LENS LEAGUE OF ADVANCED EUROPEAN NEUTRON SOURCES

Solving the grand challenges facing our societies often requires the development of new high-performance materials. Research on materials will provide the basis for the technologies of the future that are needed to achieve a sustainable high standard of living all over the globe. Tailor-made materials and material systems are required for the advancement of all key technologies, from information technology and renewable energy concepts, to safer and more environmentally friendly transport systems and life-saving medical applications. Probing materials with neutrons stands as one of the pillars of the analytical techniques in this chain of discovery. LENS will help developing these technologies by optimising the use of resources for neutron investigations through strategic coordination among the neutron facilities.

Neutron-based analytical facilities are used in numerous disciplines across the entire range of science and technology development, and generate a high socio-economic impact. Europe has achieved global leadership in this field, serving a very broad scientific community of more than 5,000 researchers by providing them with more than 32,000 instrument days at neutron scattering facilities.

With the closure of some sources and the upcoming European Spallation Source (ESS), the establishment of LENS comes at a key moment of transition and optimism in European neutron science, and places particular emphasis on the interaction between the neutron science user communities and funding organisations. By optimising resources and closely aligning policies among partners, the LENS vision is one of continuous improvement and adaptation by neutron source facilities to the communities they serve.

As a collaborative effort that aims to benefit researchers and address their needs, LENS seeks to establish excellent working relations with the European Neutron Scattering Association (ENSA). LENS will be in close dialogue with the League of European Accelerator-based Photon Sources (LEAPS), a strategic consortium that brings together synchrotron radiation and free electron laser user facilities in Europe.

LENS is an open and inclusive organisation and in this sense contributes to the integration of Europe. Its members offer an internationally visible user programme and engage in creating a collaborating eco-system of neutron facilities. Any research institution wishing to contribute to this task is welcome to join efforts with LENS.

Helmut Schober

Helmut Schober, Chair of LENS

About LENS

The League of advanced European Neutron Sources (LENS) is a not-for-profit consortium formed to promote cooperation between European-level neutron infrastructure providers offering transnational user programmes to external researchers.

In Europe there's a world-leading network of international and national neutron sources serving a scientific community of more than 5,000 researchers with over 32,000 instrument days per year. Nine of these form a strategic consortium with the aim of strengthening European neutron science by enhancing collaboration among the facilities. LENS places emphasis on the relationship between user communities and funding organisations, continuous improvement of source facilities, optimising resources between, and aligning policies among partners – all to ensure excellence to the communities they serve.

The not-for-profit consortium is open to new members in Europe which offer a transnational user programme for the majority of beamtime.

Goals and Objectives

LENS has the not-for-profit purpose of promoting the cooperation and projects between European-level neutron infrastructure providers that offer a transnational user programme. The individual members remain independent but together, through LENS, join forces to support and strengthen European neutron science by creating an effective, collaborating eco-system of neutron facilities.

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The members commit to:

- Engaging in the common promotion of neutron science, with the objective of establishing neutron science as a brand recognised by all the stakeholders, and highlighting the scientific, societal or socio-economic impact of neutron science;
- Coordinating their exchanges with national and European organisations and stakeholders (including users and funders), with the objective of contributing to the shaping of future policies;
- Coordinating technical development strategies in order to profit best from collective expertise and avoid duplication of efforts, with a view to addressing the scientific and societal challenges of the future in the most efficient manner;
- Joining efforts in expanding existing and supporting new user communities both by topic and geographical origin, with the objective of strengthening Europe's neutron expertise;
- Concerting on access, based on the principles of the "European Charter for Access to Research Infrastructures" with an emphasis on standardisation for improved user experience;
- Achieving greater coherence in the development of data policy, data-handling, -storage, -analysis, -access along "FAIR" principles, and promoting Open Science while protecting intellectual property rights, with the objective of facilitating the exchange and use of neutron research data over a broad range of scientific areas;
- Coordinating training activities and enhancing staff qualifications by facilitating staff mobility, with the objective of facilitating international career paths and developing skills in neutron science and neutron technologies;
- Facilitating industrial access and collaboration, with the objective of fostering innovation within the European Research Area.

Members

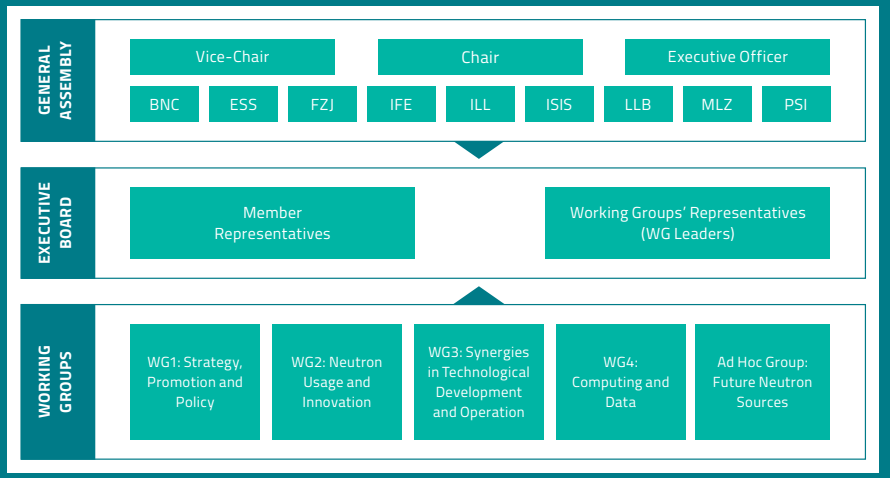
As of June 2019, the members of LENS are:

- Budapest Neutron Centre (BNC)
- European Spallation Source (ESS)
- Forschungszentrum Jülich (FZJ)
- Institute for Energy Technology (IFE)
- Institut Laue-Langevin (ILL)
- ISIS Neutron and Muon Source
- Laboratoire Léon Brillouin (LLB)
- Heinz Maier-Leibnitz Zentrum (MLZ)
- Paul Scherrer Institut (PSI)

The individual members remain independent but together, through LENS, join forces to support and strengthen European neutron science by creating an effective, collaborating eco-system of neutron facilities. LENS is open to new members in Europe that offer a transnational user programme for the majority of beamtime. The conditions for admission are:

- The submission of an application documenting the commitment to fulfil the criteria, and describing the facility (or facilities) that would be represented;
- The acceptance of the application by the General Assembly.

Organisational Structure



Science and Innovation

Neutrons have exciting abilities which allow scientists to understand the world around us at the atomic and molecular level, in a non-destructive manner. This makes neutron science one of the most useful analytical techniques used across numerous science and technology disciplines. Due to the characteristics of neutrons – making them suited to investigate magnetic properties, light elements or big samples – they can address scientific questions arising from many grand societal challenges and make great socio-economic impacts.

Neutron science is an indispensable tool to solve scientific questions in materials research for fields like health, food and water, energy, climate and environment, cultural heritage, fundamental research, or industrial applications.

Health

Ensuring healthy lives and promoting wellbeing is a key current and future grand challenge for society. These challenges are wide-ranging, from the transmissible diseases such as Malaria or Zika which affect life expectancy, to age-related diseases like Alzheimer's or Parkinson's which reduce quality of life. Understanding the complex biological processes that regulate our bodies is critical to understanding these threats, as well as learning how to minimise the damage they cause. In the field of human health research – which relies heavily on the study of biological materials – neutrons' non-destructive manner is particularly advantageous, empowering neutron science to enable a wide range of discoveries that have a real-world impact on improving health.

Food & Water

Sustainable agriculture and mitigating drought are becoming increasingly prevalent societal challenges. Understanding our food and its production processes at the molecular level will provide insights to help us improve global health and well-being as well as sustainable agriculture in the future. Neutrons are well suited to revealing the required knowledge thanks to their unique ability to interact with hydrogen atoms. Equally, better understanding of the processes underlying the pollution and purification of water will help us to ensure an everlasting supply of this indispensable resource. Neutrons have demonstrated repeatedly their high research potential in this vital area and will continue to do so in the future.

Energy

A continuous supply of energy to deliver essential requirements such as food, clean water and healthcare is proving a huge societal challenge. Improving our capacity to store energy, optimising use of current energy sources, as well as the ability to harness renewable sources, is critical. Neutron scattering techniques, with the ability to probe atomic structure, are the perfect partner to investigate the materials needed for next-generation energy research.

Climate & Environment

Without our climate, and the natural environment around us, human life would not be able to sustain itself. Climate change is already having a massive impact on weather patterns, and pollution-causing fossil fuels remain a prominent source of energy. In addition to this, urbanisation and industrialisation are also putting a strain on the environment. To preserve our standards of living and tackle these societal challenges, we must start to minimise this strain. Cleaner technologies and processes can be developed, and the better we understand the complex ecosystems that intertwine with human infrastructure, the better we can protect them. Neutrons can shed light on all aspects of this, from the air we breathe, to the rocks beneath our feet.

Cultural Heritage

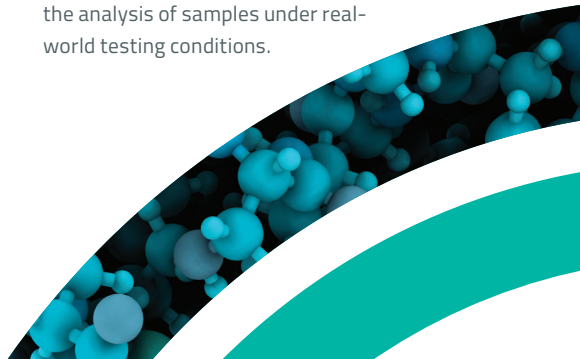
Neutron technology is an ideal tool for the characterisation of cultural heritage objects; thermal neutrons are highly penetrative of most materials, and neutron radiation can act as a diagnostic probe for collecting information from archaeological sites, or in large museum artefacts. Valuable scientific analysis harnessing the power of neutrons can be performed without causing damage to precious relics. This also provides insight of the composition of the sample, not just the surface.

Fundamental Research

Fundamental research is the birthplace of new scientific ideas, underpinning our understanding of nature and of the precise phenomena occurring at the microscopic scale that dictate its laws. It widens our knowledge of the universe, driving the development of the most cutting-edge technologies to study it as well as providing the basis for future technological innovation. Fundamental scientific research encompasses not only the identification and characterisation of the subatomic particles that make up our world, but also investigation into the organising principles behind the diverse phenomena we experience every day. In this way, scientific knowledge can move forward and then contribute to tackling societal challenges.

Industrial Applications

From robotics to genetics and almost everything in-between, devices and systems utilise the unique characteristics of advanced materials. But first they require the identification and engineering of the best materials and components with which to build them. Neutron science can lead to a huge range of applications in industry, from revealing points of weakness in materials, to enabling the analysis of samples under real-world testing conditions.



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