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## **TAL R. NAGOURNEY, PH.D., P.E., CFEI**

### **SENIOR CONSULTANT**

[trnagourney@engsys.com](mailto:trnagourney@engsys.com)

Dr. Tal Nagourney is an electrical engineer specializing in fire investigation and failure analysis of consumer electronics, appliances, batteries, USB devices, and semiconductors. He conducts scientific investigations to guide critical decisions.

His expertise is built on a foundation of research and experimental design from his doctoral studies in micro-electro-mechanical systems. As a forensic electrical engineer, he leverages that experience to lead an effective investigation, identify the root cause, and present the findings clearly to any audience.

In the field, Dr. Nagourney thoroughly documents the scene and ensures critical evidence is preserved. In the laboratory, he performs meticulous testing to identify issues with design, manufacturing, and usage. His experience with failures lends itself to design review, and he helps his clients avoid product failures that elude typical safety standard testing.

### **Areas of Specialization**

Electrical & Electronic Equipment	Consumer Electronics
Fire and Explosion Investigation	Consumer Appliances
Lithium-ion Battery Failures	Semiconductor Devices
Battery Management Systems	Radio Communications (RF)

### **Education**

Ph.D.	Electrical Engineering, University of Michigan, 2018 <i>High-Q Fused Silica Micro-Shell Resonators for Navigation-Grade MEMS Gyroscopes</i>
M.Eng.	Electrical Engineering, Cornell University, 2012
B.S.	Microelectronic Engineering, Rochester Institute of Technology, 2010

### **Licensed Professional Engineer (P.E.)**

State of Washington ..... License No. 21031868

*January 2025*

## **Professional Affiliations**

### **Institute of Electrical and Electronics Engineers (IEEE)**

Member

Product Safety Engineering Society (PSES)

### **National Association of Fire Investigators (NAFI)**

Member

CFEI Certification No.: 23786-13772

### **International Consumer Product Health and Safety Organization (ICPHSO)**

Member

## **Additional Training**

### **2024 NFPA 70E Standard for Electrical Safety in the Workplace**

Electrical Safety Training Program

1-day Online Training, Jan. 2025

### **National Association of Fire Investigators**

Fire Investigation Training Program

4-day Classroom Training, Feb. 2024

### **Battery Safety Summit**

Implementing Lithium-Ion Battery Safety to Meet Increasing Energy Demands

Additional Tutorial: Li-ion Battery Safety and Thermal Runaway

2-day Conference, Nov. 2023

### **Timron Advanced Connector Technologies**

Intensive Course on Electrical Contacts and Connector Design for Electronics and Microelectronics Applications

3-day Classroom Training, Jun. 2022

### **National Fire Protection Association**

National Electrical Code Essentials

3-day Classroom Training, Nov. 2019

### **National Association of Fire Investigators**

Fire Investigation Training Program

4-day Classroom Training, Mar. 2019

## Honors

### **University of Michigan Engineering Graduate Symposium**

Best Poster Award, 1<sup>st</sup> Prize, 2017

Best Poster Award, 2<sup>nd</sup> Prize, 2016

### **University of Michigan Lurie Nanofabrication Facility Users Symposium**

Best Poster Award, 1<sup>st</sup> Prize, 2017

Best Poster Award, 1<sup>st</sup> Prize, 2016

### **University of Michigan Workshop on Microsystems Tech for Internet of Things**

Best Poster Award, 1<sup>st</sup> Prize, 2017

### **DARPA micro-PNT MRIG micro-Challenge**

Winner, 2015

## Positions Held

### **Engineering Systems Inc., Seattle, Washington**

Senior Consultant, 2025–Present

Senior Staff Consultant, 2022–2024

Staff Consultant, 2018–2021

### **University of Michigan, Ann Arbor, Michigan**

Doctoral Researcher, 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

## Presentations

**T. Nagourney**, “Investigation of Electrical Fires,” Training course presented to International Association of Arson Investigators (IAAI), Washington Chapter 21, Kent, WA, Jan. 2024.

**T. Nagourney**, K. Farnam, N. Simons, “Pursuit of Lithium-Ion Battery Fire Claims,” Cozen O'Connor CLE, Seattle, WA, Mar. 2023.

**T. Nagourney**, “USB Type-C: Connect With Care,” International Consumer Product Health and Safety Organization (ICPHSO), Orlando, FL, Feb. 2023.

**T. Nagourney**, D. Fleming, “Defense of Lithium Batteries Involved in a Fire,” Washington Defense Trial Lawyers (WDTL) CLE, Seattle, WA, Nov. 2020.

## Publications

**T. Nagourney**, J. Jordan, L. Marsh, D. Scardino, and B. May, “The Implications of Post-Fire Physical Features of Cylindrical 18650 Lithium-Ion Battery Cells,” *J. Fire Technol.*, Jan. 2021, DOI: 10.1007/s10694-020-01077-8.

G. He, R. Gordenker, J-K. Woo, J. Nees, B. Shiari, **T. Nagourney**, J. Cho, and K. Najafi, “Laser Self-Mixing Interferometry for Precision Displacement Measurement in Resonant Gyroscopes,” in 2019 IEEE Int. Symp. on Inertial Sensors and Systems (INERTIAL), Naples, FL, 2019, pp. 183–186, DOI: 10.1109/ISISS.2019.8739659.

S. Singh, **T. Nagourney**, J. Cho, A. Darvishian, K. Najafi, and B. Shiari, “Design and fabrication of high-Q birdbath resonator for MEMS gyroscopes,” in 2018 IEEE/ION Position, Location and Navigation Symp. (PLANS), Monterey, CA, 2018, pp. 15–19, DOI: 10.1109/PLANS.2018.8373358.

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,” in 2018 IEEE Int. Symp. on Inertial Sensors and Systems (INERTIAL), Moltrasio, Italy, 2018, pp. 145–148, DOI: 10.1109/ISISS.2018.8358146.

**T. Nagourney**, S. Singh, B. Shiari, J. Cho, and K. Najafi, “Fabrication of Hemispherical Fused Silica Micro-Resonator with Tailored Stiffness and Mass Distribution,” in 2018 IEEE Micro Electro Mechanical Systems (MEMS), Belfast, Ireland, 2018, pp. 1000–1003, DOI: 10.1109/MEMSYS.2018.8346727.

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, Aug. 2017, DOI: 10.1109/jmems.2017.2715319.

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, Aug. 2017, DOI: 10.1109/JMEMS.2017.2693291.

**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 2017 Transducers — 19<sup>th</sup> Int. Conf. on Solid-State Sensors, Actuators and Microsystems (TRANSDUCERS), Kaohsiung, Taiwan, 2017, pp. 790–793, DOI: 10.1109/transducers.2017.7994167.

B. Shiari, **T. Nagourney**, A. Darvishian, J. Cho, and K. Najafi, “Numerical Study of Impact of Surface Roughness on Thermoelastic Loss of Micro-Resonators,” in 2017 IEEE Int. Symp. on Inertial Sensors and Systems (INERTIAL), Kauai, HI, 2017, pp. 74–77, DOI: 10.1109/isiss.2017.7935681.

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," in 2017 IEEE Int. Symp. on Inertial Sensors and Systems (INERTIAL), Kauai, HI, 2017, pp. 175–176, DOI: 10.1109/isiss.2017.7935697.

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, Feb. 2017, DOI: 10.1109/JMEMS.2016.2636080.

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," in 2017 IEEE 30<sup>th</sup> Int. Conf. on Micro Electro Mechanical Systems (MEMS), Las Vegas, NV, 2017, pp. 1169–1172, DOI: 10.1109/MEMSYS.2017.7863623.

**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," in Hilton Head Workshop: A Solid-State Sensors, Actuators and Microsystems Workshop, Hilton Head Island, SC, 2016, pp. 408–411, DOI: 10.31438/trf.hh2016.109.

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," in 2016 IEEE Int. Symp. on Inertial Sensors and Systems, Laguna Beach, CA, 2016, pp. 13–16, DOI: 10.1109/ISISS.2016.7435533.

**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," in 2015 Transducers — 18<sup>th</sup> Int. Conf. on Solid-State Sensors, Actuators and Microsystems (TRANSDUCERS), Anchorage, AK, 2015, pp. 1311–1314, DOI: 10.1109/TRANSDUCERS.2015.7181172.

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," in 2015 Transducers — 18<sup>th</sup> Int. Conf. on Solid-State Sensors, Actuators and Microsystems (TRANSDUCERS), Anchorage, AK, 2015, pp. 776–779, DOI: 10.1109/TRANSDUCERS.2015.7181038.

**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," in 2015 IEEE Int. Symp. on Inertial Sensors and Systems, Hapuna Beach, HI, 2015, pp. 13–17, DOI: 10.1109/ISISS.2015.7102361.

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," in Hilton Head Workshop: A Solid-State Sensors, Actuators and Microsystems Workshop, Hilton Head Island, SC, 2014, pp. 103–104, DOI: 10.31438/trf.hh2014.28.

A. Darvishian, B. Shiari, J. Cho, **T. Nagourney**, and K. Najafi, "Investigation of Thermoelastic Loss Mechanism in Shell Resonators," in ASME 2014 Int. Mech. Eng. Congr. and Expo., Montreal, Canada, 2014, pp. 1–6, DOI: 10.1115/IMECE2014-39331.

## Patents

K. Najafi, **T. Nagourney**, and J. Cho, "Three Dimensional Microstructures and Fabrication Process," U.S. Patent 9 796 586, Oct. 24, 2017.

K. Najafi, J. Cho, A. Darvishian, G. He, B. Shiari, and **T. Nagourney**, "Gyroscope and Fabrication Process," U.S. Patent 11 548 805, Jan. 10, 2023.