

PROMOTION RECOMMENDATION
The University of Michigan
College of Literature, Science, and the Arts

Jayakrishnan Nandakumar, associate professor of molecular, cellular, and developmental biology, with tenure, College of Literature, Science, and the Arts, is recommended for promotion to professor of molecular, cellular, and developmental biology, with tenure, College of Literature, Science, and the Arts.

Academic Degrees:

Ph.D.	2007	Memorial Sloan Kettering Cancer Center, Training Program in Chemical Biology (degree awarded by Cornell Medical College)
M.S.	2001	Indian Institute of Science (IISc), India
B.S.	1998	Presidency College, India

Professional Record:

2019–present	Associate Professor, Department of Molecular, Cellular, and Developmental Biology, University of Michigan
2013–2019	Assistant Professor, Department of Molecular, Cellular, and Developmental Biology, University of Michigan
2012–2013	NIH/NCI K99 Fellow, University of Colorado, Boulder
2009–2012	Helen Hay Whitney Foundation – HHMI Postdoctoral Fellow, University of Colorado, Boulder
2007–2009	HHMI Post-doctoral Fellow, University of Colorado, Boulder

Summary of Evaluation:

Teaching: Professor Nandakumar is a talented educator who has contributed to the Department of Molecular, Cellular, and Developmental Biology's (MCDB) educational mission on multiple levels. While in rank, he has taught in four courses, including the large enrollment course of Introductory Biochemistry (MCDB 310) where he helped to revamp this foundational course to include more structural biology, in recognition of the revolution that has occurred in that field over the past two decades. The upper-level elective course he created (MCDB 448: Telomerase Function) is one of the most popular specialty courses for MCDB majors. He has also participated in two graduate-level courses (MCDB 525/527: Experimental Molecular Biology) and PIBS 503: Responsible Conduct in Research. Professor Nandakumar's teaching combines scientific rigor with an effective communication style that marks him as one of MCDB's most popular instructors. In the laboratory, he has been a strong and supportive mentor for several graduate students and post-doctoral fellows, as well as numerous undergraduate researchers.

Research: Professor Nandakumar is a biochemist/structural biologist studying how the repetitive sequences at the ends of chromosomes, known as telomeres, are maintained to promote cell health and longevity. He is a world leader in the study of the shelterin complex, a group of proteins that protects telomeres and recruits an enzyme called telomerase to chromosome ends to add telomere repeats that are lost during DNA replication/cell division. Professor Nandakumar and his trainees have combined structural determination of shelterin subunits with site-specific mutagenesis as well as biochemical and cell culture assays to gain important insights in how the shelterin complex maintains chromosomal integrity. In collaboration with several laboratories, the importance of the shelterin complex has been explored in a variety of systems, including the nematode *C. elegans* and

mammalian hematopoietic stem cells and germ cells. His laboratory has also studied other proteins involved in maintaining genome integrity, including the tumor suppressor BRCA2. While in rank, Professor Nandakumar has published many papers on these topics, has received several large grants from funding agencies, and has given numerous talks at national and international meetings. He is also very active in the peer review of other researchers' work and has served on several grant panels.

Recent and Significant Publications:

- Tesmer, V.M., Brenner, K.A., and Nandakumar, J. (2023). Human POT1 protects the telomeric ds-ss DNA junction by capping the 5' end of the chromosome. *Science*, 381(6659), 771-778.
- Pendlebury, D.F., Zhang, J., Agrawal, R., Shibuya, H., and Nandakumar, J. (2021). Structure of a meiosis-specific complex central to BRCA2 localization at recombination sites. *Nature Structural and Molecular Biology*, 28(8), 671-680.
- Tesmer, V.M., Smith, E.M., Danciu, O., and Nandakumar, J. (2019). Combining conservation and species-specific differences to determine how human telomerase binds telomeres. *Proceedings of the National Academy of Sciences, U S A*, 116(52), 26505-26515.
- Grill, S., Bisht, K., Tesmer, V.M., Shami, A.N., Hammoud, S.S., and Nandakumar, J. (2019). Two separation-of-function isoforms of human TPP1 dictate telomerase regulation in somatic and germ cells. *Cell Reports*, 27(12), 3511-3521.

Service: Professor Nandakumar has an outstanding record of service within MCDB and at the university level. He has served on MCDB's graduate admissions committees and was an elected member of the executive committee. He has been a Next Prof Science mentor and has done important work to promote an inclusive culture in MCDB as the DEI officer and Rackham Faculty Ally for Diversity. At the university level, Professor Nandakumar has been deeply involved in several interdepartmental programs. He is serving in a leadership role for the Program in Chemical Biology, where he is an associate director and member of their DEI and graduate student committees. He has been a member of the executive committee of the Center of RNA Biomedicine since its inception in 2016. Professor Nandakumar has also served on multiple grant panels, including the NIH and NSF. He is a tremendous citizen for his home unit and the entire university.

External Reviewers:

Reviewer (A): "There is no doubt on my mind that [Professor Nandakumar] is among the top five investigators of his generation in the telomere field and will be leading it in years to come."

Reviewer (B): "This elegant paper [Pendlebury et al 2022] showcases the breadth of Dr. Nandakumar's research, employing a suite of structural, biochemical and cell biology approaches to dissect out the key interaction regions between MEIBL2 and BRCA2, determine a structure of the complex, and show that how inter-molecular contacts between the two proteins are essential for biological function."

Reviewer (C): "He is a structural biologist who thinks deeply about the physiological questions that need to be addressed to understand important mechanisms. He has used structural approaches to define the mechanistic underpinnings of several functions of telomeres and how they are coordinated."

Reviewer (D): "In his work on how shelterin protects chromosome ends, Dr. Nandakumar has published perhaps his most significant work to date, which recently appeared in Science. POT1, one of 6 shelterin proteins that associate in various complexes with chromosome ends, specifically binds the 3'-single-stranded telomere repeat DNA at the ends of telomeres."

Reviewer (E): “[Professor Nandakumar] has established a vibrant, creative, and highly impactful research program and is regularly publishing interesting papers that move his fields forward, often in surprising ways.”

Reviewer (F): “Dr. Nandakumar has established himself as a leading telomere researcher who uses multi-disciplinary approaches and a fantastic gamut of collaborators to ask fundamentally relevant biological questions on telomere end replication, end protection, and meiosis. His current and future research plans are timely and likely to have an important impact and yield significant advancements in the field of telomere biology.”

Summary of Recommendation:

Professor Nandakumar has established himself as a world leader in the field of telomere biology. He has a well-funded research program and is a strong mentor for his trainees, which include senior research staff, post-doctoral fellows, and graduate and undergraduate students. His past record of productivity and the strong collaborations he has established ensure that he will continue to make impactful discoveries on how telomeres are maintained and why this is essential for cellular and organismal health. Professor Nandakumar is also an exceptionally talented instructor for a variety of undergraduate and graduate courses. He has performed important work to make his unit more inclusive and provides leadership for several university-wide scientific programs. The Executive Committee of the College of Literature, Science, and the Arts and I recommend that Associate Professor Jayakrishnan Nandakumar be promoted to the rank of professor of molecular, cellular, and developmental biology, with tenure, College of Literature, Science, and the Arts.



Anne Curzan, Dean

Geneva Smitherman Collegiate Professor of
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and Education

Arthur F. Thurnau Professor
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