

## DENNIS P. CLOUGHERTY

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### EDUCATION

Massachusetts Institute of Technology

Ph. D. – Physics, June 1989

Thesis advisers: Professors D. Adler and K. Johnson

B. S. & M. S. – Electrical Engineering and B. S. – Physics, June 1982

Thesis adviser: Professor H. Haus

### PROFESSIONAL EXPERIENCE

University of Vermont, Department of Physics & Materials Science Program  
Chair (2008–2016), Professor (2003–present), Associate Professor (1996–2003), Assistant Professor (1992–1996)

University of California, San Diego, Dept. of Mechanics and Engineering Sciences  
Lecturer (1992).

University of California, Santa Barbara, Department of Physics  
Postdoctoral Fellow (1989–1992) with Professor Walter Kohn.

Massachusetts Institute of Technology, Department of Physics  
Research Assistant (1984–89).

Steinbrecher Corporation, Millimeter Wave Group, Woburn, MA  
Senior Engineer (1982–84).

### TEACHING EXPERIENCE

University of Vermont, Department of Physics

Undergraduate courses: Mechanics (Physics 31); Electricity & Magnetism (Physics 42); Relativity (Physics 095); Waves and Quanta (Physics 128); Fundamentals of Physics II (Physics 152); Electromagnetism (Physics 213 & 214); Solid State Physics (Physics 242); Statistical and Thermal Physics (Physics 265); Quantum Mechanics I (Physics 273); Applications of Quantum Mechanics (Physics 274)

Graduate courses: Mathematical Physics (Physics 301); Advanced Dynamics (Physics 311); Electromagnetic Theory (Physics 313); Solid State Physics (Physics 341); Quantum Mechanics II (Physics 362); Relativistic Quantum Mechanics (Physics 323B).

University of California, San Diego, Materials Science Program  
Lecturer (1992). Graduate course: Solid state chemistry (MS 227).

University of California, Santa Barbara, Department of Physics  
(1990). Graduate course: Condensed matter physics (Physics 223B).

Massachusetts Institute of Technology, Department of Physics  
Recitation Instructor (1988–89). Undergraduate courses: Mechanics (8.01); Electricity and Magnetism (8.02).

## HONORS & AWARDS

JILA Visiting Fellow, Boulder, Colorado (2019).

Vermont Academy of Science and Engineering (2018).

University Scholar, University of Vermont (2014).

Faculty Research Fellow, Air Force Office of Sponsored Research (1995).

Senior Member, Institute of Electrical and Electronics Engineers (1994).

*Who's Who* in America

American Men and Women of Science

Sigma Xi, scientific honor society

Eta Kappa Nu, electrical engineering honor society

Sigma Pi Sigma, physics honor society

## VISITING APPOINTMENTS

Visiting Fellow, JILA, Boulder, Colorado (2019).

Visiting Scholar, University of Texas, Austin (2007).

Visiting Scientist, Harvard University (1999, 2006).

Visiting Associate Professor, University of California, Santa Barbara (1998, 1999, 2001).

Visiting Scientist, Kavli Institute for Theoretical Physics, University of California, Santa Barbara (1997).

Visiting Scientist, MIT, Department of Physics (1996–7).

Visiting Scholar, University of California, San Diego (1994)

Visiting Scientist, Los Alamos National Laboratory, Materials Science and Technology Division (1989).

## GRANTS & PROPOSALS

Grant from NASA (2019-2021) (\$1,250,000) for the study of cold atom interactions with surfaces (PI: J. Marshall, co-I.: D.P. Clougherty; grant no. 80NSSC19M0143).

Grant from NASA (2017-2018) (\$37,500) for the study of anisotropic 2D superfluid phases in microgravity (P.I.: D.P. Clougherty).

Grant from NSF (2011-2015) (\$286,000) for an REU site on complex materials (P.I.: D.P. Clougherty; DMR-1062966).

Grant from ONR (2010-2013) (\$330,000) for the theoretical study of the mechanical and thermal properties of metallic glasses (P.I.: M. Eberhart, co-PI: D.P. Clougherty; N00014-10-1-0838).

Grant from NSF (2008-2012) (\$240,000) for the study of many-body effects in particle-surface scattering (P.I.: D.P. Clougherty; DMR-0814377).

Grant from DARPA (2006-2007) (\$167,000) for the study of theoretical models of metallic glasses (P.I.: M. Eberhart, co-I: D.P. Clougherty).

Grant from VT EPSCoR (2004) (\$20,000) was awarded for a high performance computational cluster (P.I.s: K. Chu, D.P. Clougherty, R. Headrick, J. Rankin)

Grant from DARPA (2001-2005) (\$450,000) for the study of structure-property relationships in intermetallic design (P.I.: M. Eberhart; co-I: D.P. Clougherty; #MDA9720110041).

Grant from Smithsonian Institution (1999-2000) (\$15,000) was awarded to investigate ferroelectricity in fulleride systems (P.I.: D.P. Clougherty).

Grant from University Committee on Research and Scholarship (\$4,500) (1998) was awarded to perform electronic structure calculations on strongly correlated clusters and molecules.

Grant from American Chemical Society–Petroleum Research Fund (1994-1997) (\$30,000) was awarded to investigate ultra-low energy physisorption of atoms onto surfaces at finite temperature (P.I.: D.P. Clougherty).

Grant from University Committee on Research and Scholarship (\$4,600) (1993) was awarded to study the scaling behavior of threshold sticking on low energy atoms on surfaces.

Grant from Akzo Chemical (\$40,000) (1991-1993) was awarded to investigate relations between electronic structure and mechanical properties of polymers.

Grant of eighty hours of computer time on the Cray YMP from the San Diego Supercomputer Center (1991) was awarded for the study of the electronic structure of magnetic multilayers.

Grant of forty hours of computer time on the Cray YMP from the San Diego Supercomputer Center (1990) was awarded to study the effects of electron correlation on ferromagnetism.

Grant from Los Alamos National Laboratory, Theoretical Division, Institutional Collaborative Program (\$8,400) (1989) was awarded for the investigation of the electronic structure of magnetic systems.

## THESES SUPERVISED

Dr. Sanghita Sengupta, “Quantum Many-Body Effects in Two-Dimensional Materials,” Ph.D. thesis, Materials Science (2018).

Mr. Adam Doherty, “Quantum Sticking of Cold Atomic Hydrogen to Graphene,” B.S. Honors thesis, Physics (2013).

Dr. Yanting Zhang, “Orthogonality Catastrophe in Quantum Sticking,” Ph.D. thesis, Materials Science (2012).

Mr. Ian Goyette, “Breaking Quantum Mirrors with Thermal Fluctuations,” M.S. thesis, Physics (2011).

Dr. Charles Foell, “Theory of Vector Polarons,” M.S. thesis, Physics (2006).

Mr. John Gergely, “Phonons and Thermal Transport in Carbon Nanotubes,” B.A. Honors thesis, Physics (2002).

Mr. Xiang Zhu, “Thomas-Fermi Theory of Fullerenes,” M.S. thesis, Physics (1996).

Mr. John Gorman, “A Theoretical Study of the Vibrations of C<sub>60</sub>,” B.S. Honors thesis, Physics (1995).

## OTHER PROFESSIONAL EXPERIENCE

Served as consultant to various institutions, including Akzo Research, Inc. (1991-3), Los Alamos National Laboratory, Materials Science and Technology division (1987-90), Massachusetts General Hospital, Department of Neurology (1985-89), Optex Corporation, Rockville MD (1995-6), and Quantum Energy Technologies, Inc., Cambridge, MA (1997–2001), TecPlot Inc. Bellevue, WA (2007–11) and Taylor Associates, Winooski, VT (2008–11). Scientific adviser to Bloomberg & O’Hara, Burlington VT (1996-8), Cheney, Brock & Saudek, P.C., Montpelier VT (2006), “Absolute Zero and the Conquest of Cold” American Physical Society national educational campaign (2007-8).

Serve as ad-hoc referee for many scientific publications, including Physical Review A & B, Physical Review Letters, Carbon, Physica C, the International Journal of Quantum Chemistry, the Journal of Materials Science, the Journal of Magnetism and Magnetic Materials, Journal of Physics and Chemistry of Solids, Nature, Physica Status Solidi B, Journal of Physical Chemistry A & B and the Journal of Chemical Physics.

Serve as ad-hoc referee for funding agencies, including NSF, Petroleum Research Fund (ACS), the Research Foundation, the Department of Energy and the U.S. Civilian Research and Development Foundation.

Serve as a reviewer for a variety of publishing companies, including Wiley, Addison-Wesley, W.H. Freeman and Canopus Publishing (UK).

## SELECTED COMMITTEES

### University/College

Selection Committee for Flint Professor of Natural Science, appointed by Dean of Engineering and Mathematical Sciences (2018)  
Chair, faculty research misconduct committee, appointed by Vice President for Research (2017)  
Search Committee for Director of Institutional Research, appointed by Provost (2016)  
Chair, Selection Committee for Williams Professor of Mathematics, appointed by Dean of Engineering and Mathematical Sciences (2016)  
Chair, Faculty Grievance Panel, appointed by Provost (2016)  
Search Committee for Interim Dean, College of Arts & Sciences (2015)  
Chair, Search Committee, Department of Geology (2009–10)  
Member, Transdisciplinary Research Initiative Working Group on Environment, appointed by Provost (2009–2010)  
Chair, Review Panel on research misconduct, appointed by Dean of the College of Arts & Science (2008–9)  
Faculty Standards Committee, elected by faculty of the College of Arts & Science (2007–2008)  
Chair, Grievance Panel for Reappointment, Promotion & Tenure, appointed by Provost (2005)  
Chair, Committee for the Pomeroy Professor of Chemistry, appointed by Dean of College of Arts & Science (2003)  
Materials Science Steering Committee, (1994, 1998–2003)  
Chair, Graduate Studies, Department of Physics (1993–98)  
Executive Committee, Department of Physics (1993–96)  
College of Engineering Curriculum Committee (1993–95, 2007)  
Chair, Colloquium Committee, Department of Physics (1992–97)

### External

Vermont Academy of Science & Engineering, Science Education & Outreach (2018)  
National Science Foundation, Panel (2007, 2012, 2013, 2019)  
Science Advisory Committee, ECHO Science Center, Burlington VT (2010-)  
Visiting Committee, Colorado School of Mines, Materials Science Program (2008-10)  
Scientific advisory board, 5th International Conference on Materials Science & Engineering, Guelma, Algeria (2008)  
Organizing Committee, International Workshop on Quantum Reflection, ITAMP, Harvard University (2007)  
Scientific advisory board, 3rd International Conference on Density Functional Theory of Metals and Alloys, Oran, Algeria (2007)  
Visiting Committee, Massachusetts Institute of Technology, Department of Physics (1988)

## PUBLICATIONS

- D. P. Clougherty “Comment on ‘Theory of phonon-assisted adsorption in graphene: Many-body infrared dynamics,’” *Phys. Rev. B* **101**, 247401 (2020). [arXiv:1910.00361]
- D. P. Clougherty and E. Heinrich, “Thermal and quantum fluctuations of a thin elastic plate,” *Phys. Rev. B* **101**, 144101 (2020). [arXiv:1902.11252]
- S. Sengupta and D. P. Clougherty, “Infrared Problem in Cold Atom Quantum Physisorption on 2D Materials,” *J. Phys.: Conf. Ser.* **1148**, 012007 (2018). [arXiv:1809.08990]
- D. P. Clougherty, “Infrared Problem in Quantum Acoustodynamics at Finite Temperature,” *Phys. Rev. B* **96**, 235404 (2017). [arXiv:1710.08006]
- S. Sengupta and D. P. Clougherty, “Radiative Corrections to Quantum Sticking on Graphene,” *Phys. Rev. B* **96**, 035419 (2017). [arXiv:1705.04872]
- D. P. Clougherty and S. Sengupta, “Infrared Problem in Quantum Acoustodynamics,” *Phys. Rev. A* **95**, 052110 (2017). [arXiv:1611.09445]
- S. Sengupta, V. Kotov and D. P. Clougherty, “Infrared Dynamics of Cold Atoms on Hot Graphene Membranes,” *Phys. Rev. B* **93**, 235437 (2016). [arXiv:1603.03476]
- D. P. Clougherty, “Quantum Sticking of Atoms on Membranes,” *Phys. Rev. B* **90**, 245412 (2014). [arXiv:1312.5754]
- D. P. Clougherty, “Comment on ‘Sticking of Hydrogen on Supported and Suspended Graphene at Low Temperature,’ ” *Phys. Rev. Lett.* **113**, 069601 (2014). [arXiv:1207.4019]
- D. P. Clougherty and X. Zhu, “Stability and Teller’s theorem: Fullerenes in the March model,” *Phys. Rev. A* **89**, 029902(E) (2014).
- D. P. Clougherty and Y. Zhang, “Orthogonality Catastrophe in Quantum Sticking,” *Phys. Rev. Lett.* **109**, 120401 (2012). [arXiv:1112.4544]
- Yanting Zhang and D. P. Clougherty, “Dissipative Effects on Quantum Sticking,” *Phys. Rev. Lett.* **108**, 173202 (2012). [arXiv:1012.4405]
- T. E. Jones, M. E. Eberhart and D. P. Clougherty, “Topological Catastrophe and Isostructural Phase Transition in Calcium,” *Phys. Rev. Lett.* **105**, 265702 (2010). [arXiv:1012.0803]
- Di Xiao, Junren Shi, D. P. Clougherty and Qian Niu, “Polarization and Adiabatic Pumping in Inhomogeneous Crystals,” *Phys. Rev. Lett.* **102**, 087602 (2009). [arXiv:0711.1855].
- T. E. Jones, M. E. Eberhart, D. P. Clougherty and C. Woodward, “Electronic Selection Rules Controlling Dislocation Glide in bcc Metals,” *Phys. Rev. Lett.* **101**, 085505 (2008).

- T. E. Jones, M. E. Eberhart and D. P. Clougherty, "Topology of the Spin-polarized Charge Density in bcc and fcc Iron," *Phys. Rev. Lett.* **100**, 017208 (2008).
- D. P. Clougherty, "Polarons and Solitons in Jahn-Teller Systems," (invited paper) *J. Mol. Struct.* **838**, 203 (2007).
- D. P. Clougherty, "Jahn-Teller Solitons, Structural Phase Transitions, and Phase Separation," *Phys. Rev. Lett.* **96**, 045703 (2006).
- C.D. Havey, M.E. Eberhart, T. Jones, K.J. Voorhees, J. Laramée, R.B. Cody and D. P. Clougherty, "Theory and Applications of Dissociative Electron Capture in Molecular Identification," *J. Phys. Chem. A* **110**, 4413 (2006).
- D. P. Clougherty and C. A. Foell, "Vector Polarons in a Degenerate Electron System," *Phys. Rev. B* **70**, 052301 (2004).
- M.E. Eberhart and D.P. Clougherty, "Looking for Design in Materials Design," *Nature Materials* **3** 659 (2004).
- D. P. Clougherty, "Anomalous Threshold Laws in Quantum Sticking," *Phys. Rev. Lett.* **91**, 226105 (2003).
- D. P. Clougherty, "Quantum Reflections," in **Walter Kohn**, M. Scheffler and P. Weinberger, Eds. (Springer Verlag, Berlin, 2003).
- D. P. Clougherty, "Endohedral Impurities in Carbon Nanotubes," *Phys. Rev. Lett.* **90**, 035507 (2003).
- D. P. Clougherty, "Ferroelectric Phase Transitions in a Lattice Pseudo-Jahn-Teller Model," in **Vibronic Interactions in Crystals and Molecules**, M. Kaplan and G. Zimmerman, Eds. (Plenum, New York, 2001).
- D. P. Clougherty, "Ferroelectricity in  $(K@C_{60})_n$ ," in **Fundamental Physics of Ferroelectrics**, Ronald Cohen, Editor (AIP, New York, 2000).
- D. P. Clougherty and F. G. Anderson, "Theory of Spontaneous Polarization in Endohedral Fullerenes," *Phys. Rev. Lett.* **80**, 3735 (1998).
- D. P. Clougherty and X. Zhu, "Stability and Teller's Theorem in Fullerenes," *Phys. Rev. A* **56**, 632 (1997).
- D. P. Clougherty, "On the Stability of Endohedral Rare Gas Fullerenes," *Invited paper, Can. J. Chem.* **74**, 965 (1996).
- D. P. Clougherty and J. P. Gorman, "On the Low-Frequency Vibrations of  $C_{60}$ ," *Chem. Phys. Lett.* **251**, 353 (1996).
- J. Freim, J.M. McKittrick, W.J. Nellis, and D.P. Clougherty, "Structural Ceramics Produced Through Post-Sintering of Dynamically Compacted Powder," Proc. Sym. Ceramic Mat., Shanghai, China (1994).
- M.E. Eberhart, D. P. Clougherty, and J.M. MacLaren, "Extended Structure and its Relationship to Properties of Intermetallic Alloys," *Phil. Mag. B* **68**, 455-464 (1993).

- M.E. Eberhart, D. P. Clougherty, and J.M. MacLaren, "Bonding-Property Relationships in Intermetallic Alloys," *J. Mat. Res.* **8**, 438 (1993).
- M.E. Eberhart, D.P. Clougherty, and J.M. MacLaren, "Theoretical Investigations of the Mechanism of Fracture in Metals and Alloys," *J. Am. Chem. Soc.* **115**, 5762 (1993).
- J.M. McKittrick, R. Contreras, and D. P. Clougherty, "Aligned Gadolinium Copper Oxide Thick Films Formed by In-Situ Crystallization in a Magnetic Field," *J. Mat. Res.* **8**, 438-448 (1993).
- D. P. Clougherty and W. Kohn, "Quantum Theory of Sticking," *Phys. Rev. B* **46**, 4921 (1992).
- D. P. Clougherty and W. Kohn, "Low-Energy Behavior of Quantum Adsorption," arXiv:cond-mat/9205004 (1992).
- K.H. Johnson, D. P. Clougherty and M.E. McHenry, "Fullerene Superconductivity and the Dynamic Jahn-Teller Effect," *Science* **255**, 1490 (1992).
- D. P. Clougherty, M. E. McHenry, J. M. MacLaren, "Magnetism in 4d Transition Metal-Ag(001) Sandwiches," in **Magnetic Thin Films, Multilayers and Surfaces**, H. Hopster, S. S. P. Parkin, G. Prinz, J. P. Renard, T. Shinjo, and W. Zinn, eds. (1991).
- M.E. McHenry, J.M. MacLaren, and D.P. Clougherty, "Monolayer Magnetism of 3d Transition Metals in Ag, Au, Pd and Pt Hosts: Systematics of Local Moment Variation," *J. App. Phys.* **70**, 5932 (1991).
- M. E. Eberhart, M. M. Donovan, J. M. MacLaren, and D. P. Clougherty, "Towards a Chemistry of Cohesion and Adhesion," *Invited paper, Prog. Surf. Sci.* **36**, 1-34 (1991).
- J. M. MacLaren, D. P. Clougherty, M. E. McHenry, and M. M. Donovan, "Parameterized Local Spin Density Exchange-Correlation Energies and Potentials for Electronic Structure Calculations. I. Zero Temperature Formalism," *Comp. Phys. Comm.* **66**, 383-391 (1991).
- D. Singh, D. P. Clougherty, J. M. MacLaren, R. C. Albers, and C. S. Wang, "Influence of the Local Spin-Density Correlation Functional on the Stability of bcc-Ferromagnetic Iron," *Phys. Rev. B* **44**, 7701-3 (1991).
- M.E. Eberhart, D. P. Clougherty, and J.N. Louwen, "Geometrical Origins of Interfacial Strength," *Invited paper, Mat. Res. Soc. Bull.*, **16**, 53 (1991).
- K.H. Johnson, D. P. Clougherty and M.E. McHenry, "Dynamic Jahn-Teller Theory of High  $T_c$  Superconductivity," *Invited paper*, in **High-Temperature Superconductivity: Physical Properties, Microscopic Theory, and Mechanisms**, J. Ashkenazi *et al.*, 341-352 (Plenum Press (1991)).
- K. H. Johnson, M. E. McHenry, and D. P. Clougherty, "High  $T_c$  Superconductivity in  $K_xC_{60}$  Via Coupled  $C_{60}(p\pi)$  Cluster Molecular Orbitals and Dynamic Jahn-Teller Coupling," *Physica C* **183**, 319 (1991).



J. M. MacLaren, D. P. Clougherty, and R. C. Albers, "Local Spin-Density Calculations in Iron: Effect of Spin Interpolation on Ground-State Properties," *Phys. Rev. B* (Rapid Comm.) **42**, 3206 (1990).

K. H. Johnson and D. P. Clougherty, "Hydrogen-Hydrogen/Deuterium-Deuterium Bonding in Palladium and the Superconducting/Electrochemical Properties of PdH<sub>x</sub>/PdD<sub>x</sub>," *Mod. Phys. Lett. B* **3** 795-803 (1989).

K. H. Johnson, D. P. Clougherty, and M. E. McHenry, "Dynamic Jahn-Teller Coupling, Anharmonic Oxygen Vibrations, and High  $T_c$  Superconductivity," *Mod. Phys. Lett. B* **3** 1367-74 (1989).

D. P. Clougherty, K. H. Johnson, and M. E. McHenry, "Dynamic Jahn-Teller Coupling and High  $T_c$  Superconductivity," *Physica C* **162-164**, 1475 (1989).

K. H. Johnson, D. P. Clougherty, and M. E. McHenry, "Nd, Ce( $f\pi$ )-O( $p\pi$ ) Hybridization in Nd<sub>2-x</sub>Ce<sub>x</sub>CuO<sub>4</sub> and Dynamic Jahn-Teller Pairing in High  $T_c$  Superconductors," *Mod. Phys. Lett. B* **3** 867-875 (1989).

D. P. Clougherty and K. H. Johnson, "Thermodynamic Critical Fields in High  $T_c$  Superconductivity," *Physica C* **153-155** 699 (1988).

## PATENTS

D. P. Clougherty and M. E. Eberhart, "Molecular identification and electron resonance system and method." US Patent 7,570,055 B1, granted August 4, 2009.

## CONTRIBUTED PRESENTATIONS

"Quantization of the Vibrations of a Thin Elastic Plate," American Physical Society, Boston MA, March 2019.

"Radiative Corrections to Quantum Sticking for Cold Atoms on Suspended Graphene," American Physical Society, Los Angeles CA, March 2018.

"Infrared Problem in Cold Atom Adsorption on Graphene," Physics and Chemistry of Surfaces and Interfaces, Kona, Hawaii, January 2018.

"Infrared Problem in Quantum Acoustodynamics," NASA Fundamental Physics Workshop, Santa Barbara, CA, June 2017.

"Infrared Problem in a Hybrid System: Ultracold Atoms Coupled to a Vibrating Membrane," American Physical Society, New Orleans, March 2017.

"Infrared Problem in Quantum Acoustodynamics," Frontiers in Nanomechanical Systems, La Thuile, Italy, February 2017.

"Novel Infrared Dynamics of Cold Atoms on Hot Graphene Membranes," American Physical Society, Baltimore, MD, March 2016.

"Self-energy of a Cold Atom Interacting with an Elastic Membrane," American Physical Society, San Antonio, TX, March 2015.

“Quantum Sticking of Atoms on Membranes,” American Physical Society, Madison, WI, June 2014.

“Quantum Sticking of Atomic Hydrogen on Graphene,” American Physical Society, Baltimore, MD, March 2013.

“Thermal Effects on Quantum Sticking,” American Physical Society, Boston, MA, March 2012.

“Breaking Quantum Mirrors with Thermal Fluctuations,” American Physical Society, Dallas, TX, March 2011.

“Dissipative Effects on Quantum Sticking,” American Physical Society, Dallas, TX, March 2011.

“Theory of Electric Polarization Induced by Inhomogeneity in Crystals,” American Physical Society, New Orleans, LA, March 2008.

“Theory of the Jahn-Teller Soliton,” American Physical Society, Baltimore, Maryland, March 2006.

“Effective Mass of Vector Polarons,” American Physical Society, Baltimore, Maryland, March 2006.

“Theory of the Vector Polaron,” Molecular Materials Symposium, Dartmouth College, Hanover, NH, September 2005.

“Anomalous Threshold Laws in Quantum Sticking,” American Physical Society, Montreal, Canada, March 2004.

“Vector Polarons in a Degenerate Electron System,” American Physical Society, Montreal, Canada, March 2004.

“Endohedral Impurities in Carbon Nanotubes: An Exotic Kondo Liquid,” Molecular Materials Symposium, Dartmouth College, Hanover, NH, September 2003.

“Endohedral Impurities in Carbon Nanotubes,” American Physical Society, Austin, Texas, March 2003.

“Axial Symmetry Breaking in Carbon Nanotubes,” Molecular Materials Symposium, Dartmouth College, Hanover, NH, September 2002.

“Density Functional Theory of van der Waals Interactions,” Molecular Materials Symposium, Dartmouth College, Hanover, NH, October 2001.

“Jahn-Teller Effects in Fullerenes, Fullerides and Nanotubes,” American Chemical Society, National meeting, San Diego, CA, April 2001.

“A New Mechanism for Ferroelectric Phase Transitions in Molecular Crystals,” Molecular Materials Symposium, Dartmouth College, Hanover, NH, January 2001.

“Inversion Symmetry-Breaking in Endohedral Fullerenes,” American Physical Society, Los Angeles, CA March 1998.

“Theory of Spontaneous Polarization in Endohedral C<sub>60</sub>,” Humphrey Symposium, University of Vermont, Burlington, VT October 1997.

“Thermal Effects in Quantum Sticking,” American Physical Society, Seattle, WA March 1993.

“Dynamic Jahn-Teller Theory of Superconductivity in Ceramics, Organics, and Fullerenes,” Materials Research Society, Boston, MA, November 1992.

“Dynamic Jahn-Teller Effects in High T<sub>c</sub> Superconductors,” Conference on Lattice Effects in High T<sub>c</sub> Superconductors, Santa Fe, NM, January 1992.

“Threshold Behavior of Quantum Sticking of Charged Particles on Surfaces,” Conference on Surface Interactions of Highly Charged Ions, Institute for Theoretical Physics, UC Santa Barbara, Santa Barbara, CA December 1991.

“Magnetism of 4d-Transition Metal/Ag Sandwiches,” Materials Research Society, Anaheim, CA, May 1991.

“Low Energy Behavior of Quantum Sticking,” American Physical Society, Cincinnati, OH, March 1991.

“Local Spin-Density Calculations in Fe,” American Physical Society, Anaheim, CA, March 1990.

“Investigation of Tip-Surface Interactions in the Atomic Force Microscope: Theory and Experiment,” American Physical Society, Anaheim, CA, March 1990.

“Dynamic Jahn-Teller Coupling and High T<sub>c</sub> Superconductivity,” International Conference on High Temperature Superconductors and Materials and Mechanisms of Superconductivity, Poster Presentation, Stanford University, July 1989.

“Spin Susceptibilities of Clusters and Molecules Using Spin Density Functional Theory,” American Physical Society, St. Louis, MO, March 1989.

“Thermodynamic Critical Fields in High T<sub>c</sub> Superconductivity,” International Conference on High Temperature Superconductors and Materials and Mechanisms of Superconductivity, Poster Presentation, Interlaken, Switzerland, 1988.

“Superconductivity and Magnetism,” MIT Industrial Liason Conference on Superconductivity, Cambridge, MA, 1988.

## INVITED PRESENTATIONS

“Infrared Problem in Quantum Acoustodynamics,” JILA, University of Colorado, Boulder, June 2019.

“Infrared Problem in Cold Atom Adsorption on 2D Materials,” NORDITA conference on Dynamic Quantum Matter, Stockholm, Sweden, December 2018.

“Infrared Problem in Cold Atom Adsorption on 2D Materials,” XXIV International Symposium on the Jahn-Teller Effect, University of Cantabria, Santander, Spain, June 2018.

“Infrared Problem in Quantum Acoustodynamics,” Physics Colloquium, University of Rhode Island, April 2017.

“Quantum of Surprise,” University Scholar lecture, University of Vermont, November 2014.

“Dissipation and Decoherence of a Jahn-Teller Impurity in a Solid,” XXII International Symposium on the Jahn-Teller Effect, Technische Universität Graz, Austria, August 2014.

“Berry-Phase Approach to Electric Polarization and Charge Fractionalization,” XX International Symposium on the Jahn-Teller Effect, University of Fribourg, Switzerland August 2010 (with Junren Shi, Di Xiao and Qian Niu).

“Nanoscience and Nanotechnology,” ECHO Science Center, Burlington VT April 3, 2010.

“Polarization Induced by Inhomogeneity,” Orbital Magnetization in Condensed Matter Workshop, Lausanne, Switzerland June 2009 (with Junren Shi, Di Xiao and Qian Niu).

“Nanoscience and Nanotechnology: Size Matters,” Café Scientifique, ECHO Science Center, Burlington VT January 2009.

“Fractional Electrons—It’s just a phase they pass through,” Department of Physics and Astronomy Colloquium, Dartmouth College November 2008.

“Electron Fractionalization in Jahn-Teller Crystals,” XIX International Symposium on the Jahn-Teller Effect, University of Heidelberg, Germany August 2008.

“Quantum Reflection in Sticking and Scattering from Surfaces,” Workshop on Quantum Reflection, ITAMP, Harvard University, Cambridge, MA October 2007.

“Novel Multiband Polarons and Solitons,” Third International Workshop on Density Functional Theory, Oran, Algeria May 2007.

“Ultracold Atoms at Surfaces: Sticking, Scattering and Quantum Dissipation,” University of Texas at Austin, Condensed matter seminar, February 2007.

“Polarons and Solitons in Jahn-Teller Systems,” International Centre for Theoretical Physics, Trieste, Italy August 2006.

“Fullerenes and Nanotubes for Mathematicians,” Department of Mathematics, University of Vermont, Burlington, Vermont, October 2002.

“The Kondo Effect in a Vibronic System,” Department of Physics, McGill University, Montreal, Canada, September 2002.

“Inversion Symmetry Breaking in Endohedral Fullerenes,” Department of Physics colloquium, University of Georgia, February 2001.

“Inversion Symmetry Breaking in Endohedral Fullerenes,” Condensed Matter Physics seminar, Dartmouth College, October 2000.

“Spontaneous Polarization in Endohedral Fullerenes,” Institute for Theoretical Atomic and Molecular Physics, Harvard University, October 1999.

“Vibronic Effects in Fullerenes,” Department of Physics Colloquium, University of Iowa, Iowa City, IA, May 1998.

“Vibronic Effects in Fullerenes,” Department of Physics Colloquium, Clarkson University, Potsdam, NY April 1998.

“Spontaneous Polarization in Endohedral Fullerenes,” Institute for Theoretical Physics, Santa Barbara, CA, May 1997.

“Fullerenes as Quantum Rubber Balls,” Department of Physics Colloquium, Rensselaer Polytechnic Institute, March 1996.

“Quantum Mirrors and the Threshold Laws of Atom-Surface Sticking,” Condensed Matter Physics Seminar, Harvard University, November 1995.

“C<sub>60</sub> as a Quantum Rubber Ball,” Dept. of Physics Colloquium, University College, Cork (Ireland), October 1995.

“Quantum Mirrors,” Dept. of Physics Colloquium, Tulane University, New Orleans, LA November 1994.

“Quantum Mirrors– Reflections of a Cold Atom,” Dept. of Physics Colloquium, University of Vermont, Burlington, VT October 1994.

“Sticky Issues in Quantum Sticking,” Dept. of Physics Colloquium, Northeastern University, Boston, MA March 1994.

“Sticky Issues in Quantum Sticking,” Dept. of Physics Seminar, Cornell University, Ithaca, NY November 1993.

“Universality in Physisorption Kinetics,” Dept. of Physics Seminar, Brown University, Providence, RI October 1993.

“Sticky Issues in Quantum Sticking,” Dept. of Physics Colloquium, Dartmouth College, Hanover, NH May 1993.

“Sticky Issues in Quantum Sticking,” Dept. of Physics Colloquium, Colorado School of Mines, Golden, CO February 1993.

“Topological Approach to Structure and Bonding,” Akzo Corporate Research, Dobbs Ferry, NY October 1992

“Sticky Issues in Quantum Sticking,” Dept. of Physics Colloquium, University of California– Davis, February 1992.

“Sticky Issues in Quantum Sticking,” Dept. of Physics Colloquium, University of California– San Diego, La Jolla, CA November 1991.

“Sticky Issues in Quantum Sticking,” Dept. of Physics Colloquium, University of Florida, Gainesville, FL October 1991.

“Dynamic Jahn–Teller Effect and High  $T_c$  Superconductivity,” Workshop on Mechanisms of High  $T_c$  Superconductivity, University of Miami, January 1991.

“Dynamic Jahn–Teller Theory of High  $T_c$  Superconductivity,” Department of Physics, California State University– Fullerton, March 1990.

“Recent Improvements within the Local Spin Density Approximation with Applications to Magnetic Systems,” Fall Symposium on Theory-Assisted Materials Development, Materials Processing Center, MIT, Cambridge, MA, November 1989.

“Vibronic Interactions and Superconductivity: Breakdown of the Born-Oppenheimer Approximation,” Center of Materials Science Seminar, Los Alamos National Laboratory, Los Alamos, NM, 1989.

“Molecular Orbital Approach to High Temperature Superconductivity,” Center of Materials Science Seminar, Los Alamos National Laboratory, Los Alamos, NM, 1988.