

Michel M. Maharbiz,
Assistant Professor
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Role in the Center: Co-Investigator

Areas of Research: MEMS, with a focus on biomolecular applications.

A. PROFESSIONAL PREPARATION

Cornell Electrical Engineering and Computer Science, B.S., 1997
University of California, Berkeley Electrical Engineering and Computer Science, Ph.D., 2003

B. APPOINTMENTS

Assistant Professor, EECS Department, University of Michigan 2003-present

C. SYNERGISTIC ACTIVITIES

Prof. Maharbiz has over 5 years of experience in solid-state physics devices, modeling, and fabrication techniques, and their application to biological systems. He is leading a 7-member multidisciplinary research group that is concerned with interfacing biology and microelectronics in different ways, including: Bio-MEMS circuits that alter cell growth via controlled oxygen gradients; implanting circuitry in insect larvae, allowing the mature insect to be controlled by or to control the implants; and biologically-inspired actuators.

Recent relevant professional service activities include: Co-chair, NSF Workshop: "From Macro to Nano: Challenges and Opportunities in Integrative Complex Systems Engineering;" Vice-President of Technical Operations for the IEEE Sensor Council (January 2006–present); Technical Director of Educational Activities for the IEEE Sensor Council (2004–2005).

D. RELATED PUBLICATIONS

1. M. Pinelis, R. W. Kasinskas, R. T. Borno, J. H. Park, E. Chu, N. S. Forbes and M. M. Maharbiz, "Microfluidic devices for the assembly and culture of three-dimensional multi-cellular constructs with diffusion-limited microenvironments," manuscript in prep.
2. T. Bansal, M.P. Chang, M. M. Maharbiz, "A class of low voltage, PDMS-gold 'wet' actuators for use in high-density microfluidics," Lab Chip, submitted
3. R.T. Borno, J.D. Steinmeyer, and M. M. Maharbiz, "Transpiration actuation: the design, fabrication, and characterization of biomimetic microactuators driven by the surface tension of water," Journal of Micromechanics and Microengineering, in press.
4. J. H. Park, T. Bansal, M. Pinelis, M. M. Maharbiz, "Electrolytic patterning of dissolved oxygen microgradients during cell culture," Lab on a Chip, 6, pp. 611-622, 2006.
5. M.M. Maharbiz, W. J. Holtz, J.D. Keasling, R.T. Howe, "Microbioreactor arrays with parametric control for high-throughput experimentation," Biotechnology & Bioengineering, vol. 85, no. 4, pp. 376 - 381, 20 February 2004.
6. M.M. Maharbiz, W. J. Holtz, S. Sharifzadeh, J.D. Keasling, R.T. Howe, "A Microfabricated Electrochemical Oxygen Generator for High-Density Cell Culture Arrays," J MicroElectroMechanical Sys, vol. 12, no. 5, pp. 590-599, October 2003.
7. V. Milanovic, M. M. Maharbiz, and K. Pister, "Batch Transfer Integration of RF Microrelays," IEEE Microwave and Guided Wave Letters, vol. 10, no. 8, pp. 313-315, Aug. 2000.

E. RELATED CONFERENCE PAPERS

1. M. Pinelis and M. Maharbiz, "Microfluidic devices for the assembly and culture of three-dimensional, diffusion-limited multicellular constructs," Tenth International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS), Tokyo, Japan, November 2006.
2. T. Bansal and M. Maharbiz, "'Wet' AC Actuated Microfluidic Micropore Array for Patterning Diffusible

- Gradients During Cell Culture," Tenth International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS), Tokyo, Japan, November 2006.
3. P. Padmanabhan and M. Maharbiz, "A Microelectrolytic Device for Electronically Controlled Nitric Oxide Micro-Gradient Generation," Tenth International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS), Tokyo, Japan, November 2006.
 4. M.I. Pinelis, J.H. Park and M. M. Maharbiz, "A micro "Flea Circus": Self-assembly of bacteria through spatio-temporal control of aerotaxis," 19th IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2006), Ltfi Kirdar Convention and Exhibition Centre, Istanbul, Turkey, January 22 - 26, 2006.
 5. T. Bansal, M. M. Maharbiz, "Diffusion Based Chemical Microgradient array for cell culture", Ninth International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS) 2005, Boston, MA, October 2005.
 6. R.T. Borno, M. M. Maharbiz, "Distributed actuation based on Young-Laplace forces," The 13th International Conference on Sensors and Actuators (Transducers 2005), Coex, Seoul, Korea, June 5-9, 2005.
 7. J. H. Park, T. Bansal, B.H. Chueh, S. Takayama, M. M. Maharbiz, "Electrolytic patterning of dissolved oxygen microgradients during cell culture," 18th IEEE International Conference on Micro Electro Mechanical Systems (MEMS 2005), Fontainebleau Hilton Resort, Miami Beach, Florida, January 30 - February 3, 2005
 8. M. Pinelis, J. Park and M. Maharbiz, "Bacterial Aerotaxis Assays with Spatial and Temporal Control of Oxygen Microscale Gradients," Biomedical Engineering Society (BMES), Annual Fall Meeting, Baltimore, Maryland, September 2005
 9. J. H. Park, T. Bansal, M. M. Maharbiz, "Patterning Dissolved Oxygen Microgradients during Cell Culture," Hypoxia and Development, Physiology and Disease (Keystone Symposia), Beaver Run Resort, Breckenridge, Colorado, January 16 - 21, 2006.
 10. M.M. Maharbiz, W.J.Holtz, S.Sharifzadeh, J.D. Keasling, R.T. Howe, "A Microfabricated Electrochemical Oxygen Generator for High-Density Cell Culture Arrays," Solid-State Sensor, Actuator, and Microsystems Workshop, Hilton Head Island, South Carolina, June 2-6 2002, pp. 259-264.
 11. M.M. Maharbiz, R. T. Howe, J. D. Keasling, "Silicon Microbial Bioreactor Arrays," 1st Annual International IEEE-EMBS Special Topic Conference on Microtechnologies in Medicine & Biology, Palais des Congres, Lyon, France, October 12-14, 2000, pp. 165-170.
 12. M.M. Maharbiz, R.T. Howe, K.S.J. Pister, "Batch Transfer Assembly of Micro-Components Onto Surface and SOI MEMS," Transducers '99 Conference, Sendai, Japan, June 7-10, 1999, pp. 1478-1481.
 13. M.M. Maharbiz, M.B. Cohn, R.T. Howe, R. Horowitz, A.P. Pisano, "Batch micropackaging by compression-bonded wafer-wafer transfer," Proceedings of 12th International Workshop on Micro Electro Mechanical Systems (MEMS 1999), Orlando, FL, USA, 17- 21 Jan. 1999, pp. 482-489.