National Institute of Standards and Technology

- Work is now in progress leading to a new measurement of the angular distribution for neutrons scattering from hydrogen at 15 MeVneutron energy. This work is needed due to a reduction in quality of the database near 14 MeVneutron energy.
(Collaboration with Ohio University and LANL)

- A measurement of the coherent scattering length for hydrogen with an accuracy of 0.05% was recently published in Phys. Rev. Measurements of the coherent scattering lengths for deuterium with an accuracy of 0.06% and ^{3}He with an accuracy of 0.1% have been recently completed. These measurements were all made at the NIST reactor facility. The coherent scattering length is related to the phase shift and can be used directly in certain analysis codes, such as R-matrix analyses, for evaluation of nuclear cross sections. The H and ^{3}He coherent scattering data will be used by Hale in evaluations of the hydrogen scattering and ^{3}He(n,p) standard cross sections.
(Collaboration with Indiana University, the University of Missouri-Columbia, the University of North Carolina, LANL, University of New Hampshire and the Joint Institute for Nuclear Research[Dubna])

- Work continues on methods to check the accuracy of a new cryogenic calorimeter that was built at NIST. The goal for this calorimeter is the measurement of neutron fluence to an accuracy of 0,1%. To obtain such high accuracy, systematic errors must be well understood. The calorimeter measures the thermal power produced from neutron absorption reactions in an appropriate target. The calorimeter depends on very accurate measurement of small amounts of power (less than a micro-watt) and the demonstration that all the kinetic energy of the reaction products appear as heat in the target. Initial work was done with a ^{6}Li absorber which has a large Q value. Calculations indicate there should not be a problem with energy stored in defects for this target. Confirmatory measurements are planned with a liquid ^{3}He target for which there are no energy stored in defects. The calorimeter will be used for cross section measurements and to measure NBS-1 to a total uncertainty of 0.3% which will have an effect on all cross section measurements made relative to NBS-1.

- The cryogenic calorimeter was used to measure the ^{6}Li(n,t) cross section at ~4 meV. The result is in excellent agreement with the ENDF/B-V evaluation. It is about 0.5% lower than the ENDF/B-VI evaluation. The uncertainty in this measurement is still being evaluated. It is presently estimated to be about 0.4%. Additional work is being done to study possible heat loss processes which may allow the uncertainty to be reduced even further.

- The Spherical-shell transmission measurement program has been completed. The data were obtained using TOF with a 5-meter flight path. The measurements were obtained for two different spherical shells, two different source reactions [^{15}N(p,n) with E_p=5.1 MeV; D(d,n) with E_d=3, 5 and 7 MeV]and laboratory angles of 0º, 45º, 90º, 120º and 135º. The source spectra (without a spherical shell) were measured at laboratory angles of 0º, 15º, 45º, 60º, 90º, 100º, 120º and 135º.
- Calculations have been made of neutron transport through the shells. Comparison of the measured data with these results calculated with evaluated cross sections can provide information on energy regions where additional work should be done on these cross sections. (Collaboration with Ohio University and the University of Florida)