

PROMOTION RECOMMENDATION
The University of Michigan
College of Engineering

Tal Carmon, assistant professor of electrical engineering and computer science, College of Engineering, is recommended for promotion to associate professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering.

Academic Degrees:

Ph.D.	2004	Technion, Israel Institute of Technology, Physics, Haifa, Israel
M.Sc.	1999	Technion, Israel Institute of Technology, Physics, Haifa, Israel
B.Sc.	1995	Technion, Israel Institute of Technology, Mechanical Engineering (cum laude), Haifa, Israel

Professional Record:

2007-present	Assistant Professor, Department of Electrical Engineering and Computer Science, University of Michigan
2003-2007	Post-doctoral Scholar, Center for the Physics of Information and at the Department of Applied Physics, California Institute of Technology, Pasadena, CA
1995-1999	Graduate Research Fellow, Electro Optics Unit, Technion, Haifa, Israel

Summary of Evaluation:

Teaching: Professor Carmon has made significant contributions to graduate research training, classroom education at the undergraduate and graduate levels, to curricular development, and to educational outreach. Professor Carmon has taught three courses, including an advanced undergraduate course on the Principles of Photonics (EECS 434), a graduate course on Lasers (EECS 539), and a graduate special topics course (EECS 598), in which he focuses on Photonic MEMS. Professor Carmon's principal innovations to the teaching of EECS 434 and 539 were the introduction of web-based visualization and simulation tools into the curriculum. Student letters indicate he is a conscientious and enthusiastic teacher and mentor. Professor Carmon supervises four Ph.D. students; one is well positioned to graduate in 2013, already having several high-impact papers to his credit. Professor Carmon is on track to graduate approximately one Ph.D. student per year following that. He has already had a considerable impact on post-doctoral research training, as a recent postdoc has assumed an assistant professor position at another university.

Research: Professor Carmon has established himself as an internationally recognized leader in optics, and particularly the field of optomechanics – the coupling of light to the oscillation modes of mechanical systems. His primary conceptual and technical breakthrough at Michigan has been the development of Brillouin scattering for driving high-frequency optomechanical oscillations in optical microcavities. Not only does this enable record-high frequencies to be achieved, it has enabled for the first time optical cooling of such a mechanical system. This breakthrough work is recognized internationally for its originality and the new research directions it opens up. Professor Carmon publishes almost entirely in the highest impact journals in the field. This is indicative of the extraordinarily high quality and originality of his work. Professor Carmon's CV lists over 45 refereed publications. He also lists over 80 refereed conference or symposium proceedings papers and 44 invited presentations.

Recent and Significant Publications:

- M. Kozlov, O. Kfir, A. Fleischer, A. Kaplan, T. Carmon, H. G.L. Schwefel, G. Bartal and O. Cohen, "Narrow-bandwidth high-order harmonics driven by long-duration hot-spot," *New Journal of Physics*, 14, 1-14, (2012).
- G. Bahl, M. Tomes, F. Marquardt and Tal Carmon, "Observation of Spontaneous Brillouin Cooling," *Nature Physics*, 8, 203–207 (2012). See also news and views section in *Nature Physics*, 8, 180-181 (2012).
- M. Tomes, F. Marquardt, G. Bahl and T. Carmon, "Quantum mechanical theory of optomechanical Brillouin cooling," *Physical Review A*, 84, 063806-063811, (2011).
- J. Moore, M. Tomes, T. Carmon and Mona Jarrahi, "Cascaded-Harmonic Generation and Multi-Photon Raman Lasing in Lithium Niobate Whispering-Gallery Resonators," *Applied Physics Letters*, 99, 221111-221114, (2011).
- J. Moore, M. Tomes, T. Carmon and Mona Jarrahi, "Continuous-wave ultraviolet emission through fourth-harmonic generation in a whispering-gallery resonator," *Optics Express*, 19, 24139-24146, (2011).
- G. Bahl, J. Zehnpfennig, M. Tomes and T. Carmon, "Stimulated optomechanical excitation of surface acoustic waves in a microdevice," *Nature Communications*, 2 1-6, (2011).
- M. Tomes and T. Carmon, "Photonic-MEMS vibrating at X-band (11-GHz) Rates," *Physical Review Letters*, 102, 113601-113605, (2009). See also news and views section in *Science*, 328, 812-813, (2010).

Service: Professor Carmon has taken on a significant role in service, particularly for the Optics and Photonics Lab within the EECS Department. Since 2007, he has served as the optics and photonics graduate advisor, where he is responsible for advising first and second year graduate students on course selection, qualifying exam preparation, and other issues related to their early graduate training. A second major service assignment has been that of optics and photonics graduate admissions coordinator. Service at the professional level includes membership of international conference program and organizing committees, service as a guest editor and reviewer for leading science and engineering journals in his field.

External Reviewers:

Reviewer A: "In my opinion, Tal's work will have a lasting impact in the general field of optics, nonlinear optics and dynamical systems. I regard Tal as one of the most productive investigators [of his cohort] I have seen in my career...Dr. Carmon is today one of the top experimentalist [sic] in his field. I have no doubts whatsoever regarding his future success."

Reviewer B: "...scientifically speaking, the candidate is in my view one of the high potential people of the community."

Reviewer C: "In short, the scientific yield from the portion of Tal's group that has focused on optomechanics is very much in line with what I would expect for appointment to tenure at a top research university, and I wholly support Tal's promotion...If I compare Tal's work at the University of Michigan to the work of others in the field of optomechanics who started their groups at roughly the same time as Tal, I would say that Tal is comfortably in the top tier of this group."

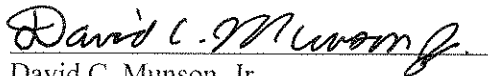
Reviewer D: "I found the findings of Prof. Carmon's group on Brillouin cooling to be a seminal contribution to an area that provides an elegant confluence of micro-resonator nonlinear optics and optomechanics...I deeply appreciate his exemplary research accomplishments particularly those conducted independently by his group at the University of Michigan. I find his overall record of scholarly activities, teaching and service to be excellent and noteworthy...I truly believe he will be a great asset to your

department for years to come, and will continue (even more effectively once tenured) his world-class research activities in the emerging field of nano- photonics.”

Reviewer E: “One could hardly ask more from someone who started just five years ago. In a very impressive series of work, Carmon and his students advanced the field of optomechanics by demonstrating that electrostrictive excitations and Brillouin scattering could indeed be used for cooling of optical microdevices. This nice and progressive series of work, culminating with the recent very visible Nature Physics, shows that Tal has the ability to select an important problem...and to reach significant results.”

Reviewer F: “...Professor Carmon has established a productive, visible, and well funded research group at the UM. He is clearly on a trajectory to a productive and successful academic career.”

Summary of Recommendation: Professor Carmon is an internationally recognized researcher who has pioneered several new directions in optics, and particularly the field of optomechanics. He is a conscientious teacher, both in the classroom and as a research advisor. He has performed valuable service to the department and especially to the Optics and Photonics Lab as graduate advisor and admissions coordinator. It is with the support of the College of Engineering Executive Committee that I recommend Tal Carmon for promotion to associate professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering.



David C. Munson, Jr.

Robert J. Vlasic Dean of Engineering
College of Engineering

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