Approved by the Regents
May 19, 2016

PROMOTION RECOMMENDATION
The University of Michigan
College of Engineering
Department of Electrical Engineering and Computer Science

Wei Lu, associate professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering, is recommended for promotion to professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering.

Academic Degrees:

Ph.D.	2003	Rice University, Physics, Houston, TX
M.A.	1999	Rice University, Physics, Houston, TX
B.S.	1996	Tsinghua University, Physics, Beijing, China

Professional Record:

2011 - Present:	Associate Professor (with tenure), Department of Electrical Engineering and Computer Science, University of Michigan
2005 - 2011:	Assistant Professor, Department of Electrical Engineering and Computer Science, University of Michigan
2003 - 2005:	Post-Doctoral Research Fellow, Department of Chemistry, Harvard University, Boston, MA

Summary of Evaluation:

Teaching: Professor Lu has established an excellent teaching record during his time in rank. His impact on teaching, at both undergraduate and graduate levels, is extremely positive. He is an outstanding classroom instructor, and has demonstrated leadership in establishing and evolving a curriculum in nanotechnology. He is an outstanding mentor for students in his courses and research projects, with demonstrated lasting impact on their future careers in science and engineering. Beyond his instructional contributions, Professor Lu has distinguished himself in graduate education. He has graduated ten Ph.D. students. He is also active with M.S. and undergraduate students. Members of his research group have all had highly successful trajectories in graduate schools, national laboratories, academia, or industry. Both undergraduate and graduate students are uniformly complimentary about his energy and enthusiasm for research, teaching and mentoring.

Research: Professor Lu's research and scholarly output are truly stellar. In the last decade, he emerged as a leading figure in the fields of nanotechnology and neuromorphic systems and is an internationally recognized leader in the development of memristors for memory and logic applications. He has established a large and well-funded research program, consistently including undergraduate research projects, which makes Michigan one of the world leaders in these fields. In addition, he developed nanowire transistors suitable for flexible electronics and optoelectronics. Professor Lu's contributions in these areas establish him as a major intellectual contributor and innovator. He is also one of the department's most prolific researchers and has published his research in more than 35 archival journals and over 20 conference and symposium papers. He has been recognized with an NSF CAREER Award as well as the CoE Rexford E. Hall Innovation Excellence Award and the EECS Outstanding Achievement Award.

Professor Lu has contributed substantially to technology transfer. He has been awarded 10 U.S. patents and several more are pending. His fundamental research on memristors has led to the establishment of Crossbar, Inc. with $50M of venture capital funding. The company is on track to produce the first commercial resistive random access memory (RRAM) device. In addition, his group actively collaborates with researchers all over the world. External reviewers were unanimous in their support of his promotion.

Recent and Significant Publications:

S. Kim, C. Du, P. Sheridan, W. Ma, S-H Choi and W.D. Lu, "Experimental demonstration of a second order memristor and its ability to biorealistically implement synaptic plasticity," *NanoLetters*, 15, 2203-2211, 2015.

Y. Yang, P. Gao, L. Li, X. Pam, S. Tappertzhofen, S-H. Choi, R. Waser, I. Valor and W.D. Lu, "Electrochemical dynamics of nanoscale metallic inclusions in dielectrics," *Nature Communications*, 5, 4232 - 4240, 2014.

Y. Yang, P. Gao, S. Gaba, T. Chang, X. Pan and W. Lu, "Observation of conducting filament growth in nanoscale resistive memories," *Nature Communications*, 3, 732-739, 2012.

K-H. Kim, S. Gaba, D. Wheeler, J.M. Cruz-Albrecht, T. Hussain, N. Srimivasa and W. Lu, "A functional hybrid memristor crossbar - array/CMOS system for data storage and neuromorphic applications," *NanoLetters*, 12, 389 - 395, 2012.

S.H. Jo, T. Chang, I. Ebong, B.B. Bhadviya, P. Mazumder and W. Lu, "Nanoscale memristor device as synapse in neuromorphic systems," *NanoLetters*, 10, 1297 - 1301, 2010.

Service: Professor Lu has compiled an excellent service record that includes both solid internal service activities and outstanding service to the electrical engineering profession and his professional societies. He has participated in a number of department and college committees, including the ECE Executive Committee, the EE Graduate Academics Committee, the EE Graduate Fellowship Committee, the college Entrepreneurial Advisory Task Force, and the college Lurie Nanofabrication Facility Council. He also served as graduate advisor in the solid-state electronics academic area of the ECE Division and in this role he advised a large group of women students. Professor Lu spent considerable time with graduate and undergraduate students in the department, on an individual basis, in the context of course choices and planning, plans for graduate studies, financial aid and career goals. Professor Lu's standing as an important member of his professional community, encompassing the areas of microelectronics and nanoelectronics, has allowed him to contribute in many areas. These range from being the founding co-editor of the high-impact-factor journal *Nanoscale* to serving as a member of important panels and in various capacities in important international conferences.

External Reviewers:
Reviewer A: "... his contribution is remarkable both in science and technology. For instance, he revealed physical/chemical phenomena occurred in a nano-scale region by in-situ TEM observation of a device switching. This [sic] his world-first work is now the standard technique in our research field."

Reviewer B: "Professor Lu has strong visibility at the national and international level. This is reflected in the high-quality journals and strong citation record. His invited presentations indicate visibility with industry and with researchers on several continents ... I am confident that he would be promoted to full professor at [my institution] ..."

Reviewer C: "Prof. Lu's research group at UM has made significant contributions that have advanced knowledge of resistance switching mechanisms and the state-of-the-art in RRAM technology . . . He certainly meets the requirements for promotion to full Professor at any major research university."

Reviewer D: "Memristor is a promising candidate for ultra-high density, non-volatile memories that can potentially replace flash-based memory due to their simple two-terminal structure and ionic nature. As of today, Prof. Lu has emerged as the world's technical leader on both academic research and practical applications."

Reviewer E: "This is a unique strength of Wei Lu. He applies his knowledge in the practice and he is one of the co-founders and leading scientist in the company Crossbar Inc., which produces non-volatile memory devices. This is a perfect example of a transfer of know-how and technology to production."

Reviewer F: "Prof. Lu has demonstrated that he can not only identify the holy grail of research but also secure it with his unbelievable creativity and productivity. Building neuromorphic circuits for a human-brain-like computer towards the last frontier of computing has been viewed as an interesting and important research direction for a while ... Prof. Lu showed for the first time in 2010 that hardware-based neuromorphic systems can be achieved by incorporating nanoscale memristors into CMOS neuron circuits."

Summary of Recommendation: Professor Lu is an internationally recognized leader in the field of nanoelectronics-based neuromorphic systems and a pioneer in the development of memristors for memory and logic applications. He has established a vigorous and productive research effort at Michigan. He has made significant contributions to both undergraduate and graduate education, and has contributed generously to both internal and external service. It is with the support of the College of Engineering Executive Committee that I recommend Wei Lu for promotion to professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering.

David C. Munson Jr.

David C. Munson, Jr.
Robert J. Vlasic Dean of Engineering
College of Engineering

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