Research Development Fund – Fall FY16 Cover Page Template
SUBMISSION DEADLINE: September 15, 2015 at 12 noon CDT to rdf@tamu.edu
(All cover pages will be posted for the campus community to view at http://rdf.tamu.edu/abstracts)

Proposal Title: Enhancing *in situ* Microscopy for Nanoscience and Nanotechnology at TAMU

Lead contact(s):
Name: James Batteas and Andreas Holzenburg
Department(s): BICH**,** BIOL, CHEM, MSEN
Email address: batteas@tamu.edu and holzen@tamu.edu
Phone number: 979-458-2965 (JB) and 979-845-1164 (AH)

Key Participating units: COS, COE/TEES, Geosciences, AgriLife

Anticipated Request Amount ($): $1.98 M

Executive summary of the intended proposal. This proposal is aimed at addressing core infrastructure needs for enhancing *in situ* microscopy tools for nanoscience and nanotechnology at TAMU. Recent investments have significantly advanced our electron microscopy capabilities on campus, however key missing elements to our materials analysis suite include *in situ* tools for examining the local mechanical/structural/chemical properties of materials on the nanoscale, and down to the atomic scale. These include tools for probing changes that occur in materials under strain, as well as tools for *in situ* nanoscale IR spectroscopy. Here faculty across the COE and COS are seeking 3 *in situ* tools for nano-indentation and tensile testing. To be outfitted across two SEMs and one high resolution TEM, to provide the ability to examine on the atomic scale concomitant structural and mechanical changes in materials under strain. These types of measurements are key to addressing new materials design in numerous areas from corrosion to biomedical implants, to engines, to the aerospace industry, and would strongly support recent new faculty hires in MEEN, PETE, CHEM and MSEN. We have significant research expertise in these areas, and the acquisition of these tools will elevate the researchers at TAMU to the top level. Moreover, these capabilities are not available at nearby institutions, making these resources regionally important.

Other tools that have been emerging as an increased need at TAMU, include enhanced facilities for high spatial resolution chemical mapping and imaging tools in dedicated BSL2 labs. Absent for example is a dedicated atomic force microscope (AFM) geared to the life sciences. Also, our materials and life sciences research groups would greatly benefit from a combined IR-AFM system to afforded both structural and chemical mapping in non-vacuum environments. Here we propose that two dedicated systems be acquired that can allow for these types of studies. One will be placed in the MIC in a dedicated BSL2 environment, and the other in the new MCF scanning probe microscopy suite. Both of these tools will have a wide user base supporting not only materials science and chemistry in COE/TEES, COS, and Geosciences, but also AgrilLife and the HSC.

Alongside these enhancements, core infrastructure upgrades will also be requested, specifically with an eye toward updating our EM user interfaces, and strengthening our EM sample preparation. Additional *in situ* and cryo-EM preparative and imaging capabilities (along with an experienced technician) are essential needs for high end characterization of nanostructures for soft materials being sought by our users. The requested instruments and staffing will be integrated into the existing MCF and MIC cores, whereby the existing facilities infrastructure is already in place to ensure apt access and maintenance of these tools. Between these two facilities, more than 500 users are supported on campus along with a host of outside industrial users, making these capabilities available to a wide audience.