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Dr. Tal Nagourney is an electrical engineer with a background in micro-electro-mechanical system (MEMS) design and fabrication.

Prior to joining ESi, Dr. Nagourney conducted his doctoral research at the University of Michigan. There, he carried out a comprehensive study on the nature of energy dissipation mechanisms in blown glass micro-shell resonators for precision MEMS gyroscopes. The resonator performance enabled by his research remains unrivaled.

Dr. Nagourney has a wide range of engineering experience including cleanroom microfabrication, mechanical machining, and precision lapping and polishing. He applies his diverse engineering skillset and strong technical communication background to provide comprehensive analyses to the unique challenges posed by clients.

Areas of Specialization

Failure Analysis

Electrical and Electronics

Inertial Sensors

Education

Ph.D., Electrical Engineering, University of Michigan, 2018

M.Eng., Electrical Engineering, Cornell University, 2012

B.S., Microelectronic Engineering, Rochester Institute of Technology, 2010

February 2018

Professional Affiliations/Honors

Institute of Electrical and Electronics Engineers (IEEE)

Member, 2017 – Present

University of Michigan Engineering Graduate Symposium

Best Poster Award, 1st Prize, 2017

Best Poster Award, 2nd Prize, 2016

University of Michigan Lurie Nanofabrication Facility Users Symposium

Best Poster Award, 1st Prize, 2017

Best Poster Award, 1st Prize, 2016

University of Michigan Workshop on Microsystems Technologies for Internet of Things

Best Poster Award, 1st Prize, 2017

DARPA micro-PNT MRIG micro-Challenge

Winner, 2015

Positions Held

Engineering Systems Inc., Seattle, Washington

Staff Consultant, 2018–Present

University of Michigan, Ann Arbor, Michigan

Graduate Student Research Assistant, 2013–2018

Lurie Nanofabrication Facility User Committee Member, 2014–2018

Bright Source Industries (Israel) Ltd., Jerusalem, Israel

Future Technologies Electrical Engineering Consultant, 2011

Rochester Institute of Technology, Rochester, New York

Research Assistant on Team Galt, 2009–2010

Eastman Kodak Company, Rochester, New York

Co-Op Employee in Display Technologies Group, 2008

Publications/Presentations

- B. Shiari, **T. Nagourney**, S. Singh, J. Cho and K. Najafi, "Simulation-Based Approach for Fabrication of Micro-Shell Resonators with Controllable Stiffness and Mass Distribution," IEEE International Symposium on Inertial Sensors and Systems, Lake Como, Italy, 2018.
- T. Nagourney**, S. Singh, B. Shiari, J. Cho, and K. Najafi, "Fabrication of Hemispherical Fused Silica Micro-Resonator with Tailored Stiffness and Mass Distribution," 31st IEEE International Conference on Micro Electro Mechanical Systems, Belfast, Ireland, 2018.
- A. Darvishian, **T. Nagourney**, J. Cho, B. Shiari, and K. Najafi, "Thermoelastic Dissipation in Micromachined Birdbath Shell Resonators," J. Microelectromech. Syst., vol. 26, no. 4, pp. 758–772, August 2017.
- B. Shiari, **T. Nagourney**, A. Darvishian, J. Cho, and K. Najafi, "Simulation of Blowtorch Reflow of Fused Silica Micro-Shell Resonators," J. Microelectromech. Syst., vol. 26, no. 4, pp. 782–792, August 2017.
- T. Nagourney**, J. Cho, B. Shiari, A. Darvishian, and K. Najafi, "259 Second Ring-Down Time and 4.45 Million Quality Factor in 5.5 khz Fused Silica Birdbath Shell Resonator," in Transducers – 19th International Conference on Solid-State Sensors, Actuators and Microsystems, Kaohsiung, pp. 790-793, Taiwan, 2017.
- B. Shiari, **T. Nagourney**, A. Darvishian, J. Cho, and K. Najafi, "Numerical Study of Impact of Surface Roughness on Thermoelastic Loss of Micro-Resonators," IEEE International Symposium on Inertial Sensors and Systems, pp. 74-77, Kauai, HI, 2017.
- C. Boyd, J.-K. Woo, J. Cho, **T. Nagourney**, A. Darvishian, B. Shiari, and K. Najafi, "Effect of Drive-Axis Displacement on MEMS Birdbath Resonator Gyroscope Performance," IEEE International Symposium on Inertial Sensors and Systems, pp. 1-2, Kauai, HI, 2017.
- A. Darvishian, B. Shiari, J. Cho, **T. Nagourney**, and K. Najafi, "Anchor Loss in Hemispherical Shell Resonators," J. Microelectromech. Syst., vol. 25, no. 1, pp. 51–56, February 2017.
- J. Cho, **T. Nagourney**, A. Darvishian, and K. Najafi, "Ultra Conformal High Aspect-Ratio Small-Gap Capacitive Electrode Formation Technology for 3D Micro Shell Resonators," IEEE International Conference on Micro Electro Mechanical Systems, pp. 1169-1172, Las Vegas, NV, 2017.
- T. Nagourney**, J. Cho, A. Darvishian, B. Shiari, and K. Najafi, "130 Second Ring-Down Time and 3.98 Million Quality Factor in 10 khz Fused Silica Micro Birdbath Shell Resonator," Hilton Head Workshop: A Solid-State Sensors, Actuators and Microsystems Workshop, pp. 408-411, Hilton Head Island, SC, 2016.
- B. Shiari, **T. Nagourney**, A. Darvishian, J. Cho, and K. Najafi, "Numerical Prediction of Stress Evolution During Blowtorch Reflow of Fused Silica Micro-Shell Resonators," IEEE International Symposium on Inertial Sensors and Systems, pp. 13-16, Laguna Beach, CA, 2016.

- T. Nagourney**, J. Cho, A. Darvishian, B. Shiari, and K. Najafi, "Micromachined High-Q Fused Silica Bell Resonator with Complex Profile Curvature Realized Using 3D Micro Blowtorch Molding," Transducers – 18th International Conference on Solid-State Sensors, Actuators and Microsystems, pp. 1311-1314, Anchorage, AK.
- B. Shiari, A. Darvishian, **T. Nagourney**, J. Cho, and K. Najafi, "A Comparison Between Experiments and FEM Predictions for Blowtorch Reflow of Fused Silica Micro-Shell Resonators," Transducers – 18th International Conference on Solid-State Sensors, Actuators and Microsystems, pp. 776-779, Anchorage, AK, 2015.
- T. Nagourney**, J. Cho, A. Darvishian, B. Shiari, and K. Najafi, "Effect of Metal Annealing on the Q-Factor of Metal-Coated Fused Silica Micro Shell Resonators," IEEE International Symposium on Inertial Sensors and Systems, pp. 1-5, Hapuna Beach, HI, 2015.
- J. Cho, **T. Nagourney**, A. Darvishian, B. Shiari, J.-K. Woo, and K. Najafi, "Fused Silica Micro Birdbath Shell Resonators with 1.2 Million Q and 43 Second Decay Time Constant," Hilton Head Workshop: A Solid-State Sensors, Actuators and Microsystems Workshop, pp. 103-104, Hilton Head Island, SC, 2014.
- A. Darvishian, B. Shiari, J. Cho, **T. Nagourney**, and K. Najafi, "Investigation of Thermoelastic Loss Mechanism in Shell Resonators," ASME International Mechanical Engineering Congress and Expo, pp. 1-6, 2014.

Patents

- K. Najafi, **T. Nagourney**, and J. Cho, "Three Dimensional Microstructures and Fabrication Process," U.S. Patent 9 796 586 B2, October 24, 2017.
- K. Najafi, J. Cho, A. Darvishian, G. He, B. Shiari, and **T. Nagourney**, "Gyroscope and Fabrication Process," U.S. Patent Application 15/444 450, February 28, 2017.