

## Job Description

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<b>Job Title:</b>	Senior Facility Microscopist
<b>Department:</b>	Office of Research
<b>Reports To:</b>	Director, Quantum-Nano Core Fabrication and Characterization Facility
<b>Jobs Reporting:</b>	None
<b>Salary Grade:</b>	USG 11 – 37.5
<b>Effective Date:</b>	June 1 <sup>st</sup> 2023

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### **Primary Purpose**

The Senior Facility Microscopist is a professional level staff person, primarily responsible for the operation and management of a suite of electron microscopy tools (including FIB and S/TEM) that are managed by the Quantum-Nano Core Fabrication and Characterization Facility (QNFCF). This person is responsible for consulting with prospective and current equipment users, generating necessary documentation, performing equipment training and when necessary performing sample microscopy and analysis tasks in order to enable efficient use of the electron microscopy tools. Furthermore, as primary operator of FIB and S/TEM systems this person is responsible for front line troubleshooting and maintenance of these systems. The ultimate purpose of this position is to enable the QNFCF to leverage this suite of electron microscopy tools to enable cutting edge research in the fields of nanotechnology and quantum computing.

### **Key Accountabilities**

#### **Operation and maintenance of equipment and lab spaces**

- Ensure that equipment is operating to specification by employing processes to monitor equipment performance and conducting or overseeing routine maintenance and diagnostics.
- Manage process of remedial action/repairs when significant degradation in equipment performance is uncovered.
- With guidance from Director: Establish, maintain and enforce policies for equipment operation and handling of materials. This accountability to be accomplished within the larger QNFCF policy and governance framework.
- Maintain an inventory of parts and supplies specific to S/TEM and FIB operation.
- Consult and negotiate with local equipment technicians and remote vendor engineers to assist during repairs and preventative maintenance work and validate work through process testing.
- Oversee and enforce the proper use and disposal of all chemical and/or hazardous materials in accordance with University waste procedures.

#### **Lab member guidance, consultation and training**

- Assist in the preparation and delivery of lab member orientations through virtual or in-person means.
- Establish, maintain and conduct S/TEM introductory seminar(s) as needed. The purpose of this seminar is to provide theoretical and practical, hands-on instruction to new S/TEM users.
- Manage the process of training new lab members in the operation of highly advanced electron microscopy equipment such as FIB-SEM and S/TEM.
- Manage documentation repository for FIB-SEM, S/TEM and other supporting equipment for electron microscopy labs.
- Instruct new lab members in health and safety protocols for electron microscopy labs.
- Enforce all health and safety guidelines in accordance with UW and facility protocols.

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- Meet with new lab members to determine electron microscopy needs. Provide relevant information regarding equipment capabilities and established techniques (both for electron microscopy tools and supporting sample preparation tools) so that new lab members can set reasonable expectations and achieve them in a timely manner.
- Define the process for and lead the review of newly proposed samples and analyses to determine feasibility in the QNFCF electron microscopy suite and ensure that equipment is protected from the risks of damage or contamination.
- Provide hands-on training/qualification for new lab members on all pieces of electron microscopy equipment.
- Provide demonstrations as needed to educate lab members and ensure optimal equipment use.
- Document standard operating procedures for FIB-SEM, S/TEM and other supporting equipment for electron microscopy labs.
- Serve as “resident expert” in all areas of electron microscopy. This entails self-directed learning and practice in order to master the advanced features of the facility’s electron microscopy equipment. Documenting and disseminating the results of these learnings are imperative in enabling the QNFCF community to make excellent use of this equipment.
- Develop and disseminate standard processes or recipes for common electron microscopy related tasks.
- Serve as primary contact to consult with QNFCF electron microscopy lab members regarding failed, or non-optimal results in various electron microscopy tools.
- Serve as primary contact to assist QNFCF electron microscopy lab members in interpretation of analysis results.

### **Electron Microscopy Capability Development**

- Keep up to date with advancements and changes in electron microscopy capabilities and bring these to the attention of the QNFCF community.
- Evaluate these capabilities and where feasible apply them to existing QNFCF electron microscopy equipment for the benefit of the QNFCF community.
- Interact with equipment vendors to implement or develop new electron microscopy techniques.

### **Electron Microscopy Service**

- Manage the process for taking in and responding to service requests from local and remote QNFCF lab members.
- Perform electron microscopy service work for local and remote lab users as needed. This may include but is not limited to: Mechanical sample preparation, TEM lamellae fabrication and lift-out with FIB, Scanning Electron Microscopy with EDS, Scanning/Transmission Electron Microscopy (Bright field, HAADF, Selected Area/Convergent Beam Diffraction, FFT analysis, Weak Beam DF, S/TEM EDS and EELS spectroscopies).

### **Reporting**

- Produce reports, presentations (technical and administrative) detailing facility operations and capabilities.
- Provide technical expertise to assist in planning for future electron microscopy and metrology acquisitions.

*\*All employees of the University are expected to follow University and departmental health and safety policy, procedures and work practices at all times. Employees are also responsible for the completion of all health and safety training, as assigned. Employees with staff supervision and/or management responsibilities will ensure that assigned staff abide by the above, and actively identify, assess and correct health and safety hazards, as required.*

### **Required Qualifications**

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### **Education**

- Ph.D. in a related area of materials science, nanotechnology, chemistry, physics or engineering or Master's degree with equivalent experience.

### **Experience**

- Three to five years experience in the hands-on application of transmission electron microscopy (TEM) to the characterization of micro/nanomaterials, thin films or semiconductor devices.
- Experience with electron spectroscopies such as EDS and EELS is highly desirable.
- Some experience preparing TEM lamellae with both mechanical and FIB/SEM techniques is essential.
- Solid, hands-on experience troubleshooting electron microscopy tools and interfacing with local and/or remote technicians to effect repairs is necessary for this role.
- Experience with scanning electron microscopy, optical microscopy, and other microscopy or materials characterization techniques is desirable.

### **Knowledge/Skills/Abilities**

- Service oriented. Exceptionally positive, diplomatic and constructive attitude as required to effectively work with a large number of people with a broad range of experience, educational and cultural backgrounds both within and outside the university.
- Practical, hands on ability to troubleshoot electron microscopy equipment and vacuum systems and effect basic repairs.
- Knowledge of the "end to end" process for transmission electron microscopy, starting at sample preparation and concluding with analysis of electron micrographs or other data output by TEM.

### **Nature and Scope**

- **Contacts:** Internal contacts include QNFCF team members, UWaterloo staff, faculty members, graduate students, co-op students and post docs. External contacts include other microscopy professionals, suppliers, customers, and visitors. The incumbent routinely obtains, clarifies and discusses information and problems with both internal and external contacts.
- **Level of Responsibility:** This position is responsible for helping to maintain the performance of highly valuable equipment in the QNFCF electron microscopy labs. This requires regular proactive testing of equipment and timely responses to issues that are noted by our community of lab members. This position is ultimately responsible for maximizing the value that lab members receive when using our advanced electron microscopy equipment. The position entails initial supervision of lab users (graduate students, post-docs) until they have reached a sufficient level of proficiency. The job has defined highly-specialized work with minimal supervision and provides guidance to many others in the lab.
- **Decision-Making Authority:** The incumbent is expected to work independently in carrying out all tasks under their scope. In complex or unusual situations the incumbent is expected to seek assistance both within and outside the QNFCF team as required.
- **Physical and Sensory Demands:** Extensive time may be spent sitting in front of the consoles for the FIB/SEM and S/TEM systems. Working at these consoles sometimes requires prolonged, focused observation of the monitor to ascertain focus conditions, alignments or other system parameters. In the course of receiving / shipping / installing new machine components this position may occasionally require the lifting of objects up to 40lbs.
- **Working Environment:** Much of the time is spent working in a laboratory environment in a seated position. Long hours may occasionally be called for to run a given sample or perform troubleshooting to support local/remote clients or local/remote equipment support personnel. There are deadline pressures, while at the same time there is a demand for thoroughness, accuracy and acute attention to

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detail. Much of the work can be accomplished sitting in a comfortable position with frequent opportunity to move about.