

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

Eric Johnsen, 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. 2008 California Institute of Technology, Mechanical Engineering, Pasadena, California
M.S. 2002 California Institute of Technology, Mechanical Engineering, Pasadena, California
B.S. 2001 University of California, Santa Barbara, Mechanical and Environmental Engineering, Santa Barbara, CA

Professional Record:

2010-present Assistant Professor, Department of Mechanical Engineering, University of Michigan
2007-2009 Post-Doctoral Fellow, Center for Turbulence Research, Stanford University, Stanford, CA, USA

Summary of Evaluation:

Teaching: Professor Johnsen is an effective teacher and excellent advisor. Since joining the University of Michigan, he has taught a core undergraduate course (ME320) and two graduate courses (ME520 and ME523) in fluid mechanics. Student comments testify that Professor Johnsen is an excellent teacher who is caring, knowledgeable, approachable and patient. His advising and mentoring performance is outstanding. He has graduated three Ph.D. students and is now advising 10 plus several M.S. students. He is praised by his graduate students to be an excellent advisor who is good at identifying important research topics, engaging in the research process, and being strongly supportive of students' development as scientific researchers. His mentorship is also well demonstrated through the many papers that he has published with his students.

Research: Professor Johnsen has been performing scholarly research and is building a great reputation in the technical areas of multi-scale modeling, high-fidelity computation and the fundamental investigations of fluid mechanics and multi-physics problems. His research draws from applied mathematics, numerical analysis, physical modeling and high-performance computing to develop novel techniques for numerical simulations and modeling of flow phenomena. His group uses these tools to uncover the basic physics underlying complex multi-scale and multi-physics flows, and finds applications in biomedical engineering, energy sciences and transportation engineering. He has developed a strong research program at the University of Michigan, with a good mix of single-investigator grants (including the NSF CAREER and ONR YIP awards) and larger collaborative projects, from NSF, ONR, NIH, DoE and Ford. Professor Johnsen has been publishing research findings in top refereed journals in his field, with over 20 journal papers published since arriving here (all with his UM students). He has also been active in presenting at important conferences in his field and has been invited to give talks at various institutions. All external referees

are positive, praising his research quality and scholarship. Overall, Professor Johnson has developed a very strong research record with outstanding potential.

Recent and Significant Publications:

- E. Vlaisavljevich, A. D. Maxwell, L. Mancina, E. Johnsen, C. Cain and Z. Xu, 2016, “Visualizing the histotripsy process: bubble cloud-cancer cell interactions in a tissue-mimicking environment,” *Ultrasound and Medicine in Biology*, 42, 2466–2477.
- E. Vlaisavljevich, Z. Xu, A. Maxwell, L. Mancina, X. Zhang, W. Lin, A. Duryea, J. Sukovich, T. Hall, E. Johnsen and C. Cain, 2016, “Effects of temperature on the histotripsy intrinsic threshold for cavitation,” *IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control* 63, 1064–1077.
- S. Norberg, E. Johnsen and M. J. Kushner, 2016, “Helium atmospheric pressure plasma jets interacting with wet cells: Delivery of electric fields,” *Journal of Physics D: Applied Physics* 49, 185201.
- S. Alahyari Beig and E. Johnsen, 2015, “Maintaining interface equilibrium conditions in compressible multiphase flows using interface capturing,” *Journal of Computational Physics* 302, 548–566.
- S. A. Norberg, E. Johnsen and M. J. Kushner, 2015, “Helium atmospheric pressure plasma jets touching dielectric and metal surfaces,” *Journal of Applied Physics* 118, 013301.
- M. T. Warnez and E. Johnsen, 2015, “Numerical modeling of bubble dynamics in viscoelastic media with relaxation,” *Physics of Fluids* 27, 063103.
- M. T. Henry de Frahan, J. L. Belof, R. M. Cavallo, V. A. Raevsky, O. N. Ignatova, A. Lebedev, D. S. Ancheta, B. S. El-dasher, J. N. Florando, G. F. Gallegos, E. Johnsen and M. M. LeBlanc, 2015, “Experimental and numerical investigations of beryllium strength models using the Rayleigh-Taylor instability,” *Journal of Applied Physics* 117, 225901.
- S. A. Norberg, E. Johnsen and M. J. Kushner, 2015, “Formation of reactive oxygen and nitrogen species by repetitively negatively pulsed helium atmospheric pressure plasma jets propagating into humid air,” *Plasma Sources Science and Technology* 24, 035026.
- A. Schmidt-Bleker, S. A. Norberg, J. Winter, E. Johnsen, S. Reuter, K. D. Weltmann and M. J. Kushner, 2015, “Propagation mechanisms of guided streamers in plasma jets: The influence of electronegativity of the surrounding gas,” *Plasma Sources Science and Technology* 24, 035022.
- P. Movahed and E. Johnsen, 2015, “The mixing region in freely decaying variable-density turbulence,” *Journal of Fluid Mechanics* 772, 386–426.

Service: Within the Department of Mechanical Engineering (ME), Professor Johnsen has been a good citizen. He has been on the department seminar committee and served as coordinator for the junior faculty mentoring lunch for an academic year; he has served as a member of the ME faculty search committee, graduate program committee, and the undergraduate program committee. He has also been active in research computing organizations at the college and university level. Externally, he has been very active in serving the technical community. He is a member of the American Institute for Aeronautics and Astronautics Fluid Dynamics Technical Committee. He has organized symposia for various conferences in his field and hosted the 2015 Office of Naval Research Naval International Cooperative Opportunities Program on cavitation erosion. Professor Johnsen has reviewed many technical papers for a variety of scientific journals and proposals for NSF, NIH and DOE.

External Reviewers:

Reviewer A: “Dr. Johnsen has a reputation for high quality numerical simulations. ...Dr. Johnsen has made important breakthroughs in developing algorithms that simultaneously address the requirements of interface capturing and turbulence in compressible flows. ...I believe he has the originality, depth, creativity, and energy, combined with the ability to choose good problems and carry out high quality work. ...Dr. Johnsen has an excellent reputation and visibility in both the national and international community and is a leader in his field.”

Reviewer B: “Eric’s contribution to the field has been really fundamental. ...Eric’s work on bubble dynamics in multiphase flows is just as impressive.”

Reviewer C: “I personally consider Dr. Johnsen as a leading expert in the field of computational fluid dynamics.”

Reviewer D: “I consider him to be a top-notch researcher. ...In my head, he is ‘the person’ in adding material models to bubble dynamics from a fluids perspective. ...I offer his case for promotion with tenure my strongest and unqualified support. I encourage you to promote him!”

Reviewer E: “I believe Prof. Johnsen has established a strong reputation as serious computational scientist ... His work is rigorous and of high quality and published in the top most archival journals...”

Reviewer F: “I have a very positive impression of Prof. Johnsen’s research: this derives from the novelty of his work, the range of application areas, the thematic focus on a valuable area of expertise (interfaces and compressibility), and his considerable productivity. I would rate Prof. Johnsen as being at or near the top in terms of high quality research contributions among his peer group.”

Summary of Recommendation: Professor Johnsen is a great asset to the University of Michigan. He is an effective teacher and excellent advisor. He has built a very strong research program with outstanding potential, and has been publishing high quality papers in top journals. He has been a good citizen in serving the university and his technical community. It is with the support of the College of Engineering Executive Committee that I recommend Eric Johnsen 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

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