



*Southern California Society
for
Microscopy & Microanalysis*

Fall Meeting

**Monday
November 7, 2016
Starts at 5:30 pm**



Invited Talks:

Elizabeth Villa, UCSD

Opening Windows into the Cell: Cryo-electron Tomography
of Intact Cells for Structural Cell Biology

Jianwei (John) Miao, UCLA

Atomic Electron Tomography: 3D Structures without
Crystals

Address: City of Hope
Arnold and Mabel Beckman Center
Argyros Auditorium
1500 East Duarte Road
Duarte, CA 91010-3000
Tel: 626-301-8265



Welcome to the 2016/2017 season of the Southern California Society for Microscopy and Microanalysis. We have two meetings planned for this academic year – our Fall meeting in November of this year and one for Spring next year.

For our Fall Meeting, we are going to focus on electron tomography. Two invited speakers will talk on the subjects of materials science and biology, respectively. Prof. Jianwei (John) Miao, from Department of Physics & Astronomy and California NanoSystems Institute, University of California Los

Angles, will focus on Atomic Electron Tomography, talking about 3D Structures without Crystals. Prof. Elizabeth Villa, from Department of Chemistry and Biochemistry, University of California San Diego, will open windows into the cell, talking about Cryo-Electron Tomography of Intact Cells for Structural Cell Biology.

Our Spring Symposium will be an all-day meeting. We will put together a full program later.

Our dues for both regular and student members will be exempted for the 2016/2017 academic year we and hope that more people may attend our meetings. Clearly, our costs are covered by our corporate members and sponsors, so please take time to talk to our vendor representatives (many of whom will be at the meetings) and maybe even buy their instruments and/or services! We are very grateful for their support. I am going to show you an updated sponsor list during our meeting and further publish them on the SCSMM website.

Our Society and board is going through some changes. At our fall meeting I will be handing over the Presidency of the SCSMM to Zhuo Li, our current VP Biological Science. After serving to the society for 25 years, Mike Pickford will resign from the position of SCSMM secretary, making an opening on the board. Please join me to thank his great contribution to the society! I am grateful that he will remain as SCSMM webmaster. If you are willing to serve on the board, please contact me. We have new board members along with some very long serving old members. Our board members are identified at the end of this newsletter. I would like to thank all of them for their hard work. We hope you support our team.

Jian-Guo Zheng,

President, SCSMM

2016 Fall Meeting Program

5:30 PM Happy Hour

6:30 PM Dinner

Business Meeting

7:30 PM Scientific Talk in Biology

Opening Windows into the Cell: Cryo-electron
Tomography of Intact Cells for Structural Cell Biology

Elizabeth Villa, UCSD

8:00 PM Vendor Talk

8:15 PM Vendor Talk

8:30 PM Scientific Talk in Materials Science

Atomic Electron Tomography: 3D Structures without
Crystals

Jianwei (John) Miao, UCLA

Registration & RSVP

If you plan to attend this meeting, please sign up using the link here: <http://www.imri.uci.edu/seminar-registration>. Reservations are due no later than **5:00 P.M. Friday, October 31, 2016**.

All SCSMM memberships are expired and must be renewed. You may register as a new SCSMM member or renew your membership using the link here: <http://www.imri.uci.edu/content/2016-2017-scsmm-membership-registration>. Alternatively, you may use the enclosed membership form.

Annual membership for the 2016-2017 term is \$0 for both regular member and students. Dues for Corporate members are \$100 for the academic year. Please refer to the enclosed membership form for additional sponsorship opportunities.

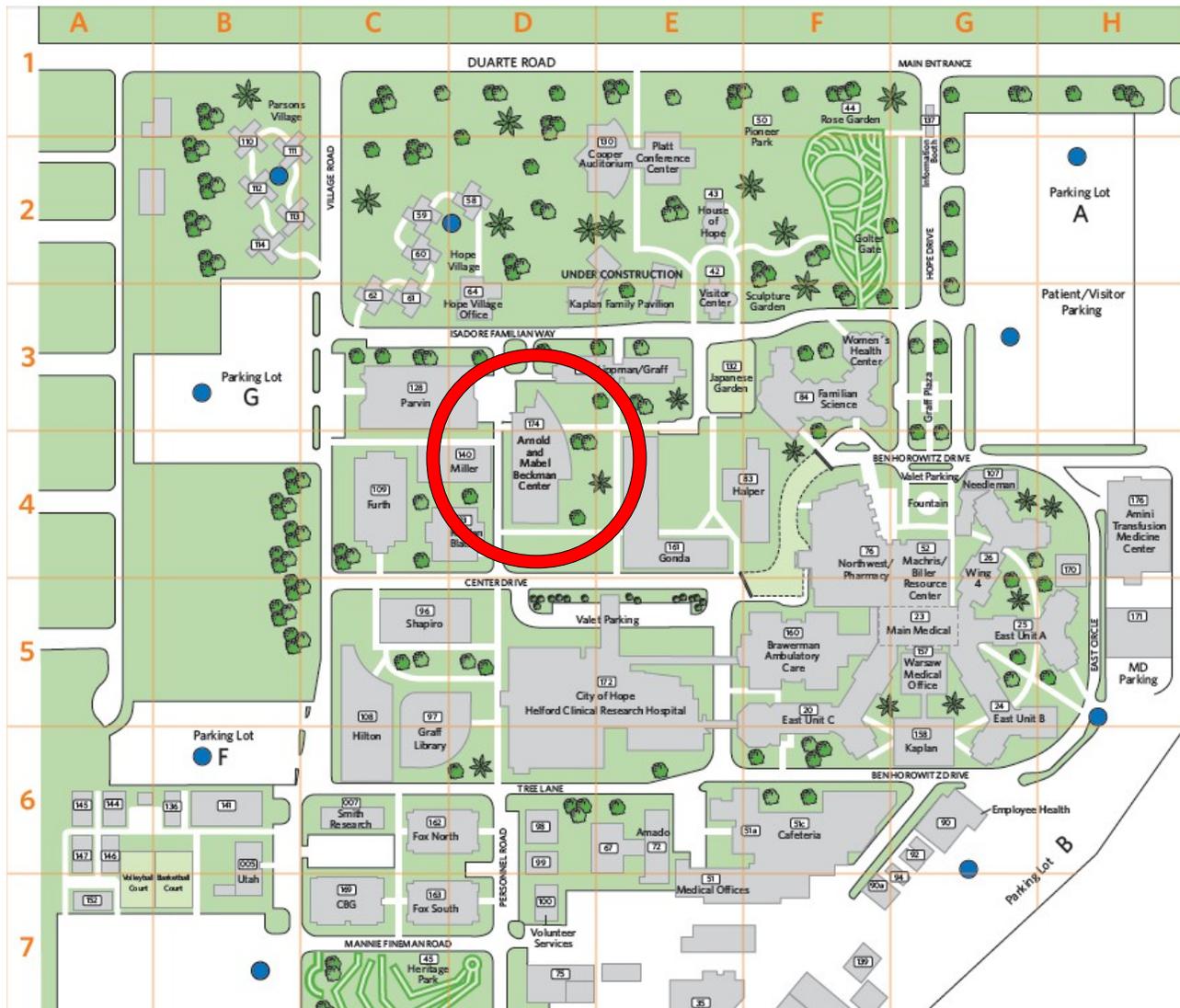
For further details visit SCSMM web site

www.scsmm.org

Map and Directions

For the Map and Directions to **City of Hope - Duarte** please refer to:

<http://www.cityofhope.org/maps-and-directions>



Parking: Lots **A** and **G** are the closest to the **Arnold and Mabel Beckman Center**. Street parking is also available at the south side of Duarte Road.

The location of **Arnold and Mabel Beckman Center** is circled in red in the campus map. The **Argyros Auditorium** is on the first floor.



Southern California Society for Microscopy & Microanalysis

Membership Application 2016 - 2017

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 two 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 the on-line membership form <http://www.imri.uci.edu/content/2016-2017-scsmm-membership-registration>. Alternatively you may fill out the paper form showed below. **The published list of members will include only your work address, phone 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. You are also invited to sponsor one of our meetings at which you may give a short presentation or product demonstration. For more information on Corporate Memberships, please contact Brian Miller at Brian.Miller@bruker.com, Phone: +1 503-984-0191.



Southern California Society for Microscopy & Microanalysis

Membership Application 2016 - 2017

Membership Valid Through August 31, 2017

Name: _____

Institution: _____

Address: _____

City, State Zip _____

Phone: _____

E-mail address: _____

Web Site: _____

Please check the appropriate membership category: Regular @ \$0.00*
 Student @ \$0.00*
 Corporate @ \$100.00

***Membership dues for Regular and Student members have been exempted for the 2016 – 2017 year.**

Corporate Memberships are entitled to two individual member listings. If you have selected a Corporate Membership, please copy this form and provide details for the second listing. Write “**2nd Listing**” at top of form.

Please attach a check for the appropriate amount made payable to SCSMM. You may bring this form along with your dues to any of our meetings or mail to:

SCSMM
c/o Mark Armitage
Micro Specialist
587 E North Ventu Park Road #304
Thousand Oaks, CA 91320

SCSMM Vendor Sponsorship Benefits and Recognition

\$500 (Gold) level

Instrumentation display during spring meeting (table)
Scheduled (15 min) talk during spring or fall meeting
Announcement/acknowledgment from the stage as a Gold sponsor of SCSMM
Listing as a Gold sponsor in all press and media materials of the SCSMM
Invitation for two to attend the spring and fall meeting

\$250 (Silver) level

Instrumentation display during spring meeting (table)
Announcement/acknowledgment from the stage as a Silver sponsor of SCSMM
Listing as a Silver sponsor in all press and media materials of the SCSMM
Invitation for two to attend the spring and fall meeting

\$150 (Bronze) level

Announcement/acknowledgment from the stage as a Bronze sponsor of SCSMM
Listing as a Bronze sponsor in all press and media materials of the SCSMM
Invitation for two to attend the spring and fall meeting

\$100 Regular Corporate membership

Listing as a Corporate Member in SCSMM spring and fall pre-meeting newsletters
Invitation for one to attend the spring and fall meetings

Vendors are also most welcome to sponsor with "in-kind" support of our meetings, such as providing wine with dinner (fall meeting) or a prize for a raffle or student talk/poster. Acknowledgments of such sponsorship will be made during the meeting and in the meeting announcement - and are always much appreciated!

*Sponsorship is effective and recognized by SCSMM only the year it was made and only after vendor's contribution got SCSMM account.

Abstracts

Atomic Electron Tomography: 3D Structures without Crystals

Jianwei (John) Miao

*Department of Physics & Astronomy and California NanoSystems Institute,
University of California, Los Angeles, USA
Email: miao@physics.ucla.edu*

Visualizing the arrangement of atoms has played an important role in the evolution of modern science and technology. Crystallography has long been used to reveal globally averaged 3D atomic structures. Scanning probe microscopes can determine surface structures at atomic level. Electron microscopes can routinely resolve atoms in 2D projections of 3D crystalline samples. In this talk, I will present a general method, termed atomic electron tomography (AET), for 3D determination of *local* structures at atomic resolution. By combining advanced electron microscopes with powerful data analysis and tomographic reconstruction algorithms, we demonstrated AET for 3D imaging of a ~ 10 nm Au nanoparticle at 2.4 Å resolution and identified several major 3D grains. We also observed nearly all the atoms in a Pt nanoparticle and, for the first time, imaged the 3D core structure of edge and screw dislocations in the nanoparticle at atomic resolution. More recently, we determined the 3D coordinates of thousands of individual atoms and point defects in materials with a precision of ~ 19 picometer, where the crystallinity of the sample was not assumed. From the coordinates of these individual atoms, we measured the atomic displacement field and the full strain tensor with a precision of 10^{-3} . The ability to determine the 3D atomic structure of crystal defects such as grain boundaries, stacking faults, dislocations and point defects, and to precisely localize the 3D coordinates of individual atoms in materials without assuming crystallinity is expected to transform our understanding of material properties and functionality at the most fundamental level.

1. M. C. Scott, C.-C. Chen, M. Mecklenburg, C. Zhu, R. Xu, P. Ercius, U. Dahmen, B. C. Regan and J. Miao, "Electron tomography at 2.4 Å resolution", *Nature* **483**, 444–447 (2012).
2. C. C. Chen, C. Zhu, E. R. White, C.-Y. Chiu, M. C. Scott, B. C. Regan, L. D. Marks, Y. Huang and J. Miao, "Three-dimensional imaging of dislocations in a nanoparticle at atomic resolution", *Nature* **496**, 74–77 (2013).
3. R. Xu, C.-C. Chen, L. Wu, M. C. Scott, W. Theis, C. Ophus, M. Bartels, Y. Yang, H. Ramezani-Dakhel, M. R. Sawaya, H. Heinz, L. D. Marks, P. Ercius and J. Miao, "Three-Dimensional Coordinates of Individual Atoms in Materials Revealed by Electron Tomography", *Nature Mater.* **14**, 1099-1103 (2015).

Opening Windows into the Cell: Cryo-electron Tomography of Intact Cells for Structural Cell Biology

Elizabeth Villa

Department of Chemistry and Biochemistry, University of California San Diego

Single-particle cryo-electron microscopy has established itself as a central tool in structural biology, ideally suited to study large macromolecular complexes from *in vitro* samples. It stands today at the center of integrative modeling, where cryo-EM maps serve as a scaffold to combine data from different sources. Cryo-electron tomography (CET) can extend the applicability of cryo-electron microscopy to study these complexes *in situ*. Recent technological advances allow CET to be applied to questions in cell biology that go beyond structural determination, where a quantitative analysis of cellular features is required including molecular distribution and supramolecular architecture. However, the ability of CET to provide three-dimensional landscapes of cells is limited by the thickness of the sample that can be examined *in situ* with a resolution that is high enough for the identification of molecular species. For intermediate resolution electron microscopes, samples must be of less than 500 nm in thickness. Most cells, specially eukaryotes, exceed the thickness accessible to CET, limiting its routine application to isolated or reconstituted subcellular systems, small prokaryotic cells, or thin peripheral regions of cells.

To overcome such limitation, focused-ion-beam milling at cryo temperatures (cryo-FIB) can produce samples of adequate thickness for CET from frozen-hydrated biological cells. This novel approach is applicable to all types of cells grown or deposited directly on EM grids by generating 100-400 nm lamellae that are supported by the surrounding cellular material, and thus remain in the EM grid. The grid is then transferred out of the dual beam and stored at liquid nitrogen temperatures for subsequent imaging in a cryo-TEM. This workflow, combined with correlative fluorescence microscopy, holds the promise of serving as a bridge between cellular and molecular scales. The routine use of this methodology will be described in detail, along with its application to the study of the structure of macromolecular complexes that were previously inaccessible to structural studies in their native environment inside the cell.



The Southern California Society for Microscopy and Microanalysis wishes to acknowledge the following Corporate Members who have faithfully supported our Society through their membership and by sponsoring our meetings for the 2015 – 2016 year.

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