[AIMS] Arizona Imaging and Microanalysis Society

Using light, electrons, ions, electromagnetism and x-rays

AIMS Newsletter Volume 7, Issue 1

PRESIDENT'S NOTE: BROOKE BEAM, AIMS 2012-2013 PRESIDENT

Happy New Year! I'd like to take a moment to look back and thank my Phoenix-based colleagues for putting on an excellent annual meeting in March of 2012. In particular, I'd like to thank AIMS Past-President Page Baluch, Treasurer Peter Crozier, and all the others who planned and hosted the 2012 AIMS conference at Arizona State University.

The 2013 AIMS conference is scheduled for Thursday, March 7, 2013 at the University of Arizona, in the South Ballroom of the Memorial Student Union. We hope that you will join us to learn from, and network with, colleagues and vendors!

Registration for the conference is a two-step process. You must first register for membership online at http://www.azmicroscopy.org at the student, individual or corporate level, Corporate members have the option to register at various sponsorship levels which includes a booth at the conference. Due to limited seating, only those registered for conference attendance will be admitted to the luncheon.

Student Volunteers: AIMS is looking for student volunteers for the March 7th conference to help with poster display board set-up, take down and conference registration. The AIMS membership fee will be waived for all student volunteers! Email Brooke Beam (bbeam@email.arizona.edu) if you are interested in helping to make the AIMS conference a success.

AIMS 2013 Program

Univ of AZ Memorial Student Union - South Ballroom

8:00 - 8:45	Check-In
8:30 - 8:45	Opening Remarks: **Brooke Beam** AIMS President and **Ernest Hall**: MSA President
8:45 - 9:45	**Pascal G. Charest, Chemistry & Biochemistry Univ of AZ** Topic: The signaling networks controlling chemotaxis
9:45 - 10:45	Student Presentations
10:45 - 11:25	Morning Break - Vendor demonstrations/Poster Session
11:30 - 12:30	**Tom Perkins, Molecular, Cellular and Developmental Biology at the Univ of Colorado Boulder** Topic: Laser-guided atomic force microscopy for high precision biophysics
12:30 - 1:30	Buffet Lunch: Tucson Room
1:30 –1:55	Poster Sessions
2:00 - 3:00	**Ernst Hall, GE Global Research—MSA Sponsored Presidential Tour Speaker** Use of Advanced Characterization Techniques to Accelerate Materials Development in Energy and Transportation
3:00 - 4:00	**Tom Zega, Lunar Planetary Sciences, Univ of AZ** Topic: From the bottom up: Decoding the physical and chemical history of the early solar system through nanoscale characterization
3:00 - 4:00	Break with Vendor Exhibits/Student Awards
4:00 - 4:30	Student Awards and Closing Remarks
4:30 - 5:30	**Bill Chapin, McCrone Associates—MAS Sponsored Tour Speaker** Topic: Forensic Science and Trace Element Analyses
5:45 – 6:00	Business Meeting

2013 AIMS CONFERENCE IS MADE POSSIBLE BY THE GENEROUS SUPPORT OF THE FOLLOWING COMPANIES:

WE WOULD LIKE TO THANK THE FOLLOWING INDIVIDUALS AND COMPANIES WHO HAVE AGREED TO BE MEETING SPONSORS AND CORPORATE MEMBERS. WITHOUT THEIR GENEROSITY, IT WOULD BE VERY DIFFICULT TO HOLD OUR ANNUAL MEETING. THIS LIST INCLUDES THE COMPANIES THAT HAD INDICATED THEIR SPONSORSHIP BEFORE THE NEWSLETTER WAS SENT OUT.

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SPEAKER ABSTRACTS:

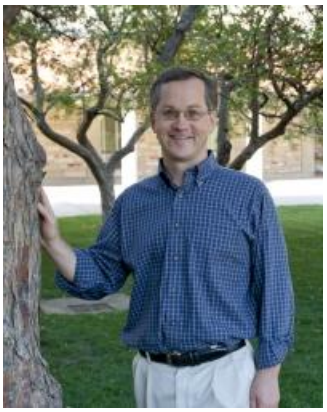
Pascal G. Charest, Chemistry & Biochemistry Univ of AZ

The signaling networks controlling chemotaxis

Abstract: Chemotaxis, or the directed migration of cells up a chemical gradient, is a basic property of many cell types. Directed cell migration is required for a wide array of biological processes that include embryogenesis, angiogenesis, epithelial wound healing, and immune responses. In response to a chemoattractant gradient, cells polarize along the axis of the gradient, forming a leading edge and a posterior, and move up the gradient using a motility cycle that involves F-actin protrusion at the leading edge followed by myosin-mediate contraction of the cell's posterior. However, the signaling pathways that link chemoattractant signal detection to regulation of this motility machinery remain largely unknown. My laboratory focuses on understanding the signal transduction mechanisms and pathways that establish cell polarity at the onset of chemoattractant signal recognition, as well as understanding how these pathways are regulated in space and time during migration.

Bio:

- I obtained my PhD in Biochemistry from the Université de Montréal. My research thesis focused on G protein-coupled receptor molecular pharmacology and signaling.
- I performed a post-doctoral fellowship in Cell Biology at the University of California, San Diego, in the laboratory of Rick Firtel working on the role and regulation of Ras proteins in chemotaxis using *Dictyostelium discoideum* as a model system.
- I then worked as Assistant Project Scientist for a year as part of Rick Firtel's group at UCSD before starting at the UofA in January 2012.



Thomas Perkins:

Laser-guided atomic force microscopy for high precision biophysics

Atomic force microscopy (AFM) is an increasingly important measurement tool in the life sciences. The most biologically relevant AFM experiments are done in liquid and at room temperature. Such perturbative environmental conditions complicate the application of AFM's exquisite sensitivity due to drift. Drift is typically associated with motion between the tip and the sample. However, our work will also show that there is significant drift in the measurement of force, AFM's core measurement. To address these issues, we developed a pair of robust solutions that dramatically reduces drift under physiologically relevant conditions. To tackle positional drift, we leveraged advanced in precision optical-trapping experiments. Specifically, we developed a method to actively stabilize both the tip and the sample using locally generated optical signals. This led to a 100-fold improvement in tip sample stability. This exquisite positional control enabled us to uncover significant drift in force. The key insight was that the cantilever's gold coating – often considered essential for high precision measurements – was the primary cause of force drift. By removing the gold, we achieved a 10-fold improvement in force precision and stability despite a 10-fold loss in reflectivity. Moreover, these improvements were achieved for a majority of commercial cantilevers test on a commercial instrument just 30 minutes after loading. We expect that many current and future applications of AFM can immediately benefit from these improvements in stability and precision Applications of this ultrastable AFM technology to the folding and unfolding proteins will be discussed.

Affiliations: Fellow, JILA, Associate Professor of Molecular, Cellular, and Developmental Biology (adjoint), Physicist, Quantum Physics Division, NIST, Task Force Member, Biofrontiers Institute, CU

Research Areas: Biophysics, Polymer physics, Molecule motors, DNA and RNA structure, Nanotechnology

Ernie Hall, MSA President-Elect

Use of Advanced Characterization Techniques to Accelerate Materials Development in Energy and Transportation

Abstract: The development of new high-performance materials for energy, aviation, transportation, and other fields requires a detailed understanding of the correlation between structure, composition, processing, and properties. Increasingly, it is necessary to measure the structure and composition of materials at higher spatial resolution, with greater efficiency, and on real materials operating under real conditions. Recent advances in techniques such as focused ion beam and electron backscatter diffraction in the SEM, synchrotron x-ray and neutron diffraction, and surface analysis using electrons, x-rays, and ions have allowed much more information to become available to the materials scientist. In this talk, I will describe some applications of these techniques, as well as conventional SEM and TEM, to characterize phase transformations, residual stress/retained strain, and mechanical behavior in materials, nanomaterials, and coatings of vital importance to the energy and transportation industries.

Bio: Ernie received his BS and PhD from the Massachusetts Institute of Technology in Materials Science and Engineering. He joined GE Corporate Research and Development in 1979 and is presently manager of the Microstructure and Microanalysis Program, which provides capabilities for AEM, SEM, EPMA, light microscopy, surface analysis, x-ray crystallography, and image analysis to GE-CRD and GE businesses. His particular areas of expertise include the techniques and applications of analytical TEM in materials science. In his role as a technical contributor he has conducted microstructural investigations of a wide variety of different materials, including semiconductors, superconductors, and nickel and titanium-based alloys for aircraft engine and aerospace applications.

Thomas Zega, Lunar and Planetary Laboratory/Dept. of Planetary Science at The University of Arizona

From the bottom up: Decoding the physical and chemical history of the early solar system through nanoscale characterization

Abstract: Our sun and planets formed over 4.5 billion years ago from the solar nebula, the cloud of gas and dust that gave birth to our solar system. Chondritic meteorites represent what was left over, and the structure and composition of the material that they contain can provide us with important information about the physical and chemical processes that occurred prior to and during solar-system formation. Extracting this information and decoding it is extremely challenging because some of the most primitive meteorites are composed of minerals intimately mixed at the nanometer scale. In my talk, I will present results from complementary and coordinated analyses using analytical techniques of nanoscience, such as transmission electron microscopy (TEM), focused ion beam scanning electron microscopy (FIB-SEM), and nanoscale secondary ion mass spectrometry (NanoSIMS), which reveal new information on the origins of the early solar nebula and ancient stars.

Bio: Dr. Thomas Zega is an Assistant Professor in the Lunar and Planetary Laboratory/Dept. of Planetary Science at The University of Arizona. Dr. Zega applies electron microscopy and focused-ion-beam microscopy to the study of meteorites. He uses information on crystal chemistry and structure to infer the physical and chemical processes that led to the formation of our solar system and ancient stars. Prior to joining the faculty at The University of Arizona, Dr. Zega was a staff member in the Materials Science and Technology Division of the Naval Research Laboratory, Washington DC, where his research was focused on the structure-property relationships of planetary materials, catalysts, thin films, and nanostructured materials for applications to cosmochemistry/astrophysics, fuel cells, spintronics, and photovoltaics.

Bill Chapin, McCrone Associates—

MAS Sponsored Tour Speaker

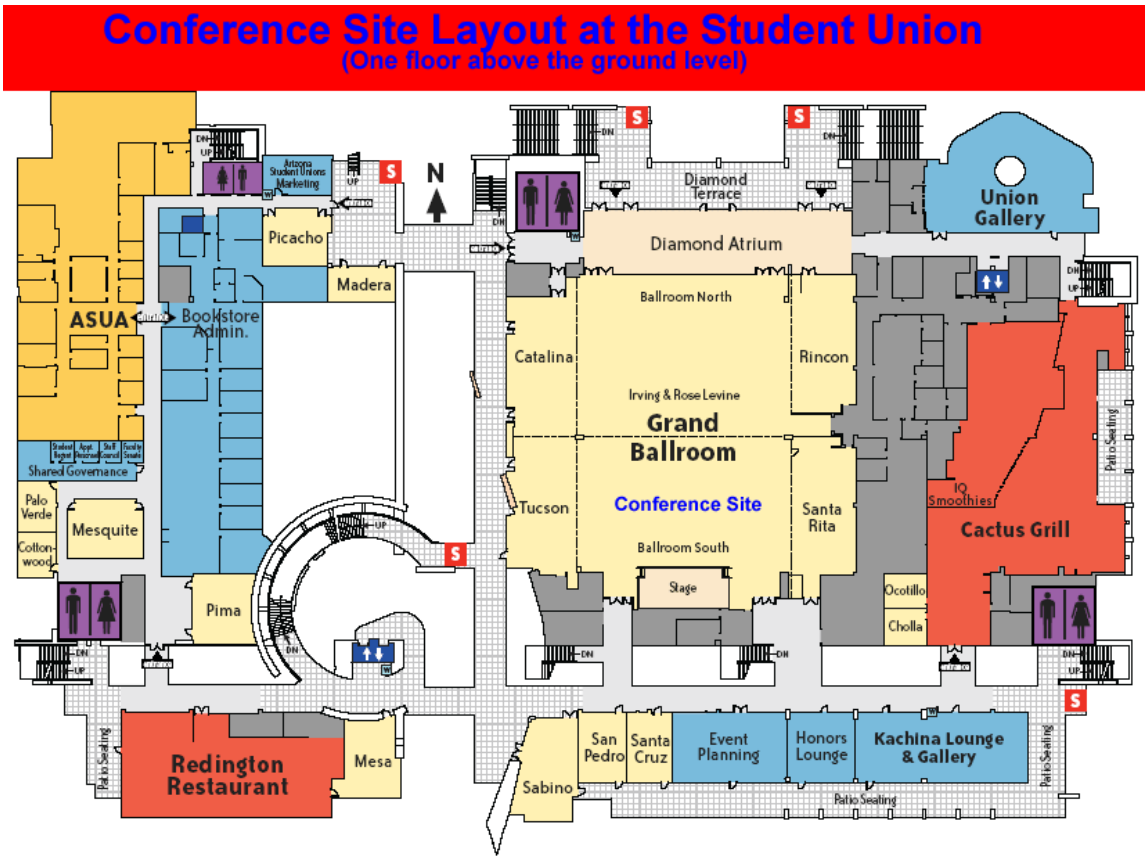
Abstract: Forensic Science has undergone dramatic changes in the last 40 years both in scientific capability and public perception. Perhaps the most dramatic scientific impacts have come from the routine application of Fourier Transform technology to instrumental equipment such as infrared spectroscopy, affordable (bench) mass spectrometers and widespread use of scanning electron microscopes. DNA technology, the O.J. Simpson trial and the popular television series CSI have greatly (and somewhat detrimentally) impacted the public's perception of Trace Evidence analyses. While the ability to perform analyses have been vastly enhanced with improved technology and research, DNA development has taken away considerable funding from the field of Trace Evidence; the O.J. Simpson trial has not done justice to the portrayal of forensic analysts; and CSI has fostered inappropriate expectations of Trace Evidence analyses. In our brief time together we will talk about some of the technical aspects of Trace Evidence analyses, the philosophical approach to dealing with Trace Evidence and what can appropriately be interpreted from the results of Trace Evidence analyses. We will also spend some time relating the concepts of a "Trace Evidence Approach" to a broader base of technical applications and along the way discuss some of the current ramifications we face due to DNA, O.J, and CSI.

Bio: Since 1973, Forensic Science has been my passion, my career, a source of frustration and above all, fulfillment in my life at many levels. I was lucky enough to begin my career at a time when Forensic Science was moving from novelty to necessity and found my voice in many of the developing technological and philosophical movements. The Midwestern Association of Forensic Scientists has been my professional home; I have served in a number of leadership capacities, presented many papers and taught in numerous workshops. Currently I am the Chairman of the Examinations Committee of the American Board of Criminalistics as a representative for ASTM. I began my career as a Drug Chemist for the Ohio Bureau of Identification and Investigation and in 1978 moved to the Johnson County Crime Laboratory in Mission, Kansas where I opened and developed their Trace Evidence Examination section. I had been in Kansas for 20 years when I "retired" as a Commissioned Law Enforcement Officer working in the Criminalistics Laboratory and moved to northern Illinois to begin a career in the private sector as a Senior Research Microscopist for McCrone Associates, Inc. I am still involved in Forensic Science and Forensic analyses through McCrone, but my skills are primarily now used to solve industrial problems provided from a variety of any industries across the United States, North America and abroad.

MARK YOUR CALENDARS: AIMS 2013 MEETING:

The Student Union at the U of A mall

The 2013 AIMS conference will be held at the University of Arizona in the Student Union South Grand Ballroom on March 7, 2013 from 8:00AM to 5:00PM



STUDENT AWARDS INFORMATION

We would like to invite any undergraduate or graduate student who uses microscopy to visualize their research to present their work at the AIMS conference poster session. We will have at least three $150 awards, thanks to our Platinum sponsors and a set of Binoculars from Zeiss, for the best posters in the category of either physical or life sciences. We will need a final copy of your poster abstract (max 250-300 words) emailed to bbeam@email.arizona.edu by Feb 21 to be included in the conference program. Below are the guidelines for the poster design and award evaluation.

Student Poster Guidelines:

1. Applicants must be or have been an undergraduate or graduate student during the academic year of the meeting.
2. The work must consist of original research authored by the participant and be co-authored by his/her advisor.
3. Each student will be given 2 minutes to present the most important aspects of their poster. It is suggested that the student prepare 1-2 PowerPoint slides to assist in the presentation.
4. The poster must be formatted to fit within an area of 60 inches wide by 40 inches high.
5. The poster should contain: title, author and affiliation, abstract, introduction, methods and materials, results, discussion, figures and legends, and references.

Award Evaluation Criteria:

The AIMS judges will use the following criteria to evaluate the student's poster and oral presentation:

1. Scientific merit
2. Soundness of the research proposal
3. Experimental design and thoroughness of investigation
4. Validation of conclusions
5. Application of microscopy/microanalysis in answering the experimental question
6. Quality of micrographs/images/data
7. Presentation
8. Response to questions
9. Diversity of instrumentation and technique
10. Clarity and quality of writing
11. Grammatical correctness

AIMS WOULD ALSO LIKE TO ACKNOWLEDGE THE GENEROUS SUPPORT OF: THE MICROSCOPY SOCIETY OF AMERICA

AND THE SUPPORT OF THE MICROBEAM SOCIETY

STUDENT TRAVEL SUPPORT

Out of town students wishing to apply for partial travel support to attend the meeting should contact AIMS President Brooke Beam at bbeam@email.arizona.edu. The Society has set aside a small pool of funds to assist students. If you would like to request assistance, please do it sooner rather than later. It is on a first come, first served basis. We may request a letter of support from your faculty advisor and/or an AIMS member.

Travel Information UA Student Union Memorial Center South Ballroom

1303 E University Blvd

Tucson, AZ 85721

http://parking.arizona.edu/maps

Travel Directions from Airport to UA:

After exiting the Airport you will be heading North on Tucson Blvd. After about 2.7 miles you will veer left onto Benson Hwy. In about 0.5 miles you will turn right onto Kino Parkway. Continue north on Kino Pkwy which turns into Campbell Ave for 4.8 miles. Turn right onto Speedway Blvd. Turn Left onto Mountain Ave. A parking garage will be on your left where there is visitor parking available at $2/hour and $10/day. The South Ballroom of the Student Union is on the second floor.

Travel Directions from I-10 to UA:

From Hwy I-10 take the Speedway Blvd exit. From south I-10 you will make a left onto Speedway Blvd. Continue on Speedway Blvd for about 2 miles. Turn right onto Mountain Ave. A parking garage will be on your left where there is visitor parking available. The South Ballroom of the Student Union is on the second floor on the south side of the building.

MSA 2013 ANNUAL MEETING

M&M 2013 will be held August 4-8 at the Indiana Convention Center in downtown Indianapolis, IN. Please check this site often for updates and new information.

http://www.microscopy.org/MandM/2013/index.cfm

We invite you to join us for Microscopy & Microanalysis 2013, August 4 - 8 in vibrant Indianapolis, Indiana. The annual M&M meeting continues to be the premier meeting for scientists, technologists, and students who use microscopy or microanalysis in their research, with 996 papers presented in 2012.

The Program Committee for 2013 has put together an outstanding scientific program that features the latest advances in the biological and physical sciences, techniques and instrumentation. Complementing the program is one of the largest exhibitions of microscopy and microanalysis instrumentation and resources in the world, attracting well over 100 companies. Educational opportunities include a variety of Sunday short courses, tutorials, evening vendor tutorials, pre-meeting workshops, and in-week intensive workshops. The Opening Reception offers an opportunity to meet new people in the field and renew old acquaintances, and the Monday morning Plenary session features showcase talks from outstanding researchers as well as recognition of the major Society and Meeting award winners. There will be other important awards conferred during the meeting, including daily poster awards to highlight the best student posters in instrumentation & techniques, biological applications of microscopy & microanalysis, and physical applications of microscopy & microanalysis.

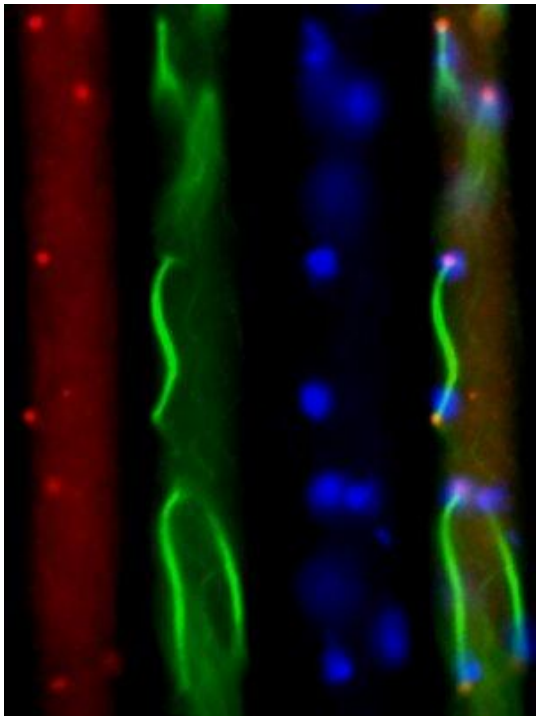
Kudos:

Congratulations to Doug Cromey of the University of Arizona for his promotion to Associate Scientific Investigator!

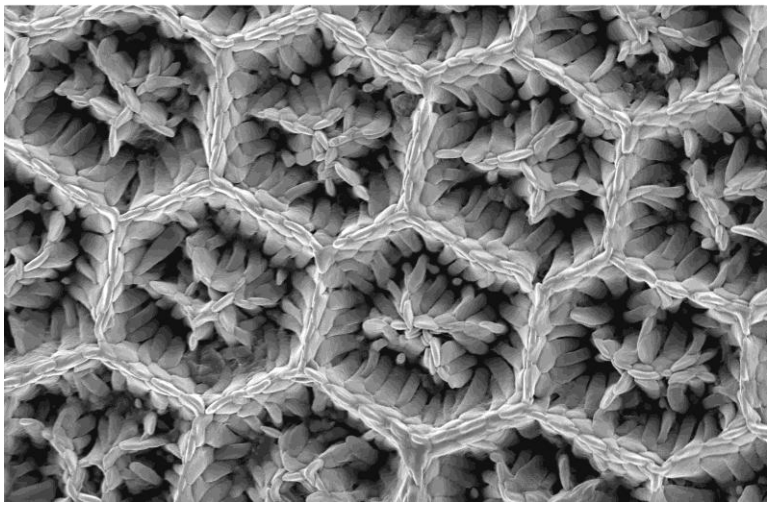
Congratulations to Dr. Robert Robertson, of Arizona State University, for winning 1st prize in the 2012 Diatome Poster Awards at the Microscopy and Microanalysis meeting in Phoenix, Arizona. Poster Title: "Ultrastructural Locations of Chirin Synthase in Fungal Cells of Neurospora." Co authors were M. Riquelme and E. Sanchez-Leon.

SEND US YOUR IMAGES

We continue to encourage all our members to submit their exciting and eye-catching images for the AIMS web site. Recently Dr. Robby Roberson has been proving that microscopy is not just for science and scientist. His images have been exhibited at several Arizona Galleries including the Tilt Gallery in Phoenix and the Arizona Science Center also in downtown Phoenix.



Confocal image, Mitosis in fungi, Robby Roberson (ASU)



FESEM image of the outer surface cuticle of a fig eater bug *Cotinus Mutabilis*—Steven Hernandez (Univ of AZ)

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