

CSMMS 2010 Spring Meeting Agenda

Stowers Institute

Thursday, April 29, 2010

9:00 - 10:00 REGISTRATION AND BREAKFAST

10:00 - 10:15 WELCOME: RHONDA TRIMBLE, EM SPECIALIST, STOWERS INSTITUTE

10:15 - 10:30 OPENING REMARKS: DR. WINFRIED WIEGRAEBE, DIRECTOR OF MICROSCOPY CENTER, STOWERS INSTITUTE

10:30 - 12:00 TOUR OF STOWERS IMAGING AND ANALYTICAL FACILITIES

10:30 - 12:00 WORKSHOP A: "CASINO - monte Carlo Simulation of electron trajectory in solids"

PAUL CARPENTER, EPMA SPECIALIST, WASHINGTON UNIVERSITY

This program is a Monte Carlo simulation of electron trajectory in solid specially designed for low beam interaction in a bulk and thin foil. This complex single scattering Monte Carlo program is specifically designed for low energy beam interaction and can be used to generate many of the recorded signals (X-rays and backscattered electrons) in a scanning electron microscope. This program can also be efficiently used for all of the accelerated voltage found on a field emission scanning electron microscope (0.1 to 30 KeV). This program is designed to simulate a large amount of electron trajectory in a solid of your choice. The main idea is to simulate enough electron trajectory to represent the condition used to image structures in a scanning electron microscope (SEM). Thus it is possible to predict theoretically the signals observed in the SEM. This Monte Carlo program use different models to simulate the interaction of electrons with a solid. For now, the versions 2.0 of CASINO produce the following signals: Backscattered coefficient and X-Ray. It also handles those geometry, multi-layered samples and grain boundary.

12:00 - 1:15 LUNCH

1:30 - 4:30 WORKSHOP B: "A PRACTICAL INTRODUCTION TO DTSA-II"

NICHOLAS RITCHIE, NATIONAL INSTITUTE OF STANDARDS & TECHNOLOGY

NIST DTSA-II can be thought of as "Power Tools for Microanalysis." DTSA-II does not replace the software provided by your EDS vendor instead it supplements it with low level and high level tools for manipulating, simulating & interpreting EDS spectra. In this workshop, we will introduce using DTSA-II. We will discuss using DTSA-II to perform standards-based quantification of bulk and particle spectra. We will discuss using DTSA-II for simulating various sample geometries using both fast analytical spectrum simulation models and the more sophisticated Monte Carlo-style models. We will investigate how these two complementary tools, quantification and simulation, can be used together to interpret challenging samples. We will show how the scripting interface can be used to perform sophisticated spectrum manipulation. Please bring a laptop and follow along. DTSA-II is freely available and runs on Windows, OS X, Linux and Unix.

WORKSHOP C: THAWED CRYOSECTIONS FOR IMMUNOCYTOCHEMISTRY

PAUL WEBSTER, Director of the Ahmanson Advanced EM & Imaging Center, HOUSE EAR INSTITUTE, LOS ANGELES

Immunocytochemistry for transmission electron microscopy provides important information on the location and relative abundance of proteins inside cells. Gaining access to this information without extracting or disrupting the location of target proteins requires specialized preparation methods. Currently, the best approach for immobilizing biological materials for immunolabeling is rapid freezing followed by freeze substitution. However, not all biological materials easily fit into a high-pressure freezer. Alternative methods for preparing sections that can be immunolabeled have to be available. Sectioning frozen blocks of chemically fixed and cryoprotected biological material is one alternative method for obtaining immunocytochemical data. Once the cells or tissues are cut, the thawed cryosections can be labeled with specific antibodies and colloidal gold probes. They are then embedded in a thin film of plastic containing a contrasting agent. Subcellular morphology can be correlated with specific affinity labeling by examination in the transmission electron microscope. Modern technical advancements both in preparation protocols and equipment design make cryosectioning a routine and rapid approach for immunocytochemistry that may provide increased sensitivity for some antibodies. This workshop will describe the methodology of obtaining and immunolabeling thawed cryosections of biological material.

6:00 PM DINNER: JACK'S STACK BBQ (COST?)

Friday, April 30, 2010

- 7:45 - 8:25** **REGISTRATION AND BREAKFAST**
- 8:25 - 8:30** **WELCOME: LOU ROSS, SR. RESEARCH SPECIALIST, UNIVERSITY OF MISSOURI**
- 8:30 - 9:15** **"IMAGE J TUTORIAL" - RICHARD ALEXANDER, (TITLE), STOWERS INSTITUTE**
- 9:15 - 10:00** **"MODELING SECONDARY FLUORESCENCE IN INCLUSIONS AND INTERFACES USING DTSA-II" - NICHOLAS RITCHIE, NIST, GAITHERSBURG, MD**
Secondary fluorescence is the ignored stepchild in most quantitative electron excited x-ray microanalysis. In most cases the secondary fluorescence correction is much smaller than either the absorption or atomic number correction. However there are times when this correction plays a significant role. These situations can result from unfortunate mixes of elements, sub-optimal sample geometry and trace analysis. In these cases it is important to understand the sources and length scales characteristic of the process. It is helpful to have tools that allow you to model the process such as those integrated into DTSA-II.
- 10:00 - 10:15** **BREAK**
- 10:15 - 11:00** **"TITLE" – DR. M. R. PETE HAYDEN, ASSISTANT PROFESSOR, UNIVERSITY OF MISSOURI**
- 11:00 - 12:00** **"BIOFILMS: ANOTHER WAY OF LOOKING AT BACTERIA" – DR. PAUL WEBSTER, HOUSE EAR INSTITUTE, LOS ANGELES**
Medical science is very good at detecting bacteria and almost as good at eradicating bacteria from the human body. However, our eradication methods are becoming less efficient as pathogens adapt. By shifting our focus from looking for, to look at bacteria we have discovered that classical laboratory methods have ignored the fact that bacteria preferentially grow attached to a substrate in the form of a biofilm. Currently the only treatment options available for biofilm infections are to physically remove the biofilm. Examination of the biofilm phenotype may reveal new ways to treat bacterial infections.
- 12:00 – 1:00** **LUNCH**
- 1:00 - 1:30** **"TITLE" - Dr. GIULIA RANCATI,(TITLE), STOWERS INSITUTE**
- 1:30 - 2:00** **"ELECTRON-PROBE MICROANALYSIS: ISSUES FOR ANALYSIS OF BIOLOGICAL AND BEAM SENSITIVE MATERIALS" – DR. PAUL CARPENTER, EPMA SPECIALIST, WASHINGTON UNIVERSITY**
- 2:00 - 3:00** **MICROSCOPY SOCIETY OF AMERICA TOUR SPEAKER KEYNOTE ADDRESS:**
"TISSUE ENGINEERING OF MODELS OF HUMAN DIGITS AND EARS" - WILLIAM LANDIS, PROFESSOR OF MICROBIOLOGY, IMMUNOLOGY AND BIOCHEMISTRY NORTHEASTERN OHIO UNIVERSITIES COLLEGE OF MEDICINE
Tissue engineering is a relatively new and potential powerful means of augmenting, repairing, and replacing various tissues that may be congenitally defective, injured, diseased, damaged or otherwise impaired in the human body. The approach of tissue engineering commonly involves seeding isolates of specific cells onto a biodegradable polymer scaffold to form a cell/scaffold construct. The construct is subsequently developed in vitro or in situ for ultimate use as a possible replacement tissue. Bone and cartilage structures, such as a human digit or ear, have now been modeled by tissue engineering methods. The presentation will describe by light and electron microscopy, correlated with laser capture microdissection and gene expression, the tissue engineering of current models of human phalanges and ears. Compared to bone and cartilage in vivo, these models demonstrate several similarities in structure, composition, and response to mechanical forces and they suggest great promise for further advances in clinical applications.
- 3:00 - 3:10** **CONCLUDING REMARKS: PAUL CARPENTER, CSMMS PRESIDENT**
- 3:15 - 4:00** **CSMMS BUSINESS MEETING**
- 4:00** **MEETING ADJOURNED**