**Research Development Fund – SPRING 2020**
**SUBMISSION DEADLINE: Monday – April 27, 2020 at 12 noon CDT to rdf@tamu.edu**

**Application Title: Upgrade of the Cryo-EM Capability in the Microscopy and Imaging Center (MIC)**

**Lead contact for RDF Application:**
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**Key Participating Units:** Microscopy and Imaging Center: Kristen Maitland, Avery McIntosh, Anindito Sen, Tom Stephens, and current MIC PIs.

**Anticipated Request Amount ($): $2,061,524.18**

**Executive summary of this application to utilize Research Development Funds:** This application is focused on improving our cryo-electron microscopy capability by adding a cryo Focused Ion Beam Scanning Electron Microscope (cryo-FIB-SEM) and upgrading 3 rooms to Biosafety Level 2 (BSL-2) forming a cryo imaging section within our facility that will encompass cryo sample preparation, the existing cryo transmission electron microscopy (TEM) and the requested cryo FIB-SEM at TAMU MIC (https://microscopy.tamu.edu/). Only cryo-transmission electron microscopy (TEM) at Biosafety Level 1 (BSL-1) is available to MIC users presently. By relocating our cryo sample preparation in with EM imaging and upgrading the space from BSL-1 to BSL-2, we will enhance the life-science research on the Texas A&M University campus. These facilities are housed within the MIC (located in the Interdisciplinary Life Sciences Building). The MIC provide critical electron microscopy resources required by TAMU PIs that support the use of advanced imaging technologies for materials and life sciences research at the nanoscale. During the past year, the MIC together has supported advanced optical and electron microscopy needs of over 160 PIs and over 420 users.

To further enhance research and graduate education performed in these facilities, we are requesting equipment: (1) to enhance biological high-resolution imaging by adding a cryo-FIB-SEM; (2) to enhance cryo sample storage and preparation with the addition of the following accessories: (a) Cressington 208HR high resolution sputter coater for FE-SEM, (b) Fischione Model 1070 NanoClean to plasma clean our sample holders for both cryo-TEM and cryo-FIB-SEM, and (c) MiTeGen cryo-EM Puck sample storage system; (3) add Gatan Latitude S&T software for necessary single particle and tomographic analysis for 3D cryo-TEM, (4) to upgrade cryo-EM instrument rooms in the MIC to consolidate space for efficient use and satisfy BSL-2 requirements including the addition of a Labconco Class II A2 biosafety cabinet. Recently, the MIC has added a new Fischione cryoholder with transfer station and a new Leica EM GP2 automatic freeze plunger to enhance cryogenic sample preparation. The proposed tools will expand capabilities of the facility, enhance the availability of advanced imaging tools, enable training of students through formal graduate courses that employ these tools, and enable BSL-2 cryo-EM high resolution imaging on campus. Existing space in the MIC will be modified using the requested funds so that no new space will be needed. The requested instrument and equipment will be integrated into the existing MIC core where the facilities infrastructure is already in place as well as the expertise to ensure access to and maintenance of these tools. Further, the facility will be available to a wide user base across campus to include the Colleges of Engineering, Agriculture and Life Sciences, Education and Human Development, Medicine, School of Public Health, Science, and Veterinary Medicine. As advanced imaging resources are critical to many individual investigator grants and have been successfully integrated into NIH shared instrumentation grants, NIEHS-funded Center and Superfund Grants, these upgrades will further enhance campus competitiveness for new funding opportunities for interdisciplinary research, particularly from the National Institutes of Health.