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## Laurence (Larry) Passell (1925–2021)

Laurence Passell, a pioneer in the international neutron community, passed away peacefully on Long Island on December 17, 2021. Larry was born on March 23, 1925 in Cleveland Ohio. Before going to college, he enlisted in the Merchant Marine Academy and served admirably during the Second World War in the Atlantic, the Mediterranean, and the Pacific fields of battle where he managed to survive two attacks by German submarines. After his service he graduated from Harvard College and earned his Ph. D. in Physics in 1955 at the University of California at Berkeley. He then took a job at Lawrence Livermore Laboratory researching neutron-nucleus interactions at the newly constructed reactor at Livermore. It was here that his interest in neutrons began, and he established a collaboration and friendship with Walter Marshall, who gave a lecture series at UC Berkeley on neutron spectroscopy from condensed matter. After a few years, Larry became disillusioned with the weapons related research he was directed to work on, so he accepted the opportunity to go to the Danish research laboratory, Risø, near Copenhagen, where a new reactor was being built dedicated to basic research. It was here in 1961 that Larry started his lifelong career as a neutron scatterer. He helped start the neutron program at Risø and, following Brockhouse, set up a newly invented 3-axis instrument at the DR3 reactor. After a few years in Denmark, Larry was enticed to come to Brookhaven National Laboratory, where the HFBR was ready to come online. His training at Livermore and Risø was ideal for setting up scientific programs at the new facility, and it was here that Larry made many of his seminal contributions to condensed matter science.



At Risø, he performed some of the first experiments looking at critical phenomena of a magnetic phase transition, namely that of iron. He also participated in the first measurements of crystal-field levels in some rare earth compounds.

Larry's greatest achievement was demonstrating that one could use neutrons to study thin films adsorbed on substrates. A leading theorist thought this was an impossible task, since the signal would be too weak and difficult to separate from the substrate, but Larry persisted and his approach of using high surface area powders such as graphite and MgO to enhance the signal made the experiments successful. Not only could he determine a number of single and multiple-layer film structures, and establish their relationship to the underlying surface structures, but he could explore the film dynamics as well. These experiments opened up a new area of research that was soon taken over by the synchrotron X-ray community.


In addition to his accomplishments in basic science, Larry had a strong interest in neutron instrumentation. Early in his BNL career Larry

worked at the Brookhaven Graphite reactor and established that neutrons of only one spin orientation are absorbed by helium-3 nuclei. This early research paved the way for the development of polarized helium-3 gas as a neutron polarizer and analyzer. He also inspired the development of composite neutron monochromators that are currently employed in high-resolution studies of crystal structures, and improved methods of producing polarized neutron beams. He and his collaborators were also the first to develop neutron-reflecting multilayer films composed of alternating magnetic and non-magnetic layers, and showed that they are efficient low-energy neutron polarizers and analyzers. His last instrumentation effort was in leading the performance calculations in designing HYSPEC, the Brookhaven-inspired novel instrument currently in high demand at the SNS facility at Oak Ridge.

Those who visited Larry's office at Brookhaven may remember that it was labelled "Laundry and Morale Office". That is a reference to the 1955 movie *Mister Roberts* about a U.S. cargo ship near the end of WWII, where junior crew members struggled to avoid conflicts with a harsh captain during challenging events. At Brookhaven, Larry always provided much-appreciated support to junior scientists.

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