Approved by the Regents
May 21, 2020

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

Junjie Zhu, associate professor of physics, with tenure, College of Literature, Science, and the Arts, is recommended for promotion to professor of physics, with tenure, College of Literature, Science, and the Arts.

Academic Degrees:

Ph.D.	2004	University of Maryland, College Park
B.S.	2000	University of Science and Technology of China

Professional Record:

2016 – present	Associate Professor, Department of Physics, University of Michigan
2010 – 2016	Assistant Professor, Department of Physics, University of Michigan
2010	Research Scientist, Department of Physics, University of Michigan
2004 – 2010	Research Associate, State University of New York, Stony Brook

Summary of Evaluation:

Teaching – Since his promotion in 2016, Professor Zhu has concentrated his efforts on two courses, "Methods of Theoretical Physics" (Physics 351, taught four times) and "Intermediate Mechanics" (Physics 401, taught one time). Both courses are central to the education of physics majors. These courses have typical enrollment ranging from 30 to 50 students. Professor Zhu's teaching statement indicates that he has critically examined his teaching and methods. He provides several examples of modifications to his teaching practices based on student feedback or on his own assessment of learning effectiveness. This includes changing the frequency of evaluation and feedback for the students, or searching for alternate textbooks when students expressed dissatisfaction with the current text. Professor Zhu clearly takes teaching seriously and has a desire to be responsive to his students. In addition to the classroom teaching, he has supervised ten undergraduate students working in his lab, seven Ph.D. students for their graduate studies, and five post-doctoral researchers in his research program since 2015.

Research – Professor Zhu's research field is experimental high-energy physics, which seeks to understand the fundamental laws of time, space, and matter – what are nature's basic building blocks and how do they interact? Since 2010, Professor Zhu's research centers upon the ATLAS experiment at the Large Hadron Collider (LHC) at the European Organization for Nuclear Research Laboratory (CERN) in Geneva, Switzerland. Since his promotion to associate professor, he has focused on observing vector boson scattering and tri-boson production at the LHC. Vector bosons (the W and Z) are the carriers of the weak force, and the successful measurement of these exceedingly rare processes would either provide important tests of the standard model of particle physics, or perhaps point the way to new physics. He organized the analysis team and served as the analysis contact person and the paper editor in ATLAS for a set of important publications that provided the first experimental evidence for and observations of these exceedingly rare and important physics processes. Professor Zhu has been very successful in establishing himself as a leader in the ATLAS collaboration in both physics *analyses*, which

extract science from the huge data-sets, and detector *upgrade projects*, which design, build, and optimize critical parts of the experimental apparatus. His leadership was recognized through his selection as a CERN Fellow in 2018 via a highly competitive process. This enabled him to spend a sabbatical at CERN to lead the ATLAS upgrade project and the physics analysis he proposed. His record of scientific publications and external funding for his research programs has been excellent.

Recent and Significant Publications:

"Observation of electroweak production of a same-sign W boson pair in association with two jets in pp collisions at $\sqrt{s}$ =13 TeV with the ATLAS detector," *Physical Review Letter*, 123, 2019, p. 161801.

"Evidence for the production of three massive vector bosons with the ATLAS detector," *Physics Letter B*, 798, 2019, p. 134913.

"Design and performance of a TDC ASIC for the upgrade of the ATLAS monitored drift tube detector," with Y. Liang, et al., *Nuclear Instruments and Methods in Physics Research A*, 939, 2019, p. 10.

"Design of a trigger data serializer ASIC for the upgrade of the ATLAS forward muon spectrometer," with J. Wang, et al., *IEEE Transactions on Nuclear Science*, 64 (12), 2017. DOI: 10.1109/TNS.2017.2771266.

Service – Since his promotion, Professor Zhu has continued to make significant service contributions at the department, university, national, and international levels, representing both his expertise in research and his dedication to undergraduate and graduate students. Among major duties, Professor Zhu has served on the Physics Graduate Admission Committee, the Qualifying Exam Committee, and the Editorial Advisory Board of the Physics Department—all since 2011. His national service includes reviewing proposals for the Department of Energy and the National Science Foundation, serving as the referee of numerous papers for publication in leading journals, and participating as a co-PI in the UM-CERN summer Research Experience for Undergraduates (REU). His outreach activities cover a very broad field, including work as a Science Communication Fellow at the UM Museum of Natural History and PI of the UM-CERN High School Teacher Program.

External Reviewers:

Reviewer (A)

"In the time since he was promoted to tenure (and before), Professor Zhu has been amazingly successful in obtaining funding for his ambitious and successful research program. In the environment in which we operate, this is a very reliable indicator of quality of research and high reputation (as compared to citations, which are generally not too useful in our field, and essentially useless at the LHC). In our field, one cannot have funding for a group of his group's size without being a very productive leader of the field who has thrived in the intense scrutiny of competitive rankings. The norm for a full professor…is about a third to half that."

Reviewer (B)

"He is a world leader in the experimental high energy physics community, with numerous seminal physics achievements addressing some of the most important questions of particle physics. … The observation of same sign W bosons, the smallest cross section ever measured by

the ATLAS experiment and the first measurement of a process involving 4 gauge boson self-couplings, is a milestone for the LHC and Junjie and his group had an important role…"

Reviewer (C)
"What I was impressed [about] most is his recent work on the observation of same-sign $W^{\pm}$ W+ production via vector-boson scattering… ...further measurements of vector boson scattering at the LHC and beyond, in particular for the longitudinal vector-boson scattering $W^{L}W^{L}$-->$W^{L}W^{L}$, would remain to be crucial means for exploration of physics beyond the Standard Model."

Reviewer (D)
"…Prof. Zhu has pursued and published the most interesting set of experimental papers in multi-boson physics. … These were all papers that as soon as I saw them on the physics archive I forwarded them to all my collaborators and we read them with avid interest. … A driver of the productivity of his research program is the innovative analysis work he is performing. ...simultaneously to Prof. Zhu's important role and leadership in ATLAS physics he has also assumed important responsibilities and leadership roles in the muon detector system. That he performs excellent and well-organized work in both physics and detector capacities is impressive."

Reviewer (E)
"…he compares favourably with the best peers in our research field. I would also like to stress that he compares very favourably with other scholars, who I know well and who have obtained professorships with tenure in the US or in Germany, during the past years. …I recommend him very strongly – and without the slightest hesitation – for promotion to Professor with tenure…"

Summary of Recommendation:
Professor Zhu has shown the highest intellectual quality, productivity, and leadership in creating and disseminating knowledge in physics. The Executive Committee of the College of Literature, Science, and the Arts and I recommend that Associate Professor Junjie Zhu be promoted to the rank of professor of physics, with tenure, College of Literature, Science, and the Arts.

Anne Curzan, Dean
Geneva Smitherman Collegiate Professor of
English Language and Literature, Linguistics,
and Education
Arthur F. Thurnau Professor
College of Literature, Science, and the Arts

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