An award is made to Montana Technological University to acquire, maintain, and operate an advanced electron microscope. The project's multifunctional electron microscope is a highly sensitive instrument ideal for both life sciences and materials research, and will advance interdisciplinary research, education, and outreach in Biology, Chemistry, Geochemistry, Mechanical Engineering, Environmental Engineering, and Geology. The project will strengthen PhD programs (in Materials Science and Earth Science and Engineering), enable undergraduate research, support state-wide public service and characterization performed by the campus's Montana Bureau of Mines and Geology, and inspire K-12 students and teachers served by the Clark Fork Watershed Education Program (CFWEP). The ability to capture and convey the beauty of the biological, mineral and nano-scale worlds to K-12 students will spark interest in scientific careers, increase science literacy, and has the potential to combat scientific misinformation. The project will significantly benefit state-wide outreach activities and underrepresented groups in Montana, including students from rural, economically disadvantaged areas, and Native American communities. The microscope's images will engage students ranging from Kindergarten to graduate education by visualizing and scientifically characterizing viruses, minerals, nanomaterials, environmental damage, and restoration. Exposure to these electron microscopy capabilities will increase student recruitment and retention, increase entry to science, technology, engineering, and mathematics (STEM) careers, and strengthen the STEM enterprise in Montana.

The instrument will image viruses, allow microanalysis of minerals in soils, and be used to determine where minerals are distributed in plant and animal tissues. This capability will particularly boost research in ecological restoration research by revealing bioaccumulation in plants, microbes, insects and fish. The microscope will be used to study a collection of over 100 student-discovered viruses that infect specific bacteria (Mycobacteria, Staphylococcus, and Pseudomonas). The microscope's advanced capabilities will probe structural and chemical features of nanoparticles and devices fabricated using electrospinning. The microscope will illuminate the role of synthetic nanoparticles on infection processes of many viruses, including phages, Herpesviruses, and papillomaviruses, by imaging the physical interactions of nanoparticles, virus, and host cells. The microscope's energy dispersive x-ray spectroscopy (EDX) capability will strengthen environmental characterization, such as analyzing sediments collected from hot springs and other geothermal features, detecting and imaging environmental metal contaminants, and analyzing metals and other elements in virgin ores and contaminated slurries associated with a legacy of mineral extraction, reactive metallurgy, and stream and soil restoration activities within a local Superfund site.