

PROMOTION RECOMMENDATION  
The University of Michigan  
College of Engineering  
Department of Mechanical Engineering

Kenn R. Oldham, associate professor of mechanical engineering, with tenure, Department of Mechanical Engineering, College of Engineering, is recommended for promotion to professor of mechanical engineering, with tenure, Department of Mechanical Engineering, College of Engineering.

Academic Degrees:

Ph.D. 2006 University of California at Berkeley, Mechanical Engineering, Berkeley, CA  
B.S. 2000 Carnegie Mellon University, Mechanical Engineering, Pittsburgh, PA

Professional Record:

2013 – present Associate Professor (with tenure), Department of Mechanical Engineering, University of Michigan  
2007 – 2013 Assistant Professor, Department of Mechanical Engineering, University of Michigan  
2006 – 2007 Post-Doctoral Fellow, Sensors and Electronic Devices Division, U.S. Army Research Laboratory, Adelphi, MD, United States of America

Summary of Evaluation:

Teaching: Professor Oldham has been a valued instructor in several courses at the undergraduate and graduate levels, including basic courses at the undergraduate level in dynamics and vibrations and advanced courses in digital control systems in mechanical engineering. As a member of the Mechanical Engineering (ME) department's DEI working group, Professor Oldham developed a strategy to raise DEI awareness among ME undergraduates by incorporating Progressive Inclusive Teaching Practices, as espoused by the American Society of Engineering Education, into the five major team-based experiential learning courses in ME. As a result, the core design, manufacturing, and laboratory courses in ME now reinforce effective team expectations and strategies throughout including modules on team basics, unconscious bias, intercultural awareness, microaggressions, and advanced team dynamics.

Professor Oldham has mentored eight Ph.D. students, 20 M.S. students, and 11 undergraduate students. He demonstrates a consistent ethic of publishing with his students as primary authors and is especially proud of his record of publishing with undergraduate students. His students praise his dedication, approachability, passion, and impact on their career paths.

Research: Professor Oldham's research focuses on applied dynamics and control of piezoelectric microactuators to various promising applications, including endoscopic scanning imaging, cardiovascular monitoring, and chip-scale inertial sensor calibration. He has published over 25 journal articles in the last five years in prestigious journals, such as *Mechatronics*, *Journal of the Electrochemical Society*, and the *ASME Journal of Mechanisms and Robotics*. He is securing funding from top sponsors, including the NSF, NIH, NIST, and DARPA. His NSF Career

Award and DARPA Young Faculty Award are indicators of his innovativeness, intellect, and commitment.

Professor Oldham's scientific identity is that of an immensely talented innovator in the application of dynamic systems and controls to micro-scale systems, including micro-robotics. He has had considerable impact on the development of miniaturized biomedical instruments, including medical endoscopy tools and non-invasive cardiovascular sensors – innovations that are currently being translated into human trials and are on commercialization pathways. As a leader in micro-robotics, his major contributions to this field are in the understanding of how terrestrial micro-robots interact with their environment, operate in the face of strict power constraints, and are designed and fabricated for enhanced mobility.

#### Recent and Significant Publications:

- B. Hahn, K. R. Oldham, "Convergence and energy analysis for iterative adaptive On-Off control of piezoelectric microactuators," *IEEE Transactions on Control Systems Technology*, 23(3): 1052-1060, 2013.
- J. Choi, X. Duan, H. Li, T.D. Wang, K. R. Oldham, "Multi-photon vertical cross-sectional imaging with a dynamically-balanced thin-film PZT z-axis microactuator," *Journal of Microelectromechanical Systems*, 26(5): 1018-1029, 2017.
- J. Qu, J. Choi, K. R. Oldham, "Dynamics structural and contact modeling for a silicon hexapod microrobot," *ASME Journal of Mechanisms and Robotics*, 9(6): 2017.
- L. Wang, S. Ansari, D. Slavin, K. Ward, K. Najarian, K. R. Oldham, "Non-invasive vascular resistance monitoring with a piezoelectric sensor and photoplethysmogram," *Sensors and Actuators A: Physical*, 263: 198-208, 2017.
- Y. Chen, E.E. Aktakka, J.-K. Woo, K. Najafi, K.R. Oldham, "On-chip capacitive sensing and tilting motion estimation of a micro-stage for in situ MEMS gyroscope calibration," *Mechatronics*, 2018.

Service: Professor Oldham has a remarkable record of internal service. As the associate chair for undergraduate education in the ME department, he has shown strong leadership, overseeing all aspects of the program. In particular, he contributed significantly to the development of the enormously successful RISE (Research, Innovation, Service, and Entrepreneurship) in the department. He has also served in other important service roles for ME, including the Advisory Committee (governance) and the Internal Review Committee. Externally, he has served as an associate editor for the leading mechatronics journal, and as leader of the Technical committee in the ASME Dynamic Systems and Control Division. He is also active in conference organization.

#### External Reviewers:

Reviewer A: "The large number of undergraduates that he has supervised shows a dedication to the grass roots of the field. I find that refreshing."

Reviewer B: "Robotics has again emerged as an area of critical national importance and Dr. Oldham has established himself as a leader in the field of micro-robotics. ... I am not aware of anyone else in the controls community who has had as much success with micro-robots."

Reviewer C: “Of particular note is the strong record of publications co-authored with his graduate and undergraduate students, indicating outstanding mentoring. ... His publication record clearly demonstrates sustained contributions and substantial cumulative evidence of impact.”

Reviewer D: “He establishes the process treatment of the PZT films for MEMS actuators. That is an excellent achievement. ... the quality of his researches [sic] on the MEMS scanners is excellent in addition to the sophisticated designs and fabrications of the devices. The results of the micro translational scanners have a large scholarly impact in this research field.”

Reviewer E: “Dr[.] Oldham is rapidly rising to a leadership position w.r.t. his peer group, and in many instances he has already arrived.... he holds excellent technical talks, capturing his audience, and inspiring the youngsters. Dr[.] Oldham is clearly a very capable leader in his field.”

Reviewer F: “Kenn Oldham is one of the worldwide most active persons in microactuators. ... Kenn Oldham is a creative and focused microsystems scientist. I consider him, at least in the field of micro piezo actuators, as one of the leading experts in the world.”

Reviewer G: “One impressive fact is that he published 12 journal papers in a single year of 2017! ... in the field of optical microendoscopy with piezoelectric actuation for z-axis scan Dr. Oldham is the top researcher in the world. ... Dr. Oldham has established himself as an internationally-known researcher as well as an outstanding educator.”

Summary of Recommendation: Professor Oldham is an exceptional innovator in micro-scale systems including micro-robotics whose research creativity and excellence is widely recognized and praised both nationally and internationally. He is similarly highly regarded and respected for his impactful service to his profession and to the University of Michigan. He is a considerable asset to our teaching enterprise at both the undergraduate and graduate levels. It is with the support of the College of Engineering Executive Committee that I recommend Kenn R. Oldham for promotion to professor of mechanical engineering, with tenure, Department of Mechanical Engineering, College of Engineering.



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Alec D. Gallimore, Ph.D.  
Robert J. Vlasic Dean of Engineering  
College of Engineering

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