MOUNTAIN STATES SOCIETY OF ELECTRON MICROSCOPISTS
AND THE
COLORADO MICROBEAM ANALYSIS SOCIETY

October 9, 2014
Table Mountain Inn, Golden CO

9:00-11:00A	**Automated Mineralogy Workshop** by Jack Mershon, Tescan Colorado School of Mines Contact Colleen Leary (cleary@tescan-usa.com or 724-772-7433) for details
11:00-11:15	**Check In and Registration** Table Mountain Inn
11:15-12:15	**Lunch Buffet** Chicken Tortilla Soup, Chimayó Chips & Salsa, Dijon Mustard Potato Salad OR Tangy Fresh Made Coleslaw, Assorted Wraps – Roasted Turkey, Ham and Roast Beef – Served with Grilled Portobello Mushrooms, Hummus & Assorted Olives, Freshly Baked Brownies & Cookies
12:30-1:15P	**Deborah Hall,** Rush University Medical Center *Understanding the Effects of Wear Particles: Lessons Learned from Postmortem Retrievals*
1:15-1:45P	**Brian Gorman,** Colorado School of Mines *Determining the Properties of Oxides using Static and Dynamic Atom Probe Tomography*
1:45-2:00P	**Vendor Talks**, Gatan, EDAX, JEOL
2:00-2:30	**Coffee Break**
2:30-3:15P	**Ed Vicenzi,** Museum Conservation Institute, Smithsonian Institution *Examination of a 19th Century Daguerreotype Photograph using High Resolution Scanning Transmission Electron Microscopy for 2D and 3D Nanoscale Imaging and Analysis*
3:15-3:45P	**Jack Mershon**, Tescan *Hyperspectral Imaging of Geological Thin Sections*
3:45-4:00P	**Adam Stokes,** Colorado School of Mines *Atom Probe Tomography Study on Cu(In,Ga)Se2 Grain Boundaries and Ordered Defect Phase Transition*
4:00P	**Adjourn**

$25/professional $5/student

Register online at http://microbeamanalysis.org/topical-conferences/colorado-mas-june-2014/registration-cmas-june-2014-meeting

Or Send Checks Payable To:
MSSEM/CMAS
c/o John Chandler
2309 Cheyenne St
Golden, CO 80401

THANKS TO OUR SPONSORS TO DATE

TESCAN PERFORMANCE IN NANOSPACE
EDAX Smart Insight
gatan
JEOL Stability · Performance · Productivity
BRUKER
ZEISS
CAMECA SCIENCE & METROLOGY SOLUTIONS

Understanding the Effects of Wear Particles: Lessons Learned from Postmortem Retrievals
Deborah Hall, Robbins and Jacobs Family Biocompatibility and Implant Pathology, Laboratory of the Department of Orthopedic Surgery, Rush University Medical Center

Total hip and knee replacements have been successful in treating the disability caused by severe osteoarthritis. However, over time joint prostheses do wear and even loosen, producing particulate wear debris. Analysis of postmortem retrieved prostheses, their surrounding tissues, and select remote organs have been most beneficial to understanding the mechanisms of wear and potentially adverse tissue reactions associated with particulate debris. The purpose of this lecture is to highlight the contributions of three postmortem retrieval studies to the current understanding of the generation and dissemination of particulate wear debris and the potential effects on local tissues and remote organs. Joint prostheses, thoracic and abdominal organ samples, and bone marrow cores were obtained postmortem from patients who had previously undergone hip or knee replacement surgery. Undecalcified plastic embedded sections of the implants with surrounding bone as well as paraffin embedded hematoxylin & eosin stained sections of the organs and marrow samples were prepared and studied using light and scanning electron microscopy. Wear particles in the tissues were identified using polarized light, energy dispersive x-ray analysis and laser Raman microprobe spectroscopy. The bearing surfaces of the implants were examined with light microscopy at magnifications of 10-50X. The results of the first retrieval study revealed that design changes in third generation cementless acetabular components significantly reduced backside wear of the polyethylene bearing surface and the incidence of osteolysis in periacetabular bone ($p \leq 0.014$). The second retrieval study identified systemic distribution of metal and polyethylene particles to the liver, spleen and abdominal lymph nodes of patients with total hip and knee implants. The results of the third study indicated that prosthetic wear can disseminate from the local site of generation to bone marrow throughout the body. These results stress the importance of reducing particle generation at both bearing and non-bearing surfaces of joint replacement prostheses. Wear particles were shown to be disseminated to remote organs and throughout the marrow and retained for the life time of the joint replacement patient. Improved prosthetic designs and material wear properties can lengthen implant durability and aid in minimizing the amount of wear particles produced.

Examination of a 19th Century Daguerreotype Photograph using High Resolution Scanning Transmission Electron Microscopy for 2D and 3D Nanoscale Imaging and Analysis
Edward P. Vicenzi, Museum Conservation Institute, Smithsonian Institution

The daguerreotype photographic process represents the first practical form of photography and was presented to the scientific community in France in 1839. The technology spread rapidly and was widely used for roughly two decades. Image formation can be generalized in four steps: 1) sensitizing a silver-coated copper plate to halogen vapors, 2) exposing the sensitized plate to visible light within a camera, 3) development of an image after the plate is treated with heated mercury vapor, and finally 4) deposition of a gold gilding layer. A effort is underway to evaluate several aspects of daguerreotypes including obtaining the composition of the nanoparticles that give rise to image contrast, the protective gilding layer, and corrosion products formed from exposure to atmospheric and other contaminants. A range of scanning and transmission electron- and X-ray-induced spectroscopies have been utilized to characterize these plates on the nano- and submicron- length scales in an effort to inform the long term preservation of these precious objects.