

2011

NC Brown Center Annual Report 2010-2011

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The background of the cover is a micrograph showing numerous small, circular, light-colored structures, possibly cells or microorganisms, scattered across a darker, textured brown background. The entire cover is framed by a thin orange border.

N.C. Brown Center for Ultrastructure Studies

Annual Report

2010-2011

Susan E. Anagnost, Director

Robert P. Smith, Assistant Director

<http://www.esf.edu/scme/ncb.htm>

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Cover photo:

Transmission electron micrograph of rotavirus; negative staining. Pseudo-color of grayscale image. Robert P. Smith

SUMMARY

RETROSPECTIVE

Over sixty researchers and clients used the microscopy services provided by the NC Brown Center for Ultrastructure Studies this year. This included faculty and students as ESF, Syracuse University, Cornell, and Upstate Medical University.

A new rate schedule for services was implemented this year. The schedule has varying rates for ESF, SU and other academic institutions, and industrial users. Several inquiries from industry were a direct result of the revised webpage for the center that includes our new rate schedule.

Dr. Robert Hanna retired as Director and Professor at ESF in December 2010.

Robert Smith visited FEI and Technical Sales Solutions, Portland, Oregon in March 2011. Susan Anagnost visited FEI and Technical Sales Solutions, Portland, Oregon in June 2011.


The NC Brown Center recognizes Pfizer (formerly Wyeth Pharmaceuticals) for their donation of \$350,000 in electron microscopy equipment. The donation received in 2009-2010 includes a Balzers Freeze Fracture unit with glow discharge, Leica EM CPC plunge freeze system, 3 Liquid N2 tanks, Leica EM FC6 Cryo and resin ultramicrotome, Leica EM Grid Staining system, drying oven, light microscope, critical point drying system and 6 diamond knives. Robert P. Smith, MS, Assistant Director of the N.C. Brown Center at SUNY-ESF solicited this donation which will help modernizing the electron microscope lab at ESF. Robert P. Smith is the former Head of Electron Microscopy at Wyeth Vaccines.

PROSPECTIVE

A new undergraduate and graduate course, CME 480/680 Fundamentals of Microscopy, was approved by the ESF Faculty and will be taught for the first time fall 2011. This course will survey current microscopy techniques and their applications and will include demonstrations on the use of light microscopes, scanning electron microscopes, transmission electron microscopes and is intended to introduce students to the wide variety of techniques available for research

The center is investigating opportunities to perform asbestos analysis for industrial clients. Rob Smith will attend the NIOSH 582 short course for asbestos fiber analysis at the McCrone Research Institute, August 2011. We are also pursuing lab certification for asbestos analysis from NYSDOH. It is anticipated that revenue generated from asbestos analysis will help to upgrade and replace our microscopes and other equipment.

PERSONNEL

- ❖ **Robert B. Hanna**, Director of the N.C. Brown Center for Ultrastructure Studies and Professor in the Department of Sustainable Construction Management and Engineering retired December 23, 2010 after 33 years at SUNY-ESF. Bob began his career at ESF in 1977 as Assistant Professor and Assistant Director of the NC Brown Center. In 1979 he was promoted to Associate Professor and to Full Professor in 1987. He became Director of the N.C. Brown Center for Ultrastructure Studies in 1993. Prior to ESF, Bob was an Instructor at the Dept. of Neuroscience, Albert Einstein College of Medicine. He obtained a B.S. in Conservation from the Univ. of Michigan, and M.S. and Ph.D. degrees in Wood Products Engineering from SUNY College of Environmental Science and Forestry. Bob was a Postdoctoral Fellow at the Institute for Cell Biology, Swiss Federal Institute of Technology, Zurich. Bob was elected as Fellow, International Academy of Wood Science in 1999. In 1994 Bob traveled to New Zealand where he was Visiting Erskine Fellow, Dept. of Plant and Microbial Science, University of Canterbury, Christchurch. Bob taught graduate courses in scanning electron microscopy, transmission electron microscopy and light microscopy. Many of his students called these classes "the most enjoyable classes in their college career", and subsequently went on to successful careers in the field of microscopy. Bob published numerous articles on the ultrastructure of the wood cell wall, including the elementary fibril, microfibril orientation, wood mechanics, pulp and paper. At ESF, Bob worked with researchers in Paper Science, Biology and Chemistry. In addition, Bob was also Adjunct Research Professor, Dept. of Anatomy and Cell Biology at Upstate Medical University where he collaborated with researchers to study neuromuscular junctions. He obtained research grants from USDA, McIntyre-Stennis, ESPRI, and in 1997 was successful in obtaining funds from the National Science Foundation for the Ultrastructure Center to purchase a scanning electron microscope. Future plans: Summers on Murray Isle in the 1000 Islands and winters in Pamlico Plantation, Washington, North Carolina.
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- ❖ **Susan E. Anagnost** was appointed Director as of January 1 2011. Dr. Anagnost had served as Assistant Director since 2003.
 - ❖ **Robert P. Smith** was appointed Assistant Director January 1 2011. Rob has been at ESF since 2007 when he was appointed Instructional Support Specialist. Rob is an alumnus of ESF and the former Head of Electron Microscopy at Wyeth Vaccines, and was lab director of the Diagnostic Electron Microscope Center, Pathology Department, Upstate Medical University; Syracuse, New York.

ACADEMIC PROGRAM

The Academic program offered by the Center consists of five graduate-level courses, one undergraduate course, graduate level special topic research projects, and graduate student guidance. Our program 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 courses offered are:

- CME 585 Light Microscopy and Image Analysis 3 credit hours
- CME 480 Fundamentals of Microscopy 3 credit hours
- CME 580 Microtechnique of Wood 3 credit hours
- CME 680 Fundamentals of Microscopy 3 credit hours
- CME 685 Transmission Electron Microscopy 2-5 credit hours
- CME 785 Scanning Electron Microscopy 5 credit hours
- CME 796 Special Topics - Advanced Electron Microscopy 1-3 credit hours

2011-2012

In the academic year 2011-2012 a new course, 480/680 Fundamentals of Microscopy, will be offered in the fall semester. The course description follows:

CME 480/CME 680 Fundamentals of Microscopy

Student learning outcomes:

After completing this course the student should be able to:

1. understand the wide variety of microscopic techniques currently available (light microscopy, electron microscopy, atomic force, confocal, Raman, Near Field Optical, Correlative and other microscopic methods) and their applications, latest literature, and which techniques are best suited for particular applications and specimen types
2. understand the specimen preparation required for each microscopic technique and type of specimen.
3. understand cellular ultrastructure
4. understand the basic techniques of light microscopy to optimize image quality.
5. be aware of image quality and how it affects interpretation; artifacts, their affect on interpretation of images and how they can be minimized.
6. prepare and present a comprehensive literature review of microscopic techniques used in research publications on a topic of their choosing -**CME 680 only**

Major concepts or methodologies:

Introduction to light microscopy, electron microscopy, atomic force, confocal, Raman, Near Field Optical, FISU, TIRF, correlative and other microscopic methods and their newest applications. Light microscopic techniques include brightfield, phase contrast, polarized light, fluorescence, Nomarski, Kohler illumination. Imaging and recording methods.

Catalog description

CME 480 (3) Fundamentals of Microscopy

Three hours of lecture/demonstration per week. Introduction to light microscopy, electron microscopy, atomic force, confocal, Raman, Near Field Optical, Correlative and other microscopic methods and their newest applications. Light microscopic techniques include brightfield, phase contrast, polarized light, Nomarski, Kohler illumination. Imaging and recording methods. Fall.

RESEARCH 2010-11

For the year 2010-2011, the NC Brown Center for Ultrastructure Studies provided microscopy facilities and assistance to over 60 researchers including faculty and students at ESF, Syracuse University, Cornell, Upstate Medical University, and industrial clients.

ESF Faculty

ESF Faculty using the center

Dr. K. Limburg
Dr. S. Anagnost
Dr. J. Nakas
Dr. I. Cabasso
Dr. N. Abrams
Dr. W. Winter
Dr. C. Nomura
Dr. R. Norton
Dr. C. Whipps
Dr. B. Ramarao
Dr. Tao
Dr. S. Liu
Dr. M. Driscoll
Dr. K. Dolle
Dr. I. Gitsov
Dr. A. Weir
Dr. G. Scott

ESF Graduate Students (partial list-see TEM and SEM user logs)

Arthur, Beth (Major Professor Dr. Ramarao)
Smith, Robert P. (Major Professor Dr.
Jessica Gibson (Major Professor Alex Weir)
Hwasung Kim (Major Professor Susan Anagnost)

SYRACUSE UNIVERSITY

Tao Cong, PhD student, Advisor, Radhakrishna "Suresh" Sureshkumar, Professor, Chair, Department of Biomedical and Chemical Engineering, Professor, Department of Physics

Dr. Bader
Dr. Bhatia
Dr. Braiman
Dr. Doyle
Dr. Luk
Dr. Mather

Dr. Maye
Dr. Schiff
Dr. Tavarides
Dr. Sureshkumar, (graduate student Tao Cong, PhD student)
Dr. Zhang
Dawn Higginson SU Graduate student

OTHER ACADEMIC INSTITUTIONS

Cornell University
Stephanie Corgie

Upstate Medical University
Stephan Wilkens

INDUSTRIAL CLIENTS

United Corrstack
Osmose
Benton Dickinson
Upstate Fresh Water Institute
Rawlings Adirondack Bat
Giner Electrochemical
Wyeth Vaccines received 2009

PUBLICATIONS

Refereed publications

Arthur, B. A., **Smith, R.P.**, Lavrykov, S. and B.V. Ramarao. Ink penetration in uncoated paper using immuno-gold labeling: Intra-fiber diffusion and wicking. Submitted and accepted, TAPPI Paper Physics Conference, Graz, Austria, September 2011.

Rosenbaum, P. F., Crawford, J. A., **Anagnost, S. E.**, Wang, C. J. K., Hunt, A., Anbar, R. D., et al.(2010). Indoor airborne fungi and wheeze in the first year of life among a cohort of infants at risk for asthma. *Journal of Exposure Science and Environmental Epidemiology*, 20(6), 503-515.

Non-refereed publications

Anagnost, Susan E. and Gloria Oporto. 2010. Women in the Wood Science and Technology Profession. Proceedings, 2010 Annual Convention of the Society of Wood Science and Technology, Geneva, Switzerland, October 11-15, 2010.

Presentations

Anagnost, Susan E. and Gloria Oporto. 2010. Women in the Wood Science and Technology Profession. Society of Wood Science and Technology 2010 Annual Convention, Geneva, Switzerland, October 11-15, 2010.

Anagnost, Susan E. 2011. "Wood Microbiology: Decay, Stain and Mold". Invited presentation at the 2011 Spring Meeting of the New England Kiln Drying Association, Oneonta, New York, April 7, 2011.

MICROSCOPE USER LOG

Transmission Electron Microscope users 6/1/2010 to 6/1/2011

1681 micrographs (# 4040 to 5721. Twenty nine users, all multiple times.

Peter Njoiki (Maye PostDoc),
Wenjie Wu (Maye Grad),
Jess Gibson (Weir Grad),
Rabeka Alam (Maye Grad),
Xinfei (Winter Grad),
Hyunjoo Han (Maye Grad),
Hunter Smith (Wilkens Employee),
Ryan Tappel (Nomura Grad),
Rob Smith (work for Rob Doyle)
Corey (Maye Grad),
Hwasung Kim (Anagnost Grad),
Tao (Grad),
Rick Bates (Doelle Grad),
Prajakta (Doelle Grad),
Matt Ali (Doelle Grad),
Colleen (Dabrowiak Grad),
Yi Shi (Dabrowiak Grad),
Rob Smith (work for Matt Driscoll),
Beth Arthur (Ramarao Grad),
Rob Smith (work for Rafaat Hussein),
Nan Qin (Cabasso Grad),
Catie Peluso (Doelle Grad),
Rob Smith (work for Mather),
Rob Smith (work for Dawn Higginson, SU Grad),
Kelly Fitzsimmons (Whipps Grad),
Rob Smith (work for Debbie Valentin, Doyle Grad),
Rob Smith (work for Pine, Mather Grad),
Rob Smith (work for Nadia, PostDoc for Doyle)

Scanning Electron Microscope users 6/1/2010 to 6/1/2011

The scanning electron microscope had twenty eight users, many multiple times users 6/1/2010 to 6/1/2011

Anna (Cabasso Grad),
Gauri (Luk Grad),
Beth Arthur (Ramarao Grad),
Rob Smith (work for Dr Zhang, SU, ME Dept),
Catie Peluso (Doelle Grad),
Rob Smith (Mark Driscoll class),
Rob Smith (work for Liu, P&P),
Rob Smith (work for Bhatia, SU),
Xinfei (Winter grad),

Sue Anagnost (work for Rawlings Co),
Rob Smith (work for Osmose Co),
Abrams (ESF Chem),
Rob Smith (work for Nadia, Doyle PostDoc),
LiLi (Gitsov Grad),
Hwasung Kim (Anagnost Grad),
Jianfeng (Tao grad),
Rick Bates (Doelle Grad),
Matt Ali (Doelle Grad),
Bernard (Meyer Grad),
Rob Smith (work for Linberg),
Rob Smith (work for Benton Dickinson Co),
Casey Simmons (grad),
Yuan (Grad),
Yunsha (Grad),
Kristina (Gitsov Grad),
Robert Hanna (ESF),
Yunyun Bi (Meyer Grad),
Nan Qin (Cabasso Grad)

FACILITIES AND EQUIPMENT

Several upgrades were purchased this year; the Image Pro software upgrade with assistance from Syracuse University, and a computer upgrade in the light microscopy lab with the assistance of the SUNY Academic Equipment Replacement fund.

We have plans to repair the Beckman Airfuge, the EDAX x-ray unit for the SEM, the Balzers freeze fracture equipment, and the Cryo-Microtome.

We are planning to upgrade the electron microscopes and have toured several microscopy facilities to learn about the most modern equipment available and which instruments would be most suitable for research applications at ESF. We also are investigating several ways to finance these upgrades.

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

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