

TENURE RECOMMENDATION  
UNIVERSITY OF MICHIGAN  
MEDICAL SCHOOL  
DEPARTMENT OF CELL AND DEVELOPMENTAL BIOLOGY

Kristen J. Verhey, Ph.D., associate professor of cell and developmental biology, without tenure, Department of Cell and Developmental Biology, Medical School, is recommended for the granting of tenure to be held with her title of associate professor of cell and developmental biology, Department of Cell and Developmental Biology, Medical School.

Academic Degrees:

Ph.D.	1995	Harvard University
B.S.	1987	University of Michigan

Professional Record:

2008-present	Associate Professor of Cell and Developmental Biology, without tenure, University of Michigan
2002-2008	Assistant Professor of Cell and Developmental Biology, University of Michigan
2000-2002	Visiting Assistant Professor, Wellesley College

Summary of Evaluation:

Teaching: Dr. Verhey assumed the role of course director in 2004, and has served as course director as well as a major lecturer in Cell Biology (CDB 530, a required PIBS [Program in Biomedical Science] graduate core course). She was principally responsible for developing this course into an integrated and interactive learning environment. She implemented active learning practices into this large lecture-based course after participating in an NSF-sponsored Learning Community "Bringing Active Learning to the Classroom." Dr. Verhey replaced one hour of lecture time per week with faculty-led small group discussions. With her help, and encouragement from both students and faculty, these changes have definitely increased the enjoyment, satisfaction and comprehension for all graduate students enrolled in CDB 530; which now number over 100. She also mentors graduate student assistants for the course, who lead individual discussion sections, and assist in grading homework and exams. Dr. Verhey also lectures in the M1 sequence Cells and Tissues and the Cytoskeleton.

Dr. Verhey currently is mentor to five Ph.D. students, one postdoctoral fellow, and two undergraduate students. One of her graduate students was the recipient of a prestigious NSF Student Fellowship, while her most successful student (to date) was selected as an associate of the Michigan Society of Fellows and was also the winner of the nationally prestigious 2007 Norton B. Gilula Award for an Outstanding Graduate Student (awarded by the American Society of Cell Biology). She has served, or is currently serving, on seven Ph.D. dissertation committees.

Research: The central theme of Dr. Verhey's research program is the role of microtubule-based motors in mammalian cells. After joining the University of Michigan, she continued to build on her previous work analyzing the mechanism of Kinesin-1 activity, focusing primarily on its autoinhibition. Her laboratory developed a new fluorescence technique in living cells to elucidate the molecular mechanisms of autoinhibition. Her laboratory identified a novel binding partner of Kinesin-1, called FEZ1, that relieves this autoinhibition and contributes to activation of the motor upon cargo binding. These studies were highlighted in an article in the *Journal of Cell Biology*. These studies constituted the initial results for her first successful NIH R01 application.

Her laboratory also developed an interest in imaging kinesin transport in living cells, which is a particularly challenging endeavor as kinesin-based transport events occur at the temporal and spatial limits of light microscopy and are hindered by fluorescence background from autoinhibited kinesins as well as by cellular autofluorescence. By combining specific fluorescence labeling techniques of Kinesin-1 with specialized imaging techniques (collaborating with Dr. Edgar Meyhofer in the Mechanical Engineering Department), they described the motile characteristics of single Kinesin-1 motor molecules in living cells. This work laid the foundation for her second successful NIH R01 application.

Since she initiated her independent research career in September 2002, Dr. Verhey has been continuously funded from several organizations, including the National Institutes of Health and top foundations. She is a recipient of the highly sought Human Frontiers of Science grant. This international award is extremely competitive. She publishes only in the very top specialty journals in her field (*Journal of Cell Biology*, *Biophysical Journal*) as well as in highly regarded general periodicals (*Current Biology*). Dr. Verhey is internationally and nationally recognized for her work. She has been invited to many seminars and professional presentations. She has received (and accepted) invitations to present her research at four seminars at other universities and will chair both sessions and give presentations at two national meetings in 2008 and 2009.

Dr. Verhey's approach to scholarship is highly interactive and collaborative. She established a large network of scientists with whom she routinely interacts, and feels strongly that these collaborations have been critical to her success. She attributes her success to her students.

#### Recent and Significant Publications:

Hammond JW, Griffin K, Jih GT, Stuckey J and Verhey KJ: Cooperative versus independent transport of Kinesin-1 cargoes. *Traffic* 9(5):725-741, 2008.

Blasius TL, Cai D, Jih GT, Toret CP and Verhey KJ: Two binding partners cooperate to activate the molecular motor kinesin-1. *Journal of Cell Biology* 176: 11-17, 2007.

Cai D, Hoppe AD, Swanson JA and Verhey KJ: Kinesin-1 structural organization and conformational changes revealed by FRET stoichiometry in live cells. *Journal of Cell Biology* 176: 51-63, 2007.

Cai D, Verhey KJ and Meyhofer E: Tracking single kinesin molecules in the cytoplasm of mammalian cells. *Biophysical Journal* 92: 4137-4144, 2007.

Reed NA, Cai D, Blasius TL, Jih GT, Meyhofer E, Gaertig J and Verhey KJ: Microtubule acetylation promotes Kinesin-1 binding and transport. *Current Biology* 16: 2166-2172, 2006.

Service: Dr. Verhey was chair of the CDB Graduate Admissions Committee for three years (2004-2007), and she currently chairs the CDB Seminar Committee. Dr. Verhey is also a member of the CDB Executive and Curriculum Committees. The Curriculum Committee considers the teaching responsibilities of department faculty and graduate students and makes annual recommendations to the chair for teaching assignments. She serves as a committee member for the Single Molecule Steering Committee, Review Committee for the Center for Live Cell Imaging, and the Biophysics Research Division. She is a member of the Cellular and Molecular Biology and the Center for Organogenesis Training Programs. She has served as a member of the Admissions Committee for the Program in Biomedical Sciences.

She is an *ad hoc* reviewer for the National Science Foundation and for MCB and is an external advisor for the Dystonia P01, Division of Neuroscience, Massachusetts General Hospital. She is a member of several professional societies.

#### External Review:

Reviewer A: "...Dr. Verhey is an excellent scientist [of her cohort] tracking an important question in the field of motor proteins. She has made significant discoveries and is well positioned to continue her ground-breaking work."

Reviewer B: "It is here that Dr. Verhey has made her unique contribution using fluorescence resonance energy transfer to execute a direct demonstration in an intracellular context that kinesin-dependent conformational changes do occur, consistent with motor activation upon substrate binding. Thus...it was Dr. Verhey who provided a definitive *in vivo* test of this idea of how microtubule motors can be maintained in an inactive confirmation until bound by cargoes."

Reviewer C: "In particular, I find her work on the roles of tubulin post-translational modifications on transport to be novel, cutting-edge and important, since the problem has been around for decades, and she is the first to start to make any sense of it...During the summer I heard her present her work at a cutting edge meeting on motor proteins in Japan, where she presented one of the very best talks among many of the leaders in her field of research."

Reviewer D: "Kristen is clearly one of the leaders of the new generation of cell biologists...Kristen is a real asset and you are very lucky to have her on the faculty."

Reviewer E: "...she and her group recently came out with not just one, but a series of utterly important findings on kinesin activation and interaction with microtubules. With these findings Kristen not just carved out a niche, but actually established herself as an important player in the molecular motors field. She is held in high regard by every kinesin aficionado I talk to."

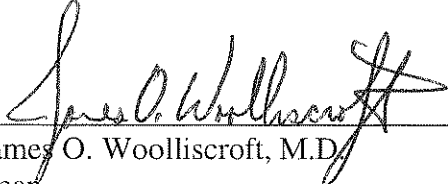
Reviewer F: "...I think Kristin [sic] Verhey is really quite superb. She does good experiments in timely research areas, writes well, and...has already made major advances in her field."

Reviewer G: "I think Verhey's work is already having an important impact, and I think her work in the future will be field-leading and influential."

Reviewer H: "...Verhey is among the leading members of the next generation of cell biologists. Given her excellent publication record, her success in funding her research effort, and particularly given the importance of her work to date, I have no doubt that Verhey would be awarded promotion and tenure were she on the faculty here..."

Summary of Recommendation:

Dr. Verhey has achieved a consistent record of exceptional scholarship and funding since coming to Michigan. The high quality of her research is recognized by colleagues here as well as at other premier institutions. Her expertise in microtubule based tracking in mammalian cells and her strong publication record are widely acknowledged. She is an excellent teacher and mentor. Dr. Verhey has assumed significant administrative responsibilities within the University, and is chairing as well as serving on numerous committees in the Department of Cell and Developmental Biology. I am pleased to recommend Dr. Kristen Verhey for the granting of tenure to be held with her title of associate professor of cell and developmental biology.

  
James O. Woolliscroft, M.D.  
Dean  
*Lyle C. Roll Professor of Medicine*

May 2009