

The MFP-3D-CF™ Combined Confocal/Atomic Force Microscopy System

Advance your research by combining the power of confocal imaging with the resolution of Atomic Force Microscopy (AFM).

For years, biologists have turned to laser scanning confocal microscopy for 3D functional imaging within thick samples such as cells or tissues. AFM also uses a scanning process to form an image, but is not limited by the wavelength of light. Now you can bring these complementary technologies together with the MFP-3D-CF. This new system (Figure 1) combines the powerful features of the MFP-3D-BIO with your choice of a commercial confocal microscope.

With the MFP-3D-CF, you can select a sample region based on its fluorescent characteristics, then zoom in for a high-resolution AFM scan; correlate topography with fluorescence; or mechanically stimulate your sample with the tip and measure an optical response. This powerful combination will bring new capabilities to your research.

Key Features

- Preferred platform is Olympus FV1000 with Spectral detector.
- Also compatible with Olympus FV300; Nikon C1; inquire regarding Zeiss, Leica.
- Low-noise, highly linear closed loop scanner – essential for precise registry of data.
- Infrared AFM source allows use of red fluorophores (Texas Red, Cy5). Blocking filter (included) prevents crosstalk from the AFM into confocal.
- Laser safety interlock automatically shuts off confocal lasers when AFM head is lifted.
- The isolation package includes acoustic hood with 30dB isolation and active vibration isolation platform.
- Transmitted light option adds transmission channel to confocal scans; also provides illumination for optical phase contrast.
- Extended Z-range (28µm) and BioHeater™ options recommended.



Figure 1: The MFP-3D-CF integrates the MFP-3D with the Olympus FluoView™ laser scanning confocal, shown here with the transmitted light option.

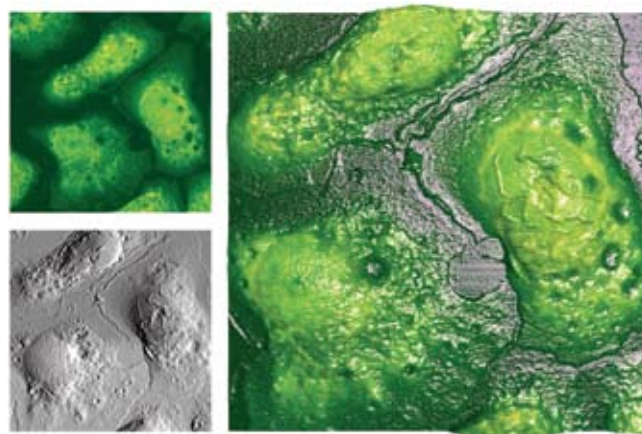


Figure 2: Fixed Mast Cell. Left, top: Confocal image of cells, 40µm scan. Left, bottom: AFM amplitude image of cells, 40µm scan. Right: Confocal data overlaid on AFM topography, 40µm scan. Courtesy of G. Liu, University of California, Davis.

Application Examples

Figure 2 shows correlation of topography and fluorescence on a sample of multicolored beads. The RGB confocal image is displayed as color overlaid on the 3D-rendered topography. Beads are easily identified by their fluorescent labels. The AFM reveals features below the confocal resolution limit, such as very small spheres and a salt crystal (foreground).

The confocal can directly image to the cantilever and tip geometry (Figure 3). This shows a maximum projection along the Z axis and X axis of a volume data set containing a Si_3N_4 cantilever. The tip location is seen precisely.

In Figure 4, the confocal was used to engage the tip precisely on 50 μm tall pollen grains. The AFM image shows fine surface detail, whereas the confocal image distinguishes the internal structure of different pollen species.

Figure 5 illustrates concurrent AFM and confocal imaging of living cells. Because the transmitted light signal is not optically sectioned, the shadow of the tip is visible even when disengaged from the surface. Transmitted light makes it easy to align the AFM tip with the confocal for imaging of a particular cell.

MFP-3D-CF is a Class 1M Laser Product

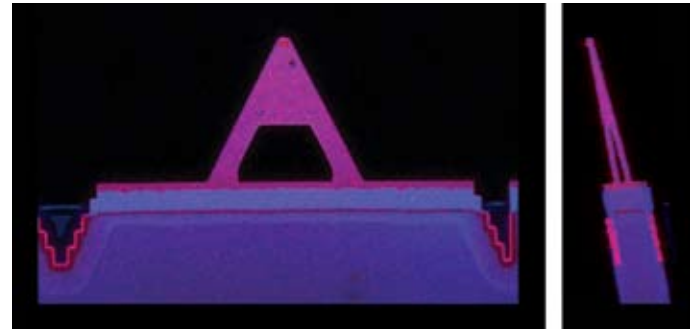


Figure 3: Olympus TR800 cantilever imaged with a Nikon C1 confocal fitted with the MFP-3D-CF. The blue indicates reflection; the red, fluorescence.

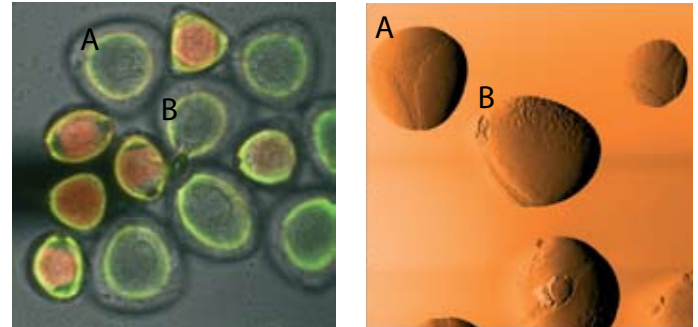


Figure 4: Mixed pollen grains imaged with Olympus FluoView 1000 and MFP-3D-CF. Left: Confocal fluorescence (red, green) with transmitted light (grayscale). Shadow of AFM cantilever is at middle left. Right: 96 μm AFM scan (amplitude channel). Due to the height of the pollen grains, only the top surfaces of the tallest grains are in range.

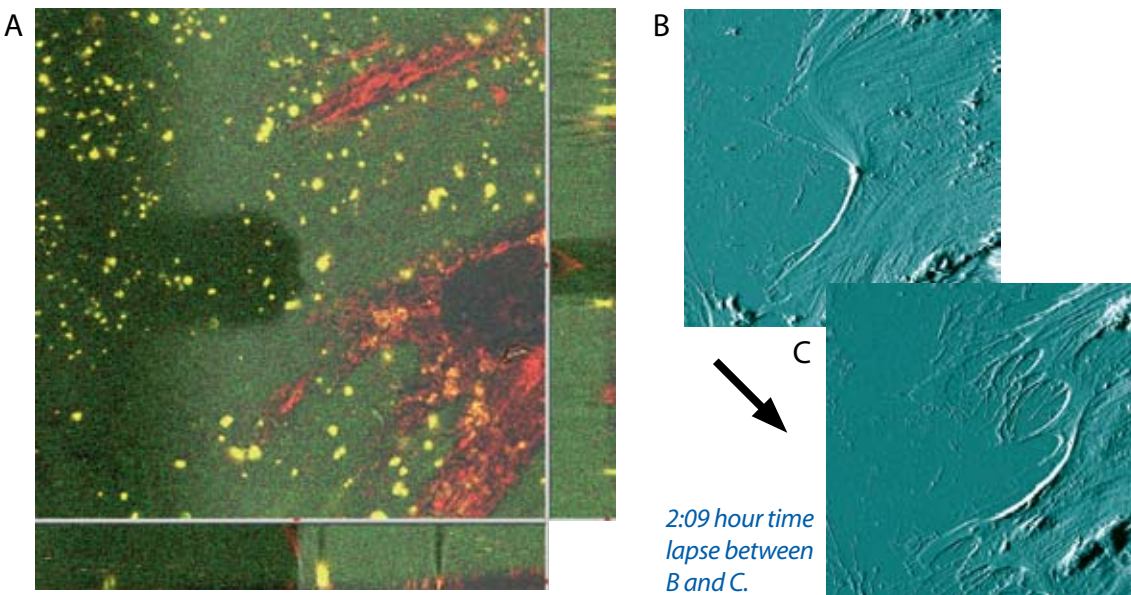


Figure 5: Living cells imaged with Nikon C1 and MFP-3D-CF.

A: Confocal fluorescence (red, green) and transmitted light (grayscale), 133 μm scan, orthogonal view.

B & C: Amplitude AFM images, 90 μm scan, taken from a five-hour sequence. Image courtesy of M. Banaszak Holl and B. Orr, U. Michigan.

2:09 hour time lapse between B and C.