

CURRICULUM VITAE

Timothy David Sands

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Education:

B.S., Highest Honors, in Engineering Physics, University of California, Berkeley, 1980
M.S. in Materials Science, University of California, Berkeley, 1981
Ph.D. in Materials Science, University of California, Berkeley, 1984

Professional Experience:

1980: *Summer Intern*, Solar Energy Research Institute (SERI), now known as the National Renewable Energy Laboratory (NREL), Golden, CO.
1984: *Postdoctoral Fellow*, Materials and Molecular Research Division, Lawrence Berkeley Laboratory.
1984 - 86: *Industry Fellow*, Center for Advanced Materials, Lawrence Berkeley Laboratory.
1984 - 90: *Member of Technical Staff*, Bellcore, Red Bank, NJ.
1990 - 91: *Director- Thin Films and Interface Science Research Group*, Bellcore, Red Bank, NJ.
1992 - 93: *Director- Nonvolatile Memory Research Group*, Bellcore, Red Bank, NJ.
1993 - 02: *Professor*, Department of Materials Science and Engineering, University of California, Berkeley.
1997 - 99: *Chair, Executive Committee*, Applied Science & Technology Graduate Group.
2001: *Visiting Professor*, Interuniversity Microelectronics Center (IMEC) and Faculty of Engineering, Katholieke Universiteit Leuven, Belgium.
2002: *Director*, Integrated Materials Laboratory (IML).
2002 – 2014: *Basil S. Turner Professor of Engineering (Named University Professorship)*, School of Materials Engineering and School of Electrical & Computer Engineering, Purdue University.
2006 – 10: *Mary Jo and Robert L. Kirk Director*, Birck Nanotechnology Center, Discovery Park, Purdue University.
April 2010 – July 2012: *Executive Vice President for Academic Affairs and Provost* of Purdue University.
July 2012 - Jan 2013: *Acting President*; Purdue University.
Jan 2013 – May 2014: *Executive Vice President for Academic Affairs and Provost* of Purdue University.
June 2014 – present: *President*, Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, VA.

Awards and Honors:

Tau Beta Pi

Phi Beta Kappa

Von Hippel Award for Graduate Student Research, Materials Research Society (MRS), 1983.

1988 Robert Lansing Hardy Gold Medal, The Minerals, Metals and Materials Society (TMS).

MSE Excellence in Teaching Award (Sp 1994), UC Berkeley MRS Student Chapter.

NSF Research Initiation Award (1994)

Seed for Success Award, Purdue University (2005)

Fellow of the Materials Research Society, MRS (2009) – *“for a succession of scientific achievements of critical impact in microelectronics and nanotechnology; for formal and informal leadership; and for service to the interdisciplinary scientific community”*

Fellow of IEEE (2010) – *“for contributions to metal/semiconductor interfaces and heterogeneous integration”*

Charter Fellow of the National Academy of Inventors, NAI (2012)

Named “Distinguished Hoosier” by Indiana Governor Michael Pence, May 15th, 2014

Edward Bouchet Legacy Award for Commitment to Diversity and Excellence in Doctoral Education, presented at the 11th Annual Forum of the Bouchet Graduate Honor Society, Howard University, September 15th, 2016.

Academic Leadership Award, 2018 GEM Leadership Awards Gala, Los Angeles, CA, Sept. 13th, 2018.

Regional Leadership Award (with Nancy Agee), Roanoke-Blacksburg Technology Council (RBTC) TechNite 2019, May 3rd, 2019.

Leadership Impact Award (on behalf of Virginia Tech), Virginia Latino Higher Education Network (VALHEN), Arlington, VA, October 22nd, 2019.

Grants and Contracts Awarded:

1. **Principal Investigator**, “Research Initiation Award: Homogenation of Magneto-optic Properties in MnBiAl Films through the Introduction of Nanoscale Artificial Crystallinity,” National Science Foundation – ECS-9409730, \$89,777, 8/1/94-7/31/96
2. **Principal Investigator**, “Ternary and Quaternary Rare Earth-Transition Metal Magnetic Thin Films, IBM Sponsored Research Agreement #2064, \$34,072, 9/1/97-8/31/98
3. **Principal Investigator**, “Microstructure-Processing-Property-Performance Relationships in Integrated Ferroelectric Capacitors: The PLZT/Metallic Ruthenate System,” National Science Foundation – ECS-9632707, \$62,256, 3/1/97-2/28/98
4. **Principal Investigator** (with Co-PI Nathan Cheung), “Laser Lift-off of Gallium Nitride from Sapphire Substrates,” UC MICRO Program, 98-133, \$28,041 from UC MICRO and \$40,000 from Hewlett-Packard Co., 7/1/98-6/30/99
5. **Principal Investigator**, “Poling of Ferroelectric Thin Films; Application to Integrated Memory, Sensing and Actuation Devices,” National Science Foundation - ECS-9732847, \$235,920, 7/1/98 - 6/30/01
6. **Principal Investigator**, “Assembly of Functionally-enhanced MEMS by Laser Liftoff and Transfer of Epitaxial Piezoelectric Thin Films,” National Science Foundation - ECS-9812906, \$100,000, 9/1/98 - 8/31/99

7. **Principal Investigator-Subaward**, “Quantum Structures for Thermoelectric Applications,” Office of Naval Research (ONR/MURI) through University of California, Los Angeles - Subaward N00014-97-1-0516, \$500,000, 5/1/97 – 4/30/02
8. **Principal Investigator-Subcontract**, “Development of Micropiezoelectric Actuator for Optical Module,” Sung Kyun Kwan University - Subcontract M2808, \$42,000, 3/1/98 - 2/28/00
9. **Principal Investigator**, “Mechanisms of Optical Damage in Fused Silica,” LLNL Memorandum Agreement B335894, \$155,560, 2/5/97-1/31/01
10. **Co-Investigator**, “Thin Films on Metal Oxide Layers,” 00562 Civilian Res. & Dev. Fdn. For Indep. Sts. Frmr. USSR – ACH 008 98, \$2,700, 10/1/98 - 9/30/99
11. **Principal Investigator**, (with Co-Investigators Luke Lee and Nathan Cheung) “XYZ-on-a-Chip: Integration of Dissimilar Materials by Bonding and Thin-film Transfer: Application to Integrated Optical Microfluidic Systems,” National Science Foundation - DMI-0088145, \$818,000, 9/1/00 - 8/31/03
12. **Principal Investigator**, “Methods and Application of High Resolution Energy-Filtering Transmission Electron Microscopy,” Max Kade Foundation, Inc. – 010884, \$67,000, 8/1/99 – 1/31/01
13. **Co-Principal Investigator** (with lead Principal Investigator A. Majumdar and Co-Principal Investigators P. Yang, V. Narayanamurti and A. Shakouri), “NIRT: Novel Energy Conversion Devices Based on Nanowire Heterostructures, National Science Foundation CTS-0103609, \$1,343,226, 7/1/01 - 6/30/05
14. **Principal Investigator** (with Co-Investigator Nathan Cheung), “Hybrid Integration and Packaging of Gallium Nitride Devices by Transient-Liquid-Phase Bonding and Laser Lift-Off”, UC MICRO Program, project #01-074 and Oriol, Inc., \$71,719 from MICRO and \$50,000 from Oriol, Inc., 8/13/01-12/31/02
15. **Co-Principal Investigator** (with Principal Investigator Nathan Cheung), “Wafer-scale Laser Lift-off of Gallium Nitride LEDs”, UC SMART Program, project #01-00098 and Oriol, Inc., \$45,082 from UC SMART and \$50,000 from Oriol, Inc., 8/27/02-8/26/03
16. **Investigator for Subaward** (PI S. Datta), “Support of Graduate Student in the Institute for Nanoelectronics and Computing (INAC),” NASA URETI Program, NCC 2-1363, \$192,309 for TDS, 09/01/02-08/31/07
17. **Co-Principal Investigator for Subaward** (with A. Wei (lead) and R. Reifengerger), “Nano-Magnetics Research at Purdue,” DARPA in coordination with the BNC, MDA972-03-1-0020, \$240,000 (\$70,000 for TDS), 05/12/03-05/11/06
18. **Principal Investigator for Purdue Subaward** “Thermionic Energy Conversion Center (TEC), ONR-DoD MURI, Lead Institution: UC Santa Cruz, Other MURI Investigators: A. Shakouri (UCSC,lead), A. Gossard (UCSB), J. Bowers (UCSB), R. Davis (NCSU), R. Nemanich (NCSU), Z. Sitar (NCSU), V. Narayanamurti (Harvard), H. Schmidt (UCSC), R. Ram, G. Bilbro (NCSU), A. Majumdar (Berkeley), \$240,000 for TDS, 05/1/03-6/30/06
19. **Co-Principal Investigator** (with Hugh Hillhouse, lead PI, and others) “Acquisition and Customization of a Facility for the In-situ X-ray Characterization of Nanostructures,” National Science Foundation – CTS-0321118, \$531,000, 8/15/03-8/14/06
20. **Principal Investigator** “Nanoheteroepitaxy of (In,Ga)N: Toward a Phosphor-Free White LED,” National Science Foundation – ECS-0424161, \$212,120, 9/15/04-8/31/07
21. **Principal Investigator** “High Efficiency Thermoelectric Waste Heat Recovery Systems for Vehicle Applications,” DOE subcontract 04-DOE930-125 through BSST, \$10,000, 11/15/04-03/15/06
22. **Co-Principal Investigator** (P.I. Tim Fisher) “Carbon Nanotube Electrical Interfaces for Thermoelectrics” Cooling Technologies Research Center at Purdue University, \$100,000, 1/1/06-12/31/07
23. **Principal Investigator** (with Co-PIs Eric Stach and Edwin Garcia) “Low-cost Substrates for High-performance Nanorod Array LEDs,” DOE DE-FC26-06NT42862, \$899,948 from DOE; \$225,195 cost share from Purdue; 5/1/06-4/30/09

24. **Principal Investigator** “Acquisition of a Custom Reactive Sputter Deposition System for Nitride Multilayers,” ONR N000140619647, \$300,000, April 13th, 2006 – May 31st, 2007.
25. **Principal Investigator** “Nanowire Arrays for Thermoelectric Power Generation,” ONR N000140610641, \$296,114, April 13th, 2006 – May 31st, 2009
26. **Principal Investigator for Purdue Subaward** “Thermionic Energy Conversion Center (TEC),” ONR-DoD MURI, Lead Institution: UC Santa Cruz, Other MURI Investigators: A. Shakouri (UCSC,lead), A. Gossard (UCSB), J. Bowers (UCSB), R. Nemanich (NCSU), Z. Sitar (NCSU), V. Narayanamurti (Harvard), H. Schmidt (UCSC), R. Ram, G. Bilbro (NCSU), A. Majumdar (Berkeley), \$233,000 for TDS, 07/1/06-6/30/08 (two-year extension of original three-year grant).
27. **Co-Principal Investigator** (PI: Tim Fisher) “Thermal and electrical characterization of carbon nanotube vias,” CTRC, \$100,000, 1/1/08-12/31/09.
28. **Co-Principal Investigator** (PI: Tim Fisher) “US-India Workshop: Frontiers in Scalable Nanostructured Interface Materials,” NSF-OISE, \$58,901, 6/15/08-6/14/10.
29. **Principal Investigator for Purdue Subaward** (with Co-PI A. Ramdas), “Nanostructured Metal/Semiconductor Materials for Thermoelectric Generators,” DARPA, Lead Institution: UC Santa Cruz, Lead PI: A. Shakouri; Purdue Subaward SO182208; \$430,000 for Purdue, 8/25/08-3/31/10; Phase II, \$240,000 for Purdue, 7/19/10-8/24/11; extended with additional \$100,000 to Purdue, with A. Shakouri as Purdue Co-PI through 8/24/12.
30. **Principal Investigator** (Co-PI: Tim Fisher) “Thermoelectric power generation from waste heat in electronic systems,” CTRC, \$80,000, 1/1/09-12/31/10.
31. **Principal Investigator** “Copper-copper bonding for laminated thermoelectric elements,” ONR, \$162,000, 1/1/09-12/31/09.
32. **Principal Investigator** “Composition modulated nanowire arrays for thermoelectric power generation,” ONR, \$381,442, 5/1/09-4/30/12.
33. **Principal Investigator for Purdue Subaward** “Collaborative Research: TIE: AIN High-Q MEMS FBAR (Film Bulk Acoustic Resonator) in a Liquid Environment,” NSF IIP 0933592, \$50,000, 7/15/09-7/14/11.
34. **Co-PI for Purdue Subaward** “NSF/DOE Thermoelectrics Partnership: Thermoelectrics for Automotive Waste Heat Recovery,” NSF CBET 1048616, \$446,785, 1/1/11-12/31/12.
35. **Institutional Principal Investigator** “Sustainable Energy Concepts – Professional Development Model for Rural Schools and Its Extension to a Systemic Approach for Integrating STEM Research and Education, NSF 09-63621, \$502,378, 9/15/10-8/31/15.
36. **Institutional Principal Investigator** (PI as of June 2011; Co-PIs: Monica F. Cox and Christine G. Taylor) “LSAMP Indiana Alliance – Phase II”, NSF HRD 07-03443, \$3,040,194, 5/1/2007-4/30/2012.
37. **Institutional Principal Investigator** (PI as of July 2012; Co-PIs: C.G. Taylor, A. Pawley, C. Sahley, D. Reed, K. Kokini, V. Moghadam) “ADVANCE Institutional Transformational Award: Purdue Center for Faculty Success,” NSF HRD 0811194, \$3,945,625, 10/1/2008-9/30/2013.

Leadership in Professional Societies:

Electronic Materials Committee (EMC/TMS)

Elected member in 1989; Session organizer ((1988, 1991, 1992, 1993, 2005, 2006); Elected Officer of the EMC (Treasurer, 1991-93; Vice-Chair, 1993-95; Chair, 1995-97; Past Chair, 98-99); Technical Program Chairman for 1994 EMC (Boulder, CO) and 1995 EMC (Charlottesville, VA); Member-at-Large (2001-2010); EMC representative to Journal of Metals Advisory Committee (2003); Member, Journal of Electronic Materials Editorial Oversight Committee (TMS/IEEE) (2000-2010)

The Minerals, Metals and Materials Society (TMS/AIME)

Member, TMS Hardy & Mathewson Awards Subcommittee (1994-97); Chair, TMS Hardy & Mathewson Awards Subcommittee (1997); Member, Nominations Committee (1995-98); *Ex Officio* Member, Electronic, Magnetic and Photonic Materials Division (EMPMD)(1995-97); Member, AIME Rossiter W. Raymond Memorial Award Committee (1997-99); Member, TMS John Bardeen Award Committee (2005-08), 2008 Chair

Materials Research Society (MRS)

Symposium organizer (Spring 1989, Fall 1993, Spring 2003); Meeting Co-Chair for Fall 1994 MRS Meeting (Boston, MA); Member, MRS Meeting Quality Subcommittee (1995); Member, MRS Continuing Education Committee (1995-97); Member, Public Affairs Committee, Public Outreach Subcommittee (1998-01); Chair, Long-Range Planning Committee (1999-2000); Member, MRS Program Committee (2000-01); Member, MRS Tutorial Program Subcommittee (2000-01); Elected MRS Councillor (1997-99); Member, MRS Gateway Task Force Committee (2000-01); Judge, MRS Graduate Student Award Competition, Fall 2002; Member, Intersociety Interactions Task Force (2004); Member, Outstanding Young Investigator Award Subcommittee (2007-11); Member, Strategic Program Planning Subcommittee (2008); MRS Fellow, 2009

IEEE

Member (2002-); Senior Member (2008-); Fellow (2010-)

Principal Editor - Physical Properties - Acta Materialia and Scripta Materialia (1994-99)

Review Committees and Boards:

National Science Foundation (NSF): CAREER Award Panel, DMR-Electronic Materials (1995); ERC Panel (1997); ECS Panel (1999); CAREER Award Panel (1999); CAREER Award Panel, DMR-Electronic Materials (2003); DMII Nanomanufacturing Panel (2004); Nanoscale Exploratory Research - Nanomanufacturing Panel (2004); DMR-CER-MWN Panel (2010)

External Review Committee, Dept. of Mater. and Nucl. Engineering, U. Maryland (1999)

External Review Committee, MSE Dept., Cornell University (2004)

Science Foundation Ireland Proposal Review Panel, Cork, IRL (2006)

Chair, Director's Review Committee, Materials Science Division, Lawrence Berkeley National Lab (2006)

Member, External Advisory Board for the Institute for Materials Research (IMR) at Ohio State University (2009-2014)

Member, Advisory Council for the Andlinger Center for Energy and the Environment, Princeton University (2011-17)

Member, Strategic Advisory Board, SMART-LEES, MIT-Singapore Alliance (2012-2014)

Chair, Board of Directors for the Innovation and Commercialization Center, Inc., Purdue Research Foundation (2012-13)

Member, Board of Directors, Innovation and Entrepreneurship Investment Authority (IEIA) (2014-20)

Member, Board of Directors, Center for Innovative Technology (CIT) (2014-20)

Member, Board of Directors, Virginia Tech Carilion School of Medicine (2014-18)

Member, Board of Directors, Northern Virginia Technology Council (NVTC) (2014-)

Chair, Management Board, 4-VA (2016)

Member, Board of Directors, The Business-Higher Education Forum (BHEF) (2017-)

Chair, Council of Presidents, Universities Research Association (URA) (2017-18)

Member, Board of Visitors, National Intelligence University (2017-)

Chair, Board of Directors, Virginia Space Grant Consortium (2017-)

Chair, Executive Committee, Commission on Information, Measurement and Analysis (CIMA), Association of Public and Land-Grant Universities (APLU) (2017-18); Chair (2019-20)
 Member, APLU Board of Directors (2019-20)
 Chair, Jefferson Science Associates (JSA) Board of Directors (3/2018-2/20)

Postdoctoral Fellows and Visiting Researchers:

Prof. Monica Sorescu, Duquesne University (Summer 1998); Prof. Jaichan Lee, SungKyunKwan U.-Korea (Summer 1998); Dr. Nilgun Ozer (1998-00); Prof. Geun-Young Yeom (1999-01); Dr. David Taylor (2000-01); Prof. Jong-Lam Lee, Pohang Univ. of Sci. and Technol., Korea (2001-02); Dr. Tau Yu, Berkeley Scholar, Nanjing University, China (2002); Prof. Chen-Chia Chou, Natl. Taiwan Univ. of Sci. and Technol. (2002); Dr. Marisol Martin-Gonzalez (2000-01); Dr. Placidus Amama, INAC Fellow jointly supervised with Prof. Tim Fisher (2004-07).

Graduate Student Advising:

Ph.D. – Advisory Committee Chair or Co-Chair: Prabhakar Bandaru (MSE, UCB, 98), William Wong (MSE, UCB, 99), Yaoxi Wu (MSE, UCB, 00), Joseph Behnke (MSE, UCB, 00), Loucas Tsakalacos (MSE, UCB, 00), Anu Bhat Kaul (MSE, UCB, 00), Alberto Salleo (MSE, UCB, 01), Ning Cheng (MSE, UCB, 01), Pushkar Ranade (MSE, UCB, 02), George Dougherty (MSE, UCB, 02), Woong Choi (MSE, UCB, 02), Peter Radkowski (AST, UCB, 03); Ho Gyoung Kim (Physics, Purdue, 2007); Parijat Pramili Deb (MSE, Purdue, 2007); Sangho Kim (ECE, Purdue, 2008); Vijay Rawat (MSE, Purdue, 2008); Manuel DaSilva (MSE, Purdue, 2008); Kalapi Biswas (MSE, Purdue, 2008); Isaac Wildeson (ECE, Purdue, 2011), David Ewoldt (MSE, Purdue, 2011); Jeremy Schroeder (MSE, Purdue, 2012); Polina Burmistrova (ECE, Purdue, 2012); Rob Wortman (ECE, Purdue, 2013); Pankaj Jha (ECE, Purdue, 2013); Sung Hwan Chung (ECE, Purdue, 2013); Yuefeng Wang (MSE, Purdue, 2014), Bivas Saha (MSE, Purdue, 2014) – **27 completed.**

M.S. – Advisory Committee Chair or Co-chair: Jordana Blacksberg (MSE, UCB, 97), Joseph Behnke (MSE, UCB, 97), Rachel Lau (MSE, UCB, 98), Alberto Salleo (MSE, UCB, 98), Loucas Tsakalacos (MSE, UCB, 98), Jacob Hernandez (MSE, UCB, 99), Peter Radkowski (AST, UCB, 99), Ning Cheng (MSE, UCB, 99), Clifford Knollenberg (MSE, UCB, 01), Juan Chediak (MSE, UCB, 01), Jeremy Schroeder (MSE, UCB, 02), Vorrada Loryuenyong (MSE, UCB, 02), Tao Su (MSE, UCB, 03), Amman Sareen (ECE, Purdue, 05); Robert Wortman (ECE, Purdue, 06); Mara Howell (MSE, Purdue, 07, with Prof. E. Garcia); Himanshu Mishra (ME, Purdue, with Prof. T. Fisher, 07); Vijay Rawat (ECE, Purdue, 08); Mark Oliver (MSE, Purdue, 08); Pankaj Jha (ECE, Purdue, 2010); Pranati Tewari (ECE, Purdue, 2010), Caitlin Burger (MSE, Purdue, with Prof. J. Appenzeller, 2011) – **22 completed.**

Undergraduate Research Advising:

Justin Gee (MSE, UCB, 94-95), Elizabeth Lyons (Harvard, Summer 95), Steve Nishimoto (MSE, UCB, 95), Dustin Gasser (MSE, UCB, 96), Nathaniel Quitariano (MSE, UCB, 00), Ben Bowser (Erskine, Summer 03), Gage Simpson, Coriander Gobeyn, Laura McNabb, Sean Weber and Richard Scott (MSE Senior Project, Purdue, 03-04), Arjun Guha (ECE, Purdue, 03-04), Sean Liao (ECE, Purdue, 03-04), Stephanie Rothrauff (MSE, Purdue, 04), Abbey Heinlein (Michigan, Summer 04), Jonathan Winterstein (WSU, Summer 04), Paul Kapoor (MSE, Purdue, Summer 04), Jeff Ziebarth (ECE, Purdue, Summer 04),

Derek Floyd, Erin Dick, Mike Koutsis, Ben Darland, Brad Allison, and Jeff Yanke (MSE Senior Project, Purdue, 04-05), Matt Schenider (MSE, Purdue, 04), Daniel Wood (MSE/Physics, Purdue, 04-06), Ben Darland (MSE, Purdue, Summer 05), In Chul Jang (ME, Purdue, 05), Zhiwei “Wes” Li (Purdue, Physics, 05), Mark Oliver (MSE, Purdue, 05-06), Shaud Tavakoli (Columbia, Summer 05), Krista Gumiela (ECE, Purdue, Summer 06), Andrew J. Martin (MSE, Purdue, Summer 2007); Mitchel Floyd (MSE, Purdue, 10); Jonathan Comparan (ECE, Purdue, Summer 13). - **35 total.**

Classroom Teaching:

UC Berkeley (1993-2002)

- ***MSE 24:** Freshman Seminar - "The Disk Drive: Microcosm of Engineering" (2 semesters)
- MSE 102:** Junior-level undergraduate core course - "Bonding, Crystallography and Crystal Defects" (8 semesters)
- MSE 123:** Senior-level undergraduate MSE elective - "Semiconductor Processing" (1 semester)
- ***MSE 125:** Senior-level undergraduate MSE elective - "Thin-Film Materials Science" (4 semesters)
- MSE 202:** Graduate course - "Crystal Structure and Bonding" (1 semester)
- ***MSE 225/AS&T 225** – Graduate course - "Thin-film Science & Technology" (4 semesters)

Purdue University (2002-2009)

- MSE 553/ECE 553:** Ceramic Materials in Electronic Devices (S03)
- ***MSE 697T/ECE695T:** Principles and Methods of Nanofabrication (F03, F04, S06, S08)
- MSE 430/440:** Senior Design project advisor (F03-S04, F04-S05)
- MSE 597V (now MSE 548):** Deposition Processing of Thin Films and Coatings (S04, F05)
- ***MSE 595E/ECE 597G:** Materials and Devices for Solid-State Energy Conversion (S05, F06, S09)
- MSE 367:** Materials Processing Laboratory (S06)

**course developed by TDS*

BIBLIOGRAPHY

Patents Issued

Patents Issued

1. U. S. Patent No. 4,466,423; DOE case No. S 56,043, "*Rim Drive Cable Aligned Heliostat Collector System*," James E. Dolan and Timothy D. Sands, issued Aug. 21st, 1984.
2. U. S. Patent No. 5,016,074; "*Epitaxial Intermetallic Contact for Compound Semiconductors*," (*Epitaxial Permeable Base Transistor*) Timothy D. Sands, issued May 14th, 1991.
3. U. S. Patent No. 5,051,792; "*Epitaxial Intermetallic Contact for Compound Semiconductors*," (*Epitaxial Gate Field-Effect Transistor*) Timothy D. Sands, issued Sept. 24th, 1991.
4. U. S. Patent No. 5,045,502; "*PdIn Ohmic Contact to GaAs*," S. S. Lau, T. D. Sands and L. C. Wang, issued September 3rd, 1991.
5. U. S. Patent No. 5,075,755; "*Epitaxial Intermetallic Contact for Compound Semiconductors*," (*Transition metal aluminides with B2 structure*) Timothy D. Sands, issued Dec. 24th, 1991.
6. U. S. Patent No. 5,169,485; "*Method for the Preparation of Epitaxial Ferromagnetic Manganese Aluminum Magnetic Memory Element*," S. J. Allen, Jr., J. P. Harbison, M. L. Leadbeater, R. Ramesh, and T. D. Sands, issued Dec. 8th, 1992.
7. U. S. Patent No. 5,145,832; "*Superconducting Film on a Flexible Two-Layer Zirconia Substrate*," K. S. Harshavardhan, S. Sampere, T. D. Sands, and T. Venkatesan, issued Sept. 8, 1992.
8. U. S. Patent No. 5,262,347; "*Palladium Welding of a Semiconductor Body*," T. D. Sands, issued Nov. 16, 1993.
9. U.S. Patent No. 6,071,795; "*Separation of Thin Films from Transparent Substrates by Selective Optical Processing*," N. W. Cheung, T. D. Sands and W. S. Wong, issued June 6th, 2000 (UC Ref. No. 98-018.1).
10. U. S. Patent No. 6,420,242; "*Separation of Thin Films from Transparent Substrates by Selective Optical Processing*," N. W. Cheung, T. D. Sands and W. S. Wong, issued July 17th, 2002 (UC Ref. No. B00-026-2).
11. U. S. Patent No. 6,335,263; "*Method of Forming a Low Temperature Metal Bond for Use in the Transfer of Bulk and Thin Film Materials*," N.W. Cheung, T.D. Sands and W.S. Wong, issued January 1st, 2002 (UC Ref. No. B00-026-3).
12. U.S. Patent No. 6,996,147; "*Method of Fabricating Nanostructures and Nanowires and Devices Fabricated Therefrom*," P. Yang, E. Weber, A. Majumdar, T. Sands, R. Fang, J. Kind, A. Shakouri, R. Russo, H. Feick, S. Mao, Y. Wu, H. Yan and M. Huang, issued February 7th, 2006. (UC Berkeley Case No. B01-B90-4); European Patent Application filed March 29th, 2002.
13. U.S. Patent No. 7,221,455 B2 "*Integrated, Fluorescence-Detecting Microanalytical System*," by J. Alex Chediak, ZhongSheng Luo, Timothy D. Sands, Nathan W. Cheung, Luke P. Lee, and Jeonggi Seo, issued May 22nd, 2007 (UCB Ref.: B03-069-2).
14. U.S. Patent No. 7,569,847 B2; "*Methods of Fabricating Nanostructures and Nanowires and Devices Fabricated Therefrom*," A. Majumdar, A. Shakouri, T.D. Sands, P. Yang, S.S. Mao, R.E. Russo, H. Feick, E.R. Weber, H. Kind, M. Hunag, H. Yan, Y. Wu, R. Fan, issued August 4th, 2009 (continuation).
15. U.S. Patent No. 7,569,941 B2; "*Methods of Fabricating Nanostructures and Nanowires and Devices Fabricated Therefrom*," A. Majumdar, A. Shakouri, T.D. Sands, P. Yang, S.S. Mao, R.E. Russo, H. Feick, E.R. Weber, H. Kind, M. Hunag, H. Yan, Y. Wu, R. Fan, issued August 4th, 2009 (continuation).
16. U.S. Patent No. 7,834,264 B2; "*Methods of Fabricating Nanostructures and Nanowires and Devices Fabricated Therefrom*," A. Majumdar, A. Shakouri, T.D. Sands, P. Yang, S.S. Mao, R.E. Russo, H. Feick, E.R. Weber, H. Kind, M. Hunag, H. Yan, Y. Wu, R. Fan, issued November 16th, 2010 (continuation).
17. U.S. Patent No. 8,679,630; "*Vertical Carbon Nanotube Devices in Nanoporous Templates*," Matthew R. Maschmann, Timothy S. Fisher, Timothy D. Sands and Rashid Bashir, issued March 25th, 2014.
18. U.S. Patent No. 8,754,321 B2; "*Laminated Thin Film Metal-Semiconductor Multilayers for Thermoelectrics*," Jeremy L. Shroeder and Timothy D. Sands, issued June 17th, 2014.
19. U.S. Patent No. 8,872,154; "*Field-effect Transistor Fabrication from Carbon Nanotubes*," Aaron D. Franklin, Timothy D. Sands, Timothy S. Fisher and David B. Janes, issued October 28th, 2014.

20. U.S. Patent No. 8,986,835; "Growth Process for Gallium Nitride Porous Nanorods," Isaac H. Wildeson and Timothy D. Sands, issued March 24th, 2015.
21. U.S. Patent No. 10,312,426 B2; "Giant Cross-Plane Seebeck Effect in Oxide Metal Semiconductor Superlattices for Spin-Magnetic Thermoelectric Devices," Pankaj Jha and Timothy D. Sands, issued June 4th, 2019.

Refereed Publications: Archival Journals

Web of Science h-index = 52; 315 items, total citations = 9,727 (January 29th, 2020); Google Scholar h-index = 67, total citations = 16,863 (January 29th, 2020); Author Identifier: D-2133-2009, ResearcherID site: <http://www.researcherid.com/rid/D-2133-2009>; ORCID: <https://orcid.org/0000-0001-9718-6515>

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182. P.V. Burmistrova, J. Maassen, T. Favaloro, B. Saha, S. Salamat, Y.R. Koh, M.S. Lundstrom, A. Shakouri and T.D. Sands, "Thermoelectric properties of epitaxial ScN films deposited by reactive magnetron sputtering onto MgO(100) substrates," *J. Appl. Phys.* **113** (2013) 153704.
183. P. Jha, T.D. Sands, P. Jackson, C. Bomberger, T. Favaloro, S. Hodson, J. Zide, X. Xu and A. Shakouri, "Cross-plane thermoelectric transport in p-type $\text{La}_{0.67}\text{Sr}_{0.33}\text{MnO}_3/\text{LaMnO}_3$ oxide metal/semiconductor superlattices," *J. Appl. Phys.* **113** (2013) 193702.
184. B. Saha, G. Naik, V.P. Drachev, A. Boltasseva, E.E. Marinero and T.D. Sands, "Electronic and Optical Properties of ScN and (Sc,Mn)N Thin Films Deposited by DC-Magnetron Sputtering," *J. Appl. Phys.* **114** (2013) 063519.
185. J.L. Schroeder, D.A. Ewoldt, R. Amatya, R.J. Ram, A. Shakouri and T.D. Sands, "Bulk-like Laminated Nitride Metal/Semiconductor Superlattices for Thermoelectric Devices," *IEEE J. MEMS* **23** (2014) pp. 672-80.
186. G.V. Naik, B. Saha, J. Liu, S.M. Saber, E. Stach, J.M.K. Irudayaraj, T.D. Sands, V.M. Shalaev and A. Boltasseva, "Epitaxial Superlattices with Titanium Nitride as a Plasmonic Component for Optical Hyperbolic Metamaterials," *Proc. National Academy of Sciences* **111** (2014) pp. 7546-51.
187. S.R. Das, C. Akatay, A. Mohammad, M.R. Khan, K. Maeda, R.S. Deacon, K. Ishibashi, Y.P. Chen, T.D. Sands, M.A. Alam and D.B. Janes, "Electrodeposition of InSb Branched Nanowires: Controlled Growth with Structurally Tailored Properties," *J. Appl. Phys.* **116** (2014) 083506.
188. B. Saha, G.V. Naik, S. Saber, C. Akatay, E.A. Stach, V.M. Shalaev, A. Boltasseva, and T.D. Sands, "TiN/(Al,Sc)N Metal/Dielectric Superlattices and Multilayers as Hyperbolic Metamaterials in the Visible Spectral Range," *Phys. Rev. B* **90** (2014) 125420.
189. B. Saha, S.K. Lawrence, J.L. Schroeder, J. Birch, D.F. Bahr and T.D. Sands, "Enhanced Hardness in Epitaxial TiAlScN Alloy Thin Films and Rocksalt TiN/(Al,Sc)N Superlattices," *Appl. Phys. Lett.* **105** (2014) 151904.
190. B. Saha, S. Saber, G.V. Naik, A. Boltasseva, E.A. Stach, E.P. Kvam and T.D. Sands, "Development of Epitaxial $\text{Al}_x\text{Sc}_{1-x}\text{N}$ for Artificially Structured Metal/Semiconductor Superlattice Metamaterials," *Phys. Status Solidi B* **252** (2015) 251-59 – Editor's Choice and Front Cover Illustration.
191. J.L. Schroeder, B. Saha, M. Garbrecht, N. Schell, T.D. Sands and J. Birch, "Thermal Stability of Epitaxial Cubic-TiN/(Al,Sc)N Metal/Semiconductor Superlattices," *J. Mater. Sci.* **50** (2015) pp. 3200-06 DOI 10.1007/s10853-015-8884-5.

192. P.V. Burmistrova, D.N. Zakharov, T. Favaloro, A. Mohammed, E.A. Stach, A. Shakouri and T.D. Sands, "Effect of Deposition Pressure on the Microstructure and Properties of Epitaxial ScN(001) Thin Films Sputtered onto MgO(001) Substrates," *J. Mater. Res.* **30** (2015) pp. 626-34.
193. B. Saha, Y.R. Koh, J. Comparan, S. Sadasivam, J.L. Schroeder, M. Garbrecht, A. Mohammad, J. Birch, T.S. Fisher, A. Shakouri and T.D. Sands, "Cross-plane Thermal Conductivity of (Ti,W)N/(Al,Sc)N Metal/Semiconductor Superlattices," *Phys. Rev B* **93** (2016) 045311.
194. C.V. Manzano, B. Abad, M.M. Rojo, Y.R. Koh, S.L. Hodson, A.M. Lopez Martinez, X. Xu, A. Shakouri, T.D. Sands, T. Borca-Tasciuc and M. Martin-Gonzalez, "Anisotropic Effects on the Thermoelectric Properties of Highly Oriented Electrodeposited Bi₂Te₃ Films," *Sci. Rep.* **6** (2016) 19129 doi: 10.1038/srep19129.
195. B. Saha, S. Saber, E.A. Stach, E.P. Kvam and T.D. Sands, "Understanding the Rocksalt-to-Wurtzite Phase Transformation Through Microstructural Analysis of (Al,Sc)N Epitaxial Films," *Appl. Phys. Lett.* **109** (2016) 172102 doi: 10.1063/1.4966278.
196. M. Garbrecht, J.L. Schroeder, L. Hultman, J. Birch, B. Saha and T.D. Sands, "Microstructural Evolution and Thermal Stability of HfN/ScN, ZrN/ScN and Hf_{0.5}Zr_{0.5}N/ScN Metal/Semiconductor Superlattices," *J. Mater. Sci.* **51** (2016) pp. 8250-8258 doi: 10.1007/s10853-016-0102-6.
197. B. Saha, Y.R. Koh, J.P. Feser, S. Sadasivam, T.S. Fisher, A. Shakouri and T.D. Sands, "Phonon Wave Effects in the Thermal Transport of Epitaxial TiN/(Al,Sc)N Metal/Semiconductor Superlattices," *J. Appl. Phys.* **121** (2017) 015109 doi: 10.1063/1.4973681.
198. M. Garbrecht, B. Saha, J.L. Schroeder, L. Hultman and T.D. Sands, "Dislocation-pipe Diffusion in Nitride Superlattices Observed in Direct Atomic Resolution," *Sci. Reports* (2017) 7:46092 doi: 10.1038/srep46092.
199. B. Saha, M. Garbrecht, J.A. Perez-Taborda, M.H. Fawey, Y.R. Koh, A. Shakouri, M. Martin-Gonzalez, L. Hultman and T.D. Sands, "Compensation of Native Donor Doping in ScN: Carrier Concentration Control and p-type ScN," *Appl. Phys. Lett.* **110** (2017) 252104 doi: 10.1063/1.4989530.
200. M. Garbrecht, L. Hultman, M.H. Fawey, T.D. Sands and B. Saha, "Void-Mediated Coherency-Strain Relaxation and Impediment of Cubic-to-Hexagonal Transformation in Epitaxial Metastable Metal/Semiconductor TiN/Al_{0.72}Sc_{0.28}N Multilayers," *Phys. Rev. Mater.* **1** (2017) 033402 doi: 10.1103/PhysRevMaterials.1.033402.
201. M. Garbrecht, L. Hultman, M.H. Fawey, T.D. Sands and B. Saha, "Tailoring of Surface Plasmon Resonances in TiN/(Al_{0.72}Sc_{0.28})N Multilayers by Dielectric Layer Thickness Variation," *J. Mater. Sci.* **53** (2018) 4001-09 doi:10.1007/s10853-017-1837-4.
202. B. Saha, A. Shakouri and T.D. Sands, "Rocksalt Nitride Metal/Semiconductor Superlattices: A New Class of Artificially Structured Materials," *Appl. Phys. Rev.* **5** (2018) 021101 doi: 10.1063/1.5011972.
203. B. Saha, J.A. Perez-Taborda, J.H. Bahk, Y.R. Koh, A. Shakouri, M. Martin-Gonzalez and T.D. Sands, "Temperature-dependent Thermal and Thermoelectric Properties of n-type and p-type Sc_{1-x}Mg_xN," *Phys. Rev. B* **97** (2018) 085301 doi:10.1103/PhysRevB.97.085301.

Perspectives and Opinions

1. P.R. Sanberg, M. Gharib, P.T. Harker, E.W. Kaler, R.B. Marchase, T.D. Sands, N. Arshadi and S. Sarkar, "Changing the Academic Culture: Valuing Patents and Commercialization Toward Tenure and Career Advancement," *Perspective – Proc. National Academy of Sciences* **111** (2014) pp. 6542-47.

Refereed Conference and Symposium Proceedings

83 to date – Only invited contributions listed below.

2. **Invited-** T. Sands, "Application of Cross-sectional Transmission Electron Microscopy to the Characterization of Ion-implanted Semiconductors," *Proc. 43rd Ann. Meet. Electron Microscopy Soc. of America*, Ed. G. W. Bailey (San Francisco Press, San Francisco, 1985), p. 292; (LBL-19162).
3. **Invited-** T. Sands, "Contributions of Electron Microscopy to the Understanding of Reactions on Compound Semiconductor Surfaces," *Mater. Res. Soc. Symp. Proc. Vol. 62*, Eds. L. W. Hobbs, K. H. Westmacott and D. B. Williams (MRS, Pittsburgh, 1986) p. 25; (LBL-20509).

4. **Invited-** T. Sands, "Heteroepitaxy of Stable Metallic Phases on GaAs: Identification of Candidate Phases by TEM," *Proc. 45th Ann. Meet. Electron Microsc. Soc. Amer.*, Ed. G. W. Bailey (San Francisco Press, San Francisco, 1987), p. 322; (TM-ARH-008796).
5. **Invited-** T. Sands, "Intermetallic Contacts to Gallium Arsenide: Doping and Alloying by Limited Solid-Phase Reactions," *Proc. 46th Ann. Meet. Electron Microsc. Soc. Amer.*, Ed. G. W. Bailey (San Francisco Press, San Francisco, 1988), p. 794; (TM-ARH-011353).
6. **Invited-** T. Sands, J. P. Harbison, N. Tabatabaie, W. K. Chan, H. L. Gilchrist, S. A. Schwarz, C. L. Schwartz, L. T. Florez, and V. G. Keramidas, "Growth and Properties of (Al,Ga)As/NiAl/(Al,Ga)As: An Epitaxial Semiconductor/Metal/Semiconductor System," *Mater. Res. Soc. Symp. Proc. Vol. 144*, Eds.: D. K. Sadana, L. E. Eastman, and R. Dupuis, (MRS, Pittsburgh, 1989), pp. 571-582; (TM-ARH-013540).
7. **Invited-** C. J. Palmstrøm, J. P. Harbison, T. Sands, R. Ramesh, T. G. Finstad, S. Mounier, J. G. Zhu, C. B. Carter, L. T. Florez, and V. G. Keramidas, "Buried Metal/III-V Semiconductor Heteroepitaxy: Approaches to Lattice Matching," *Mater. Res. Soc. Symp. Proc. 198*, 153 (1990); (TM-ARH-017040).
8. **Invited-** T. Sands, J. P. Harbison, C. J. Palmstrøm, R. Ramesh and V. G. Keramidas, "A Template Approach to Metal/III-V Semiconductor Epitaxy," *MRS Symp. Proc. Vol. 221*, eds. R. F. C. Farrow, J. P. Harbison, P. S. Peercy and A. Zangwell, (MRS, Pittsburgh, 1991) p. 271; (TM-ARH-019578).
9. **Invited-** J. P. Harbison, T. Sands, C. J. Palmstrøm, L. T. Florez and V. G. Keramidas, "New Directions for III-V Structures: Metal/Semiconductor Heteroepitaxy," *Inst. Phys. Conf. Ser. No. 120*: Ch. 1 (1992) pp. 1-8; (TM-ARH-020111).
10. **Invited-** R. Ramesh, W. K. Chan, H. Gilchrist, B. Wilkens, T. Sands, J. M. Tarascon, V. G. Keramidas, J. T. Evans, Jr., F. D. Gealy and D. K. Fork, "Oxide Ferroelectric/Cuprate Superconductor Heterostructures: Growth and Properties," *Materials Res. Soc. Symp. Proc. Vol. 243; Ferroelectric Thin Films II*, A. I. Kingon, E. R. Myers and B. Tuttle, eds. (MRS, Pittsburgh, 1992) pp. 477-487.
11. **Invited-** J. P. Harbison, T. Sands, C. J. Palmstrøm, J. De Boeck, L. T. Florez and V. G. Keramidas, "MBE Growth of III-V / Metal Heterostructures," *Record of Alloy Semiconductor Physics and Electronics Symposium* (1993); (IM-BCR-000203).
12. **Invited** - J.C. Caylor, A.M. Stacy, B. Bloom, R. Gronsky, T. Sands, W.W. Fuller-Mora, A. Ehrlich, D. Song, and G. Chen, "Growth and Properties of Multilayered Skutterudite Thin Films," *Eighteenth International Conference on Thermoelectrics. Proceedings, ICT'99*, IEEE (1999) pp. 656-61; presented by J.C. Caylor, 18th ICT, Baltimore, MD, Sept 2nd, 1999.
13. **Invited-** T. Sands, "Excimer Laser Lift-off for Packaging and Integration of GaN-based Light-emitting Devices," *Proc. of SPIE, Vol. 4977, Photon Processing in Microelectronics and Photonics II* (2003) pp. 587-601; presented by T. Sands in *International Symposium 8977 – LASE 2003, Laser-based Packaging in Microelectronics and Photonics II (LA10)*, San Jose, CA, January 2003.

Non-refereed Proceedings and Technical Reports

1. T. D. Sands, "The Effects of Oxygen on the Microstructure of Cu_{2-x}S Thin Films," M. S. Thesis, University of California, Lawrence Berkeley Laboratory, Nov. 1981; (LBL-13659).
2. T. D. Sands, "Formation and Degradation of Cu_{2-x}S/CdS Single-Crystal Heterojunctions: A Transmission Electron Microscope Study," Ph. D. Thesis, University of California, Lawrence Berkeley Laboratory, April 1984; (LBL-17684).
3. T. Sands, R. Ramesh, H. L. Gilchrist, M. Johnson, T. L. Cheeks, A. Inam and V. G. Keramidas, "Prospects for Semiconductor-based Nonvolatile Information Storage and Retrieval Systems with Gigabyte Capacity," Bellcore Technical Memorandum, Feb., 1992 (TM-ARH-021043).
4. J. Behnke, W. Ruythooren and T. Sands, "Pore Ordering in Anodically Oxidized Aluminum Thin Films," *Proceedings of the Third Symposium on Electrochemically Deposited Thin Films*, Vol. 96-10, ed. M. Paunovic and D. A. Scherson, (The Electrochemical Society, Pennington, NJ, 1997) pp. 206-215.
5. W. Wong, T. Sands, N. Cheung, M. Kneissl, D. Bour, P. Mei, L. Romano and N. Johnson, "Ubiquitous Blue LEDs: The Integration of GaN Thin Films with Dissimilar Substrate Materials by Wafer Bonding and Laser Lift-off," *Compound Semiconductor*, Nov/Dec 1999, pp. 54-56.

Books and Book Chapters

1. **Book Chapter-** T. Sands and V. G. Keramidis, "Metal/Compound-Semiconductor Interactions," Chapter 26 in *Handbook on Semiconductors, Second Edition, Vol. 3. Materials, Properties and Preparation*, T. S. Moss and S. Mahajan, Eds. (Elsevier Science, Amsterdam, 1994), pp. 1997-2032.
2. **Book Chapter-** C. J. Palmstrøm and T. Sands, "Stable and Epitaxial Contacts to III-V Compound Semiconductors," Chapter 2 in *Contacts to Semiconductors, - Fundamentals and Technology* ed. L. Brillson, Materials Science and Process Technology Series (Noyes, Park Ridge, NJ, 1993).
3. **Book Chapter-** T. Sands, W.S. Wong and N.W. Cheung, "Layer Transfer by Bonding and Laser Lift-off," Ch. 11 in "Wafer Bonding: Applications and Technology" eds. Marin Alexe and Ulrich Gösele (Springer-Verlag, Berlin 2004), pp. 377-415.

Edited Conference and Symposium Proceedings

1. **Edited Conference Proceedings-** "Chemistry and Defects in Semiconductor Heterostructures," *Materials Research Society Symposium Proceedings, Vol. 148*, M. Kawabe, T. D. Sands, E. R. Weber and R. S. Williams, Eds. (MRS, Pittsburgh, PA, 1989).
2. **Edited Journal Section-** A. Inam and T. Sands, eds., Special Section in the *Journal of Electronic Materials*, Vol. 21, May 1992 Issue, "Metal Oxide Films."
3. **Edited Conference Proceedings-** "Defect-Interface Interactions," *Materials Research Society Symposium Proceedings, Vol. 319*, E. P. Kvam, A. H. King, M. J. Mills, T. D. Sands and V. Vitek, Eds. (MRS, Pittsburgh, PA, 1994).
4. **Edited Conference Proceedings-** "Integration of Heterogeneous Thin-film Materials and Devices," *Materials Research Society Symposium Proceedings, Vol. 768*, H.A. Atwater, M.I. Current, M. Levy and T. Sands, Eds. (MRS, Pittsburgh, PA, 2003); Proceedings of Symposium G at the 2003 MRS Spring Meeting, San Francisco, CA.

Invited Talks at Major Conferences, Symposia and Workshops

as lead presenter or co-author

1. Tech. Meeting of SPIE, Los Angeles, CA, Jan. 1984.
2. 43rd Ann. Meeting of the Electron Microscopy Soc. of America, Louisville, KY, Aug. 1985.
3. Fall Meeting of Mater. Res. Soc., Boston, MA, Nov. 1985.
4. AIME Annual Meeting, New Orleans, LA, March 1986.
5. Workshop on 3-5 Semiconductor: Metal Interfacial Chemistry and Its Effect on Electrical Properties, Stanford University, Palo Alto, CA, Nov. 1986.
6. Fall Meeting of TMS/AIME, Orlando, FL, Oct. 1986.
7. 45th Ann. Meet. Electron Micros. Soc. Amer., Baltimore, MD, Aug. 1987.
8. Symposium on Solid-State Materials for Advanced Technology: Unresolved Issues, sponsored by the Office of Naval Research, Mellon Institute, Pittsburgh, PA, Dec. 1987.
9. 46th Ann. Meet. Electron Micros. Soc. of America, Milwaukee, WI, Aug. 1988.
10. Fall Meeting of The Electrochemical Society, State-of-the-art Program on Compound Semiconductors (SOTAPOCS IX), Chicago, IL, Oct. 1988.
11. Fall Meeting of the Mater. Res. Soc., Boston, MA, Dec. 1988.
12. Annual Meeting of the Minerals, Metals and Materials Society (TMS/AIME), Las Vegas, March 1989.
13. DOE Workshop on "Materials Science for Epitaxial Heterostructures," Monterey, CA, Jan., 1989.
14. 4th International Conf. on Modulated Semiconductor Structures, Ann Arbor, MI, July, 1989.
15. Electronic Materials Conf., Cambridge, MA, June, 1989.
16. American Crystallographic Assoc. Ann. Meeting, Seattle, WA, July, 1989.
17. MRS Fall Meeting, Boston, MA, Nov., 1989.
18. MRS Spring Meeting, San Diego, CA, April, 1989.
19. MRS Spring Meeting, San Diego, CA, April, 1990.

20. TMS Annual Meeting, February, 1990, Anaheim, CA.
21. Annual Meeting of TMS, February, 1990, Anaheim, CA.
22. Fall Meeting of the Electrochemical Society, October, 1990, Seattle, WA.
23. 3rd Electronic Materials and Processing Congress of ASM International, San Francisco, CA, August, 1990.
24. Workshop on "Microstructural Processes in Nucleation and Initial Growth on Semiconductor Surfaces," sponsored by The International Union of Vacuum Science, Techniques and Applications (IUVSTA), Obertraun, Austria, February, 1990.
25. MRS Spring Meeting, San Francisco, CA, April, 1990.
26. Annual Meeting of TMS, February, 1990, Anaheim, CA.
27. Fall Meeting of the Electrochemical Society, October, 1990, Seattle, WA (2).
28. 35th Annual Conference on Magnetism & Magnetic Materials, October, 1990, San Diego, CA.
29. MRS Fall Meeting, Boston, MA, Dec., 1991.
30. MRS Spring Meeting, Anaheim, CA, April, 1991.
31. International Conf. on Metallurgical Coatings and Thin Films, San Diego, CA, April, 1991.
32. Scanning Microscopy Conf., Bethesda, MD, May 1991.
33. 18th International Symp. on GaAs and Related Compounds, Seattle, WA, Sept. 1991.
34. Fall Meeting of The Minerals, Metals and Materials Society (TMS), Cincinnati, OH, Oct., 1991.
35. MRS Fall Meeting, Boston, MA, Dec., 1991.
36. Fall Meeting of the American Ceramics Soc., Arlington, VA, October, 1991.
37. 1992 Electronic Materials Conf., Boston, MA, June 1992.
38. International Magnetism Conference (INTERMAG), Stockholm, Sweden, April 1993.
39. Fall Meeting of TMS/ASM, Pittsburgh, PA., October, 1993.
40. 38th Annual Conf. on Magnetism and Magnetic Materials (MMM), Minneapolis, MN, November, 1993.
41. 23rd Annual Electronic Materials Symposium (sponsored by TMS and IEEE), San Jose, CA, March 20, 1995.
42. 125th Annual TMS Meeting, Anaheim, CA, February 4-8, 1996.
43. Meeting of The American Ceramics Society - Northern California Section, Oakland, CA, May 21, 1996.
44. Joint International Meeting (the 192nd Meeting of The Electrochemical Society, Inc. and the 48th Annual Meeting of the International Society of Electrochemistry), September 5, 1997, Paris, France.
45. MRS Fall Meeting, Boston, MA, December, 4th, 1997.
46. MRS Fall Meeting, Boston, MA, December 2nd, 1998.
47. American Physical Society Centennial Meeting, Atlanta, GA, March 20-26, 1999.
48. MRS Spring Meeting, San Francisco, CA, April 1999.
49. 10th International Workshop on Glasses, Hybrids and Nanocomposites from Gels," Sept., 1999, Yokohama, Japan.
50. MRS Fall Meeting, Boston, MA, December 1999.
51. American Vacuum Society 47th International Symposium, Boston, MA, Oct. 2, 2000.
52. MRS Fall Meeting, Boston, MA, Nov. 28th, 2000.
53. SPIE International Symposium, San Jose, CA, January 2003.
54. 132nd Annual Meeting of The Minerals Metals and Materials Society (TMS), San Diego, CA, March 4th, 2003.
55. ASME International Mechanical Engineering Congress and RD&D Expo (IMECE), Anaheim, CA, Nov. 14th, 2004.
56. Photonics West, Conference, San Jose, CA, January 24th, 2005.
57. Nanotech 2005, Anaheim, CA, May 9th, 2005.
58. 2nd Energy Nanotechnology International Conference (ENIC), Santa Clara, CA, September 2007.
59. Amer. Soc. Ceramics Meeting, Daytona Beach, FL, Jan. 21st, 2008
60. TMS, New Orleans, LA, March 10th, 2008.
61. MRS Spring Meeting, San Francisco, CA, March 27th, 2008.
62. 17th Biennial University, Government, Industry Micro/Nano Symposium, IEEE UGIM, Louisville, KY, July 13th, 2008.
63. Nanotechnology and the Environment Conference, Indianapolis, IN, August 5th, 2008.
64. Keynote, ASME 3rd Energy Nanotechnology International Conference, Jacksonville, FL, August 13th, 2008.
65. Joint India-US Workshop on Scalable Nanomaterials for Enhanced Energy Transport, Conversion and Efficiency, J.F. Welch Technology Centre, GE Global Research, Bangalore, India, August 21st, 2008.
66. 5th International Congress of Nano-Bio Clean Tech 2008, San Francisco, CA, October 28th, 2008.
67. Plenary speaker, Fourth International Conference on Advanced Materials and Nanotechnology (AMN-4), Otago University, Dunedin, NZ, February 9th, 2009.

68. Deutsche Physikalische Gesellschaft Spring Meeting 2009, Dresden, Germany, March 26th, 2009.
69. Indiana Chapter of the International Microelectronics and Packaging Society Meeting, Indianapolis, IN, April 27th, 2009.
70. XVIII International Materials Research Congress 2009, Cancún, Mexico, August 17th, 2009.
71. MRS Fall Meeting, Boston, MA, December 1st, 2009.
72. Keynote, NSF Nanoscale Science & Engineering Grantees Conference, Arlington, VA, December 8th, 2009.
73. Keynote, ESTECH Conference, Reno, NV, May 5th, 2010.
74. 2010 International Conferences on Modern Materials & Technologies (CIMTEC), Montecatini Terme, Tuscany, Italy, June 2010.
75. MRS Spring Meeting, San Francisco, CA, April 7th, 2015.

Seminars and Colloquia

1. Hewlett-Packard Laboratories, Palo Alto, CA, April 1984
2. Bell Communications Research, Inc., Murray Hill, NJ, May 1984.
3. Department of Materials Science and Engineering, Stanford University, Stanford, CA, May 1984.
4. Department of Electrical Engineering, California Institute of Technology, Pasadena, CA, Oct. 1984.
5. National Center for Electron Microscopy, Lawrence Berkeley Laboratory, Berkeley, CA, Nov. 1984.
6. Philips Research Laboratory, Sunnyvale, CA March 1985.
7. Center for Advanced Materials, Lawrence Berkeley Laboratory, Berkeley, CA, March 1985.
8. Department of Materials Science and Engineering, Cornell University, Ithaca, NY, Oct. 1985.
9. Department of Metallurgical Engineering, The Ohio State University, Columbus, OH, April 1986.
10. Electrical Engineering and Computer Science Department, University of California, San Diego, La Jolla, CA, Nov. 1986.
11. IBM Thomas J. Watson Research Center, Yorktown Heights, NY, Oct. 1987.
12. Solid State Electronics Seminar, Lehigh University, Bethlehem, PA, Sept. 1988.
13. Materials Science Seminar, University of Wisconsin, Madison, WI, March 1988.
14. Center for Thin Film Sciences, Carnegie Mellon University, Oct. 1988.
15. Brown University, Providence, RI, March, 1989.
16. Department of Materials Science Seminar, University of California, Los Angeles, Los Angeles, CA, February, 1990.
17. Materials Science Seminar, Rutgers University, New Brunswick, NJ, April, 1990.
18. IBM Almaden Research Center, San Jose, CA, May 1992.
19. Joint Seminar of the Department of Electrical & Computer Engineering and the Microelectronic Research Laboratory, Rutgers University, March, 1993.
20. Electrical Engineering Seminar, U. C. Davis, May 1994.
21. Materials Science & Engineering Department Seminar, Stanford University, Stanford, CA, February 24, 1995.
22. School of Materials Engineering Seminar, Purdue University, West Lafayette, IN, March 1, 1995.
23. Electronic Materials Laboratory Seminar Series at Xerox Palo Alto Research Center (PARC), Palo Alto, CA, March 10, 1995.
24. H-P Laboratories, Palo Alto, CA, 5/8/98.
25. Xerox PARC, Palo Alto, CA, 5/29/98.
26. Advanced Magnetic Materials Seminar, IBM Almaden Research Center, San Jose, CA, 2/24/99.
27. Stanford University MSE Colloquium, Stanford, CA, May 14th, 1999.
28. California Institute of Technology Materials Research Lecture, October 20th, 1999.
29. Materials Science & Engineering Colloquium, University of Michigan, Ann Arbor, MI, April 7th, 2000.
30. Interuniversity Microelectronics Center (IMEC), Leuven, Belgium, June 11th, 2001.
31. Document Handling Laboratory Seminar, Xerox PARC, Palo Alto, CA, Oct. 3rd, 2001.
32. Electrical and Computer Engineering (ECE) Dept. Seminar, University of California, San Diego, La Jolla, CA, October 26th, 2001.
33. School of Engineering and Computer Science Seminar, San Francisco State University, San Francisco, CA, Nov. 14th, 2001.

34. Joint Electrical & Computer Engineering - Materials Engineering Distinguished Seminar, Purdue University, Jan. 18th, 2002.
35. Ceramics Seminar, University of Illinois, Urbana-Champaign, November 20th, 2003.
36. Department of Chemical Engineering and Materials Science Seminar, University of Minnesota, Minneapolis, MN, April 13th, 2004.
37. GE Global Research Nanotechnology Seminar, Schenectady, NY, April 11th, 2005.
38. Nanotechnology Seminar Series, ECE, Carnegie Mellon University, Pittsburgh, PA, September 29th, 2005.
39. IMEC, Leuven, Belgium, May 15th, 2007.
40. Hitachi Global Storage Technology, San Jose Research Laboratory, July 16th, 2008.
41. Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore, India, August 22nd, 2008.
42. GM Tech Centre, Bangalore, India, August 25th, 2008.
43. Vellore Institute of Technology, Vellore, India, August 26th, 2008.
44. Institute for Materials Research Colloquium, The Ohio State University, Columbus, OH, February 3rd, 2009.
45. Institut für Angewandte Physik, University of Hamburg, Hamburg, Germany, March 27th, 2009.
46. Solid-State Seminar, University of Notre Dame, Notre Dame, IN, April 22nd, 2009.
47. Philips Lumileds Lighting, San Jose, CA, May 18th, 2009.
48. Materials Research Center, Indian Institute of Science, Bangalore, India, August 23rd, 2010.

Contributed Presentations at Conferences and Workshops

156 to date – Award winning presentations listed below

1. "Separation of GaN Thin Films from Sapphire Substrates using Pulsed Laser Processing" W. S. Wong, T. Sands and N. W. Cheung, presented by W.S. Wong at the 1998 Spring MRS Meeting, April 1998, San Francisco, CA; 1998, **Winner of the Best Poster Award.**
2. "Bonding and Laser Liftoff of GaN Thin Films from Sapphire onto Si and GaAs Substrates," W.S. Wong, A.B. Wengrow, Y. Cho, E.R. Weber, N.W. Cheung and T. Sands, presented by W.S. Wong at the 1998 MRS Fall Meeting, Boston, MA, November 30th, 1998; **W.S. Wong received the MRS Graduate Student Silver Award.**
3. "Pulsed Laser Deposition of Thin Film Skutterudite Thermoelectrics," J.C. Caylor, A.M. Stacy, R. Gronsky and T. Sands, presented by J.C. Caylor in *Symposium Z: Thermoelectric Materials 2000*, MRS Spring 2000 Meeting, San Francisco, CA, April 24th, 2000; **J.C. Caylor received the MRS Graduate Student Gold Award.**
4. "Electrodeposition of Thermoelectric Nanowire Composites," A.L. Prieto, M. Martín-González, J.F. Behnke, M.S. Sander, A.M. Stacy, R. Gronsky, and T. Sands, presented by A.L. Prieto in Symposium C, MRS Fall 2000 Meeting, Boston, MA, Nov. 29th, 2000 - **Winner of the Best Poster Award.**
5. "Metal/Semiconductor Multilayers for Thermionic Energy Converters," V. Rawat and T. Sands, ASME Energy Nanotechnology International Conference (ENIC 2006), MIT, Cambridge, MA, June 26-28, 2006; poster presented by Vijay Rawat; **Winner of the Best Poster Award.**
6. "Lithography-free In Situ Ohmic Contacts to Single-Walled Carbon Nanotubes," A.D. Franklin, J.T. Smith, M.R. Maschmann, D.B. Janes, T. Sands and T.S. Fisher, Symposium Q, 2006 Fall MRS Meeting, Boston, MA; presented by A.D. Franklin, Boston, MA, 11/28/06; **Aaron Franklin received the MRS Graduate Student Silver Award.**
7. "Semi-Vertical SWNT FETs: Steps towards Verticality and Manufacturability," A.D. Franklin, J.T. Smith, T.D. Sands, T.S. Fisher and D.B. Janes Nano and Giga Challenges in Electronics and Photonics (NGC2007), Phoenix, AZ; presented by A.D. Franklin, 3/15/07; **Awarded First Place Poster Prize.**
8. "Schottky, p-n Junction and Light Emitting Diodes Employing (In,Ga)N Nanorod Heterostructures," by P.P. Deb, H. Kim, Y. Qin, R. Lahiji, M. Oliver, D. Ewoldt, R. Reifenberger and T. Sands, 2007 MRS Spring Meeting, San Francisco, CA; paper DD13.8 presented by Parijat Deb, San Francisco, CA, April 12th, 2007; **Parijat Deb received the MRS Graduate Student Silver Award.**

Presentations to Lay Audiences

1. "High-Resolution Imaging of Interfaces in Semiconductor Devices," Regents Oversight Committee, Lawrence Berkeley Laboratory, Berkeley, CA, April 1984.
2. "Storage Technology Trends: 1980-2000," Telco Computer Maintenance and Operations Meeting, St. Louis, MO, October, 1992.
3. "Network Information Access Technology Program - A BCC Resource," Telco Computer Operations and Maintenance Workshop, East Brunswick, NJ, April, 1992.
4. "Nanotechnology: Far-fetched or Just around the Corner?" International Truck and Engine Company, Fort Wayne, IN, Sept. 22nd, 2004.
5. "Nanomaterials: Quantum Dots, Nanowires and Nanotubes," NCLT Nanotechnology 101 Series, presented July 15th, 2005 (on the web at <https://www.nanohub.org/education/nanotechnology101>)
6. "Designing Nanocomposite Thermoelectric Materials," NCN Nanotechnology 501 Series, presented 11/8/05. (on the web at <https://www.nanohub.org/education/nanotechnology501>)
7. "Designing Nanocomposite Materials for Solid-state Energy Conversion" NCLT tutorial, presented 11/10/05.
8. "Nanostructured Semiconductors: The Key to Efficient Solid-State Energy Conversion Devices", Purdue Silicon Valley Symposium, Palo Alto, CA, February 22nd, 2006.
9. Panelist for Purdue University Student Pugwash on "Alternative Energy", April 12th, 2006
10. "Nanowires and Nanotubes – One-dimensional Nanomaterials," NCLT Nanotechnology 101 Series, presented July 13th, 2006 (on the web at <https://www.nanohub.org/resources/?id=1639>)
11. Speaker for Purdue University Student Pugwash on "Nanotechnology," September 19th, 2006.
12. "Solid-State Lighting: An Opportunity for Nanotechnologists to Address the Energy Challenge," NCN Nanotechnology 501 tutorial, presented April 4th, 2007 (on the web at <https://www.nanohub.org/resources/2647/>)
13. Moderator for a Faculty Symposium on "Tiny Technologies for Huge Impacts on Health," in honor of the France A. Córdova Inauguration, Purdue University, April 11th, 2008.
14. "Nanotechnology – Far-fetched or Just Around the Corner?" Elderhostel seminar, Purdue University, June 16th, 2008; Michigan City Rotary, September 11th, 2008; Boswell Rotary, October 23rd, 2008.
15. "Tutorial on Solid-State Lighting," Purdue Energy Club, December 4th, 2008.
16. "Nanotechnology@Purdue," Lafayette Kiwanas Club, West Lafayette, IN, July 2nd, 2009.
17. "Nanomaterials: Quantum Dots, Nanowires and Nanotubes," NCLT Teacher Workshop, Purdue University, July 20th, 2009.
18. "Nano-enabled Future of Solid-State Energy Conversion," Nanobusiness Conference, Chicago, IL, September 9th, 2009.
19. "Nanotechnology@Purdue," Purdue Alumni Club of Anderson/Madison County, October 21st, 2009.
20. "Nanotechnology – Far-fetched, Just Around the Corner, or All Around You Today?" Tippecanoe/Benton/Carroll Retired Teachers Assoc. Meeting, West Lafayette, IN, November 19th, 2009.
21. "Nanotechnology@Purdue," The Alliance, Indianapolis, IN, February 19th, 2010.
22. "Nanotechnology: Problems, Perils and Promises," 2010 Purdue Student Pugwash Conference, April 10th, 2010, Purdue University, West Lafayette, IN.

National Presentations on Higher Education

1. Panelist for "University Technology Transfer: Challenges and Opportunities," AAU Chief Academic Officers Meeting, September 14th, 2010, Laguna Beach, CA.
2. Panelist for the "Provost's Roundtable," NSF Innovation through Institutional Innovation (I3) Meeting of Principal Investigators and Project Leaders; Institutional Innovation in a Time of Accountability and Economic Challenge, Nov. 9th, 2010, Arlington, VA.
3. Speaker, "The Military Family Research Institute at Purdue; Leveraging the Extension Infrastructure," Session on Higher Education and the U.S. Military: Partnering to Benefit Military Families and Their Communities," 123rd Annual APLU Meeting, Nov. 15th, 2010, Dallas, TX.
4. Panelist, "Making the Case to Our Funders: The Unique Qualities of Research University Undergraduate Education," 123rd Annual APLU Meeting, Nov. 15th, 2010, Dallas, TX.
5. Speaker, "What Next for Public Research Universities?" 2011 HUBbub, April 5th, 2011, Indianapolis, IN.

6. Panelist, “Would Thomas Edison Receive Tenure?” 2nd Annual Conference of the National Academy of Inventors, February 22nd, 2013, Tampa, FL.
7. Panelist, “Crisis Communications,” APLU Meeting, Nov. 3rd, 2014, Orlando, FL.
8. Panelist, “Bridging the Divide: Liberal Education and Professional Preparation,” National Conference on Trusteeship, Association of Governing Boards (AGB), April 4th, 2017, Dallas, TX.
9. Keynote Speaker, “Traversing Boundaries to Transform Virginia Tech into a VT-Shaped University,” Polytechnic Summit, Purdue University, June 6th, 2017, West Lafayette, IN.
10. Panelist, “Research as an Engine for Economic Growth,” Higher Education and Research as a Vehicle of Change in Turbulent Times – The Balancing Act of Modern Universities, University Day sponsored by APLU and the U.S. Swedish Embassy, February 13th, 2019, Washington, DC.
11. Panelist, “Public-Private Partnerships: Accelerating Education, Skills Development and Diversity in STEM,” Business Higher Education Forum, February 28th, 2019, Washington DC.
12. Panelist, “Inside the Amazon HQ2 Decision: A Foundation Story,” Association of Governing Boards of Universities and Colleges Forum, January 26th, 2020, San Diego, CA.