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(G*) Virtual Learning Resources for Education and Training in Neutron Scattering

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Neutron scattering is one of the most powerful experimental techniques in the modern study of materials. Neutrons are used to investigate the structure and dynamics of materials on an atomic scale, helping scientists to understand the properties of materials ranging from high-temperature superconductors to red blood cells and turbine blades. However, access to neutron beams is in short supply. There is only one facility for neutron scattering in Canada (the McMaster Nuclear Reactor), and opportunities for in-person teaching and learning are rare. The goal of this project was to develop virtual learning resources for education and training in neutron scattering techniques and applications. This project consists of three parts. First, we have created a series of videos explaining the basic principles of neutron scattering targeting first-year university students in physics. These videos can be used individually or as add-on materials for the first-year introductory physics course. Second, we have created a series of virtual lab experiments targeted at upper-year undergraduate students. These experiments can be combined to form a one-semester practical introduction to neutron scattering, or they can be used individually as modules in an existing upper-year laboratory or experimental methods course. Third, we have also developed two new virtual instruments that simulate neutron scattering beamlines at the McMaster Nuclear Reactor. This includes virtual versions of the McMaster Alignment Diffractometer (MAD) and the McMaster Small-Angle Neutron Scattering facility (MacSANS). This simulation explains the function of the instrument and provides users opportunities to conduct virtual experiments with a variety of materials.

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