Confocal and Multiphoton Facility

The Confocal and Multiphoton Facility at Iowa State University features equipment that provides both confocal and multiphoton capabilities in a single instrument. This system is one of the few instruments in the world with both a white light laser and an optical parametric oscillator (OPO).

Confocal/Multiphoton System

Confocal microscopes remove out-of-focus fluorescent light, allowing clearer imaging of the sample’s structures and components. The Leica SP5 X MP confocal/multiphoton microscope system in the Molecular Biology Building allows real-time optical sectioning of fixed and living specimens. Users easily can switch between the confocal and the multiphoton mode that allows users to image deeper into their samples than is possible with confocal systems.

New technology

New technology on the confocal/multiphoton system includes a white light laser tunable to any wavelength between 470 and 670 nm, an infrared laser, high sensitivity detectors, and an optical parametric oscillator. The system has an acousto-optical beam splitter which enables researchers to precisely set the emission wavelengths for capture, rather than be limited to preset emission ranges determined by fixed filter sets. The optical parametric oscillator expands the range of the multiphoton laser to include the red and high red ranges, enabling use of essential fluorophores such as mCherry and Alexa Fluor 660. High sensitivity detectors allow visualization of structures with low fluorescence.

Other features

The system also has a resonant scanner which enables video rate scanning at speeds up to 16,000 lines per second, a 405 laser, and an Argon laser. The system has fluorescence resonance energy transfer (FRET), fluorescence recovery after photobleaching (FRAP), time lapse, hyperspectral signal separation, colocalization, deconvolution, region of interest scanning, brightfield, and differential interference contrast (DIC). User-friendly software for 3D reconstruction is available.

Researchers can work with live cells over long time periods by using live cell equipment, including a heated stage with microcontainment or macrocontainment system, active gas regulation, cell cultivation chamber, and microinjection system.

Other Confocal Capabilities

The Nikon C1si confocal microscope operated by the Plant Sciences Institute offers excitation wavelengths of 440, 457, 476, 488, 561, and 638 nm. Capture of transmitted light images is available.

Standard confocal detection mode simultaneously captures up to three fluorescence channels and one transmitted light channel. Spectral imaging mode simultaneously acquires up to 32 channels (2.5 nm, 5 nm, or 10 nm individual channel widths) of fluorescence spectra in a single pass. Additional capabilities include FRET and time lapse.