Cell biologists' top scientific honor goes to pioneers of the cytoskeleton

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Wilson Medals are for three pioneers of the cytoskeleton: (L-R) Peter Satir, Bill Brinkley, and John Heuser. Credit: ASCB Photos

If cells were cars, then the three pioneering cell biologists just named winners of the 2014 E.B. Wilson Medal, the highest scientific honor of the American Society for Cell Biology, helped write the essential parts list. William "Bill" Brinkley of the Baylor College of Medicine in Houston, John Heuser of the Washington University School of Medicine in St. Louis, and Peter Satir of the Albert Einstein College of Medicine in the Bronx identified crucial pieces of the cytoskeleton, the cell's shape-shifting framework, and showed how these elements drive life at the cellular level.

Named for Edmund Beecher Wilson (1856-1939), America's first

modern cell biologist, the Wilson Medal will be presented to the winners in December at the ASCB's 54th Annual Meeting in Philadelphia. "We selected these three people because of their lifetime contributions to the field of cell biology, particularly to the study of the cytoskeleton," says Joseph Gall, of the Carnegie Institution of Washington, who chaired the Wilson Medal selection committee for ASCB. "The E.B. Wilson is the highest award given by the ASCB and it means a great deal to ASCB members, who recognize that our science is both collaborative and shaped by exceptional individuals. These three are exceptional."

Early in his career, Satir made major breakthroughs using the then-novel technology of electron microscopy to visualize the famous 9+2 cross-section of bundled microtubules in the flagellum, the whip-like extensions that drive motile cells like sperm, or in the ciliary cells that line human airways, sweeping out debris in synchronized waves. Satir discovered that the microtubules in the bundle move by sliding past each other, proving they were powered by a one-way motor protein now called dynein. Satir's continued work and continued insistence that ciliary action was central to many life processes led to the discovery by other researchers in 2000 that defects in non-motile cilium, cells with a single non-moving "antenna," were at the root of a common, lethal human disorder, polycystic kidney disease (PKD). This touched off a scientific land rush, linking cilium defects to a long list of "ciliopathies," diseases such as Bardet-Biedel syndrome, situs inversus, and nephronophthisis.

Heuser helped develop and refine new methods for "fixing" samples for electron microscopes through freeze-fracturing, using his technique of "deep freeze-deep etch EM" to revealed for the first time cellular processes too fleeting for traditional microscopy, including calcium-regulated exocytosis and membrane recycling. These "Heusergrams," as his former students called them, revealed details of the cytoskeleton in amazing high-resolution including cytoskeletal motors, clathrin and

coated pits, SNARE complexes that are the mechanism of vesicle fusion, and endosomal sorting complexes that are required for vesicle transport.

Brinkley is best known for his discovery of the kinetochore, the crescent-shaped, three-layered laminated plate that attaches the center of a duplicated chromosome to microtubule spindle fibers that pull it apart from its "sister" duplicated chromosomes during cell division. This is the culmination of the whole process of DNA replication and thus the basis of growth. Brinkley's work was also critical in the description of the MTOC, the microtubule organizing center, another major piece of cell machinery, and in later work linking MTOC defects to cancer. Brinkley was also the first to successfully employ an immunofluorescent antibody to study tubulin, the family of proteins that combine to generate microtubules.

All three 2014 Wilson Medal winners are longtime ASCB members. Brinkley, who has been a member since 1964, was ASCB President in 1980. Heuser joined the ASCB in 1976 and delivered the prestigious Keith Porter Lecture in 1985. Satir was a founding member of ASCB in 1961 and served on ASCB Council from 1981 to 1983.

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