

PROMOTION RECOMMENDATION
The University of Michigan
College of Literature, Science, and the Arts

Silas D. Alben, associate professor of mathematics, with tenure, College of Literature, Science, and the Arts, is recommended for promotion to professor of mathematics, with tenure, College of Literature, Sciences, and the Arts.

Academic Degrees:

Ph.D.	2004	New York University
M.S.	2002	New York University
A.B.	1999	Harvard University

Professional Record:

2012 – present	Associate Professor, Department of Mathematics, University of Michigan
2007 – 2012	Professor, School of Mathematics, Georgia Institute of Technology
2005 – 2006	Lecturer, Division of Engineering and Applied Sciences, Harvard University
2004 – 2007	NSF Post-doctoral Fellow, Division of Engineering and Applied Sciences, Harvard University

Summary of Evaluation:

Teaching – Professor Alben has established a strong teaching record, successfully teaching classes ranging from sophomore differential equations to advanced graduate courses. He designed and taught a new graduate course entitled “Modeling and Mechanics.” In all but one of his classes, student evaluations of his teaching exceeded the average of other instructors of the same course. He has supervised a master’s student, a doctoral student, three undergraduate research projects, a post-doctoral researcher, and he is currently supervising another post-doctoral researcher. He has served as the director of the Applied and Interdisciplinary Mathematics (AIM) program since 2015 and taught the AIM seminar each semester.

Research – Professor Alben is an applied mathematician in the area of mathematical bio-fluid mechanics. He works primarily on the analysis of objects whose shapes can change as they move in complicated environments, such as flags flapping in the wind and jellyfish swimming in water. He has established himself as a worldwide leader in this area of difficult study. He is recognized for the broad scope and interdisciplinary character of his work. He has obtained major grants in support of his research and his papers are published in the top journals of his field. He recently extended his research to address topics in nanoscale physics.

Recent and Significant Publications:

“Dynamics and locomotion of flexible foils in a frictional environment,” with X. Wang, *Proceedings of the Royal Society A*, 474, 2018, pp. 1-20.
“Intracellular localization of nanoparticle dimers by chirality reversal,” with M. Sun, et al., *Nature Communications*, 8, 1847, 2017, pp. 1-10.
“Improved convection cooling in steady channel flows,” *Physical Review Fluids*, 2, 2017, pp. 1-26.

“Optimal convection cooling flows in general 2D geometries,” *Journal of Fluid Mechanics*, 814, 2017, pp. 484-509.

Service – Professor Alben has served as the director of the Applied and Interdisciplinary Mathematics program since 2015. He served on the departmental Executive Committee for a year and on the Undergraduate Counseling Committee for three years. Outside the University, he is on the editorial boards of two journals, and he has served as a referee for many more journals and for granting agencies. He has been an active organizer of conferences.

External Reviews:

Reviewer (A)

“I have been impressed by the rigor and thoroughness of the analyses in each paper Silas wrote. The papers included in the dossier are excellent. Each paper is an adventure into a new application which requires the development of a new algorithm and careful analysis. ... Silas is well-regarded in the APS-DFD community for his technical ability, his fairmindedness, and for his independent spirit.”

Reviewer (B)

“Prof. Alben is, in my view, at the absolute forefront of interdisciplinary work in biomechanics and applied mathematics. ... The work that Prof. Alben has done has been tremendously influential in the area of biomechanics. The computational techniques that he uses produce results that beautifully relate to biological problems, and Prof. Alben is fantastic (unparalleled, in my experience) at talking to biologists and explaining how he did his computations, what the assumptions and pitfalls are, and at providing methods and results that allow testing of hypotheses that we just can’t do with experimental approaches.”

Reviewer (C)

“[Professor] Alben has studied a whole raft of very interesting problems... It is an impressive body of work, grounded by his interdisciplinary collaborations...and by his attention to interesting experimental developments. ...Silas Allben [sic] is a truly excellent mathematical scientist who has made, and continues to make, important contributions to science and mathematics through his expertise in modeling, applied analysis, and simulation. His creativity is shown by the variety of interesting problems that he has addressed and solved.”

Reviewer (D)

“A distinctive feature of Silas’s research is his use of sophisticated mathematics and computations to quantify these flows and to explore the underlying physics so that we understand the mechanisms at work. In this he has an excellent reputation both nationally and internationally...”

Reviewer (E)

“I would therefore, without question, rank him among the international leaders of those studying flexible structures in fluid environments. ... I am a great admirer of his papers and always place the highest value on his solutions to problems. ... Silas has also been an excellent citizen to the field of fluid dynamics. Most notably, he currently serves as an Associate Editor of the *Journal of Fluid Mechanics*, an outstanding honor and a testament to the value with which he is regarded

by peers. He also serves as the Editor for *Advances in Computational Mathematics*. He has also been a very active organizer of mini-symposia at various conferences, which have been instrumental at bringing the community together.”

Reviewer (F)

“He has at least four active directions of research involving soft materials, optimal flows for convective cooling, undulatory locomotion, and the translation, rotation and deformation of membranes in (inviscid) flows. Silas tackles these problems using analytical and numerical means and his analytical toolbox is broad and deep.”

Reviewer (G)

“Silas is one of the nation’s most talented applied mathematicians, and is known internationally for his work using mathematics to understand complex fluid systems. I give him my highest recommendation for promotion to the rank of Professor!”

Reviewer (H)

“...the complexity of the problems Silas considers - usually involving a combination of physical effects and complex, often time-evolving boundaries – necessitates this kind of inspired and careful modelling. ... In an age where big data is gaining traction even in the arena of the classical physical sciences, I believe the role of the kind of basic and insightful modelling for which Silas has become known will only grow. And Silas will be at the vanguard of this (he already is).”

Summary of Recommendation:

Professor Alben is a leader in applied mathematics with a particular focus on the dynamics of elastic objects in addition to other applications. He makes a major contribution to the department’s teaching at all levels of the curriculum and he has carried substantial service duties. The Executive Committee of the College of Literature, Science, and the Arts and I recommend that Associate Professor Silas D. Alben be promoted to the rank of professor of mathematics, with tenure, College of Literature, Science, and the Arts.



Elizabeth R. Cole, Interim Dean
Professor of Women’s Studies, Psychology,
and Afroamerican and African Studies
College of Literature, Science, and the Arts

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