JOSEPH JOHN TALGHADER
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Electrical and Computer Engineering
University of Minnesota
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Joseph Talghader obtained his B.S. in electrical engineering from Rice University. He was awarded an NSF Graduate Fellowship and attended the University of California at Berkeley where he received his M.S. in 1993 and Ph.D. in 1995. He worked at Texas Instruments as a Process Development Engineer, where he investigated EEPROM memory design and reliability issues. After graduating from Berkeley in 1995, he joined Waferscale Integration where he developed microfabrication processes for high-density nonvolatile memory devices. In 1997 Dr. Talghader joined the faculty at the University of Minnesota as an Assistant Professor and was later promoted to Associate and then Full Professor. He has been extensively involved in optical materials, optical coatings, and directed energy component technologies. Among his most impactful work has been on the study of particles on laser-induced material breakdown. His research group also develops thermal infrared and radiation heat transfer devices and micro- and nano-opto-mechanical systems and has demonstrated the highest sensitivity uncooled thermal detectors and the first tunable multispectral thermal detectors. He has several patents and patent applications in these areas. His group works in a number of different fields including recent research on the measurement of the optical and materials properties of glacial ice. Dr. Talghader has received the Antarctic Service Medal of the United States in 2014 from the National Science Foundation, an Outstanding Editor Award from Light: Science and Applications, 3M Faculty Awards on three occasions, and the University of Minnesota Innovations Awards on four occasions. His technology has been a Finalist for the Minnesota Cup for entrepreneurs. He has served on various program committees and reviews, including service on the triennial strategic planning panel for the Army Research Office Electronics Division, as General and multiple Program chairs of the International Conference on Optical MEMS and Nanophotonics, and twice as Guest Editor of the Journal of Selected Topics in Quantum Electronics.

EDUCATION:

Ph.D., 1995, University of California at Berkeley, Electrical Engineering
Advisor: J. Stephen Smith
Thesis Title: Optimization of Vertical-Cavity Surface-Emitting Lasers and Processing for Fluidic Self-Assembly
M.S., 1993, University of California at Berkeley, Electrical Engineering
B.S., 1988, Rice University, Electrical Engineering

PRESENT POSITION:

Professor of Electrical and Computer Engineering

University of Minnesota, 2008-present

Associate Professor of Electrical and Computer Engineering
University of Minnesota, 2003-2008

Assistant Professor of Electrical and Computer Engineering
University of Minnesota, 1997-2003

PREVIOUS POSITIONS:

Senior Device Physicist,
Waferscale Integration (now part of ST Microelectronics), 1995-1996
Development of high density, low power Flash and EPROM memory.

Graduate Student Researcher,
UC-Berkeley, 1991-1992, 1993-1995
GaAs and Si micromachining for optoelectronic self-assembly.
Epitaxial growth, materials research, device design, and fabrication of vertical-cavity surface-emitting lasers.

Process Development Engineer,
Texas Instruments, 1992-1993
Device and materials characterization for EEPROM and CMOS processes.

PROFESSIONAL ACTIVITIES/AWARDS

Optica Fellow (Optical Society of America Fellow), Citation: "For advances in high optical power thin film physics and thermal infrared coating design"
Antarctic Service Medal of the United States, 2014
Outstanding Editor Award 2016, *Light: Science and Applications*, Nature Publishing Group
Finalist, Minnesota Cup (Entrepreneurship Award), Ascir Inc.
Editor, *Light: Science and Applications*, Nature Publishing Group
Member of Borehole Logging Working Group (sub group of US Polar research Scientific Advisory Board)
Army Research Office, Electronics, Three Year Planning Review Committee
University of Minnesota Innovations Award 2006, 2008, 2014
University of Minnesota Innovations Award 2010, for U.S. Patent 7,800,066, "Detection beyond the standard radiation noise limit using reduced emissivity and optical cavity coupling."
Steering Committee – IEEE Optical MEMS and Nanophotonics Conference, 2015-present, and 2002-2009
Guest Editor, *IEEE Photonics Technology Letters*, Special Issue on Optical MEMS, 2016.
Lead Guest Editor, *IEEE Journal of Special Topics on Quantum Electronics*, Special Issue on Optical Micro- and Nano- Systems
Conference Chair, 2006 IEEE/LEOS Optical MEMS and Nanophotonics Conference, Yellowstone/Big Sky
Guest Editor, *IEEE Journal of Special Topics on Quantum Electronics*, Special Issue on Optical Microsystems

Program Chair, 2015 IEEE Photonics Society Optical MEMS and Nanophotonics Conference, Jerusalem, Israel
Program Chair, 2003 IEEE/LEOS Optical MEMS Conference, Hawaii, Hawaii
Program Committee, Conference on Lasers and Electro-optics, Pacific Rim. August 2018
Program Committee, IEEE Optical MEMS and Nanophotonics Conference, 2007-2013, 2017, 2018, 2019, 2021
Program Committee, 2019, 2017, 2009 Transducers
Program Committee, 2003-2007 SPIE Micromachining and Microfabrication Conference, San Jose, CA
Program Committee, Optical MEMS and Nanophotonics Conference, 2000-2002, 2003-2005
Steering Committee, IEEE Optical MEMS and Nanophotonics, 2015-present
3M Faculty Award, 2003
3M Faculty Award, 2002
3M Faculty Award, 2001
President of Minnesota Section of the Optical Society of America, 2002-3
Vice President of Minnesota Section of the Optical Society of America, 2001-2
Secretary/Treasurer of Minnesota Section of the Optical Society of America, 2000-1
Participant in NSF ScienceWorks! Program for Minneapolis Public Schools
HKN/ECS Department Finalist 1999 Teacher of the Year
National Science Foundation Graduate Fellow
IEEE, Eta Kappa Nu
Optical Society of America
Sigma Pi Sigma

INVITED CONFERENCE TALKS, PRESENTATIONS, AND EDITORIALS:

Keynote J. J. Talghader, "The impact of surface particulates and laser-accelerated particles on continuous-wave laser damage," *SPIE Laser Damage Conference*, Rochester, NY, 13 October 2021.

Invited Webinar J. J. Talghader, "Fundamental properties and real-world breakdown of low absorption thin films from the visible to infrared," *OSA Thin Film Technical Group*, 12 October, 2021.
https://www.optica.org//en-us/meetings/webinar/2021/10_october/fundamental_properties_and_real-world_breakdown_of/

J. J. Talghader, High Power Optical Breakdown and Design to Combat Dirt and Airborne Particles, *Proceedings of CLEO, Conference on Lasers and ElectroOptics*, Virtual, May 13, 2020, 2 pages.

J. J. Talghader, A. Brown, and T. Mitra, "The failure of high power optics due to dirt and airborne particles," *OSA Laser Congress, Advanced Solid State Lasers*, Vienna, Austria, October 2, 2019, AW3A.1.

J. Talghader, “Mitigating Thermal Effects in the Mirrors and Cavities of High Power Laser Systems,” *SPIE Defense + Security, High Power Lasers*, Strasbourg, France, September 12, 2019.

J. J. Talghader, “Particle acceleration and particle-induced breakdown in high power laser optics,” *High Power Lasers Conference in SPIE Defense and Security*, Berlin, Germany, September 12, 2018.

J. J. Talghader, T. Mitra, A. K. Brown, D. M. Bernot, S. Defrances, “Laser Acceleration of Absorbing Particles and Their Role in Inducing Early Materials Failure,” *Optical Trapping and Optical Micromanipulation in SPIE Optics and Photonics*, San Diego, August 22, 2018.

J. J. Talghader, “Revisiting Planck’s Law: Thermal Emission and Radiation Noise in Subwavelength Optical Cavities,” *Light Conference 2018*, Changchun, China, July 16-18, 2018.

J. J. Talghader, "Future Directions for Microbolometers and Thermopile Infrared Detectors," *Image Sensing Technologies: Materials, Devices, Systems, and Applications V in SPIE Defense and Commercial Sensing*, Orlando, FL, April 2018.

J. J. Talghader, "Future Directions for Uncooled Infrared Detectors," *DoD Basic Research Forum*, Arlington, VA, October 19, 2017.

J. J. Talghader, "Revisiting Planck’s Law: Thermal Emission and Radiation Noise in Subwavelength Infrared Cavities," *Conference on Lasers and Electrooptics Pacific Rim*, Oral 3-2F-1, Singapore, August 3, 2017.

J. J. Talghader, “Optical breakdown of contaminated materials: Physics wins even with dirt,” *Emerging Technologies CMOS Workshop*, Warsaw, Poland, May 29, 2017.

J. J. Talghader, “Optical breakdown of contaminated materials: Physics wins even with dirt,” Seminar, University of Ljubljana, Ljubljana, Slovenia, May 26, 2017.

J. J. Talghader, “Microsensors and Particles: Infrared detectors, solar driven devices, and sensing inside explosions,” *Stanford Photonics Research Conference*, Stanford, CA, September 19-20, 2016.

J. J. Talghader, “Optical Breakdown of Contaminated Materials: Physics Wins even with Dirt,” *Light Conference 2016*, Changchun, China, July 4-8, 2016.

J. J. Talghader, “Controlling the Infrared: Macro-to-Micro-to-Nano and from Photons to Electron Waves,” *EECS Seminar*, Penn State University, State College, PA, October 13, 2016.

J. J. Talghader, “Controlling Thermal and Photon Emission: Pushing Against the Background Noise Limit and Tuning Bandgaps,” *University of Southern California Nanoscience and Technology Seminar*, Los Angeles, CA, October 20, 2016.

J. J. Talghader, "Microsensors and Particles: Infrared detectors, solar driven devices, and sensing inside explosions," Halliburton, Houston, TX, October 26, 2016.

J. J. Talghader, "Optical Borehole Logging of Volcanic Layers in Antarctica and Nanomechanical Tuning of the Semiconductor Bandgap," *ECE Seminar*, Rice University, Houston, TX, October 27, 2016.

J. J. Talghader, "Optical Engineering in Antarctica: Borehole Logging of Volcanic Eruptions and Ice Crystal Structure," *ECE Colloquium*, University of Texas, Austin, TX, November 16, 2016.

J. J. Talghader, "Controlling the Infrared: Macro-to-Micro-to-Nano and from Photons to Electron Waves," *ECE Seminar*, J. J. Pickle Research Campus, University of Texas, Austin, TX November 17, 2016.

J. J. Talghader, "Physical Limits of Thermal Infrared Detection", *IEEE Sensors Conference*, Busan, South Korea, November 1-4, 2015.

J. J. Talghader, "Thermal Performance Limits of Optical Micro- and Nanomechanical Devices," *International Conference on Micro/Nano Optical Engineering*, July 3-5, 2014, Changchun, China.

J. J. Talghader, "Laser-induced thermal breakdown of optical coatings," *High Power Lasers Conference, Security and Defense Symposium*, Dresden, Germany, September 23, 2013.

J. J. Talghader, "Thermal performance limits of micro- and nanomechanical devices," *International Symposium on Applications and Potentials of MEMS/NEMS*, Tsinghua University, Beijing, China, April 18-19, 2013.

J. J. Talghader, "Thermal history sensing using thermoluminescence: measurement concepts and testing," *DTRA Workshop on Time-Dependent Temperature Measurements in Energy Release Processes*, Chicago, IL, October, 10, 2012.

J. J. Talghader, "High-Sensitivity Infrared Detection and Spectroscopy," 2012 *CMOS Emerging Technologies Workshop*, Vancouver, BC, July 18-21, 2012.

J. J. Talghader, "Thermal conduction in optical coatings and interfaces: a key to high-power meta-optics," *2011 Laser Damage Conference*, Talk 8190-40, Boulder, CO, September 18-21, 2011.

J. J. Talghader, "Nanomechanical Control of Electron States," *International Conference on Micro/Nano Optical Engineering*, June 12-16, 2011, Changchun, China, p. 15.

J. J. Talghader, "Luminescent microparticles as thermal history sensors," CMOS *Emerging Technologies Workshop*, Vancouver, BC, May 19-21, 2010.

J. J. Talghader, "Micro- and Nano-particles for the Distributed Sensing of Thermal History," *Seventh International Conference on Networked Sensing Systems*, Kassel, Germany, June 15-18, 2010.

J. J. Talghader, "Material Signatures and Tunable High Sensitivity Detection in the Infrared," *5th Asia-Pacific Conference on Transducers and Micro-Nano Technology*, Perth, Western Australia, July 6-9, 2010.

W. B. Song and J. J. Talghader, "IR Detectors with Adaptive Responsivity and Wavelength," SPIE MOEMS-MEMS Micro & Nanofabrication 2007, January 20-25, 2007, *Proceedings of the SPIE*, vol. 6464, *MEMS/MOEMS Components and Their Applications IV*, 2007, article 6460L.

J. J. Talghader, O. Solgaard, and L. Y. Lin, "Editorial: Introduction to the Issue on Optical Micro- and Nano- Systems," *IEEE Journal on Selected Topics in Quantum Electronics*, vol. 13, no. 2, Mar/Apr 2007, p. 145.

J. J. Talghader, "From micro- to nano-: thermal effects in micromachined devices," *2006 Conference on Optoelectronic and Microelectronic Materials and Devices*, Perth, Western Australia, December 6-8, 2006.

J. J. Talghader, "Adaptive imaging with uncooled LWIR detectors," *SPIE Defense and Security Symposium, Intelligent Integrated Microsystems*, Orlando, FL, April 20, 2006.

J. J. Talghader, "Heat and Temperature in Micromechanical Systems," *2005 International Semiconductor Device Research Symposium*, WP6-03, Bethesda, MD, December 7-9, 2005.

J. J. Talghader, "Mechanics of Optical Coatings in Extreme Thermal Environments," *2005 International Conference on Metallurgical Coatings and Thin Films*, San Diego, CA, May 2005.

J. J. Talghader, Topical Review: "Thermal and Mechanical Phenomena in Micromechanical Optics," *Journal of Physics D*:*Applied Physics*, vol. 37, pp. R109-R122, 2004.

O. Solgaard, J. Talghader, H. Toshiyoshi, and H. Kopola, "Editorial: Introduction to the Issue on Optical Microsystems," *IEEE Journal on Selected Topics in Quantum Electronics*, vol. 10, no. 3, May/June 2004, p. 433.

J. J. Talghader, "Ultimate Performance in Optical MEMS," *SPIE International Symposium on Microelectronics, MEMS, and Nanotechnology*, December 10-12, 2003, Perth, Australia.

J. J. Talghader, "Microsensor communication using self-assembly," *NSF International Workshop on Advances in Micro and Nano Technology for Sensing Applications*, Melbourne, Australia, Dec. 12-14, 2002. Co-Sponsored by the Australian Research Council and the Japan Society for the Promotion of Science.

J. R. Leger and J. J. Talghader, "Design of microspectrometers," *2002 LEOS Annual Meeting*, Glasgow, Scotland, November 10-14, 2002.

J. J. Talghader, "Shape control and heat transfer in Optical MEMS," *LEOS Newsletter* (On the Academic Side Feature), vol. 16, no. 3, pp. 3-8, August 2002.

J. J. Talghader, "MEMS confocal microresonator arrays using mirrors with strain-induced curvature*," SPIE – Photonics West – Laser Resonators and Beam Control V*, San Jose, CA, January 22, 2002.

J. J. Talghader, "Wavelength tunable thermal cavity technology," *DSRC Workshop on Reconfigurable Focal Plane Detection Systems*, October 22, 2001, Hosted by Richard Osgood, (DSRC and Columbia University) and John Carrano (DARPA).

J. J. Talghader, "Thermal management in optical MEMS," *Proceedings of the SPIE*, (MOEMS and Miniaturized Systems II Conference), vol. 4561, pp. 20-27, 2001.

J. J. Talghader, "Optical coatings and flatness in micromirrors," NSF Workshop on Adaptive Optics, Berkeley, CA, Nov. 13, 2000.

J. J. Talghader, ``Integration of VCSELs using fluidic self-assembly," *Proceedings of the SPIE - Vertical Cavity Surface Emitting Lasers II*, vol. 3286, pp. 86-95, 1998.

Many Invited Talks at Universities, Industrial Labs, and National Labs.

RESEARCH FUNDING:

[1] Title: MRI: Optical and Thermomechanical Design of High Reflectivity Deformable Membranes
Funding Agency: Joint Technology Office via Office of Naval Research
PI: Joseph Talghader, co-Is: Tom Bifano (Boston University), Albert Ogloza (Navy Port Hueneme Division), Jeff Thomas (Penn State Electro-optics Center), David Samuels (ATFilms)
Amount for Base + Option Period: $3,143,813, (Talghader portion: Approximately $1,262,808)
Duration: September 1, 2017 to August 31, 2022 NCE request to August 31, 2023

[2] Title: Towards uncooled thermal imaging focal plane devices with NETD near 1mK
Funding Agency: Army Research Office
PI: Joseph Talghader
Amount: $565,358 = $450,252 original + $115,106 incoming supplement
Duration: June 18, 2018 to June 17, 2023

[3] Title: Collaborative Research: Laser Cutting Technology for Borehole Sampling
Funding Agency: National Science Foundation
PI: Joseph Talghader, (A. Kurbatov of U Maine is our collaborator with linked proposal with separate budget)
Amount: $318,164
Duration: September 1, 2020 to August 31, 2022 likely NCE to extend to 2023.

[4] Title: Miniaturizing the Microbial Fuel Cell Design for Hydrogen Production
Funding Agency: MNDrive Environment Seed Grant
Investigators: Daniel Bond (PI, Microbiology), Joseph Talghader
Duration: August 2020 to December 2021

[5] Title: Borehole Logging to Classify Volcanic Signatures in Antarctic Ice
Funding Agency: National Science Foundation
PI: Joseph Talghader (Ryan Bay of UCB has a separate collaborative proposal)
Amount: $100,000
Duration: May 1, 2017 to September 30, 2019

[6] Title: Photon Statistics and Spectral Selectivity Limits of Thermal Detectors
Funding Agency: Army Research Office
PI: Joseph Talghader
Amount: $389,626
Duration: June 1, 2015 to March 31, 2019

[7] Title: Fundamental Analyses and Techniques of Plenoptic Imaging
Funding Agency: DARPA
Investigators: Jim Leger (PI), Joseph Talghader, Jarvis Haupt, Gary Meyer, Jim Fienup
Amount: over $2,999,603
Duration: January 18, 2016 to December 31, 2020

[8] Title: MRI: Particulate and Contamination-Induced Breakdown in Large Area Optics
Funding Agency: Joint Technology Office via Office of Naval Research
PI: Joseph Talghader, co-I: Albert Ogloza (Naval Postgraduate School), Greg Hartland (Notre Dame), Kevin Kjoller (Anasys), Ramin Lalezari (ATF), Jeff Thomas (Penn State Electro-optics Center)
Amount: $3,343,484, (Talghader portion: ~ $1,248,000)
Duration: August 15, 2012 – February 28, 2019

[9] Title: Engineering Van der Waal's Gases in Solids
Funding Agency: GIA (New Research Area Seed Funding) University of Minnesota
PI: Joseph Talghader
Amount: $47,648
Duration: January 1, 2016 to June 30, 2017

[10] Title: MRI: 3D Meta-Optics for High Energy Lasers
Funding Agency: Joint Technology Office

Investigators: Eric Johnson (PI), Joseph Talghader, Robert Magnusson, Martin Richardson
Amount: approx. $2.5million (Talghader portion: $569,299)
Duration: September 30, 2010 – June 30, 2016

[11] Title: Optical Fabric and Fiber Logging of Glacial Ice
Funding Agency: National Science Foundation
PI: Joseph Talghader (Ryan Bay of UCB has a collaborative proposal also funded)
Amount: $398,785
Duration: June 1, 2012 to May 31, 2016

[12] Title: Luminescence Materials as Nanoparticle Thermal Sensors
Funding Agency: Defense Threat Reduction Agency
Amount: Approximately $1,750,000 (Talghader Portion: approx. $759,434)
PI: Eduardo Yukihara, Joseph Talghader, Luiz Jacobsohn
Duration: February 22, 2010 to December 15, 2015

[13] Title: Continuation: Tunable Narrowband Thermal Infrared Detectors with Ultra-High Sensitivity
Funding Agency: DARPA/Army Research Labs
PI: Joseph Talghader
Amount: $100,000
Duration: February 3, 2014 – September 30, 2015

[14] Title: Tunable Narrowband Thermal Infrared Detectors with Ultra-High Sensitivity
Funding Agency: DARPA
PIs: Joseph Talghader
Amount: $250,000
Duration: October 20, 2011 – May 31, 2013

[15] Title: High Power Optical Coatings by Atomic Layer Deposition and Signatures of Laser-Induced Damage
Funding Agency: Office of Naval Research
PI: Joseph Talghader
Amount: $107,000
Duration: August 1, 2009 – July 31, 2012

[16] Title: Chemical Identification and Thermal Conductivity Characterization of Local Absorbers in HEL Coatings
Funding Agency: Joint Technology Office
Investigators: Kevin Kjoller – Anasys, Inc., Joseph Talghader
Amount: (Talghader portion: $214,978)
Duration: May 5, 2010 – May 4, 2012

[17] Title: Hyperspectral and Mid-wave Uncooled Detection with Cryogenic Performance
Funding Agency: Penn State Electro-optics Center
Amount: $235,000

PI: Joseph Talghader
Duration: November 1, 2008 to April 30, 2011

[18] Title: Laterally Integrated Photovoltaic Devices
Funding Agency: IREE
Amount: $800,000
Investigators: Phil Cohen, Joseph Talghader, Jim Leger, Paul Ruden, E. Enemuoh
Duration: May 17, 2009 to May 16, 2012

[18] Title: Tunable Quantum Coupling in Nanomechanical Heterostructures
Funding Agency: National Science Foundation
PI: Joseph Talghader (co-Is: Len Chen of Raytheon and Chris Palmstrom of UCSB)
Amount: $330,000
Duration: June 1, 2007 to May 31, 2011

[19] Title: Infrared Microspectrometer for Unmanned Space Probes
Funding Agency: NASA - Goddard
PI: Joseph Talghader
Amount: $35,000
Duration: July 20, 2010 to July 19, 2011

[20] Title: MRI: Optomechanical Coatings for high power mirrors and adaptive optics
Funding Agency: Air Force Office of Scientific Research (from Joint Technology Office)
Amount: $900,000
PI: Joseph Talghader
Duration: July 1, 2005 to June 30, 2008

[21] Title: Bioagent Thermal History using Microparticle Trap Luminescence
Funding Agency: Defense Threat Reduction Agency
Amount: $462,628
PI: Joseph Talghader (co-I: Eduardo Yukihara at Oklahoma State University)
Duration: December 1, 2006 to November 30, 2009

[22] Title: Uncooled Tunable LWIR Microbolometer
Funding Agency: Army Research Office
Amount: $497,904
PI: Joseph Talghader
Duration: September 2003 to December 2007 or 2009 depending on options exercised

[23] Title: MEMS and NEMS Technologies for Temperature Sensitive Semiconductors and Smart Materials
Funding Agency: Australian Research Council (ARC)
Number of Co-PIs: 7 (Prime PI: John Dell at University of Western Australia)
Amount: Total: $867,000 Australian Dollars
Duration: 2005 to 2008
Comment: This grant does not provide direct funding to my group but rather seeds

collaborations such as personnel exchange

[24] Title: Actuators for Angstrom-scale Movement of Micromachined Devices
Funding Agency: NSF
Amount: Total: $77,955
PI: Joseph Talghader
Duration: June 2006 to November 2007

[25] Title: Innovation Grant: Testing Feasibility of Thermal Detectors
Funding Agency: Venture Center, University of Minnesota
PI: Joseph Talghader
Amount: $74,660
Duration: December 14, 2007 to December 14, 2008

[26] Title: Optical Probing of Deep Glacial Ice
Funding Agency: Grant-in-Aid, University of Minnesota
PI: Joseph Talghader
Amount: $29,966
Duration: January 2008 to June 2009

[27] Title: 3M Faculty Award
Funded by: 3M
Amount: $35,000
PI: Joseph Talghader
Duration: N/A

[28] Title: MRI: Fabrication, testing, coating, and alignment of fast segmental optics
Funding Agency: Air Force Office of Scientific Research
PIs: Buddy Martin of the University of Arizona, Jim Burge, Joseph Talghader
Amount: Total: Approx. $2.4 million Talghader portion: $511,000
Duration: July 2002 to July 2005

[29] Title: ACTIVE EYES (Acronym)
Funded by: DARPA
PIs: Ravi Athale, Joseph Talghader, Jim Leger
Number of Co-PIs: 4
Amount: Total: $2.2 million, Talghader portion: approximately $509,000
Duration: June 2000 to July 2005

[30] Title: Distributed microsensor packaging based on self-assembly after sensing
Funding Agency: NSF
Amount: Total: $210,000
PI: Joseph Talghader
Duration: September 2001 to August 2004

[31] Title: Nanomechanical Control of Electron States

Funded by: Grant-in-Aid
Amount: $25,736
Duration: January 2005 to June 2006

[32] Title: Distributed microfluidic sensors using self-assembled read-out
Funding Agency: University of Minnesota Grant-in-Aid
Amount: $21,252
Duration: January 1, 2001 to June 30, 2002

[33] Title: Micromirrors in MO Recording
Funding Agency: Seagate Technologies
Amount: $50,000
Duration: January 1, 1999 to December 31, 2000

[34] Title: Sensors for Magnetic Resonance Imaging
Funding Agency: Biomedical Engineering Institute
Amount: $35,000
Duration: Summer 1998 to Summer/Fall 1999

[35] Title: Adaptive structures for optical recording
Funding Agency: Seagate Technologies
Amount: $25,000
Duration: January 1, 1998 to December 31, 1998

[36] Title: Manufacturing and assembly for micro-optic systems
Funding Agency: Grant-in-Aid of Research, Artistry, and Scholarship
Amount: $22,020
Duration: July 1, 1997 to December 15, 1998

JOURNAL PUBLICATIONS:
(All publications led by J. Talghader unless marked by *)

[1] T. Luo, D. Lin, C. Hashemi, J. R. Leger, and J. J. Talghader, "Photography-Based Real-Time LWIR Scattering Estimation Technique," *Journal of the Optical Society of America A*, vol. 38, no. 7, pp. 1041-1050, July 2021. doi.org/10.1364/JOSAA.422069

[2] P. Lin, M. Mah, J. Randi, S. DeFrances, D. Bernot, and J. J. Talghader, "High Power and Contamination Properties of All-Silica High Reflectivity Multilayers," *IEEE Photonics Journal*, vol. 13, no. 4, 2200407, August 2021. doi: 10.1109/JPHOT.2021.3100803

[3] M. Mah and J. J. Talghader, "Effects of Kolmogorov turbulence on optical cavity spectral response," *Applied Optics*, vol. 60, no. 19, pp. 5488-5495, 1 July 2021. doi.org/10.1364/AO.424293

Most Downloaded Papers [4] A. Das and J. J. Talghader, "Enhanced absorption per unit mass for infrared arrays using subwavelength metal–dielectric structures," *Journal of the Optical Society of America B*, vol. 38, no. 1, pp. 183-193, January 2021.

Editor's Choice [5] Y. Lee, A. Das, and J. Talghader, "High-Q diamond microresonators in the long-wave infrared," *Optics Express*, vol. 28, pp. 5448-5458, 2020.

[6] Y.-J. Lee, A. Das, M. L. Mah, J. J. Talghader, "Long-wave infrared absorption measurement of undoped germanium using photothermal common-path interferometry" *Applied Optics*, vol. 59, no. 11, pp. 3494-3497, 2020.

[7] M. L. Mah and J. J. Talghader, "The decomposition of aberrated or turbulent wavefronts into a spatial mode spectrum using optical cavities," *Applied Optics*, vol. 58, no. 16, pp. 4288-4299, 1 June 2019. https://doi.org/10.1364/AO.58.004288

[8] A. Das, A. K. Brown, M. L. Mah, J. J. Talghader, "Photon diffusion in microscale solids," *Journal of Physics: Condensed Matter*, vol. 31, 335703, 2019. https://doi.org/10.1088/1361-648X/ab1f3d

[9] A. Brown, D. Bernot, A. Ogloza, Kyle Olson, Jeff Thomas, Joseph Talghader, "Physical origin of early failure for contaminated optics," *Scientific Reports*, vol. 9, Article number 635, 24 January 2019.

[10] T. Mitra, A. K. Brown, D. M. Bernot, S. DeFrances, J. J. Talghader, "Laser acceleration of absorbing particles," *Optics Express*, vol. 26, no. 6, pp. 6639-6652, 19 March 2018.

[11] Y. J. Lee and J. J. Talghader, "Observational limitations of Bose-Einstein photon statistics and radiation noise in thermal emission," *Physical Review A*, vol. 97, 013844 (11 pages), 26 January 2018. DOI: 10.1103/PhysRevA.97.013844

[12] P. Armstrong, M. Mah, H. Ross, and J. Talghader, "Individual Microparticle Measurements for Increased Resolution of Thermoluminescent Temperature Sensing," *IEEE Sensors*, vol. 18, no. 11, pp. 4422-4428, 1 Jun 2018.

[13] A. Brown, K. Olson, A. Ogloza, and J. Talghader, "Continuous-Wave Laser Particle Conditioning: Thresholds and Time Scales," *Optics and Laser Technology*, vol. 89, pp 27-30, March 2017.

[14] W. S. Chan, M. L. Mah, R. C. Bay, and J. J. Talghader. "Long- wavelength optical fiber logging for high resolution detection of ash layers in glacier ice," *Journal of Glaciology*, vol.63, no. 237, pp. 17-21, February 2017.

[15] K. Olson, and J. Talghader "Spectrally dependent fluctuations of thermal photon sources, *Physical Review A*, vol. 94, 013822, 5 pages, 2016.

[16] J. J. Talghader, M. Mah, E. G. Yukihara, and A. Coleman "Thermoluminescent Microparticle Thermal History Sensors," Invited *Microsystems and Nanoengineering*, vol. 2, 16037, Nature Publishing Group, 2016.

[17] L. Taylor and J. Talghader, "Subsampling Phase Retrieval for Rapid Thermal Measurements of Heated Microstructures," *Optics Letters*, vol. 41, no. 14, pp. 3189-3192, 2016.

[18] P. Armstrong, M. Mah, K. Olson, L. Taylor, and J. Talghader, "Reduction of Thermal Emission Background in High Temperature Microheaters," *Journal of Micromechanics and Microengineering*, vol. 26, no. 5, 055004, 2016.

*[19] T. Devkota, M. Devadas, A. Brown, J. Talghader, and G. Hartland, "Spatial Modulation Spectroscopy Imaging of Nano-Objects of Different Sizes and Shapes," *Applied Optics*, vol. 55, no. 4, pp. 996-801, February 1, 2016.

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[130] W. Liu and J. J. Talghader, "Spatial Mode Control in Microoptical Cavities using Shape-Tunable Mirrors," *Technical Digest of the 2004 IEEE/LEOS Optical MEMS Conference*, pp. 14-15, Takamatsu, Japan, August 2004.

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[132] W. B. Song and J. J. Talghader, "Microbolometers with adaptive detectivity using electrostatic actuation," *Technical Digest of the 2004 Solid State Sensor and Actuator and Microsystems Workshop*, Hilton Head, SC, June 6-10, 2004, pp. 336-339.

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*[136] J. R. Leger and J. J. Talghader, *Invited Paper* "Design of microspectrometers," 2002 LEOS Annual Meeting, Glasgow, Scotland, November 10-14, 2002.

[137] W. B. Song and J. J. Talghader, "Adaptive thermal detectors using electrostatically controlled thermal conductance," *2002 IEEE/LEOS International Conference on Optical MEMS*, 20-23 August 2002, Lugano, Switzerland, pp. 31-32.

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[144] R. Supino and J. J. Talghader, "Absorption monitoring and optical damage protection for micromechanical optics," *Proceedings of the 2001 Conference of Lasers and Electro-optics*, Baltimore, MD, p. 155, 2001.

[145] K. Cao and J. J. Talghader, "High-reflectivity, high-flatness multilayer optical coatings on micromirrors," Postdeadline Paper, *Proceedings of the 2000 Optical MEMS Conference*, Kauai, Hawaii, August 21-24, 2000.

[146] R. Supino and J. J. Talghader, "Thermal time response of microfilaments," *Proceedings of the 2000 Optical MEMS Conference*, Kauai, Hawaii, August 21-24, 2000, pp. 123-124.

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[148] J. J. Talghader, *Invited Paper* ``Integration of VCSELs using fluidic self-assembly," *Proceedings of the SPIE - Vertical Cavity Surface Emitting Lasers II*, vol. 3286, pp. 86-95, 1998.

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CONFERENCE PRESENTATIONS WITHOUT SUMMARIES/PROCEEDINGS

[151] *Keynote* J. J. Talghader, "The impact of surface particulates and laser-accelerated particles on continuous-wave laser damage," *SPIE Laser Damage Conference*, Rochester, NY, 13 October 2021.

[152] *Invited Webinar* J. J. Talghader, "Fundamental properties and real-world breakdown of low absorption thin films from the visible to infrared," *OSA Thin Film Technical Group*, 12 October, 2021.
https://www.optica.org//en-us/meetings/webinar/2021/10_october/fundamental_properties_and_real-world_breakdown_of/

[153] M. Mah, A. Kurbatov, and J. J. Talghader, "Laser Cutting to Collect Ice Samples in Boreholes," *West Antarctic Ice Sheet (WAIS) Workshop*, Sterling, VA, September 20-23, 2021.

[154] M. L. Mah, M. X. Wulff, A. V. Kurbatov, and J. J. Talghader, "RELIC: Robotics-enhanced laser ice collection," C45D-1024, *AGU (American Geophysical Union) Fall Meeting*, New Orleans, LA, 16 December 2021.

[155] M. L. Mah and J. J. Talghader, "Effects of Kolmogorov Turbulence on Optical Cavity-Based Measurement," *2021 Advanced High-Power Laser and Beam Control Conference*, Directed Energy Professional Society, Online, August 2021.

[156] Z. Tebow, J. Hunt, A. Ogloza, and J. Talghader, "Phase Mismatch in Optical Coatings for Multi-Wavelength Adaptive Optics," *2021 Advanced High-Power Laser and Beam Control Conference*, Directed Energy Professional Society, Online, August 2021.

[157] J. H. Hunt, M. L. Mah, J. J. Talghader, "Laser Annealing of Optical Coatings for Post-Assembly Deformable Mirror Processing," *2021 Advanced High-Power Laser and Beam Control Conference*, Directed Energy Professional Society, Online, August 2021.

[158] *Invited* J. J. Talghader, A. Brown, and T. Mitra, "The failure of high power optics due to dirt and airborne particles," *OSA Laser Congress, Advanced Solid State Lasers*, Vienna, Austria, October 2, 2019, AW3A.1.

[159] *Invited* J. Talghader, "Mitigating Thermal Effects in the Mirrors and Cavities of High Power Laser Systems," *SPIE Defense + Security, High Power Lasers*, Strasbourg, France, September 12, 2019.

[160] J. Talghader and A. Das, “Photon Diffusion Heat Transfer in HEL-Illuminated Surfaces,” in *Laser Technology for Defense and Security XV* at the *SPIE Defense and Commercial Sensing Symposium*, Orlando, FL, April 17-18, 2019.

[161] J. Talghader and M. Mah, “Optical Cavity Spatial Mode Spectra for Sensing Wavefront Aberrations and Turbulence,” *2019 Annual DEPS Science and Technology Symposium*, Destin, FL, April 8-12, 2019.

[162] J. H. Hunt, M. L. Mah, J. J. Talghader, “Observed Aberration-Induced Spectral Changes in Optical Cavities: Applications to Turbulence Sensing,” *2020 Annual DEPS Science and Technology Symposium*, West Point, NY, March 9-13, 2020.

[163] M. L. Mah, A. Ogloza, J. Randi, D. Samuels, and J. J. Talghader, “Impact of Contamination Density on Optical Damage of Directed Energy Optics,” *2020 Annual DEPS Science and Technology Symposium*, West Point, NY, March 9-13, 2020.

*[164] J. Stone, P. E. Spector, T. Hillebrand, J. H Gombiner, J. K. Feathers, J. Talghader, J. P. Severinghaus, D. Pollard, G. Balco and L. K. Fifield, "West Antarctic Ice Sheet History from a Subglacial Bedrock Core," C21E-1507, *American Geophysical Union Fall Meeting*, San Francisco, CA, December 9-13, 2019.

*[165] J. Stone, P. Spector, T. Hillebrand, J. Gombiner, J. Feathers, D. Pollard, J. Severinghaus, J. Talghader, G. Balco, N. Brown, and K. Fifield, "Searching for subglacial evidence of past West Antarctic Ice Sheet collapse – 1: Exposure history of a subglacial bedrock core," *26th Annual WAIS (West Antarctic Ice Sheet) Workshop*, Julian, CA, USA, Oct 16-18, 2019.

[166] J. J. Talghader, *Invited Talk* “Particle acceleration and particle-induced breakdown in high power laser optics,” *High Power Lasers Conference in SPIE Defense and Security*, Berlin, Germany, September 12, 2018.

[167] J. J. Talghader, “Particulate and contamination-induced failure of high power optics,” in *Laser Systems, Laser Materials, and Applications I* conference at the *SPIE Defense and Commercial Sensing Symposium*, Orlando, FL, April 15-19, 2018.

[168] J. J. Talghader, T. Mitra, A. K. Brown, D. M. Bernot, S. Defrances, *Invited Talk*, “Laser Acceleration of Absorbing Particles and Their Role in Inducing Early Materials Failure,” *Optical Trapping and Optical Micromanipulation* in *SPIE Optics and Photonics*, San Diego, August 22, 2018.

[169] J. J. Talghader, *Invited Talk* "Future Directions for Microbolometers and Thermopile Infrared Detectors," *Image Sensing Technologies: Materials, Devices, Systems, and Applications V in SPIE Defense and Commercial Sensing*, Orlando, FL, April 2018.

[170] J. J. Talghader, *Invited Talk* “Revisiting Planck’s Law: Thermal Emission and Radiation Noise in Subwavelength Optical Cavities,” *Light Conference 2018*, Changchun, China, July 16-18, 2018.

[171] T. Mitra, A. Brown, D. M. Bernot, S. DeFrances, and J. J. Talghader, “Acceleration and Forces Induced by High Power Laser Illumination of Absorbing Particles,” High Power Laser Ablation Conference, Santa Fe, NM, March 26-29, 2018.

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[174] T. Mitra, A. Brown, D. M. Bernot, S. DeFrances, and J. J. Talghader, “Acceleration and Forces Induced by High Power Laser Illumination of Absorbing Particles,” Accepted for oral presentation at the *High Power Laser Ablation Conference*, Santa Fe, NM, March 2018.

[175] *Invited Talk* J. J. Talghader, "Future Directions for Uncooled Infrared Detectors," *DoD Basic Research Forum*, Arlington, VA, October 19, 2017.

[176] *Invited Talk* J. J. Talghader, "Revisiting Planck’s Law: Thermal Emission and Radiation Noise in Subwavelength Infrared Cavities," *Conference on Lasers and Electrooptics Pacific Rim*, Oral 3-2F-1, Singapore, August 3, 2017.

[177] *Invited Talk* J. J. Talghader, “Optical breakdown of contaminated materials: Physics wins even with dirt,” *Emerging Technologies CMOS Workshop*, Warsaw, Poland, May 29, 2017.

[178] A. Brown, A. Ogloza, K. Olson, J. Thomas, and J. Talghader, “Bandgap dependence of particle induced CW laser damage,” *DEPS Annual Meeting*, Huntsville, AL, February 13-17, 2017.

[179] M. L. Mah, W. S. Chan, R. C. Bay, and J. Talghader, “Strong correlation of borehole optical backscattering and volcanic sulfate signatures at Siple Dome,” C53A-0699, *American Geophysical Union Fall Meeting*, San Francisco, CA, December 12-16, 2016.

[180] *Invited Talk* J. J. Talghader, “Microsensors and Particles: Infrared detectors, solar driven devices, and sensing inside explosions,” *Stanford Photonics Research Conference*, Stanford, CA, September 19-20, 2016.

[181] A. K. Brown, A.Ogloza, K. Olson, and J. Talghader, "Continuous-Wave Laser Particle Conditioning: Thresholds and Time Scales," *Directed Energy Professional Society Annual Symposium*, Albuquerque, NM, March 7 – 11, 2016.

[182] *Invited Talk* J. J. Talghader, “Optical Breakdown of Contaminated Materials: Physics Wins even with Dirt, *2016 Light Conference,* Changchun, China, July 4-8, 2016.

[183] *Invited Talk* J. J. Talghader, "Physical Limits of Thermal Infrared Detection", *IEEE Sensors Conference*, Busan, South Korea, November 1-4, 2015.

[184] A. Brown, A. Ogloza, L. Taylor, J. Thomas, and J. Talghader, "Continuous-wave laser damage and conditioning of particle contaminated optics," *Directed Energy (DEPS) Symposium*, Anaheim, CA, March 2015.

*[185] A. Ogloza, A. Brown, A. Lozano, J. Thomas, and J. Talghader, "CW Laser Damage and Light Refraction due to Sea Water Contamination of Optics," *Directed Energy Society (DEPS) Symposium*, Anaheim, CA, March 2015.

[186] K. Olson, A. Ogloza, J. Thomas, and J. Talghader, "CW Laser Heating of ultra-low absorption materials," *Directed Energy Society (DEPS) Symposium*, Anaheim, CA, March 2015.

[187] J. J. Talghader and E. G. Yukihara, "Thermometry using Microparticle Thermoluminescence: Overview and Outlook," *15th International Detonation Symposium*, July 13-18, San Francisco, CA, 2014.

*[188] E. G. Yukihara, J. J. Talghader", A. Coleman, B. Doull, T. Gustafson, S. Bastani, M. L. Mah, P. R. Armstrong, "Particle Thermometry using Microparticle Thermoluminescence: Overview and Outlook," *15th International Detonation Symposium*, July 13-18, San Francisco, CA, (2014.).

[189] *Invited Talk* J. J. Talghader, "Thermal Performance Limits of Optical Micro- and Nanomechanical Devices," International Conference on Micro/Nano Optical Engineering, July 3-5, 2014, Changchun, China.

[190] J. J. Talghader, *Invited Talk* "Laser-induced thermal breakdown of optical coatings," *High Power Lasers Conference, Security and Defense Symposium*, Dresden, Germany, September 23, 2013.

*[191] E. G. Yukihara, D. Wang, B. A. Doull, L. C. Oliveira, B. Obryk, L. L. Campos, J. Lee, and J. J. Talghader. "Temperature sensing using thermoluminescence: Principles and State of the Art". *17th International Conference on Solid State Dosimetry*, Sep 22 - 27, Recife, Brazil (2013).

[192] J. J. Talghader, *Invited Talk* "Thermal performance limits of micro- and nanomechanical devices," *International Symposium on Applications and Potentials of MEMS/NEMS*, Tsinghua University, Beijing, China, April 18-19, 2013.

[193] P. R. Armstrong, M. L. Mah, and J. J. Talghader, "The Accidental Sensor: 'Off-label' Uses for Thermoluminescent Radiation Dosimeters," *Design of Medical Devices Conference*, Minneapolis, MN, April 9, 2013.

[194] L. N. Taylor, A. K. Brown, and J. J. Talghader, "Pulsed vs. CW Thermal Breakdown in Nanolaminate Optical Coatings on Patterned Optics," *15th Annual Directed Energy Symposium*, Albuquerque, New Mexico, November 2012.

[195] J. J. Talghader, *Invited Talk* "Thermal history sensing using thermoluminescence: measurement concepts and testing," *DTRA Workshop on Time-Dependent Temperature Measurements in Energy Release Processes*, Chicago, IL, October, 10, 2012.

[196] J. J. Talghader, *Invited Talk* "High-Sensitivity Infrared Detection and Spectroscopy," 2012 *CMOS Emerging Technologies Workshop*, Vancouver, BC, July 18-21, 2012.

[197] R. Shea, A. Gawarikar, and J. Talghader, "Impact of thermal radiation on the performance of ultrasmall microcoolers" *International Conference of Thermoelectrics*, Aalborg, Denmark, July 9, 2012. (Note that a subset of the presentations from this conference became papers in the Journal of Electronic Materials listed above.)

*[198] E. G. Yukihara, B. Doull, L. C. Oliveira, E. D. Milliken, L. G. Jacobsohn, C. L. McPherson, M. Mah, P. Armstrong, and J. J. Talghader. "A survey of thermoluminescent materials for temperature measurements". 2012 International Conference on Defects in Insulating Materials, June 24-29, Santa Fe, NM (2012).

[199] J. J. Talghader, *Invited Talk* "Thermal conduction in optical coatings and interfaces: a key to high-power meta-optics," *2011 Laser Damage Conference*, Talk 8190-40, Boulder, CO, September 18-21, 2011.

[200] J. J. Talghader, *Invited Talk* "Nanomechanical Control of Electron States," *International Conference on Micro/Nano Optical Engineering*, June 12-16, 2011, Changchun, China, p. 15.

[201] M. Mah, P. Armstrong, J. Lightstone, J. Talghader, "Thermal history sensing of post-detonation environments with thermoluminescent microparticles," *APS Shock Compression of Condensed Matter 2011*, Chicago, IL, June 27-July1, 2011.

[202] *Invited Talk* J. J. Talghader, "Luminescent microparticles as thermal history sensors," *CMOS Emerging Technologies Workshop*, Vancouver, BC, May 19-21, 2010.

[203] *Invited Talk* J. J. Talghader, "Material Signatures and Tunable High Sensitivity Detection in the Infrared," *5th Asia-Pacific Conference on Transducers and Micro-Nano Technology*, Perth, Western Australia, July 6-9, 2010.

[204] W. S. Chan, M. Mah, M. Gugliemi, J. J. Talghader, "Raman probing of gaseous constituents and water isotopes in deep glacial ice," *Eos Trans. AGU*, 88(53), Fall Meet. Suppl., Abstract C41C-0537, 2008.

[205] J. J. Talghader, "Optical Probing of Deep Glacial Ice using Short Laser Pulses," *14th Annual West Antarctic Ice Sheet Workshop*, September 5-8, 2007, Sterling, VA.

[206] J. J. Talghader, “From micro- to nano-: thermal effects in micromachined devices,” *2006 Conference on Optoelectronic and Microelectronic Materials and Devices*, Perth, Western Australia, December 6-8, 2006.

[207] J. J. Talghader, *Invited Talk* “Adaptive imaging with uncooled LWIR detectors,” *SPIE Defense and Security Symposium, Intelligent Integrated Microsystems*, Orlando, FL, April 20, 2006.

[208] J. J. Talghader, *Invited Talk* “Mechanics of Optical Coatings in Extreme Thermal Environments,” *2005 International Conference on Metallurgical Coatings and Thin Films*, San Diego, CA, May 2005.

[209] J. J. Talghader, “Optical time domain reflectometry for probing deep glacial ice,” *Midwest Glaciology Meeting*, Minneapolis, MN, March 25-26, 2004.

[210] J. J. Talghader, *Invited Talk* “Ultimate Performance in Optical MEMS,” *SPIE International Symposium on Microelectronics, MEMS, and Nanotechnology*, December 10-12, 2003, Perth, Australia.

[211] J. J. Talghader, *Invited Talk*, “MEMS confocal microresonator arrays using mirrors with strain-induced curvature*,” SPIE – Photonics West – Laser Resonators and Beam Control V*, San Jose, CA, January 22, 2002.

[212] Y. Wang and J. J. Talghader, “Fluorescence-based tracking of micro- and nanosensors in microfluidic systems,” *2001 OSA Annual Meeting*, Talk WII3, October 17, 2001, Long Beach, CA.

[213] R. Supino and J. J. Talghader, “Substrate quenching of microfilaments and thermal microdetectors,” *2000 OSA Annual Meeting*, October 22-26, Providence, RI, 2000.

[214] W. Liu, and J. J. Talghader, ``Modeling and fabrication of MEMS reflective modulators using deformable optical coatings," *SPIE Photonics West, Integrated Optics IV*, San Jose, January 2000.

[215] W. Liu and J. J. Talghader, ``Chemical and mechanical properties of hard oxide coatings for MEMS," 1999 Spring Meeting of the Materials Research Society, San Francisco, Presentation BB7.18.

[216] *Invited Talk* J. J. Talghader, ``Integration of VCSELs using fluidic self-assembly," *Proceedings of the SPIE - Vertical Cavity Surface Emitting Lasers II*, vol. 3286, pp. 86-95, 1998.

PATENTS:

J. Talghader and J. Hunt, *Local Annealing to Pattern the Mode Index of Optical Fiber*, University of Minnesota Invention Disclosure 2022-200, 2022.

J. Talghader and M. Mah, "Optical Aberration Detection Systems," U.S. Patent No. 10,962,474 Issued on March 30, 2021.

J. J. Talghader, "Detection beyond the standard radiation noise limit using reduced emissivity and optical cavity coupling," U. S. Patent 8,704,179, Issued April 22, 2014.

J. J. Talghader, A. Gawarikar, and R. Shea, "Detection Beyond the Standard Radiation Noise Limit using Spectrally Selective Absorption," US Patent 8,629,398, Issued January 14, 2014, Plus related foreign applications.

J. J. Talghader, Y. Wang, and M. Sutton, "Tunable Finesse Infrared Cavity Thermal Detectors," U.S. Patent 7,968,846, Issued June 28, 2011, Plus several related foreign applications.

J. J. Talghader, "Detection beyond the standard radiation noise limit using reduced emissivity and optical cavity coupling," U.S. Patent 7,800,066. Issued September 21, 2010. Plus several related foreign applications.

M. Blumenfeld, M.A. Sanders, J. J. Talghader, et. al., "Imaging of biological samples using electronic light detector," U.S. Patent 7,145,645, Issued December 5, 2006.

M. Blumenfeld, J. J. Talghader, M. A. Sanders, S. A. Nelson, K. Anderson, S. A. Lewis, "Scanning of Biological Samples," U.S. Patent 6,867,851, Issued March 15, 2005.

M. Blumenfeld, J. J. Talghader, and M. A. Sanders, "Direct mapping of DNA chips to detector arrays," U.S. Patent 6,784,982, Issued August 31, 2004.

Yuichiro Ezoe (Tokyo Metropolitan University), Ikuyuki Mitsuishi, Kazuhisa Mitsuda (Japan Aerospace Exploration Agency), Joseph J. Talghader, "X-ray Optics," UM Docket 20100162.

BOOK CHAPTERS

W. S. Chan, P. Armstrong, L. N. Taylor, M. L. Mah and J. J. Talghader. *Fabrication and manufacturing technology for optical MEMS*. Book chapter in Hongrui Jiang (Ed.), *Optical MEMS for Chemical Analysis and Biomedicine*. IET, 2016.

J. J. Talghader and M. L. Mah, "Sensing Temperature inside Explosions," in *Smart Sensors for Industrial Applications*, no. 16, K. Iniewski, Ed. CRC Press, 2013, pp. 259–272.

J. J. Talghader and M. L. Mah, "Luminescent thermometry for sensing rapid thermal profiles in fires and explosions," Chapter 4 in *Optical, Acoustic, Magnetic, and Mechanical Sensor Technologies*, Ed. K. Iniewski, CRC Press, pp. 79-105, 2012.

STUDENT ADVISING:

PHD STUDENTS

Woo-Bin Song PhD Awarded 2004 University of Minnesota
Thesis: Thermal Control in Micromachined Devices and Its Application

Wei Liu PhD Awarded Spring 2005 University of Minnesota
Thesis: Electrically Tunable Micromirrors and Microcavities

Ryan Supino PhD Awarded Fall 2005 University of Minnesota
Thesis: Autonomous Microfluidic Sensor Particles

Yuyan Wang PhD Awarded Summer 2007 University of Minnesota
Thesis: Tunable Filters for Infrared Detection

Jan Makowski PhD Awarded 2008 University of Minnesota
Thesis: Band-Gap Tuning through Mechanical Semiconductor Heterostructures

Nick Gabriel PhD Awarded Spring 2011 University of Minnesota
Thesis: High-Power and High-Aspect-Ratio Optical Coatings by Atomic Layer Deposition

Sangho Kim PhD Awarded Spring 2013 University of Minnesota
Thesis: Fabrication and Characterization of Micromachined Dielectric Thin Films and Temperature Sensors using Thermoluminescence

Anand Gawarikar PhD Awarded Spring 2013 University of Minnesota
Thesis: Spectrally Selective High Detectivity Uncooled Detectors for the Long Wave Infrared

Ryan Shea PhD Awarded Spring 2013 University of Minnesota
Thesis: Design and fabrication of state of the art uncooled thermopile infrared detectors with cavity coupled absorption

Kyle Olson PhD Awarded Fall 2015 University of Minnesota
Thesis: High Power Continuous Wave Laser Heating and Damage with Contamination, and Non-Uniform Spectrally Dependent Thermal Photon Statistics

Wing Shan Chan PhD Awarded January 2016 University of Minnesota
Thesis: MEMS Actuators for Tuning Nanometer-scale Airgaps in Heterostructures and Optical Instrumentation for Glacier Ice Studies

Luke Taylor PhD Awarded May 2016 University of Minnesota
Thesis: Going Deeper into Laser Damage: Experiments and Methods for Characterizing Materials in High Power Laser Systems

Merlin Mah PhD Awarded July 2017 University of Minnesota
Thesis: Fire and Ice: Thermoluminescent Temperature Sensing in High-Explosive Detonations and Optical Characterization Methods for Glacier Ice Boreholes

Phil Armstrong PhD Awarded July 2017 University of Minnesota
Thesis: Thermoluminescent Microparticles used as Harsh Environment Temperature Sensors Characterized using MEMS Devices

Andrew Brown PhD Awarded June 2018 University of Minnesota
Thesis: Contamination Induced Continuous Wave (CW) Laser Damage of Optical Elements

Yu-Jen Lee PhD Awarded March 2020 University of Minnesota
Thesis: Spectrally Dependent Radiation Noise in Thermal Emission and Long-Wave Infrared High-Q Diamond Microdisks

MASTERS STUDENTS GRADUATED (As of 2014)

Andrew Bettino
Wing Shan Chan
Ke Cao
Nick Gabriel
Anand Gawarikar
Mousumi Gupta
Wing Shan Chan
Daniel Kelly
Christopher Larson
Wei Liu
Merlin Mah
Jan Makowski
Michael Manfred
Tirtha Mitra
Benjamin Potter
Suffian Zamali
Hongjian Fan
Kyle Olson
Ryan Shea
Charles Sperling
Ryan Supino
Mike Sutton
Luke Taylor

Eric Vogt

TEACHING AND COURSE DEVELOPMENT:

1) Bush Mid-Career Teaching Program
2) Infrared Technology and Environmental Sensing – EE 5649
   This is a new course covering infrared physics and technology and its applications to chemical detection, thermal imaging, spectroscopy, and other fields.
3) Introduction to Microsystems Technology - EE 5141
   This course was altered from a processing course to a physics-based phenomenological course covering microscale mechanics, actuation, heat transfer, optics, and fluids. The students work on a class fabrication lab as well.
4) Optical Fiber Communication – EE5627
5) Advanced MOS Devices – EE5953
   This course was a new development from my industry experience covering metal-oxide semiconductor device physics.
6) Semiconductor Properties and Devices I – EE5163
7) Semiconductor Properties and Devices II – EE5164
8) Photonic Communication Devices – EE5632
   This course was a new development that covered device-physics material related to optical fiber communications. Some of the material of this one-time transition course was merged into 5627.
9) Quantum Electronics – EE 8163
   This course has been taught in two formats. One covered semiconductor quantum electronics material where the students were introduced to quantum mechanics and field quantization applied to p-n junction lasers and detectors. The second was a quantum optics course covering photon statistics, vacuum fields, microcavity effects, and laser cooling.
10) Semiconductor Devices – EE3063
11) Semiconductor Devices – EE3161
12) Transmission Lines (Electromagnetism) – EE 3601
12) Contemporary Optics – EE5630/PHYS5805
13) Linear Systems and Circuits – EE2011
14) Optical Electronics – EE5624
15) Senior Honors Project – Supervised many students 1999-2011
16) Senior Design Project – EE 4951 – Selected Project Titles:
    Surface Roughness Sensor
    Electronic Article Surveillance
    RF "Professor" Tracker
    Sun Tracker (Electronic Visor)
    Tamper Proof RF Tags
    Home Lighting Automation

UNIVERSITY AND DEPARTMENTAL COMMITTEES:
Faculty Recruiting Committee Chair, 2008-2009, 2019-2020

College of Science and Engineering Faculty Consultative Committee, 2011-2015
Chair, 2014-2015
Post-Tenure Review Committee, 2007-2009, 2021-2023
Faculty Recruiting Committee, 2006-2008, 2014-2015, 2018-2019, 2020-2021
Promotion, Tenure, and Awards Committee, 2009-2011, 2015-17, Chair 2016-2017
Departmental Faculty Consultative Committee, 1998-2001, 2002-2003
President's Postdoctoral Fellowship Program (Fellowship program to recruit minority faculty)
Review Committee, 2021
Minnesota Futures Review Panel 2022, 2019
Graduate Committee, 2000-2001, 2003-2005, Chair 2005-2006, 2012-2013
External Relations Committee, 2021-2022
Colloquium Coordinator, 2001-2003
HKN Faculty Advisor, 2005-2011

CONSULTING WORK:
Eyesafe, Inc. – Electronic Displays and Blue Light Toxicity
Logic PD – Micromechanical Resonators for Biosensing
Hutchinson Technology – Noninvasive Fiber Optic Sensors and Microsystems
Syndia Corp. – Microoptics and Telecommunications Patent Analysis
Guidant – Microelectronics Packaging
Photon Imaging – Advanced Microelectronic Assembly

JOURNAL/PROPOSAL/OTHER REVIEW WORK: (Partial List)
NSF Proposal Reviews, Polar Programs
ARO Proposal Reviews
Light: Science and Applications (Nature Publishing Group Open Access Journal), *Editor*
Dissertation Defense Opponent, University of Iceland, Candidate Pauline Renoux, Advisor Snorri Ingvarsson, March 2014.
Photonics Technology Letters, *Guest Editor*
IEEE Journal on Selected Topics in Quantum Electronics, *Lead Guest Editor*
IEEE Journal on Selected Topics in Quantum Electronics, *Guest Editor*
Nature Photonics Review
NSF Workshop on "Nanotechnology as an Enabler for Ocean Observatories", Seattle, WA, April 2008
AFOSR Proposal Review
University of Western Australia Dissertation Reviews
Austrian Science Fund Proposal Review
Singapore National Research Foundation Proposal Review
NSF Review Panel, ECCS, May 2007
NSF Review Panel, Chemical and Transport Systems
NSF Reviews, Chemical and Transport Systems
NSF Review Panel, SBIR MEMS, 2002
NSF Review Panel, ECS Optoelectronics, 1998
Journal of Applied Physics
IEEE/ASME Journal of Microelectromechanical Systems
Sensors and Actuators

IEEE Transactions on Electron Devices
IEEE Electron Device Letters
IEEE Journal of Lightwave Technology
OSA Optica
OSA Applied Optics
OSA Optics Express
OSA Optics Letters
Infrared Physics and Technology
Nanomaterials
SPIE Journal of Microlithography, Microfabrication, and Microsystems