Approved by the Regents
May 18, 2023

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

Kenneth A. Shorter, assistant professor of mechanical engineering, Department of Mechanical Engineering, College of Engineering, is recommended for promotion to associate professor of mechanical engineering, with tenure, Department of Mechanical Engineering, College of Engineering.

Academic Degrees:

Ph.D.	2011	University of Illinois, Mechanical Engineering, Urbana-Champaign, IL
M.S.	2007	University of Illinois, Mechanical Engineering, Urbana-Champaign, IL
B.S.	2001	University of Colorado, Mechanical Engineering, Boulder, CO

Professional Record:

2017 – present	Assistant Professor, Department of Mechanical Engineering, University of Michigan, Ann Arbor, MI
2015-2017	Assistant Research Scientist, Department of Mechanical Engineering, University of Michigan, Ann Arbor, MI
2011-2015	Research Investigator, Department of Mechanical Engineering, University of Michigan, Ann Arbor, MI
2011-2011	Post-doctoral Researcher, Biology, Woods Hole Oceanographic Institution, Woods Hole, MA

Summary of Evaluation:
Teaching: Professor Shorter has contributed significantly to the educational mission of the Department of Mechanical Engineering (ME), including teaching graduate and undergraduate courses, as well as effectively mentoring students throughout his time at UM. His course evaluations are consistently high, and he was recognized with the John F. Ullrich Education Excellence Award in 2021. Students enjoy his intentional use of examples from his research to foster student interest in the classroom. In addition to using research examples in the classroom, Professor Shorter emphasizes undergraduate student research experiences that have a meaningful impact on his trainees. His students and trainees appreciate his prioritizing their social and mental health. He has graduated five Ph.D. students as an advisor or co-advisor, with another four in progress, with one student expected to graduate this year.

Research: Professor Shorter is a recognized researcher and scholar in the biomechanics of human and animal locomotion. His research program prior to his appointment as assistant professor was primarily in human biomechanics. He has expanded that work into the design, deployment, and analysis of biologging tags for marine animals. He develops models, experimental paradigms, and algorithms to extract high-impact results from the datasets that his biologging tags produce. He has made significant contributions in the design and fitting of devices that monitor and intervene during locomotion and his scientific inquiries have produced significant impact in not only engineering and biology but also in conservation biology and in

government regulations. His lab at UM has produced a steady stream of publications. His total journal publication count is 37. According to Google Scholar, Professor Shorter has an h-index of 18 and has 1,622 citations. His funding portfolio, at $4.7M, is healthy and well-sustained, with sources from NSF, Woods Hole Oceanographic Institute, NOAA, ONR, and the DoD (Navy).

Recent and Significant Publications:

Gabaldon, J, Zhang, D, Lauderdale, L, Miller, L, Johnson-Roberson, M, Barton, K, Shorter, KA, "Computer-vision object tracking for monitoring bottlenose dolphin habitat use and kinematics," *PLoS ONE*. 02/01/2022; 17(2 February).

Zhang, D, van der Hoop, JM, Petrov, V, Rocho-Levine, J, Moore, MJ, Shorter, KA**,** "Simulated and experimental estimates of hydrodynamic drag from bio-logging tags," *Marine Mammal Science*. 01/01/2020; 36(1): 136-157.

Baroudi, L, Newman, MW, Jackson, EA, Barton, K, Shorter, KA, Cain, SM, "Estimating Walking Speed in the Wild," *Front Sports Act Living*. 2020; 2: 583848.

Flaspohler, GE, Caruso, F, Aran Mooney, T, Katija, K, Fontes, J, Afonso, P, Alex Shorter, K**,** "Quantifying the swimming gaits of veined squid (Loligo forbesii) using bio-logging tags," *Journal of* Experimental *Biology*. 01/01/2019; 222(24).

Gabaldon, Joaquin, Turner, E, Johnson-Roberson, M, Barton, K, Johnson, M, Anderson, E, Shorter, K**,** "Integration, calibration, and experimental verification of a speed sensor for swimming animals," *IEEE Sensors Journal*. 01/2019.

Shorter, K. Alex, Amy Wu, and Arthur D. Kuo, "The high cost of swing leg circumduction during human walking," *Gait & posture*. 54 (2017): 265-270.

Zhang, D, Gabaldon, J, Lauderdale, L, Johnson-Roberson, M, Miller, LJ, Barton, K, Shorter, KA, "Localization and tracking of uncontrollable underwater agents: Particle filter based fusion of on-body IMUs and stationary cameras," *International Conference on Robotics and Automation*. *(ICRA)*, 05/20/2019.

Service: Professor Shorter has provided important service, both internally at the University of Michigan and externally for the academic community. Internally, he contributed to content development for MECHENG 599 Professional Skills for Graduate Student Success, specifically content related to presentation skills. He also participated in the ME Strategic Planning group for 2020-2021. Service in ME includes his role as the coordinator for both the Junior Faculty Mentoring Lunch in 2019 and the ME Department Seminar Series in 2017. Externally, he is an active member of the American Society of Biomechanics and served on its Education Committee since 2016. This committee is responsible for organizing tutorial sessions and evaluating the annual meetings of the society. Additionally, Professor Shorter organized the session entitled, "Biologging Ecology and Oceanography: Integrative approaches to animal-borne observations in a changing ocean," at the Ocean Sciences Meeting in February 2020. For the community, Professor Shorter leased out his biologging tags to 22 research groups. This lease program includes online educational modules to facilitate self-paced learning for tag users. Through this effort, he aims to improve equity in the marine mammal science community which has limited commercial options for such essential equipment. Moreover, he has used his biologging tags to educate the general public at the Brookfield Zoo, Illinois, and Dolphin Quest Oahu, Hawaii.

External Reviewers:
Reviewer A: "I cannot overstate how crucial it is that the engineering sensor development that he is doing is having translational impact; as an engineer, it is one thing to develop and test a sensory system for monitoring some aspect of animals in the wild, but it is an entirely different matter to have said research…impact the literature of conservation law and molecular ecology..."

Reviewer B: "Few researchers in animal behavior and locomotion have Dr. Shorter's technical capabilities and innovation in developing mobile sensors. In addition, few researchers developing wearable sensing technologies have Dr. Shorter's understanding and appreciation of important physiological and biomechanical questions that remain unanswered. This novel combination has made Dr. Shorter a world leading scientist in his chosen research niche."

Reviewer C: "Dr. Shorters [sic] research on biologging and remote sensing is world class. He is a research leader in his field and he is constantly spearheading the development of new technology and analytical tools that allows us to understand how both humans and animals move, behave and spend energy while free-moving in the wild."

Reviewer D: "Alex is the de facto leader of the current generation of faculty when it comes to marine mammal research. Over the course of his career, he has been at the forefront of designing, building, and deploying marine mammal tags."

Reviewer E: "I especially appreciate his work in the area of marine animal biotagging, biomechanics, and conservation biology. This is an important and under-explored area of research, and it is important that there are engineers like Dr. Shorter that are the fore-front of such research, working closely with biologists."

Summary of Recommendation: Professor Shorter is a dedicated mentor and teacher. He is a recognized researcher and scholar in the biomechanics of human and animal locomotion and has provided important service internally and for his research community. It is with the support of the College of Engineering Executive Committee that I recommend Kenneth A. Shorter for promotion to associate professor of mechanical engineering with tenure, Department of Mechanical Engineering, College of Engineering.

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

May 2023