The Focal Point

The Newsletter for The Indiana Microscopy Society
November, 2006 Volume 3, Number 1

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About the Cover

Francisco Noia in the Department of Chemistry and Biochemistry at the University of Notre Dame took artistic license with this TEM micrograph of murine hepatic tissue contaminated with lead citrate crystals. Francisco thought that the image had artistic value so he decided to modify it in photoshop using color and contrast to increasing its impact. This way a totally unacceptable scientific picture is transformed into an aesthetically pleasing image.

Message from the President

It has been about two years since the founding of INMS. It is still a very young society. The survival and existence as well as the growth of INMS depend on our members. As the new president of the society, let me first thank you for your participation whether you have been with us for the last two years or are a new member of the society. Our current members are mostly from the Indianapolis area. It is of paramount importance that we have more members from other cities and institutions from around the state. I encourage our members to spread the word around about INMS when communicating with colleagues from other cities or campuses in the state and to invite them to join the society. Since many of our scientific works, from biological to physical sciences, can be enhanced by using microscopy, I believe INMS has a lot to offer by fulfilling its scientific and educational goals and to serve its members. We will have an executive council meeting this summer to discuss strategies of how to make INMS more visible and enhance its image in the state. If you have any ideas or suggestions, please feel free to contact me or drop by my office. I look forward to working with you and serving our society.

Dr. Weiming Yu

Message from the Past President

On September 16, 2004 a group of interested Indiana Microscopists gathered to form this Indiana Microscopy Society. We accepted Bylaws and a Constitution that were presented by the Bylaws Committee; we also held elections for society officers. It has been an honor to serve as your inaugural President. We have been busy over the last 2 years. Our request to become an official Local Affiliate Society of the Microscopy Society of America was granted. We have had two successful Spring Meetings, one in Indianapolis and the other at Notre Dame this last spring. Our Fall Meeting in 2005 was held at Eli Lilly's International Corporate Offices. Our membership has grown and we are being recognized at a national level. We are off to a great start, but we are only as strong as our membership, so remember to renew your membership and spread the word about our Society and our meetings.

Dr. Vincent Gattone

Officers for 2006-2008

Elected Officers

President:	Weiming Yu	wmyu@iupui.edu
Past President:	Vincent Gattone	vgattone@iupui.edu
President Elect:	Mike Esterman	esterman@ccrtc.com
Interim Secretary:	Caroline Miller	camiller@anatomy.iupui.edu
Interim Treasurer:	Janice Pennington	jgpennin@iupui.edu

Non-elected Positions

Newsletter Editor:	Janice Pennington	jgpennin@iupui.edu
Web Site Coordinator:	Mandy Gacsko	agacsko@iupui.edu
Affiliate Liaison:	Caroline Miller	camiller@anatomy.iupui.edu or caromill@iupui.edu
Biological Representative:	Michael Rubart	mrubartv@iupui.edu
Physical Representative:	Robert Walson	rwalson@sbcglobal.net
Student Representative:	Pam (Young) Muriello	payoung@iupui.edu

Treasurer's Report

7-1-05 through 6-30-06

Assets as of July 1, 2005:		
Checking:	$542.09	
Savings:	$590.03	
Total:	**$1,132.12**	**$1,132.12**
Receipts:		
Dues 2005/2006:	$50.00	
Fall Meeting-Eli Lilly:		
Corporate Memberships	$100.00	
Corporate Donations	$100.00	
Spring Meeting-Notre Dame:		
Member Dues/Registration	$230.00	
Corporate Memberships	$600.00	
Corporate Donations	$900.00	
Savings:		
Interest	$11.22	
Total:	**$1,991.22**	**1991.22**
Total Receipts:		**$3,123.34**
Expenses:		
Fall Meeting-Eli Lilly:		
Honorarium	$50	
Catering	$338.35	
Other	$1.00	
Spring Meeting-Notre Dame:		
Honorarium	$150	
Catering	$1,093.60	
Poster/Micrograph Winners	$150	
Supplies	$111.25	
Dinner	$106.26	
Other	$6.55	
American Association of Anatomists-		
Platform Session	$100.00	
Small Business Fee	$63.10	
Total Expenses:	**$2,170.11**	**2170.11**
Total Assets		**$953.23**
Total Assets by Account		
Total Checking		**$351.98**
Total Savings		**$601.25**
Total Assets		**$953.23**

Treasurer's Report

7-1-06 through 11-10-06

Assets as of July 1, 2006:			
	Checking:	$351.98	
	Savings:	$601.25	
Total:		**$953.23**	**$953.23**
Receipts:			
	Corporate Membership Dues	$300.00	
	Regular Membership Dues	$220.00	
	Interest Savings	$5.02	
		$525.02	**$525.02**
Total Receipts:			**$1,478.25**
Expenses:			
	Small Business Fee	$6.51	
Total Expenses:		**$6.51**	**$6.51**
Total Assets			**$1,471.74**
Total Assets by Account			
	Total Checking		**$865.47**
	Total Savings		**$606.27**
Total Assets			**$1,471.74**

Second Annual Meeting of the Indiana Microscopy Society

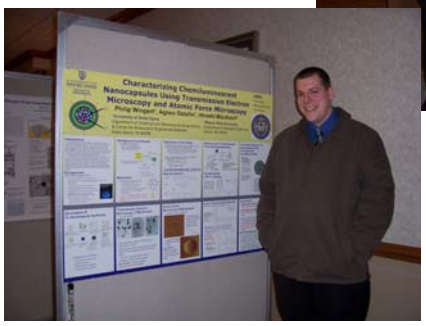
The 2nd Annual Spring Meeting of the Indiana Microscopy Society was held on the University of Notre Dame campus on March 20th 2006. The meeting was hosted by the Center of Molecularly Engineered Materials.

From left to right: Alex Kandel (speaker), Vince Gattone, Eva Chi (speaker), Agnes Ostafin, and Daphna Yaniv (speaker).

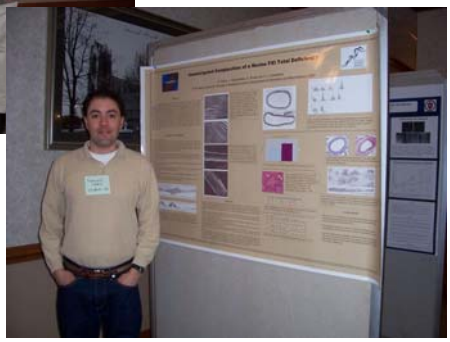
Attendees enjoyed a buffet breakfast while viewing the posters and micrographs, followed by our first speaker Dr. Daphna Yani, from Electron Microscopy Sciences/Quantomix, who spoke on electron microscopy of hydrated samples, or WET SEM. After lunch Dr. Eva Chi, from the Department of Chemistry, at the University of Chicago, spoke on the role of cell membranes in the pathogenesis of Alzheimer's disease. Dr. Alex Kandel from the Department of Chemistry and Biochemistry at the University of Notre Dame completed the session with his talk which utilized scanning tunneling microscopy to study organic molecules on surfaces.

The meeting was put together by co-program chairs Caroline Miller from Indiana University School of Medicine and Agnes Ostafin from the University of Notre Dame.

Poster Winners

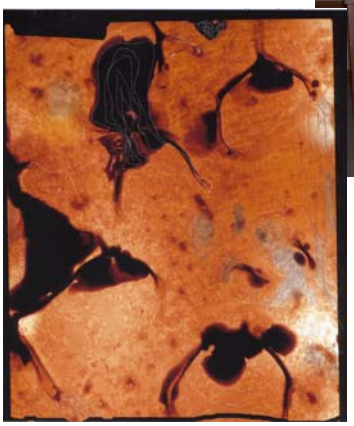


Philip Wingert, University of Notre Dame

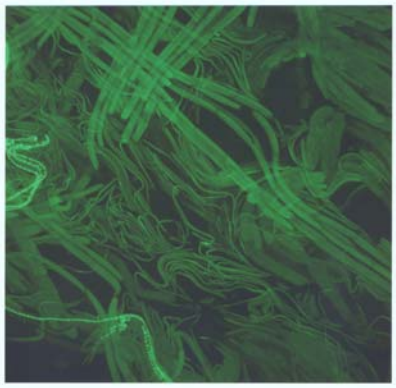


Francisco Noria, University of Notre Dame

Micrograph Winners



Francisco Noria, University of Notre Dame



Michelle Marshall, Indiana University South Bend

Vendors

Zeiss

Fisher Scientific

Olympus

Electron Microscopy Sciences

SPONSORS of the 2nd Annual INMS Spring Meeting

Advanced Microscopy Techniques Corporation

Zeiss

FEI Company

Fryer Company, Inc.

JEOL

Olympus

Optical Analysis Corporation

Ted Pella

Fisher Scientific

Leica Microsystems

Hitachi

Mager Scientific, Inc.

Electron Microscopy Sciences

Speaker Abstracts

Role of Cell Membrane in the Pathogenesis of Alzheimer's Disease

Eva Chi, University of Chicago, Department of Chemistry, Chicago, IL

Alzheimer's disease (AD) is a protein deposition neurodegenerative disease affecting more than 4.5 million people in the U.S. and to date, no successful treatment is available. Although it is widely accepted that the aggregation of normally monomeric amyloid-β peptide (Aβ) into insoluble fibrils is the primary event driving AD pathogenesis, the fundamental mechanism of Aβ fibril formation and toxicity in vivo is still unclear. Cell membrane has been implicated to play important roles in both Aβ fibril formation and toxicity. We used lipid monolayers as model cell membrane to probe Aβ-membrane interactions. Lipid monolayers were formed in a Langmuir trough and insertion of Aβ into monolayer at constant pressure was measured. The effect of Aβ insertion on membrane integrity and lipid packing were monitored by fluorescence microscopy where direct visualization of monolayer morphology during Aβ insertion was made. Furthermore, the location of Aβ association in the lipid film was assessed by dual-probe experiments where the peptide was labeled with a fluorophore that has a different emission spectrum than that of the lipid dye. Electrostatic interactions between Aβ and phospholipid head groups were found to modulate Aβ insertion into lipid monolayers. Specifically, Aβ exhibited higher insertion into an anionic lipid, which usually resides in the inner leaflet of the cell membrane. Aβ was found to preferentially insert into more fluid regions of the lipid monolayer and disrupted condensed domains during insertion. Furthermore, the enhanced interaction of Aβ with anionic lipids induced rapid fibril Aβ formation. Our results demonstrated that Aβ can favorably interact with membrane lipids, leading to Aβ aggregation and disruption of cell membrane.

Structure and Dynamics of Organic Molecules on Surfaces, One Molecule at a Time

S. Alex Kandel, University of Notre Dame, Department of Chemistry and Biochemistry, Notre Dame, IN

With in situ scanning tunneling microscopy, we characterize surfaces at the molecular scale, initiate physical modifications of the surface, and determine exactly which molecules have changed as a result. While organosulfur monolayers on gold are remarkably stable, we can use this method to observe and characterize molecular diffusion and reorientation that occurs near film defects created by high-energy gas bombardment.

EM of Fully Hydrated Samples

Daphna Yaniv, Electron Microscopy Sciences, Hatfield, PA

EMS/Quantomix WETSEM technology will be introduced. WETSEM allows direct observation of wet samples with the scanning electron microscope (SEM), at atmospheric pressure. The sample is placed in a sealed specimen chamber, and is separated from the vacuum by a thin, electron-transparent membrane. The partition membrane allows the penetration of electrons to the sample and the collection of backscattered electrons (BSE), while withstanding pressure differences of up to one atmosphere.

The technology offers several unique advantages. Sample preparation involves only liquid handling, obviating the need for drying, embedding, sectioning or coating. The simple sample preparation procedures minimize deformations and other artifacts, and allow preservation of labile, hydrated structures.

The technology is also compatible with Energy Dispersive Spectroscopy (EDS) measurements of wet samples.

Experiments ranging from life science to material science applications will be presented. Images and EDS measurements of cells, tissues, bacteria, powders, nanoparticles, emulsions, and creams will be demonstrated. Results will show imaging in solutions (aqueous and non aqueous), isolated environments and in “as is” conditions. A newly developed application of the WETSEM technology is following dynamic changes under ambient condition.

A movie following changes due to hydration processes will be shown.

Student Abstracts

Characterizing Chemiluminescenct Nanocapsules Using Transmission Electron Microscopy and Atomic Force Microscopy

Philip Wingert, Department of Chemical and Biomolecular Engineering,
Universtiy of Notre Dame, Notre Dame, IN 46556

Nanoencapsulation can create a protective environment for chemical events, allowing quantitative analysis and detection of a system irrespective of the presence of interfering substances. This technology is useful in a wide variety of applications such as catalysis, online sensing, drug delivery, and medical diagnostics. The scientific and engineering challenges in this area involve synthesis as well as understanding the basic chemical processes inside nanocapsules. In my project we have used chemiluminescent reactions as a model chemical reaction system to study in such materials. Chemiluminescence, the emission of light as a result of a chemical reaction, has been used for decades to detect oxidative chemical processes, trace metals, and organic contaminants with high sensitivity. This great sensitivity also means that most of these reactions require carefully controlled conditions in solution. Nanoencapsulation may be a practical strategy to expand the usefulness of these reactions into realistic processing conditions. Paramount to the success of synthesis is materials characterization involving both Transmission Electron Microscopy (TEM) and Atomic Force Microscopy (AFM) methods. Along with the complementary imaging of these nanocapsules we will be describing some issues involving synthesis and performance of the materials.

Near-field Scanning Microwave Microscopy and its Applications in Characterization of Dielectric Materials

Qinxin Zhang and Paul J. McGinn, Dept. of Chemical and Biomolecular Engineering, University of Notre Dame, Notre Dame, IN, 46556

Abstract: Dielectric properties of dielectric materials are related to microstructure, defects and composition variations. Traditional impedance measurement is an average along the length scale, which is not sensitive to local structure and compositional variations. Near-field scanning microwave microscopy is a useful technique to investigate the local dielectric properties variation. Examples are shown of the use of SMM to examine
1. local dielectric properties variation due to twinning in a $LaAlO_3$ single crystal;
2. oxygen stoichiometry dependence of dielectric constant in a TiO_2 crystal;
3. eutectic structure in a $MgTiO_3$-$CaTiO_3$ diffusion couple;
4. regional microstructure variations in an $LaAlO_3$-TiO_2 diffusion couple.

The surface effect on the sedimentation of colloidal particles in suspension

Cuiyue Lei, Caitlin Fogarty and Yingxi Elaine Zhu, Dept. of Chemical and Biomolecular Engineering,
University of Notre Dame, Notre Dame, IN 46556

Particles sediment when they are heavier than the solvent in which they are suspended. The substrate where the particles settle must counter gravity by transmitting the force from the particles through the solid surface. We are exploring how the transmitted force is affected by the surface-particle interaction. We study the sedimentation of negatively-charged polystyrene colloidal particles in aqueous media onto surfaces of neutral, likely-changed and oppositely charged. By using a confocal laser scanning microscopy, we can directly visualize the aggregation dynamics of colloidal particles during sedimentation at a single particle resolution and at real time. As the particle-surface interaction varies we have observed different packing configuration of colloidal aggregates when they are settled near surface. We also observed a strong dependence of surface chemistry on the sedimentation rate of early stage.

Student Abstracts

Impeded dynamics of colloidal suspension confinement under

Prasad Sarangapani, Yingxi Elaine Zhu, Dept. of Chemical and Biomolecular Engineering, Fitzpatrick Hall # 182, University of Notre Dame, Notre Dame, IN 46556

Packing configuration of colloidal particles in suspensions is determined by interparticle interaction and volume fraction. Many modern technological applications of colloidal suspensions entail applications of surface confinement and significantly modify the packing structure of colloidal particles. However, the packing configuration and dynamics of colloidal suspension under confinement is poorly understood. We have custom-built a colloidal force apparatus and integrated it with a confocal laser scanning microscopy. Thus, while varying the gap spacing of two surfaces that confine colloidal suspension in between substrates, we can simultaneously visualize the 3-D microstructure and motion of colloidal particles at a single particle resolution and at real time. A shear apparatus is currently being built, which allows us to characterize the mechanical properties of colloidal suspension and also probe the restructuring of confined colloidal particles when they are driven out of equilibrium.

Unknown facts of murine FXI total deficiency

Fransicsco Noria, Dept. of Chemistry and Biochemistry, University of Notre Dame, Notre Dame, IN 46556

The zymogen serine-protease factor XI (FXI) is an essential player of the initial part of the intrinsic pathway of coagulation known as the contact system. Partial deficiency of this factor can cause localized bleeding and propensity to infections. These observations are not unique to humans and have been documented to occurs in other species such as, certain strains of cattle and dogs. The intriguinghallmark of this protease deficiency is the poor correlation between the levels of FXI in plasma and its capacity to form stable bloodclots, and sometimes heterozygotes for the deficiency with FXI levels of 50U/dL can experience the same type of bleeding than homozygotes with less than 20U/dL. This phenotypical unexplained paradigm is exclusive of FXI deficiency and the lack of any other of the components of the contact system display no bleeding diathesis. Furthermore, mice with a total deficiency in FXI ($FXI^{-/-}$) crossbreed and develop with no apparent problems other than a slightly delayed plasma aPTT. Reexamination of these mice at adult and elder stages using TEM, SEM and histological approaches revealed a series of abnormalities that expose unknown complexities of the phenotype. Additionally, inflammatory challenge of these animals with a Copper Cuff model for accelerated arterial plaque formation shows an exacerbated inflammatory response. The spontaneous and induced phenotype on these mice could contribute to explain the uncorrelated facts of the FXI deficiency in humans.

Microscopy and Microanalysis 2006

Microscopy and Microanalysis 2006 took place at Navy Pier from July 31 through August 3rd, in Chicago IL. Indiana Microscopy Society members in attendance were Vince Gattone, Caroline Miller, Janice Pennington, Weihong Lei, Sharon Bledsoe, Clif Duhn, Peggy Harger-Allen, Sandy White, Pam Young Mureillo and Sherry Clendenon.

For those new members who do not know, Microscopy and Microanalysis is the annual meeting of the Microscopy Society of America (www.microscopy.org), which is the parent organization of our Local Affiliate Society (LAS) the Indiana Microscopy Society (www.indianamicroscopy.org). There are 33 local affiliate societies though out the United States and you may view their websites by going to the MSA website above and clicking on the Local Affiliate Societies icon on the left of the screen. A representative from each society meets every year at the national meeting, for the LAS breakfast. Caroline Miller represents our society at this meeting and you can find her report from the meeting on page 16. Next spring on April 20 and 21 the Indiana Microscopy Society will host a joint regional meeting which will include four other Local Affiliate Societies. This meeting will be held in Indianapolis at the Van Nuys Medical Science Building on the IUPUI campus.

Microscopy Society of America MegaBooth

The Microscopy Society of America offers a MegBooth during the meeting which supplies attendees with information about the Society. It is usually located centrally on the showroom floor and is composed of several major areas which include: **Nestor's Cyber Café**, the **MSA Book Display**, **Project Micro**, and the **Technologist's Forum.** The central booth is where attendees can find information about membership, sign up for Exhibitor Tutorial Demonstration, rent DVD tutorials, or learn about the MSA Undergraduate Scholarship Program.

The **MSA Book Display** (left) coordinated by Janice Pennington of the Indiana Microscopy Society, showcases newly published books donated by publishers to the society. Seating is provided between the book display and **Nestor's Cyber Café** so that attendees may sit and visit with colleges, browse through the books, or just rest while waiting to use the Cyber Cafe.

The **Technologists' Forum** is a committee dedicated to the growth and development of technologist in MSA. This is where information can be found about becoming a Certified Electron Microscopists. The committee organizes a symposium each year with topics of interest to technologists. The Forum also sponsors Professional Technical Staff Awards.

Pam Lloyd (left) has the huge responsibility of coordinating the entire **MegaBooth** as well as the **Placement Office**. The Placement Office allows perspective employers and employees to exchange job posting and resumes at this booth. Seated next to Pam is her right hand man Dave Tomlin. Both Pam and Dave are associated with the Microscopy Society of the Ohio River Valley LAS.

Project Micro is tirelessly headed by Caroline Schooley and is a resource for educational material for grade k-12. **MICRO** stands for **M**icroscopy **I**n **C**urriculum **R**esearch **O**utreach. The goal of Project Micro is to put MSA members, teaching materials, and microscopes in middle school classrooms nation wide.

In 1993 MSA collaborated with experienced science educators at Lawrence Hall of Science of the University of California at Berkeley to develop educational materials. Since 1998 they have published teachers manuals in the Lawrence Hall of Science (LHS) GEM (Great Explorations in Math and Science) series. Interested microscopists can help present this material in the classroom, by becoming a volunteer. This will be more important that ever this coming year as the "No Child Left Behind" act of 2001 has been reauthorized for 2007. The goals of the act are to prepare all students with 21st century skills, create enthusiasm for learning, close achievement gaps, and ensure that educators have the resources and tools they need to get the job done. To find out more about this program go to the MSA website (www.microscopy.org) and scroll down to Reference and Educational Materials and click on Project Micro.

Update on the 2006, M & M meeting held in Chicago, IL
LAS Liaison for INMS, Caroline Miller:

As part of my duties as the LAS (Local Affiliate Societies) Liaison for the Indiana Microscopy Society, I attended the LAS breakfast meeting at the M & M meeting in Chicago, IL this past summer. We were welcomed by the incoming MSA president, Mike O'Keefe, Lou Ross, MSA national LAS Director and MSA membership committee Chairperson, Jeanette Killius with the title being, "What can MSA do for You?"

Topics discussed included resources available to all Local Affiliate Societies, Project Micro, the budget, Nominations for 2007 tour speakers and other LAS resource data. Some of these topics were relevant to our LAS because of the interest in having a Joint LAS Spring Meeting in 2007.

As explained, there are many financial resources available to help support LAS with local meetings. If a society uses a MSA tour speaker, all travel expenses are paid for. Grant-In-Aid is available to cover Honoraria, travel, equipment rental, etc. for up to $650 per year for each society participating in a meeting. Special meeting support for up to $1000 is also available for joint meetings, one of a kind meetings and symposia. Non-related M & M workshops can be up subsidized for up $1000 by FIG (Focused Interest Group) support.

Many of the Local Affiliate Societies are faced with the same problems, such as ways to strengthen their societies and gain membership. Most feel more money through awards or travel is needed for students and technical members. There was talk of the possibility of a traveling workshop and future web site member resources. It was suggested that at a local level to have a technical meetings that involved more than just microscopy, such as the addition of chemical and geological societies. It was mentioned that the Educational Committee, Traveling Poster exhibit was important to keep, but it needed to be in digital format.

Finally as the LAS national director, Lou Ross would like to have a member list from each LAS to compile a membership directory. MSA is welcoming ideas and suggestions for ways that they can help make the LAS stronger and a more integral part of the Microscopy Society of America.

Late Fall Meeting of The Indiana Microscopy Society

December 1st, 2006 from Noon to Five
In the old Medical Science Building, rooms 813 & 14

Speakers:
Dr. James Williams, Professor, Department of Anatomy and Cell Biology
Computed Tomographic X-ray Imaging of Biological Structures Using Micro CT

Dr. Jay Siegel, School of Science
Director-Forensic and Investigative Sciences Program
"The Spectrophotometer and the Microscope: A Marriage Made in Forensic Heaven"

Important business meeting will precede speakers
No registration Fee
Pizza & refreshments Provided

RSVP to Caroline Miller
Program Chair, INMS, camiller@anatomy.iupui.edu

Fall Meeting Speaker Abstracts

The Spectrophotometer and the Microscope: A Marriage Made in Forensic Heaven

As forensic chemistry has become ever more popular and sophisticated, the need to analyze increasingly smaller particles of evidence has accelerated. Spectrophotometric techniques have long been popular in characterizing various types of evidence including hairs and fibers, paint chips, drugs, inks, etc. Microscopes are, of course, the most useful instruments in the crime lab for viewing and characterizing small particles and pieces of microscopic evidence. In recent years, the two instruments have been merged to great benefit to forensic chemists. This paper will discuss some of the applications of UV-visible-near IR and FTIR microspectrophotometers in the analysis of forensic evidence. The relatively new technique of micro-Raman spectroscopy will also be mentioned.

Computed Tomographic x-ray imaging using Micro CT

Computed tomographic x-ray imaging is now being done at the microscopic level in many fields. Micro CT, as it is called, has been used most extensively for studies in bone and for industrial applications, such as in quality control of electronic parts. Its value is in its ability to image an uncut specimen non-destructively, with complete three-dimensional reconstruction at levels as small as 1 micron voxel size. Examples of biological applications will be shown, including special aspects of bone imaging, characterization of vascular trees, and exploration of the earliest stages of kidney stone formation in human biopsy specimens.

Joint Spring Meeting

April 20 and 21, 2007

Hosted by

The IndianaMicroscopySociety (INMS)

www.indianamicroscopy.org

Participating Local Affiliate Societies:

Midwest Microscopy and Microanalysis Society (M³S)

Iowa Microscopy Society (IMS)

Michigan Microscopy and Microanalysis Society (MMMS)

Central States Microscopy and Microanalysis Society (CSMMS)

Dear Microscopists,

This edition of The Focal Point highlights some of the aspects of the Microscopy Society of America, our parent organization. Many members of MSA are members of Local Affiliate Societies and this spring our society will host a joint meeting with four of these societies. More information about this meeting will be posted on the website as the details become finalized.

Many of us who are members of our LAS are also involved in the Microscopy Society of America. Caroline Miller and I are both on the Education Committee. Caroline is in charge of the Traveling Poster Exhibit, and I manage the MSA Book Display. Mike Goheen, supervisor of the Electron Microscopy Laboratory in the Department of Pathology is on the Certification Board of the Microscopy Society of America. Mike grades written and practical exams that are taken for Certification in Electron Microscopy. Graduate student Pam Young Muriello, was a student volunteer at the recent MSA meeting in Chicago.

As the Indiana Microscopy Society continues to grow, we will be able to have a positive impact on the community around us. It is people who donate their time to help educate and inspire others that can make a difference. If you would like to donate your time to our society please feel free to contact anyone on the executive council (page 2). We will have a short Fall Meeting on December 1, from noon to five, beginning with a business meeting to discuss the Joint Spring Meeting. Please RSVP to ensure that you will be entitled to some free pizza! Hope to see you there!

Sincerely,
Janice Pennington
Newsletter Editor
Indiana Microscopy Society