Laasberg Lecture Series:
"Dynamic interplay between force and membrane geometry during actin-mediated vesicle formation"

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Hosted by: Assistant Professor Shane McInally

Tuesday, November 12th, 12:00 pm
Gateway 1002 ~ Pizza will be served

Abstract: Clathrin-mediated endocytosis is a critical process by which cells take up nutrients, control serum cholesterol levels, and regulate cell signaling. It is now appreciated that from budding yeast to human cells, a burst of actin assembly generates forces to assist plasma membrane invagination during clathrin-coated vesicle formation. Studies presented address mechanisms by which mechanical forces from actin assembly are harnessed for efficient vesicle formation. These studies use both budding yeast and human cells to investigate force production, load adaptation, and feedback between membrane geometry and biochemical reaction rates. Reconstitution experiments in budding yeast demonstrate that actin assembly on the surface of a lipid bilayer is sufficient to drive vesicle formation, suggesting that membrane-associated actin assembly might represent an ancient vesicle-forming mechanism. Yeast genetics have identified the core actin-associated proteins required for efficient vesicle formation, and a combination of genetics, biochemistry, and mathematical modeling are revealing the biophysical mechanisms for force generation and harnessing. Other studies in budding yeast indicate that cargo controls the rate of vesicle formation, while studies in mammalian cells indicate that membrane geometry plays a key role in controlling biochemical reaction rates. Feedback from membrane geometry, cargo, lipid composition, and physical load are key parameters dictating progress toward vesicle formation.

Bio: David Drubin has served on the faculty at the University of California, Berkeley for 36 years, where he holds the Ernette Comby Chair in Microbiology. His research combines live cell imaging, molecular and cell biology, genetics, biochemistry, and mathematical modeling. The primary focuses of his research are the cytoskeleton and membrane trafficking. He studies these processes in budding yeast, human stem cells and zebrafish. In recent years, he has begun to use genome-edited human stem cells for investigations of how the cytoskeleton and membrane trafficking events are altered during differentiation to serve the specific biological demands of the differentiated cells. Through

collaboration with Fyodor Urnov and his colleagues at Sangamo Biosciences, David's lab became the first to use genome editing to express fluorescent fusion proteins at native levels in human cells to avoid perturbing the processes being investigated.

David served as Editor in Chief of the American Society for Cell Biology's research journal, *Molecular Biology of the Cell*, for 10 years, and as Chair of the Department of Molecular and Cell Biology for five years. He has also served as Head of the MCB Department's Division of Cell and Developmental Biology and Graduate Program at UC Berkeley. He has served on numerous editorial boards, external department review panels, and NIH grant review study sections, and he has organized several international research conferences. In 1999 he was Program Chair for the American Society for Cell Biology's annual national meeting. David earned his bachelor's degree in Biochemistry at UC Berkeley working on bacterial transcription factor enzymology with Michael J. Chamberlin, and his Ph.D. in Biochemistry and Biophysics with Marc Kirschner at the University of California, San Francisco working on microtubule-associated tau protein in neurons. He performed studies on yeast cell biology as a Hellen Hay Whitney Fellow with David Botstein at MIT. Among the awards he has received as a faculty member are the Searle Scholar Award, the American Cancer Society Faculty Research Award, the Ira Herskowitz Award, an NIH Merit Award, and election to the National Academy of Sciences, the American Academy of Arts and Sciences, and the American Association for Advancement to Science. He is a fellow of the American Society for Cell Biology and served as a Senior Investigator at the Allen Institute for Cell Science. He was selected to give the Keith Porter Lecture the 2023 annual meeting of the American Society for Cell Biology.