Gina Sosinsky

1955 - 2015

Biography

Gina Sosinsky was born on April 15, 1955, in New York City, but she finished high school in the Chicago suburbs, and received her undergraduate degree in biology from the University of Chicago. She received her Ph. D. in 1983 in Biophysics from the University of California, where she first became interested in macromolecular structure. She was a post-doc in structural biology with Don Caspar and David DeRosier at Brandeis (where her future husband, John Badger, was also a post-doc. There, she began a collaboration with Dan Goodenough at Harvard Medical School. That collaboration was the beginning of her life-long research on gap junction structure and function. While in Boston, she was a Charles A. King Trust Fellow of the Medical Foundation of Boston, 1987-1989.

She joined the faculty at UC San Diego, in 1995, where she was head of the Biology EM lab until 1998, and taught courses between 1997 and 2011. In 2007, she was appointed Professor in the Neurosciences Department and the Center for Research in Biological Systems.

She is survived by her husband, Dr. John Badger, and her three sons: Ethan, Graham and Sam.

Professional activities

- Editorial Board member 2011-2016 and Assistant Editor for the Journal of Biological Chemistry.
- Editor for Microscopy Research and Technique.
- Guest editor for Cell Communication and Adhesion.
- Reviewer for many premier journals
- Was head of the 3DEM mailing list and web site
- Frequent grant reviewer for NIH and NSF.

Memberships

- American Association for the Advancement of Science
- American Society for Cell Biology
- Society for Neuroscience
- Biophysical Society,
- Microscopy Society of America

Grant Support

- NIH Traineeship, I977-I980.
- NSF (gap junctions) 1996 -2005; NIH 1992-1996; 2003-2014
- NSF and NIH instrumentation-related grants: 1996-2008

Former Postdocs

- Guy Perkins
- Soumitra Ghoshroy
- Atsuori Oshima
- Daniela Boassa
- Angela Cone

With David DeRosier at Brandies

Gap junctions

Gap junctions are one of the primary ways that cells communicate with each other.
They are found in almost all tissues in which cells abut each other.

Connexin26 (Cx26), the smallest of the gap junction protein family and one of the most functionally important, is found in significant quantities in many major organ systems including brain, liver and intestine. Human mutations in connexins are the leading cause of hereditary deafness worldwide. The Sosinsky laboratory isolated Cx26 gap junctions as in situ, ordered, two-dimensional crystals for analysis by electron microscopy (EM) structure determination, atomic force microscope imaging (AFM) and biochemical studies.

She used and helped to develop a variety of sophisticated multi-resolution imaging approaches to probe the trafficking, assembly and structure of gap junctions and a family of related proteins, the pannexins. Multiple microscopies such as confocal and atomic force microscopy in addition to electron microscopy (especially electron tomography) were used to better understand gap junction dynamics.

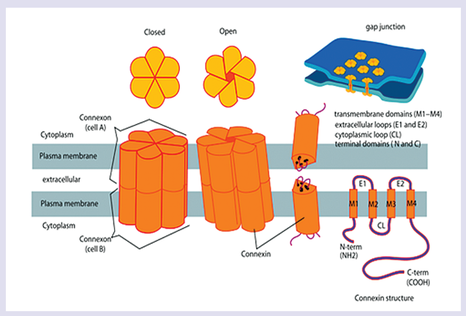

Fig. 1. Schematic of the gap junction and the role of connexions, the main focus of Gina's scientific career.

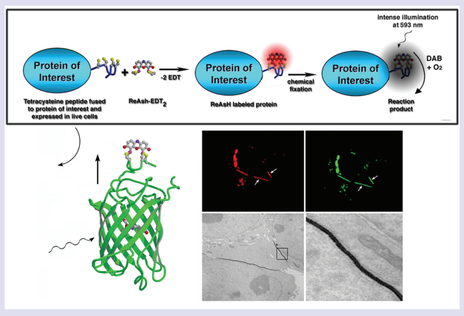

Fig. 2. Correlative microscopy: FRET based photo-oxidation -- ReAsH added to live cells, followed by fixation in glutaraldehyde after labeling yields optimal ultrastructral preservation.

Sosinsky, G.E., Giepmans, B.N.G., Deerinck, T.J., Gaietta, G.M. and Ellisman, M.H. (2007) Markers for correlated light and electron microscopy. In McIntosh, J.R. (ed.), Cellular Electron Microscopy. Elsevier, San Diego, CA, Vol. 79, pp. 573-589.

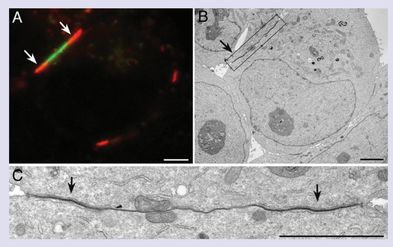

Fig. 3. Correlated light and electron microscopy using pulse-labeled specimens.

Gaietta, G., Deerinck, T.J., Adams, S.R., Bouwer, J., Tour,, O., Laird, D.W., Sosinsky, G.E., Tsien, R.Y. and Ellisman, M.H. (2002) Multicolor and electron microscopic imaging of connexin trafficking, Science, 296:503-507.

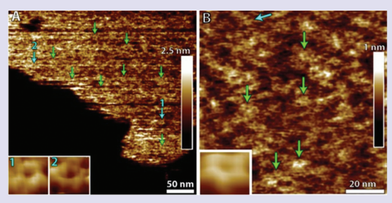

Fig. 4. AFM images of purified membrane fragments containing connexin Cx26 hemi-channels.

Meckes B, Ambrosi C, Barnard H, Arce FT, Sosinsky GE, Lal R.(2014) Atomic force microscopy shows connexin26 hemichannel clustering in purified membrane fragments. Biochemistry. 53:7407-14.

Flagellar basal body

In 1992, still at Brandies, she did work on the flagellar basal body (see references below). Here, she is pictured in Japan with Keiichi Namba, a leader in that field, and her husband, John Badger.

Neurosciences

Sosinsky's work in the neuroscieces, a major interest of the National Center for Microscopy and Imaging Research (NCMIR) at UCSD. The work involved study of the nodes of Ranvier and their relation to gap junction structure. This work involved pannexins, proteins similar to connexins, and once thought to be involved in gap junctions. She was involved in gathering and extracting new information about the structural organization of the node using molecular labeling and electron tomographic imaging.
Techniques used included genetically encoded tags for correlated light and electron microscopy, and widefield fluorescent brain mapping to plot the distribution of protein expression at high resolution across the brain.

NCMIR, Outreach, Technology Development

Sosinsky served as the assistant director of the National Center for Microscopy and Imaging Research (NCMIR) at UCSD, where she was involved in technology development, teaching, and training on a local and national scale.

As NCMIR co-P, her responsibility was the experimental tomography efforts (including molecular labeling techniques and experimental data collection).

She was the project originator of the Electron Microscopy Outreach Program. This was a joint project between the National Center for Microscopy and Imaging (NCMIR) and the San Diego Supercomputer Center (NPACI/SDSC).

She was very involved in setting up data-sharing mechanisms, including the Neuroscience Information Framework and the NIDDK Information Network, and particularly the NCMIR's Cell-Centered Database. Her work on pannexin distribution highlighted the variable results and difficulties in working with antibodies and genetically modified organisms, leading to her participation in the Resource Identification Initiative, (RII) an effort to improve reporting standards for reagents and tools used to produce the findings of a study.

Here is a list of technologies that Gina employed in her work

- STEM
- CryoEM
- AFM
- TEM/IVEM
- Confocal microscopy
- Multi photon microscopy
- Wide field, high resolution brain maps
- Electron tomography
- Live cell imaging
- Immunocytochemistry
- Genetically modified proteins
- FRET

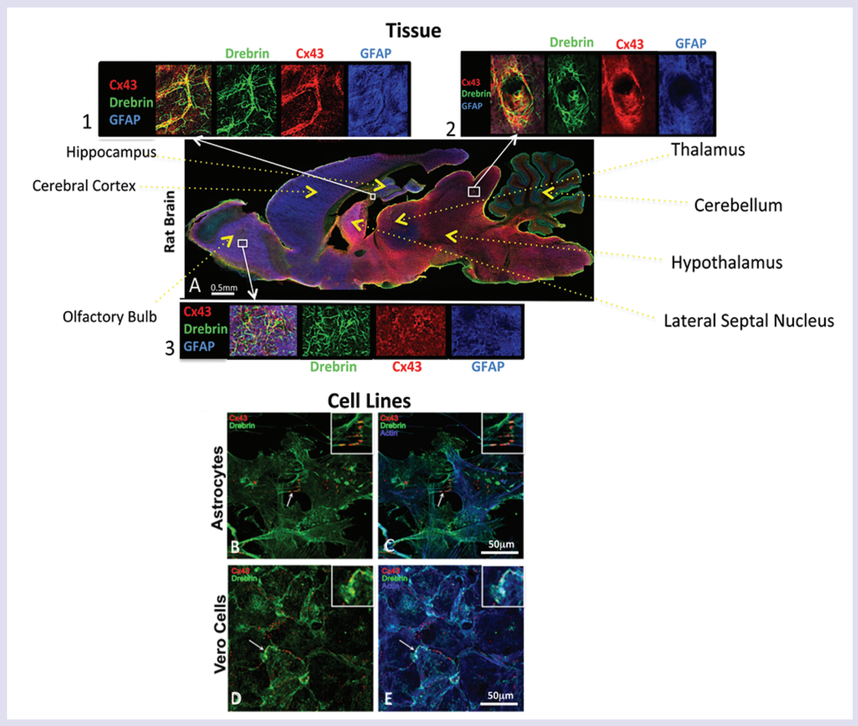

Fig. 5. Multi-color labelling. The manuscript is dedicated to the memory of Gina Sosinsky who passed away on September 2015, while working on completing this project.

Ambrosi, C., Ren, C., Spagnol, G., Cavin, G., Cone, A., Grintsevich, E., Sosinsky, G., Sorgen, P. (2016) Connexin43 Forms Supramolecular Complexes through Non-Overlapping Binding Sites for Drebrin, Tubulin, and ZO-1. PLoS One DOI:10.1371/journal.pone.0157073, 1-23

MSA and Microscopy Society involvement

Gina was a Biological Director on the Council of the Microscopy Society of America from 2010 to 2012, and for seven years she was co-chair of the UCSD Women in Science Committee. She was several times Chair for Three-Dimensional Electron Microscopy at the Gordon Conferences.

Below is a list of her MSA involvement, which received special recognition in 2012 by her receipt of the Morton D. Maser Award for outstanding service the Society.

- Presidential Scholar 1979.
- Invited Speaker, 1992.
- Session Chair, 1997, 1998,1999, 2000
- Invited Tutorial Speaker, 2002
- Invited Speaker, 2006 annual meeting
- Awards committee, 2008-2010
- Director, Council 2010-2012
- Head Biological Tutorials (Education Committee, 2000-2002)

2012 presentation of the Maser award by then-President of MSA, Janet Woodward.

Selected bibliography

Gap Junctions

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Sosinsky, G.E. (1992) Image analysis of gap junction structures. In Electron Microscopy Reviews. Subcellular and Biomolecular Structure (Harris, J.R., Horne, R.W. and Chiu, W., eds.) 5:59-76, Pergamon Press, New York.

Sosinsky, G.E. (1992) Order and disorder in gap junction lattices. In Transactions of the American Crystallographic Association, Electron Crystallography, 28:165-174.

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Hand, G.M., Martone, M.E., Stelljes, A., Ellisman, M.E., and Sosinsky, G.E. (2000) Specific labeling of connexin43 in NRK cells using tyramide-based signal amplification and fluorescence photooxidation. Microsc. Res. Tech., 52:331-343.

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Gap Junctions

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Sosinksy, G. (2016) Gap junctions (Section 11.5) in: Molecular Biology of Assemblies and Machines. Steven, A, Baumeister, W, Johnson, L and Perham, R (eds) Garland Science, Milton Park, UK.

Meckes B, Ambrosi C, Barnard H, Arce FT, Sosinsky GE, Lal R.(2014) Atomic force microscopy shows connexin26 hemichannel clustering in purified membrane fragments. Biochemistry. 53:7407-14.

Ambrosi, C., Ren, C., Spagnol, G., Cavin, G., Cone, A., Grintsevich, E., Sosinsky, G., Sorgen, P. (2016) Connexin43 Forms Supramolecular Complexes through Non-Overlapping Binding Sites for Drebrin, Tubulin, and ZO-1. PLoS One DOI:10.1371/journal.pone.0157073, 1-23

Technology development

Sosinsky, G.E., Giepmans, B.N.G., Deerinck, T.J., Gaietta, G.M. and Ellisman, M.H. (2007) Markers for correlated light and electron microscopy. In McIntosh, J.R. (ed.), Cellular Electron Microscopy. Elsevier, San Diego, CA, Vol. 79, pp. 573-589.

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Neurosciences

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Flagellar Basal Body

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Other

Sosinsky, G.E., Schekman, R. and Glaeser, R.M. (1986) Morphological observations on the formation and stability of the crystalline arrays in the yeast plasma membrane. J. Ultrastruc. Res. 94:37-51.

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Acknowledgements

- Powerpoint slides from Dr. Maryann Martone, as presented at M&M2016:
Martone, ME (2016) Complete cells and a complete scientist: a tribute to Dr. Gina Sosinsky. Microsc. Anal. 22(3):1100-1101.
- Pictures and text from Dr.John Badger, Gina's husband.
- Additional information from the NCMIR and UCSD websites.