

# Neutron Interferometry Experiments for Nuclear Physics

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The neutron interferometer, pioneered by H. Rauch and S. Werner in the 1970's, splits the neutron wave function by Bragg diffraction into two paths and recombines them to produce an interference pattern, in close analogy to the classical Mach-Zender interferometer. Previously the neutron interferometer has been used to demonstrate important quantum-mechanical phenomena such as the  $4\pi$  rotational symmetry of a spinor and the neutron phase shift in the Earth's gravitational field. Neutron interferometry is also the only way to directly measure neutron scattering lengths, and it can do so with very high precision. We are pursuing a number of neutron interferometry experiments that are important for nuclear physics. These include a new precision measurement of the neutron charge radius and precision neutron scattering length measurements in light nuclei. This work is supported by the National Science Foundation.