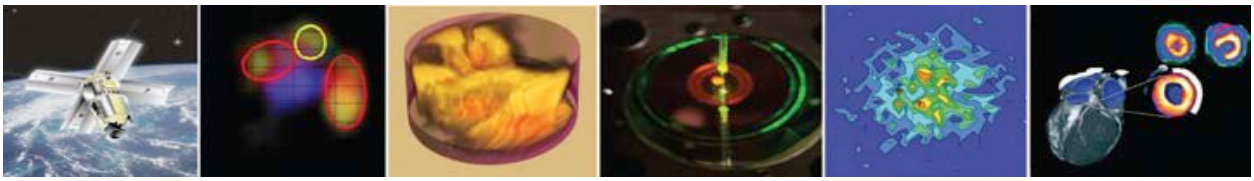

Science of Signatures
Advanced Studies Scholars Program 2014

Speaker: Michelle Espy, P-21 Applied Modern Physics

Title: Building a Research Program Within a National Laboratory Setting: A Completely One-sided View.

Abstract: Having spent an entire career at Los Alamos (from graduate student on), this talk will focus on one person's experience entirely from within this system. The talk will first cover the underlying science of SQUIDs, bio-magnetism for studying the human brain, and the methods of ultra-low field nuclear magnetic resonance (NMR) and magnetic resonance imaging (MRI) applied to diverse research areas from brain studies to looking for hidden bombs. With this background, we can then cover the topics of: what it has really been like as a scientist in a national lab; what has worked in terms of developing and growing successful research projects and what hasn't; dealing with success and failure; and techniques for operating inside a dense bureaucracy.

Bio: Dr. Michelle Espy grew up in Southern California, received her B.S. in Physics from U.C. Riverside, and her Ph.D. in experimental nuclear physics from the University of Minnesota (which is much colder than Southern California). After completion of her PhD she devoted herself to the application of nuclear physics techniques to biomedical research. She began work as a Director's Funded Postdoctoral Fellow at Los Alamos as part of the P-21 "SQUID" team. Her research was focused on developing instrumentation for measuring the weak magnetic signals from the human brain (magnetoencephalography or MEG), primarily based upon the novel application of superconducting quantum interference devices (SQUIDs). After conversion to a LANL staff position Michelle continued to work on both basic science and applied physics applications of the SQUID including: experimental development of the SQUID instrumentation component of the neutron electric dipole moment experiment; development of a new approach to biological assay based on magnetic labeling; demonstration of an MEG system based on a SQUID sensor array helmet; the new field of SQUID-based ultra-low field nuclear magnetic resonance (NMR) and magnetic resonance imaging (MRI); development of an ultra-low field NMR /MRI based

method to quantify uranium enrichment – even in challenging conditions encountered in the field; ultra-low field NMR/MRI in combination with MEG; development of a non-invasive method (based upon NMR techniques) to detect liquid explosives; and development of nuclear quadrupole resonance methods to detect concealed explosives. Michelle became team leader in 2007 and she and her team are now recognized as world leaders in the field of SQUID-based ultra-low field nuclear magnetic resonance (NMR) and magnetic resonance imaging (MRI). She has over 55 publications since her PhD in 1996, 4 patents, and several awards reflecting excellence as a physicist. To top it off, she remains a pretty cool person.