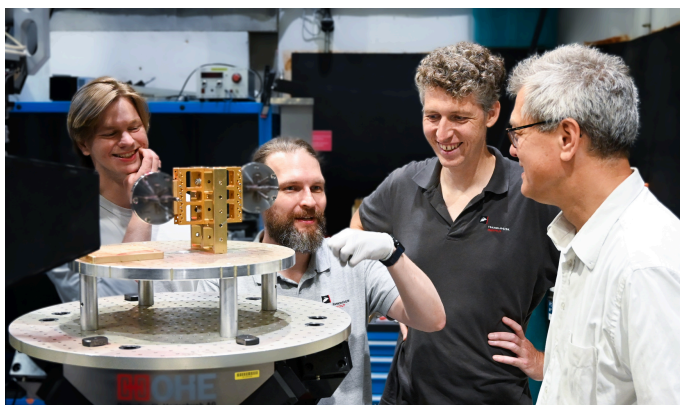
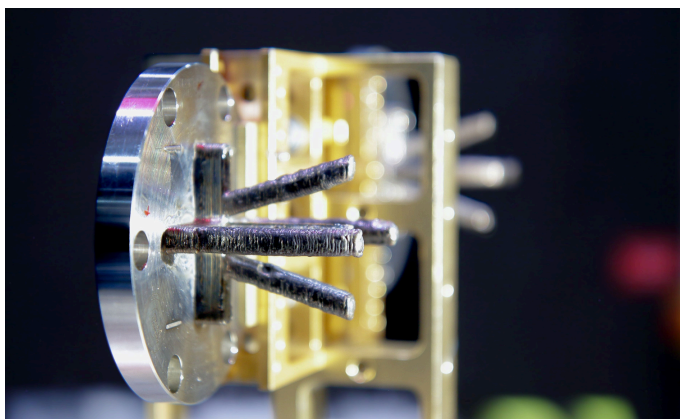


Welcome! Being at ICNS, you might have noticed one of the impressive aspects of neutron science: the wide variety of fields of research in which it is useful, and its impact in societal-challenge areas such as health, energy and the environment, quantum materials, as well as in improving our understanding of the Universe.

The ILL provides the most intense neutron beams in the world, and its data naturally spreads across all sessions, in a variety of presentations given by ILL scientists and ILL scientific users alike.

## 3D PRINTED IN SPACE, TESTED AT THE ILL



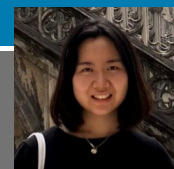
Pioneering neutron measurements were recently performed at ILL instrument SALSA on remarkable samples: stainless-steel components that were 3D printed aboard the International Space station. 3D print is predicted to become a key technology for space exploration however the lack of gravity changes how the metal cools during additive manufacturing.

Scientists from the ILL and the Danish Technological Institute (DTI) work together to compare components printed in zero gravity on the ISS and here on Earth. The aim is to improve the quality, durability and safety of the 3D metal-printed products of the future.

This research is part of a wider collaboration involving DTU Space, the European Space Agency - ESA, and Airbus, who supplied the metal 3D printer for the ISS.

## HIGHLIGHTS

### PLANT-BASED MEAT ANALOGS THE IMITATION GAME



As consumer concerns about sustainability, health and animal welfare rise, the challenge of developing convincing plant-based meat analogues is increasingly relevant for the food industry. One of the challenges is how neutrons can help improve texturization.

At ICNS2025 **Tong Guan (ETH Zurich)** presents a comprehensive multi-scale study by neutron small angle scattering through in-situ real-time observations of the process.

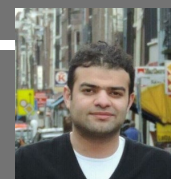
### PLASTIC ICE VII, AN EXOTIC PHASE OF WATER



Plastic phases are hybrid states that blend properties of solids and liquids. State-of-the-art neutron spectrometers and sample environment infrastructures at the ILL have enabled the first experimental observation of plastic ice VII. The results have been published in Nature earlier this year.

At ICNS2025, **Livia E Bove (CNRS, La Sapienza University, EPFL)**, the main author of this study, discusses how plastic water is in diverse environments and under varying pressure and temperature conditions.

### NEUTRON FOR SUPERCONDUCTIVITY



Applications of superconductivity are still limited by the need for cooling to extremely low temperatures. The discovery of superconductivity in magnesium diboride (MgB<sub>2</sub>) at a relatively high transition temperature of 39K ignited significant interest due to the existence of multiple energy bands.

At ICNS2025, **Ahmed Alshemi (Lund University)** presents recent findings from experiments carried out at the ILL and SINQ.

### NEUTRONS IN A BOX



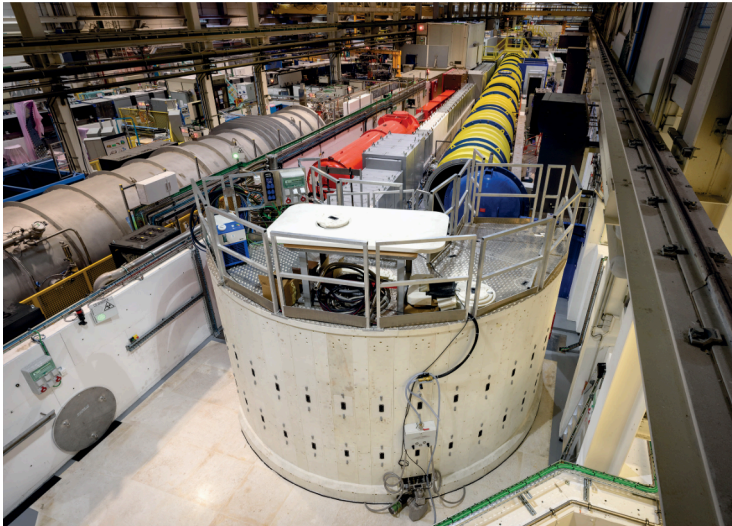
Ultra-cold Neutrons have such a small kinetic energy that they can be trapped and observed for long times. They form bound quantum states on flat surfaces in the gravitational field of Earth. Measuring the transitions between these states, we can test the Newtonian potential at the micrometer scale. The results provide constraints on dark matter or dark energy models.

At ICNS2025, **Joachim Bosina (Wien)** represents the qBounce collaboration, which in recent years successfully commissioned a new spectrometer setup for such measurements at the ILL.

# ILL : at the heart of the European Neutron landscape

The ILL is the world-leading facility in neutron science and technology. Delivering the most intense neutron beams in the world to its unparalleled suite of 43 state-of-the-art neutron scattering instruments, the ILL offers a unique tool for probing matter and materials. A major European project, the ILL was founded in Grenoble in 1967 by France and Germany, joined a few years later by the UK. Today, 13 countries fund the facility for their research communities.

Every year, around 1500 international researchers visit the ILL to carry out over 1000 cutting-edge experiments in a variety of disciplines, including physics, chemistry, biology, and material science and engineering. Besides its impact in scientific research and education excellence, the ILL helps drive innovation in the fields of health, energy, the environment and quantum materials. The ILL is engaged in the production of radioisotopes for medical applications since more than 15 years now.



## Green light for operations until the end of 2033

Just over one month ago, the ILL received the firm commitment from France, UK and Germany for operations until the end of 2033, the end of the current inter-governmental protocol.

With a new Science strategy and the completion of its upgrade programme Endurance, the ILL is in great shape, with an unparalleled instrument suite, a reactor whose vessel has been changed in 1995 (and has an expected lifetime above 60 years) and an excellent set of support facilities.

At the forefront of neutron science and technology for nearly 60 years, the ILL, now more than ever, is ready to contribute to the European competitiveness as a cornerstone of the European neutron landscape.

## ILL technology for the future of neutrons in Europe

As world leader in neutron technologies, the ILL supports the other neutron centres in Europe. Two collaboration agreements have been signed between the ILL and the ESS in 2024. The first concerns the supply of a TYREX station for the production of polarised Helium-3. The second, the construction of the CSPEC detector. Each of the 12 detector modules will be tested and manufactured at the ILL, delivered to the ESS by the end of 2027, and then filled with the detection gas before installation on the instrument. The agreement includes the training of ESS staff.



## MEET...

### KEN ANDERSEN ILL DIRECTOR



A Copenhagen-native and ILL director since 2023, it's only fair to say that Ken Andersen knows neutron sources around the world: he was associate director at Oak Ridge, USA (2020-2023) and head of the Neutron Instruments Division at the ESS in Lund (2010-2019); before that, he was instrument scientist at ILL and ISIS (UK), and spent a brief period at KENS (Japan). At ICNS2025, he will present the ILL facility update.

### JACQUES JESTIN ILL SCIENCE DIRECTOR



Jacques Jestin is science director at the ILL since 2021 and French Associate Director in October 2022. At ICNS2025, he will present the new ILL Science Strategy, in the session 'Neutron updates and facility roadmaps' on Wednesday 9 July at 11 am.

### ANDREAS MEYER ILL TECHNICAL DIRECTOR



Andreas Meyer is ILL German Associate Director from October 2021, and also Head of the Technology and Projects Division (DPT). At ICNS2025, ILL Technologies are very well represented with dedicated talks and posters, as well as the brand new brochure 'Neutron Technologies' that we are very glad to present.

### URSULA BENGAARD HANSEN ICNS2025 SPEAKER, ILL SCIENTIST



Also a Copenhagen native, Ursula Bengaard Hansen is a scientist at ILL and co-responsible for the instrument IN20. At ICNS2025, she will talk about the analysis of polarised neutron scattering data, a powerful tool to study the magnetic properties of materials at the atomic scale, crucial in quantum materials. (INST06, 9 July 2 pm)

## SLH - Soft Matter, Life sciences and Health

Neutrons are great explorers of the structure and dynamics of matter. In particular, they can provide unique insights into the structure and dynamics of biological systems at different time- and length-scales, from small molecules such as lipids or peptides, to larger molecules and molecular assemblies including viruses. Being electrically neutral, neutrons can travel deep into materials and are non-destructive.

Neutrons offer a unique technology for understanding the processes involved in the cell mutations that lead to cancer and for developing innovative treatments to combat this disease. Thanks to their unique properties, and in particular their ability to explore complex cellular systems right down to the atomic level, neutrons are a key ally in our quest to understand biological mechanisms and develop innovative therapeutic solutions. The neutron science conducted at the ILL provides valuable information that contributes, among other things, to the development of messenger RNA vaccines or the early detection of neurodegenerative diseases such as Alzheimer's disease.

Talk to the experts at ICNS 2025! **Frank Gabel** is a keynote speaker at ICNS2025 and the Head of the Biology, Deuteration, Chemistry and Soft Matter Support Group at ILL. **Ralf Schweins** is the head of ILL's Large Scale Structures Instrument Group, responsible for a set of instruments based on different techniques, measuring structures on the scale of 1 to hundreds of nanometers and used to study a diversity of systems including biological materials, polymers, and colloids.

More info: [www.ill.eu/science-technology/ill-science-highlights/soft-matter-and-biology](http://www.ill.eu/science-technology/ill-science-highlights/soft-matter-and-biology)



## QM - Electronic Phenomena and Quantum Materials

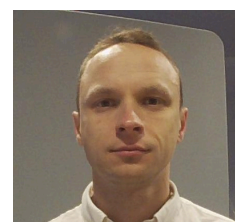
2025 is the UN's Quantum Year! Indeed, quantum technology is set to revolutionise the world of information technology. New electronic states of matter involving the nanoscale magnets of electron spins will be at the heart of new solutions for data storage, data transmission and quantum computers. Quantum materials are also smart materials for new devices which combine electronic and magnetic properties and include superconductors.

To make these promising applications come true, fundamental studies are essential. Neutrons are nanomagnets able to explore matter in the extreme conditions in which new quantum states emerge: high pressures, very low temperatures and high magnetic fields. ILL researcher **Andrew Wildes** is a recognised expert in the field who, in addition, has a talent for giving clear explanations on complex scientific topics.

At ICNS 2025, ILL scientist **Iurii Kibalin** will be awarded the Neutron Instrumentation and Innovation Award 2025 for his significant contribution to polarized neutron diffraction techniques. His development of the CrysPy software tool (a dedicated computational tool developed for analysing polarised neutron diffraction data) has transformed polarised neutron powder diffraction on magnetic samples into a routine, accessible method for a broad scientific community.

Multiferroic materials, in which electric and magnetic properties are combined in promising ways, will be the heart of new solutions for data storage. This is the subject of the ICNS 2025 talk by **Adheena Painganoor, PhD student at the ILL and the Technical University of Denmark**. In her thesis, she explores the route towards non-volatile, energy-efficient memory devices.

More info: [www.ill.eu/science-technology/ill-science-highlights/magnetism-and-quantum-materials](http://www.ill.eu/science-technology/ill-science-highlights/magnetism-and-quantum-materials)

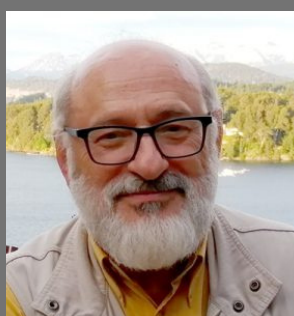


### Juan Rodriguez Carvajal (ILL)

**Walter Halg Prize** "for his extraordinary impact on the field, namely as the 'father of FullProf', the globally renowned software for crystallographic and magnetic studies.

Juan Rodriguez-Carvajal is not only an exceptional scientist with profound instrumental expertise, but also possesses deep insight into the underlying physics of neutron scattering, particularly in the realm of strongly correlated materials.

He actively shares his knowledge through training courses and schools worldwide, and continues to develop FullProf in close collaboration with its user community, advancing the software in step with scientific and technological progress."



## MAT - Material Engineering and Chemistry

### NEUTRONS FOR SUSTAINABILITY

Climate change is one of the most pressing challenges facing humanity today. The world's leading research centres are working hard to combat global warming and protect the environment. At the ILL, neutron techniques are helping to make significant progress in reducing greenhouse gas emissions and developing cleaner, more environmentally friendly technologies.

That's the focus of the presentations of two PhD students currently at the ILL. **Aliki Gerakianaki** reports on her study of a low-cost option for catalysts optimising hydrogen production from water electrolysis, which emerges as a vital energy carrier as the urgency for decarbonisation intensifies.

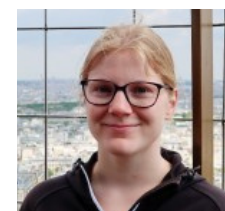
**Kirstin Wilson** reports on the use of neutron diffraction structural analysis of metal-organic frameworks (MOFs) comprising multiple metal elements to unveil their unique structural features and role in catalysing CO<sub>2</sub> reduction (converting CO<sub>2</sub> and H<sub>2</sub> into CO and water).

Still on the topic of environmental sustainability, ILL researcher **Bettina Schwaighofer** presents at ICNS 2025 the EU funded project ReMade@ARI. This project is providing scientists exploring the properties and structures of recyclable materials with a wide range of tailored services including access to more than 50 European analytical research infrastructures, including the ILL.



remade-project.eu

More info: <https://www.ill.eu/science-technology/ill-science-highlights/chemistry-1>



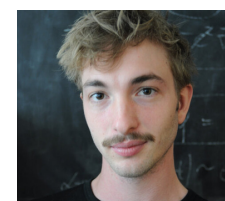
## Universe Essentials

Progress in particle physics is constantly improving our knowledge of the origins and evolution of the Universe. Scientists at the ILL probe the origins of matter-antimatter asymmetries by studying in detail the properties of the neutron and its decay, and look for hints of dark matter or dark energy by investigating possible deviations from the known gravitational pull. The uniqueness of the ILL nuclear and particle physics programme is recognised in the 'Long Range Plan for European Nuclear Physics', published in 2024 by the Nuclear Physics European Collaboration Committee (NuPECC). This European strategy document clearly recommends the exploitation of ILL well beyond 2033 – due to its scientific relevance, competitiveness in nuclear (and particle) physics, and its capabilities for producing radioisotopes for research and cancer treatment.

At ICNS 2025, you can meet **Tobias Jenke**, ILL scientist involved in some of the most challenging experiments at the ILL in this domain. He is also a member of the scientific advisory committee and the chair of the 'Universe Essentials' working group. Meet also **Valentin Czamler**, who has just been awarded the Best PhD Thesis Award 2025 of SFN (French neutron scattering association), for the quality and impact of his work investigating new, very cold neutron sources. Valentin completed his PhD at ILL and is now as a postdoctoral researcher at LPSC in Grenoble.

On the nuclear physics side, **Caterina Michelagnoli** will show in her talk the path to answer many fundamental questions about atomic nuclei through experiments at the nuclear physics instruments at ILL.

More info: [www.ill.eu/science-technology/ill-science-highlights/nuclear-and-particle-physics](http://www.ill.eu/science-technology/ill-science-highlights/nuclear-and-particle-physics)



### Talk to the experts at ICNS 2025!

**These and other ILL scientists are ready to answer all your questions. If you need help to get in touch with them, or any further information or material just get in touch!**

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