

PROMOTION RECOMMENDATION  
THE UNIVERSITY OF MICHIGAN  
MEDICAL SCHOOL  
DEPARTMENT OF PHARMACOLOGY  
DEPARTMENT OF INTERNAL MEDICINE  
COLLEGE OF LITERATURE, SCIENCE, AND THE ARTS  
DEPARTMENT OF BIOPHYSICS

Arun Anantharam, Ph.D., assistant professor of pharmacology, Department of Pharmacology, assistant professor of internal medicine, Department of Internal Medicine, Medical School, and assistant professor of biophysics, Department of Biophysics, College of Literature, Science, and the Arts, is recommended for promotion to associate professor of pharmacology, with tenure, Department of Pharmacology, associate professor of internal medicine, without tenure, Department of Internal Medicine, Medical School, and associate professor of biophysics, without tenure, Department of Biophysics, College of Literature, Science, and the Arts.

Academic Degrees:

Ph.D.	2007	Cornell University
B.A.	1998	Columbia University

Professional Record:

2018 – present	Assistant Professor of Biophysics, University of Michigan
2017 – present	Assistant Professor of Internal Medicine, University of Michigan
2016 - Present	Assistant Professor of Pharmacology, University of Michigan
2011 - 2016	Assistant Professor of Biological Sciences, Wayne State University

Summary of Evaluation:

Teaching: Dr. Anantharam has made major contributions to the education mission of the Department of Pharmacology at the University of Michigan. He has participated in teaching MedChem 600, Pharm 614, Pharm 502, and Dental Pharmacology. Beginning in winter semester of 2019, he will take over the directorship of Pharm 614, Autonomic Pharmacology. Dr. Anantharam is also an outstanding mentor. Since joining the faculty here, he has graduated one Ph.D. student and is currently mentoring two additional pharmacology Ph.D. students. Four Master's Degree students have completed their training in his lab. Dr. Anantharam has trained 13 undergraduate students, and currently has two post-doctoral fellows under his supervision. He has served on eight Ph.D. dissertation committees and a number of oral preliminary examination committees throughout his career. Reviews of Dr. Anantharam's didactic teaching include high rankings of his organization skills, his ability to make the material interesting, his enhancement of student understanding, his provision of useful materials, and for the overall respect and professional behavior he exhibits to students, postdoctoral fellows, colleagues, and staff.

Research: Dr. Anantharam has made significant contributions to neuroscience, focusing on the mechanisms of exocytosis of secretory granules from neuroendocrine cells. He has identified important roles for the synaptotagmins, a family of calcium sensor proteins, in the mechanism of secretory granule release in response to increases in intracellular calcium as well as in the differential kinetics of cargo release. His body of work has contributed to furthering our understanding of the mechanisms of neurosignaling, with particular emphasis on neurotransmitter secretion at the molecular and subcellular levels. His research program utilizes a combination of biochemical, molecular biological and cutting edge optical techniques to address these questions. Dr. Anantharam

has developed and mastered innovative technologies in optics and custom designed laser/microscope imaging systems, including polarized total internal reflection fluorescence microscopy (pTIRFM) to measure shape changes of secretory vesicles as they undergo exocytosis in adrenal chromaffin cells and neurons. He has been well-funded for his research through the National Institutes of Health, the National Science Foundation, and the American Heart Association. He has presented his research by invitation on 19 occasions nationally and internationally. Dr. Anantharam has published 20 peer-reviewed articles.

#### Recent and Significant Publications:

MacDougall D, Lin Z, Chon N, Jackman S, Lin H, Knight J, Anantharam A: The high-affinity calcium sensor synaptotagmin-7 serves multiple roles in regulated exocytosis. *Journal of General Physiology* 150(6): 783-807, 2018.

Bendahmane M, Bohannon K, Bradberry M, Rao T, Schmidtke M, Abbineni P, Chon N, Tran S, Lin H, Chapman E, Knight J, Anantharam A: The synaptotagmin C2B domain calcium-binding loops modulate the rate of fusion pore expansion. *Molecular Biology of the Cell* 29(7): 834-845, 2018.

Schenk N, Dahl P, Hanna M 4, Audhya A, Tall G, Knight J, Anantharam A: A simple supported tubulated bilayer system for evaluating protein-mediated membrane remodeling. *Chemistry and Physics of Lipids* 215: 18-28, 2018.

Rao T, Santana Rodriguez Z, Bradberry M, Ranski A, Dahl P, Schmidtke M, Jenkins P, Axelrod D, Chapman E, Giovannucci D, Anantharam A: Synaptotagmin isoforms confer distinct activation kinetics and dynamics to chromaffin cell granules; *Journal of General Physiology* 149(8): 763-780, 2017.

Rao T, Passmore D, Peleman A, Das M, Chapman E, Anantharam A: Distinct fusion properties of synaptotagmin-1 and synaptotagmin-7 bearing dense core granules. *Molecular Biology of the Cell* 25(16): 2416-2427, 2014.

Service: Dr. Anantharam is currently serving on the Graduate Admissions Committees for both the pharmacology and the cellular and molecular biology graduate programs and he serves on the Preliminary Examination Committee for the neuroscience program. He has contributed to the Department of Pharmacology graduate student activities, including the annual Midwest Pharmacology Colloquium, the annual Pharmacology Retreat, the Departmental Seminar Program, and the Charles Ross Summer Student Fellowship Program for under-represented students. Dr. Anantharam has served as a reviewer for many scientific journals and he is currently a member of the editorial board for *Frontiers in Endocrinology* and *Scientific Reports*. Since 2011, he has served as an ad hoc member of NSF study sections, and he is a member of the International Symposium on Chromaffin Cell Biology. In 2023, he will serve as the organizing chair for a symposium on Chromaffin Cell Biology to be held at the University of Michigan.

#### External Reviewers:

Reviewer A: "...I believe there is every reason to be highly enthusiastic about recommending Arun Anantharam for promotion to the rank of Associate Professor with Tenure in the Instructor Track. He has developed a highly successful independent research program...He is already regarded as a very promising [junior] investigator in his field with evidence of good visibility both nationally and internationally. He has clearly achieved excellence in scholarship with publications and presentations that have been featured in three different disciplines... His service to the discipline and



contributions to teaching are both robust and appropriate for someone at his career stage. Finally, he is very interactive with his colleagues and forms productive collaborations quite easily. ...Arun Anantharam would certainly be viewed very favorably at my institution for promotion to the rank of Associate Professor with Tenure. Thus, I recommend him for advancement at the University of Michigan with the highest level of enthusiasm.”

Reviewer B: “Arun’s phenomenal work on synaptotagmin isoforms and the regulation of dense core vesicle fusion (Rao et al *MBC* 2014, Rao et al *JGP* 2017, Bendahmane et al *MBC* 2018) has already influenced our field. Given the highly competitive nature of this field, Arun’s success in carving out a productive niche for his research program provides a testament to his quantitative biophysical excellence and biological taste. These aspects separate Arun from his peers. ...Taking his scientific and professional contributions as a whole in comparison to faculty members at, I am confident that Arun would be granted tenure here. Arun is in the process of building a strong and well-funded research program. Given his scientific impact in the membrane fusion field...I strongly support Arun’s promotion to Associate Professor. I look forward to watching his research career develop and anticipate that he will be a real asset at Michigan in the years to come.”

Reviewer C: “Overall, Dr. Anantharam is doing an outstanding job balancing his research program with teaching, mentoring and service to his institute. His achievements have been recognized as indicated by his success in publishing in excellent journals and obtaining research funding, including an ROI from NIH. In my opinion, Dr. Anantharam is highly qualified and would be eligible for tenure here at [my institution]. I highly recommend you consider Anantharam for the promotion from the rank of Assistant Professor to the rank of Associate Professor with Tenure (Instructional Track) in [t]he Department of Pharmacology, Medical School at the University of Michigan.”

Reviewer D: “Arun has made important contributions to the field of membrane fusion in the control of endocrine function. He has conducted innovative and incisive studies of the role of different synaptotagmin isoforms in triggering and controlling of exocytosis from chromaffin cells...Arun has produced an impressive body of work... I view Arun as the best person in his current cohort of biophysicists studying exocytosis... He would easily be promoted to Associate Professor with tenure in my department. I enthusiastically endorse his promotion without reservations.”

Reviewer E: “Dr. Anantharam’s primary focus is on the measure and molecular understanding of the process of fusion of large dense-core secretory granules in neuroendocrine cells...this topic of research is of major importance...Dr. Anantharam is best known is the role of Synaptotagmin isoforms and subdomains in the regulation of the exocytic fusion pore of the fusing secretory granule...I would consider this a field that will continue and that Dr. Anantharam is well established in this area and thus would expect that similar productivity will continue in the future...Dr. Anantharam has published several high quality manuscripts in excellent journals since establishing his own research program...it must be recognized that Dr. Anantharam has built a respectable research program...the answer to the question ‘Would this candidate be successful in promotion or be granted tenure at my institution?’ is, yes.”

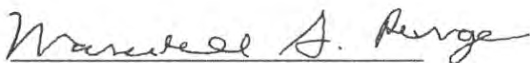
Reviewer F: “Arun’s work is of very high quality and sets a standard in the field...he has worked on the different roles that different isoforms of the calcium sensor synaptotagmin play in exocytosis of secretory vesicles in a number of different cell lines. He found that synaptotagmin 7 forms fusion pores with different much slower kinetics than synaptotagmin 1, the predominant isoform for fast synchronous neurotransmitter release. This was again a stellar piece of work using cutting edge live cell microscopy and making a major mark in the field. A follow-up of this work was published after

Arun moved to the University of Michigan. In this *J Gen Physiol* paper, which won the Paul Cranefield prize from the Society of General Physiologists, Arun's lab again developed new imaging and analysis tools to track the mobility and location of dense core vesicles in chromaffin cells. Two additional papers published this year in *Mol Biol Cell* and *J Gen Physiol* establish Arun as the major authority having figured out the mechanism of a previously poorly studied isoform of synaptotagmin, i.e. syt-7, in exocytosis...In summary, I have no reservations supporting the promotion of Dr. Arun Anantharam to Associate Professor with Tenure at the University of Michigan School of Medicine."

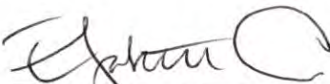
Reviewer G: "Dr. Arun Anantharam is a very dedicated, hard-working, imaginative and highly intelligent scientist whose originality and quality are at the highest level...What sets his work apart from the crowd is its originality, thoroughness, thoughtfulness, insistence on physiological relevance and intellectual rigor...Needless to say, I strongly and enthusiastically support his appointment as an Associate Professor with Tenure. In fact, I cannot think of anyone I have ever known who is more deserving. I highly recommend the highest level of support and commitment possible. He exceeds all of the criteria for the Instructional Track, as amply noted in his CV – teaching, scholarship, research, and service are all over the top."

Summary of Recommendations:

Dr. Anantharam is an excellent citizen, a well-respected teacher, an effective mentor, and an innovative and outstanding scientist. He is a nationally recognized expert in cellular neurobiology and neurotransmitter secretion, and he has made significant contributions to understanding the mechanism of secretion at the molecular and subcellular levels. He has emerged as a leader in the field of membrane remodeling, particularly in understanding the role of synaptotagmin in exocytosis, and is recognized for his talents in biochemistry, electrophysiology, molecular biology, neuroscience, pharmacology, optical imaging, and physiology. I am pleased to recommend Arun Anantharam, Ph.D. for promotion to associate professor of pharmacology, with tenure, Department of Pharmacology, associate professor of internal medicine, without tenure, Department of Internal Medicine, Medical School, and associate professor of biophysics, without tenure, Department of Biophysics, College of Literature, Science, and the Arts.



Marshall S. Runge, M.D., Ph.D.  
Executive Vice President of Medical Affairs  
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