Southern California Society for Microscopy & Microanalysis

University of California at Los Angeles

Tuesday November 9, 2010

Directions

- From the inland freeways (such as 10, 110, 210, and 5), merge onto the 405 freeway.
- Take the Wilshire Blvd exit (55B) to merge east (0.7 miles).
- Turn left at Westwood Blvd (0.4 miles).
- Cross Charles Young Dr intersection, and approach Parking Kiosk (in median to the left).
- Tell the kiosk attendant you need a parking pass for parking structure 9
- CNSI is next to parking 9 Engineering building V is also close.

Agenda

4:00 PM **Equipment Demo**

Demo sessions on Thermo Scientific fully integrated EDS, WDS, EBSD analytical system in Engineering building V, UCLA MSE Department

To schedule individual demos on the Thermo Sci. EDS, EBSD, WDS system during the week of Nov. 8 -12· contact: Wayne Watson at Phone: (650) 969-2273, Email: wayne.watson@thermofisher.com

Engineering V Building, Room 1230

5:30 PM **Social Hour**

CNSI Building

6:00 PM **Dinner**

Romaine hearts & spinach salad, Braised brisket of beef jardinière, Poached salmon medallions, Mashed potatoes, Fresh vegetables, New York-style cheesecake, Coffee, Tea, Lemonade, Wine.

CNSI Building

Tonight's dinner and meeting are graciously sponsored by:

Carl Zeiss SMT
FEI Company
Physical Electronics
Thermo Fisher Scientific

7:00 PM **Scientific Program**

Invited Presentation
The Earliest History of Life: Solution to Darwin's Dilemma
J. William Schopf, Director of UCLA's Center for the study of Evlution and the Origin of Life

Sponsor Presentations
Gas Cluster Ion Beam for Chemical Depth Profiling of Organic Materials
John Callaghan, Physical Electronics USA

Fully Integrated EDS, WDS, EBSD Analysis
John Konopka, Thermo Scientific, USA

Carl Zeiss Analytical Power for the Sub-Nanometer World
Dan Jacobson, Carl Zeiss Inc.

TBA
Amanda Englund, FEI company

CNSI Auditorium

8:25 PM **Best SEM Image MNA Student Award**

Cost: Meetings are free to all members of SCSMM. For non-members, the cost is the price of membership.

Membership rates are:

$4 – Student, $10 – Regular, and $50 – Corporate.

Memberships are valid through August 31, 2010.

RSVP: Please reserve no later than 5:00 pm, Tuesday, November 2, 2010. Contact Jim Kulleck at (818) 354-5666, email james.kulleck@jpl.nasa.gov

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FROM THE DIRECTOR

It is my privilege to announce the start of the new 2010/2011 term. Our society is in a good health and we had exciting meetings and erudite and interesting lecturers during the past term. I am convinced that all of you will join me in expressing our gratitude to the outgoing President John Porter, who was the main driving force in keeping the quality and pace of the activities in our society so high. I am enthusiastic about the future of our society and the root for my optimism is the clear evidence that our members are willing to invest their time and energy to promote the Society's activities. Prime examples, in addition to our outgoing President, are Jim Kuleck, our treasurer, who is indispensable asset for keeping the financial health of SCSMM in check; Board members Bill Tivol, Carol Garland, our

new Secretary John Curulli and Mark Armitage who provided the vital connection to our corporate members. Special recognition should go to Mike Pickford who is stepping down after more than 20 years actively serving as our Secretary, and who has tirelessly kept host of activities and projects on track and last but not least all of you who as regular members provide the reason and substance of the SCSMM existence.

We expect to have an interesting year this term also. Our goals are to keep our base as broad as possible, microscopy is a scientific field which joins multitude of diverse fundamental and applied disciplines and technologies, ranging from biology and medicine, through material science and nanotechnology to geology and manufacturing, and all these aspects of microscopy are present in one or another form in the diverse and vibrant Southern California area. The Society goals are to promote the interaction and communication among all microscopy disciplines and foster educational efforts in microscopy at all levels. The main tool in succeeding in such endeavor is increasing our membership and keep our activities strong and alive. In view of all this we are planning two meetings for this term: first one on November 9th, 2010 at UCLA in Los Angeles, and second one would be a day-long conference meeting in the Spring of 2011, the exact date and location to be specified.

We need to thank our members who had renewed their membership and also the new members who had joined us. This is one of the many ways in which you help to keep the society healthy.

Your input to any aspect of the SCSMM activities, functions, and goals are strongly encouraged.

Best wishes to you all.

Krassimir Bozhilov

The Earliest History of Life: Solution to Darwin's Dilemma

J. William Schopf

In 1859, Darwin stated the problem:

"If the theory [of evolution] be true, it is indisputable that before the lowest Cambrian stratum was deposited, long periods elapsed ... and the world swarmed with living creatures. [However] to the question why we do not find rich fossiliferous deposits belonging to these earliest periods ... I can give no satisfactory answer. The case at present must remain inexplicable; and may be truly urged as a valid argument against the views here entertained."

For more than a century, this "missing" record of early life stood out as one of the greatest unsolved problems in natural science.

In Darwin's day, the oldest known fossils were Cambrian trilobites, lobster-like crustaceans entombed in rocks laid down about 540 million years ago. But in the mid-1960s, understanding of the pre-Cambrian history of life began to emerge as new finds -- not of animals, but of tiny microscopic microbes -- extended the fossil record into the remote reaches of geological time. Today, life is known to have been extant at least ~3,500 million years ago, a documented history more than seven times longer than was known only a few decades ago.

During recent years, understanding of life's early history has expanded at an ever-quickening pace, an upsurge spurred by the introduction of three analytical techniques: confocal laser scanning microscopy (CLSM), and Raman and fluorescence spectroscopic imagery. Unlike other methods, these techniques can yield data from rock-embedded microscopic fossils, at submicron spatial resolution, in both two and three dimensions; and because they are non-destructive and non-intrusive, all can be used to analyze especially precious specimens (such as those archived in museum collections or, in the future, rocks brought to Earth from Mars). Used together, the techniques address the two prime problems that previously hindered progress: (1) accurate documentation of the three-dimensional morphology and cellular anatomy of fossilized microbes; and (2) establishment of the chemical composition (molecular structure) of the carbonaceous material of which such fossils are composed and that of their enclosing matrices. The techniques are complementary, CLSM detecting the laser-induced fluorescence of the polycyclic aromatic hydrocarbons that predominate in the carbonaceous matter of organic-walled fossils, and Raman and fluorescence imagery documenting the molecular structure of such coaly kerogen and identifying associated minerals.

Darwin was right: the Precambrian world *did* "swarm with living creatures" -- but with microscopic life, not the much larger plants and animals that he had envisioned. After more than a century of search, the dilemma posed by the "missing" early record of life has been solved -- the once unknown, and thought unknowable, has been discovered.

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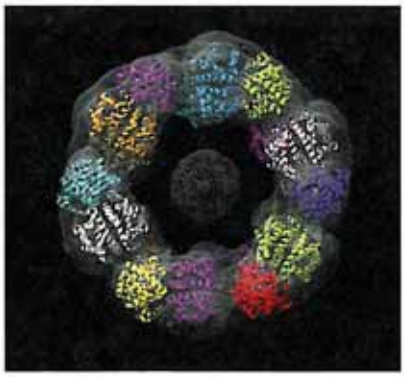

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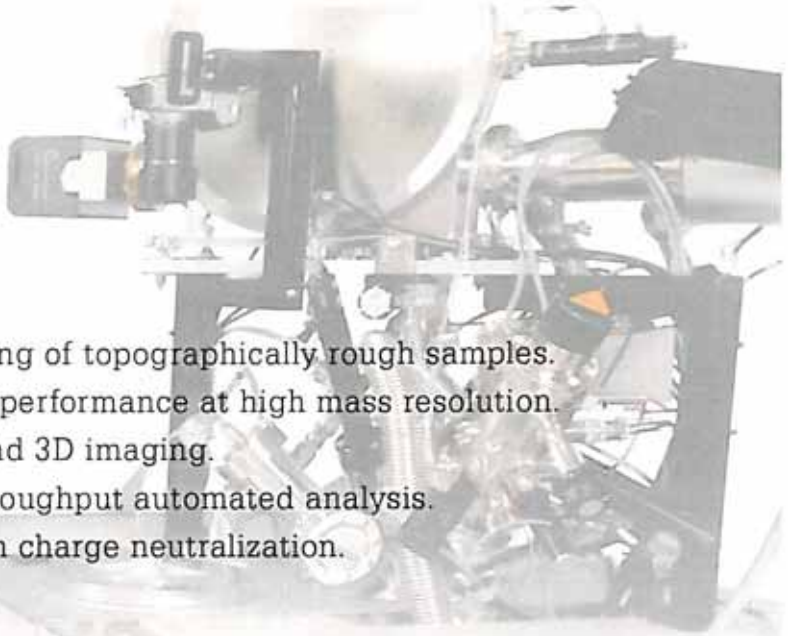

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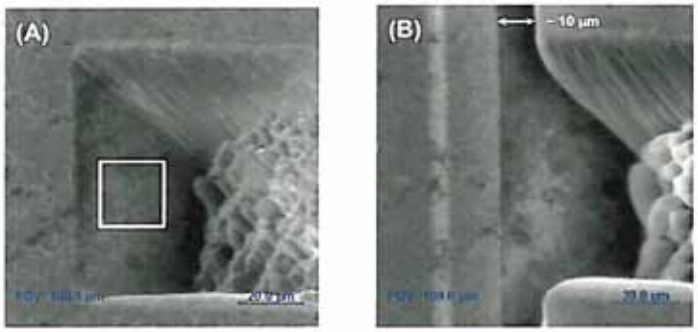
Biological IMAGING

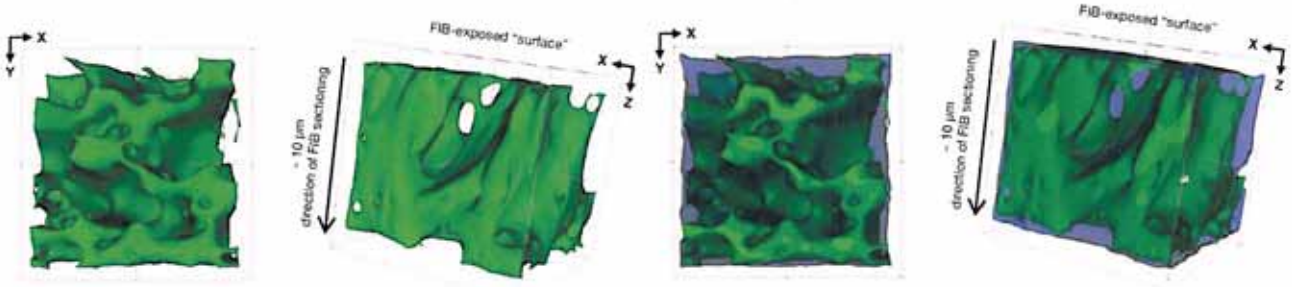
Molecular images of different layers of a mouse skin cross-section. The overlay (far right) shows four chemically distinct layers within the epidermis and dermis layers.

Total Ion Image | Cholesterol (*m/z* 369) | C_4H_8N (*m/z* 70) | Phosphocholine (*m/z* 184) | C_4H_8N / Cholesterol / Phosphocholine



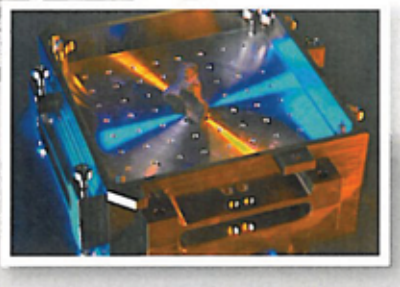
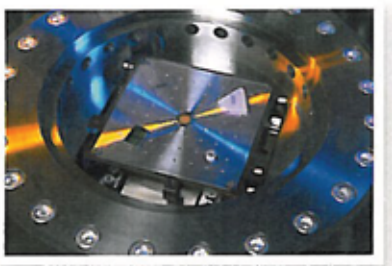
Primary ion-induced secondary electron (SE) images of a Cu-W alloy sample showing (A) the initial FIB-milled crater and (B) after 20 successive FIB sections. The approximate location of the 20 x 20 µm² area imaged by TOF-SIMS is indicated in panel (A) and the approximate "depth" of the imaged volume is indicated in panel (B).

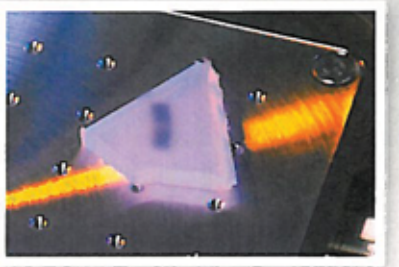
3D FIB-TOF IMAGING



(Two images on left) 3D iso-surface images of Cu^- (green, 63 m/z) and (two images on right) 3D iso-surface overlay images of Cu^- (green, 63 m/z) and WO^- (blue, 200 m/z). The distribution of copper and tungsten in the 20 µm x 20 µm x 10 µm volume is revealed without the artifact of differential sputtering. Note that the opacity of the WO^- iso-surface has been reduced so that the interior distribution of the Cu^- iso-surface image is visible. Note also that the depth scale is defined by the cumulative length of the FIB line cuts in the plane perpendicular to the surface of the sample.

PHYSICAL ELECTRONICS

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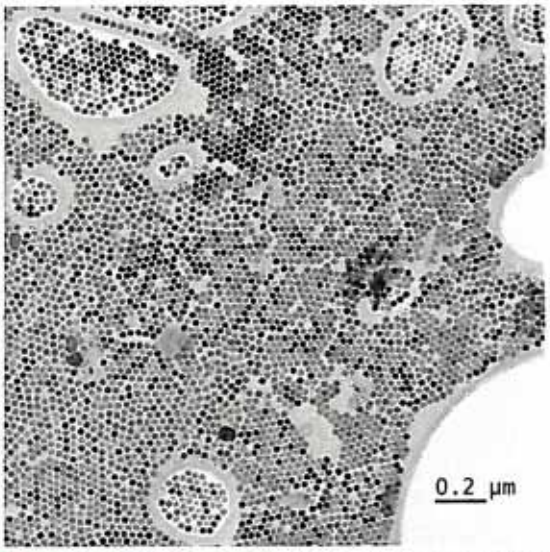
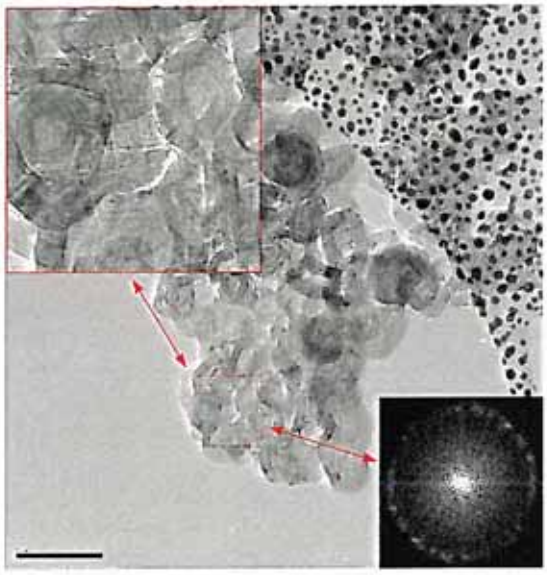
The Model 994 UltraScan® 1000XP replaces the highly acclaimed UltraScan® 1000 camera line, and with its introduction Gatan once again raises the performance standard in TEM scientific digital imaging. Redesigned from the ground up, the US1000XP combines state-of-the-art CCD electronics, Gatan's next generation high-contrast resolution (HCR™) fiber-optic technology, and new P+ and U+ scintillators to achieve unrivaled performance in resolution, speed and sensitivity.

A new class in itself, the US1000XP seamlessly blends in a single camera the ultimate image quality from the UltraScan® series with the highest speed from the Orius® series, opening up extraordinary possibilities in applications ranging from sub-Angstrom HREM to *in-situ* TEM, from electron diffraction to low dose cryoEM. Designed to be a reliable workhorse for years to come, the US1000XP is equally well suited for use by novices and experts, from the most routine to the most demanding EM investigations.

The US1000XP's 2k x 2k CCD is read-out over 4 ports using Gatan's patented Multi-Scan® technology. The standard 4 Megapixel/s readout mode reliably yields the very highest image quality possible. The optional 40 Megapixel/s readout mode allows live viewing at up to 30 frames/s (15fps at 50% duty cycle). True pixel-by-pixel correlated double sampling (CDS) guarantees the lowest noise possible in either readout mode. Various combinations of the new fiber optics and P+ and U+ phosphor scintillators deliver the highest image resolution at the optimal sensitivity for the particular application at hand. Flexible binning and sub-area readout as always support a wide range of imaging needs.

The UltraScan® 1000XP is controlled by the industry standard Gatan Microscopy Suite (GMS®) software which includes the industry standard DigitalMicrograph® software.





Top – Nano-crystals recorded with Gatan UltraScan® 1000XP CCD camera on a 120 kV TEM. Sample courtesy of University of California - Berkeley, Dr. Kent McDonald.
Bottom – graphitized carbon showing 0.34nm lattice and FFT

Features	Benefits
Large format, 2k x 2k, 14 µm CCD	Large high-resolution information content
Full frame CCD	*100% fill factor for highest sensitivity*
Multi-Scan read-out with CDS	Highest signal to noise ratio at all readout speeds
4 and 40 Mpixels/s readout modes	Up to 30 fps for searching, set-up, and in-situ TEM
HCR fiber optics with P+ and U+ scintillators	Resolution and sensitivity optimized by kV and application
Retractable	Compatible with Gatan GIF imaging energy filter and Enfina EELS spectrometer

Specifications

Operating voltage	80 to 400kV
CCD sensor	Full frame, 2048 x 2048 14 µm square pixels
CCD active area	28.7mm x 28.7mm
Anti-blooming	Yes
Scintillator	High-resolution phosphor optimized for kV and application, (P+ and U+ types)
Coupling	HCR™ Fiber optics 1:1
Binning	1x, 2x, 4x, 8x
CCD readout	Full or arbitrary sub area
Magnification to film	1.3–1.7x
Readout speed	4 Megapixels/s standard, 40 Megapixels/s optional
Dynamic range	16 bits
Frame rate	Standard: ~5fps (512x512, bin x4) High speed option: up to 30 fps; 15fps @ 50% Duty cycle (Search mode, 512x512, bin x4)
Peltier cooling	Peltier cooled to -20 °C, connected to TEM water lines and chiller
Sensitivity (DQE @ 1/2 Nyquist	Typical 6% at 200kV (U+ type only)
Readout noise (RMS)	<20 CCD e'
Mounting position	On-axis TEM bottom port
Non-linearity	<1%
Conversion efficiency	1 - 5 counts / primary electron (200kV; P+ type)
Exposure setting	1 msec to 30 min
CCD overheat protection	Yes
Computer interface	Firewire 800 (IEEE 1394b)
Computer platform	Windows® XP-32bit, Windows 7 optional (32 or 64 bit)
Water connection	Yes, interconnect to existing TEM water line
Regulatory compliance	PTB Standard

Note: Specifications are typical and subject to change.

Ordering information

Model	Configuration	Description
994.10B	US 1000XP	Bottom mount, up to 120kV
994.20B	US 1000XP	Bottom mount , up to 200kV
994.40B	US 1000XP	Bottom mount, up to 400kV
994.HS	US 1000XP	High speed option

Computer and monitor are not included
Accessories and optional software
are not listed. Please consult with your sales representative for details.

Primary applications

Biological imaging

Diffraction

Cryo-low dose

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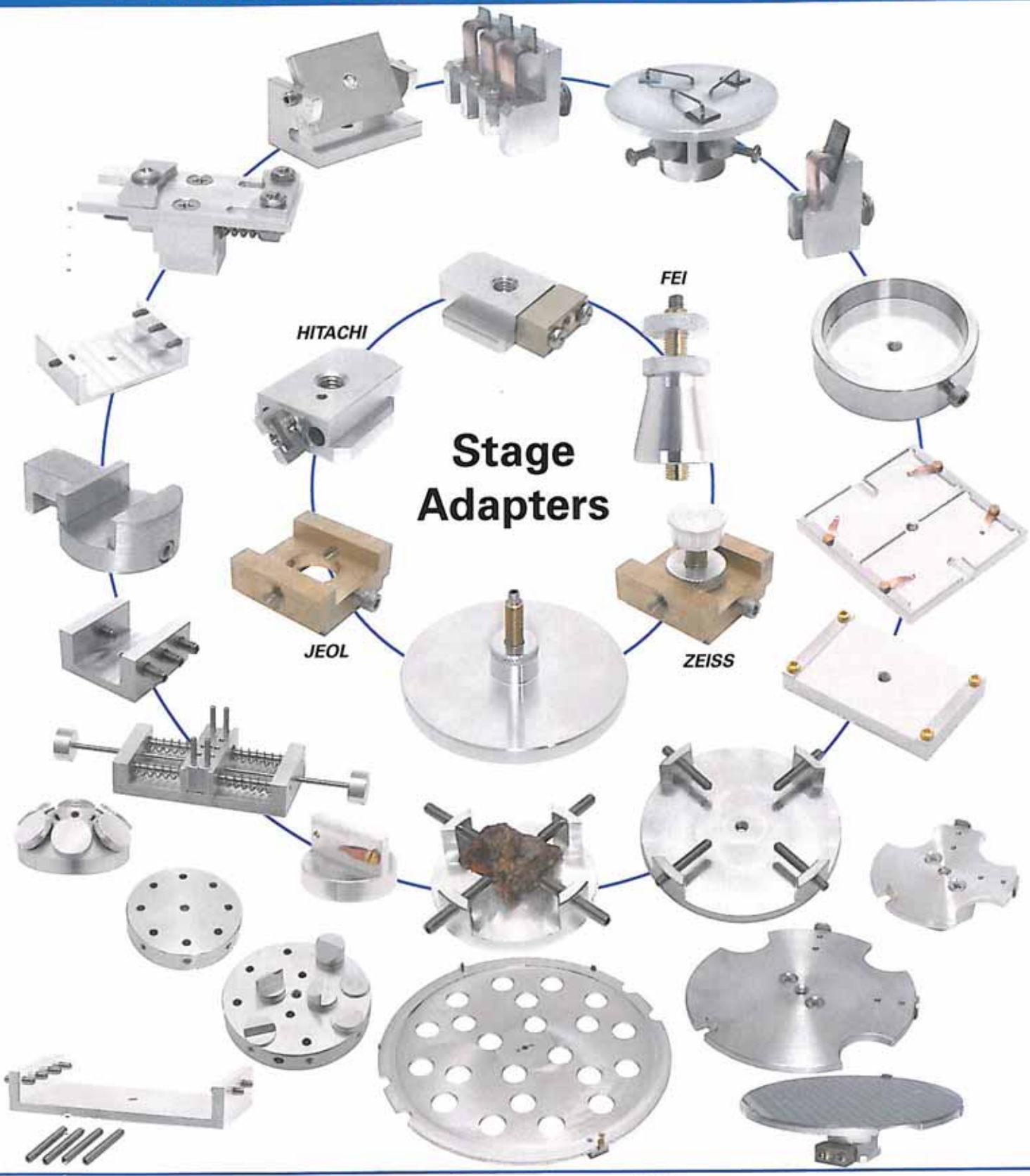

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Southern California Society for Microscopy & Microanalysis

Membership Application 2009 - 2010

About SCSMM

The **SOUTHERN CALIFORNIA SOCIETY FOR MICROSCOPY & MICROANALYSIS** is dedicated to increasing interest and information in all areas of microscopy and microanalysis, including, but not limited to: transmission electron, scanning electron and electron microprobe, ion probe, microbeam analysis, optical and confocal microscopies, and microspectroscopies. You are invited to join, or renew your membership in the society.

The Society generally meets four times per year at various locations throughout the greater Los Angeles area. The program usually begins with a Social Hour followed by Dinner, then a brief Business Meeting and finally the Scientific Program which consists of one or two presentations in the biological and physical sciences selected to be of sufficient breadth and interest to appeal to the entire membership.

Among our current members are students (graduate and undergraduate), post-docs, college and university professors and research assistants, laboratory directors, vendors of electron microscopes, microanalysis and/or related equipment, laboratory technicians, technologists, assistants, and many others. Their professional work spans the full range of the biological, medical and physical sciences.

In order that we may have precise records, please complete all of the information included on this application, including both your work and home addresses. You may indicate at which address you wish to receive SCSMM mailings. Fax numbers and e-mail address will be used to notify you of last minute changes in scheduled events. This information will be used only for SCSMM business. **The published list of members will include only your work address, phone number, fax number and/or e-mail address and will only be made available to members and meeting sponsors of SCSMM. You may request that your name not be included in the published list.** If your company or laboratory has a web site, we would like to publish this in a directory of services available to Southern California microscopists.

CORPORATE MEMBERSHIP: Corporate members are entitled to place two individual's names on the rolls per membership. Your membership will be acknowledged throughout the year via SCSMM Meeting Announcements and Newsletters. Corporate members are invited to place advertising in our Meeting Announcements and Newsletters. The cost for this is $175 per 8½ x 11" page and helps to defray the cost of the mailings. You are also invited to sponsor one of our meetings at which you may give a short presentation or product demonstration. Your $275 donation will provide food and beverage (non-alcoholic) for the pre-meeting social hour and includes a one page advertisement in the Meeting Announcement for that meeting. For more information on Corporate Memberships, please contact Mark Armitage at micromark@juno.com, phone (626) 969-5197; or Mike Pickford at mspford@pacbell.net, phone (714) 731-9191 ext. 320.

Membership Application 2009 - 2010

Membership Valid Through August 31, 2010

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The Southern California Society for Microscopy and Microanalysis wishes to acknowledge the following Corporate Members who faithfully advertise in our Meeting Announcements, sponsor meetings and have renewed their commitment to our society for the 2009 - 2010 year.

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