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Prize for a Faculty Member for Research in an Undergraduate Institution (2021): Research and Teaching with Cold Neutrons[1]

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Cold neutrons make an ideal laboratory for several areas of physics. On the fundamental side, the direction of neutron beta decay products can be directly compared to theory without the complication of nuclear structure. Angular correlations between the decay products can test the standard model, time reversal invariance, and the unitarity of the CKM matrix. On the more practical side, spin-polarized neutron beams can be scattered off materials to probe magnetic structures. The ability to polarize neutron beams using polarized ^{3}He has come a long way toward becoming a standard option in neutron scattering. Working with neutrons involves a wide variety of techniques, giving students an accessible way to see the interplay between their theory courses and tightening bolts. I will walk through select experiments from the fundamental physics beamlines at the NIST reactor with an emphasis on student contributions and learning opportunities.

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