

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

Hui Deng, 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.	2006	Stanford University
M.S.	2003	Stanford University
B.S.	1999	Tsinghua University

Professional Record:

2015 – present	Associate Professor, Department of Physics, University of Michigan
2008 – 2015	Assistant Professor, Department of Physics, University of Michigan
2006 – 2008	Postdoctoral Fellow, California Institute of Technology

Summary of Evaluation:

Teaching – Since her last promotion, the department has asked Professor Deng to focus primarily on teaching laboratory courses, Physics 341 and Physics 441/442 (fall/winter). She has also taught Physics 463, “Introduction to Solid State Physics,” for one term. The 441/442 laboratory courses are hands-on surveys of the experimental foundations of modern physics. Professor Deng has been successful in guiding students through the challenges of the experimental courses by working with each student to help them use their own strengths to solve problems. She has also introduced ethical and social issues involved in research into her courses. Professor Deng has mentored nearly 40 undergraduate students and five high school students. Many of these undergraduate students have gone to graduate school, and several have won prizes or fellowships. Professor Deng has graduated a total of six doctoral students.

Research – Professor Deng is internationally recognized for her work in the area of light/matter interactions. Her focus is on semiconductor materials which are the basis of modern technology and information science. Her work falls into three general areas: 1) development of lithographically patterned III-Nitride quantum dots for creating a scalable room temperature source of single photons; 2) creation of polariton condensates and the study of correlated quasiparticles in strongly coupled systems; and 3) discovery of highly correlated exciton-photon physics in the newly discovered two-dimensional van der Waals materials. In recognition of her contributions to the field of quantum photonics, she was elected as a fellow of the American Physical Society in 2017 and a fellow of the Optical Society of America in 2018. She also received the prestigious Friedrich Wilhelm Bessel Research Award from the Humboldt Foundation in 2017. Since her last promotion, she has published approximately 24 papers in leading journals, including *Nature*, *Science*, *Nature Communications*, *Physical Review Letters*, and in *Physical Review A*, *B*, and *X*. Her work has garnered international interest and she has given numerous invited talks at major conferences. Professor Deng is extremely well supported by major federal research-granting agencies including the National Science Foundation and the

Department of Defense, among other groups. The external letter writers were unanimous in their praise of her as a leader in the field of quantum optical interactions in semiconductors.

Recent and Significant Publications:

- “Interlayer exciton laser with extended spatial coherence in an atomically-thin heterostructure,” with E. Y. Paik, et al., *Nature*, 576, 2019, pp. 80-84. Doi:10.1038/s41586-019-1779-x.
- “A coherent polariton laser,” with S. Kim, et al., *Physical Review X*, 2016, 011026. DOI: <https://doi.org/10.1038/s41586-019-1779-x>.
- “Site-controlled InGaN/GaN Single-photon-emitting diode,” with L. Zhang, et al., *Applied Physics Letters*, 108(15), 2016, 153102. DOI: <https://doi.org/10.1063/1.4945984>.

Service – Professor Deng has been an active mentor for students at all levels, and an overall good citizen. She has served as the advisor for the Society of Physics Students (SPS) and the Society of Women in Physics (SWIP), as well as an official mentor to new graduate students and as a mentor to assistant professors. Professor Deng serves as a member of the Graduate Admissions Committee and the faculty hiring committee, and was elected to the department Executive Committee. At the university level, she served a two-year appointment on the Council for the Lurie Nanofabrication Facility and recently joined the Advisory Committee to the Vice President for Development at UM. Professor Deng has served on conference organizing committees for the American Physical Society, the Optical Society of America, and other major organizations. She has volunteered in community outreach working to involve K12 and underrepresented minority students to become involved in STEM activities. She is working with faculty and staff in the College of Engineering to establish a high school research program through the Multidisciplinary University Research Initiative (MURI) program that she is leading.

External Reviewers:

Reviewer (A)

“Her studies of collective many-body phenomena in cavity exciton-polariton systems have led to the observation of polariton lasing, polariton condensation, and nonlinear dynamics of coupled exciton-polariton condensates. They show convincingly the transition between photon and polariton lasing, BEC and BCS-like regimes, and Josephson-like coupling, thus making a bridge between strongly correlated electron systems and light-matter coupled systems.”

Reviewer (B)

“...there is no doubt...that Prof. Hui Deng has established herself as a leading expert in the field of light-matter interaction, polariton physics/devices, and atomically thin materials. Her papers represent the highest accomplishments in these fields. She will definitely be promoted to the rank of full professor at my institute and other top-ranked universities in the U.S.”

Reviewer (C)

“...[Professor Deng] developed a novel cavity architecture with a photonic crystal mirror... This work has paid off in producing a single mode polariton laser whose line-width is controlled by interactions with the condensate; this is unambiguous evidence for strong-interaction physics in polariton condensates...”

Reviewer (D)

“Prof. Deng’s early works on the discovery and understanding of exciton-polariton Bose-Einstein condensation (BEC) have been the milestones in modern science. She has been a pioneer and a leader of the field. ... Perfect absorption and perfect reflection by a monolayer [Horng et al. arXiv:1903.06645 (2019)] and interlayer excitons in homo-bilayers forming an ultra-thin laser [Paik, arXiv:1901.00598 (2019)] are two remarkable examples.”

Reviewer (E)

“Her research productivity has accelerated in recent years, with...24 publications in high quality peer reviewed scientific journals since her promotion to associate professor in 2015. ...[She] has established an impressive research record at the University of Michigan, Ann Arbor, and is a clear leader in her research area. Based on the materials you sent me, Professor Deng is also a dedicated teacher and has an excellent record for service in the department, the university, and the scientific community. I strongly support her promotion to full professor at your institution.”

Reviewer (F)

“In summary, Professor Hui Deng is a highly regarded member of the physics/optics community. She has made significant contributions to semiconductor physics, especially polariton physics, and quantum optics. I strongly recommend her promotion from the rank of associate professor to the rank of professor with tenure at the University of Michigan.”

Summary of Recommendation:

Professor Deng 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 Hui Deng be promoted to the rank of professor of physics, with tenure, College of Literature, Science, and the Arts.



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

May 2020