

**PROMOTION RECOMMENDATION**  
The University of Michigan  
College of Engineering

Approved by the Regents  
May 20, 2010

Max Shtein, assistant professor of materials science and engineering, Department of Materials Science and Engineering, assistant professor of chemical engineering, Department of Chemical Engineering, assistant professor of macromolecular science and engineering, Macromolecular Science and Engineering Program, College of Engineering, and assistant professor of art and design, School of Art and Design, is recommended for promotion to associate professor of materials science and engineering, with tenure, Department of Materials Science and Engineering, associate professor of chemical engineering, without tenure, Department of Chemical Engineering, associate professor of macromolecular science and engineering, without tenure, Macromolecular Science and Engineering Program, College of Engineering, and associate professor of art and design, without tenure, School of Art and Design.

Academic Degrees:

Ph.D. 2004 Princeton University, Chemical Engineering, Princeton, NJ  
B.S. 1998 University of California-Berkeley, Chemical Engineering, Berkeley, CA

Professional Record:

2008 - present Assistant Professor, School of Art and Design, University of Michigan  
2006 - present Assistant Professor, Department of Chemical Engineering, University of Michigan  
2004 - present Assistant Professor, Department of Materials Science and Engineering, University of Michigan  
2004 - present Assistant Professor, Macromolecular Science and Engineering Program, University of Michigan

Summary of Evaluation:

Teaching: Professor Shtein has established himself as an excellent teacher, receiving the 2007 John R. and Beverly S. Holt Award for Excellence in Teaching. At Michigan, he has taught 10 courses, five of which were unique. He has co-taught a new course with the School of Art and Design and A. Alfred Taubman College of Architecture and Urban Planning. This was done in addition to his normal teaching load. The MSE undergraduates consider him one of the very best teachers in the department. Professor Shtein has also engaged many students at all levels in research. During his time at Michigan, he has worked during summers with high school students from Greenhills School. He has worked with 14 undergraduate students and two M.S. students, and he is chairing or has chaired or co-chaired 10 Ph.D. committees. Two of these students have graduated, and another is expected to graduate soon. In addition, he has been invited to be a member of more than 20 other Ph.D. committees.

Research: Professor Shtein's work has focused on enhancement of the performance of organic optoelectronic devices and incorporation of energy harvesting devices into novel configurations. Both organic photovoltaics and photodiodes currently suffer from limited device performance. Since organic devices are very thin, many light harvesting strategies for inorganic devices are not applicable to organics. Thus, Professor Shtein has used optical modeling and thin film deposition to engineer external coatings to enhance energy conversion. A second main thrust of his research is concerned with the incorporation of energy harvesting devices into novel configurations, namely cantilevers and textile fibers. Since the early days of near-field scanning optical microscopy, there have been numerous attempts to produce nanoscale light sources for local imaging and spectroscopy. Professor Shtein and his team have succeeded in fabricating and demonstrating both organic light emitting diodes and detectors onto the tip of an atomic

force microscopy cantilever. For this purpose, they developed a process that exploited both the directionality of thermal evaporation and the field focusing effects of tip geometry to achieve localized light-emission and detection. Professor Shtein and his team achieved the first demonstrations of solar cells and light-emitting diodes in this geometry.

Professor Shtein has developed a well funded, high profile, research program, producing twenty refereed archival publications. He has filed nine patents, five of which have been issued, including four based on his research here at Michigan. He is well on his way to establishing a world-class effort on organic electronics. An indication of Professor Shtein's level of promise is the receipt of the 2007 Presidential Early Career Award for Scientists and Engineers.

#### Recent and Significant Publications:

- K. H. An, B. O'Connor, K. P. Pipe, and M. Shtein, "Organic photodetector with spectral response tunable across the visible spectrum by means of internal optical microcavity," *Organic Electronics* 10, (2009) 1152.
- B. O'Connor, C. Haughn, K. H. An, K. P. Pipe, and M. Shtein, "Transparent and conductive electrodes based on unpatterned, thin metal films," *Applied Physics Letters*, 93, (2008) 223304.
- K. H. An, B. O'Connor, K. P. Pipe, Y. Zhao, and M. Shtein, "Scanning Probe Optical Microscopy Using an Integrated Submicron Organic Photodetector," (Proceedings) 2008 *Conference on Lasers and Electro-Optics & Quantum Electronics and Laser Science Conference*, Vols. 1-9 (2008) 1085.
- K. H. An, B. O'Connor, K. P. Pipe, Y. Zhao, and M. Shtein, "Scanning optical probe microscopy with submicrometer resolution using an organic photodetector," *Applied Physics Letters*, 93, (2008) 033311.
- B. O'Connor, K. P. Pipe, and M. Shtein, "Fiber based organic photovoltaic devices," *Applied Physics Letters*, 92, (2008) 193306.
- M. S. Kim, J. S. Kim, J. C. Cho, M. Shtein, L. J. Guo, and J. Kim, "Flexible conjugated polymer photovoltaic cells with controlled heterojunctions fabricated using nanoimprint lithography," *Applied Physics Letters*, 90, (2007) 123113.

Service: Professor Shtein has served on seven departmental committees and several additional committees at the college and university level, a service assignment load that is above what is expected of junior faculty members. Within his department, he has helped to improve the MSE curriculum in his roles on the undergraduate, graduate, and ABET review committees.

Professor Shtein's numerous invitations to serve as organizer and session chair for technical meetings illustrate that he is regarded as a valued leader in his field of research. His service as an organizer for two MRS meetings, three EMC conferences, and one APS meeting focus session are particularly notable, as these are prestigious conferences in the area of material science. For the past three years, he has been instrumental in the organization of the Organic/Inorganic Hybrid Photovoltaics technical program at the Electronic Materials Conference. He has also served as an invited reviewer for the Department of Energy's solid state lighting program for the past three years, further illustrating his status as a recognized leader in the area organic solar cell devices.

In conjunction with colleagues at the School of Art and Design, Professor Shtein has introduced two courses related to energy and material science. In one course, student teams developed exhibits for the Ann Arbor Hands-On Museum. These efforts served to both reduce barriers between the arts and sciences and to produce outstanding educational tools in the sciences for youth visiting the museum. Outside of these broad efforts to promote diversity, he has also specifically contributed to improving the participation of women and under-represented minorities in engineering, where he has provided research opportunities for five female undergraduates, two female high school students, and several female

graduate students in his laboratory. He also volunteers his time for public service, as a faculty judge for local middle school science fairs and as a guest lecturer and panelist on the role of renewable energy in business and society and the role of art and creativity in engineering.

External Reviewers:

Reviewer A: "...Shtein's seminal work on external coatings deserves special mention...he is well on his way to establishing a world-class effort on organic electronics and becoming a major star in the field."

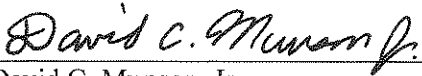
Reviewer B: "I place Professor Shtein in the cohort of new entrants to the organic electronics and photonics field...Shtein stands out from among them as having the ability to push the frontiers of organic device architectures...thus changing the thinking of practitioners in the community."

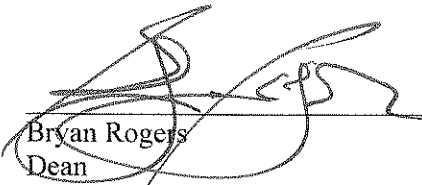
Reviewer C: "Professor Shtein has fully lived up to the great promise his faculty members saw in the [junior] researcher...there are several further examples of his research which illustrate his great facility to bring together different scientific and technical concepts, creating something new and possibly important..."

Reviewer D: "His funding is far above what is seen for faculty at this level of their careers, and would be considered excellent for someone...at the full professor level...his work with multi layer optical fibers for light absorption (photovoltaics) and light emission is one of the most creative things that I have seen in the optoelectronics field in a long time."

Reviewer E: "...this body of work is of the highest quality, consistent with a number of significant awards bestowed upon Max during this time...Max's work represents, to my knowledge, the only examples of solar cells of LED's in this geometry."

Summary of Recommendation: Professor Shtein has established a strong national and international presence in novel organic electronic device architectures and optimization of materials and device performance. He is a dedicated teacher and mentor. His contributions to service for the college, the university and the profession are significant. It is with the support of the College of Engineering Executive Committee that I recommend Max Shtein for promotion to associate professor of materials science and engineering, with tenure, Department of Materials Science and Engineering, associate professor of chemical engineering, without tenure, Department of Chemical Engineering, associate professor of macromolecular science and engineering, Macromolecular Science and Engineering Program, College of Engineering, and associate professor of art and design, without tenure, School of Art and Design.

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

  
Bryan Rogers  
Dean  
School of Art and Design

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