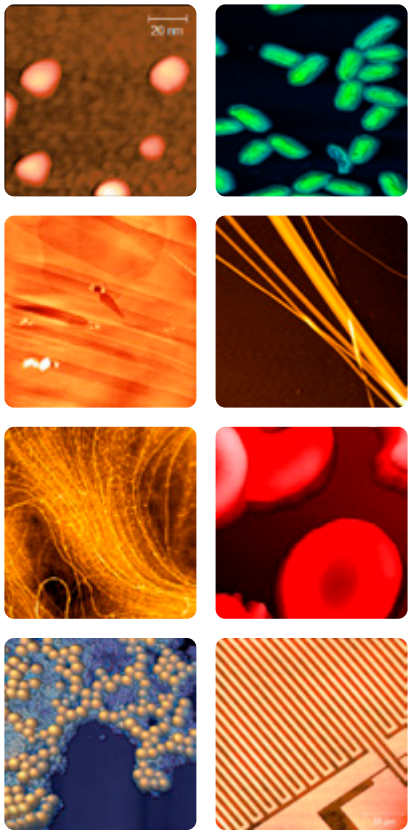
B-3 AFM

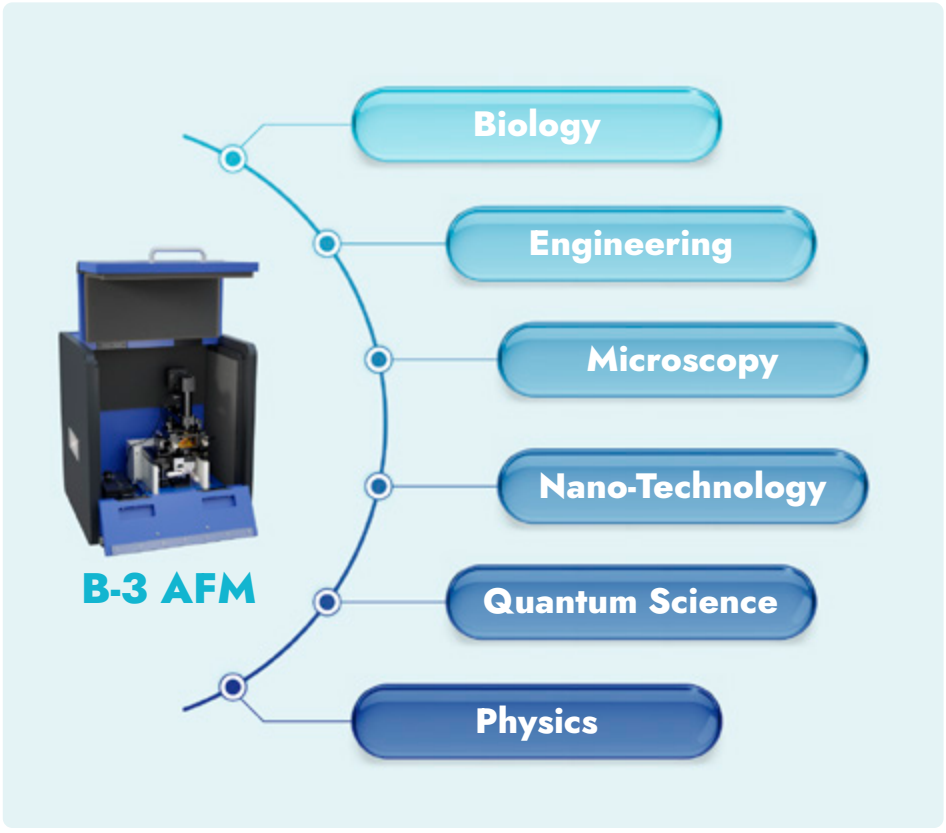
Atomic Force Microscope for Advanced Science Education Programs

Help your students visualize the world at the nanoscale! The **B-3 AFM** from AFMWorkshop provides a rare opportunity for students to gain hands-on operation of a cutting-edge microscope.

With a B-3 AFM in your school, students can:

- Develop advanced hands-on microscopy skills and an appreciation for micro and nanoscale imaging
- Participate in award-winning research projects
- Gain a solid foundation for technical careers and/or higher education in STEM
- Learn about nanotechnology and other advanced scientific concepts





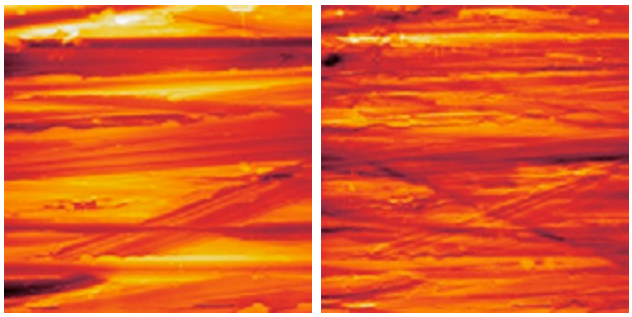
PREPARING FOR THE FUTURE

An effective method to prepare your students for careers in STEM is through providing hands-on experience with scientific tools, such as an atomic force microscope (AFM). The **B-3 AFM** provides an affordable and easy entry into the world of probing and imaging surfaces, forces, and objects that are unsuitable for standard optical microscopes. Atomic force microscopy provides a strong interdisciplinary foundation for more complex characterization techniques such as scanning tunneling, and scanning electron microscopy.

Hands-on Learning

Students will increase their understanding of:

- Conceptual and experimental designs of scanning probe and atomic force microscopy
- Using a computer-controlled instrument to image surfaces and objects that are too small for optical microscopes
- Changing software parameters to control and improve image quality
- How sample surfaces can be probed, measured, and imaged.
- Using micro tools and performing tasks like sample mounting, cantilever tip exchange, keeping samples clean and dust-free



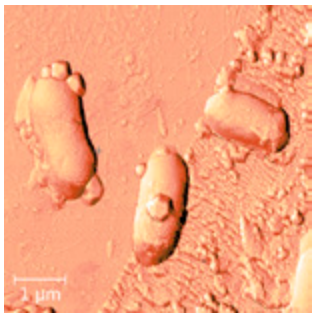
Copper foil, smooth and sanded

Developing Valuable Skills

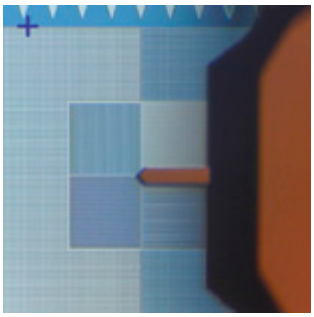
Students will gain valuable skills for STEM careers in fields such as:

- Quality Control
- Failure Analysis
- Metrology and Tribology
- Scientific Research
- Environmental Science
- Nanotechnology

With exposure to AFM, a Nobel Prize-winning technology, students can gain skills that will facilitate their preparedness for advanced challenges in STEM careers and education.



E. coli bacterial cells



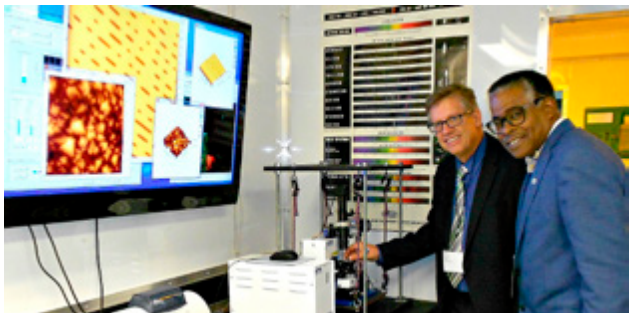
Video microscope image of a Budget Sensors test pattern. The size of the outer box is 1 x 1 mm. The cantilever is 35µ wide and 125µ long.

NANOTECHNOLOGY

The atomic force microscope is credited with the birth of nanotechnology and its inventors won the 1986 Nobel Prize. Measuring and visualizing nanostructures is at the foundation of the nanotechnology revolution. Scientists and engineers in the field of nanotechnology are developing amazing innovations in all disciplines of science and technology, medicine, electronics, and so much more. And now your students can be part of this revolution!

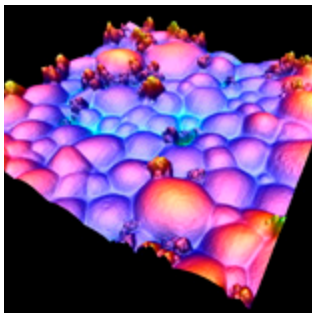
The AFMWorkshop Advantage

AFMWorkshop developed the first truly affordable, quality AFMs beginning in 2010. Since then over 300 AFMWorkshop AFMs have been installed around the world. In the USA, prestigious universities such as MIT, UC Berkeley and Stanford chose our product to use as a tool to teach their students. The University of Michigan has 4 AFMWorkshop AFM units and has taught over 1000 students with our products. We understand that an AFM for education needs to be robust, easy to use, and involve very low maintenance costs.

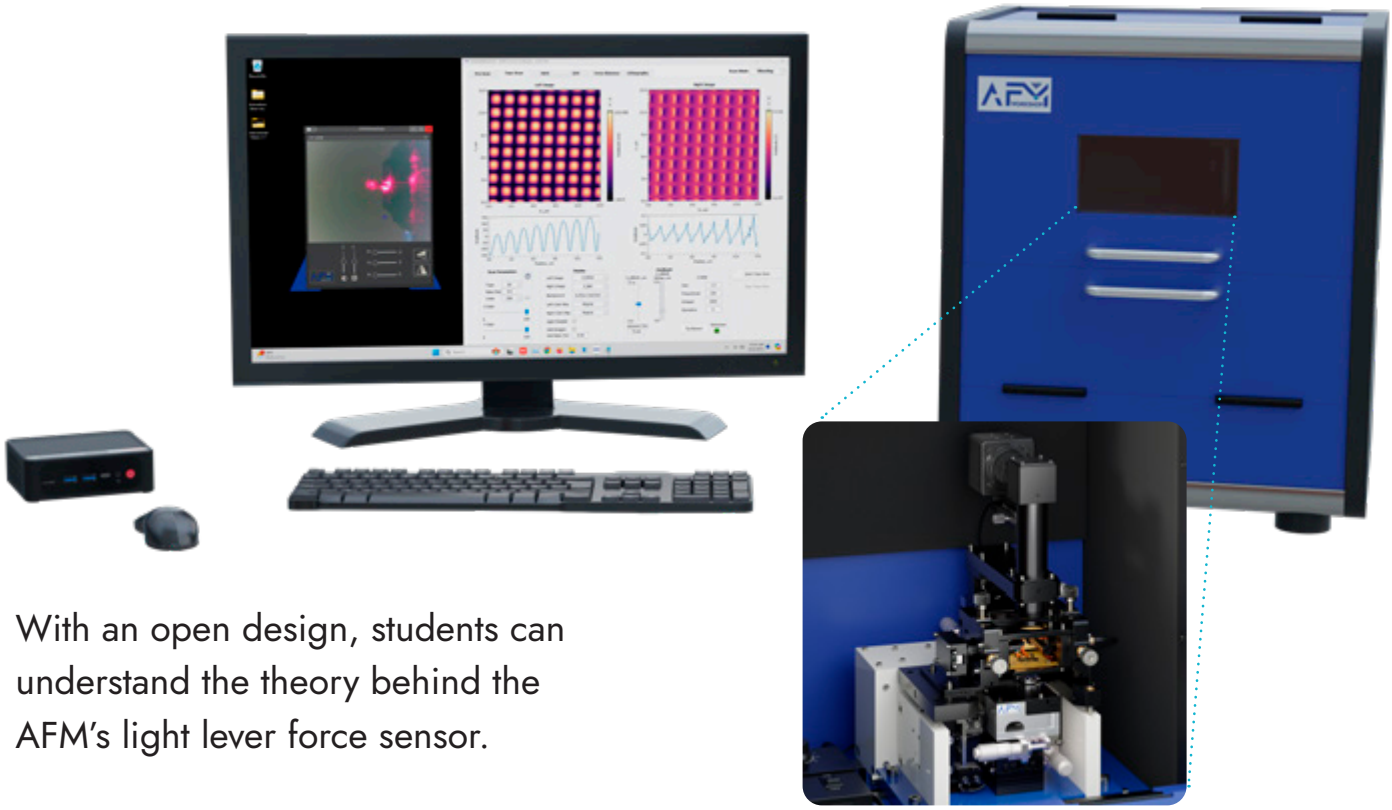


Dr. Paul West, AFMWorkshop and Dr. Gary Harris (1953-2020), Howard University, on Howard's "Nano Express," a mobile learning unit exposing thousands of young people to the Nano world every year.

We Are Here To Help



We understand that purchasing an AFM is a major decision. AFMWorkshop is here to help as your partner in educating your students about the nano-world. We aim to support you as an educator while you learn more about this exciting technology along with your students. We will guide educators through learning the concepts with instrument tutorials, application briefs, and teaching materials for a strong educational program.



With an open design, students can understand the theory behind the AFM's light lever force sensor.

The B-3 AFM comes with everything you need to start imaging surfaces with students at your school. Accessories with the unit include:

- Light Lever Force Sensor
- Video Optical Microscope
- Noise and Vibration Reducing Enclosure
- Piezoelectric Scanner
- Computer with easy-to-use software
- Probes and Probe Exchange Tools

Installing the B-3 AFM is as easy as setting the unit on a sturdy table, plugging it into a socket and attaching a USB to the control computer.

Specifications

Piezo Scanner	50 µ x 50 µ x 17 µ
Z Noise Floor	< 0.3 nm
Sample Size	< 1 x 1 x 0.25"
XY Sample Stage	0.5 x .5" (2 micron resolution)
Software	AFMControl
Computer	Windows 11
Modes	Vibrating, Non-vibrating, Phase, Lateral Force

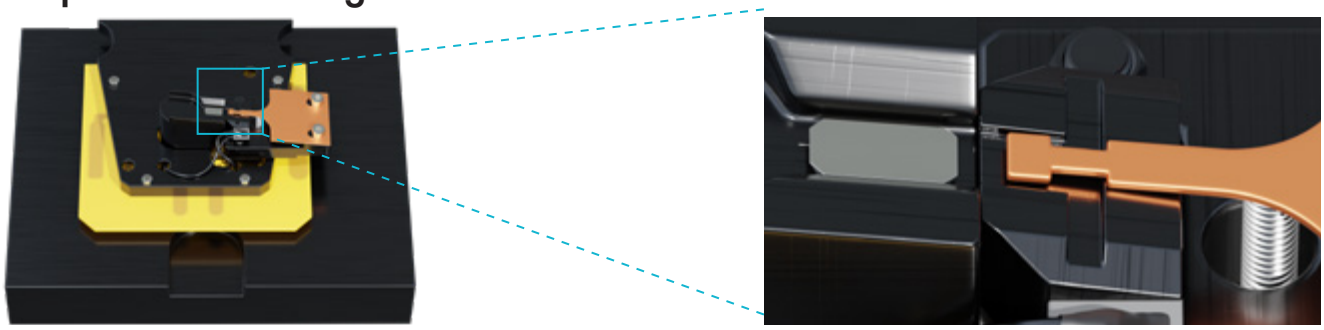
PROBE HOLDER/EXCHANGE

The **B-3 AFM** utilizes a unique probe holder/exchange mechanism. Probes are held in place with a spring device that mates with a probe exchange tool.

This combination makes changing probes fast and easy on the **B-3 AFM**.

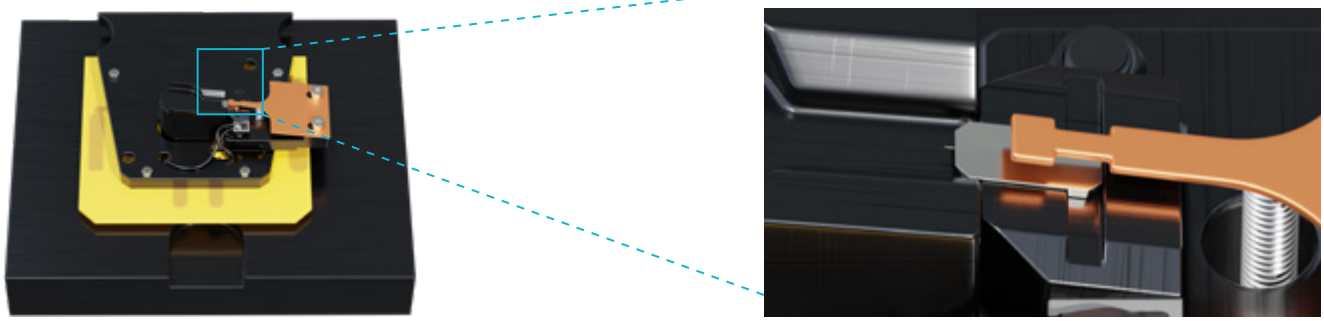
STEP 1

Put probe on exchange tool



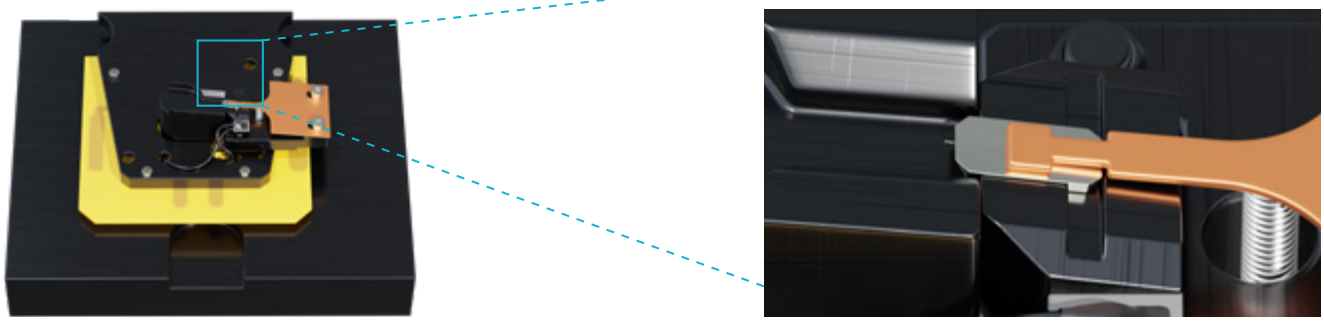
STEP 2

Press down and slide probe into holder



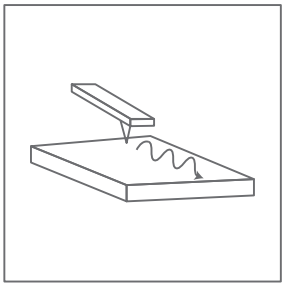
STEP 3

Release spring



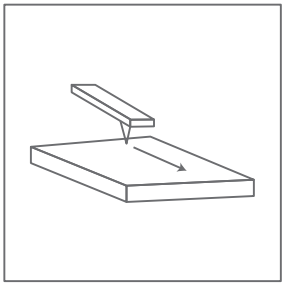
SCANNING MODES

The **B-3 AFM** includes the MOST COMMONLY USED AFM MODES. They are:



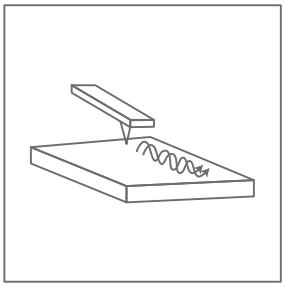
VIBRATING (TAPPING)

Vibrating mode imaging is the most commonly used mode for measuring topography images with an AFM. In vibrating mode the vibration amplitude of the probe is held constant during a scan. Adjustable parameters include the vibrating frequency, amplitude of vibration, and the amount of dampening of the vibrating probe.



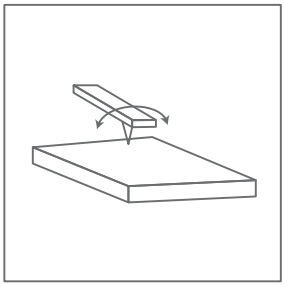
NON-VIBRATING (CONTACT)

In non-vibrating mode, commonly called contact mode, the deflection of a cantilever is held constant during scanning. This mode is often used for scanning in liquids and is also used for measuring force-distance curves.



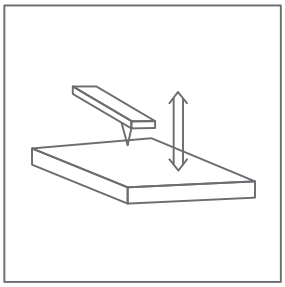
PHASE

Phase mode images are measured in vibrating mode and are useful for identifying different areas of hardness on a surface. The technique operates by measuring the phase change caused by differing materials on a surface while scanning.



LATERAL FORCE (LFM)

Lateral force mode measures the local friction a probe senses as it is scanned across a surface. The friction can be caused by surface texture and differing chemical composition.



BASIC FORCE/DISTANCE

Force-Distance curves measure the deflection of a cantilever as it interacts with a surface. Force-Distance measurements monitor such surface parameters as: Adhesion, Stiffness, Compliance, Hardness, and Contaminate Thickness. This simple AFM module allows measurements of force-distance curves. It can be upgraded to the Advanced Force-Distance module (see below).