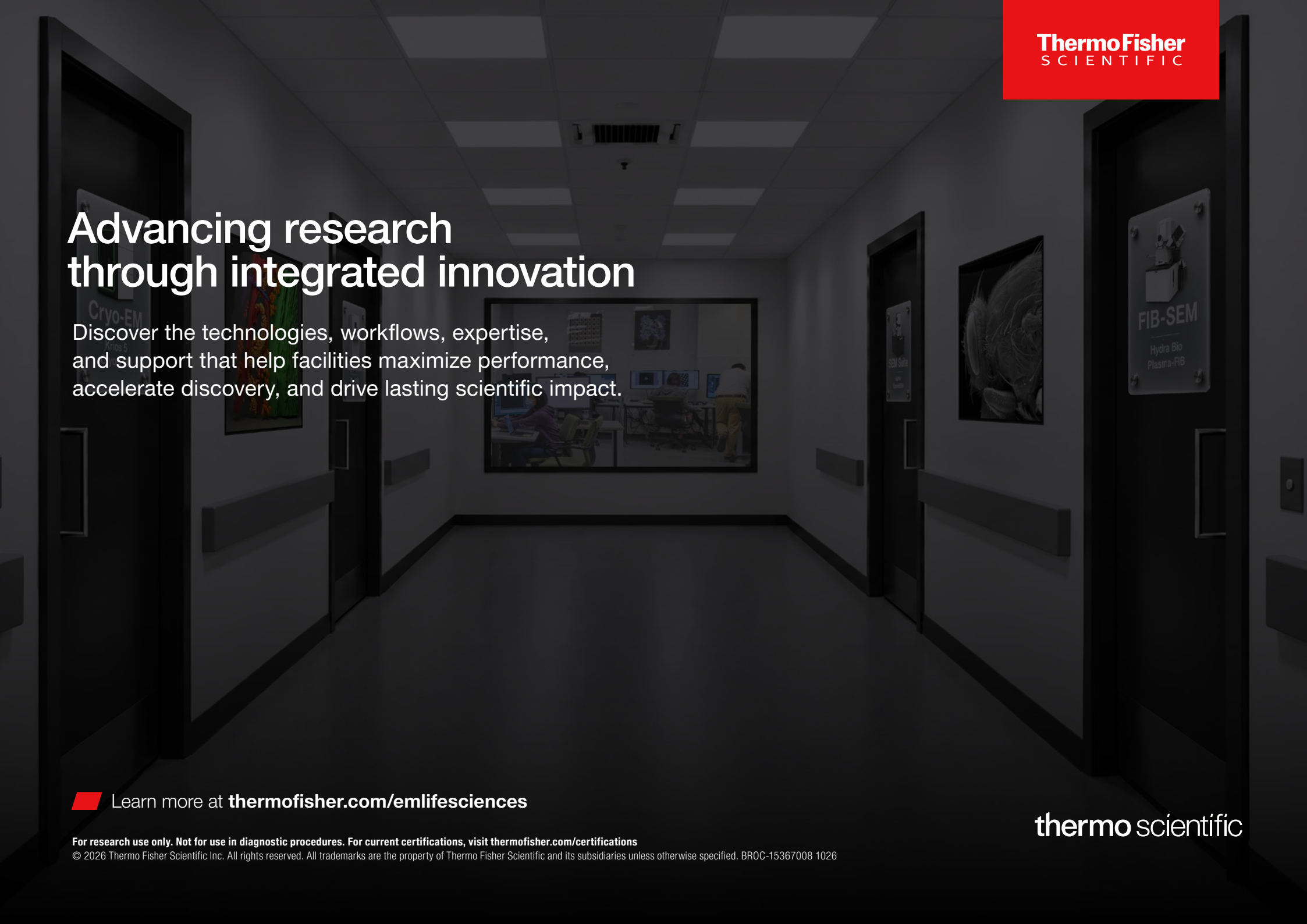
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