Higher order cytoskeletal structures

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Cytoskeletal polymers play key roles in cellular organization, morphology, and dynamics. Often individual polymers interact with each other or additional proteins to build complex machines, which were the focus of the "Higher Order Cytoskeletal Structures" Minisymposium. Many of the speakers in this session utilized improved visualization strategies and overcame technological challenges in a variety of model organisms to provide new insights into the organization and function of higher order cytoskeletal assemblies.

Microtubule structures and organization

The session opened with talks highlighting microtubule-based structures, including centrioles and basal bodies, microtubule-organizing centers (MTOCs), and cilia. **Matthew R. Hannaford** (Rusan laboratory, National Heart, Lung and Blood Institute) found a role for kinesin-1 and dynein in centriole motility along noncentrosomal microtubules in *Drosophila* cells. These movements require Pericentrin-like protein, which serves as an adapter that links centrioles directly to these motor proteins. The theme of noncentrosomal microtubules continued as **Ariana D. Sanchez** (J. Feldman laboratory, Stanford University) used TurboID, a genetically encoded proximity labeling approach, in *Caenorhabditis elegans* differentiated epithelial cells to identify key components of noncentrosomal MTOCs including VAB-10B/Spectraplakin and WDR-62/WDR62.

DOI:10.1091/mbc.E19-12-0679
Molecular Biology of the Cell Volume 31 Page 398
MBoC is pleased to publish this summary of the Minisymposium on "Higher Order Cytoskeletal Structures," held at the 2019 ASCB EMBO Meeting, Washington, D.C., December 8, 2019.

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The next talks focused on cilia, beginning with **Carolyn Ott** (Lippincott-Schwartz laboratory, HHMI Janelia Research Campus), who mined volumetric transmission electron microscopy data of mouse visual cortex cells in collaboration with the Allen Institute to image brain cilia in their native context. These cilia have a surprising amount of diversity in architecture and positioning, providing hypotheses about how brain cilia send and receive signals. **Jenna L. Wingfield** (Lechtreck laboratory, University of Georgia) used photobleaching experiments in the single-cell green alga *Chlamydomonas* to image individual intraflagellar transport (IFT) trains as they move within cilia, to better understand the nature of train turnaround at the tip. Anterograde IFT trains appear to fragment into smaller subcomplexes with most components remaining associated during reorganization into retrograde trains. Finally, **Adam W. J. Soh** (Pearson laboratory, University of Colorado Anschutz Medical Campus) found roles for basal body appendages in the elaborate cortical basal body positioning found in multiciliated cells such as *Tetrahymena*. He showed that striated fibers and specialized microtubule bundles dynamically link basal bodies to one another and to the cell cortex to maintain position in the face of ciliary forces.

Actin structures and function

Brae M. Bigge (Avasthi laboratory, University of Kansas Medical Center) bridged the microtubule and actin portions of the session by discussing how ciliary assembly in *Chlamydomonas* requires proteins in the ARP2/3 branched actin-promoting complex. She showed that both the conventional actin and a divergent actin in this system are likely regulated by ARP2/3. A series of talks on actin-based structures began with **Jaakko Lehtimäki** (Lappalainen laboratory, University of Helsinki), who showed a role for nonmuscle myosin II pulses in organizing cortical actin meshwork into filament bundles. These actomyosin bundles are precursors for perinuclear basal stress fibers in migrating animal cells. *MBoC* Paper of the Year awardee **Eric T. Hall** (Ogden laboratory, St. Jude Children's Research Hospital) found ways to better visualize very fine filopodia called cytonemes, showing that they are more ubiquitous than previously appreciated and that cytoneme-dependent signals can cause rapid responses in receiving cells. Finally, **Daniel Cortes** (A. Maddox laboratory, University of North Carolina, Chapel Hill) used microfluidics to mount *C. elegans* zygotes for even illumination of cytokinetic rings, which produced a better approximation of ring component density and improved agent-based modeling of ring dynamics.

The Minisymposium closed with a talk on septins, a cytoskeletal component that can self-assemble to regulate spatial organization in cells. **Megan Radler** (Spiliotis laboratory, Drexel University) discussed how neurons break symmetry to form neurites using septin 7 and myosin II.