

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

Billy Tsai, Ph.D., Assistant Professor of Cell and Developmental Biology, Department of Cell and Developmental Biology, Medical School, is recommended for promotion to Associate Professor of Cell and Developmental Biology, with tenure, Department of Cell and Developmental Biology, Medical School.

Academic Degrees:

Ph.D.	1999	Harvard University
M.S.	1994	University of California-Los Angeles
B.S.	1993	University of California-Los Angeles

Professional Record:

2003-Present	Assistant Professor of Cell and Developmental Biology, University of Michigan
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Summary of Evaluation:

Teaching: Dr. Tsai's major teaching responsibilities have been as a lecturer in Cell Biology (CDB 530, a required PIBS graduate core course). He lectures on the fundamental principles of biological membranes, with particular emphasis on the mechanisms of protein transport across biological membranes. Each year he provides seven one-hour lectures and six one-hour discussion sections, interacting with 18-20 students each time. Dr. Tsai is also a laboratory instructor for Medical Histology (CDB 501) and is responsible for histology classes that focus on the study of the lymphatic and central nervous systems, as well as the histology of the eye. He lectures on the basic properties of biological membranes for Dental Histology (Integrated Medical Sciences I 525) during the fall semester. Dr. Tsai currently serves as Chair of the CDB Graduate Recruitment Committee, and has served for several years on the CDB Graduate Affairs Committee, which considers issues regarding graduate student training and exams. He is also a member of the CDB Executive Committee, and is a member of the Cell and Molecular Biology training program. Dr. Tsai currently is mentor to six Ph.D. students and two undergraduate students. One of his graduate students is the recipient of a prestigious NSF Student Fellowship, another is a Merit Fellow. He has served on eight Ph.D. dissertation committees.

Research: The central theme of Dr. Tsai's research program is to understand how pathogens interact with host cells to cause disease. His initial application to the University of Michigan was accepted by the BSSP (Biological Sciences Scholars Program) committee and he became a Biological Scholar. After coming to the University of Michigan, he continued to build on his previous work in polyoma virus trafficking, and focused his initial efforts on clarifying the mechanism by which polyoma penetrates the endoplasmic reticulum membrane. This research led to a paper published in *Molecular Cell* where he reported the identification of an ER protein called ERp29, which unfolds polyoma virus to initiate the membrane penetration process. Not

only did these findings lay the foundation for his first successful NIH R01 grant, but the paper also led to an invitation to write a chapter in the very prestigious and influential *Annual Review of Cell and Developmental Biology*. He was named a Presidential Early Career Award Nominee by the NIH-NIAID.

Dr. Tsai's laboratory maintains an interest in understanding the mechanism of cholera toxin retrotranslocation. They discovered that PDI and PDI-like protein called ERp72 play opposing roles in the retro-translocation of cholera toxin, findings published in the *Journal of Cell Biology*. These results were the basis for his successful application for the highly competitive (13 awarded/year from >400 invited applications) Burroughs Wellcome Fund in Pathogenesis of Infectious Disease.

Since he began his independent research career in September 2004, Dr. Tsai has been continuously funded from several organizations, including the National Institutes of Health and the Burroughs Wellcome Fund. His work has been published only in the very top specialty journals in his field (*Journal of Cell Biology*, *Molecular Biology of the Cell*, *Molecular Cell*, *Journal of Virology*).

Dr. Tsai's approach to scientific scholarship has been highly interactive and collaborative. He has established a significant network of scientists with whom he routinely interacts, and feels strongly that these collaborations have been critical to his success. Like any good mentor, he attributes his success to his students.

Recent and Significant Publications:

Rainey-Barger EK, Magnuson B and Tsai B: A chaperone-activated non-enveloped virus perforates the physiologically relevant ER membrane. *J Virology* 81:12996-13004, 2007.

Rainey-Barger EK, Mkrtchian S and Tsai B: Dimerization of ERp29, a PDI-like protein, is essential for its diverse functions. *Mol Biol Cell* 18:1253-1260, 2007.

Forster LM, Sivick K, Park Y-N, Arvan P, Lencer W and Tsai B: Protein disulfide isomerase-like proteins play opposing roles during retro-translocation. *J Cell Biology* 173:253-259, 2006.

Low JA, Magnuson B, Tsai B and Imperiale M J: Identification of gangliosides GD1b and GT1b as receptors for BK virus. *J Virology* 80:1361-1366, 2006.

Magnuson B, Rainey EK, Benjamin T, Baryshev M, Mkrtchian S and Tsai B: ERp29 triggers a conformational change in polyomavirus to stimulate membrane binding. *Mol Cell* 20:289-300, 2005.

Service: Dr. Tsai has been a member of the following CDB Departmental committees: Executive Committee, Graduate Affairs Committee, Curriculum Committee, Alumni Newsletter Committee, Faculty Search Committee, Graduate Recruiting Committee, and the CDB Seminar Committee. He is a member of the Cellular and Molecular Biology Training Program, and was a committee member for the University of Michigan Medical School Site Visit.

He is an *ad hoc* reviewer for two NIH study sections as well as several peer-reviewed journals, including *Nature*, *Journal of Cell Biology*, *Journal of Cell Science* and *Journal of Virology*, to name a few. He has been invited to present talks at several National and International meetings, at other top tier institutions, and is a member of several professional societies.

External Review:

Reviewer A: “Dr. Tsai’s experiments are technically superb, highly innovative, and significant to a previously impenetrable area of virology/cell biology. They are leading us to a new understanding of protein dynamics within the ER, and host transport mechanisms that facilitate protein trafficking from the ER to the cytoplasm....Dr. Tsai is now becoming recognized as a concept leader in this field.”

Reviewer B: “All of these papers and reviews have been published in high impact journals. Billy is making excellent progress in unraveling the cell biology of the entry of polyoma virus into cells....Billy’s study showing the ERp29 triggers a conformational change that stimulates polyomavirus to bind to membranes was an original and elegant study.”

Reviewer C: “His results continue to have a great impact on our work...His work has been original, important, and, as far as I can tell from having repeated some of his earlier experiments completely trustworthy.”

Reviewer D: “Dr. Tsai was a speaker in our Molecular Virology seminar series...and he gave one of the best seminars I have heard in recent years....This seminar already indicated he has talents as a teacher in addition to his research capabilities....His research program is exciting and productive.”

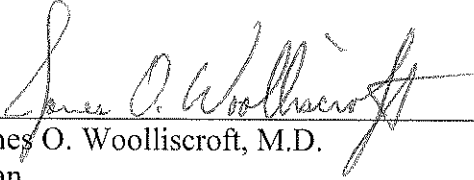
Reviewer E: “...He had clearly thought about this virus topological problem, and devised an elegant and systematic approach to solving the problem with mechanistic precision. This is a wonderful research topic and one that few others, if any, are pursuing.”

Reviewer F: “He has unique strengths, in that he combines insight into key problems in cell biology...with rigorous biochemical approaches....I look forward to the next discoveries that will come from this combination of strengths, and I anticipate wanting to read his forthcoming work with the same interest that has attracted me to his published work so far.”

Reviewer G: “The record of publication, grant support, peer review and seminar invitations clearly demonstrate that he has assembled an active lab devoted to research in this area and has attained national recognition as a scholar.”

Summary of Recommendation:

Dr. Tsai has achieved a consistent record of exceptional research productivity and funding since coming to Michigan. His expertise in pathogen interaction with host cells to cause disease and his strong publication record are widely acknowledged both within the University and at other institutions as evidenced by his many productive research collaborations and speaking invitations. He has been fully engaged in graduate student teaching and training, as well as medical student teaching. I enthusiastically recommend that Dr. Billy Tsai be promoted to Associate Professor of Cell and Developmental Biology, with tenure.



James O. Woolliscroft, M.D.

Dean

Lyle C. Roll Professor of Medicine

May 2008