Approved by the Regents
May 19, 2016

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

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

Academic Degrees:

Ph.D.	2000	University of Maine
B.S.	1995	Pennsylvania State University

Professional Record:

2010 – present	Assistant Professor, Department of Astronomy and Department of Physics, University of Michigan
2004 – 2009	Assistant Astronomer, National Optical Astronomy Observatory/CTIO
2000 – 2004	Post-doctoral Researcher, Carnegie Mellon University

Summary of Evaluation:

Teaching – Professor Miller is an excellent teacher who has revitalized aspects of astronomy's undergraduate curriculum. He played a major role in bringing more computational science into the core courses for astronomy majors. As part of this effort, he revised and revamped the primary observational class, which provides astronomy students the basic understanding of how to study the universe. These efforts have aided students in both academic and non-academic career tracks. Professor Miller also has a strong record of mentorship at all levels, including outreach efforts to expand scientific opportunity at the international level.

Research – Professor Miller's research area is in cosmology with a focus on using large databases to gain new understanding of the origin and evolution of the universe. He is acknowledged to be a leading international expert in the interdisciplinary area of astronomical data science, which merges the results from large-scale surveys with statistical techniques to extract unique information. His work has opened up new pathways in the study of the formation of structure in the universe. Professor Miller has played an important role in a number of large consortia, such as the Dark Energy Survey and the Dark Energy Spectroscopic Instrument. His foundational work has placed him in a leadership role within the burgeoning area of astronomical data science and its fascinating ability to peek backwards in time to study the birth of the universe. Since 2010, he and his group have published thirteen papers in leading field-specific journals where Professor Miller or part of his group are in the top three of the author list. His funding comes from a diverse set of sources, including the National Aeronautics and Space Administration, the National Science Foundation (NSF), and the Department of Energy. He was ineligible for NSF funds while employed at the National Optical Astronomy Observatory.

Recent and Significant Publications:

"Orientation bias of optically selected galaxy clusters and its impact on stacked weak lensing analyses," with J. P. Dietrich, et al., *Monthly Notices of the Royal Astronomical Society*, 443, 2014, p. 1713.

"A systematic analysis of caustic methods for galaxy cluster masses," with D. Gifford, C. J. Miller, and N. Kern, *Astrophysical Journal*, 773, 2013, p. 116.

"Impact of systematics on SZ-optical scaling relations," with T. Biesiadzinski, et al., *Astrophysical Journal*, 757, 2012, p. 1.

"Galaxy clustering," in Advances for Machine Learning and Astronomical Data Analysis, M. Way (ed.), Chapman and Hall CRC Press, 2012.

Service – Professor Miller has served on a variety of department committees. His work on the Computer Committee is particularly notable as this committee focuses on maintaining and overseeing critical support infrastructure. Because he represents the Department of Astronomy's interest in data science within the university and at the national level, Professor Miller also served on the Steering Committee and Executive Committee for the Michigan Institute for Data Science and on the board for the Large Synoptic Survey Telescope Corporation. Professor Miller was awarded Builder Status by the Dark Energy Survey management for his contributions to the success of this project.

External Reviewers:

Reviewer (A)

"The combination of his extensive well-cited publication record, leadership role in current field-leading observational projects, and promising new research directions, as well as the fact that he is an excellent colleague, would be the elements of a successful tenure case at [my institution], and suggest Dr. Miller would be a great tenure candidate at UM[,] too."

Reviewer (B)

"Chris works in an increasingly important area of overlap between astronomy/cosmology, applied computer science, and statistics, which is an excellent example of what is now loosely called 'data science,' which really reflects fundamental changes in the way we do research in any field in the era of an exponential data growth. He is a fine example of the new generation of computationally and data savvy scientists, and his skills and expertise will be in an increasing demand. This goes well beyond astrophysics, and it is reflected in your own MIDAS/MINDS initiative, where he is and can be one of the major players."

Reviewer (C)

"His command of astronomical techniques, cosmological physics, statistical analyses, and data mining skills are extraordinary and deep, and his work with his students is awe inspiring. I am particularly impressed in his commitment to teaching in an authentic way, to work towards improving student learning, and in his commitment of time and energy, well above anything we would require, towards personally supporting University of Michigan students in the 4-week Chilean international experience that he designed. The folder is very strong in all three categories of research, teaching, and service."

Reviewer (D)
"Dr. Miller is well known in his fields of study, and a recognized leader. The promotion under consideration is absolutely appropriate. … An early example of the sort of work that Dr. Miller excels at is Miller, Nichol and Batuski (2001) – the first detection of baryon acoustic oscillations (BAO) in galaxy and galaxy cluster catalogs. BAO has become a central technique in cosmology and the study of dark energy, and is core to the scientific mission of DES [Dark Energy Survey]."

Reviewer (E)
"Chris shows an impressive record of student supervision since 2010: six undergraduate students, five graduate students and one postdoc, not to mention his co-research mentoring of 10 additional graduate students and two postdocs. This is an excellent achievement for such a short period of time in terms of the formation of the new generation of astronomers."

Reviewer (F)
"…Chris is an amazing scientist mastering all aspects of data analysis and interpretation, with the ability and skill to handle a wide array of experiments (from X-rays to CMB to optical astronomy). His computational and mathematical confidence is outstanding and he is one of the best of his generation at such research."

Reviewer (G)
"…Miller is an exemplar of a 21st century astronomer – he is at the forefront of astrophysical data science, a key participant in both the scientific and technical aspects of multiple major astronomical surveys, and a leader in making modern statistical and data mining techniques accessible to the astronomy community in general. His contributions to the field are significant, and his impact moving forward is likely to be even more considerable."

Summary of Recommendation:
Professor Miller has distinguished himself as a leader in the expanding field of astronomical data science. He has been an effective teacher and has made important contributions to numerous university and national committees. The Executive Committee of the College of Literature, Science, and the Arts and I recommend that Assistant Professor Christopher J. Miller be promoted to the rank of associate professor of astronomy, with tenure, College of Literature, Science, and the Arts.

Andrew D. Martin, Dean
Professor of Political Science and Statistics
College of Literature, Science, and the Arts

May 2016