# Recommendation for an IUPAP Resolution to Establish a Working Group in the Field of Major Neutron Research Facilities

## *U.S. Liaison Committee for IUPAP*

Major Neutron Research Facilities, both accelerator-based (spallation sources) and reactor-based, have been a standard tool for forefront research in pure and applied and research for over half a century, responsible for a significant number of technological innovations and even several Nobel Prizes. Based on the need for neutron research to advance high priority research fields, major global regions and nations, like the European Union, China, and the US, are investing or are planning to invest the equivalent of billions of (US) dollars to develop (d), upgrade or extend (u) existing neutron sources, or build new neutron (n) sources. Neutron source research in the past few decades has been focused on spallation-type sources based on powerful mega-watt class hadron accelerators, such as the new European Spallation Source (n), the extension of the China Spallation Source (Phase II) (u), the UK ISIS 2 (d), and the US Spallation Neutron Source Second Target Station (u). In addition, several countries are building or are considering new research reactors or compact accelerator sources, such as Argentina (d), Canada (d), Germany (d).

Designing, building, and operating advanced neutron sources is a multidisciplinary endeavor, cutting across many of the applied physics fields covered by existing Commissions and Working Groups (such as Accelerators) under the auspices of IUPAP. The research carried out at the research sources spans an enormous number of disciplines of technological relevance, ranging from condensed to soft matter, quantum materials, and the production of isotopes for applications in industry and health. Many of these research areas are also represented in IUPAP Commissions or Working Groups, yet, a unified approach is missing, which results in a fragmented, uncoordinated, and sub-optimal approach to the neutron source utilization and operation.

Neutron sources are considered major critical research infrastructures that provide access to characterization capabilities for new and novel materials (such a quantum materials) and the understanding of functional parts of deformed proteins (which are responsible for the development of illnesses such as Alzheimer, etc.) but also access to critically needed industrial, security, or medical isotopes. The latter one is in increasingly sparse supply and heightened demand. Also, neutron sources provide highly sought after capabilities to develop and test industrial materials and components for the fusion and fission industries in accelerated extreme conditions.

Given the significant cost of designing, building, and operating neutron sources, we propose that IUPAP establish a Working Group to bring together key stakeholders for existing and new or planned sources to better coordinate plans, generate more science opportunities for the global physics community, and advocate for and promote those opportunities.

These should include:

- Regular updated documentation about existing and accessible neutron sources, planned and considered neutron sources, and the corresponding user-facilities and access requirements.

- Education tools for general outreach to the community, which will help to provide understanding and acceptance of neutron sources and the related technologies.
- Training of the next generation of neutron source users and operators that could be coordinated and organized, including international youth workshops and neutron schools.

As first deliverables, a report on global neutron sources (comparable to WG9 IUPAP report 41) should be generated, a document that provides a clear value proposition of the peaceful uses of neutrons from neutron sources for science and society. Moreover, a roadmap for outreach and training should be established.

**Resolution:** We recommend that IUPAP establish a Working Group on Neutron Research Facilities to bring together key stakeholders for existing, new, and planned neutron sources to better coordinate plans, generate more science opportunities for the global science community, and advocate for and promote those opportunities.