CURRICULUM VITAE
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Current Position(s):

2013 - present	Group Leader, Nanosystems, Separations and Materials Research Group, Oak Ridge National Lab
2012 - present	Distinguished Scientist, Oak Ridge National Lab
2010 - present	Professor, Bredesen Center for Interdisciplinary Research and Graduate Education (CIRE), University of Tennessee
2004 - present	Adjunct Professor, Marquette University

Experience:

2007 - 2013	Group Leader, Nanosystems and Structures Group, Oak Ridge National Lab
2004 - 2011	Senior Scientist, Oak Ridge National Lab
2006 - 2010	Research Professor, University of Tennessee
1999 - 2006	Research Associate Professor, University of Tennessee
1997 - 2004	Research Scientist, Oak Ridge National Lab
1994 - 1999	Research Assistant Professor, University of Tennessee
1989 - 1994	Postdoctoral Research Associate, University of Tennessee
1985 - 1988	Research Assistant, Oak Ridge National Laby/ University of Tennessee

Education:

1988 Ph.D. in Physics, University of Tennessee, Knoxville, Tennessee
1983 B. S. in Physics, University of Ioannina, Ioannina, Greece

Summary of Experience:

Dr. Panos Datskos is a distinguished scientist and the group leader of the NanoSystems, Separations and Materials Research Group at Oak Ridge National Laboratory. He is also a Professor at the University of Tennessee and an Adjunct Professor at Marquette University. During his tenure at ORNL he led R&D programs covering a broad range of science and technologies in nanomanufacturing, nanomaterials, MEMS and microsensors at Oak Ridge National Laboratory, including prior and current DARPA programs. He has over 20 years experience in scientific research and development that involve the physics of nanomaterials, micro and nanomechanical (MEMS/NEMS) systems, micro-mechanical physical and chemical sensors, the physics of electron transport and ionization in gases and liquids. His current research interests focus on nanostructured surfaces, two dimensional materials, MEMS and NEMS and the development of physical and chemical sensors using microcantilevers, microcalorimetric spectroscopy, and uncooled MEMS infrared (IR) detectors. He has demonstrated leadership strengths and has led multi-disciplinary research teams, and managed

large research teams consisting of senior and junior technical staff, postdoctoral fellows, graduate and undergraduate students. He has demonstrated the ability to develop and manage research programs with teams from ORNL and other research organizations and universities. He has received a 2000 Discover award, and seven coveted R&D 100 Awards, which is given to the 100 best technologies of the year. He has 90 open literature publications, and 96 conference proceedings and presentations, 14 issued patents and 5 pending patents.

Publications:
Authored or co-authored over 180 publications: Journals/Book chapters > 90; Conference Proceedings/Presentations > 95

U.S. Patents:
Fourteen issued U.S. and three pending patents applications

Awards:
1985 Science Alliance Award (UTK)
1986 Science Alliance Award (UTK)
1987 Science Alliance Award (UTK)
1988 Science Alliance Award (UTK)
1996 R&D 100 Award (R&D magazine)
1998 R&D 100 Award (R&D magazine)
1999 R&D 100 Award (R&D magazine)
2000 Discover Award (Discover Magazine)
2000 Inventor of the year (UT-Battelle)
2000 Technical Accomplishment Award (UT-Battelle)
2003 R&D 100 Award (R&D magazine)
2010 R&D 100 Award (R&D magazine)
2011 R&D 100 Award (R&D magazine)
2012 R&D 100 Award (R&D magazine)

Activities:
Member of Editorial Board of Sensors & Transducers Journal
Member of Editorial Board of Open Applied Physics Journal
Member of Editorial Board of Review of Scientific Instruments
Member of the Editorial Board of Microelectronic Engineering
Member of the Editorial Board of Dataset Papers in Optics
Member of the Editorial Board of Journal Sensing and Imaging

Reviewer for Peer Reviewed Journals:
Journal of Physics D, Applied Physics
Nature
Applied Physics Letters
Review of Scientific Instruments
Journal of Micromechanics and Microengineering
Measurement Science and Technology
IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control
IEEE/OSA Journal of Lightwave Technology

Optical Engineering
Open Applied Physics Journal
Sensors and Actuators

Research Background:
The research work has been carried out at Oak Ridge National Laboratory and the University of Tennessee:

- **Atomic Thickness Membranes:** Developed new methods to grow graphene layers and investigated the dependence of electrical and thermal conductivity on defect concentration.
- **Nanostructured Materials with Low Surface Energy:** Developed new classes of nanostructured materials with characteristics and properties that include superhydrophobic behavior, anti-icing, anti-corrosion, and anti-fouling.
- **Micro-Electro-Mechanical Systems (MEMS and Nano-Electro-Mechanical Systems (NEMS) for nano-electronic and sensing applications:** Investigated and developed MEMS and NEMS with applications to high-speed nano-electronic single-electron transistors, and physical and chemical sensors.
- **Microcantilevers for Physical and Chemical Sensing:** Investigated the use of microcantilevers for chemical sensing and detection of infrared, visible and ultraviolet radiation. Studied the interaction of infrared photons with micromechanical structures and developed microcantilever thermal detectors. Studied the photo-induced (electronic stress in semiconductor cantilevers, and quantum well cantilevers. Investigated the adsorption of molecules on the surface of micromechanical thermal and developed novel chemical detection approaches.
- **Photon Scanning Tunneling Microscopy:** Developed a photon scanning tunneling microscope (PSTM) to image small viral particles (such as T4 Bacteriophages).
- **Multiphoton Processes in Dense Media:** Studied the mechanisms and energetics of laser induced multiphoton ionization and excitation processes in dense gases. Developed a technique for the determination of the ionization threshold of molecules in dense media, using multiphoton ionization. Designed and built laser ionization and fluorescence cells for high temperature, high pressure, and high electric fields.
- **Fast Gas Mixtures for Gas-Filled Particle Detectors:** Improved binary and ternary gas mixtures were discovered which optimized counter operation for particle detection, identification and localization. The composition of these gas mixtures was based on knowledge of their basic electron scattering properties. Identified and tailored new gas dielectrics by optimization of the electron and ion densities and their energies in these gases. Investigated the role of electron attachment in the choice of unitary gas dielectrics or electronegative components in dielectric gas mixtures, and also investigated the role of electron scattering at low energies in the choice of buffer gases for such mixtures
- **Photodetachment of Negative Ions:** Developed techniques to investigate the energetics, dynamics and dependence on photon energy of photodetachment processes. Measured the photodetachment cross section as a function of photon energy for hexafluorobenzene (C_6F_6) in a buffer gas of tetramethylsilane [$Si(CH_4)_4$].
- **Electron Detachment from Negative Ions:** Developed a new technique to study the energetics, dynamics and dependence on temperature and gas number density of electron detachment processes. Studied the electron detachment from hexafluorobenzene (C_6F_6), hexafluorobutene (c-C_4F_6) and sulfur hexafluoride (SF_6) anions in a buffer gas of N_2 as a

function of temperature and gas number density.

- **High Pressure Electron Swarm and Electron Drift Studies:** Investigated the electron attachment mechanism in gases from the low to the high-pressure regime. Studied the effect of the nature and state (density and temperature) of the medium on electron motion and negative ion formation in gases. Performed computer analyses of electron swarm and electron drift data to determine the momentum-transfer and electron attachment cross-sections in gases.

Accomplishments:

- R&D 100 Award for nonlinear MEMS oscillators. In 2010 he received an R&D 100 Award for the study and development of nonlinear oscillators using state-of-the art MEMS cantilevers.
- Micro and nanomechanical gyroscopes. In 2009 he invented a NEMS gyroscope that can be used in GPS devices or inertial navigations units.
- R&D 100 Award for optical readout for large arrays of bimaterial MEMS cantilevers. In 2003 he received an R&D 100 award for the development of an uncooled infrared camera with optical readout based on bimaterial cantilevers.
- Developed techniques to measure extremely small masses using MEMS. In 2003 he successfully measured femtogram mass changes using bimaterial microcantilevers.
- Explosive detection using microcantilevers. In 2000 he was the recipient a Discover Award for the development of a micromechanical TNT detector.
- R&D 100 Award for uncooled infrared quantum detector based on MEMS. In 1999 he received an R&D 100 Award for the development of a micromechanical quantum detector.
- New class of photomechanical chemical detectors based on microcantilever thermal detectors and microcalorimetric spectroscopy. In 1998 he was recipient of an R&D 100 Award for the development of a microcalorimetric spectrometer.
- R&D 100 Award for novel chemical sensors based on microcantilevers. In 1996 he received an R&D 100 Award for a microcantilever mercury vapor detector.
- R&D 100 Award for microcantilever thermal detectors for uncooled IR imaging and temperature sensing. In 1996 he received an R&D 100 award for a microcantilever temperature sensor.
- Ionization measurements of molecules in dense media. Developed new experimental techniques for the measurement of the ionization threshold of molecules in dense media.
- Development of new experimental techniques for study of electron detachment from negative ions in gases.
- Development of new experimental techniques for the measurement of photodetachment cross-sections from negative ions in gaseous media.

Patents:

1. "Chemical Detection Using Calorimetric Spectroscopy," U.S. Patent: 5,923,421 (1999).
2. "Uncooled Infrared Photon Detector and Multicolor Infrared Detection Using Micro-Opto-Mechanical Sensors," U.S. Patent: 5,977,544 (1999).
3. "Non-contact Passive Temperature Measuring System and Method of Operation Using Micro-Mechanical Sensors," U.S. Patent: 6,050,722 (2000).
4. "Method Using Photo-induced and Thermal Bending of MEMS Sensors" U.S. Patent:

6,312,959 (2001).
5. "Photo-induced Micro-Mechanical Optical Switch," U.S. Patent: 6,385,363 (2002).
6. "Apparatus and Method for Detecting Electromagnetic Radiation Using Electron Photoemission in a Micromechanical Sensor," U.S. Patent: 6,444,972 (2002).
7. "Integrated Optical Interrogation of Micro-Structures," U.S. Patent: 6,525,307 (2003).
8. "Acoustic Sensors Using Microstructures Tunable with Energy Other than Acoustic Energy," U.S. Patent: 6,651,504 (2003).
9. "Response Microcantilever Thermal Detector," U.S. Patent: 6,805,839 (2004).
10. "Acoustic Sensors Using Microstructures Tunable with Energy Other than Acoustic Energy" U.S. Patent: 6,901,802 (2005).
11. "Detection of Electromagnetic Radiation Using Micromechanical Multiple Quantum Wells Structures" U.S. Patent: 7,244,959 (2007).
12. "Electron/Hole Transport-Based NEMS Gyro and Devices Using the Same" U.S. Patent: 7,552,636 (2009).
13. "Nonlinear Nanomechanical Oscillators For Ultrasensitive Inertial Detection," U.S. Patent 8,505,382 (2013).
14. "MEMS Based Pyroelectric Thermal Energy Harvester," U.S. Patent: 8,519,595 (2013).
15. "Pulsed Photothermal Phase Transformation Control For Titanium Oxide Structures And Reversible Bandgap Shift For Solar Absorption," (U.S. Patent Application: 20120073640).
16. "Nano-Mechanical Electric and Electromagnetic Field Sensor," (U.S. Patent Application: 20120206609 A1).
17. "High Quality Large Scale Single and Multilayer Graphene Production by Chemical Vapor Deposition," (U.S. Patent Application: 20130174968 A1).
18. "Method of Synthesizing Silica Nanofibers Using Sound Waves," (U.S. Patent Application).
19. "Graphene Reinforced Materials And Related Methods of Manufacture," (U.S. Patent Application).

Publications / Journals:

1. P. G. Datskos and L. G. Christophorou, "Variation of the Electron Attachment to n-C_4F_{10} with Temperature," *J. Chem. Phys.* **86**, 1982 (1987).
2. P. G. Datskos and L. G. Christophorou, "Variation with Temperature of the Electron Attachment to SO_2F_2," *J. Chem. Phys.* **90**, 2626 (1988).
3. H. Faidas, L. G. Christophorou, P. G. Datskos and D. L. McCorkle, "The Ionization Threshold of N,N,N$^{!}$,N$^{!}$- Tetramethyl-p-phenylenediamine in Dense Fluid Ethane; Effects of Fluid Density and Temperature," *J. Chem. Phys.* **90**, 6619-6626 (1989).
4. P. G. Datskos L.G. Christophorou, and J. G. Carter, "Temperature-Enhanced Electron Attachment to CH_3Cl", *Chem. Phys. Lett.* **168**, 324 (1990).
5. L. G. Christophorou, P. G. Datskos, and J. G. Carter, "Gases of Possible Interest to SCC Muon Detectors," *Nucl. Instr. Meth. Phys. Res. A* **309**, 160 (1991).
6. P. G. Datskos, L. G. Christophorou, and J. G. Carter, "Effect of Vibrational Excitation on Electron Transport in Gases," *Chem. Phys. Lett.* **186**, 11 (1991).
7. P. G. Datskos, L. G. Christophorou, and J. G. Carter, "Ionization Coefficients in Selected Gas Mixtures of Interest to Particle Detectors," *J. Appl. Phys.* **71**, 1 (1992).
8. L. G. Christophorou, P. G. Datskos, and J. G. Carter, "Effect of Temperature on the Dissociative and Nondissociative Electron Attachment to Freons," *Ber. der Bunsenges. Phys. Chem.* **3**, 96 (1992).

9. P. G. Datskos, L. G. Christophorou, and J. G. Carter, "Temperature Enhanced Autodetachment from c-$C_4F_6^{-*}$," *Chem Phys. Lett.* 1**95**, 329 (1992).
10. P. G. Datskos, L. G. Christophorou, and J. G. Carter, "Effect of Temperature on the Attachment of Slow (< 1 eV) Electrons to CH_3Br," *J. Chem Phys.* **97**, 9031 (1992).
11. P. G. Datskos, L. G. Christophorou, and J. G. Carter, "Temperature-Enhanced Electron Detachment from $C_6F_6^-$ Negative Ions," *J. Chem Phys.* **98**, 7875 (1993).
12. P. G. Datskos, L. G. Christophorou, and J. G. Carter, "Temperature Dependence of Electron Attachment and Detachment in SF_6 and c-C_4F_6," *J. Chem Phys.* **99**, 8607 (1993).
13. L. G. Christophorou, P. G. Datskos, and J. G. Carter, "Response to `Comment on Temperature-enhanced electron detachment from $C_6F_6^-$ negative ions' [J. Chem. Phys. **100**, 6981 (1994)]", *J. Chem. Phys.* **100**, 6983 (1994).
14. L. G. Christophorou, P. G. Datskos, and H. Faidas, "Photodetachment in the Gaseous, Liquid and Solid States of Matter," *J. Chem. Phys*. **101**, 6728 (1994).
15. L. G. Christophorou, L. A. Pinnaduwage, and P. G. Datskos, "Electron Attachment to Excited Molecules," in "Linking the Gaseous and Condensed Phases of Matter: The Slow Electrons and Its Interactions," L. G. Christophorou, E. Illenberger, and W. F. Schmidt (Eds.) (Plenum Press, New York, 1994).
16. P. G. Datskos, J. G. Carter, and L. G. Christophorou, "Photodetachment of SF_6^-," *Chem. Phys. Lett.* **239**, 38 (1995).
17. L. G. Christophorou, and P. G. Datskos, "Effect of Temperature on the Formation and Autodestruction of Parent Anions," *Int. J. Mass Spectr. Ion Proc.* **149/150**, 59 (1995).
18. L. A. Pinnaduwage and P. G. Datskos, "A Novel Technique for Real Time Monitoring of Electron Attachment to Laser Excited Molecules: Measurements on ArF-Excimer-Laser Irradiated Nitric Oxide," *J. Chem. Phys.* **104**, 8382 (1996).
19. E. A. Wachter, T. G. Thundat, P. G. Datskos, P. I. Oden, S. L. Sharp, and R. J. Warmack, "Remote Optical Detection Using Microcantilevers," *Rev. Sci. Instr.* **67**, 3434 (1996).
20. P. G. Datskos, P. I. Oden, T. G. Thundat, E. A. Wachter, R. J. Warmack, and S. R. Hunter, "Remote Infrared Radiation Detection Using Piezoresistive Microcantilevers," *Appl. Phys. Lett.* **69**, 2986 (1996).
21. P. I. Oden, P. G. Datskos, T. Thundat, and R. J. Warmack, "Uncooled Thermal Imaging Using July 24, 2006dea Piezoresistive Microcantilever," *Appl. Phys. Lett.* **69**, 3277 (1996).
22. P. G. Datskos, L. A. Pinnaduwage, and John F. Kielkopf, "Photophysical and Electron Attachment Properties of ArF-Excimer-Laser Irradiated H_2," *Phys. Rev. A* **55**, 4131 (1997).
23. L. A. Pinnaduwage and P. G. Datskos, "Electron Attachment to Excited States of Silane: Implications for Plasma Processing Discharges," *J. Appl. Phys.* **81**, 7715 (1997).
24. P. G. Datskos, C. Tav, I. Sauers, and L. A. Pinnaduwage, "Electron Attachment to Vibrationally Excited Trichlorotrifluoroethane (1,1,2-$C_2Cl_3F_3$)," *J. Phys. D: Appl. Phys.* **30**, 2596 (1997).
25. L. A. Pinnaduwage, P. G. Datskos, and C. Tav, "Electron Attachment to Photofragments and Rydberg States in Laser-Irradiated CCl_2F_2," *J. Appl. Phys.* 84, 3442 (1998).
26. P. G. Datskos, S. Rajic, and I. Datskou, "Photo-induced and Thermal Stress in Silicon Microcantilevers," *Appl. Phys. Lett.* **73**, 2319 (1998).
27. C. Tav, P. G. Datskos, and L. A. Pinnaduwage, "Electron Attachment to Boron Trichloride," *J. Appl. Phys.* **84**, 5805 (1998).
28. P. G. Datskos, and I. Sauers, "Detection of 2-mercaptoethanol Using Microcantilevers," *Sensors and Actuators B* **61**, 75 (2000).

29. P. G. Datskos, S. Rajic and I. Datskou, "Detection of Infrared Photons Using the Electronic Stress in Metal-Semiconductor Cantilever Interfaces," *Ultramicroscopy* **82**, 49 (2000).
30. J. Headrick, M. Sepaniak, S. Alexandratos, and P. G. Datskos, "Chelating Scintillation Fibers for Measurements of ^{137}Cs," *Anal. Chem*., **72**, 1994 (2000).
31. T. Betts, C. Tipple, M. Sepaniak, and P. G. Datskos, "Selectivity of Chemical Sensors Based on Micro-Cantilevers Coated with Polymeric Films," *Anal. Chim. Acta*, **422**, 89 (2000).
32. B. C. Fagan, C. A. Tipple, Z. Xue, M. J. Sepaniak, P. G. Datskos, "Modification of Micro-Cantilever Sensors with Sol-Gels to Enhance Performance and Immobilize Chemically Selective Phases," *Talanta*, **53**, 599 (2000).
33. M. J. Sepaniak, N. V. Lavrik, C. A. Tipple, and P. G. Datskos, "Hybrid Nanostructured Microcantilevers for Enhanced Chemimechanical Transduction and SERS", *Micro Total Analysis Systems,* J.M Ramsey and A. van den Berg, Eds, Kluwer Academic Publishers, London, 450-452 (2001).
34. P. G. Datskos, S. Rajic, L. R. Senesac and I. Datskou, "Fabrication of Quantum Well Microcantilever Photon Detectors," *Ultramicroscopy*, **86**, 191 (2001).
35. N. Lavrik, C. Tipple, P. Datskos, and M. Sepaniak, "Enhanced Chemi-Mechanical Transduction at Nanostructured Interfaces," *Chemical Physics Letters*, **336**, 371 (2001).
36. N. V. Lavrik, C.A. Tipple, P.G. Datskos, M.J. Sepaniak, "Gold Nano-Structures for Transduction of Biomolecular Interactions into Micrometer Scale Movement," Biomedical Microdevices, **3**, 35 (2001).
37. P. G. Datskos, and M. Sepaniak, C.A. Tipple, and N. Lavrik, "Photomechanical Chemical "Microsensors," *Sensors and Actuators* B, **76**, 393 (2001).
38. P. G. Datskos, S. Rajic, L.R. Senesac, I. Datskou, M.S. Sepaniak, N. Lavrik, and C.A. Tipple, "Chemical Detection Based on Adsorption-Induced and Photo-Induced Stresses in MEMS Devices," *Journal of Vacuum Science and Technology B***, 19**, 1173 (2001).
39. P. G. Datskos, and T.G. Thundat "Nanocantilever Signal Transduction Using Electron Transfer," *Journal of Nanoscience and Nanotechnology*, **2**, 369 (2002).
40. C. A. Tipple, N.V. Lavrik, M. Culha, J. Headrick, P.G. Datskos, and M.J. Sepaniak "Nanostructured Microcantilevers With Functionalized Cyclodextrin Receptor Phases Self-Assembled Monolayers and Vapor Deposited Films," *Analytical Chemistry*, **74**, 3118 (2002).
41. J. L. Corbeil, N. V. Lavrik, S. Rajic, and P. G. Datskos, "Self-Leveling Uncooled Microcantilever Thermal Detector," *Applied Physics Letters*, **81**, 1306 (2002).
42. G. Muralidharan, D. M. Nicholson, S. Rajic, T. M. Daniels-Race, H. Li, T. G. Thundat, and P. G. Datskos, "An Atomic Force Microscope-Based Investigation of Vertical Transport Through GaAs/GaAlAs/InAlAs/GaAs Step-Barrier Heterostructures" *Ultramicroscopy*, **91**, 133 (2002).
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49. L. R. Senesac, J. L. Corbeil, S. Rajic, N. V. Lavrik, and P. G. Datskos, "IR Imaging Using Uncooled Cantilever Sensors," *Ultramicroscopy,* **97**, 451 (2003).
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52. L. V. Lavrik, M. J. Sepaniak, and P. G. Datskos, "Detection of Explosive Compounds Using Microcantilevers with Nanoporous Coating," *Sensor Letters,* **1**, 25 (2003).
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54. P. G. Datskos, N. V. Lavrik and S. Rajic, "Performance of Microcantilever Thermal Detectors," *Review of Scientific Instruments,* **75**, 1134 (2004).
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