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

Christopher J. Miller, associate professor of astronomy, with tenure, and associate professor of physics, without tenure, College of Literature, Science, and the Arts, is recommended for promotion to professor of astronomy, with tenure, and professor of physics, without tenure, College of Literature, Science, and the Arts.

Academic Degrees:
Ph.D.   2000   University of Maine, Department of Physics
B.Sc.   1995   Penn State University

Professional Record:
2016–present   Associate Professor, Department of Astronomy, University of Michigan
2010–present   Assistant Professor, Department of Astronomy, University of Michigan
2004–2009   Assistant Astronomer, NOAO, La Serena Chile
2000–2004   Post-doctoral Researcher, Dept of Physics, Carnegie Mellon University

Summary of Evaluation:
Teaching: Professor Miller is a dedicated and award-winning teacher, one particularly skilled at connecting with students in introductory-level undergraduate courses. His background in astronomy and data science research areas gives him special insights to the interconnectedness of modern astrophysics with other fields, which he has been particularly successful at imparting to his students. Since his last promotion, Professor Miller has chaired or co-chaired the Ph.D. research of four students in the Astronomy (two students) and Physics (two students) departments, illustrating his interdisciplinary expertise and mentoring commitment. He has worked on research projects with numerous undergraduates both within UROP and other programs. The breadth of his teaching efforts is particularly noteworthy, having taught a total of seven different classes (ranging from 100- to 500-level offerings) since his last promotion. His teaching philosophy clearly reflects his aim to provide students with key tools to understand the varied subject matter he teaches through engagement, innovative demonstrations, and a strong personal passion. His work as undergraduate advisor in the Department of Astronomy particularly highlights his commitment to ensure that astronomy students have access to the wide range of research and pedagogical offerings the department offers, an effort that has positively affected hundreds of students.

Research: Since his last promotion, Professor Miller has been extraordinarily active in his research efforts. His publication and citation rate, based on many metrics, ranks near the top of all researchers in the Department of Astronomy and quite high compared to his peers nationally and internationally. Thanks to his long-term involvement with the Dark Energy Survey (DES), he has published on an impressive variety of topics ranging from the solar system to cosmological studies probing the origins of the universe. His work with his doctoral students highlights his continued fruitful focus on studies of galaxy clusters and how they can be used to gain insights to the evolution and composition of the universe. The papers listed below focus

primarily on this research, all done in collaboration with his students. His impressive citation rate—growing significantly since his last promotion—confirms that his efforts continue to make a broad impact within the field.

Recent and Significant Publications:

Halenka, V. & Miller, C.J. (2020). Testing emergent gravity with mass densities of galaxy clusters. *Physical Review D*, *102*(8), 4007.

Stark, A., Miller, C.J., & Halenka, V. (2019). Deriving galaxy cluster velocity anisotropy profiles from a joint analysis of dynamical and weak lensing data. *Astrophysical Journal*, *874*(1). https://doi.org/10.3847/1538-4357/ab06fa

Golden-Marx, J.B. & Miller, C.J. (2018). The impact of environment on the stellar mass-halo mass relation. *Astrophysical Journal*, *860*(2). https://doi.org/10.3847/1538-4357/aac2bd

Stark, A., Miller, C.J., & Dragan, H. (2017). Cosmology with galaxy cluster phase spaces. *Physical Review D*, *96*(2). https://doi.org/10.1103/PhysRevD.96.023543

Service: A substantial portion of Professor Miller's contributions lie in the area of interactions with undergraduate students, where he has done a great deal of systematization in the advice given to students. Professor Miller has also ably served on a large number of departmental committees, including some (preliminary exam and student admissions) that are quite demanding. Within the university, Professor Miller was notably instrumental in the success of the MIDAS initiative. Professor Miller's service efforts outside the university align with his research interests. In practice this work represents a broad service effort. For example, Professor Miller's contributions to the Dark Energy Survey (DES) enable not only his activities but also frontline research beyond galaxy clusters as well. Professor Miller has taken a lead in coordinating the department's involvement in the European Extremely Large Telescope MOSAIC Spectrograph. Professor Miller also serves on the governing board of the MDM telescope project, an important legacy facility for departmental research.

External Reviewers:

Reviewer (A): "…[Professor Miller is] a recognized world leader, with an impressive multidisciplinary publication record, and clear leadership capabilities."

Reviewer (B): "Chris' service contributions to the discipline have been substantial and sustained, starting with his time with NOAO/CTIO in Chile, through leadership positions with LSST, and achieving Builder status for his contributions to the DES."

Reviewer (C): "Both of these ongoing research programs are producing high-quality work with the most powerful available data. I also appreciate Professor Miller's choice of projects that are not already over-worked by the rest of the community– this choice makes it easier for PhD students to make major contributions, and also increases the likelihood of important breakthroughs."
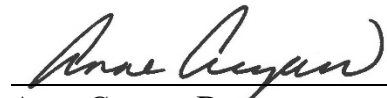
Reviewer (D): Chris' work on machine learning I regard as very important for the field of astronomy as a whole. Machine learning to someone outside of that field can seem quite mysterious. But it is becoming an important facet of science."

Reviewer (E): "Prof. Miller is well versed in big data science and has recently led work (with a student) on machine learning (for galaxy morphologies)."

Reviewer (F): "Prof. Miller's publication record is strong (20000+ citations, h factor of 69), and there can be no question that he has contributed significantly to his field. Beyond the papers he and his students and postdocs have led are many other papers that have emerged from the broader collaborations that have been impacted by Prof. Miller's guidance and comments."

Summary of Recommendation:
Professor Miller has continued to advance in all areas of academic activity since his promotion to the associate rank. He is a highly productive and respected researcher, as well as a dedicated teacher and mentor. The Executive Committee of the College of Literature, Science, and the Arts and I recommend that Associate Professor Christopher J. Miller be promoted to the rank of professor of astronomy, with tenure, and professor of physics, without tenure, College of Literature, Science, and the Arts.

Anne Curzan, Dean
Geneva Smitherman Collegiate Professor of
English Language and Literature, Linguistics,
and Education
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May 2022