

Laboratory for Advanced Electron and Light Optical Methods



College of Veterinary Medicine North Carolina State University

A Fully GLP-Compliant Laboratory

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Statement of LAELOM Services

The LAELOM maintains a *technical staff and an array of transmission and scanning electron microscopes as well as photomicroscopes and peripherals:*

<ul style="list-style-type: none">• JEOL JSM-6360LV Scanning EM	<ul style="list-style-type: none">• FEI/Philips EM 208S Transmission EM	<ul style="list-style-type: none">• Nikon C1 Confocal Scanning Laser System

- Olympus VANOX AHS-3 photomicroscope with SPOT RT Slider cooled-CCD digital camera
- Wild M-400 photomicroscope
- Software for digitizing images (PAX-IT) and performing morphometric analysis (Image-Pro Plus)

In addition to all the necessary support equipment for preparing samples for electron microscopy, the LAELOM has a **totally equipped darkroom** set up for the production of black-and-white prints, copy negatives, 2 X 2 black-and-white slides, and posters. A **cryostat** is available for producing frozen sections for light microscopy.

The LAELOM facilities and equipment can be used by researchers who wish to do their own hands-on work or all aspects of cytological work can be performed by our staff.

We provide extensive **consultation services**. The LAELOM Director has over 30 years of experience in electron microscopy methods, with 14 years serving the **pharmaceutical industry**.

The LAELOM has **technical expertise** for working with:

- **macromolecules** (DNA, proteins) • **viruses** • **bacteria** (free-living and in biofilms) • **fungi**
- **protozoans** • **cell cultures** • **metazoan tissues** (i.e., insects, crustaceans, mammals, reptiles, birds, fish)
- **textile polymers** • **plastic films from electrical storage cells** • **artificial joint materials, artificial cell matrices** • **immunolabeling** of ultrathin frozen and plastic-embedded sections

Consultation services are available concerning:

- **Technical methods** • **Budgeting** • **SOP preparation** • **Equipment selection**

The LAELOM maintains a state-of-the-art **Leica Ultracut UCT** ultramicrotome with a **Leica EM FCS** attachment designed for cutting ultrathin frozen sections for **immunolabeling**.

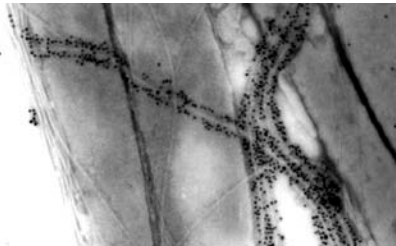
We can help select fixation **protocols**, appropriate molecular probes (lectins, immunolabels, cytochemistry), and give advice concerning proper preparation of biological samples for evaluation within our facility or for application of microanalytical techniques available locally.

We provide **training** on our equipment to those familiar with EM techniques and also offer a one-semester **electron microscopy course** (CBS-732) in the spring to introduce novices to all the techniques utilizing TEM and SEM. Individual training in photomicroscopy, morphometry and digitized imaging is available.

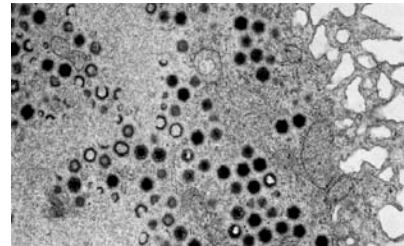
Consultation concerning project costs is available for the preparation of project budgets. After conversations with the investigator, a detailed **cost analysis** and timeline is provided.

If we can be of any service to you or any members of your organization, please call us for further information.

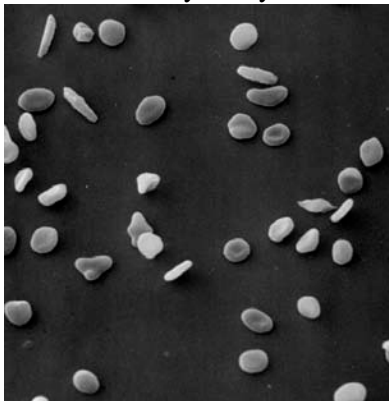
Borrelia burgdorferi (Immunolabeling)



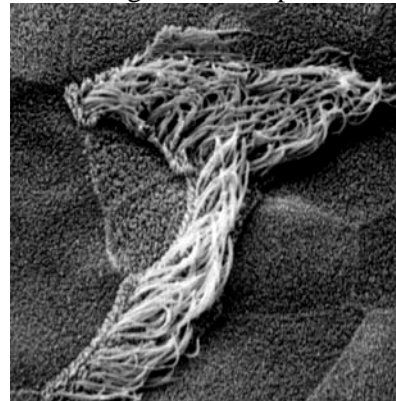
Lymphocystis (Iridovirus) in fish



Canine Erythrocytes



Guinea Pig Tracheal Epithelium



Laboratory Director's Experience:



Dr. Michael J. Dykstra - Dr. Dykstra has worked in the field of ultrastructural research for over 35 years. He received his B.A. and M.S. degrees in botany from the University of Iowa and then received a Ph.D. from the University of North Carolina at Chapel Hill in botany, specializing in cell biology and mycology.

After 2 years of post-doctoral training at the University of Florida in botany, microbiology and soil science, he transferred to a post-doctoral position in the pathology department in the College of Medicine.

Dr. Dykstra next spent one year as a visiting lecturer at the University of North Carolina at Chapel Hill before joining the College of Veterinary Medicine at the University of Georgia as the Director of the Electron Microscopy Facility in 1979, a post he held for 5 years. During those 5 years, he earned an M.S. in medical microbiology from the same institution.

In 1984, the North Carolina State University College of Veterinary Medicine hired Dr. Dykstra to create an electron microscopy service laboratory. By the spring of 1985, the facility had been equipped, personnel trained, a teaching program in electron microscopy had been instituted, and the service facility was fully operational in support of transmission and scanning electron microscopy studies as well as light microscopy. In 1995, the Laboratory for Advanced Electron and Light Optical Methods (LAELOM) was re-structured as a fully-compliant GLP support laboratory for pharmaceutical industry service work in the areas of electron microscopy (TEM and SEM) as well as light microscopy and morphometry.

In 1987, Dr. Dykstra was hired as a long-term consultant to re-open the Electron Microscopy Laboratory at Burroughs Wellcome Co., where he was charged with the responsibility of establishing the standard operating procedures (SOPs) for the facility as well as overseeing the operation of the laboratory, including the day-to-day work performed by the technical staff he trained. In addition, he consulted with research personnel during the design phase of ultrastructural studies and did the microscopy, analysis of photomicrographs, and provided the written reports on ultrastructural findings that were appended to reports provided to the Food and Drug Administration in support of drug development. In the early 1990s, he was responsible for bringing the Burroughs Wellcome Electron Microscopy Laboratory into GLP compliance. After 9 years of service in this capacity, Dr. Dykstra terminated this relationship one year following the merger which created Glaxo Wellcome Co.

Dr. Dykstra has published ultrastructural papers on viruses, bacteria, protozoans, fungi, mammalian and other metazoan tissues as well as studies on cytopathology. He has also published three textbooks on biological electron microscopy and contributed a chapter to the second edition of the *Illustrated Guide to the Protozoa* (2000).

Dr. Dykstra has served as a consultant for research and pharmaceutical companies including Novartis, Dupont, Syngenta, Genentech, Rhone-Poulenc Rorer, R.W. Johnson, Sandoz and Cotton Incorporated concerning facility design, equipment purchases, SOP preparation and electron microscopy study support. He has provided electron microscopy support for American, European and Japanese pharmaceutical development studies. Dr. Dykstra has been a full member of the Society of Toxicologic Pathology since 2000.

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WORKS EDITED

Guest editor, *Journal of the Elisha Mitchell Scientific Society*, 97:67-189 (1981). A festschrift in honor of the retirement of Lindsay S. Olive.

Examples of LAELOM Services and Available Equipment

1. **TEM sample preparation** (fixation and embedment; up to 4 vials of tissue resulting in 16 blocks)
2. **SEM sample preparation** (fixation, critical point drying, and sputter coating)
3. **Light microscopy sample preparation** (cryostat samples, JB-4 glycol methacrylate sample preparation including staining)
4. **Sectioning and staining** of resin-embedded samples, resulting in semithin and ultrathin sections for examination by light and electron microscopy, respectively
5. **Miscellaneous services** such as chemical preparation, protocol development, and fiscal analyses
6. **Equipment:**
 - FEI/Philips EM208S/Morgagni **Transmission Electron Microscope**
 - JEOL JSM-6360LV **Scanning Electron Microscope**
 - Ladd **Vacuum Evaporator**
 - Anatech Hummer VI **Sputter Coater**
 - Ladd **Critical Point Dryer**
 - Leica UCT **Ultramicrotome** with Leica EMFCS **Cryostage Attachment**
 - Leica UC6 **Ultramicrotome**
 - Reichert Ultracut E **Ultramicrotome**
 - AO **Cryostat**
 - Wild M400 **Photomicroscope** with Nikon Digital Sight DSFi1 Camera
 - Nikon TE-2000-E **Inverted Photomicroscope**
 - Nikon 2000-S **Inverted Photomicroscope** with Nikon Digital Sight DSFi1 Camera and Hoffman Contrast Optics and Epifluorescence Capabilities
 - Nikon C-1 **Confocal Scanning Laser System**
7. **Graphic services**
 - Black-and-White **Prints** (working and publication quality)
 - **Image scanning with Microtex ScanMaker 8700**
8. Olympus Vanox AH-3 **Photomicroscope** equipped with SPOT RT Slider cooled-CCD **digital camera**, bright field and epifluorescence capabilities, and ImagePro Plus **morphometry program**
9. Zeiss AxioImager M-1 **Photomicroscope** with bright field, phase, DIC, epifluorescence and image deconvolution capabilities

Facilities Description

Room Number and Use	Square Feet
C-103 light optics/morphometry lab	156
C-105 print darkroom/copy facility	230
C-106 sample preparation lab	598
C-106A TEM microscope room	132
C-107 SEM microscope room	132
C-108 Administrative office	126
C-109 Negative/service darkroom	161
C-110 Light microscopy/confocal prep lab	322
C-110A Confocal microscope room	<u>143</u>
Total Square Feet	2000