

2018

European Microbiology Research Conference

December 3–5, 2018
Valencia, Spain
<http://europeanmicrobiology.madridge.com>

From Images to Knowledge with ImageJ & Friends

December 6–8, 2018
Heidelberg, Germany
www.embl.de/training/events/2018/IMJ18-01

American Society for Cell Biology

(ASCB) 2018 Annual Meeting
December 8–12, 2018
San Diego, CA
<http://ascb.org/future-ascb-annual-meetings>

2D Materials and Technologies

December 10–13, 2018
Melbourne, Australia
www.fleet.org.au/icon2dmat

Smart NanoMaterials 2018:

Advances, Innovation and Application

December 10–13, 2018
Paris, France
www.snaia2018.com

Physics and Chemistry of Surfaces and Interfaces

January 13–17, 2019
Santa Fe, NM
<https://pcsi2019.avs.org>

Imaging the Biomechanics of Life

January 13–18, 2019
Les Houches, France
www.e-smi.eu/index.php?id=278

2019

Microscopy & Microanalysis 2019

August 4–8, 2019
Portland, OR
www.microscopy.org

2020

Microscopy & Microanalysis 2020

August 2–6, 2020
Milwaukee, WI
www.microscopy.org

2021

Microscopy & Microanalysis 2021

August 1–5, 2021
Pittsburgh, PA
www.microscopy.org

2022

Microscopy & Microanalysis 2022

July 31–August 4, 2022
Portland, OR
www.microscopy.org

2023

Microscopy & Microanalysis 2023

July 24–28, 2023
Minneapolis, MN
www.microscopy.org

More Meetings and Courses

Check the complete calendar near the back of this magazine.

The Mystery of the Missing Centriole Solved!

Stephen W. Carmichael* and Jeffery L. Salisbury

Mayo Clinic, Rochester, MN 55905

*carmichael.stephen@mayo.edu

Most mammalian cells contain two centrioles that duplicate during cell division. One would expect the human zygote to have two centrioles during interphase and four centrioles during mitosis. However, four centrioles have never been shown in any mammalian zygote, only three. Since the human oocyte lacks centrioles, it seems the centrioles of the embryo are paternally inherited. The paternal centrioles reside in the sperm neck, a region at the junction of the nucleus and flagellum. The neck also contains the striated columns and capitulum, which surround a relatively clear region called the vault.

The current dogma is that the centrioles in the sperm undergo reduction so that a sperm cell then contains one typical centriole, called the proximal centriole (PC), while the distal centriole (DC) disintegrates and the protein surrounding it is eliminated and replaced by the vault. Therefore, it is thought the sperm has only one functional centriole, the PC. If the zygote inherits only one centriole, how does it provide four centrioles, two for each daughter cell? A large international team led by Emily Fishman and Tomer Avidor-Reiss set out to solve this mystery [1].

A clue was provided by earlier work on insects where it had been shown that, in addition to the familiar centriole, insect sperm has a second atypical centriolar structure. This atypical structure had been shown to be essential for normal fertility and embryonic development. The presence of this atypical structure in insects led Fishman et al. to look for a similar atypical structure in humans. They investigated human spermatozoa and bovine zygotes to determine if mammals have a functional atypical second centriole.

Fishman et al. explored for the presence of a catalog of known centrosomal proteins and found that a subset of them were unexpectedly present in the DC of human spermatozoa. Using correlative light and electron microscopy, high-pressure freezing, and freeze substitution electron microscopy, they found that the DC is attached to the base of the central strand of the flagellum (the axoneme) but that its microtubules splayed outward forming a novel,

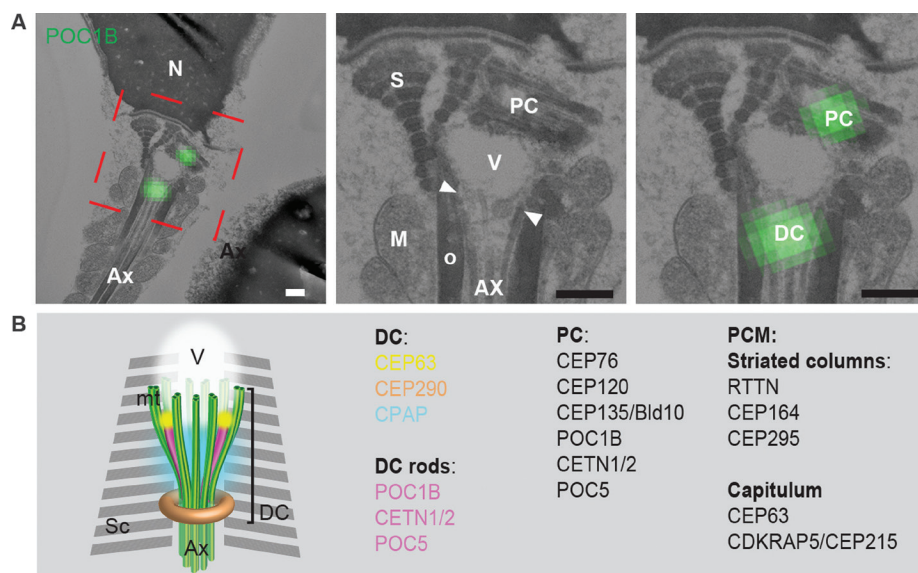
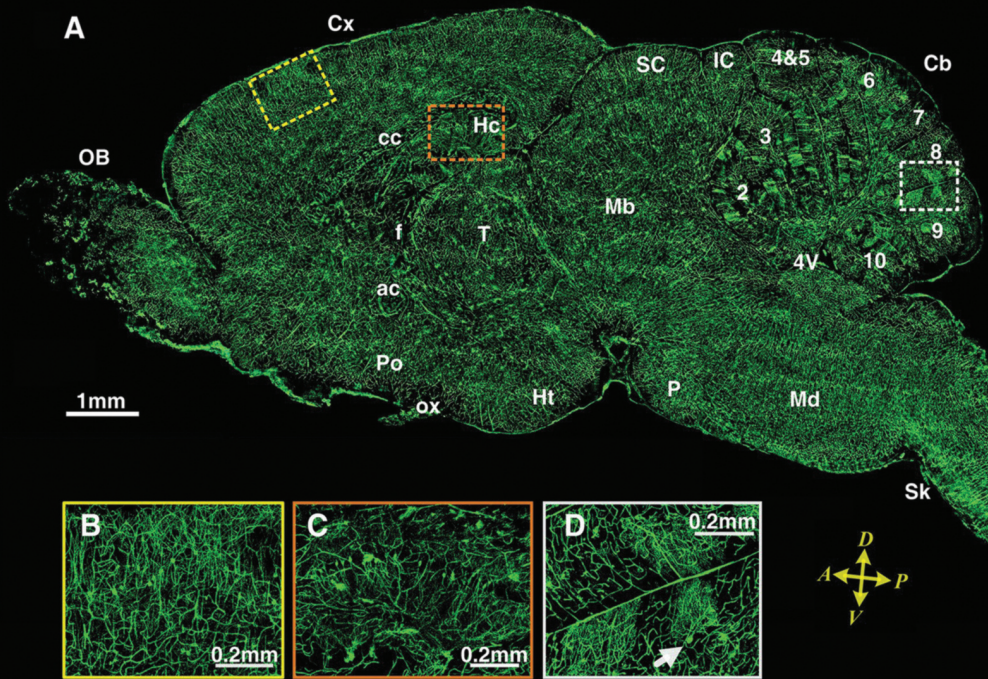


Figure 1: (A) The PC and DC were labeled with the centriolar protein POC1B using correlative light and electron microscopy. These structures were found to be associated with the splayed microtubules (arrowheads, between the axoneme and electron light vault). Scale bars = 200 nm. (B) Model of the DC in ejaculated spermatozoon based on electron microscopy, confocal microscopy, and 3D-SIM (super resolution microscopy). Sc: striated columns, AX: axoneme, V: vault.

YOU'LL FIND **DiATOME** AT THE FOREFRONT OF **INNOVATION...**



Creating a High Resolution Atlas of the Mouse Brain...

(A) A sagittal image reconstructed from a stack of 100 virtual sagittal sections (total thickness of 0.1 mm). These sections were transformed from the original coronal sections. The sagittal image was located in the right hemisphere about 0.4 mm lateral to the middle. Almost all major regions of the brain can be seen in this image, e.g., the Olfactory Bulb (OB), Cerebral Cortex (Cx), Hippocampus (Hc), Fornix(f), Anterior Commissure (ac), Thalamus (T), Cerebellum (Cb), Midbrain (Mb), Pons (P), Medulla (Md), Corpus Callosum (cc), Superior Colliculus (SC), Inferior Colliculus (IC), Hypothalamus (Ht), Preoptic Area (Po), Optic Chiasm (ox), 4th ventricle (4V) and nine lobules of the cerebellum (Arabic numerals, 2 to 10). The three regions inside the different colored rectangle in (A) are the positions of (B), (C) and (D), which illustrate the cerebral cortex, hippocampus and cerebellum, respectively. In the reconstruction of sagittal image, no dislocation was observed along the D-V axis, i.e., the coronal sections are inherently aligned along the A-P axis.

DiATOME QUALITY AND INNOVATION APPLIED...

Micro-Optical Sectioning Tomography to Obtain a High-Resolution Atlas of the Mouse Brain

Existing imaging tools have limitations for brainwide mapping of neural circuits at a mesoscale level. In collaboration with DiATOME, researchers developed a Micro-Optical Sectioning Tomography (MOST) system utilizing a DiATOME Diamond Knife that can provide micron tomography of a centimeter-sized whole mouse brain.

Slicing was performed by moving the specimen to generate ribbons, and each ribbon was simultaneously imaged. The illuminating beam passed through a beam splitter, mirror and objective to irradiate the ribbon. The imaging beam collected by the objective and passed through the mirror, beam splitter and tube lens was then recorded by a line-scan CCD.

A 3D structural dataset of a Golgi-stained whole mouse brain at the neurite level was obtained. The morphology and spatial locations of neurons and traces of neurites were clearly distinguished. Researchers found that neighboring Purkinje cells were sticking to each other.

Acknowledgement

Micro-Optical Sectioning Tomography to Obtain a High-Resolution Atlas of the Mouse Brain Anan Li, Hui Gong, Bin Zhang, Qingdi Wang, Cheng Yan, Jingpeng Wu, Qian Liu, Shaoqun Zeng, Qingming Luo

Britton Chance Center for Biomedical Photonics, Wuhan National Laboratory for Optoelectronics—Huazhong University of Science and Technology, Wuhan 430074, P. R. China.

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atypical structure. Using super-resolution light microscopy, they found that in human and bovine sperm the DC subset of centriolar proteins is organized into rods. They used an *in vitro* system to show that the human DC recruited pericentriolar material (PCM) protein γ -tubulin. Furthermore, they followed the DC of bovine sperm into the zygote and found that it recruits PCM and forms a new daughter centriole, which gives rise to an aster localized to the spindle pole, all the while maintaining its attachment to the axoneme. Their finding of a novel, atypical centriole in a mammalian sperm that functions in the zygote solves the mystery of the missing centriole!

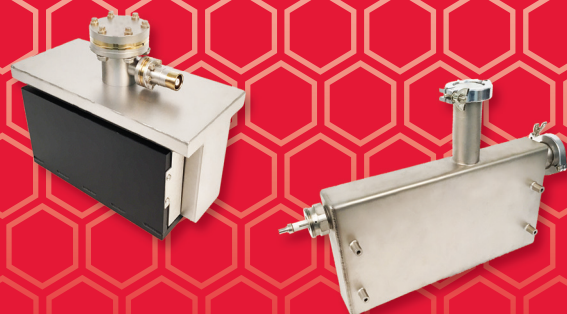
As was found in insects, Fishman et al. showed that mammalian sperm also have one typical and one atypical centriole. Their observations argue for an evolutionary pressure to maintain functional centriole numbers with variable structure, microtubule organization, and protein composition. This conservation suggests that sperm centrioles and their remodeling could play a critical role in fertility and early embryonic development. This could lead to an understanding of the precise mechanisms of centrosome transmission during reproduction and may solve male infertility problems that currently have no treatment. Also, this could generate novel targets for male contraception and even support organelle donation strategies to treat centriole-mediated infertility.

References

- [1] EL Fishman et al., *Nat Comm* 9 (2018) article 2210, DOI: 10.1038/s41467-018-04678-8.
 [2] The authors gratefully acknowledge Dr. Tomer Avidor-Reiss for reviewing this article.

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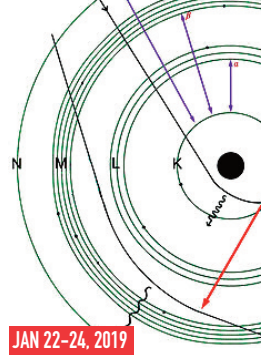
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JAN 15-17, 2019

Sample Preparation for Semiconductor Devices: A Complete Picture



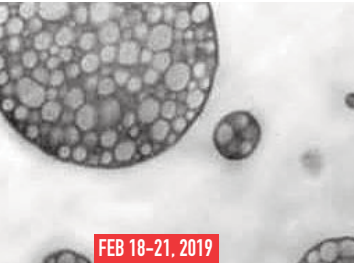
JAN 22-24, 2019

X-Ray Microanalysis Workshop: A Complete Picture



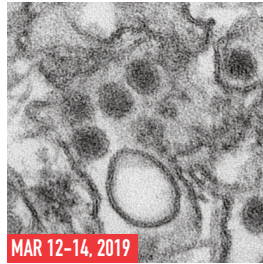
FEB 5-7, 2019

Introduction to Microscopy Techniques Workshop



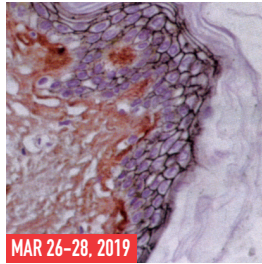
FEB 18-21, 2019

Materials Ultramicrotomy Workshop



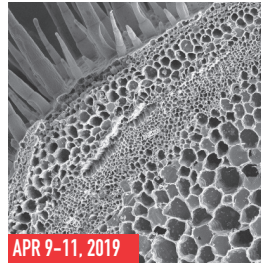
MAR 12-14, 2019

Biological TEM Workshop: A Complete Picture



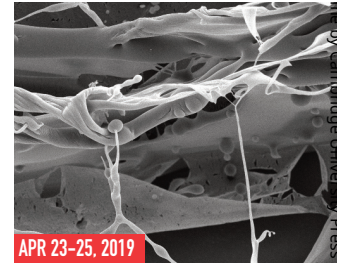
MAR 26-28, 2019

Aurion Immunogold Silver Staining



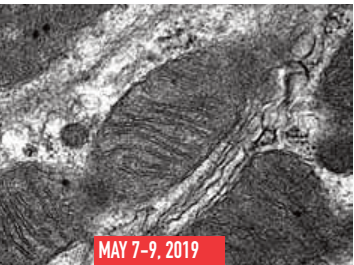
APR 9-11, 2019

Biological SEM Workshop: A Complete Picture



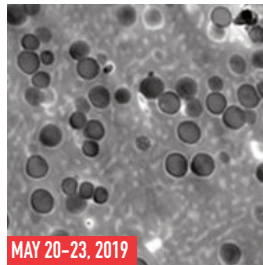
APR 23-25, 2019

Cryo SEM Workshop



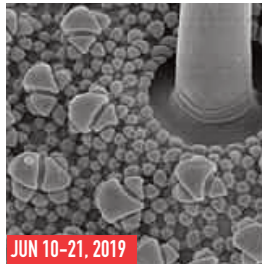
MAY 7-9, 2019

Automated and Rapid Specimen Processing for Electron Microscopy Workshop



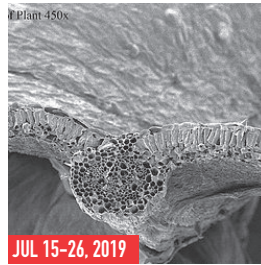
MAY 20-23, 2019

Materials Ultramicrotomy Workshop



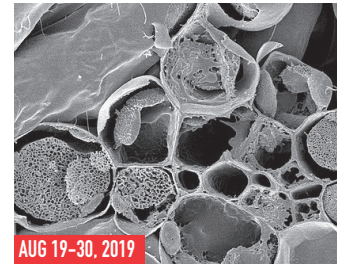
JUN 10-21, 2019

Microscopy: The Complete Image



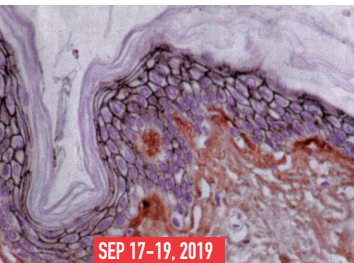
JUL 15-26, 2019

Microscopy: The Complete Image



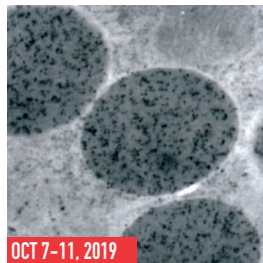
AUG 19-30, 2019

Microscopy: The Complete Image



SEP 17-19, 2019

Aurion Immunogold Silver Staining



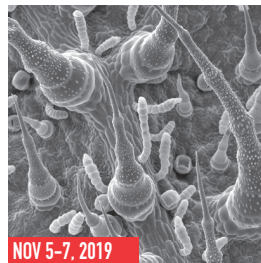
OCT 7-11, 2019

Cryosectioning/Immunogold Workshop



OCT 22-24, 2019

Introduction to Microscopy Techniques Workshop



NOV 5-7, 2019

Biological SEM Workshop: A Complete Picture



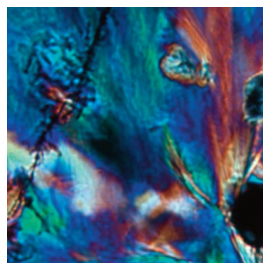
NOV 12-14, 2019

Biological TEM Workshop: A Complete Picture

Plus: Pharmaceuticals Workshops, dates to be determined...

- Pharmaceutical Microscopy Workshop
- Pharmaceutical Microscopy Workshop: Applications
- Pharmaceutical Chemical Imaging Workshop
- Pharmaceutical Microscopy Workshop: Polymorphism
- Pharmaceutical Microscopy Workshop: Techniques

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