MONTANA STATE UNIVERSITY | College of Letters & Science — Physics Colloquium

Friday, December 2nd
4:10 – 5:00 PM
Barnard Hall 103

Quantum Science at Idaho National Laboratory

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Abstract:

The concept of strongly correlated topological insulators is very appealing not only because the surface states, protected from backscattering by time-reversal symmetry, may have massless charge carriers with locked helical spin polarization, but also because the surface of such a correlated system may host non-trivial electronic structure, not present in band insulators. While many of these effects are well understood in d- and 4f-electron systems, the role of 5f electrons in the formation of topological states remains unclear. For instance, in 5f systems strongly correlated electrons may give rise to a larger Kondo gap; and consequently, will reduce the deleterious impact of defects or impurities and, at the same time, increase the Fermi velocities of the topological surface states. Topological phases, especially those governed by strong spin-orbit interactions, will be crucial for the realization of next-generation quantum technologies. Therefore, of particular interest is the realization of quantum effects in systems such as actinides, where spin-orbit interactions are the strongest. During the talk, I will present our recent results on; (i) correlated magnetism and strong spin-orbit interactions in antiferromagnetic Mott-Hubbard insulator, uranium dioxide; (ii) magnetotransport in Kagome systems $(Ho,Er)Mn_6Sn_6$; and (iii) our search for topological characteristics in novel transuranium-based systems. I will also present our new initiatives toward quantum sciences, especially our newly established Center for Quantum Actinide Science and Technology (C-QAST).

Host: Nick Borys

**** Refreshments served in the Barnard second floor atrium at 3:30 p.m. ****