

SOLARIS NEWS

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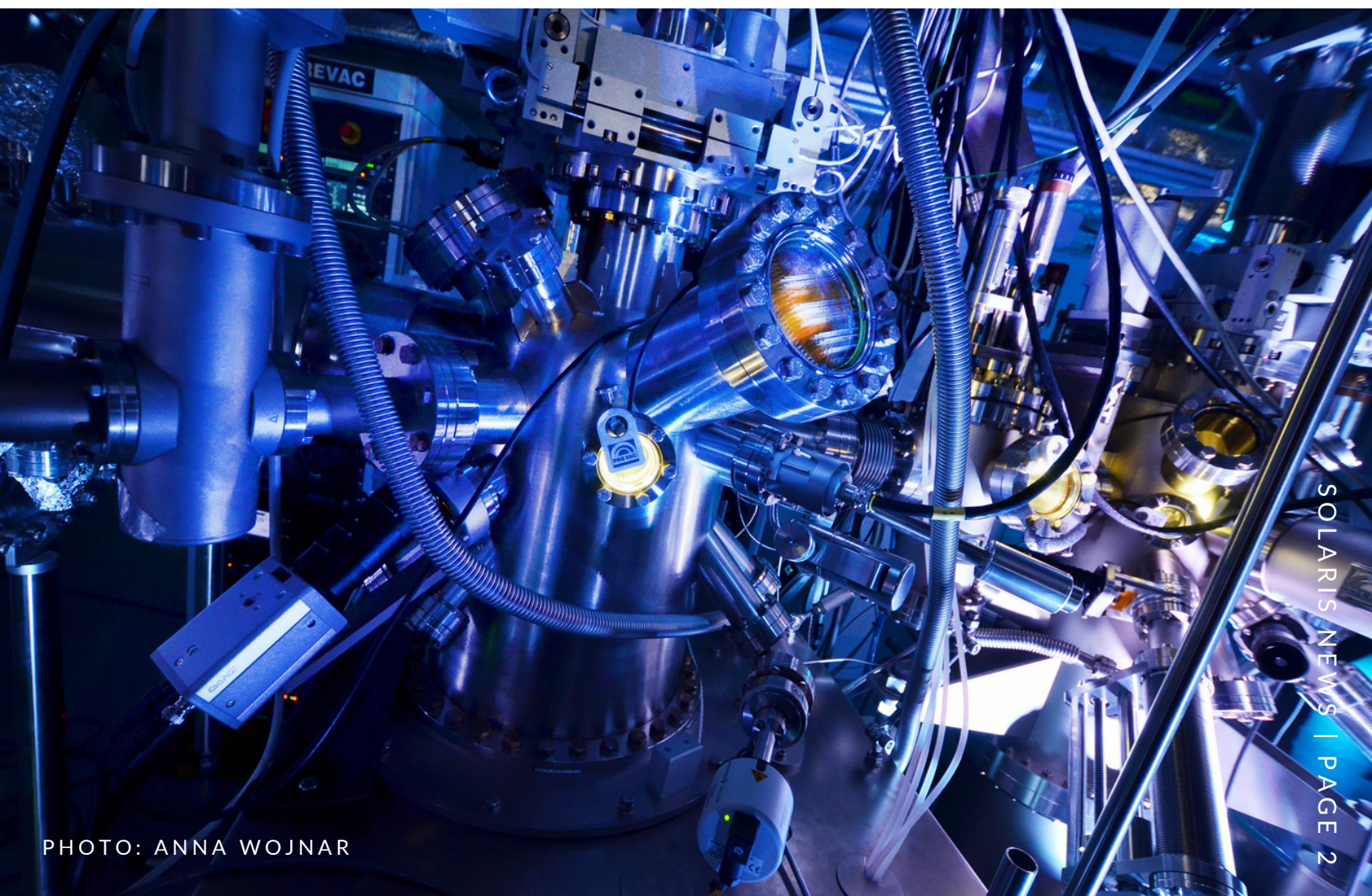
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INDUSTRY COOPERATION PROGRAMME

SOLARIS National Synchrotron Radiation Centre is open for industrial users! Our industry cooperation programme focuses on the applications of synchrotron radiation based techniques in solving scientific and technological challenges of small and large companies, non-profit organizations, as well as public and private R&D centres.

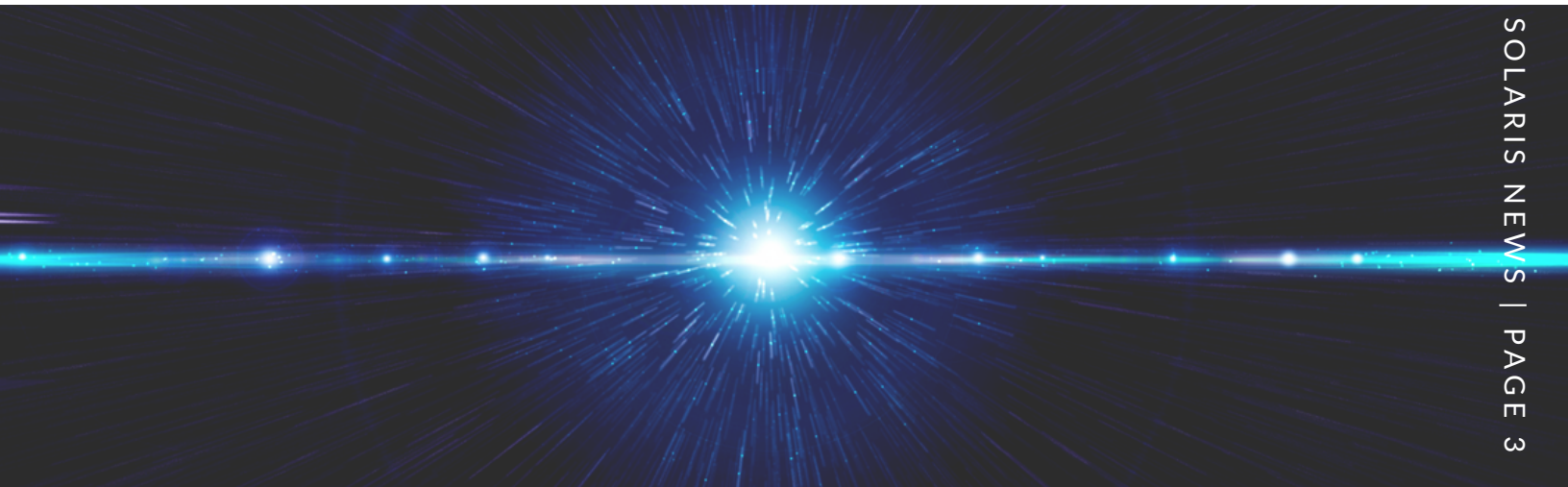
SOLARIS Centre is a research facility, which operates the first and only synchrotron light source in the CEE (Central and Eastern Europe) region, as well as the cryo-electron microscopy facility.

A synchrotron is an electron accelerator, keeping the electron beam travelling at almost the speed of light enclosed in a circular orbit. The beam is kept in a storage ring with the diameter of almost 100 m. When the direction of motion of electrons changed, using bending magnets, or various insertion devices, such as wigglers, or undulators, they produce electromagnetic radiation, which is then used by our scientists to study the properties of matter.

Synchrotron radiation has unique properties, enabling our scientists to conduct experiments, which would be impossible to conduct in other laboratories. Its intensity is tens of millions times stronger than the intensity offered by the conventional sources and its frequency is tunable. This means that the experimental results are available much faster, they have better quality and a variety of different techniques, utilizing different parts of the electromagnetic spectrum, can be used for advanced experiments.

The SOLARIS Centre is one of the most advanced research facilities in Europe and is used by the world-class scientists. However, this doesn't mean that it's inaccessible for businesses struggling with very specific technological problems. Our scientists are experienced in industrial research and ready to engage in the technological projects and experiments. We offer a wide range of access modes, ranging from a simple access to our research infrastructure for the external researchers, to the full service encompassing all steps of industrial R&D projects.

More information about SOLARIS National Synchrotron Radiation Centre can be found on our webpage: synchrotron.uj.edu.pl/en

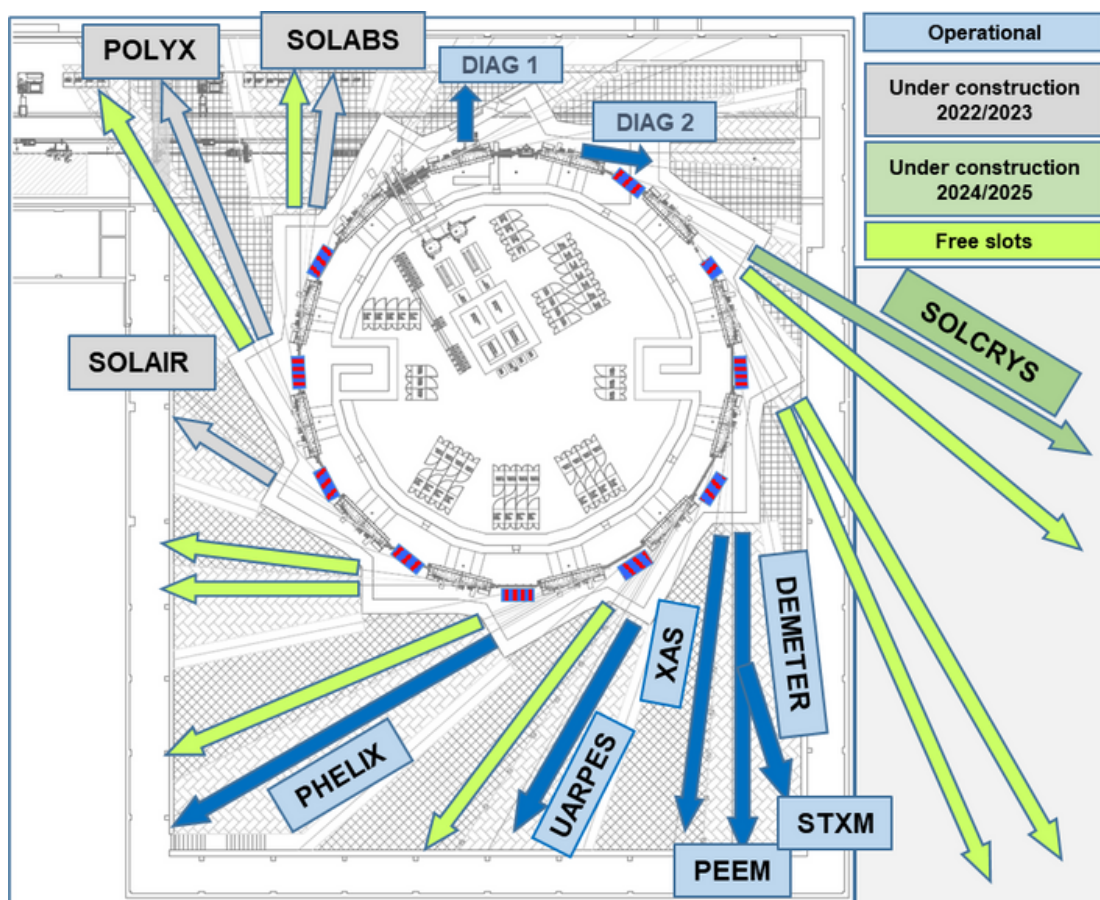


AVAILABLE BEAMLINES AND TECHNIQUES

Electromagnetic radiation emitted by the electrons in the storage ring is extracted and directed to the beamlines, which are responsible for transferring it to the end-stations, where the scientific experiments are taking place. Each beamline is optimized to use only a part of the spectrum extracted from the storage ring, which translates into different microscopic, scattering and spectroscopic techniques.

We currently offer access to 6 experimental end-stations, on 5 different operational beamlines. 3 more beamlines are under construction and expected to become operational until the end of 2023. One beamline is in the planning phase and is expected to be commissioned by 2025. 9 slots for new beamlines are available and we are cooperating with our industrial and academic partners in order to expand our experimental opportunities.

Techniques available at SOLARIS can be applied in chemistry, catalysis, biotechnology, materials science and engineering, nanotechnology, electronics, spintronics, oil&gas and many other areas.



Beamlines at the SOLARIS Centre

AVAILABLE BEAMLINES AND TECHNIQUES

Following characterization techniques are, or will be available in the near future at the SOLARIS Centre.

Spectroscopic:

- X-ray absorption spectroscopy (EXAFS/XANES, transmission, total electron yield and fluorescence detection modes)
- X-ray fluorescence (2023)
- IR spectroscopy (2023)
- Photoelectron emission spectroscopy in different modes (angular and spin resolution, UV/X-ray excitation)
- Linear and circular magnetic dichroism

Microscopic:

- Cryo-electron microscopy
- Scanning transmission X-ray microscopy
- Photoelectron emission microscopy
- AFM/SNOM/IR microscopy (2023)

Scattering:

- Electron diffraction
- Microcrystal diffraction
- X-ray microtomography (2023)
- X-ray microdiffraction (2023)
- X-ray crystallography (2025)
- Small angle X-ray scattering (2025)

Characterization techniques available at SOLARIS can be used to: (1) study the composition of materials, chemical environment of atoms, including their oxidation state and bond-types, (2) image the samples on the scale of millimeters to nanometers, often with chemical sensitivity and the ability to probe molecular interactions and (3) to observe the structure of matter on the atomic scale and characterize phase transformations.

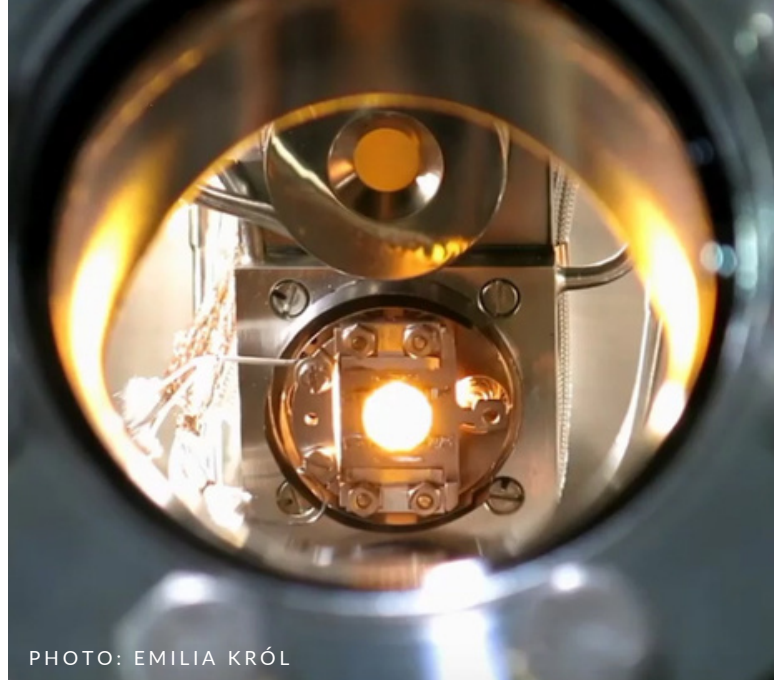


PHOTO: EMILIA KRÓL

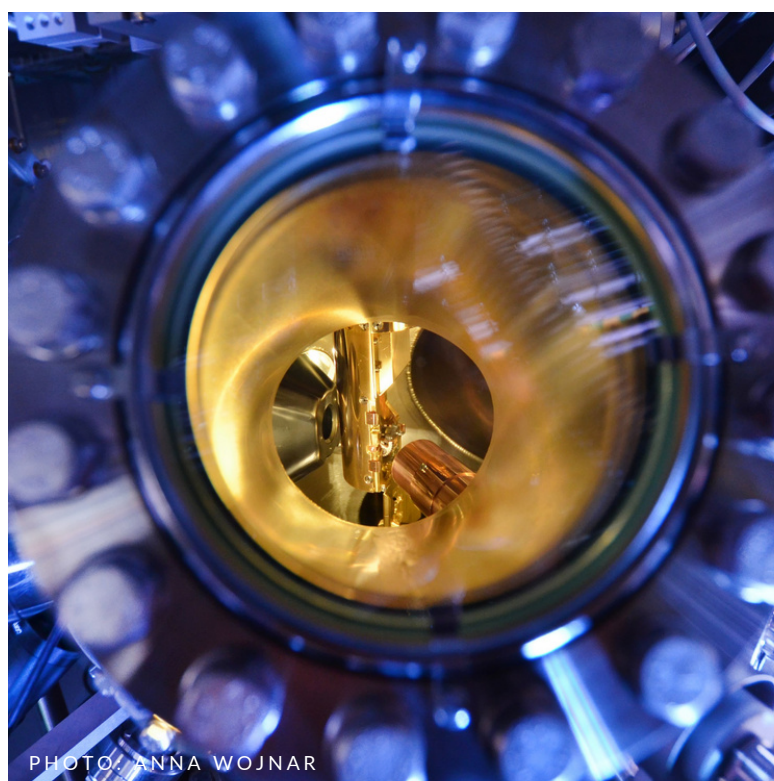


PHOTO: ANNA WOJNAR

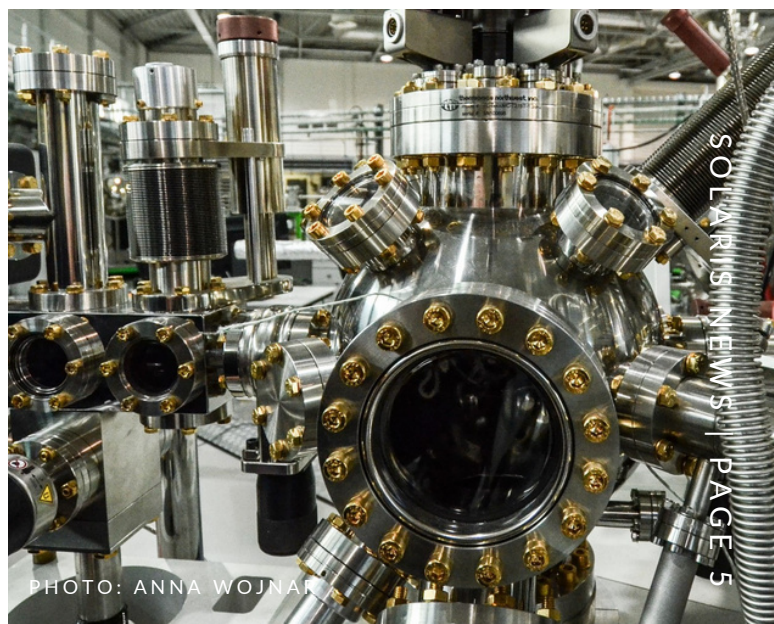


PHOTO: ANNA WOJNAR

SOLABS BEAMLINE AVAILABLE

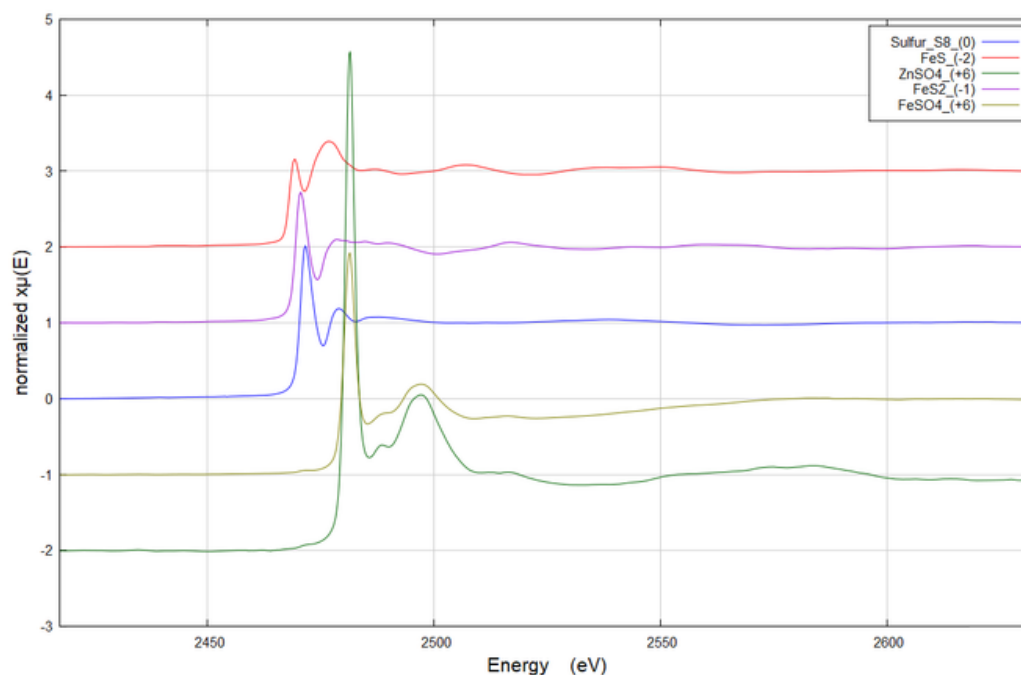
SOLABS is the newest beamline at the SOLARIS Centre, commissioned in winter 2021. The primary analytical technique available at the beamline is X-ray absorption spectroscopy (EXAFS: Extended X-ray Absorption Fine Structure and XANES: X-ray Absorption Near Edge Structure). The beamline uses radiation from the bending magnet, in the energy range of 1keV – 15keV, which covers K absorption edges of the chemical elements between Mg and Se, as well as L and M edges of many other elements.

The measurements are possible in vacuum, ambient pressure, as well as in the dedicated reaction cells.

XAS technique is based on the absorption of X-ray photons by the studied materials. When the energy of incident photons approaches the excitation energy of electrons (absorption edge), absorption coefficient rises significantly. This energy is characteristic for a given element, therefore the method can be used to study the chemical composition of the samples.

Thanks to the subtle variation of the absorption coefficient near the absorption edge, which can be probed by varying the energy of the incoming X-ray radiation, chemical properties (such as oxidation state) and local geometric arrangement of the atoms surrounding probed element (distance to the nearest neighbors and their number) can be characterized.

The beamline is the joint project of Hochschule Niederrhein, Synchrotron Light Research Institute, Bonn University and SOLARIS.



XAS spectra of various sulphur compounds,
measured at the SOLABS beamline

CRYO-EM FOR INDUSTRIAL USERS

CryoEM facility at the SOLARIS Centre is open for industrial users. Our team of world-class scientists specializes in characterizing function and interaction of biological macromolecules using Thermo Scientific™ Glacios™ cryo-EM microscope.

We offer a comprehensive service, which includes: sample preparation, grid freezing, data collection and structure, reconstruction, as well as expert consultations of the obtained results.

Glacios™ Cryo TEM is a state-of-the-art microscope, equipped with Gatan BioQuantum K3 Imaging Filter for contrast enhancement, two detectors: 16-bit CMOS with a resolution of 14 MP and a Falcon4 direct electron detector with a resolution of 14 MP. The system can be used in a semi-automated fashion and achieve structural resolution of up to 2 Å.

Techniques available at the facility include:

- Single Particle Analysis
- Cryo-electron Tomography
- Microcrystal Electron Diffraction

Our services include structure determination of proteins and protein complexes without the need of crystallization, characterization of liposomes, or polymers, and much more!



PHOTO: ANNA WOJNAR

CryoEM facility at SOLARIS

**CONTACT OUR INDUSTRY
LIAISON OFFICE FOR MORE
DETAILS ABOUT OUR OFFER**

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**STAY TUNED FOR THE NEXT NUMBER
OF SOLARIS NEWS!**