Abstract: Army research in nanomaterials for sensors and photonic/electron devices encompasses a wide range of topics, including next generation electronic and photonic component employing emerging materials by design that span a range of dimensionalities from bulk to two-dimensional films, one-dimensional quantum wires, and zero-dimensional quantum dots. Critical to the understanding of these lower dimensional materials and devices is the study of their interfaces with surrounding materials and environments, including active heterogeneous interfaces involving heterostructures containing dissimilar alloys that achieve new electronic or photonic functionalities. Multiscale modeling of these emerging materials is validated using unique experimental capabilities that span the electromagnetic spectrum from ultraviolet to terahertz and mm-waves, and time scales from femtoseconds to continuous wave. In this talk, I shall give an overview of some of the novel materials and capabilities being developed/exploited for Army sensors and electronic devices at the Army Research Laboratory (ARL), including opportunities for collaboration through ARL’s Open Campus concept, and within this context provide specific examples involving unique ultrafast optical studies of wide bandgap semiconductor nanostructures and III-Nitride/SiC avalanche photodiodes incorporating active heterogeneous interfaces.

Biography: Dr. Michael Wraback received his Ph.D. in physics from Brown University. During his tenure at ARL, he has used optical techniques to investigate coherent and incoherent excitonic optical nonlinearities and nonequilibrium electron and phonon dynamics and transport in semiconductor heterostructures and optoelectronic devices. He has also presided over research and development of semiconductor ultraviolet and visible light sources and detectors, and optical generation and detection of terahertz radiation. He has authored or coauthored more than 200 papers and presentations addressing the physics of semiconductor materials and devices and holds 13 U.S. patents. He has received the ARL Award for Scientific Achievement in 2005, and Department of the Army Research and Development Achievement Awards in 1994, 1997, 2002, 2005, and 2009. Dr. Wraback is a Fellow of the American Physical Society, the Optical Society of America, and the Army Research Laboratory, and is currently the Chief Scientist of the Sensors and Electron Devices Directorate at ARL.