



MACROSCOPIC SOLUTIONS

Inspiring Discovery

Macroscopic Solutions, LLC
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January 11, 2017

Background

Macroscopic Solutions, LLC is the developer and sole source provider of the Macropod Pro imaging system. The Macropod Pro is a professional digital microscope/stereoscope that performs a variety of functions including 1) high resolution, macro/micro imaging, 2) 3D scanning and modeling and 3) 1080P/high speed (60fps) video in both lab and field based settings.

The Macropod is a fully portable and automated device that is capable of capturing detailed, high resolution images for samples ranging from 1 micron to infinity (∞).

Photographic Capabilities

The primary function of the Macropod as a photographic apparatus is to create focus stacked (z-stack) images of a specimen. The apparatus includes a rigid longitudinal member having a longitudinal axis and includes translational and rotational stages that are designed to move the specimen relative to the camera mount. The translational device allows for precise positioning and panoramic style imaging. The rotational device allows for the specimen to be rotated 360° around a first axis that is perpendicular to the longitudinal axis to generate 3D movies and point clouds that can be used for 3D printing, volumetric analyses and as visual aids for research and educational purposes. The Macropod achieves all this while maintaining a compact, rigid and reliable platform that can be easily transported and carried into the field using only the provided backpack.

The Macropod includes all necessary hardware/software (with updates), 6D camera body, MT-24EX Dual Flash, 4 LWD Mitutoyo microscope objectives (100x, 50x, 20x, 10x), 1-5x 65mm stereoscopic lens, 70-200mm telephoto, 100mm macro and 24-105mm.

The provided 1-5x stereoscopic lens is best used for pinned insects, rocks, fossils, minerals, metals, plants and slides that are smaller, but not limited to, 4 cm in size (Fig 1).
Figure 1.

The long working distance (LWD) objectives resolve details 0.4 microns in size (Fig 2). Note*** 100x would be the equivalent to 1000x on a compound microscope as those manufacturers multiply the 10x eyepiece by the microscope optic.

100mm, 70-200mm, and 24-105mm lenses are also provided with this system for imaging subjects greater than 4cm in size.

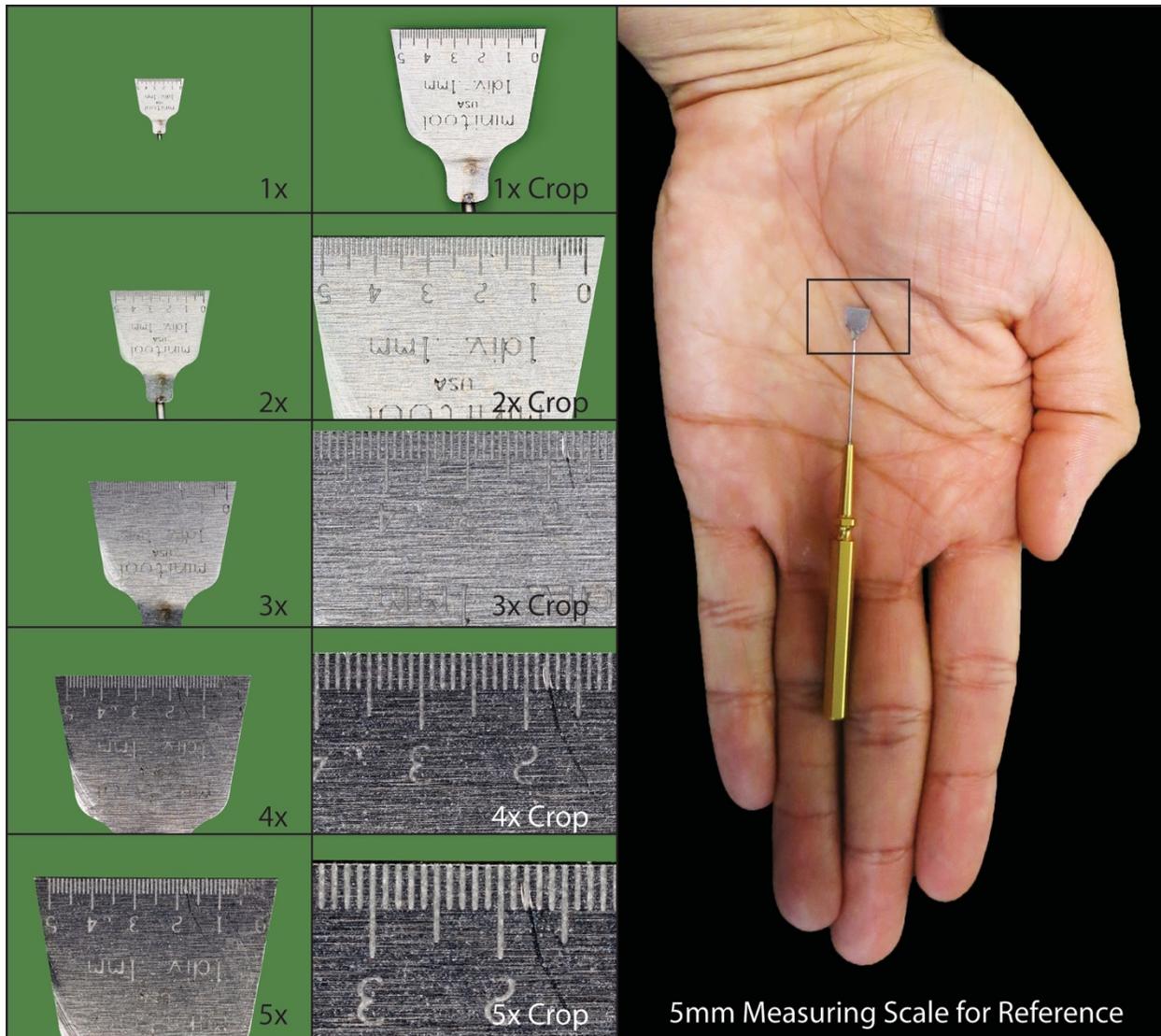


Figure 1.

Ergonomics

The Macropod Pro imaging system is designed to be ergonomically beneficial. The microscope/camera live view is transferred to a computer screen which eliminates eye and back strain commonly experienced when looking through microscope binoculars. The motorization/automation of the system naturally lends itself to ergonomics and work flow. Light intensity and other camera settings are adjusted through a user-friendly interface on the computer.

Infrastructure

No special infrastructure is needed for the Macropod setup other than any solid surface (i.e. table). It may run plugged into standard 120V electrical outlets or can be completely battery-operated.

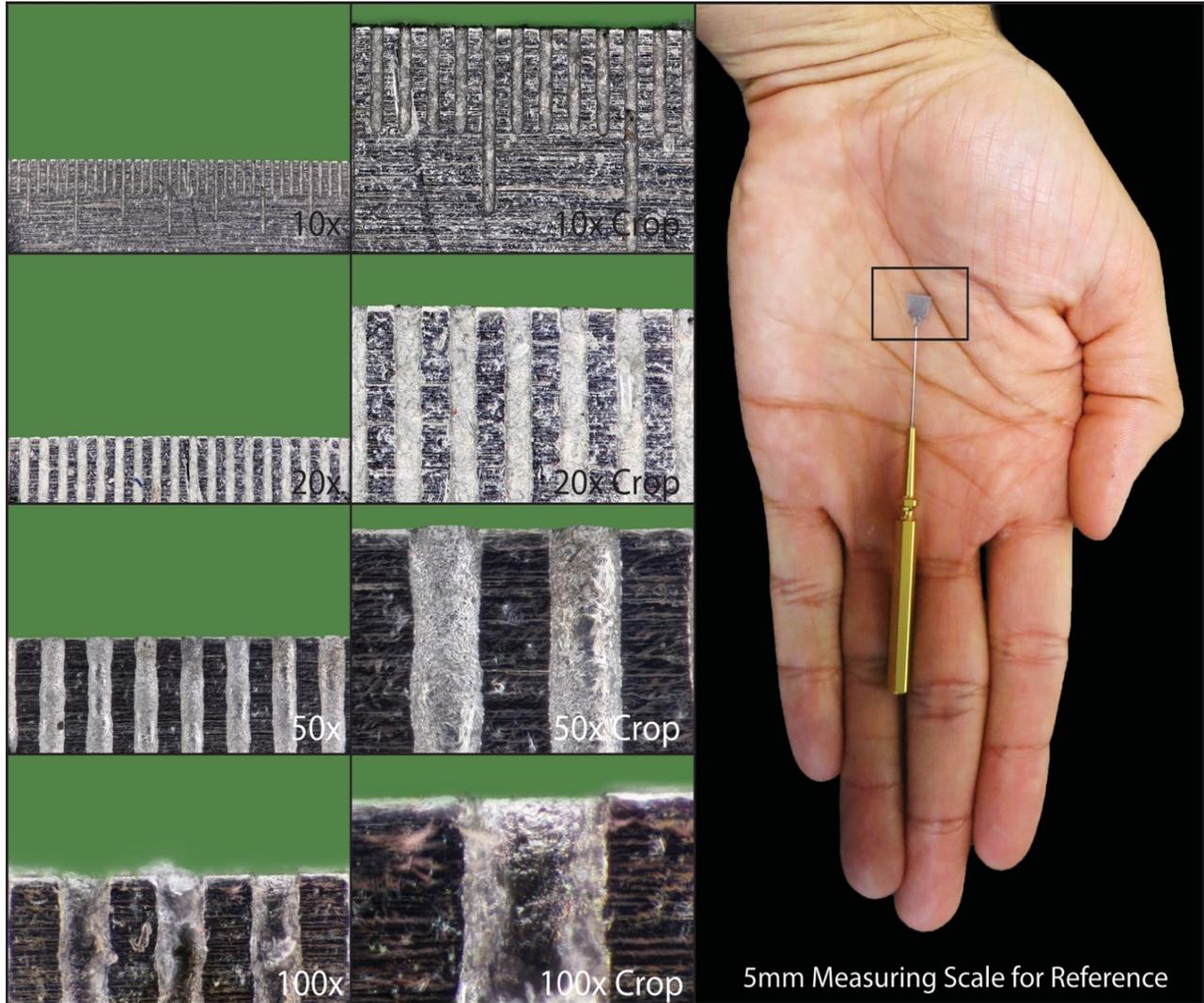


Figure 2.

Additional Capabilities and Advantages

The Macropod Pro utilizes reflected, transmitted, fluorescent and cross-polarized light sources. The device is completely modular and can be configured for each lighting technique, all the while ensuring even light distribution.

The camera body incorporates a GPS receiver so that images captured in the field can be georeferenced in a geospatial reference frame.

Sample preparation is not needed and imaging methods are non-destructive. The system is capable of imaging dry specimens as well as specimens in solution.

Applications

The Macropod Pro is designed for interdisciplinary use in science and engineering. The following figures describe some ways in which the technology has been used throughout its lifetime. Please note the images shown are not full resolution but can be downloaded in max resolution on Flickr. To access additional information about the Macropod Pro, any of its accessories and a database of images, visit Macroscopic Solutions' website and Flickr pages.

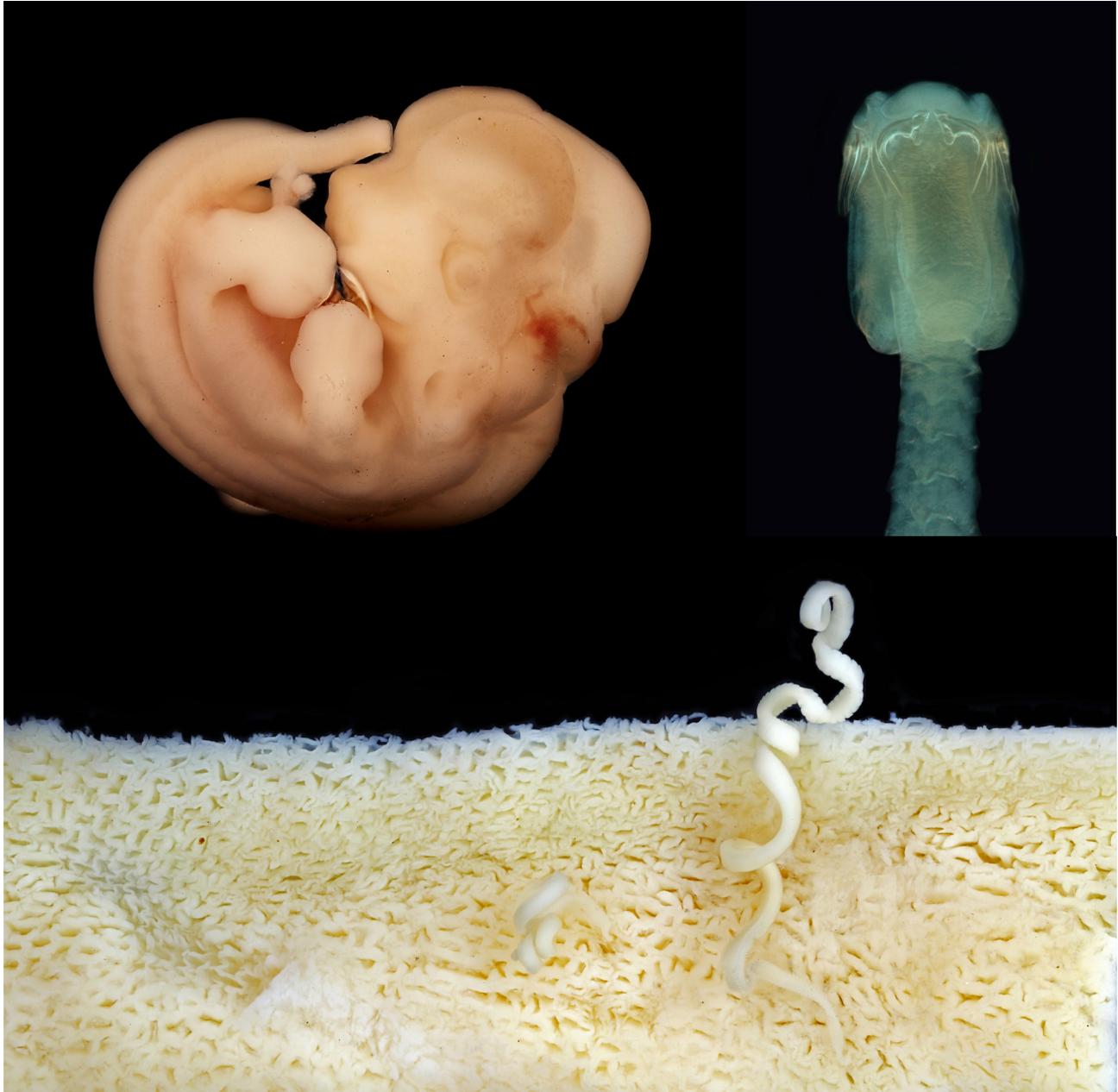


Figure 3. Mouse embryo in solution (bottom left), tapeworm (right), tapeworm in shark intestine (bottom).

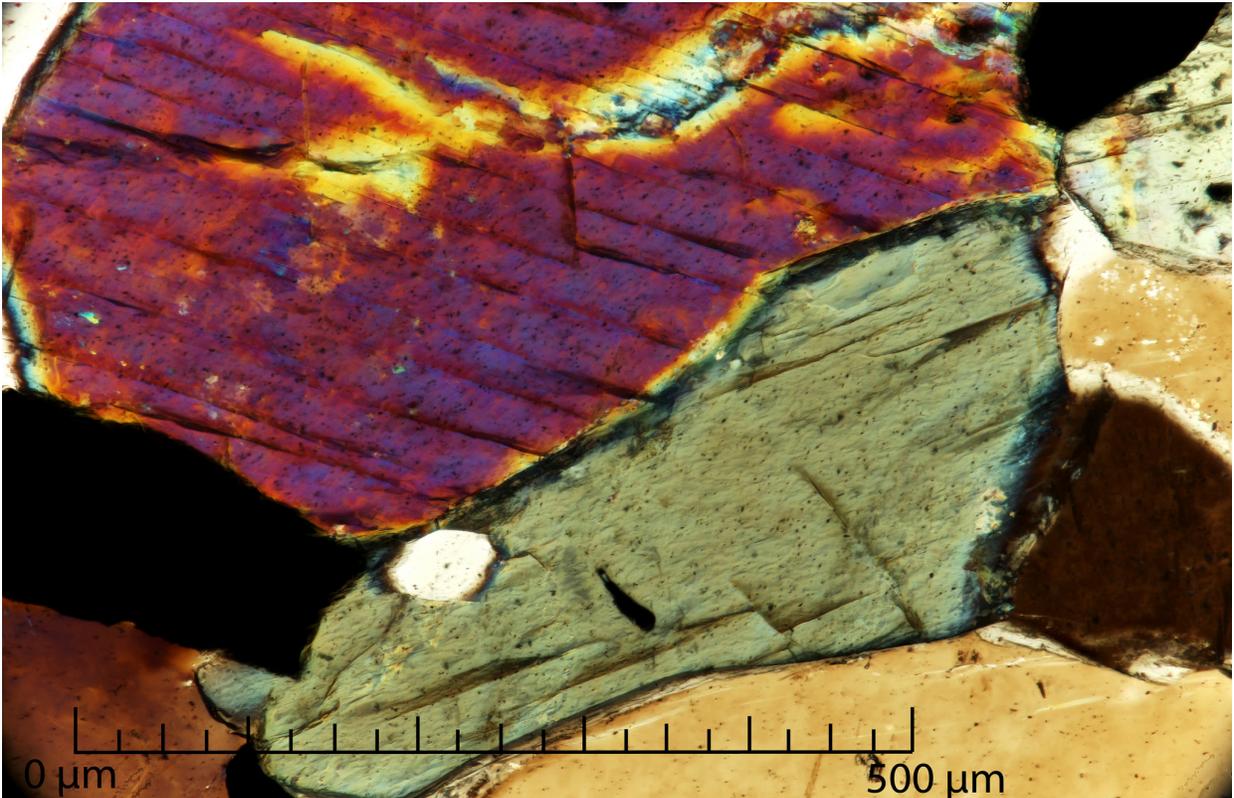


Figure 4. Hornblende-Plagioclase Gneiss magnified at 5x (top) and 50x (bottom), polarized light.

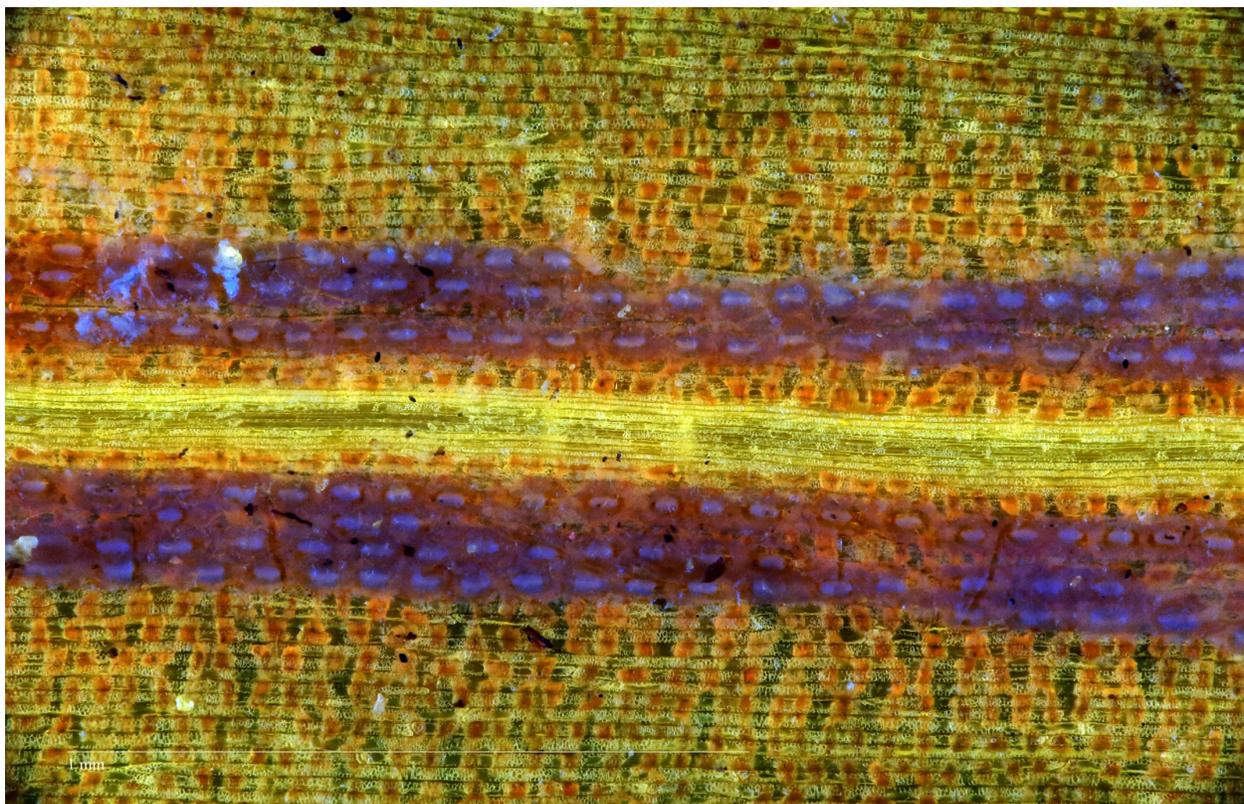
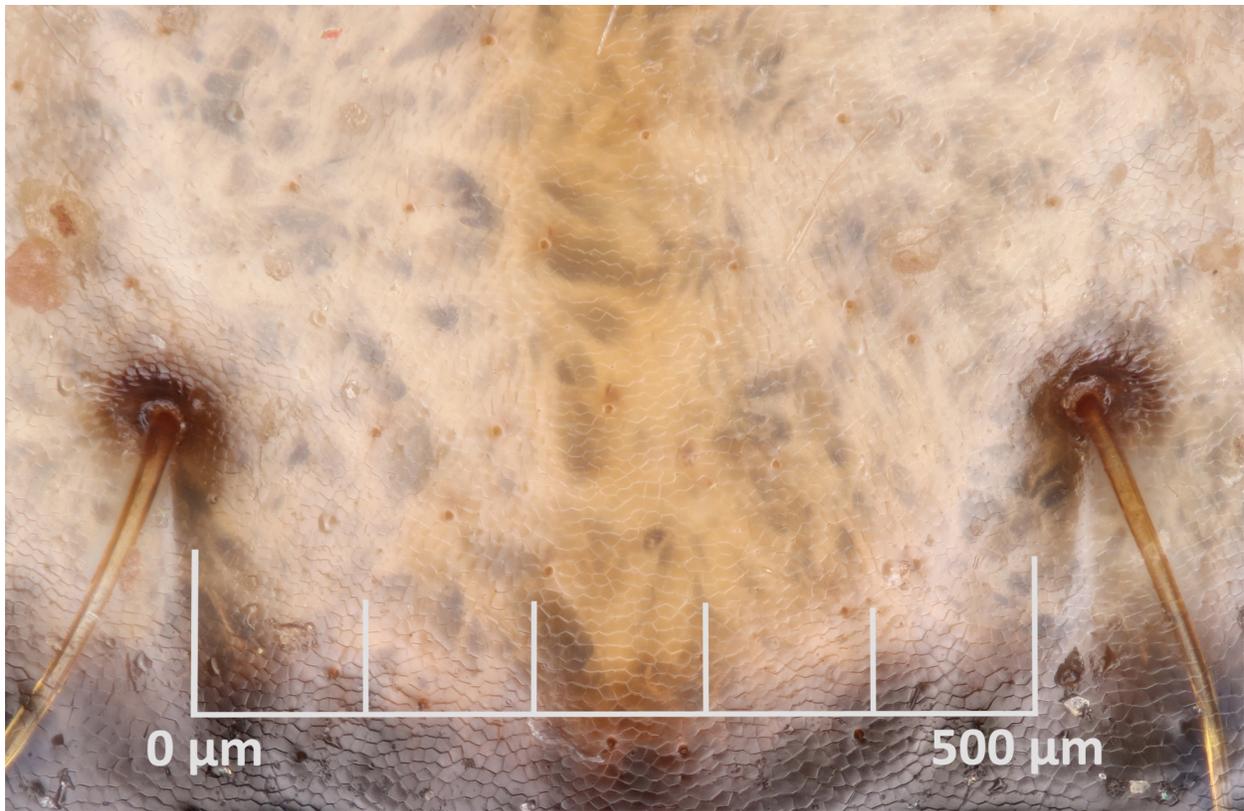


Figure 5. Tiger beetle, magnified at 50x, at the cellular level (above). Pine needles imaged with fluorescence, magnified at 20x, organelles visible (below).



- Reflected Light 3D Modeling/Scanning
- Fluorescent Light Portability
- Transmitted Light Imaging Services
- Cross Polarized Light Time Lapse/Video



The Macropod Pro Imaging System at Cornell University (CUIC)

Acquired in the fall of 2015, the Macropod Imaging System gives the collection a new way to present its holdings to the public. The system acts like a microscope, but it has a camera instead of a magnification lens. The lens points down at the specimen. Photographs of three-dimensional specimens are taken using auto-stacking, a technique in which pictures are snapped at intervals as the lens inches closer to the specimen. Once completed, the computer stacks and combines them to create a detailed photograph with a greater depth of field.

One undergraduate who works in the CUIC will be graduating in May 2016 with five publications. He used the Macropod Imaging System to illustrate specimens in all of his papers. The imaging system is also used to take photographs of slide collections. This allows researchers around the world to view the CUIC and collaborate with the university.

Source: <https://research.cornell.edu/content/cornell-university-insect-collection-cuic>

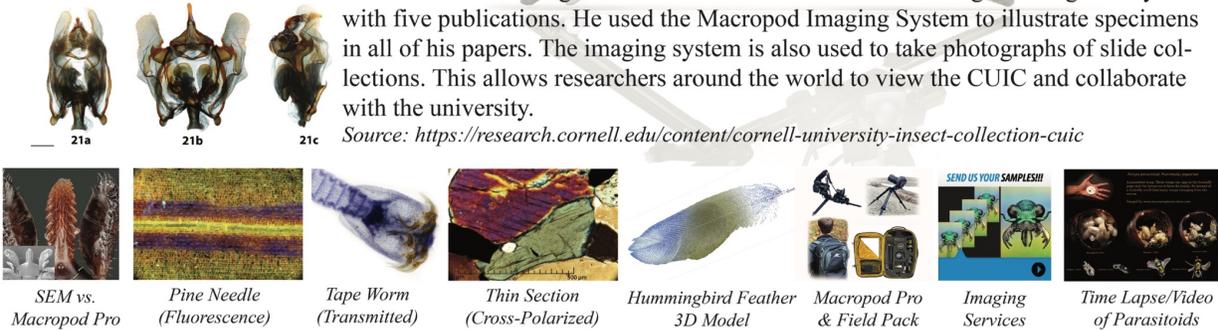


Figure 6.

Training and Support

Training is provided and arranged at the convenience of the institution and its personnel. Online/phone support is thereafter available during regular business hours.

Warranty

Macroscopic Solutions provides warranties of 5 years for mechanical hardware, 2 years for stacking hardware and 1 year for electronic hardware, with all software updates included in perpetuity.

Conclusion

The Macropod Pro encompasses and exceeds capabilities offered by conventional optical/imaging systems. These include confocal, petrographic, optical, compound, and scanning electron microscopy. The technology has proven to be an innovative solution to the ever-expanding needs of modern day researchers (Fig 6).

I certify that the Macropod and the attributes referred to in this letter are true and that Macroscopic Solutions, LLC is the sole source provider of the Macropod technology.

Sincerely,

A handwritten signature in black ink, appearing to read 'C. Fagan', with a long horizontal flourish extending to the right.

Chad E. Fagan
Macroscopic Solutions, LLC