Microscopes and Bioart: Using Microscopy to Create Art

BRIANNE WEFEL AND JAMEL ALI

Abstract

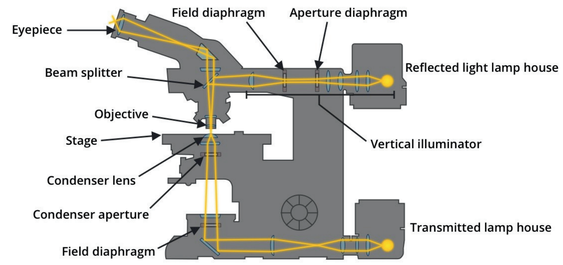
Bioart is a subfield of art focused on living systems. This field is often aided by the use of microscopes to form aesthetically interesting images. In this UROP project, we learned and used various types of bright field microscopy in order to create Bioart pieces. Through the use of upright and inverted light microscopes, we applied wide-field, reflected, polarized light, phase contrast, and differential interference contrast imaging modes for creating aesthetically striking images.

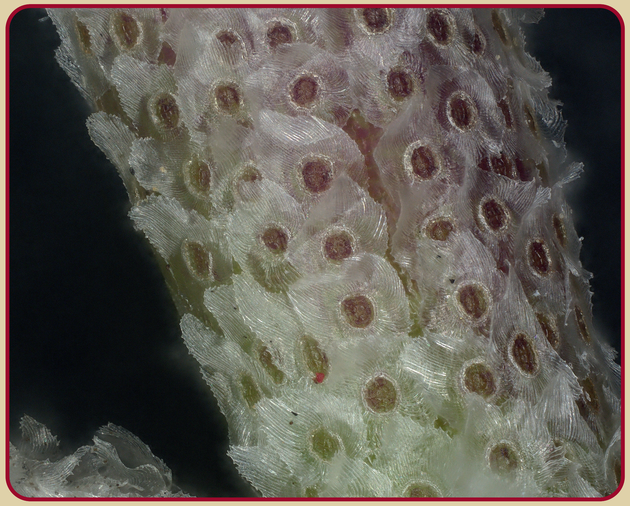
My personal focus of this project is the local Spanish moss, Tillandsia usneoides, and an interesting strain of slime mold, Physarum polycephalum. The moss was chosen for its local significance and the slime mold for personal interest. The end goal of this work is to eventually create a piece to be submitted to the annual Nikon Small World Competition for microscopy. The purpose of this work was to train in microscopy and to create a piece of art in a scientific setting, as scientific partnerships with art can create better understanding of scientific concepts and bring science and art closer together.

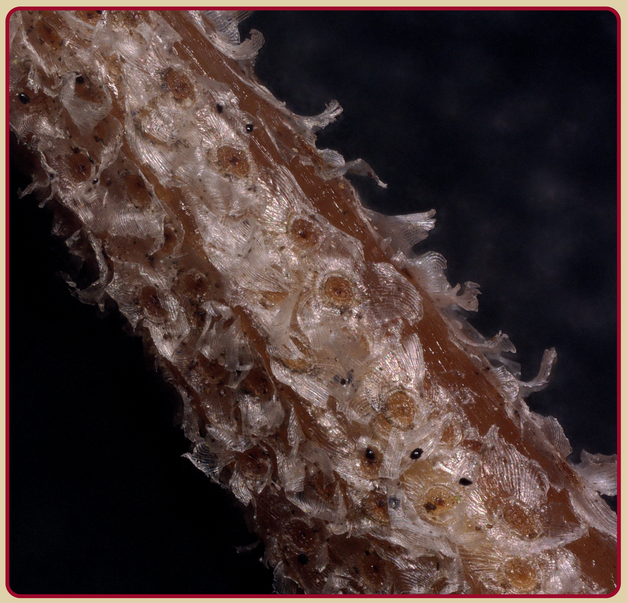
Methods

The main way images were gathered was using the VHX 8000 upright microscope. An upright microscope is designed with the objective located above the stage. Though I learned many different imaging techniques such as dark field, direct interference contrast (DIC) and polarized light, the one I chose to use was reflected light imaging, as it is the best for samples that are not thin and transparent. This way, the sample is illuminated from above and the light reflected off of it is captured through the objective into the lens/camera. There is another light source below the sample, called transmitted light, that can be used in combination to create the most pleasing image. Many images were taken of each sample, adjusting position, lighting and magnification. Due to the limited depth of field at high magnification the technique of image stacking was used, the camera taking a series of photos at varying depths then combining them into one indepth image The best images were then post-processed using the editing software DaVinci Resolve. Colors were enhanced and the background smoothed, attempting to bring out the beauty that was observed in the sample.

Reflected/Transmited Light Microscope







Results

After much investigation in the lab, one of the subjects I chose to focus on was the local Spanish Moss, scientific name Tillandsia usneoides. I selected this specimen due to its unique appearance under the microscope, as well as its significance in shaping the Tallahassee landscape. The images were taken using the standard technique of reflected light imaging on a VHX 7000 microscope.

The other was a strain of Slime mold called Physarum polycephalum. This slime mold, despite being unicellular, is unusually smart, able to solve mazes and respond to many different stimuli. For example, during the imaging process the sample of Physarum was able to escape from it's closed petri dish in search of food and finding none, transformed into the sclerotica phase, in which in can survive for years until more favorable conditions are met. Physarum polycephalum was imaged using the VHX 7000. I chose this sample in order to spread more awareness about this fascinating organism.

Tillandsia usneoides 200x

Physarum polycephalum 40x

Tillandsia usneoides 150x (above) and 100x (below)

References

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Diagram:

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