

Curriculum Vitae

Ellen D. Williams

Distinguished University Professor, University of Maryland
Department of Physics, and
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EDUCATION

Ph.D. in Chemistry, September 1981

California Institute of Technology, Pasadena, CA 91125

Thesis Topic: Studies of Chemical Adsorption Using Low Energy Electron Diffraction

Thesis Advisor: Dr. W. H. Weinberg π

B.S. in Chemistry, June 1976,

Michigan State University, East Lansing MI 48824

AWARDS

Fred Kavli Distinguished Lectureship in Materials Science 2016

Foreign Member of the Royal Society 2016

Distinguished Alumnus Award, California Institute of Technology 2016

Honorary Ph.D., Michigan State University, 2016

Dow Distinguished Lecture Award, U. of California, Berkeley, 2015

Cheetham Award Lecture, U. of California Santa Barbara, 2014

Women in Science, Technology, Engineering and Production Award,
Manufacturing Institute 2013

National Academy of Sciences, 2005

Materials Research Society – David Turnbull Award, 2003

American Academy of Arts and Sciences, 2003

American Physical Society – David Adler Lectureship Award, 2001

Distinguished University Professor, 2000

American Physical Society Centennial Speaker (1998-9)

University of Maryland Distinguished Faculty Research Fellow (1996-1998)

Japan Society for the Promotion of Science Fellow (1996)

E.W. Mueller Award, University of Wisconsin-Milwaukee, 1996

University of Maryland Outstanding Woman of the Year, 1996

Fellow of the American Vacuum Society, 1993

Fellow of the American Physical Society, 1993

American Physical Society - Maria Goeppert - Mayer Award, 1990

Office of Naval Research Young Investigator, 1986-1989

Presidential Young Investigator, 1984-1989

Cottrell Research Grant, 1983

IBM Graduate Fellowship, 1979-80

National Science Foundation Fellowship, 1976-79

Alumni Distinguished Scholars Scholarship, Michigan State University, 1972-76

EMPLOYMENT

Distinguished University Professor, University of Maryland, 2000-present

Professor, 1991-present
Department of Physics, and
Institute for Physical Science & Technology
University of Maryland

Director, Advanced Research Projects Agency – Energy, December 2014 – January 2017

Senior Advisor to the Secretary of Energy, May – December 2014

Chief Scientist, BP, January 2010 – April 2014

Visiting Professor, Department of Physics, Imperial College, June 2010 - 2014

University of Maryland:

Director, 1993-1995
Chemical Physics Program

Associate Professor, 1990-1991
Institute for Physical Science and Technology

Associate Professor, 1987-1991
Department of Physics

Assistant Professor, 1983-1987
Department of Physics and Astronomy

Research Associate, 1981-1983
Department of Physics and Astronomy
Advisor: R. L. Park

Graduate Research Assistant, 1977-81
California Institute of Technology

Teaching Assistant, 1976-79
California Institute of Technology

Summer Research, 1976
Kodak Research Laboratories
Rochester, New York

Summer Research, 1974
Miles Laboratories
Ames Research Laboratories
Elkart, Indiana

AFFILIATIONS

Phi Beta Kappa, Sigma Xi, American Physical Society, American Vacuum Society,
American Chemical Society, Materials Research Society, American Academy of Arts and
Sciences, National Academy of Sciences

PROFESSIONAL ACTIVITIES

Member, NAS Policy and Global Affairs Committee, 2012- 2014

Member, Electric Power Research Institute Advisory Board, 2011-2014

Member of the State Department International Security Advisory Board, 2011- 2013

Program Lead, BP Energy Sustainability Challenge (ESC), 2010-2014

Scientific Liaison: BP Gulf Research Initiative (GRI), 2010-2011

Program Lead, BP Distributed Research Laboratory (DRL), 2011 – 2014

Chairman, NAS committee on the Technical Issues Concerning the Comprehensive Test Ban Treaty, 2009-11.

Director, NSF-Materials Research Science and Engineering Center, University of Maryland, 1996-2009

JASON group, member 1993-present, steering committee 2001 - 2009, vice chair 2004-2009.

Member of Inaugural Editorial Board for Annual Review of Condensed Matter Physics, 2008 - 2009

Class Membership Committee, National Academy of Sciences, 2008-10.

Member: Congressional Commission on the Strategic Posture of the United States 2008-9

Member: DOE-BES Review of Materials Science programs at Sandia National Laboratory-Livermore and Lawrence Livermore Laboratory, 2008

American Physical Society, Davison Germer Prize Selection Committee
Member 1996; Chair 1998, Chair 2008

American Physical Society, James C. McGroddy Prize for New Materials Selection
Committee Member 2008

Board of Reviewing Editors, Science Magazine (2003-2009)

Editorial Board, Nano Letters (ACS), 2001-present

Member, NRC Board on Army Science and Technology (2007-9)

Member, NRC Committee on Conventional Prompt Global Strike Capability (2007-8)

Member, National Security Panel of University of California President's Council, 2000-2007

External Review Committee, Stanford NSEC (2007)

External Review Committee, Physics Dept. N. Carolina State U. (2007)

Member, Materials Research Society Board of Directors (2006-7)

Member, Nuclear Weapons Complex Assessment Committee, AAAS (2006-7)

Member, Physics Policy Committee, American Physical Society (2005-7)

PROFESSIONAL ACTIVITIES (continued)

Co-organizer, National Nanotechnology Initiative Grand Challenges Workshop on Energy (DOE, 2004).

Editorial Board of the Journal of Applied Physics and Applied Physics Letters (2004-6)
Member, Committee on Nanotechnology for the Intelligence Community (NRC) 2003-4
Member, Director's Review Committee, Materials Science Division, Lawrence Berkeley
National Laboratory, 2003
Participant, National Nanotechnology Initiative Grand Challenges Workshop on
Nanomaterials (NSF, 2003)
External Advisory Committee for the University of Chicago MRSEC, 1997-present
External Advisory Committee for Harvard University NSEC (2003)
External Advisory Committee for Cornell University NSEC (2003)
External Review Committee, Department of Physics, Rutgers University 2002.
Member, NNSA Advisory Committee, 2001-2
Member Solid State Sciences Committee, Board on Physics and Astronomy (NAS),
2001-2004
Chairman of the Gordon Conference on Thin Films and Crystal Growth, July 2001
Organizer of Greater Washington Nanoscience Openhouse at University of Maryland,
October 2001 (University of Maryland, Naval Research Laboratory, and National
Institute of Standards and Technology Open House series)
American Physical Society, Adler Award Selection Committee, 2001
Meeting Chair, Materials Research Society, Fall 1999
Co-Organizer of Materials Research Society Symposium, Mechanisms and Principles of
Epitaxial Growth in Metallic Systems, Spring 1998
External Review of the NIST Nanomanufacturing of Atom Based Standards Project,
NIST, Gaithersburg, MD, August 1996
Editorial Board, Surface Science, 1995-2001
Co-organizer, Materials Research Society Symposium, Evolution of Thin Film and
Surface Morphology, Fall 1996
Member at Large, Executive Committee of the Division of Condensed Matter Physics,
American Physical Society, 1994-1997
Principal Investigator: NSF Materials Research Group, 1991-1996
Co-Organizer, Materials Research Society Symposium, Evolution of Thin Film and
Surface Morphology, Fall 1994
Forum on Science in the National Interest, 1994
Co-Organizer, Workshop on New and Emerging Techniques for Imaging Surfaces,
Washington, D.C., 1993
Editorial Board, Review of Scientific Instruments, 1991-1993

PROFESSIONAL ACTIVITIES (continued)

American Physical Society Committee on the Status of Women in Physics, 1990-1992
Co-Chairman, Local Arrangements Committee, Physical Electronics Conference, 1990
Executive Committee, Surface Science Division of the American Vacuum Society,

1989-1990

Local Arrangements Committee, 33rd National Symposium, American Vacuum Society,
Baltimore, 1986

Rapporteur for the National Academy of Science Research Briefing on Selected
Opportunities in Physics, 1984

Reviewer for NSF, DOE, Israel Science Foundation, Surface Science, Physical Review B,
Physical Review Letters, Journal of Vacuum Science and Technology, Applied
Physics Letters, Science, Nature

DISSERTATIONS SUPERVISED

- Yves U. Idzerda, "Interacting Thin-Film Systems Probed by Electron-Induced Extended Fine Structure," Ph.D. May 1986.
- Robert Q. Hwang, "'Two Dimensional Phase Transitions studied by LEED", Ph.D 1988 (co-advised with R.L. Park)
- Tim R. Ohno, "Reaction of Arsenic and Nickel with Vicinal Silicon Surfaces: A LEED/AES Study," Ph.D. May 1989.
- Yu-Nong Yang, "Study of High-Index Silicon Surfaces," Ph.D. May 1990.
- Xue Sen Wang, "Construction of a Scanning Tunneling Microscopy and Application to Vicinal Si (111) Surfaces," Ph.D. August 1990.
- Romel Gomez, "Facetting of Vicinal Si(111): Design and Application of the Scanning Tunneling Microscope," Ph.D. December 1990.
- Jill Goldberg, "Statistical Mechanics of Steps Studied Using scanning Tunneling Microscopy," Ph.D. June 1992.
- Timothy Jung, "LEED Studies of Vicinal Semiconductor Surfaces," (co-advisor R.J. Phaneuf).Ph.D. June 1992.
- Jian Wei, "Studies of Equilibrium Properties of Steps and Kinks Using High-Resolution LEED," Ph.D. in Chemical Physics, June 1992.
- Kai-Tak Wan, "Relationship Between Fundamental Intersurface Forces and Fracture Properties of Brittle Materials," (Advisor: Brian Lawn, NIST), Ph.D. in Chemical Physics, June 1993.
- Bin Li, "Studies of Oxidation and Thermal Equilibrium on Vicinal Si Surfaces," Ph.D. December 1993.
- Elain Fu, "Characterization and Fabrication of Nano- and Micron-sized Structures on the Si Surface using Scanning Probe Microscopies," Ph.D. August 1997.
- Vincent Tsai, "Calibration of Atomic Force Microscopes with Silicon Step Artifact," (Advisor: T. Vorburger, NIST), Ph.D. in Materials Science, May 1998.
- Erika Jones, "Design of Sample Templates for Doping Characterization," M.S. in Chemical Physics May 1999.
- Robert Ryland, "Application and Development of Scanning Tunneling Microscopy Techniques" Ph.D. August 2001.
- Jonathan McCoy, "Bayesian Solutions to the Deconvolution Problem," (co-advisor, R. Pego, Applied Mathematics) M.S. in Applied Mathematics, August 2001.
- Ruchirej Yongsunthon, "Magnetic Force Microscopy for Observation of Current Crowding in Electromigration Phenomena," Ph.D August 2002.
- Karen Siegrist, "Characterization of Contrast Mechanisms of the Photoelectron Emission Microscope," Ph.D. December 2002.

Daniel B. Dougherty, “Experimental Studies of Fluctuations and Transport at Solid Surfaces”, Ph.D. December 2004.

Masashi Degawa, “Equilibrium and Non-Equilibrium Properties of Finite-Volume Crystallites,” Ph.D. May 2006

Mihela Breban, “ Photocurrent Spectroscopy of Thin-Film Organic Semiconductors “ Ph.D. December 2006

Chenggang Tao, “Fluctuations on metal surfaces and molecu/metal interfaces, “ Ph.D. December 2007.

Tarek Ghanem, “ Electronic transport in low dimensions: carbon nanotubes and mesoscopic silver wires,” (co-advisor with Michael Fuhrer) Ph.D. December 2008

Hui Wang, “Low-temperature Scanning Tunneling Microscopy,” (co-advisor with Barry Barker) Ph.D. December 2008

Brad Conrad, “Interface Effects on Nanoelectronics,” Ph.D. May 2009

Jianhao Chen, Diffusive Charge Transport in Graphene, Ph.D. December 2009

Vinod Sanwan, “Carbon Nanotube Thin Film as an Electronic Material,” Ph.D. December 2009

Tracy Moore, “Nanoelectronic structures and performance“, Ph.D. December 2010.

Andrew Tunnel, “Hig Frequency Generation from Carbon Nanotube Field Effect Transistors used as Passive Mixers,” Ph.D. May 2012.

POLICY PUBLICATIONS

“Nanoscience for Energy Needs,” Report of the March 2004 NNI Grand Challenge Workshop, Department of Energy, Office of Basic Energy Sciences, Workshop report, (www.nano.gov/nni_energy_rpt.pdf),

(E.D. Williams, R.Q. Hwang (organizers) and P. Alivisatos, P. Cummings, J. DeYoreo, K. Fichtohorn, B. Gates, D. Lowndes, A. Majumdar, L. Makowski, T. Michalske, J. Misewich, C. Murray, S. Sibener, C. Teague). {Workshop report.}

"The United States Nuclear Weapons Program: The Role of the Reliable Replacement Warhead," American Association for the Advancement of Science, Center for Science,, Technology and Security Policy, Washington, DC, April 2007,

(<http://cstsp.aaas.org/content.html?contentid=899>),

(B. Tartar (Chair), Philip Coy, Charles Curtis, Steve Fetter, John Foster, Steve Guidice, Siegfried Hecker, Eugene Ives, Raymond Jeanloz, Robert Selden, Michael Telson, Ellen Williams, Richard Wagner)

National Research Council, Committee on Conventional Prompt Global Strike Capability, "U.S. Conventional Prompt Global Strike Capability: Issues for 2008 and Beyond:" (The National Academies Press, 2008), 250 pgs, http://www.nap.edu/catalog.php?record_id=12061

(Albert Carnesale (Chair), Paul Bracken, Paul K. Davis, Steve Fetter, John S. Foster, Jr., Eugene Fox, Alec D. Gallimore, Richard L. Garwin, Eugene Habiger, David V.

Kalbaugh, L. David Montague, Walter B. Slocombe, William D. Smith, John P. Stenbit, David M. Van Wie, Robert H. Wertheim, Ellen D. Williams)

The Congressional Commission on the Strategic Posture of the United States,
Interim Report: Dec. 15, 2008. http://www.usip.org/strategic_posture/interim.html
Final Report: May 6, 2009: http://www.usip.org/strategic_posture/final.html

“Technical Issues Concerning the Comprehensive Test Ban Treaty,” National Research Council, 2012, <http://www.nap.edu/catalog/12849/the-comprehensive-nuclear-test-ban-treaty-technical-issues-for-the>.

Ellen D. Williams (study chair), Theodore Bowyer, Linton Brooks, Donald Cobb, Richard Garwin, Raymond Jeanloz, Richard Mees, Bruce Tartar.

“Water in the Energy Industry, An Introduction,” 2013.

<http://www.bp.com/en/global/corporate/sustainability/the-energy-future/energy-and-natural-resources.html>

E.D. Williams and J.E. Simmons

“ARPA-E: The First Seven Years. A Sampling of Project Outcomes,” 2016.

<https://arpa-e.energy.gov/?q=engage/articles-publications>

“ARPA-E Impacts: A Sample of Project Outcomes, Volume II,” 2017

<https://arpa-e.energy.gov/?q=publications/arpa-e-impacts-sample-project-outcomes-volume-ii>

RESEARCH PUBLICATIONS

1. "A Determination of Adatom-Adatom Interaction Energies: Application to Oxygen Chemisorbed on the Tungsten (110) Surface," *J. Vacuum Sci. Technol.* 15, 417 (1978); *J. Chem. Phys.* 68, 4688 (1978), (E.D. Williams, S. L. Cunningham and W.H. Weinberg).
2. "A Structural Determination of the Unreconstructed and the Reconstructed (110) Surfaces of Iridium," *J. Vacuum Sci. Technol.* 16, 642 (1979), (C.-M. Chan, K.L. Luke, M.A. Van Hove, E.D. Williams and W.H. Weinberg).
3. "The Geometric Structure of Carbon Monoxide Chemisorbed on the Ruthenium (001) Surface at Low Temperatures," *Surface Sci.* 82, 93 (1979), (E.D. Williams and W.H. Weinberg).
4. "Structural Study of the Reconstructed Ir(110)-(1x2) Surface by Low Energy Electron Diffraction," *Solid State Commun.* 30, 47 (1979), (C.-M. Chan, M.A. Van Hove, W.H. Weinberg and E.D. Williams).
5. "The Adsorption of Sulfur on the Reconstructed Ir(110)-(1x2) Surface," *Surface Sci.* 81, L309 (1979), (E.D. Williams, C.-M. Chan and W.H. Weinberg).
6. "Debye Temperatures of the (110) and (111) Surfaces of Iridium Determined by LEED," *Surface Sci.* 82, L577 (1979), (C.-M. Chan, E.D. Williams and W.H. Weinberg).
7. "The Chemisorption of CO on Rh(111)," *Surface Sci.* 84, 54 (1979), (P.A. Thiel, E.D. Williams, J.T. Yates and W.H. Weinberg).
8. "An R-Factor Analysis of Several Models of the Reconstructed Ir(110)-(1x2) Surface," *Surface Sci.* 91, 440 (1979), (C.M. Chan, M.A. Van Hove, W.H. Weinberg and E.D. Williams).
9. "Does Chemisorbed Carbon Monoxide Dissociate on Rhodium?" *Surface Sci.* 91, 562 (1980), (J.T. Yates, E.D. Williams and W.H. Weinberg).
10. "Segregation of Co-absorbed Species: Hydrogen and Carbon Monoxide on the Rh(111) Surface," *J. Chem. Phys.* 72, 3496 (1980), *AIP Conference Proceedings: Aspects of the Kinetics and Dynamics of Surface Reactions*, ed. Uzi Landman, American Institute of Physics, New York, 1980, p. 275 (E.D. Williams, P.A. Thiel, W.H. Weinberg, and J.T. Yates).
11. "Computations of Profiles of Low-Energy Electron Diffraction Beams for Arrays of Ordered Islands," *Proceedings of the Fourth International Conference of Solid Surfaces*, p. 311 (1980); *Surface Sci.* 109, 574 (1984), (E.D. Williams and W.H. Weinberg).
12. "CO on Ru(001), Island Size and Disorder," *J. Chem. Phys.* 76, 1150 (1982), *J. Vacuum Sci. and Technol.* 20, 534 (1982), (E.D. Williams, W.H. Weinberg, and A. C. Sobrero).
13. "Reply to Comments on 'Does Chemisorbed Carbon Monoxide Dissociate on Rhodium?'" *Surface Sci.* 115, L93 (1982), (J.T. Yates, E.D. Williams and W.H. Weinberg).

RESEARCH PUBLICATIONS (continued)

14. "A Model for the Saturated Water Bilayer on Ru(001) Based on a Comparison of Experimental and Calculated LEED Patterns," J. Vacuum Sci. Technol. A1, 1188 (1983), (E.D. Williams and D.L. Doering).
15. "Relationship between Many-Parameter Lattice Gas Systems and Simpler Models: Easy Approximations for T_c ," J. Vacuum Sci. Technol. A2, 1188 (1984), (N. C. Bartelt, T.L. Einstein and E.D. Williams).
16. "Electron Energy Loss Study of the Epitaxial Growth of Cu on W(110)," Surface Sci. 148, 453 (1984), (J. Vahakangas, H. Iwasaki, E.D. Williams and R.L. Park).
17. "Precursor Adsorption of CO on Ni(111) near 5 K and the Activation Energy for Chemisorption," Surface Sci. 154, L239 (1985), (M. Shayegan, E.D. Williams, R.E. Glover III and R.L. Park).
18. "Two-dimensional Ordering of Chlorine on Ag(100)," Phys. Rev. B 32, 4653 (1985); J. Vacuum Sci. Technol. A2, 895 (1984), (D.L. Taylor, E.D. Williams, N.C. Bartelt, R.L. Park and T.L. Einstein).
19. "Surface Extended Electron Loss Fine Structure: Dependence on Incident Electron Energy and Collection Solid Angle," Surface Sci. 160, 75 (1985), (Y.U. Idzerda, E.D. Williams and R.L. Park).
20. "On the Detailed Growth Mode of Thin Silver Films on Si(111)," Surface Sci. 172, 433 (1986), (Q.-G. Zhu, A.-D. Zhang, E.D. Williams and R.L. Park).
21. "Growth and Alloying of Ti on Cu(111)," Phys. Rev. B 33, 2281 (1986), (J. Vahakangas, E.D. Williams and R.L. Park).
22. "The initial growth of Ti on Si," Phys. Rev. B 33, 8716 (1986), (J. Vahakangas, Y.D. Idzerda, E.D. Williams and R.L. Park).
23. "Formation of Iron Silicide Thin Films," J. Appl. Phys. 60, 2629 (1986), (Q.-G. Zhu, H. Iwasaki, E.D. Williams and R.L. Park).
24. "Initial Formation of Titanium Silicide," Surface Science 177, L1028 (1986), (Y.U. Idzerda, J. Vahakangas, E.D. Williams and R.L. Park).
25. "Reaction and Structure of Ti on Si: Probed by SEELFS and EAPFS," J. Vac. Sci. Technol. A5, 847 (1987) (Y.U. Idzerda, T.L. Einstein, E.D. Williams and R.L. Park).
26. "Low-Energy Electron Transmission through Cu/Ni Quantum Wells," J. Vac. Sci. Technol. A5, 2065 (1987); Phys. Rev. Lett 58, 2563 (1987) (Q.-G. Zhu, A.-D. Zhang, E.D. Williams and R.L. Park).

RESEARCH PUBLICATIONS (continued)

27. "Influence of Surface Steps on the Growth of Epitaxial NiSi₂," J. Vac. Sci. Technol. A5, 2143 (1987); and Appl. Phys. Lett. 50, 754 (1987) (G. Akinci, T. Ohno and E.D. Williams).
28. "Comparison of High-Temperature and Laser-Quenched Si(111)," Phys. Rev. B 35, 4155 (1987), (R.J. Phaneuf and E.D. Williams).
29. "Metastable Structures of Si(111) Formed by Laser-Quenching," Surface Sci. 195, 330 (1988), (R.J. Phaneuf and E.D. Williams).
30. "Surface Phase Separation of Vicinal Si(111)," Phys. Rev. Lett. 58, 2563 (1987), (R.J. Phaneuf and E.D. Williams).
31. "Electron-Induced Extended Fine Structure Measurements of Thin Film Growth and Reactions," Phys. Rev. B 36, 5941 (1987), (Y.U. Idzerda, E.D. Williams, T.L. Einstein and R.L. Park).
32. "NiSi₂ on Si(111): I. Effects of Substrate Cleaning Procedure and Reconstruction," Surface Sci. 193, 534 (1988), (G. Akinci, T. Ohno and E.D. Williams).
33. "Temperature Dependence of the Phase Diagram of Cl/Ag(100)," Phys. Rev. B. 37, 5870 (1988), (R.Q.Hwang, E.D. Williams, N.C. Bartelt and R.L. Park).
34. "NiSi₂ on Si(111): II. Effects of Substrate Temperature and Defect Structure," Surface Sci. 201, 27 (1988), (G. Akinci, T.R. Ohno and E.D. Williams).
35. "Thermal Disordering of the Structure of Al on Si(111)," Surface Sci. 193, L53 (1988), (R.Q. Hwang, E.D. Williams, N.C. Bartelt and R.L. Park).
36. "The Temperature Dependence of Vicinal Si(111) Surfaces," Phys. Rev. B38, 1984 (1988); Proceedings of the 2nd International Conference on the Structure of Surfaces, eds, J.F. van der Veen and M.A. Van Hove, Springer-Verlag, Berlin (1987), p. 525, (R.J. Phaneuf, N.C. Bartelt and E.D. Williams).
37. "Defect Sensitivity of the Growth of Nb on Si(111)," Solid State Commun., 68, 145 (1988), (S.R. Mahamuni, D.T. Abell and E.D. Williams).
38. "Appearance Potential Study of Ba-Activated Oxidation of Ni," Surface Sci. 206, 289 (1988), (R. Gomez and E.D. Williams).

RESEARCH PUBLICATIONS (continued)

39. "Temperature-Orientation Phase Diagram of Vicinal Si(111): Relationship Between (7x7) Reconstruction and Range of Unstable Orientations," Nucl. Phys. B. (suppl.) 5A, 300 (1988), (R.J. Phaneuf, E.D. Williams, N.C. Bartelt and T.L. Einstein).
40. "Comparisons of LEED and STM Measurements of Vicinal Si(111)," J. Microsc., 152, 473 (1988), (X.-S.Wang, R.J. Phaneuf and E.D. Williams).
41. "Orientational Stability of Silicon Surfaces," J. Vacuum Sci. Technol. A7, 1898 (1989), (N.C. Bartelt, E.D. Williams, Y. Yang, R.J. Phaneuf and S. Das Sarma).
42. "Carbon-Induced Facetting of Si(112)," Surface Sci., 215, 102 (1989), (Y. Yang and E.D. Williams).
43. "Surface Facetting and The Equilibrium Crystal Shape," Ultramicroscopy 31, 36 (1989), (E.D. Williams and N.C. Bartelt). (Review Article)
44. "Comment on 'Kinetics and Reconstruction of Steps at the Si(001) Surface'," Phys. Rev. Lett. 65, 1285 (1990), (Y. Yang and E.D. Williams).
45. "A High-Resolution Low-Energy Electron Diffraction Instrument," Rev. Sci. Instrum. 60, 2945 (1989); J. Vac. Sci. Technol. A2, 1004 (1984), (R.Q. Hwang, E.D. Williams and R.L. Park).
46. "High Resolution LEED Study of the Phase Diagram of Vicinal Si(111) Surfaces," Phys. Rev. B40, 11716 (1989), (R.Q. Hwang, E.D. Williams and R.L. Park).
47. "Arsenic-Induced Facetting of Vicinal Si(100) Surfaces," Jpn. J. of Appl. Phys. 28, L2061(1989), (T.R. Ohno and E.D. Williams).
48. "A Step-Height Tripling Transition on Vicinal Si(111)," Phys. Rev. B41, 2991 (1990), (R.J. Phaneuf and E.D. Williams).
49. "Arsenic-Induced Step Rearrangement on Vicinal Si(111) Surfaces," Appl. Phys. Lett. 55, 2628 (1989), (T.R. Ohno and E.D. Williams).
50. "The Role of Carbon in the Facetting of Silicon Surfaces on the (111) to (100) Azimuth," J. Vac. Sci. Technol. A8, 2481 (1990), (Y. Yang and E.D. Williams).
51. "Disordering of the (3x1) Reconstruction on Si (113) and the Chiral Three-State Potts Model," Phys. Rev. Lett. 64, 2410 (1990); The Structure of Surfaces III, Eds., M.A. Van Hove et al. (Springer, Berlin, 1991), (Y. Yang, E.D. Williams, R.L. Park, N.C. Bartelt, and T.L. Einstein).

RESEARCH PUBLICATIONS (continued)

52. "Step Structure and Interface Morphology: Arsenic on Vicinal Silicon Surfaces," J. Vac. Sci. Technol. B8, 874 (1990), (T.R. Ohno and E.D. Williams).
53. "Terrace Width Distributions on Vicinal Si(111)," Phys. Rev. Lett. 65, 2430 (1990), (X.-S. Wang, J.R. Goldberg, N.C. Bartelt and E.D. Williams).
54. "The Precipitation of Kinks on Stepped Si(111) Surfaces," The Structure of Surfaces, Eds. M.A. Van Hove et al. (Springer, Berlin 1991); J. Chem. Phys., 94, 8384 (1991), (J. Wei, X.-S. Wang, N.C. Bartelt, E.D. Williams and R.T. Tung).
55. "Diffraction from Stepped Surfaces in Thermal Equilibrium," Surface Sci. 244, 149 (1991), N.C. Bartelt, T.L. Einstein, and E.D. Williams).
56. "The Influence of Step-Step Interactions on Step Wandering," Surface Sci. 240, L591 (1991), (N.C. Bartelt, T.L. Einstein and E.D. Williams).
57. "Quantization of Terrace Widths on Vicinal Si(111)," J. Vacuum Sci. Technol. A9, 1868 (1991), (J. Goldberg, X.-S. Wang, J. Wei, N.C. Bartelt and E.D. Williams).
58. "Thermodynamics of Surface Morphology," Science 251, 393 (1991), (E.D. Williams and N.C. Bartelt). (Review Article)
59. "Low Energy Electron Diffraction Study of the Reconstruction and Orientational Stability of Si(331)," Surface Sci. 250, L368 (1991), (J. Wei, E.D. Williams and R.L. Park).
60. "Stability of the Si-YBa₂Cu₃O_{7-x} Interface," J. Materials Res., 6, 1634 (1991), (B. Li and E.D. Williams).
61. "Surface Height Correlation Functions of Vicinal Si(111) Surfaces Using Scanning Tunneling Microscopy," Surface Sci. 249, L285 (1991), (J.L. Goldberg, X.S. Wang, N.C. Bartelt and E.D. Williams).
62. "Step Structure and Reconstruction on Vicinal Ge(111) Surfaces," Surface Sci. 254, 235 (1991), (T.M. Jung, R.J. Phaneuf and E.D. Williams).
63. "LEEM Investigation of Orientational Phase Separation on Vicinal Si(111)," Phys. Rev. Lett. 21, 2986 (1991), (R.J. Phaneuf, N.C. Bartelt, E.D. Williams, W. Swiech and E. Bauer).
64. "Step-Height Mixtures on Vicinal Si(111) Surfaces," Phys. Rev. Lett. 68, 3885 (1992), (J. Wei, X.S. Wang, J.L. Goldberg, N.C. Bartelt and E.D. Williams).

RESEARCH PUBLICATIONS (continued)

65. "LEEM Investigation of the Domain Growth of the 7x7 Reconstruction on Si(111)," *Surface Sci.* 268, 227 (1992), (R.J. Phaneuf, N.C. Bartelt, E.D. Williams, W. Swiech and E. Bauer).
66. "Step Doubling and Related Transitions on Vicinal Surfaces," *J. Vacuum Sci. Technol.* A10, 2600 (1992), (T.L. Einstein, T.M. Jung, N.C. Bartelt, E.D. Williams and C. Rottman).
67. "The Role of Step Collisions on Diffraction from Vicinal Surfaces," *Surface Sci.* 276, 308 (1992), (N.C. Bartelt, T.L. Einstein and E.D. Williams).
68. "The Equilibration of Terrace Width Distribution on Stepped Surfaces," *Surface Sci.* 273, 252 (1992), (N.C. Bartelt, J.L Goldberg, T.L. Einstein and E.D. Williams).
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191. "Impurity Decoration for Crystal Shape Control: C60 on Ag(111)," *Physical Review Letters* **102**, 085501 (2009), (T. J. Stasevich, Chenggang Tao, William G. Cullen, Ellen D. Williams, and T.L. Einstein.)
192. "Percolative Effects on Noise in Pentacene thin film transistors," *Appl. Phys. Letters*, **91** 242110 (2007) (B. Conrad, W.G. Cullen, W. Yan, and E.D. Williams). <http://link.aip.org/link/?APPLAB/91/242110/1>
193. "Charged impurity scattering in graphene," *Nature Physics*, **4**, 377- 381 (2008) (J.H. Chen, C. Jang, M.S. Fuhrer, E.D. Williams and M. Ishigami).
194. "Effect of Impurities on Pentacene Island Nucleation." *Physical Review B*, **77**, 205328 (2008) (B. Conrad, E. Gomar-Nadal, W. G. Cullen, A. Pimpinelli, T. L. Einstein and E. D. Williams).
195. "Dynamic interfaces in an organic thin film," *Proceedings of the National Academy of Science*, **105**, 16418-16425 2008 (C.G. Tao, Q. Liu, B. Riddick, W.G.Cullen, J. Reutt-Robey, J.D. Weeks and E.D. Williams).
196. "Tuning the effective fine structure constant in graphene: opposing effects of dielectric screening on short- and long-range potential scattering," *Physical Review Letters* **101** 146805 2008 (C. Jang, S. Adam, J.-H. Chen, E.D. Williams S. Das Sarma, M.S. Fuhrer).

RESEARCH PUBLICATIONS (continued)

197. "Facile fabrication of suspended as-grown carbon nanotube devices," V. K. Sangwan, V. W. Ballarotto, M. S. Fuhrer, and E. D. Williams, *Applied Physics Letters* **93**, 113112 (2008).
198. "Vertical Integration on Plastic Substrates using Transfer Printing," *Applied Physics Letters* **93** 193113 (2008) (A. J. Tunnell, V. W. Ballarotto, D. R. Hines, and E. D. Williams).
199. "Pentacene islands grown on ultra-thin SiO₂," *Surface Science* 603, L27-30 2009 (B.R. Conrad, W.G. Cullen, B.C. Riddick, E.D. Williams).
200. "Defect Scattering in Graphene," *Physical Review Letters* 102, 236805, 2009 (J. H. Chen, W. G. Cullen, C. Jang, M. S. Fuhrer and E. D. Williams).
201. "Diffusive Charge Transport in Graphene on SiO₂," *Solid State Communications*, 149, 1080, 2009 (J.-H. Chen, C. Jang, M. Ishigami, S. Xiao, W.G. Cullen, E.D. Williams, M.S. Fuhrer) review article.
202. "Characterizing Voltage Contrast in Photoelectron Emission Microscopy," *Journal of Microscopy*, 238, 210-217, 2010, (Vinod K. Sangwan, Vincent W. Ballarotto, Karen Siegrist and Ellen D. Williams).
203. "C₆₀ Cluster Formation at Interfaces with Pentacene Thin Film Phases," *Applied Physics Letters*, 95 213302 2009 (B. R. Conrad, J. Tosado, G. Dutton, D. B. Dougherty, W. Jin, T. Bonnen, A. Schuldenfrei, W. G. Cullen, E. D. Williams, J. E. Reutt-Robey, and S. W. Robey).
204. "Charged impurity scattering in bilayer graphene" *Physical Review B* 82, 041406, 2010 (Shudong Xiao, Jian-Hao Chen, Shaffique Adam, Ellen D. Williams and Michael S. Fuhrer).
205. "Solution-processed single walled carbon nanotube electrodes for organic thin-film transistors" *Organic Electronics* 10, 1556 2009 ([doi:10.1016/j.orgel.2009.09.001](https://doi.org/10.1016/j.orgel.2009.09.001)) (Adrian Southard, Vinod Sangwan, Jeremy Cheng, Ellen D. Williams and Michael S. Fuhrer).
206. " Visualizing the Electron Scattering Force in Nanostructures," *Science* 328, 736-740, 2010 (C.G. Tao, W.G. Cullen and E.D. Williams)
207. " First-principles quantum transport theory of the enhanced wind force driving electromigration on Ag(111)," *Physical Review B* 81, 235416 (2010), (K.H. Bevan, H. Guo, E.D. Williams and Zhenyu Zhang).
208. "Controlled growth, patterning and placement of carbon nanotube thin films," *Solid State Electronics* 54, 1204, 2010, (V.K. Sangwan, V.W. Ballarotto, D.R. Hines and E.D. Williams).

RESEARCH PUBLICATIONS (continued)

209. "Optimizing transistor performance of percolating carbon nanotube networks," Applied Physics Letters 97, 04311, 2010 (V. K. Sangwan, A. Behnam, V. W. Ballarotto, M. S. Fuhrer, Ant Ural and E. D. Williams)
210. "[Anomalous decay of multilayer holes on SrTiO\(3\)\(001\)](#)" Physical Review B 82, 115436, 2010. (M. Yamamoto; K. Sudoh Koichi; H. Iwasaki Hiroshi;, E.D. Williams).
211. "[High-Fidelity Conformation of Graphene to SiO\(2\) Topographic Features.](#)" Physical Review Letters 105, 215504, 2010 (W. G. Cullen, M. Yamamoto, K.M. Burson, J.-H. Chen, C. Jang, M.S. Fuhrer and E.D. Williams).
212. "[Tunable Kondo effect in graphene with defects.](#)" *Nature Physics* 7, 535, 2011 (J.-H. Chen, L. Li, W.G. Cullen, E.D. Williams and M.S. Fuhrer)
213. "[Polymeric semiconductor/graphene hybrid field-effect transistors.](#)" *Organic Electronics* 12, 1471 2011 (J. Huang, D.H. Hines, B.J. Jung, M.S. Bronsgeest, A. Tunnel, V. Ballarotto, H.E. Katz, M.S. Fuhrer, E.D. Williams and J. Cumings).
214. "Characterization of the electrical contact between a conductive atomic force microscope cantilever and a carbon nanotube," *Journal of Applied Physics* 110, 054305 2011 (T.K. Ghanem Tarek, E.D. Williams, M.S. Fuhrer)
215. " Transfer printing approach to all-carbon nanoelectronics," *Microelectronic Engineering* 88, 3150-54, 2011 (V.K. Sanwan, A. Southard, T.L. Moore, V.W. Ballarotto, D.R. Kines, M.S. Fuhrer and E.D. Williams).
216. " Temperature-dependent nucleation and capture-zone scaling of C(60) on silicon oxide," *Surface Science* 606, 53-56, 2012 (M.A. Groce, B.R. Conrad, W.G. Cullen, A Pimpinelli, E.D. Williams and T.L. Einstein).

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INVITED TALKS AND COLLOQUIA (9/95 through 4/2010)

92. **Thermodynamics and Kinetics of Surface Morphology**, Physics Department Colloquium, University of Virginia, September 1995.
93. **Mobility and Metastability on Silicon Surfaces**, Materials Science Department Colloquium, Johns Hopkins University, October 1995.
94. **Thermodynamics and the Evolution of Nanostructure on Silicon Surfaces**, Physics and Chemistry of Semiconductor Interfaces, San Diego, January 1996.
95. **Creating and Using Novel Step Morphologies on Silicon Surfaces**, March Meeting of the American Physical Society, March 1996.
96. **Mobility and Metastability on Silicon Surfaces**, Materials Research Lecture, California Institute of Technology, Pasadena, California, April 1996.
97. **Evolution and Decay of Metastable Structures on Si(111)**, Physical Electronics Conference, Boston, June 1996.
98. **Predicting Mass Transport for the Stability of Nanostructures**, Physics Colloquium, Cornell, October 1996.
99. **Anomalous Effects in Growth**, Condensed Matter Seminar, Cornell, October, 1996.
100. **Acceleration of Mass Transport with Direct Current on Si(111)**, Materials Research Society, December, 1996.
101. **Equilibrium Morphology and Morphological Transitions**, Mueller Award Lecture, University of Wisconsin-Milwaukee, January 1997.
102. **Equilibrium Fluctuations and Rates of Mass Transport**, Mueller Award Lecture, University of Wisconsin-Milwaukee, January 1997.
103. **Evolution of Morphology from Nanometers to Microns**, Mueller Award Lecture, University of Wisconsin-Milwaukee, January 1997.
104. **Potential Applications of Surface Studies to Electromigration**, Lucent-Bell Labs technical seminar, January 1997.
105. **Electromigration on Si Surfaces**, 23rd Japan-U.S. Seminar, Nagoya, Japan, March 1997.
106. **Nanostructure and Step Dynamics**, Annual Meeting of the Physical Society of Japan, Nagoya, Japan, March 1997.
107. **Evolution of Nanostructure via Step Motion**, Annual Meeting of the Japanese Society of Applied Physics, Tokyo, Japan, April 1997.
108. **The Mesoscale Approach to Surface Nanostructure**, James Franck Institute Colloquium, University of Chicago, May 1997.
109. **Surface Nanostructure**, Gordon Conference on Thin Films and Crystal Growth Mechanisms, New Hampshire, July 1997.

INVITED TALKS AND COLLOQUIA (continued)

110. **Nanostructure Evolution and Electromigration on Silicon: Experimental Applications of Length-Scaling Predictions Advancing Frontiers of Condensed Matter Science**, University of Pennsylvania, October 13-14, 1997.
111. **Understanding and Controlling Surface Nanostructure**, Johns Hopkins University, Condensed Matter Seminar, October 22, 1997.
112. **Fluctuations in Materials Science**, Physics Department Colloquium, University of Maryland, March 1998.
113. **Stability and Aging of Nanostructures on Si**, Materials Research Society Meeting, San Francisco, April 1998.
114. **Equilibrium Fluctuations and the Prediction of Structural Stability**, Physics Colloquium, University of Illinois, September 1998.
115. **Quantifying Surface Electromigration: Si(111) as a Model System**, Physics Colloquium, Carnegie Mellon University, October 1998.
116. **Quantifying Surface Electromigration: Si(111) as a Model System**, 45th International American Vacuum Society Symposium, Baltimore, November 1998.
117. **Step Energies and Electromigration Patterns**, International Symposium on Surfaces and Interfaces, Tokyo Institute of Technology, November 1998.
118. **Small Structures on Si Surfaces: Characterizing Stability and Electronic Structure**, Physics Seminar, Joint Research Center on Atom Technology, Tsukuba, Japan, November 1998.
119. **Patterns and Rates in sub-micron Scale surface Restructuring**, Materials Research Society Meeting, Boston, December 1998.
120. **Designing Smart Experiments to Predict Materials Behavior: Examples from the Electromigration of Silicon**, Physics Colloquium, Johns Hopkins Applied Research Laboratory, January 1999.
121. **Fluctuations in Materials: Stability and Aging**, East-West Surface Science Workshop, Pamporovo, Bulgaria, February 1999.
122. **Equilibrium Fluctuations and the Prediction of Structural Stability**, Physics Colloquium, Princeton University, March 1999.
123. **Characterization and Comparison of Advanced Microscopies**, SEMATECH Analytical Managers Working Group Meeting, NIST, April 1999.
124. **Equilibrium Fluctuations and the Prediction of Structural Stability**, Condensed Matter Physics Seminar, Technion, Haifa, May 1999.
125. **Equilibrium Fluctuations and the Prediction of Structural Stability**, Department of Physics and Complex Systems, Weizmann Institute of Science, Rehoboth, May 1999.

INVITED TALKS AND COLLOQUIA (continued)

126. **From Steps to the Meso-Scale: Experimental Observations on Si(111) and (113)**, International Conference on Stepped Surfaces, Wohldenberg, Germany, September 1999.
127. **From Steps to the Meso-Scale: Experimental Observations on Si(111) and (113)**, Forschungszentrum, Jülich, September, 1999.
128. **Equilibrium Fluctuations and the Prediction of Structural Stability**, Physics Colloquium, Vanderbilt University, February 2000.
129. **Nano-scale to Micron Scale Structural Stability**, Physics Colloquium, Vanderbilt University, Nashville, February 2000.
130. **Nano-scale to Micron Scale Structural Stability**, Condensed Matter Physics Seminar, Case-Western Reserve, Cleveland, May 2000.
131. **Fluctuations and Stability of Nanoscale Structures**, International Symposium on Surface and Interface-Properties of Different Symmetry Crossing, Nagoya, Japan, October 2000.
132. **Molecular Electronics**, Laboratory for Physical Science Colloquium, October 2000.
133. **Fluctuations and Stability of Nanoscale Structures**, Fall Meeting of the MRS, Boston, December 2000
134. **Nanoscale Fluctuations on Solid Surfaces**, American Association for the Advancement of Science, San Francisco, February 2001
135. **Interdisciplinary research using advanced surface science instrumentation**, NSF Workshop: Analytical Instrumentation for the New Millenium - Materials, New Orleans, March 2001
136. **Surface Fluctuations on Nanoscale Structures**, American Physical Society, David Adler Award Lecture, Seattle, March 2001.
137. **Nanoscale Fluctuations on Solid Surfaces**, Physics Department Colloquium, University of Maryland, March 2001.
138. **Nanoscale Fluctuations on Solid Surfaces**, Arthur M. Sackler Colloquia of the National Academy of Sciences, Washington, D.C., May 2001.
139. **Structural Fluctuations and Structural Evolution**, Materials Research Society, Boston, December, 2001.
140. **Fluctuations and Relaxation of Small Structures: Workshop on Morphological Evolution of Crystalline Surfaces**, Rosh Pina, Israel, May 2002 (workshop cancelled).
141. **Fluctuations of Nanoscale Structures: Integrated Nanosystems 2002**, Berkeley, California, September 2002.

INVITED TALKS AND COLLOQUIA (continued)

142. **Continuum Step Dynamics: Deterministic and Stochastic Processes:** University of Leiden, Condensed Matter Physics Seminar, December 2002.
143. **Nanoscale Fluctuations on Solid Surfaces:** Dutch Condensed Matter Physics Conference, Veldhoven, The Netherlands, December 2002 (Plenary talk).
144. **Bridging Atomic to Nanoscale Properties:** Rutgers University, Physics Colloquium, March, 2003.
145. **Nanoscale Fluctuations on Solid Surfaces:** Michigan State University, Physics Colloquium, March 2003.
146. **Thermodynamics at the Nanoscale:** Air Force Institute of Technology, Wright-Patterson AFB, April 2003.
147. **Nanoscale Fluctuations on Solid Surfaces:** University of New Hampshire, Physics Colloquium, April 2003.
148. **Nanoscale Fluctuations on Solid Surfaces:** Harvard University, Physics Colloquium, April 2003.
149. **Deterministic to Stochastic Processes in Nanostructure Evolution:** University of Washington, May 2003.
150. **Surface Lability: How, why and when surfaces reorganize to form self-patterned substrates,** Gordon Research Conference on Condensed Matter Physics, June 2003
151. **Nanoscale Fluctuations on Solid Surfaces:** Ohio State University, October 2003
152. **Fluctuations and Instabilities in Nanoscale Materials,** Turnbull Award Lecture, Materials Research Society, Boston, December 2003.
153. **Nanoscale Fluctuations on Solid Surfaces,** Sigma Xi Colloquium, Naval Research Laboratory, Washington, DC, December 2003.
154. **Nanoscale Structures: Lability, Length Scales and Fluctuations,** JFI Colloquium, University of Chicago, Chicago, February 2004.
155. **Nanoscale Structures: Lability, Length Scales and Fluctuations,** Physics Colloquium, Pennsylvania State University, State College, PA, March 2004.
156. **Evolution of Nanoscale Structures,** Mathematics Colloquium, University of Maryland, April 2004.
157. **Nanoscale Structures: Lability, Length Scales and Fluctuations,** Physics Colloquium, University of Delaware, Wilmington, DE, May 2004.
158. **Fluctuations on Nanoscale Structures: Correlation Length, Persistence and Survival,** Lorentz Workshop on Collective Aspects of Stochastic Non-Equilibrium Phenomena at Surfaces and Interfaces, Lorentz Center, Leiden University, June 2004

INVITED TALKS AND COLLOQUIA (continued)

159. **Length Scales and Time Scales in First-Passage Behavior of Step Wandering on Solid Surfaces**, 22nd International Conference on Statistical Physics, Bangalore, India, July 2004
160. **Nanoscience Research for Energy Needs**, report of the NNI Grand Challenges Workshop on Energy Needs, presented at the NNI Research Direction II Workshop, Washington, DC, September 2004.
161. **One-dimensional interfaces in Two-dimensional Materials Structures**, Materials Research Society, Boston, November 2004
162. **Nanoscale Structures Direct Observation of Fluctuation and Evolution**, Applied Mathematics Colloquium, Harvard University, November 2004
163. **One-dimensional interfaces in Two-dimensional Materials Structures**, Workshop on Nanoscale Material Interfaces: Experiment, Theory and Simulation, Institute for Mathematical Sciences, U. of Singapore, January 2005
164. **One-Dimensional Interfaces in Two-Dimensional Structures**, Statistical Physics Seminar, University of Maryland, February 2005.
165. **What's new in Nanoscale Structures? -- Fluctuations and Entropy**, National Science Foundation Distinguished Lecture, February 2005.
166. **Fluctuations in Nanostructures**, 50th Anniversary of Atomic Resolution Microscopy (Mueller Memorial), Pennsylvania State University, June 2005.
167. **Electronic transport at the outer nanometer, effects of disorder and fluctuations**, Gordon Research Conference on the Chemistry of Electronic Materials, July 2005.
168. **Nanoscale Shape and Evolution of Supported Crystallites**, Gordon Research Conference on Dynamics at Surfaces, August 2005
169. **Progress and Opportunities in Nanoscience**, Committee to Review the National Nanotechnology Initiative, NRC-National Materials Advisory Board, Washington, DC August 2005
170. **What's New in Nanoscale Structures?**, Colloquium, Department of Chemical Engineering, University of Minnesota, September 2005
171. **What's New in Nanoscale Structures?** Annual Coordination Meeting of the DOE Computational Materials Science Network, Madison, October 2005
172. **What's New in Nanoscale Structures?**, Colloquium, Department of Physics, University of North Carolina, December 2005
173. **Electronic transport at the outer nanometer**, NIST Nanotechnology Colloquium, December 2005

INVITED TALKS AND COLLOQUIA (continued)

174. **Flexible Electronics Research Activities**, NanoCenter Industrial Workshop (Lockheed-Martin), February 2006
175. **What's new in Nanoscale Structures**, Department of Chemistry, U. of Maryland, February 2006
176. **What's new in Nanoscale Structures**, Cornell University, March 2006
177. **Fluctuations and Transport in Nanoscale Structures**, Fourth Stig Lundqvist Conference on Advancing Frontiers of Condensed Matter Physics, International Centre for Theoretical Physics, Trieste, Italy, July 2006.
178. **Fluctuations and Transport in Nanoscale Structures**, Sanken International Symposium on Nanoscience and Nanotechnology 2006, University of Osaka, Japan, September 2006.
179. **Flexible Electronics and Alternative Materials**, NanoCenter Industrial Workshop (Applied Materials), January 2007
180. **What \sqrt{N}/N means for nanoelectronics**, Physics Colloquium, University of Texas, Austin February 2007.
181. **Fluctuations of Nanoscale Structures**, 21st Annual LSM Symposium, Rutgers, New Jersey March 2007
182. **Flexible Electronics, Transfer Print and Alternative Materials**, NanoCenter Industrial Workshop (Red Shift Ventures), January 2007
183. **Resolving Electron Flow and What it Means for Nanoelectronics**, The third annual nanoprobes workshop, Stanford University, 2007.
184. **Fluctuations of Nanoscale Structures**, German Physical Society, Regensburg, March 2007.
185. **Fluctuations in Nanoscale Structures**, CSCAMM workshop, University of Maryland, May 2007.
186. **Structure-Function in the Nano-World**, Gordon Research Conference, July 2007.
187. **Flexible Electronics**, NanoCenter Industrial Workshop (Samsung), August 2007
188. **Graphene is all surface (why it's good to be clean)**, CMSN Workshop, Ames Laboratory, Iowa State University, September 2007
189. **Overview of the University of Maryland MRSEC**, NRI Members' Visit, November 2007.
190. **What means for nanoelectronics**, NSEC seminar, Columbia University, November 2007.
191. **Human Performance Modification**, Laboratory for Physical Sciences Seminar, December 2007.
192. **Stochastic properties in nanoelectronic materials: C60, Pentacene and graphene**, Materials Science Colloquium, Johns Hopkins University, February 2008

INVITED TALKS AND COLLOQUIA (continued)

193. **Human Performance Modification**, Institute for Defense Analysis, Alexandria, VA, February 2008.
194. **Interfaces in Molecular Films**, NanoSteps 2008, Cargèse, July 2008.
195. **Introduction to nanostructures on crystalline surfaces**, NanoSteps 2008, Cargèse, France, July 2008.
196. **Interfaces in Molecular Films**, VIth Stranski-Kaischew Surface Science Workshop, Black Sea Coast, Bulgaria, September 2008.
197. **Interface Dynamics and Electromigration**, CMSN Workshop, Oakridge Tennessee, October 2008.
198. **Fluctuations and scattering in nanoscale structures**, Howard University Physics Colloquium, January 2009.
199. **Novel materials applications in transfer printing**, MRS Spring Meeting, San Fransisco, April 2009.
200. **Interfaces in molecular films**, European Conference on Surface Science, Italy, September 2009
201. **Fluctuations and scattering in nanoscale structures**, Imperial College, London, June 2010
202. **BP Technology in perspective**, Stage T Conference, York, June 2010
203. **Context and Purpose of the Energy Sustainability Challenge**, Energy/Water Footprints Workshop, MIT, July 2010
204. **Science and technology opportunities – an energy industry perspective**, International Energy Forum on Clean Energy, Heifei, August 2010

OUTREACH AND EDUCATIONAL SERVICE

1984-2010

1. **Research Tutorial: Surface Science**, American Association of Physics Teachers summer meeting, June 1984.
2. **How Flat is a Surface?, Thank Goodness it's Physics Seminar**, Eleanor Roosevelt High School, December 1984.
3. **Creating New Materials Via Epitaxial Growth**, AAPT Physics Teaching Resource Agents Program, July 1986.
4. **Epitaxy and Scanning Tunneling Microscopy**, Physics Olympiad Training Program, University of Maryland, University of Maryland, July 1987.
5. **Epitaxy and Scanning Tunneling Microscopy**, AAPT/Physics Olympiad Enrichment Seminar, University of Maryland, July 1988.
6. **Scanning Tunneling Microscopy**, Physics Department, Towson State University, October 1988.
7. **Nanofabrication and Scanning Tunneling Microscopy**, Physics Olympiad Enrichment Seminar, May 1988.
8. **Organized First APS-CSWP Site Visit**, University of Maryland Physics Department, 1990.
9. **Seeing Atoms: Scanning Tunneling Microscopy**, Physics Olympiad Enrichment Seminar, May 1990.
10. **Scanning Tunneling Microscopy**, AAPT U.S.-Soviet Exchange Visit Seminar, August 1990.
11. **Seeing Atoms: Applications and Implications**, National Science Teachers Association's Area Convention, Washington D.C., December 1990.
12. **Seeing Atoms and Doing Science with the Scanning Tunneling Microscope**, Haverford College, April 1991.
13. **Scanning Tunneling Microscopy - Science and Applications**, Physics Olympiad Enrichment Seminar, June 1991.
14. **Essay: Scanning Tunneling Microscopy, in Physics**, 3rd Ed. By P.A. Tipler, Worth Publishers, New York, 1991.
15. **APS (CSWP) Site Visit to Rensselaer Polytechnic**, March 1992.
16. **Scanning Tunneling Microscopy**, Physics Olympiad Enrichment Seminar, June 1992.
17. **Seeing Atoms: Applications and Implications**, NSF Science Teaching Institute in the Rockies, Montana State University, July 1992.
18. **Experimental Statistical Mechanics on Silicon Surfaces**, NSF Faculty Enrichment Workshop, Montana State University, July 1992.
19. **Laboratory Tours**, University of Maryland High-School Outreach Program, July 1992.

OUTREACH AND EDUCATIONAL SERVICE (continued)

20. **APS (CSWP) Site Visit to the University of Illinois**, Urbana, November 1992.
21. **Seeing Atoms and Doing Science with the Scanning Tunneling Microscope**, Mid-Atlantic and Southeastern Regional Meeting of the ACS, Washington D.C., December 1992.
22. **Seeing Atoms with the Scanning Tunneling Microscope**, U. of Wisconsin-Madison Introductory Physics Enrichment Seminar, February 1993.
23. **Applications and Implications of Scanning Tunneling Microscopy**, Physics Olympiad Enrichment Seminar, May 1993.
24. **APS (CSWP) - AAPT Site Visit to Kansas State University**, Manhattan, Kansas, September 1993.
25. **Women in Physics**, MITRE Technical Women's Group Seminar, MITRE Corporation, McLean, Virginia, November 1993.
26. **Sigma Gamma Tau Panel Discussion on DOD-Sponsored Research at Universities**, Engineering College, University of Maryland, February 24, 1994.
27. **Press Briefings for the American Physical Society**, March Meeting, March 18 and 24, 1994.
28. **APS (CSWP) - AAPT Site Visit to State University of New York- Stony Brook**, April 1994.
29. **Scanning Tunneling Microscopy**, Physics Olympiad Enrichment Seminar, June 1994.
30. **Scanning Tunneling Microscopy and Surface Physics**, Physics Graduate Student Association Seminar Series, Physics Department, University of Maryland, College Park, February 1995.
31. **Space for Women, Space for All: A Symposium on Careers in the Physical Sciences**, Discussion Panel Member, University of Maryland, College Park, March 11, 1995.
32. **Scanning Tunneling Microscopy**, Physics Department Seminar, Towson State University, October 1995.
33. **Workshop on Scanned Probe Microscopies**, American Association of Physics Teachers, August, 1996.
34. **Discovery and Development of Scanning Tunneling Microscopy**, Freshman Physics Seminar, October, 1996.
35. **Thermodynamics Review, GRE preparation workshop**, University of Maryland, October, 1996.
36. **Doing Experimental Statistical Mechanics on a Surface**, Graduate Seminar: Foundations and Frontiers of Physics, U. of Maryland, December 1996.

OUTREACH AND EDUCATIONAL SERVICE (continued)

37. **Seeing Atoms - Science and Applications with Scanned Probe Microscopies**, Physics Olympiad, U. of Maryland, June 1997.
38. **Seeing Atoms and Doing Science with the Scanning Tunneling Microscope**, Physics Olympiad Enrichment Seminar, U. of Maryland, June 1997.
39. **Seeing Atoms and Doing Science with the Scanning Tunneling Microscope**, MRSEC-REU students, U. of Maryland, July 1997.
40. **Laboratory Tours for High School Seniors in Physics**, U. of Maryland, November 1997.
41. **Preparing for the Science Fair**, Kettering Middle School Parents Meeting, November 1997.
42. **Science Fair Mentoring**, Kettering Middle School, Nov.-Dec. 1997
43. **Seeing Atoms and Doing Science with the Scanning Tunneling Microscope**, Freshman Physics Survey Course, U. of Maryland, November 1997.
44. **Seeing Atoms and Doing Science with the Scanning Tunneling Microscope**, Innovations in Science Education Seminar, U. of Maryland, November 1997.
45. **Science Fair Judging**, Kettering Middle School, February 1998.
46. **Judge at MRSEC-Kettering Student Science Conference**, April 23, 1998
47. **Fluctuations on Surfaces**, Physics Department Seminar, Towson State University, February, 1998.
48. **Seeing Atoms and Doing Science with the Scanning Tunneling Microscope**, Physics Olympiad Enrichment Seminar, University of Maryland, June 1998.
49. **Preparing for the Science Fair**, Paint Branch High School Parents' Meeting, October 1998.
50. **Seeing Atoms and Doing Science with the Scanning Tunneling Microscope**, College Park Scholars Science and Technology Program, October 1998.
51. **Laboratory Tours for High School Seniors In Physics**, University of Maryland, November 1998.
52. **Developing a Science Fair Project**, Kettering Middle School, 1st, 2nd and 3rd period classes, December 1, 15 and 21, 1998.
53. **Judge at MRSEC-APS Student Science Conference**, April, 1999.
54. **Science Fair Parents' Meeting**, Kettering Middle School, October, 1999.
55. **Nanostructures on Surfaces**, Graduate Student Frontiers of Physics Seminar, October 1999.

OUTREACH AND EDUCATIONAL SERVICE (continued)

56. **Laboratory Tours for High School Seniors In Physics**, University of Maryland, November 1999.
57. **Seeing Atoms and Doing Science with the Scanning Tunneling Microscope**, Freshman Survey Physics Course, U. of Maryland, November 1999.
58. **Developing a Science Fair Project**, Kettering Middle School, Saturday Workshops (2), November 1999.
59. **Panelist on Diane Rehm Radio Talk Show, “Nanotechnology,”** January 18, 2000
60. **Science Fair Judging**, Greenbelt Middle School, February 2000.
61. **Congressional Visits Day**, participant, April 4-5, 2000.
62. **Judge at MRSEC-APS Student Science Conference**, May, 2000
63. **Seeing Atoms: Scanning Tunneling Microscopy**, Physics Olympiad Enrichment Seminar, May 2000.
64. **From Then to Now - Scanned Probe Microscopy**, REU Science Enrichment Seminar, June 2000.
65. **GRE Review for Physics Majors - Thermodynamics**, October 2000.
66. **Seeing Atoms and Doing Science with Scanning Tunneling Microscopy:** Freshman Survey Physics Course, U. of Maryland, November 2000.
67. **Science Fair Parents’ Meeting**, Kettering Middle School, December, 2000.
68. **Science Fair Judging**, Greenbelt Middle School, December 2000.
69. **Excel Workshop**, Greenbelt Middle School, January, 2001.
70. **Students Lunch with the Experts**, American Physical Society, March Meeting, Seattle, March 2001
71. **Materials Science at the Nanoscale**, College Park Scholars, University of Maryland, April 2001.
72. **Seeing Atoms...Touching Atoms...Pushing Atoms Around**, University of Maryland Senior University, May 2001.
73. Judge at the “**NSF-MRSEC-APS Student Science Conference**,” American Institute of Physics, College Park, May 2001.
74. **Seeing Atoms...Touching Atoms...Pushing Atoms Around**, Physics Olympiad Students, May 2001.
75. **Electrostatics and Magnetics**, Hands on Presentation for Homeschool students, University of Maryland, December 2001

OUTREACH AND EDUCATIONAL SERVICE (continued)

76. **Science Fair Judging**, Greenbelt Middle School, January 2002.
77. **Materials Science at the Nanoscale**, Presentation and Lab Tour for ENMA 698T, Special Problems in Materials Science, Nanotechnical Characterization, University of Maryland, February 2002.
78. **MGM Award Winners Panel Discussion**, March Meeting of the American Physical Society, Indianapolis, March 2002.
79. Judge at the “**NSF-MRSEC-APS Student Science Conference**”, American Institute of Physics, College Park, May 2002.
80. **Seeing Atoms and Doing Science with the Scanned Probe Microscope**, Physics Olympiad Students, June 2002.
81. **Seeing Atoms and Doing Science with the Scanned Probe Microscope**, Physics Department, Towson State University, December 2002.
82. **Materials Science at the Nanoscale**, Presentation and Lab Tour for ENMA 698T, Special Problems in Materials Science, Nanotechnical Characterization, University of Maryland, February 2003.
83. Judge at the “**NSF-MRSEC-APS Student Science Conference**”, American Institute of Physics, College Park, May 2003.
84. **Seeing Atoms and Doing Science with the Scanned Probe Microscope**, Physics Olympiad Students, June 2003.
85. Panelist: EPSCOR meeting on Materials Research Science and Engineering Centers, August 4, 2003.
86. **Experimental Statistical Mechanics**: Freshman Survey Physics Course, October 2003.
87. **Experimental Statistical Mechanics with Scanned probe Microscopy**: Frontiers of Physics (Graduate Survey Course), February 2004
88. **Nanoscience: Past and Present**: Physics 100 (Social Implications in Physics), March 2004
89. **Seeing Atoms and Doing Science with the Scanned Probe Microscope**: Freshman Survey Physics Course, October 2004.
90. **Seeing Atoms with the STM**, MRSEC High School Materials program, February, 2005.
91. Judge, MRSEC Student Science Conference, April 2005
92. **Seeing Atoms: How a Technology Innovation Shaped Nanoscience**, Physics Olympiad Students, May 2005

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93. **Research Frontiers in at the Nano-Bio interface**, Designing Biology Conference, Radcliffe Institute for Advanced Study, Harvard, May 2005
94. **Physics of Nanotechnology**, Washington Academy of Sciences Nanotechnology Forum, January 2006
95. **Hands-on Materials Characterization**, Flowers High School –MRSEC Project Lead the Way, March 2006.
96. Judge, **MRSEC Student Science Conference**, April 2006.
97. **Scanned Probes in Nanomaterials**, guest lecture ENMA 698N, Nanomaterials, April 2006.
98. **Hands-on Materials Characterization**, Flowers High School –MRSEC Project Lead the Way, April 2007.
99. **Proposing and Implementing a Multidisciplinary Center**, “Next Level” Research Development seminar, University of Maryland, April 2007.
100. **Scanning Tunneling Microscopy and Nanoscience**, REU seminar, June 2007
101. **Seeing atoms: the beginnings of Nanotechnology**, ENMA 181 seminar
102. **Nobel prizes in Nanoscience**, PHYS 170 seminar, Oct. 2007
103. **Hands-on Materials Characterization**, Flowers High School –MRSEC Project Lead the Way, November 2007.
104. **Seeing Atoms: the beginnings of NanoTechnology**, AAPT conference, Baltimore, January 2008
105. **Experimental Statistical Mechanics at the Nanoscalee**, Lecture for PHYS 299C, Special problems in Physics, Undergraduate Physics Colloquium, January 2008.
106. **Seeing Atoms: the beginnings of nanoscience**, NSBP conference, Washington, D.C. February 2008
107. **Seeing Atoms: the beginnings of nanoscience**, ADVANCE Workshop, Kansas State University, February 2008
109. Judge, **MRSEC Student Science Conference**, April 2008
- 108: **Seeing Atoms and doing Science with the Tunneling Microscope**: REU presentation, UMD MRSEC May 2008
109. **Seeing Atoms: the beginnings of nanoscience**, Guest lecture Physics 170, November 2008
110. **The beginning of Nanotechnology: seeing atoms with the STM**, Lecture for PHYS 299C, Special problems in Physics, Undergraduate Physics Colloquium, January 2009
111. Judge, **MRSEC Student Science Conference**, April 2009

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112. **The beginning of Nanotechnology: seeing atoms with the STM**, REU presentation, UMD MRSEC June 2009
113. Judge, Grand Finals, **Ultimate Field Trip 2010**, National History Museum, London 12 April 2010
114. **Science and Science Careers**, STEM Festival, Sunbury, 29 April 2010.