

Attendees to this

### **FIVE-DAY WORKSHOP**

build their own atomic force microscope and learn how to operate it. Additionally, daily seminars provide attendees with training on the theory, operation and applications of an atomic force microscope.

Each day begins with one to two hours of coursework followed by hands-on microscope assembly, testing and operation.

Attendees of the TT-AFM Assembly & Operation workshop:

- A** **Are better able to operate**, gain optimal performance, and obtain the best images from their AFM.
- B** **Can repair the microscope** whenever needed because they know the assembly process and all the parts used in its construction.
- C** **May easily modify their instrument** to create unique instrumentation designed for their specific research applications.

## THE AGENDA

for the **5 day TT-AFM Assembly & Operation Workshop**



### MONDAY

#### Morning

**Introduction to Atomic Force Microscopes:** This seminar includes the history of AFMs and explains why they are unique instruments that have enabled major innovations in nanotechnology. Detailed animations help present the operating principles of an AFM.

#### Afternoon

**Assemble AFM Subcomponents:** Assemble the XYZ Piezo scanner, Build AFM stage.



### TUESDAY

#### Morning

**AFM Design:** Key design elements of the AFM are presented. This includes the rationale for selecting mechanical as well as electrical components in the AFM. A detailed explanation of light lever alignment follows.

#### Afternoon

**AFM Operation:** Each step required for gaining images from the AFM is discussed. This includes sample preparation, instrument setup and SPM Control software operation.

The AFM light lever is assembled, tested, and integrated into the AFM stage. By the end of the day the entire microscope is assembled and ready for testing.



### WEDNESDAY

#### Morning

**High Resolution Scanning with an AFM:** The techniques that must be used to achieve image resolutions below 1nm are presented. This includes control of external vibrations, using the correct probe, optimizing scan parameters, and achieving a good probe approach.

#### Afternoon

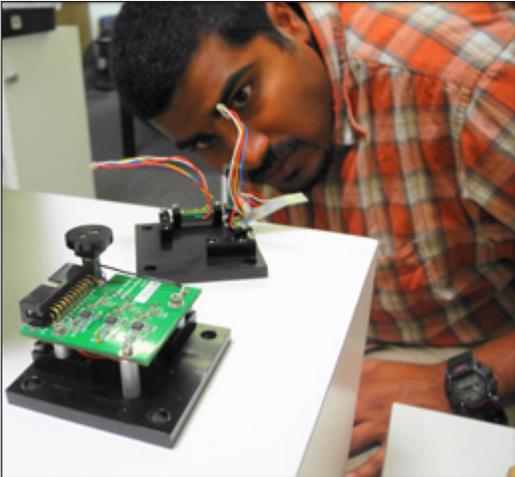
**Misc. Topics:** Topics covered in this seminar include probe selection, imaging in controlled environments, AFM scanning modes, and the factors required to establish AFM image resolution.

Final adjustments are made and the instrument is fully functional. Students practice vibrating and non-vibrating modes of operation.

## THE AGENDA

for the **5 day TT-AFM Assembly & Operation Workshop**

*continued...*



### THURSDAY

#### Morning

**AFM Image Artifacts:** As with any microscope, AFMs can produce unwanted artifacts within images. This morning's talk covers the most common image artifacts as well as their source. Examples of each type of artifact are presented.

**Gwyddion image analysis software:** After an AFM image is captured, the TT-AFM uses Gwyddion software to process, display and analyze the image. The key functions of Gwyddion software are presented and demonstrated on an AFM image.

**Probes-Cantilever:** How to choose the right one for various types of samples.

#### Afternoon

**System Certification:** This brief presentation covers the performance standards that are required to certify the AFM before it is shipped.

Attendees master measuring images in topography modes, learn to calibrate the AFM, and learn to measure LFM and phase images. Additionally, workshop attendees practice the techniques required for high-resolution imaging, such as scanner gain control and probe approach.



### FRIDAY

#### Morning

**Open Discussion:** Any additional topics attendees wish to discuss are addressed.

The AFM is fully certified to the appropriate standards. Once specifications are demonstrated, the AFM is packaged for shipment.