



MAJOR EQUIPMENT

Major equipment for Robert P. Apkarian Integrated EM Core Users

Located at two sites at Emory University's main campus, the Robert P. Apkarian Integrated Electron Microscopy Core (IEMC) provides services and training on conventional transmission electron microscopy (TEM), cryo-transmission electron microscopy (Cryo-TEM), single particle cryo-electron microscopy (SP-Cryo-EM), cryo-electron tomography (Cryo-ET), conventional scanning electron microscopy (SEM), microcrystal-electron diffraction (microED), Focused Ion Beam – Scanning Electron Microscopy (FIB-SEM) and cryo-high resolution scanning electron microscopy (Cryo-HRSEM). The IEMC supports academic, clinical, and industry users. Its focus and technical expertise aim to generate structural data from biological and non-biological specimens to support research in basic, biomedical, and material sciences and engineering.

IEMC - Emerson Site

Transmission Electron Microscopes. The IEMC – Emerson site houses TEMs suitable for imaging biological and non-biological specimens prepared at room temperature or under cryo-conditions.

- **JEOL JEM-2200FS**, 200 kV with in-column Omega filter and phase plates (Zernike and hole-free). This field emission TEM is set up for the semi-automated acquisition of single particle cryo-TEM data, tilt series for cryo-electron tomography, and microcrystal electron diffraction data. It is equipped with two direct electron detection devices (Direct Electron DE20 and Gatan K2) for high resolution imaging and a Gatan Orius CCD camera for screening.
- **JEOL JEM-1400** 120 kV LaB₆ TEM with a Gatan US1000 CCD camera. Capable of all modes of TEM, including tomography of sectioned materials, cryo-TEM and conventional TEM. Semi-automated data acquisition (conventional and cryo-TEM, conventional and cryo-ET) is available with the Serial EM software. Minimum Dose System (MDS) by JEOL also allows for imaging of beam-sensitive samples. A beam blocker makes this instrument amenable to electron diffraction experiments.
- **Hitachi HT-7700** 120 kV TEM with Tungsten filament and AMT CCD camera. Capable of all modes of TEM, including tilt imaging and electron diffraction. A motorized goniometer allows +/- 15° sample tilting.
- **Holders for Cryo-EM** image acquisition: two Gatan 626 holders for untilted data collection and 2 Gatan 914 holders for acquisition of tilt series (tilted data).

Scanning Electron Microscope (SEM). JEOL JSM-IT700HR Field Emission SEM with secondary back-scattered electron detectors. This instrument is fitted with a JEOL JED-2300 energy-dispersive micro-analysis system (EDS) with a silicon drift detector (SDD) for elemental analysis. Capable of imaging biological samples and materials under high and low vacuum conditions.

Focused Ion Beam – Scanning Electron Microscopy (FIB-SEM). ThermoFisher Helios 5 Hydra CX to be installed in the Fall 2024. This Plasma FIB-SEM is capable of cryo and room temperature applications and has four switchable ion species: Xe, Ar, O, and N. Samples can be prepared by plunge-freezing in liquid ethane, high-pressure freezing, and metal coating. An integrated Fluorescent Light Microscope (iFLM, Delmic Meteor) system will allow Correlated



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Light and Electron Microscopy (CLEM) applications without the need for sample exchange between instruments.

Coating systems. For the application of metal films on support surfaces and samples.

- **Denton DV-602 Turbo Magnetron** Sputter system with a chromium target for metal film coating of specimens in preparation of SEM and cryo-SEM data acquisition.
- **Denton Benchtop Turbo Carbon/Gold Evaporator** for applying thin layers of carbon or gold on surfaces, SEM samples, or specimen support grids.

Two Critical Point Dryers. A Polaron CPD and EMS K850 CPD for preparation of biological samples for SEM.

Four Ultramicrotomes. For producing semithin and ultrathin sections from embedded tissues or prepared materials at room temperature or under cryo conditions. Three ultramicrotomes for room temperature ultrathin and semithin sectioning of resin embedded samples (Leica UC6, Leica Ultracut S, and RMC Power-Tome PC). One cryo-ultramicrotome (Leica UC6i/FC6) for sectioning under cryo conditions.

BALTEC HPM 010 High Pressure Freezing machine for preparing frozen specimens including thick samples and monolayer cell cultures.

Leica AFS Cryo-Substitution apparatus designed for dehydration and fixation of cryo preserved specimens followed by gradual temperature increase and resin embedding.

ThermoFisher Vitrobot Mark IV for plunge freezing aqueous solutions and cell suspensions in liquid ethane or propane for cryo-TEM or cryo-ET data acquisition.

Quorum GloQube Plasma Cleaner to prepare support films by glow discharging for conventional and cryo electron microscopy. This instrument hosts a separate chamber for special treatment of support films under various gas environments

Imaging Data Processing and Analysis. 3 iMac workstations with Microsoft, Adobe, ImageJ, and IMOD software packages. Other image processing software packages installed as needed.

IEMC - Biochemistry Connector Site

Two Transmission Electron Microscopes. The IEMC – Biochemistry Connector site houses TEMs suitable for imaging biological and non-biological specimens at room temperature and under cryo-conditions.

- **FEI Talos Arctica (200 kV)** with Bio-Quantum/K3 direct electron detector and Autoloader system. This instrument is suitable for cryo-grid screening and automated high throughput collection of high-resolution single particle cryo-EM data.
- **FEI Talos L120C (120 kV)** with LaB6 and 4k CETA detector for negative stain and cryo-grid screening.
- **Holders for Cryo-EM** image acquisition: Gatan 626 and Gatan ELSA cryo-transfer holders



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ThermoFisher Vitrobot Mark IV and CP3 Plunger- Gentle blot (Model 930) for plunge freezing aqueous solutions and cell suspensions in liquid ethane or propane for cryo-TEM or cryo-ET data acquisition.

Denton Benchtop turbo Carbon Evaporator for Carbon coating of grids.

Plasma cleaning systems to prepare support films by glow discharging for conventional and cryo electron microscopy. These systems include a Solarus Plasma Cleaning System (Model 950) for cleaning of grids and sample holders and a Pelco Easy glow for glow discharge.

Imaging Data Processing and Analysis. Through a direct connection with an SBGrid-supported, TensorEX, 4 GPU, Linux workstation, users can access structural biology processing software including single particle, tomography and x-ray crystallography applications.