

Curriculum Vitae

THOMAS THUNDAT

Professor, Dept. Chemical and Biological Engineering
University at Buffalo, Buffalo NY 14260-4200

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DEMOGRAPHIC AND PERSONAL INFORMATION

Current Appointments

University

2017 - present SUNY Empire Innovation Professor, Chemical and Biological Engineering, University at Buffalo, The State University of New York, Buffalo NY

2009 - present Distinguished Professor (honorary), Indian Institute of Technology, Madras

Personal Data

Education and Training:

Ph. D., Physics, 1987, State University of New York at Albany

M. Sc., Physics (First Class), 1980, Indian Institute of Technology, Madras, India

B. Sc., Physics (major), Chemistry and Mathematics (minors), (First Class) 1978,
University of Kerala, India

Post-doctoral (scanning probe microscopy): 1987-1990 Arizona State University

Past Professional Experience (in reverse chronological order):

2010 - 2017 Canada Excellence Research Chair (CERC) Professor, Department of Chemical Materials Engineering, University of Alberta, Alberta, Canada

2013 - 2016 Centenary Chair Professor, visiting, Indian Institute of Science, Bangalore, India

2012 - 2015 Fellow, National Institute of Nanotechnology (NRC, Canada)

2014 - 2016 Associate Director, India-Canada Center of Excellence (IC-IMPACTS)

2005 - 2010 UT-Battelle Corporate Fellow, Oak Ridge National Laboratory (ORNL)

2002 - 2005 Distinguished Scientist, ORNL

1998 - 2002 Senior Scientist, ORNL

1998 - 2010 Group Leader, Nanoscale Science and Devices Group, ORNL

2001 - 2010 Research Professor/Joint Faculty, University of Tennessee, Knoxville, TN

1996 - 2010 Visiting Professor, University of Burgundy, Dijon, France

1992 - 1998 Research Staff Member, ORNL

1983 - 1984 Graduate Research Intern, Bell Labs, Murray Hill, NJ

Professional Society Fellowships:

Fellow, American Institute for Medical and Biological Engineering (AIMBE)(2017)

Fellow, National Academy of Inventors (NAI)(2014)

Fellow, Society for Optics and Photonics Engineers (SPIE) (2012)

Fellow, American Society of Mechanical Engineers (ASME) (2010)

Fellow, Electrochemical Society (ECS) (2008)

Fellow, American Association for Advancement of Science (AAAS) (2006)

Fellow, American Physical Society (APS) (2002)

Honors and Awards:

- 2019 Nano Energy Award, Beijing China
- 2013 State University of New York, Albany, Distinguished Alumni Award
- 2010 R&D100 Award (Mode Synthesizing AFM)
- 2010 Outstanding Achievement Award, ECS Sensor Division
- 2007 Nano 50 Award
- 2007 Southeastern Federal Laboratory Consortium (FLC) Award
- 2006 UT - Battelle Significant Event Award
- 2005 National FLC Award
- 2004 Jesse Beams Medal (Southeastern American Physical Society)
- 2004 Scientific American 50 Award
- 2004 Pioneer Awards, American Society of Mechanical Engineers (ASME)
- 2004 R&D 100 Award (explosive vapor sensor)
- 2004 National Federal Laboratory Consortium Award
- 2004 Distinguished Alumni Award, IIT Madras
- 2004 Life Sciences Division, Excellence in Research Award
- 2003 ORNL Inventor of the Year (Molecular comb)
- 2003 Southeastern Federal Laboratory Consortium Award
- 2003 Battelle Distinguished Inventor
- 2002 New York Kerala Center, Outstanding Accomplishments in Applied Sciences Award
- 2001 National Federal Laboratory Consortium Award
- 2000 Discover Magazine Award
- 2000 ORNL Inventor of the Year (cantilever sensors)
- 2000 UT - Battelle Technical Achievement Award for publication
- 2000 UT - Battelle Technical Achievement Award for Invention
- 1998 Lockheed Martin R&D Accomplishment Award
- 1997 ASME Emerging Technology Award
- 1997 Lockheed Martin R&D Accomplishment Award
- 1997 Lockheed Martin Publication Award
- 1996 U.S. Department of Energy Young Scientist Award
- 1996 R&D 100 Award (Cantilever IR sensors and Hg sensors)
- 1996 Lockheed Martin Publication Award
- 1996 Lockheed Martin Inventor's Award
- 1995 Health & Safety Research Division Excellence in Research Award
- 1994 Martin-Marietta Energy Systems Significant Event Award
- 1982 Outstanding Teaching Assistant Award, State University of New York
- 1978 National Merit Scholarship (India)

RESEARCH ACTIVITIES

My research activities are focused on understanding and manipulating nanomechanical effects at interfaces and using that knowledge for the development of high performance sensors, devices, and materials, for applications in health, environment, and energy. These interdisciplinary research efforts cover from basic research to design and development of complete systems. Multi-modal and multi-physics approaches are used for generating orthogonal data for high performance sensing. These approaches include molecular engineering of surfaces and interfaces, modulation of adsorbates with optical, thermal, and electrical/electrochemical modulation, etc. To address the challenge of delivery electrical power to the sensors a new concept of transferring electrical power through a single wire was developed. New concepts in energy conversion, storage, and transmission are pursued.

Significant Career Accomplishments:

- Developed new technique of tribotunneling for energy harvesting (2017)
- Pioneered the development of single wire (single contact) electricity transmission concept (2010)
- Developed multi-physics sensor concepts of combining electrical, optical, and mechanical resonances (2000)
- Pioneered the development of a novel class of physical, chemical, and biological sensors based on adsorption-induced force (1991)
- Developed and patented micromechanical infrared detection, imaging technique including mechanical IR spectroscopy (1995)

U.S. Patents Awarded (40 Issued 5 pending):

1. V. Putkaradze, A. Phani, P. Kovur, T. Thundat, "Sensor including mechanical resonator with nanostructured surfaces", US Patent 10495607 (2019)
2. A. Passian, T.G. Thundat, and L. Tetard, "Mode synthesizing atomic force microscopy and mode-synthesizing sensing", US Patent #8,789,211 B2 (2014)
3. A. Passian, T.G. Thundat, and L. Tetard, "Mode synthesizing atomic force microscopy and mode-synthesizing sensing", US Patent #8,448,261 B2 (2013)
4. T.G. Thundat, L.R. Senesac and C. Van Neste, "Acoustic enhancement for photo detecting devices", U.S. Patent #8,378,286 B2 (2013)
5. T.G. Thundat, C. Van Neste, G. Brown and L. Senesac, "Photoacoustic microcantilever", U.S. Patent #8,194,246 B2 (2012)
6. T.G. Thundat, C.W. Van Neste and A.A. Vass, "External split field generator", U.S. Patent # 8,120,225 B2 (2012)
7. T.G. Thundat, T.L. Ferrell and G.M. Brown, "Photoelectrochemical molecular comb", U.S. Patent # 8,110,082 B2 (2012)
8. T.G. Thundat, C.W. Van Neste and A.A. Vass, "Internal split field generator", U.S. Patent # 8,089,188 (2012)
9. C.W. Van Neste, M.E. Morales-Rodriguez, L.R. Senesac and T.G. Thundat, "Standoff spectroscopy using a conditioned target", U.S. Patent # 8,080,796 (2011)
10. Y. Dechang, L.R. Senesac and T.G. Thundat, "Sensor for detecting and differentiating chemical analytes", U.S. Patent # 7,972,865 (2011)
11. C. Van Neste, L.R. Senesac and T.G. Thundat, "Photoacoustic point spectroscopy", U.S. Patent # 7,961,313 (2011)
12. T.G. Thundat, A. Passian and R.H. Farahi, "Microscale fluid transport using optically controlled Marangoni effect", U.S. Patent # 7,939,811 (2011)
13. C. Van Neste, L.R. Senesac and T.G. Thundat, "Reverse photoacoustic standoff spectroscopy", U.S. Patent # 7,924,423 (2011)
14. T.G. Thundat and G. M. Brown, "Electrochemical sensor having suspended element counter electrode and deflection method for current sensing", U.S. Patent # 7,716,965 (2010)
15. M. Su, T.G. Thundat and D. Hedden, "Method and apparatus for remote sensing of molecular species at nanoscale utilizing a reverse photoacoustic effect", U.S. Patent # 7,665,364 (2010)

16. V.I. Boiadjiev, G.M. Brown, L. Pinnaduwege, T.G. Thundat, P.V. Bonnesen and G. Goretzki, "Method for making gold thiolate and photochemically functionalizing microcantilevers", U.S. Patent # 7,579,052 (2009)
17. T.G. Thundat and R.J. Warmack, "Surface wave chemical detector using optical radiation", U.S. Patent # 7,243,548 (2007)
18. T.G. Thundat, T.L. Ferrell and G.M. Brown, "Photo-electrochemical molecular comb", U.S. Patent # 7,211,181 (2007)
19. L.A. Pinnaduwege, T.G. Thundat, G.M. Brown, J.E. Hawk and V.I. Boiadjiev, "Chemically functionalized microcantilevers for detection of chemical, biological, and explosive material", U.S. Patent # 7,207,206 (2007)
20. B.M. Evans, T.G. Thundat, R.D. Komistek, D.A. Dennis and M. Mahfouz, "In-vivo orthopedic implant diagnostic device for sensing load, wear, and infection", U.S. Patent # 7,097,662 (2006)
21. T.G. Thundat, T.L. Ferrell and G.M. Brown, "Photo-electrochemical molecular comb", U.S. Patent # 7,090,757 (2006)
22. J.W. Lee and T.G. Thundat, "Separation and counting of single molecules through nanofluidics, programmable electrophoresis, and nanoelectrode-gated tunneling and dielectric detection", U.S. Patent # 7,033,476 (2006)
23. J.W. Lee and T.G. Thundat, "DNA and RNA sequencing by nanoscale reading through programmable electrophoresis and nanoelectrode-gated tunneling and dielectric detection", U.S. Patent # 6,905,586 (2005)
24. T.L. Ferrell and T.G. Thundat, "Spectrometry and filtering with high rejection of stray light", U.S. Patent # 6,831,747 (2004)
25. T.G. Thundat, T.L. Ferrell, K.M. Hansen, F. Tian, "High Throughput Microcantilever Detector", U.S. Patent # 6,763,705 (2004)
26. M.J. Doktycz, C.L. Britton, S.F. Smith, P.I. Oden, W. Bryan, J.A. Moore, T.G. Thundat and R.J. Warmack, "Micro-machined calorimetric sensors", U.S. Patent # 6,436,346 (2002)
27. T.G. Thundat and E.A. Wachter, "Piezoelectrically tunable resonance frequency beam utilizing a stress sensitive film", U.S. Patent # 6,336,366 (2002)
28. J.K. Davis, T.G. Thundat and E.A. Wachter, "Magnetically tunable resonance frequency beam utilizing a stress-sensitive film", U.S. Patent # 6,311,557 (2001)
29. T.G. Thundat, P.I. Oden, R.J. Warmack and E.L. Finot, "Micromechanical transient sensor for measuring viscosity and density", U.S. Patent # 6,311,549 (2001)
30. T.G. Thundat, K.B. Jacobson, M.J. Doktycz, S. J. Kennel and R.J. Warmack, "Micromechanical antibody sensor", U.S. Patent # 6,289,717 (2001)
31. T.G. Thundat, E.A. Wachter and J.K. Davis, "Electrostatically tunable resonance frequency beam utilizing a stress-sensitive film", U.S. Patent # 6,263,736 (2001)
32. T.G. Thundat, "Uncoated microcantilevers as chemical sensors", U.S. Patent # 6,212,939 (2001)
33. C.L. Britton, R.J. Warmack, W.L. Bryan, R. L. Jones, P.I. Oden and T.G. Thundat, "Capacitively readout multi-element sensor array with common-mode cancellation", U. S. Patent # 6,167,748 (2001)
34. T.G. Thundat, R.J. Warmack and E.A. Wachter, "Electromagnetic and nuclear radiation detector using micromechanical sensors", U.S. Patent # 6,118,124 (2000)
35. T.G. Thundat and M.J. Doktycz, "Micromechanical scanning differential calorimeter", U.S. Patent # 6,096,559 (2000)

36. T.G. Thundat, P.I. Oden and P.G. Datskos, "Non-contact passive temperature measuring system and method of operation using micro-mechanical sensors", U.S. Patent # 6,050,722 (2000)
37. T.G. Thundat, "Micro-mechanical potentiometric sensors", U.S. Patent # 6,016,686 (2000)
38. T.G. Thundat and R.J. Warmack, "High resolution three dimensional doping profiler", U.S. Patent # 6,005,400 (1999)
39. T.G. Thundat, "Microcantilever detector for explosives", U.S. Patent # 5,918,263 (1999)
40. T.G. Thundat, and E.A. Wachter, "Microcantilever sensor," U.S. Patent # 5,719,324 (1998)
41. E.A. Wachter, and T.G. Thundat, "Microbar sensor," U.S. Patent # 5,445,008 (1995)

PUBLICATIONS:

Total Peer Reviewed Journal Publications: 448

Web of Science - Refereed Journal Publications: 448

Total Citations: ~ 15,555 **h-index:** 63 (web of science)

Google Scholar – total citations 25,800+, **h-index** 81, and **i-10 index** 360

2020

1. U. Thakur, P. Kumar, S. Gusarov, A. E Kobryn, S. Riddell, A. Goswami, K. Alam, S. Savela, P. Kar, T. Thundat, A. Meldrum, K. Shankar, "Consistently high Voc values in pin type perovskite solar cells using Ni²⁺ doped NiO nanomesh as hole transporting layer", ACS Applied Mat. Interfaces, (2020)
2. A. Alodhayb, F. Khan, H. Etayash, T. Thundat, "Nanomechanical calorimetric spectroscopy using bi-material microfluidic cantilevers", J. Electrochem. Soc., 167, 37504 (2019)

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3. S. Djokić, Ž. Antić, N. Djokić, T. Thundat, "Electroless deposition of Fe-Ni alloys from acidic and alkaline solutions using hypophosphate as reducing agent", J. Serbian Chem. Soc., 84, 1199 (2019)
4. J. Liu, Mohamad Ibrahim Cheikh, Rima Bao, Huihui Peng, Feifei Liu, Zhi Li, Keren Jiang, James Chen, Thomas Thundat, "Tribo-tunneling DC generator carbon aerogel/silicon multi-nanocontacts", Advanced electronic Materials, 5, 1900464 (2019)
5. A. Kumar, Ankur Goswami, Kirandeep Singh, Ryan McGee, Thomas Thundat, Davinder Kaur, "Magnetolectric Coupling in Ni–Mn–In/PLZT Artificial Multiferroic Heterostructure and Its Application in Mid-IR Photothermal Modulation by External Magnetic Field", ACS Appl. Electro. Mat., 11, 2226 (2019)
6. J. Liu, Yaqian Zhang, James Chen, Rima Bao, Keren Jiang, Faheem Khan, Ankur Goswami, Zhi Li, Feifei Liu, Ke Feng, Jingli Luo, Thomas Thundat, "Separation and Quantum Tunneling of Photo-generated Carriers Using a Tribo-Induced Field", Matter, 1, 650 (2019)
7. J. Liu, Feifei Liu, Rima Bao, Keren Jiang, Faheem Khan, Zhi Li, Huihui Peng, James Chen, Abdullah Alodhayb, Thomas Thundat, "Scaled-up Direct-Current Generation in MoS₂ Multilayer-Based Moving Heterojunctions", 38, 35404 (2019)
8. R. McGee, Ankur Goswami, Syed Asad Manzoor Bukhari, Liang Zhou, Karthik Shankar, Thomas Thundat, "Fabrication of Phase Change Microstring Resonators via Top Down Lithographic Techniques: Incorporation of VO₂/TiO₂ Into Conventional Processes", J. Microelectromechanical Systems, 28, 766 (2019)

9. Y. Yoon, Thomas Thundat, Jungchul Lee, “Resonant hair humidity sensors for disposable applications: Revisit the hair hygrometer”, *Sensors & Actuators B-Chemical*, 292, 1 (2019)
10. N. Debnath, Alope Kumar, Thomas Thundat, Mohtada Sadrzadeh, “Investigating fouling at the pore-scale using a microfluidic membrane mimic filtration systems” *Sci. Reports*, 9, 1 (2019)
11. T. Abraham, Nhan Lam, Jonathan Xu, Dan Zhang, Harshita Wadhawan, Han Jun Kim, Michael Lee, Thomas Thundat, “Collapse of house-of-cards clay structures and corresponding tailings dewatering induced by alternating electric fields”, *Drying Technology*, 37, 1053 (2019)
12. Z. Antić, Kovur Prashanthi, Dragana Jovanović, Thomas Thundat, Miroslav D Dramićanin, “Structure, morphology, and luminescent behavior of RE³⁺-doped GdVO₄ thin films”, *Appl. Phys. A*, 6, 410 (2019)
13. Y. Zhao, Yuting Hou, Jing Ji, Faheem Khan, Thomas Thundat, D Jed Harrison, “Sample preparation in centrifugal microfluidic discs for human serum metabolite analysis by surface assisted laser desorption/ionization mass spectrometry”, *Anal. Chem.*, 91, 7570 (2019)
14. J. Chen, Qiongyao Peng, Thomas Thundat, Hongbo Zeng, “Stretchable, Injectable and Self-Healing Conductive Hydrogel Enabled by Multiple Hydrogen Bonding toward Wearable Electronics”, *Chemistry of Materials*, 31, 4553 (2019)
15. J. Chen, Jifang Liu, Thomas Thundat, Hongbo Zeng, “Polypyrrole-Doped Conductive Supramolecular Elastomer with Stretchability, Rapid Self-Healing, and Adhesive Property for Flexible Electronic Sensors”, *ACS Appl. Mat. Interfaces*, 11, 18720 (2019)
16. K. Jiang, Faheem Khan, Javix Thomas, Parth Rakesh Desai, Arindam Phani, Siddhartha Das, Thomas Thundat, Thermomechanical responses of microfluidic cantilever capture DNA melting and properties of DNA premelting states using picoliters of DNA solution”, 114, 173703 (2019)
17. U.K Thakur, Sheng Zeng, Pawan Kumar, Sahil Patel, Ryan Kisslinger, Yun Zhang, Piyush Kar, Ankur Goswami, Thomas Thundat, Alkiviathes Meldrum, Karthik Shankar, “Nanophotonic enhancement and improved electron extraction in perovskite solar cells using near-horizontally aligned TiO₂ nanorods”, *J. Power Sources*, 417, 176 (2019)
18. Y. Yoon, Inseok Chae, Thomas Thundat, Jungchul Lee, Polymer Microelectromechanical Systems: Hydrogel Microelectromechanical System (MEMS) Resonators: Beyond Cost-Effective Sensing Platform, *Advanced Mat. Technologies.*, 4, 1970017 (2019)
19. J. Chen, Min Wu, Lu Gong, Jiawen Zhang, Bin Yan, Jifang Liu, Hao Zhang, Thomas Thundat, Hongbo Zeng, Mechanistic Understanding and Nanomechanics of Multiple Hydrogen-Bonding Interactions in Aqueous Environment, *J. Phy. Chem.*, 123, 4540 (2019)
20. M. Razi, Hadi Nazariipoor, Behnam Sadri, Thomas Thundat, Mohtada Sadrzadeh, “Development of a 3D-printed modified Scheludko-cell: Potential application for adsorption and thin liquid film study”, *Colloids and Surfaces*, 561, 341 (2019)
21. Z. Li, Keren Jiang, Faheem Khan, Ankur Goswami, Jun Liu, Ali Passian, Thomas Thundat, “Anomalous interfacial stress generation during sodium intercalation/extraction in MoS₂ thin-film anodes”, *Science Advances*, 5, DOI: 10.1126/sciadv.aav2820 (2019)
22. A. Sohrabi, Ghazaleh Haghghat, Parmiss Mojir Shaibania, CW Van Nested, Selvaraj Naicker, Mohtada Sadrzadeh, Thomas Thundat, “Degradation of pharmaceutical contaminants in water by an advanced plasma treatment”, *Desalination and Water Treatment*, 139, 202 (2019)
23. K. Chaudhari, Tripti Ahuja, Vasanthanarayan Murugesan, Vidhya Subramanian, Mohd Azhardin Ganayee, Thomas Thundat, Thalappil Pradeep, “Appearance of SERS activity in single silver nanoparticles by laser-induced reshaping”, *Nanoscale*, 11, 321 (2019)

24. J. Liu, Keren Jiang, Lan Nguyen, Zhi Li, Thomas Thundat, Interfacial friction-induced electronic excitation mechanism for tribo-tunneling current generation”, *Materials Horizons*, 6, 1020 (2019)
25. S. Kim, Thomas Thundat, Photothermal Cantilever Deflection Spectroscopy”, *ECS Interface* 28, 55 (2019)

2018

26. Liu, A. Goswami, K.R. Jiang, F.M. Khan, S. Kim, R.T. McGee, Z. Li, Z. Hu, J. Lee, and T. Thundat, “Direct current triboelectricity generation by sliding skottky nanocontact”, *Nature Nano*, 13, 112 (2018)
27. J. Liu, M. Mia, K. Jiang, F. Khan, A. Goswami, R. McGee, Z. Li, L. Nguyen, Z. Hu, J. Lee, K. Cadien, and T. Thundat, “Sustained electron tunneling at unbiased metal-insulator-semiconductor triboelectric contacts” *Nano Energy* 48, 320-326 (2018)
28. P.M. Shaibani, E.H. Etayash, K. Jiang, A. Sohrabi, M. Hassanpourfard, S. Naicker, M. Sadrzadeh, and T. Thundat, “Portable nanofiber-light addressable potentiometric sensor for rapid E-coli detection in orange juice”, *ACS Sensors*, 3, 815-822 (2018)
29. R. McGee, A Goswami, S. Pal, K. Schofield, S.A.M. Bukhari, T. Thundat, “Sharpness and intensity of modulation of the metal-insulator transition in ultra thin VO₂ by interfacial structure manipulation”, *Phy. Rev. Mat.*, 2, article # 034605 (2018)
30. D. Zhang, A. Karkooti, L. Liu, M. Sadrazadeh, T. Thundat, Y. Liu, and R. Narain, “Fabrication of antifouling and anti-bacterial PES/cellulose nanocrystals nanocomposite membranes, *J. Memb. Sci.*, 549, 350-356 (2018)
31. K. Prashanthi, Željka Antić, Garima Thakur, Miroslav D Dramićanin, Thomas Thundat, “Surface State-Induced Anomalous Negative Thermal Quenching of Multiferroic BiFeO₃ Nanowires”, *Physica Status Solidi*, 12, 1870403 (2018)
32. S. Husain Mir, Larry Akio Nagahara, Thomas Thundat, Parvaneh Mokarian-Tabari, Hidemitsu Furukawa, Ajit Khosla, “Organic-inorganic hybrid functional materials: An integrated platform for applied technologies”, *J. Electrochem. Soc.*, 165, B3137 (2018)
33. R. Kant Upadhyay, Selvaraj Naicker, Anjan Barman, Susanta Sinha Roy, Thomas Thundat, Prashant R Waghmare, “Fabrication of free-standing graphene oxide films using a facile approach toluene swollen paraffin peeling and green reduction of these films into highly conductive reduced graphene oxide films”, *Chemical Engg. Journal.*, 354, 149 (2018)
34. A. Khosla, Shreyas Shah, MD Nahin Islam Shiblee, Sajjad Husain Mir, Larry Akio Nagahara, Thomas Thundat, Praveen Kumar Shekar, Masaru Kawakami, Hidemitsu Furukawa, “Carbon fiber doped thermosetting elastomer for flexible sensors: physical properties and microfabrication”, *Sci. Reports.*, 8, 12313 (2018)
35. JE Hawk, MS Ghoraiishi, Arindam Phani, Thomas Thundat, Exploiting broader dynamic range in Si-bridge modified QTF’s for sensitive thermometric applications”, *Sensors and Actuators*, 279, 442 (2018)
36. A. Sohrabia, Ghazaleh Haghghatb, Parmiss Mojir Shaibania, Charles William Van Nesteb, Selvaraj Naickerb, Mohtada Sadrzadeha, Thomas Thundatb, Elimination of pharmaceutical contaminants fluoxetine and propranolol by an advanced plasma water treatment, *Desalination and Water Treatment*, 113, 346 (2018)
37. S.B Patil, Rajai M Al-Jehani, Hashem Etayash, Valerian Turbe, Keren Jiang, Joe Bailey, Walid Al-Akkad, Rania Soudy, Kamaljit Kaur, Rachel A McKendry, Thomas Thundat, Joseph W

Ndieyira, “Modified cantilever arrays improve sensitivity and reproducibility of nanomechanical sensing in living cells”, *Communications Biology*, 1, 175 (2018)

38. S. Pendharker, Farid Kalthor, Todd Van Mechelen, Saman Jahani, Neda Nazemifard, Thomas Thundat, Zubin Jacob,” Spin photonic forces in non-reciprocal waveguides”, 26, 23898 (2018)
39. Y.J. Chen, W.D. Wang, D. Wu, M. Nagao, D.G. Hall, T. Thundat, and R. Narain, “Injectable self-healing zwitterionic hydrogels based on dynamic benzoxaborole-sugar interactions with tunable mechanical properties”, *Biomacromolecules*, 19 596-605 (2018)
40. B. Khorshidi, I. Biswas, T. Ghosh, T. Thundat, M. Sadrzadeh, “Robust fabrication of thin film polyamide-TiO₂ nanocomposite membranes with enhanced thermal stability and anti-biofouling propensity, *Sci. Reports*, 8, article# 784 (2018).
41. R. McGee, A. Goswami, R. Abraham, S. Bukhari, T. Thundat, “Phase transformation-induced modulation of the resonance frequency of VO₂/TiO₂ coated microcantilevers”, *MRS Advances* 3, 359-364 (2018).

2017

42. A. Goswami, P. Dhandaria, S. Pal, R. McGee, F. Kdopedhan, Z. Antic, R. Gaikwad, K. Prashanthi, T. Thundat, “Effect of interface on mid-infrared photothermal response of MoS₂ thin film grown by pulsed laser deposition, *Nano Research* 10, 3571-3584 (2017)
43. Z. Antic, K. Prashanthi, D. Jovanovic, K. Ahadi, M.D. Dramicani, T. Thundat, “Transparent and highly luminescent dysprosium GdVO₄ thin films fabricated by pulsed laser deposition, *Thin Solid films*, 638, 332-337 (2017)
44. R. McGee, A. Goswami, B. Khorshidi, K. McGuire, K. Schofield, T. Thundat, “Effect of process parameters on phase stability and metal-insulator transition of VO₂ thin films by pulsed laser deposition, *Acta Materialia* 137, 12-21 (2017)
45. G. Thakur, K. Prashanthi, K. Jiang, and T. Thundat, “Self-assembly of human serum albumin: A simplex phenomenon” *Biomolecules* 7, 69 (2017)
46. X. Xu, N. Zhang, G.M. Brown, T.G. Thundat, H.F. Ji, “Ultrasensitive detection of Cu²⁺ using microcantilever sensor modified with L-Cysteine SAM, *Appl. Bio. Chem. Biotechnol.*, 183, 555-565 (2017)
47. S.C. Roy, T. Kundu, V.R. Ramgopal Rao, T. Thundat, “On-chip integration of photodetector and sensor: A multi-modal photonic device for sensing applications”, *IEEE Sensors Journal*, 17, 4773-80 (2017).
48. Y.Q. Zhang, H.B. Tao, J. Liu, Y.F. Sun, J. Chen, B. Hua, T. Thundat, J.L. Luo, “A rational design for enhanced oxygen reduction: Strongly coupled silver nanoparticles and engineered perovskite nanofibers”, *Nano Energy*, 38, 392-400 (2017).
49. B. Khorshidi, T. Thundat, D. Pernitsky, and M. Sadrzadeh, “A parametric study on the synergic impacts chemical additives on permeation properties of thin film composite polyamide membrane”, *Journal of Membrane Science*, 535, 248-257 (2017).
50. X.C. Liu, I. Chae, N. Miriyala, D. Lee, T. Thundat, S. Kim, “Broadband mid-infrared standoff reflection-absorption spectroscopy using a pulsed external cavity quantum cascade laser”, *Applied Spectroscopy*, 71, 1494-1505 (2017).
51. S. Chaudhari, K. Chaudhari, S. Kim, M.F. Khan, J. Lee, and T. Thundat, “Electrophoresis assisted time-of-flow mass spectrometry using hollow channel nanomechanical resonators”, *Sci. Reports*, 7, 3535 (2017).
52. D. Zhang, T. Thundat, and R. Narain, “Flocculation and dewatering of fine mature tailing using temperature-response cationic polymers”, *Langmuir* 33, 5900-09 (2017).

53. Z. Antic, S. Kuzman, V. Dordevic, M.D. Dramicanin, T. Thundat, “white- and blue-light emitting dysprosium(III) and terbium(III) doped gadolinium titanate phosphors, *Luminescence* 32, 539-544 (2017).
54. J.S. Chen, B. Yan, X.G. Wang, O.X. Huang, T. Thundat, H.B. Zheng, “Core cross-linked double hydrophilic block copolymer micelles based on multiple hydrogen bonding interactions”, *Polymer Chemistry*, 8, 3066-3073 (2017).
55. K.R. Jiang, Y.N. Yang, G. Thakur, Y. Kotsuchibashi, S. Naiker, R. Narain, T. Thundat, “Rapid and highly sensitive detection of dopamine using conjugated oxaborole-based polymer and glycopolymer systems, *ACS Applied Materials and Interfaces*, 9, 15225-31 (2017).
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5. Z. Hu, D. Zhou, R. Greenberg and T. Thundat, "Electrochemical characterization of implantable high aspect ratio nanoparticle platinum electrodes for neural stimulations" in *Artificial Sight: Basic research, biomedical engineering, and clinical advances*, pp243-254. Edited by Mark S. Humayun, James D. Weiland, G. Chader and Elias Greenbaum, Springer (2008).
6. L. Senesac and T. Thundat, "Explosive detection using microcantilever sensors", in *Counterterrorist Detection Techniques of Explosives*", J. Yinon, ed., Elsever (2007).
7. Z. Hu, D.M. Zhou, R. Greenberg, and T. Thundat, "Electrochemical characterization of implantable high aspect ratio nanoparticle platinum electrodes", *Artificial Sight*, edited by M.S. Humayun, J.D. Weiland, G. Chader, E. Greenbaum, Springer (2007).
8. T. Thundat, "Explosive vapor detection using microcantilevers" *Trace Chemical Sensing of Explosives*, R.L. Woodfin, ed., Wiley-Interscience (2007).
9. A. Passian, A. L. Lereu, R. H. Farahi, T. L. Ferrell, and T. Thundat, "Thermoplasmonics in thin solid films", in *Trends in Thin Solid Films Research*, NOVA, ISBN 1-60021-455-X (2007).
10. T. Thundat, L. Pinnaduwege, and R. Lareau, "Explosive Vapor detection using Micromechanical sensors", in *Electronic Noses & Sensors for the detection of Explosives*, pp 249-266, J.W. Gardner and J. Yinon (eds.), Kluwer Academic Publishers (2004).
11. T. Thundat and A. Majumdar, "Microcantilevers for physical, chemical, biological sensing", *Sensors and Sensing in biology and engineering*, Barth, Humphry, Secomb (eds.) pp 338-355 SpringWein NewYork (2003).
12. T. Thundat, P.I. Oden, and R.J. Warmack, "Physical, Chemical, and Biological Detection Using microcantilevers", *Molecular Nanotechnology*, IBC Publications, Ed. Shelly Minton (1997).
13. T. Thundat, P.I. Oden, and R.J. Warmack, "Chemical, Physical, and Biological detection using microcantilevers", *Microstructures and microfabricated systems III*, P.J. Hesketh, G. Barna, and H.G. Hughes, Editors pp. 179-187, *Electrochemical Society Vol. 97-5* (1997).
14. T.L. Ferrell, D.P. Allison, T. Thundat, and R.J. Warmack, "Scanning Tunneling Microscopy in Sequencing of DNA", *Molecular Biology and Biotechnology: A Comprehensive Desk Reference*, R. A. Meyers, ed., VCH Publishers, Inc., New York, p. 851-53 (1995).
15. D.P. Allison, T. Thundat, and R.J. Warmack , "Scanning Probe Microscopy in Genomic Research", *Book Chapter: Automated Technologies for Genome Characterization*, John Wiley & Sons, Inc. (1995).
16. S.M. Lindsay, T. Thundat, and L.A. Nagahara, "Imaging biopolymers under water by STM", in *Biological and Artificial Intelligence Systems*, pp 124-142 (Eds. E. Clementi and S. Chin) ESCOM, Leiden (1988).

EDUCATIONAL ACTIVITIES

Classroom instructions

- CE304 Chemical Engineering Thermodynamics

The object of this undergraduate course is to provide basic concepts in thermodynamics with applications in chemical engineering.

- CE400/500 Principles of Nanosensors

This graduate/senior undergraduate course focuses on nanoscale science with applications in sensor design.

- CHE694 Principles of Nanosensors

The objective of this graduate course is to introduce the concepts of nanoscale interaction of analytes and surfaces and molecular transport properties so as to design chemical and biological sensors. (see attached syllabus in the appendix)

- MATE694 Scanning Probe Microscopy

The objective of this graduate course was to introduce the basic instrumentation as well as the quantum theory involved in the scanning probe microscopy techniques such as STM, AFM, PFM, PSTM, and other variations.

- CME694 Nanoscience and Nanosensors

The objective of this graduate course was to introduce the quantum mechanical and statistical methods used in sensor operations.

SERVICE

University

- Associate Director, India-Canada Center of Excellence (IC-IMPACTS) (2014-16).
- Associate Director, Ingenuity Lab, Nanoaccelerator, at the University of Alberta (2014-2016).
- Science Advisory Board, Institute of Oil Sands Research (2013 - 2017)
- IIT Madras –Institutional Review Committee (2014)

Served as thesis committee member for many PhD and MSc thesis (Canada and the US)

Served as external examiner for PhD thesis in Denmark, Australia, and India.

National Lab and Other National Entities:

- National Research Council (NRC) Committee on Human and Environmental Exposure - Science in the 21st Century (2010-2012)
- NIH-National Cancer Institute (NCI) Think Tank (2012, 2008)
- Chair, ORNL Corporate Fellow Council (2009 - 2010)
- Japan-US National Academies joint meeting delegate in Tokyo (2003)

Proposal review panel for NSF, NIH, NCI, ONR, etc.

Proposal reviewer for Ireland, The Netherlands, Denmark, and the UK

Editor/Editorial Boards:

- Associate Editor, Journal of Electrochemical Society (2019-)
- Editorial Board, Nature Scientific Reports (2012-)
- Editor, Microscale Thermophysical Engineering Journal (2004 -)
- Editorial Board, Journal of Nanotechnology (2008-2015)
- Editorial Board, Scanning (2010-2016)
- Editorial Board, Review of Sci. Instruments (2005-2008)

Industry

- Protein Discovery, Inc. Science Advisory Board (2003 – 2008)
- FemtoGen, Inc., Science Advisory Board (2003 - 2007)
- Kalinex, Inc. Science Advisory Board (2005 -2010)
- Protiveris Science Advisory Board (1998 - 2005)
- ORNL Inventors Forum council member (1996 - 1998)

Professional Societies - Conference Organizer (Last 10 years):

- Co-Organizer, MRS Fall Symposium, Boston (2015)
- Co-Organizer MRS Fall Symposium, Boston (2014)
- Co-Organizer, SPIE Defense and Security Conference, Baltimore (2013)
- Co-Organizer, MRS Spring Meeting, San Francisco, (2012)
- Co-Organizer, SPIE Defense and Security Conference, Baltimore (2012)
- Co-Organizer, Sixth International Nanomechanics Workshop, Bombay, India (2012)
- Co-Organizer, ECS Meeting Symposium, Montreal, Canada, (2011).
- Co-Organizer, MRS Fall Meeting Symposium, Boston, MA, (2010)
- Co-Organizer, APS March meeting, Division of Biological Physics Symposium, Portland, OR, (2010).
- Co-Organizer, Fifth International Nanomechanics Workshop, Banff, Canada, (2010).
- Track Organizer, ASME NEMBIB 2009, Huston, TX, (2010).
- Organizer, Fifth International Conference on Nanomechanical Cantilever Sensors, Jeju Island, S. Korea, (2009).
- Co-Organizer, ECS Meeting, San Francisco, CA, (2009).
- Co-Organizer, ICMEMS – IIT Madras, India, (2009).
- Co-Organizer, MRS Fall Conference, Symposium on Biomedical Nanotechnology, Boston, MA, (2008).
- Co-Organizer, Fourth International Conference on Nanomechanics, Max Plank Institute, Mainz, Germany, (2008)
- Co-Organizer, Third ASME Nanomechanics Workshop, Denmark, (2006).
- Co-Organizer, MRS Symposium on Nanosensors, Boston, MA, (2006).
- Co-Organizer, Second ASME Nanomechanics Workshop, Knoxville, TN, (2005).
- Organizer and symposium chair, Nanomechanical Sensor Symposium, APS Meeting, Los Angeles, CA, (2005).
- Co-Organizer, Microcantilever Sensor Symposium, ECS Fall Meeting, Los Angeles, CA, (2005).

Invited Talks:

(Plenary, and Keynote, and Invited Seminars that I have personally given) (2018 -2000):

1. “Chemical Selectivity in MEMS and NEMS” University of Missouri, Columbia (Sept. 2018)
2. “4D printing for sensors and energy applications” 1st International conference on 4D materials and Systems, Electro Chemical Society, Yamagata, Japan (Aug. 2018)
3. “Nanomechanical biosensors”, IEEE Summer Workshop, IISc Bangalore (June 2018)
4. “Nanobiosensors” International Conference on Nanomechanics, Seoul, S. Korea (Aug. 2018)

5. "Triboelectric tunnel current generation" J. Liu and T. Thundat, MRS Spring Meeting, Phoenix, AZ (April, 2018)
6. "Single wire electric power transmission", Cochin University, India (Jan. 2018)
7. "Nanomechanical Sensors" M.G. University, India (Jan. 2018)
8. "Nanosensors for personalized medicine", International Conference on Nanomedicine, (Dec. 2017)
9. "Nanosensors" University of Waterloo, Canada
10. "Photothermal chemical selectivity", MRS Fall Meeting, Boston (Dec. 2016)
11. "Tesla's Dream: Single Wire Electricity Transmission", Yamagata University, Japan (Nov. 2016).
12. "Chemical Selectivity" Keynote talk, ECS Prime, Honolulu, Hawaii (Oct. 2016)
13. "Strides towards chemical selectivity", International Workshop on Nanomechanics, Delft, The Netherlands, June 2016.
14. "Wire-free electricity transmission", Delft University, 2016
15. "Tesla's Dream Revisited", Center for Nanophase Material Science, ORNL (2016)
16. "Chemical selectivity in MEMS sensors", Cochin Nano, India (2016)
17. "Defect Engineering" Technical University Denmark, Copenhagen (2016)
18. "Story of a Cantilever: Nanomechanics at Interfaces" Distinguished Speaker Series, York University, Toronto (2015)
19. "Nanowire Calorimetry for Chemical sensing", International Conference on MicroNanotechnology, Shanghai, China (2015)
20. "MEMS and NEMS for Molecular Recognition", International Workshop on Nanotechnology, Kookmin University, Seoul (2015)
21. "Nanomechanical Systems: From Molecular Recognition to Energy Conversion" Plenary Talk, International Conference on Nanotechnology, Calgary (2015)
22. "Colloids in Confined Spaces", Key Note address, International Conference on Colloids and Interfaces, Mainz, Germany (2015).
23. "Photothermal and photoacoustic spectroscopy" Invited talk, International Conference on Optical Properties of Materials, Montenegro, (2015).
24. "Mechanical Photothermal Spectroscopy", University of Central Florida, Nanoscience Center, Jan. 2015.
25. "Chemical sensing through Calorimetry", Texas Tech. University, Department of Chemical Engineering, June 2015.
26. "Nanomechanical Sensors" Invited talk, Biotronics 2014 international conference, Seoul, Korea, Sept. 2014.
27. "Nanoburning of Methanol", Plenary Talk, International Conference on Nanoenergy Conference, Beijing, Dc. 2014.
28. "Single wire electricity transmission", Shanghai Jiatong University, Department of Micro Nano Electronics, Shanghai (Dec. 2014).
29. "Sustained Electrical Power from Catalytic Burning of Methanol", Shanghai University, Department of Physics (Dec. 2014).
30. "Reviving Tesla for an array of possibilities", Leadership Lecture Series IIT Madras, May 2014
31. "Single wire power transmission", IEEE Seminar, IIT Bombay, May 2014
32. "Calorimetric Cantilever Sensors", Physics Department, IIT Madras, May 2014

33. "Nanomechanical sensors for biomedical applications", Amrita Institute, Center for Nanoscience, Cochin, May 2014
34. "Photothermal Nanomechanical Spectroscopy", NMC 2014 Madrid May 2014.
35. "Nanothermal Sensors", Center for Nanoscience, IISc Bangalore, December 2013.
36. "Thermomechanical Sensors", International Conference of Solid State Physics, New Delhi, December 2013
37. "Tip-induced nanolithography", SPIE Conference, Baltimore, April 2013.
38. "Standoff and point sensing using MEMS", Keynote talk, International Conference on Emerging Electronics, IIT Bombay, December 2012.
39. "Micromechanical Sensors", Invited Tutorial, International Conference on Emerging Electronics, IIT Bombay, December, 2012.
40. "Subs-surface imaging in scanning probe microscopy", Cochin University, India, Dec. 2012
41. "Photothermal Spectroscopy and Microscopy", MRS Fall Meeting, Boston, 2012
42. Nanosensors, Public Lecture, University of Alberta, Oct., 2012
43. "Controlling fluid flow at microscale: Applications in sensing and biofilms", Plenary Talk ASME conference, San Juan, Puerto Rico, July 2012.
44. "Micro and Nanomechanics and Molecular detection", IIT Bombay Invited Tutorial, International Nanomechanics Workshop, Bombay, India, June 2012.
45. "Photothermal Spectroscopy", International Scanning Probe Microscopy Conference, Toronto, June 2012
46. "Micromechanical Sensing", Physics Department Colloquium, University of Alberta, Jan. 2012
47. "Cantilever Sensors", Technical University Denmark, Christmas Symposium 2011.
48. "Photothermal Cantilever Deflection Spectroscopy", Cochin University, India 2011
49. "Optically Directed Transport and Detection of Biomolecules", City College Dublin, Ireland (2011)
50. "Frizzy Hair, Nanomechanics, and Oil Sands, Tech Fest, IIT Bombay, 2011
51. "Molecular Recognition in Cantilevers" POSTECH, S. Korea, 2011
52. "Nanomechanical Sensors" National Academies Panel on Chemical and Biological Sensors, Washington, DC, (2010).
53. "Standoff Detection of Explosives", ACS Pacific Rim Conference, Hawaii, 2010
54. "Cantilever sensors" Keynote Address, ICONSAT, Indian Institute of Technology (IIT), Bombay, India, (2010).
55. "Molecular Speciation" IIT, Department of Physics Colloquium, Madras, India, (2010).
56. "Scanning probe microscopy and sub-surface imaging" Institute of Mathematical Sciences, Madras, India, (2010).
57. "Standoff and point detection", IIT, Department of Electrical Engineering, Madras, India (2010).
58. "Nanomechanical Systems", Columbia University, Dept. of Mechanical Engineering, NYC, (2009).
59. "MEMS and Molecular Recognition", Stevens Institute of Technology, Nanotechnology Institute, NJ, (2009).
60. "Cantilever-Based Biosensors", University of Miami, FL, (2009).
61. "Microcantilever Sensors", NEMS Workshop, California Institute of Technology, Pasadena, CA, (2009).

62. "Thermomechanical Systems", Plenary Talk, NanoGiga Conference, McMaster University, Hamilton, ON, (2009).
63. "Nanomechanical Sensing: Challenges and Opportunities", National Nanotechnology Initiative, Washington, D.C., (2009).
64. "MEMS and NEMS" Electrical Engineering Department, Pennsylvania State University, (2009).
65. "Chemical sensing using cantilever sensors" Chemistry Department, Drexel University, Philadelphia, PA, (2009).
66. "Nanomechanical Sensing", Mechanical Engineering Department, Vanderbilt University, Nashville, TN, (2009).
67. "Strategies for Molecular Recognition in MEMS", Keynote Address, ICMEMS, IIT Madras, Chennai, India, (2009).
68. "Molecular Recognition in MEMS Sensors", IIT Bombay, India, (2009).
69. "Nanoengineering Applications", Rajagiri School of Engineering, Cochin, India, (2009).
70. "Nanotechnology for Biomass Conversion", Botany Department, St. Theresa's College, Cochin, India, (2009).
71. Molecular Recognition in MEMS, University of Arkansas, Fayetteville, AR, (2008).
72. Nanomechanical Sensing", Mechanical Engineering Dept., Virginia Tech, Blacksburg, VA, (2008).
73. "Receptor-free biosensing", APS March Meeting, New Orleans, LA, (2008).
74. "Detection of IEDs", IED Detection Conference, Washington, D.C., (2008).
75. "Microcantilever Sensors", State University of New York Albany, NY, (2008)
76. "Integrated Nanomechanical Sensors", General Electric Company, Schenectady, NY
77. "Receptor-free mechanical sensing", Institute of Electrical and Electronics Engineers (IEEE) Sensor Conference, Atlanta, GA, (2007).
78. MEMS Sensors, Chemical Engineering Dept., Vanderbilt University, Nashville, TN (2007).
79. Chemical and biological sensing using cantilevers, Photonic West, San Jose, CA, (2007).
80. "Chemical and Biological Detection Using Cantilever Sensors", Pittcon Meeting, Chicago, IL, (2007).
81. Receptor-free sensing, SPIE Conference, Orlando, FL, (2007).
82. Receptor-free detection of chemicals, International Conference on Cantilever Sensors, Montreal, Canada, (2007).
83. Explosive Detection using Cantilever Sensors, US Army, ARDEC, Detroit, MI, (2006).
84. Microcantilever sensors, Material Research Society Conference Tutorial, Boston, MA, (2006).
85. Nanomechanical sensors, MRS Conference, Boston, MA, (2006).
86. Molecular recognition in MEMS sensors, Technical University, Denmark, (2006).
87. Cantilever Sensors, Max Plank Institute, Mainz, Germany, (2006).
88. Photothermal Spectroscopy, University of Burgundy, France, (2006).
89. Nanomechanical Sensors, International conference on scanning probe microscopy, Montpellier, France, (2006).
90. Selective and sensitive detection of analytes using MEMS, CEA, France (2006).
91. Cantilever Arrays, International Conference on Nanomechanics, Denmark, (2006).
92. Mechanical Sensors, Texas Tech University, Lubbock, TX, (2006).

93. Microcantilever Sensor Arrays, Sandia National Laboratory, Albuquerque, NM, (2006).
94. Explosive vapor sensing, DHS-DOE Workshop on Explosives, Albuquerque, NM, (2006).
95. MEMS Environmental Sensors, Workshop On Nanotechnology for EPA Applications, Raleigh-Durham, NC, (2006).
96. "Explosive vapor detection using cantilever sensors", American Chemical Society Meeting, Washington, D.C., (2005).
97. "Nanomechanical Sensor Arrays for Multiplexed detection of Chemicals", Weissberger/Williams Lecture, Eastman Kodak Company, Rochester, NY, (2005).
98. "Nanomechanical Sensors", National Academies (USA) Japan-US Workshop on sensors, Tsukuba, Japan, (2005).
99. "Cantilever Sensor Arrays for chemical sensing", Academia Sinica, Taiwan, (2005).
100. "Microcantilever Biosensors", Institute of Physics, Academia Sinica, Taiwan, (2005).
101. "Molecular recognition using MEMS arrays", ITRI, Taiwan, (2005).
102. "Nanobiology and Nanomechanics", Molecular Biology Department, University of Tennessee, Knoxville, TN, (2004).
103. "Nanomechanics", IIT, Madras, India, (2004).
104. "MEMS sensors", American Physical Society, March Meeting, Montreal, Canada, (2004).
105. "Molecular recognition using nanomechanics", ASME Workshop on Nanotechnology, Reno, NV, (2004)
106. "MEMS-based explosive detectors", ATF-DHS Workshop, Scottsdale, AZ, (2004).
107. "Microcantilevers and molecular recognition", MRS Spring Meeting, San Francisco, CA (2004).
108. "Frictional effects in MEMS", DOE Workshop on Friction, Oak Ridge National Laboratory, TN, (2004).
109. "Cantilevered MEMS sensors", Council for the Advancement of Science Writing (CASW) New Horizons in Science Briefing, Knoxville, TN, (2003).
110. "Explosive vapor detection using nanomechanics", NATO Advanced Studies Workshop, England, (2003).
111. "Micromechanical detection of chemical and biological warfare agents", Biodefense Conference, Washington, D.C., (2003).
112. "Cantilever array sensors", Protiveris Inc., Bethesda, MD, (2003).
113. "Molecular recognition using mechanical sensors", Rutgers University, NJ, (2003).
114. "Micromechanical sensors", Auburn University, Auburn, AB, (2003).
115. "Physical, chemical, and biological detection using cantilevers", Pittcon Meeting, Orlando, FL (2003).
116. "Environmental sensing using mechanical sensors", American Chemical Society, New Orleans, LA, (2003).
117. "MEMS and NEMS Sensors", Northwestern University, Evanston, IL, (2003)
118. "Detection of Terrorist weapons using microcantilever sensors", Lawrence Livermore National Laboratory, Livermore, CA, (2002).
119. "Mechanical Sensing", State University of New York Albany, NY, (2002).
120. "Microcantilever gas sensors", DARPA Workshop on Microsensors, Monterey, CA, (2002).

121. "Micromechanical Sensors", Nanotechnology Conference, Georgia Institute of Technology, Atlanta, GA, (2002).
122. "Micromechanical Sensors", Electrical Engineering Dept., Arizona State University, Tempe, AZ, (2002).
123. "MEMS and NEMS", Oak Ridge National Laboratory M&C Seminar, (2002).
124. "Environmental Sensing using Microcantilevers", Pittcon Meeting, New Orleans, LA, (2002).
125. "Nanofriction at electrified interfaces", ACS National Meeting, Orlando, FL, (2002).
126. "Microcantilever Biosensors," Materials Research Society Spring Meeting, San Francisco, CA, (2002).
127. " Terrorist Weapon Detection using microcantilevers", Scanning Microscopy Conference, Las Vegas, NV, (2002).
128. "Detection of terrorist threat using micromechanical sensors", AVS Topical Conference, Monterey CA, (2002).
129. MEMS and NEMS - Bridge to the Nanoworld, Mechanical Engineering Department, University of Tennessee, Knoxville, TN, (2002).
130. "Fundamental mechanisms in cantilever sensors", International Conference on Scanning Probe Microscopy, Tokyo, Japan, (2001).
131. "Microcantilever sensors", Scanning Microscopy conference, NY City, NY, (2001).
132. "Microcantilever Sensors", IIT Madras, Department of physics, Madras India, January 2001.
133. "Micromechanical Sensors", Department of Materials Science and Engineering, Ohio State University, Columbus, OH, (2001).
134. "Microcantilever chemical sensors", American Chemical Society, Ohio Valley Chapter, Columbus, OH (2000).
135. "Micromechanical sensors for biological applications", Monsanto Chemical Company, Saint Louis, MO, (2000).
136. "Micromechanical sensors", Department of Materials Science and Engineering, Ohio State University, Columbus, OH (2000).