

PROMOTION RECOMMENDATION
The University of Michigan
College of Engineering

Katsuo Kurabayashi, associate professor of mechanical engineering, with tenure, Department of Mechanical Engineering, and associate professor of electrical engineering and computer science, without tenure, Department of Electrical Engineering and Computer Science, College of Engineering, is recommended for promotion to professor of mechanical engineering, with tenure, Department of Mechanical Engineering, and professor of electrical engineering and computer science, without tenure, Department of Electrical Engineering and Computer Science, College of Engineering.

Academic Degrees:

Ph.D.	1998	Stanford University, Materials Science and Engineering, Stanford, CA
M.S.	1994	Stanford University, Materials Science and Engineering, Stanford, CA
B.S.	1992	University of Tokyo, Precision Engineering, Tokyo, Japan

Professional Record:

2006 – present	Associate Professor (with tenure), Department of Mechanical Engineering, University of Michigan
2006 – present	Associate Professor (without tenure), Department of Electrical Engineering and Computer Science, University of Michigan
2004 – 2006	Assistant Professor, Department of Electrical Engineering and Computer Science, University of Michigan
2000 – 2006	Assistant Professor, Department of Mechanical Engineering, University of Michigan
1999	Research Associate, Department of Mechanical Engineering, Stanford University, Stanford, CA

Summary of Evaluation:

Teaching: Professor Kurabayashi has taught a wide range of undergraduate core classes at Michigan. He has served as the course leader for ME320 (Fluid Mechanics I) since 2006. He has also contributed to our graduate education by revitalizing the MEMS course (ME553) via adding content that is more relevant to current ME research fields. The course has been subsequently adopted as a graduate core course as part of the new ME Ph.D. qualifying exam. His teaching evaluations have been good. Since his last promotion, most of his Q2 evaluations have been around or above 4.0. Students consider Professor Kurabayashi an effective and knowledgeable teacher, and they greatly appreciate his willingness to help them beyond what is the norm.

Professor Kurabayashi has also demonstrated excellence in advising graduate students in research. He has graduated 10 Ph.D. students and two M.S. students. He currently advises four Ph.D. students and one M.S. student in his group. His students have been publishing with him in high quality journals. In addition, Professor Kurabayashi has contributed to student mentoring by serving as a faculty advisor to an international student organization.

Research: Professor Kurabayashi is a nationally and internationally renowned scholar and leading researcher in the field of micro heat transfer, microfluidics and nanotechnology. Highlights of his accomplishments include the use of biomolecular motors to transport analyte molecules to detectors, the development of a cytometer system with integrated fluidics and optics, and the development of a

micromachined modulator for two-dimensional gas chromatography, all of which have attracted significant interest and praise from the research community and his peers.

Professor Kurabayashi has developed a strong research program at Michigan. His projects are well supported by a diverse set of funding agencies, most of which use a highly competitive peer review process to evaluate the scholarly nature and potential impact of the proposals. Since last promotion, he has served as the principal investigator or co-principal investigator on four grants from the National Science Foundation, two grants from the National Institutes of Health, and one from the Wallace H. Coulter Foundation, amongst others. This is a robust portfolio that indicates active and sustainable research activities.

Professor Kurabayashi has published over 30 full-length journal publications, many in high impact and high quality journals. Since promotion to his current rank, he has published 16 full-length journal papers and eight shorter communications in journals. In addition, he has published 11 papers in refereed conference proceedings. The quality and impact of his work and publications have been highly praised by his peers.

Recent and Significant Publications:

- Kim, S.-J., Serrano, G., Kurabayashi, K., and Zellers, E.T., "Evaluation of Microfabricated Thermal Modulator for Comprehensive Two-Dimensional Gas Chromatography," *Analytical Chemistry*, published online, DOI: 10.1021/ac200336e, 2011.
- Huang, N.-T., Truxal, S.C., Tung, Y.-C., Hsiao, Y., Luker, G.D., Takayama, S., and Kurabayashi, K., "Multiplexed spectral signature detection for microfluidic color-coded bioparticle flow," *Analytical Chemistry*, vol.82, pp. 9506–9512, 2010.
- Lin, C.T., Meyhofer, E., and Kurabayashi, K., "Predicting the stochastic guiding of kinesin-driven microtubules in microfabricated tracks: A statistical-mechanics-based modeling approach," *Physical Review E*, vol. 81, No.011919, 2010.
- Kim, S.-J., Reidy, S.M, Block, B., Wise, K.D., Zellers, E.T., and Kurabayashi, K., "Microfabricated Thermal Modulator for Comprehensive Two-Dimensional Micro Gas Chromatography: Design, Thermal Modeling, and Preliminary Testing," *Lab on a Chip*, vol. 10, pp. 1647-1654, 2010. (a cover image article)
- Kim, S.-J., Wang, F., Burns, M.A., and Kurabayashi, K., "Temperature-Programmed Natural Convection for Micromixing and Biochemical Reaction in a Single Microfluidic Chamber," *Analytical Chemistry*, vol. 81, pp. 4510-4516, 2009.
- Shalaby, M.M., Wang, Z., Chow, L.L.W., Jensen, B.D., Volakis, J.L., Kurabayashi, K., and Saitou, K., "Robust Design of RF-MEMS Cantilever Switches Using Contact Physics Modeling," *IEEE Transaction on Industrial Electronics*, vol. 56, No. 4, pp. 1012-1021, 2009.
- Chung, H., Kurabayashi, K., and Das, S., "Laser micro-machining using near-field optics," *Applied Surface Science*, vol. 254, pp. 5105-5110, 2008.
- Truxal, S.C., Tung, Y.-C., and Kurabayashi, K. "A Flexible Nanograting Integrated Onto Silicon Micromachines by Soft Lithographic Replica Molding and Assembly," *Journal of Microelectromechanical Systems*, vol. 17, pp. 393-401, 2008.
- Truxal, S.C., Kurabayashi, K., and Tung, Y.-C., "Design of a MEMS Tunable Polymer Grating for Single Detector Spectroscopy," *International Journal of Optomechatronics*, 2, pp. 75-87, 2008.

Service: Professor Kurabayashi has been a good citizen in serving the University and the technical community. He has been a member on several important departmental committees, such as the Graduate Program Committee, Undergraduate Program Committee, Faculty Search Committees, Internal Planning Committee, and Advisory Committee. He is an associate editor for the *International Journal of Optomechatronics*, and has been a guest editor for *IEEE Transactions on Advanced Packaging*. He has

served on the ASME Heat Transfer K-15 executive committee and on a Steering Committee for the SPIE ISOT Optomechanronics Micro/Nano Devices and Components Division. He has also served regularly on NSF Review Panels. His efforts in international education and exchange are noteworthy, particularly through management of international partnerships for the NSF WIMS center and the MicRO alliance program between the University of Michigan, Kyoto University in Japan, the University of Freiburg in Germany, and the Institute for Electronics Microelectronics and Nanotechnology in France.

External Reviewers:

Reviewer A: "Most researchers develop devices not systems. Katsuo has the vision of recognizing the importance of system integration...This is a beautiful piece of work. He is not the first one to make a micro cytometer device, but is among the first few ones to integrate hydrodynamic focusing chip and optical excitation/sensing instrument into a system...He has made major impact in the field of micro/nano technologies and established his own field of prominence. Katsuo has demonstrated his leadership in bio-MEMS."

Reviewer B: "His recent move towards biomedical applications by well-targeted projects is very positive and successful and it will be of strong impact for the society. The microfluidics and biomedical MEMS community will benefit also a lot from Dr. Kurabayashi's research."

Reviewer C: "The proposed new approach to realize an innovative microarray immunoassay system is very challenging but has big potential as the new type of technologies...Overall, I believe that Prof. Kurabayashi is one of the top researchers in the field of MEMS."

Reviewer D: "This careful piece of work...The theory he developed...was fundamental for providing design insight for optimization of sample pre-concentration rates in molecular assays...These improvements are highly significant as they will enable heterogeneities of cell populations to be obtained more efficiently, and find application in disease diagnosis and drug discovery...Prof. Kurabayashi is a highly creative individual with an outstanding record."

Reviewer E: "Katsuo has made significant and creative scholarly contributions to his research field, particularly as they relate to the development of new methodologies and integrated microsystems that provide a technological platform for real-world applications ranging from energy to health care to homeland security."

Summary of Recommendation: Professor Kurabayashi is a renowned scholar and highly productive researcher in the emerging areas of micro heat transfer, microfluidics and nanotechnology. He is a well-respected and effective teacher and a caring advisor to our students. He has contributed to the U-M and his professional community with a wide variety of service activities. It is with the support of the College of Engineering Executive Committee that I recommend Katsuo Kurabayashi for promotion to professor of mechanical engineering, with tenure, Department of Mechanical Engineering, and professor of electrical engineering and computer science, without 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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