

2016

# NC Brown Center Annual Report 2015-2016

Susan E. Anagnost

*SUNY College of Environmental Science and Forestry*, seanagno@esf.edu

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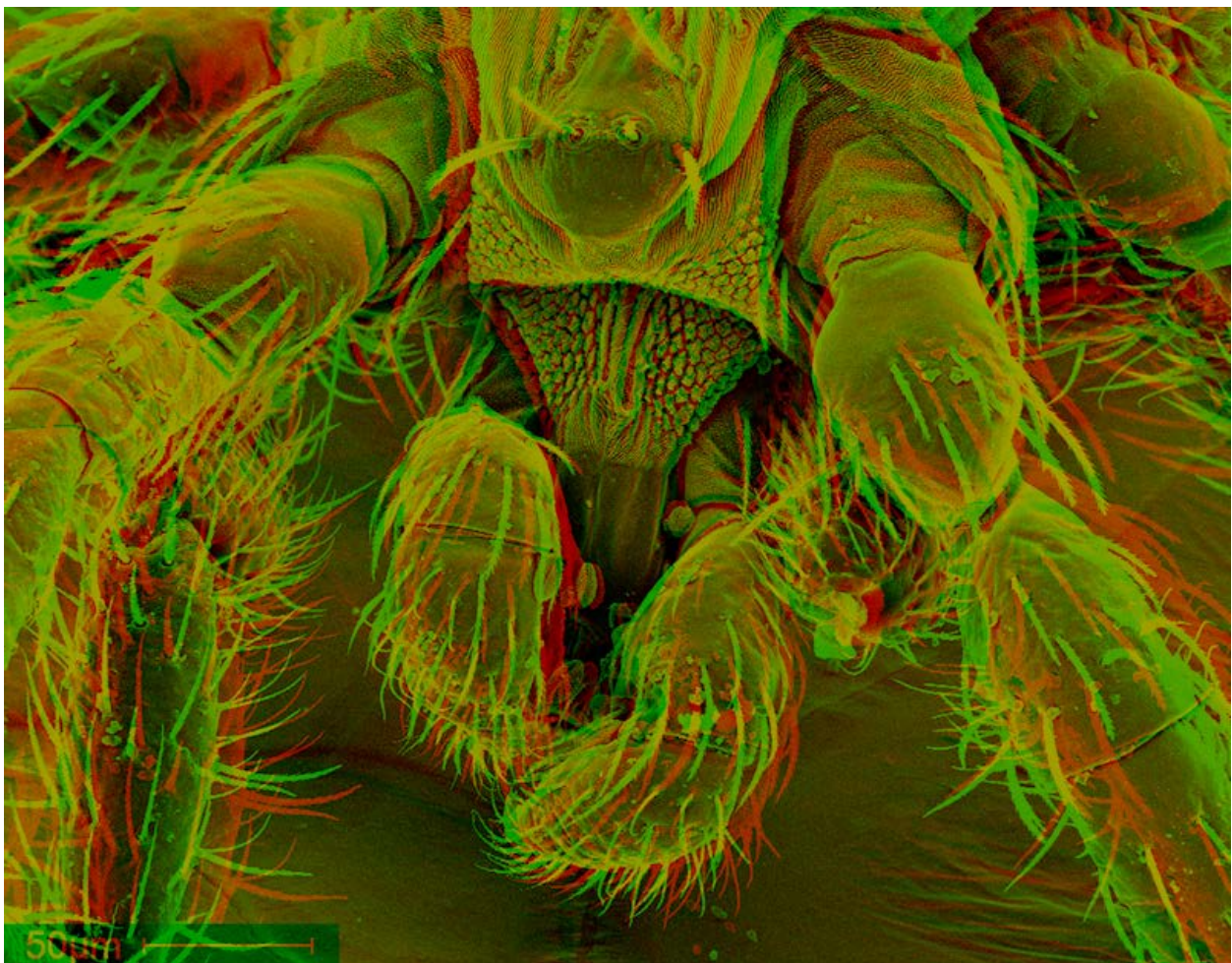
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**N.C. Brown Center for Ultrastructure Studies**

# **Annual Report**

**2015-2016**



Susan E. Anagnost, Director

<http://www.esf.edu/pbe/ncb>

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Cover Photo: Stereo image of a mite by Jeremy Sullivan, graduate student in Chemistry and former Teaching Assistant in the NC Brown Center. A 3-D effect can be seen using red-green glasses. Two images were taken with a scanning electron microscope (JSM 5800LV) at 6 degree tilt differential and then combined with Photoshop to produce a red-green stereo pair, or anaglyph.

## SUMMARY

Highlights of the year July 1, 2015- June 30, 2016:

- A proposal was awarded by the National Science Foundation Major Research Instrumentation Program for a new transmission electron microscope, Principal Investigator, Susan Anagnost. The proposal *MRI: Acquisition of a Cryo Field Emission Transmission Electron Microscope* sought financial support for the acquisition of a cryo field emission scanning transmission electron microscope (FES/TEM) to replace the current 30 year old transmission electron microscope in the NC Brown Center for Ultrastructure Studies at SUNY-ESF. The award of \$1.12M funds 70% of the project costs, with 30% additional cost share from ESF, SU, UMU and NYSTAR, for total project cost of \$1.6M.
- Teaching: Microscopy course offered were: MCR 484, MCR 783, MCR 480, MCR 570, MCR 683, MCR 685, MCR 785.
- Offered NC Brown Ultrastructure Center expertise and services to the following businesses: Car-Freshner Corp., CSArch, Indiana University of Pennsylvania, Schoder Rivers Engineers.
- Class demonstrations of the scanning electron microscope were provided by Dr. Anagnost for ENS 132.
- Changes in management of microscopes. Provost Bruce Bongarten made the decision that Analytical and Technical Services would manage the use and maintenance of the electron microscopes.

## SCOPE AND PURPOSE OF THE CENTER

The N.C. Brown Center for Ultrastructure Studies is the **central microscopy facility** at SUNY-ESF, located on the second floor of **Baker Lab**. The Center for Ultrastructure Studies provides students, faculty and research staff with access, assistance, and training in modern microscopy techniques. These techniques include light microscopy, scanning electron microscopy, transmission electron microscopy, digital imaging, image analysis and a host of ancillary applications. This facility was first established in 1957 with the installation of the first transmission electron microscope in central New York. The N.C. Brown Center for Ultrastructure Studies was formally established in 1972 when an ETEC scanning electron microscope was installed in Baker Laboratory. The Center has always maintained a position of leadership and excellence in the areas of wood structure and microscopy, both nationally and internationally. Many departments and programs within the College and neighboring universities are represented among the faculty, staff and students who utilize the Center for research. During an average year, 30 faculty, 35 graduate students, and numerous undergraduate students utilize the resources of the Center for their research. Outreach activity is also an important service provided by the Center. These services include providing micrographs for educational purposes, assistance to other universities, tours and demonstrations to interested technology groups, and microscopy assistance to private industry. The types of private industries for which we provided microscopy services include forest product industries, pulp and paper manufacturers, wood preservation companies, consulting engineering firms, and others.

## CONTACT INFORMATION

Susan Anagnost, 211 Baker Lab, 470-6837; [seanagnos@esf.edu](mailto:seanagnos@esf.edu)

## PARTICIPATING FACULTY/STAFF

Susan Anagnost, Director

Robert P. Smith, Assistant Director

Fernanda Oliveira, Teaching Assistant, Fall 2015, and graduate student in PBE

Richard L. List, Teaching Assistant, Spring 2016, and graduate student in PBE

## FACILITIES AVAILABLE

### LAB FACILITIES IN THE CIK WANG WOOD BIODEGRADATION LABS IN 252 AND 243 BAKER:

Light microscopes, stereo microscopes, transfer hood (Laminar flow hood)  
sliding microtomes, autoclave, balances

#### *MICROSCOPES*

- JEOL 2000EX, an 80-200 KV transmission electron microscope with tilt stage goniometer
- JEOL 5800 low vacuum scanning electron microscope equipped with an EDAX energy dispersive x-ray analyzer
- An array of specialized light microscopes with SPOT digital cameras. Three Nikon with fluorescence, phase contrast, Nomarski differential interference contrast, polarized light
- Phase contrast light microscopes for fiber counting (NIOSH 7400 Counting Rules A)

#### *ANCILLARY EQUIPMENT*

- Leica UC6 Cryo and Resin Ultramicrotome
- Balzers T400 Rotary Shadow Freeze-Fracture Device with Glow Discharge System
- Leica Freeze Substitution Machine
- Leica Plunge Freeze Device
- Leica Automatic Grid Stainer
- Beckman Airfuge
- Sliding Microtomes
- Microtek Flat Bed Film Scanner
- ImagePro, Image J, and PhotoShop

## ACCOMPLISHMENTS OVER THE PAST YEAR (PROJECTS, DISCOVERIES, ETC.)

Wood anatomy and wood decay evaluation:

- AECOM- decay condition analysis and wood identification of building support piles in Wisconsin
- CME Associates-Wood identification and specific gravity of wood samples
- CSArch- wood identification of structural beams
- Giles Engineering- decay condition and wood identification of building support piles – 4 projects
- Schoder Rivers Associates- wood identification of structural beams, fall 2015
- Indiana University of Pennsylvania- Oneida Lake Shipwreck project- wood identification of 12 samples; October 2015
- Seward House Museum wood identification of four samples June- August 2015

## FUTURE DIRECTIONS

### Objectives for upcoming year

- Purchase, Installation and Training on new TEM
- Training on new SEM
- Incorporate new microscopy capabilities into the coursework
- Submit research grants building on capabilities of new electron microscopes

## OTHER

### ACADEMIC PROGRAM

The Academic program offered by the Center is unique in central New York. Even though a number of other institutions are equipped with electron microscopes, we are the only one offering comprehensive formal training in the theory and application of these research tools. The NC Brown Center offers graduate and undergraduate microscopy courses as well as professional certification in fiber counting (NIOSH 582 equivalent). The four undergraduate courses compose a minor in microscopy.

#### Courses offered in the NC Brown Center:

##### Undergraduate:

- MCR 480 Fundamentals of Microscopy (3)
- MCR 484 Scanning Electron Microscopy (3)
- MCR 485 Transmission Electron Microscopy (3)

##### Graduate/ Advanced Undergraduate

- MCR 580 Microtechnique of Wood (1-3)
- MCR 585 Light Microscopy for Research Applications (3)
- MCR 570 Medical and Industrial Applications of Microscopy (3)

##### Graduate:

- MCR 680 Fundamentals of Microscopy (3)
- MCR 682 Transmission Electron Microscopy for Nanoparticle Research (2)
- MCR 683 Operation of the Transmission Electron Microscope (3)
- MCR 685 Transmission Electron Microscopy (5)
- MCR 783 Operation of the Scanning Electron Microscope (3)
- MCR 785 Scanning Electron Microscopy (5)

#### Professional Certification:

Phase Contrast Microscopy Fiber Analysis Course (NIOSH 582-Asbestos Fiber Counting)

#### Microscopy Minor:

- MCR 480 Fundamentals of Microscopy (3)
- MCR 484 Scanning Electron Microscopy (3)
- MCR 485 Transmission Electron Microscopy (3)
- MCR 570 Industrial Applications of Microscopy (3)

## Class Demonstrations for courses at SUNY-ESF

### Guest Lectures

- Prepared and delivered a lecture/demonstration of the Scanning Electron Microscope for sixty students (4 groups of 15) enrolled in ENS 132 Orientation for Environmental Science, October, 2015
- Lecture for PSE223 Introduction to Lignocellulosics; lecture/lab on wood anatomy and identification, January 2016

### *Outreach and Service*

#### Outreach activities

- Lecture, "Wood Microbiology, Decay, Stain and Mold" for the Kiln Drying Workshop: *Drying Quality Lumber for Profit*, SUNY-ESF January, 2016
- Lecture: "Wood Anatomy and Identification" for the Kiln Drying Workshop: *Drying Quality Lumber for Profit* SUNY-ESF January, 2016
- Television show, GOING GREEN Segment on Mold and Indoor Air Quality, November, 2016

## RESEARCH

ESF and SU users of the NC Brown Center microscopes generated Masters and PhD dissertations and research publications which are not included here.

### PUBLICATIONS

Judith A. Crawford, Paula F. Rosenbaum, Susan E. Anagnost, Andrew Hunt, Jerrold L. Abraham. 2015. Understanding the conditions that affect indoor fungal exposures. *Science of the Total Environment* 517:113-124.

### GRANT PROPOSALS

Anagnost, Susan E., Gitsov, I.I, and Smith, R.P. *MRI: Acquisition of a Cryo Field Emission Transmission Electron Microscope*. NSF Major Research Instrumentation Program. \$1,210,000. Submitted February, 2015. Funded.

A grant for \$1.12 million was received from the National Science Foundation from the Major Research Instrumentation (MRI) program for the acquisition of a transmission electron microscope. The grant, "Anagnost, Susan E., Gitsov, I.I, Smith, R.P., Wilkens, S, and MM. Maye; *MRI: Acquisition of a Cryo Field Emission Transmission Electron Microscope*; NSF Major Research Instrumentation Program; \$1,120,000; September 1, 2015 to August 31 2018", is a collaborative project between the three Hill academic institutions SUNY-ESF, UMU and Syracuse University. The NSF grant was awarded August 17, 2015.