

PROMOTION RECOMMENDATION  
The University of Michigan  
College of Engineering

Joseph L. Bull, associate professor of biomedical engineering, with tenure, Department of Biomedical Engineering, College of Engineering, is recommended for promotion to professor of biomedical engineering, with tenure, Department of Biomedical Engineering, College of Engineering.

Academic Degrees:

Ph.D. 2000 Northwestern University, Mechanical Engineering, Evanston, IL  
M.S. 1995 Northwestern University, Mechanical Engineering, Evanston, IL  
B.S. 1992 University of Wisconsin, Mechanical Engineering, Platteville, WI

Professional Record:

2012-present Arthur F. Thurnau Professor, University of Michigan  
2007-present Associate Professor (with tenure), Department of Biomedical Engineering, University of Michigan  
2007-2012 Associate Professor, Department of Surgery, University of Michigan  
2001-2007 Assistant Professor, Department of Biomedical Engineering, University of Michigan  
2006-2007 Assistant Professor, Department of Surgery, University of Michigan  
2001 Research Investigator, Pediatric Surgery and Biomedical Engineering, University of Michigan  
2000 Post-doctoral Fellow, Pediatric Surgery and Biomedical Engineering, University of Michigan

Summary of Evaluation:

Teaching: Professor Bull has been recognized for his teaching excellence through the John F. Ullrich Education Excellence Award in the College of Engineering in 2008 and the Arthur F. Thurnau Professorship in 2012. He has created two new classes in biomedical engineering: BME 479 Biotransport and BME 311 Introduction to Biofluid Mechanics. These are two important courses for two of biomedical engineering's undergraduate concentration areas. His Q1 and Q2 teaching evaluations for these two courses have been outstanding, averaging over 4.7 and 4.9, respectively, which is even more impressive given the large enrollment in these classes. He has recently taken on the task of revamping another key undergraduate course BME 231 Introduction to Biomechanics. Numerous students have commented on Professor Bull being their best instructor during their tenure at Michigan, citing his attention to the needs of the students and his open availability for questions and mentoring.

In addition to Professor Bull's excellent classroom instruction, he has an outstanding record of mentoring undergraduate students through directed research projects and graduate students in graduate research. He has chaired or co-chaired eight Ph.D. graduates, who have gone on to a variety of academic and industrial positions. He has advised 15 Master's students and supervised 22 undergraduate directed research projects. Letters from graduate and undergraduate students describe Professor Bull as being able to strike an excellent balance between supervision and student independence and being willing to mentor on career planning and other matters.

Research: Professor Bull has established a strong international reputation for high quality research in biofluid mechanics, including theoretical and computational modeling, and *in vivo* and *in vitro* experiments. His work primarily centers on the cardiovascular and pulmonary systems and related

biomedical devices, including micro- and nano-fluid mechanics. One particularly novel and exciting project involves gas embolotherapy, a method that involves injecting perfluorocarbon liquid droplets into the bloodstream and then selectively vaporizing them to form gas bubbles that occlude blood flow to tumors. External reviewers praised the novelty and innovation of this approach. Other important projects include the study of flow in aneurysms, aortic dissection, and intravascular medical devices. Similarly, his group has examined the unique properties of pulsatile blood flow through artificial lung devices.

Professor Bull has over 50 peer-reviewed articles published or “in-press.” His work has appeared in excellent technical journals such as *Applied Physics Letters* and *Physics of Fluids* and excellent journals in the life sciences and medicine, such as *ASAIO Journal* and *Microcirculation*. His laboratory has been well-funded through a variety of sources, including the Coulter Foundation, Department of Veteran Affairs, and difficult to obtain grants from the National Institutes of Health. He has a number of important collaborations with faculty from other departments in engineering as well as the Medical School.

#### Recent and Significant Publications:

- Calderón, A.J., Fowlkes, J.B. and Bull, J.L., “Bubble splitting in bifurcating tubes: a model study of cardiovascular gas emboli transport,” *Journal of Applied Physiology*, 99: 479-487, 2005.
- Ye, T. and Bull, J.L., “Microbubble expansion in a flexible tube,” *Journal of Biomechanical Engineering*, 128(4): 554-563, 2006.
- Calderón, A.J., Eshpuniyani, B., Fowlkes, J.B. and Bull J.L., “A boundary element model of the transport of a semi-infinite bubble through a microvessel bifurcation,” *Physics of Fluids*, 22(6): Art. No. 061902, 2010.
- Wong, Z.Z., Kripfgans, O.D., Qamar, A., Fowlkes, J.B. and Bull, J.L., “Bubble evolution in acoustic droplet vaporization at physiological temperature via ultra-high speed imaging,” *Soft Matter*, 7(8):4009-4016, 2011.
- Samuel, S., Duprey, A., Fabiilli, M.L., Bull, J.L. and Fowlkes, J.B., “Acoustic droplet vaporization and microbubble lodging in the rat cremaster muscle,” *Microcirculation*, 19(6): 501-509, 2012.

Service: Professor Bull’s service contributions are highly valued. He was associate department chair and director of the undergraduate program and was a coordinator of the department’s successful ABET accreditation review. He has served in numerous other service roles, including faculty search committees, promotion casebook committees, chair of the graduate admissions committee, and concentration advisor. He has served on numerous NIH and NSF review panels and regularly chairs sessions at international meetings. He has made many contributions to improving the diversity and climate in the department and at Michigan. He functions as the department’s diversity coordinator and has been active in student recruitment at such organizations as American Indian Science and Engineering Society Annual Conference, the Institute on Teaching and Mentoring Conference, and the Society for Advancement of Chicanos and Native Americans in Science Annual Conference. His mentoring activities to all students are greatly appreciated and help to create a supportive environment in the department.

#### External Reviewers:

Reviewer A: “...his ability to lead in computations and experimentation, especially in both the tedious but important *in vitro* and *in vivo* experiments, is impressive. This combined expertise and productivity is what I consider his greatest strength or achievement...I would feel tremendous confidence in the direction and values of the College if you were to promote Joseph Bull to Professor.”

Reviewer B: "...Dr. Bull has been a productive associate professor in all areas that promotion to Full Professor requires. He is one of those faculty members that exhibit a very good balance in all areas of academia."

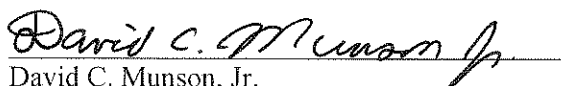
Reviewer C: "Joe has already been functioning at the level of full professor for a number of years through his establishment of [a] well-funded strong research program that is scientifically balanced. He uses his research laboratory to mentor students at all levels, and thus is guiding the next generation of scientists."

Reviewer D: "I think Dr. Bull has demonstrated the ability to make an impact in new areas of research that are related but also quite different from his formal training. This is an excellent sign for his future success and can really be a good 'litmus' for promotion to Professor."

Reviewer E: "Especially the computational/experimental analyses of droplet/bubble transport in microtubes related to gas embolotherapy for eventual tumor treatment is the most exciting project."

Reviewer F: "...Dr. Bull is performing at a high level in research, teaching, and service, and has firmly established himself as an international leader in his research area...he has been extremely active and has been a main contributor to efforts to build a major biomedical engineering program at [the] University of Michigan."

Summary of Recommendation: Professor Bull is outstanding in all aspect of his professional activities. His teaching is superb, having received several teaching awards, having developed several new classes, and being revered as a supportive and dedicated mentor. He has developed a well-funded research program and has established an international reputation for rigorous and creative research in biofluids in the cardiovascular system. His institutional and professional service has also been outstanding, particularly with respect to advancing the biomedical engineering undergraduate program and in outreach activities. It is with the support of the College of Engineering Executive Committee that I recommend Joseph L. Bull for promotion to professor of biomedical engineering, with tenure, Department of Biomedical Engineering, College of Engineering.



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

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