P. Chris Hammel

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Education

- B.A. in Physics, University of California, San Diego,
  Magna Cum Laude 1977.
- Ph.D. in Physics, Cornell University 1984,
  Thesis topic: "Magnetic Coupling Across the Liquid ^{3}He-Substrate Interface"
  Advisor: Prof. R.C. Richardson.

Employment and Appointments

- **Professor** and **Ohio Eminent Scholar**, The Ohio State University, June 2002 to present
- **Fellow**, Los Alamos National Laboratory, July 2000 to August 2004
- **Staff member**, Condensed Matter and Thermal Physics Group, Los Alamos National Laboratory, October 1989 to June 2002
- **Visiting Associate in Physics**, California Institute of Technology, Pasadena, CA, 1996–2000
- **J. Robert Oppenheimer Fellow**, Los Alamos National Laboratory, October 1986 to October 1989
- **Postdoctoral Fellow**, MIT with Prof. John S. Waugh, January 1984 to October 1986
- **Research Assistant**, Laboratory of Atomic and Solid State Physics, Cornell University, Ithaca, NY, June 1979–January 1984

Research Interests

- Magnetic resonance force microscopy
- Spin electronics and microwave properties of magnetic materials
- Biomagnetism
- Novel approaches to magnetic resonance
- Optically detected magnetic resonance

Awards and Honors

- Oppenheimer Fellow, Los Alamos National Laboratory, October 1986
- Fellow, Los Alamos National Laboratory, July 2000
- Los Alamos National Laboratory Fellows Prize, February 1995
- Fellow, The American Physical Society, 1998
- Fellow, The American Association for the Advancement of Science, 2006

Professional Activities

- Director, Center for Emergent Materials (CEM), a National Science Foundation funded Materials Research Science and Engineering Center (MRSEC)
- Founding Director, Center for Electronic and Magnetic Nanoscale Complex Multifunctional Materials (ENCOMM) 2005–2011
- Member-At-Large, Executive Committee of The American Physical Society Topical Group on Magnetism and its Applications
- Member, External Review Committee for US DOE, Office of Basic Energy Sciences (BES) Materials Chemistry Research Program at the Lawrence Berkeley National Laboratory (LBNL) 13–16 January 2014 and 15–18 January 2008, Berkeley, CA
- Member Visiting Committee, Cornell Center for Materials Research, an NSF MRSEC, 1–2 May 2013, Ithaca, NY
- Member, DOE Committee of Visitors Review of the Materials Sciences and Engineering Division May 22–24, 2012, DOE Germantown Complex
- External reviewer for the Department of Physics at Kent State University
- Member, Program Committee, 2011 Magnetism and Magnetic Materials International Conference
- Member, American Physical Society (1979-present)
- Member, Penn State University MRSEC Visiting Committee
- Member, Executive Committee of the *Instrumentation and Measurement Sciences Topical Group* of the American Physical Society (2001-2005)
- Co-chair, *International Workshop on Novel Magnetic Materials,* Leibniz Institute for Solid State and Materials Research, 23–25 August 2010, Dresden, Germany
- Member, American Association for the Advancement of Science (2002-present)
- Proposal referee and panelist, National Science Foundation,
- Proposal referee, Department of Energy, The Research Foundation and the Petroleum Research Foundation
- Manuscript referee, *Physical Review Letters, Science, Nature, Physical Review B, Applied Physics Letters, Journal of Applied Physics* and *Physica C*
- Chairman, DOE BES Electron and Scanning Probe Microscopies Contractors Meeting, October 26–29, 2008
- Member, External Review Committee, Materials Chemistry Division, Lawrence Berkeley National Laboratory, Berkeley CA, 15–18 January 2008
- Member, External Review Committee, Materials Division, Argonne National Laboratory, Argonne, IL, 14–16 May 2008
- Invited panelist, Scientific Review of Stanford's *Center for Probing the Nanoscale,* 16–19 September, 2009
- Co-organizer, *International Conference on Experimental Implementation of Quantum Computation*, January 16–19, 2001, Sydney, Australia

- Co-organizer of workshop on *Scanned Probe Microscopy in Biology, Chemistry and Physics,* December 9–12, 2001 Santa Fe, NM.
- Member, Quantum Information Science and Technology Expert Panel, tasked with developing a national quantum information roadmap (2000-2002)
- Member, International Advisory Committee, Australian Research Council Special Research Centre for Quantum Computer Technology (2000-2002)
- Member, Los Alamos National Laboratory Postdoctoral Committee (2000-2002)
- Leader, Complex Functional Nanomaterials Thrust of the LANL/Sandia Center for Integrated Nanomaterials (2001-2002)

Invited Talks

American Physical Society

1. "^{17}O NMR in $YBa_2Cu_3O_{7-\delta}$," presented at the March Meeting of the American Physical Society, Anaheim, California, March 16–20, 1990.
2. "NMR Studies of $La_2CuO_{4+\delta}$," presented at the March meeting of the American Physical Society, Seattle, Washington, March 22–26, 1993.
3. "NMR/NQR Studies of Oxygen Doped La_2CuO_4: Inhomogeneous Structure and Hole Localization," presented at the March meeting of the American Physical Society, St. Louis, Missouri, March 18–22, 1996.
4. "Ferromagnetic Resonance in Microscopic Magnets Using Magnetic Resonance Force Microscopy," presented by Z. Zhang at the March meeting of the American Physical Society, Kansas City, Missouri, March 17–21, 1997.
5. "Magnetism of Charge-Stripe Ordered 2D Transition Metal Oxides," presented at the March meeting of the American Physical Society, Atlanta, GA, March 21–26, 1999.
6. "Magnetic Resonance Readout in the Silicon-Based Nuclear Spin Quantum Computer," presented at the March meeting of the American Physical Society, Minneapolis, MN, March 20–24, 2000.
7. "Scanning MRFM of Microscopic Ferromagnets" presented at the March meeting of the American Physical Society, Indianapolis, IN, March 18–22, 2002.
8. "Force-Detected Scanned Probe Magnetic Resonance Microscopy," presented at the March meeting of the American Physical Society, Montreal, Canada, March 26, 2004
9. "Ferromagnetic Resonance Imaging with Magnetic Resonance Force Microscopy," presented by Denis Pelekhov at the March Meeting of the American Physical Society, March 2009
10. "Nanoscale scanning probe ferromagnetic resonance imaging using localized modes," presented at the March Meeting of the American Physical Society, Dallas TX, March 2011

Gordon Research Conferences

1. "Anisotropic Knight Shifts and Relaxation Rates in $YBa_2Cu_3O_7$," presented at the *Gordon Research Conference on Magnetic Resonance*, Plymouth NH, June 19–23, 1989.
2. "Phase Separation, Structure and Superconductivity in Oxygen-Annealed $La_2CuO_{4+\delta}$," presented at the *Gordon Research Conference on Superconductivity*, Oxnard, CA, January 4–8, 1993.
3. "Localized Holes in Superconducting Lanthanum Cuprate," presented at the *Gordon Research Conference on Superconductivity*, Ventura, CA, January 12–17, 1997.
4. "Glassy Spin Freezing in Lanthanum Cuprate" presented at the *Gordon Research Conference on Superconductivity*, Oxford, England, 9–14 September 2001.
5. "Scanned Probe Ferromagnetic Resonance Studies of Microscopic Ferromagnets," presented at the *Gordon Research Conference on Magnetic Nanostructures*, May 12–17, 2002 in Il Ciocco, Italy.
6. "Nanoscale scanning probe ferromagnetic resonance imaging using localized modes," *Gordon Research Conference on Magnetic Nanostructures*, Bates College, ME, 8–13 August 2010.
7. "Scanned Probe Ferromagnetic Resonance Imaging," *Gordon Research Conference on Magnetic Resonance*, 15 June 2011, University of New England, Biddeford, ME.

International Conferences and Workshops

1. "Incommensurate Spin Fluctuations and Oxygen Doping in Super-Oxygenated $La_2CuO_{4+\delta}$," presented at the *Distinguished Visitors Workshop on Spin Effects in High Temperature Superconductors*, University of Illinois at Urbana-Champaign April 2–4, 1992.

2. "Magnetism, Phase Separation, Local Structure and Superconductivity in Super-Oxygenated $La_2CuO_{4+\delta}$," presented at the *International School of Solid State Physics Workshop: Aspects of Phase Separation in Cuprate Superconductors*, May 6–13, 1992, Erice, Sicily.

3. "NMR Study of Local Structural Inhomogeneity in Metallic $La_2CuO_{4+\delta}$," presented at the *International Conference on Strongly Correlated Electron Systems*, August 16–19, 1993, La Jolla, California.

4. "NMR Study of Local Structural Inhomogeneity in Metallic $La_2CuO_{4+\delta}$," presented at the *Second International Workshop on Phase Separation in Cuprate Superconductors*, September 5–10, 1993 in Cottbus, Germany.

5. "Local Structure in Oxygen-Doped $La_2CuO_{4+\delta}$" presented at the *International Workshop on Anharmonic Properties of High-T_c Cuprates*, Bled, Slovenia, September 1–6, 1994.

6. "Sub-surface Imaging with the Magnetic Resonance Force Microscope" presented at the *Symposium on Quantum Fluids & Solids-95*, Cornell University, June 12–17, 1995.

7. "NMR Studies of the Cuprates: Localization of Doped Holes in Metallic $La_2CuO_{4+\delta}$ and An Examination of the Oxygen Relaxation Rate in $YBa_2Cu_3O_7$," presented at the *Third International Workshop on Phase Separation, Electronic Inhomogeneities and Related Mechanisms for High-T_c Superconductors*, Erice, Italy, July 9–15, 1995.

8. "The Magnetic Resonance Force Microscope: Recent Experiments" presented at the *Southeast Magnetic Resonance Conference*, Tallahassee, FL, December 1, 1995.

9. "Localized Holes in Superconducting Lanthanum Cuprate," presented at the *International Conference on Stripes, Lattice Instabilities and High T_c Superconductivity*, Rome, Italy, December 8–12, 1996.

10. "Microscopic Characterization of Magnetic Materials Using Magnetic Resonance Force Microscopy," presented at the *NATO Advanced Study Institute: Frontiers in Magnetism of Reduced Dimension Systems*, Crimea, Ukraine, May 25–June 3, 1997.

11. "Charge Inhomogeneity in Lanthanum Cuprate and Lanthanum Nickelate," presented at the *Workshop on Spin-Charge-Lattice Coupling in Complex Electronic Materials*, Los Alamos, NM, August 12–14, 1997.

12. "Microscopic Characterization of Magnetic Materials Using Magnetic Resonance Force Microscopy," presented at the *4^{th} International Conference on Magnetic Resonance Microscopy and Macroscopy*, Albuquerque, NM, September 21–25, 1997.

13. "Microscopic Characterization of Layered Magnetic Materials Using Magnetic Resonance Force Microscopy," presented at the *25^{th} Conference on the Physics and Chemistry of Semiconductor Interfaces*, Salt Lake City, Utah, 18–22 January 1998.

14. "Charge Inhomogeneity in Transition Metal Oxides," presented at the *Second International Conference on Stripes and High T_c Superconductivity,* Rome, Italy, 2-6 June 1998.

15. "Microscopic Characterization of Magnetic Materials Using Magnetic Resonance Force Microscopy," presented at the *3^{rd} International Symposium on Metallic Multilayers*, Vancouver, British Columbia, Canada, 14–19 June 1998.

16. "Magnetism of Charge-Striped 2D Transition Metal Oxides" presented at the *Colloquium on Magnetic Resonance in High-T_c Superconductors,* Engelberg, Switzerland, 17–21 January 1999.

17. "High Resolution Scanned Probe Magnetic Resonance Microscopy," plenary talk presented at the Swiss-US workshop on *Tools and Simulations in Nanotechnology,* Zürich, Switzerland, 20–21 September 1999.

18. "Inhomogeneous Low Frequency Spin Dynamics in $La_{1.8-x}Eu_{0.2}Sr_xCuO_4$" presented at the Symposium on *Itinerant and Localized States in HTSC* in Klosters, Switzerland, 6–10 April, 2000.

19. "Glassy Spin Freezing in Lanthanum Cuprate," presented at the *Workshop on High Temperature Superconductivity*, Institute for Theoretical Physics, University of California, Santa Barbara, CA, August 14–18, 2000.

20. "Glassy Spin Freezing and Stripe Order in Lanthanum Cuprate," presented at *Stripes 2000* in Rome, Italy, 25–30 September 2000.

21. "The Magnetic Resonance Force Microscope: Readout for a Silicon-Based Nuclear-Spin Quantum Computer," presented at the International Conference on Experimental Implementation of Quantum Computation, Sydney Australia, 16–19 January, 2001.

22. "Glassy Spin Freezing in Lanthanum Cuprate," presented at the *Aspen Winter Physics Conference*, Aspen, CO, January 21–27, 2001.

23. "Probing Materials with Magnetic Resonance," presented at the *The Future of Materials Physics* Workshop in honor of Zachary Fisk, August 13-15, 2001, Los Alamos, NM

24. "Force-Detected Scanned Probe Magnetic Resonance Microscopy," presented at the Physical Phenomena at High Magnetic Fields-IV Conference, Santa Fe, New Mexico, October 19–25, 2001

25. "Force Detected Scanned Probe Magnetic Resonance: The Magnetic Resonance Force Microscope," presented at *Physical Properties of Amyloid Diseases Workshop*, the University of California, San Francisco, CA November 29–December 1, 2001

26. "The Silicon-Based Nuclear Spin Quantum Computer," to be presented at the SPIE International Conference "Photonics West", San Jose, CA, Jan 20–25, 2002

27. "The Silicon-Based Quantum Computer," presented at the *3^{rd} Annual Conference of the Southwest Quantum Information and Technology Network*, NIST, Boulder, CO, March 8-10, 2002.

28. "Ultrasensitive Electron Spin Resonance with the Magnetic Resonance Force Microscope," presented at *EPR 2005*, Columbus, OH, on 7 September 2005.

29. "The Magnetic Resonance Force Microscope: A New Tool for High Resolution Materials Studies," presented at the 135th Annual Meeting of *The Minerals, Metals & Materials Society (TMS)*, San Antonio, TX, March 13, 2006.

30. "The Magnetic Resonance Force Microscope: A New Tool for High Resolution Materials Studies" presented at the Summer School on Magnetic Resonance Force Microscopy, Ithaca, NY, June 23, 2006

31. "Ultrasensitive Magnetic Resonance Detection with Micromechanical Cantilevers" presented at the Symposium on Nonlinear Dynamics of Nanosystems at Chemnitz, Germany, August 29, 2007.

32. "Submicron Ferromagnetic Resonance Imaging Using Scanned Probe MRFM," presented at the 2007 Aspen Conference on Spins in Nanostructures, Aspen, CO, January 2007

33. "Scanned Probe Ferromagnetic Resonance Imaging," presented at the Third International Workshop on Nanomagnetism, Coma Ruga, Spain, 2 July 2007

34. "The Spirit of Adventure in the Search for Truth: Magnetic Resonance Studies of Condensed Matter," presented at the Conference honoring Bob Richardson, 12–13 April 2008, Ithaca, NY

35. "Mechanisms of FMR imaging," invited presentation, International Conference on Nanoscience & Technology 21–25 July, 2008

36. "Scanned Probe Magnetic Resonance Imaging and Spectroscopy of Materials," invited presentation at the DOE sponsored Workshop on *Frontiers of Atomic-Scale Functionality Imaging* 28–30 September, 2008, Annapolis, MD

37. "Scanned Probe Magnetic Resonance Imaging and Spectroscopy of Materials," invited presentation at the International Conference on *Physics and Chemistry of Surfaces and Interfaces*, January 9, 2009, Santa Barbara, CA

38. "Scanned Probe Magnetic Resonance" presented at the Conference on *Functional Materials by Design*, Los Alamos National Lab, 20 January, 2009

39. "Ferromagnetic Resonance Imaging," presented at the Workshop *Molecular Imaging 2009: Routes to Three-Dimensional Imaging of Single Molecules,* August 9–13, 2009, Ithaca NY

40. "Generation of Localized Ferromagnetic Resonance Modes for Scanned Probe Imaging," to be presented at the Workshop: *Opportunities for Magnetism in MEMS/NEMS*, Argonne National Laboratory, 16–17 April 2010

41. "Nanoscale scanned probe ferromagnetic resonance imaging using localized modes," to be presented at the *3rd nano-MRI research conference: Exploring the Frontiers of Magnetic Resonance Imaging* to be held at Le Tremblay sur Mauldre, France, 12–16 July 2010

42. "Scanned probe imaging of spin physics," presented at the *International Workshop on Novel Magnetic Materials,* Leibniz Institute for Solid State and Materials Research, 23–25 August 2010, Dresden, Germany

43. "Localized Ferromagnetic Resonance Modes for Scanned Probe Imaging," *55th Annual Conference on Magnetism & Magnetic Materials,* 14–18 November 2010, Atlanta, GA

44. "Spin Transport Driven by Magnetization Dynamics: Nanoscale studies of spin dynamics," invited talk presented at the *8th ASRC International Workshop on Spin Mechanics,* Tokai, Japan, 24–26 February 2013

45. "Spin dynamics and transport in nanoscale volumes," invited talk presented at the 2014 Annual Meeting of the AAAS, 13–17 February 2014, Chicago, IL

46. "Probing the Influence of Interfaces in Spin Pumping," SPIE Spintronics VII, 17 - 21 August 2014, San Diego, California

47. "The Role of Interfaces in Dynamic Spin Transport," 59th Annual Magnetism and Magnetic Materials Conference, 3–7 November 2014, Honolulu, Hawaii

Colloquia and Seminars

1. "Magnetism in $YBa_2Cu_3O_{7-y}$: Insights from NMR" at the Physics and Theoretical Division Colloquium, Los Alamos National Lab, March 1990.

2. "^{139}La Magnetic Resonance Studies of Single Crystal $La_2CuO_{4+\delta}$", Physics Department, Northwestern University, Evanston Illinois, March 18, 1991.

3. "^{139}La Magnetic Resonance Studies of Single Crystal $La_2CuO_{4+\delta}$", Materials Science Division, Argonne National Laboratory, March 19, 1991.

4. "NMR Studies of the High Temperature Superconductors $YBa_2Cu_3O_{7-y}$," Joint Los Alamos National Laboratory and Sandia National Laboratories Office of Basic Energy Sciences Materials Sciences Information and Review Meeting, May 29–30, 1991.

5. "Magnetism, Phase Separation, Local Structure and Superconductivity in Super-Oxygenated $La_2CuO_{4+\delta}$," presented at the Theory Institute of the Swiss Federal Institute of Technology (ETH), Zurich, Switzerland, May 18, 1992.

6. "Magnetism, Phase Separation, Local Structure and Superconductivity in Super-Oxygenated $La_2CuO_{4+\delta}$," presented at the Solid State Physics Laboratory of the University of South Paris, Orsay, France, May 25, 1992.

7. "NMR Study of Local Structure in Metallic $La_2CuO_{4+\delta}$," presented at the University of Köln, September 16, 1993.

8. "NMR Study of Local Structure and Charge Distribution in Metallic $La_2CuO_{4+\delta}$," presented at the Condensed Matter Physics Department, California Institute of Technology, January 11, 1994.

9. "NMR Study of Local Structure and Charge Distribution in Metallic $La_2CuO_{4+\delta}$," presented at the Physics Department, University of California at Riverside, January 13, 1994.

10. "Phase Separation and Local Structure in Oxygen-Doped $La_2CuO_{4+\delta}$," presented to the Physics Department at the University of California at Los Angeles, May 18, 1994.

11. "An Examination of the Oxygen Relaxation Rate in $YBa_2Cu_3O_7$" presented to the Physics Department, University of Florida, Gainesville, FL, November 27, 1995.

12. "The Magnetic Resonance Force Microscope: Recent Experiments" presented to the Physics Department, University of Florida, Gainesville, FL, November 28, 1995.

13. "Localized Holes in Superconducting Lanthanum Cuprate," presented at the Condensed Matter Physics Seminar, Physics Department, University of Illinois at Urbana/Champaign, February 21, 1997.

14. "Doped Holes and Stripes in 2D Cuprates and Nickelates," presented at the Condensed Matter Physics Seminar, Department of Physics, Florida State University and National High Magnetic Field Laboratory, Tallahassee, FL, April 11, 1997.

15. "The Magnetic Resonance Force Microscope: A New Probe of Magnetic Materials," presented at the Condensed Matter Seminar, Department of Physics, The Ohio State University, Columbus, OH, November 12, 1997.

16. "The Magnetic Resonance Force Microscope: A New Probe of Magnetic Materials," presented at the Physics Colloquium, Texas A&M University, College Station, TX, December 4, 1997.

17. "Consequences of Inhomogeneous Charge Structures for Magnetism in 2D Transition Metal Oxides from NMR" presented at the University of Köln, Köln, Germany, May 25, 1998.

18. "Consequences of Inhomogeneous Charge Structures for Magnetism in 2D Transition Metal Oxides from NMR" presented at the University of Augsburg, Augsburg, Germany, May 27, 1998.

19. "The Magnetic Resonance Force Microscope: A New Probe of Magnetic Materials," presented at the University of Zürich, Zürich, Switzerland, May 28, 1998.

20. "The Magnetic Resonance Force Microscope: A New Approach to Microscopic Subsurface Imaging," Physics Department Colloquium presented at the University of California, Davis, February 22, 1999.

21. "Magnetism of Charge-Striped 2D Transition Metal Oxides," presented at the University of California, Riverside, February 23, 1999.

22. "Magnetism of Charge-Stripe Ordered Transition Metal Oxides," presented at Solid State Sciences Seminar, Caltech, Pasadena, CA May 25, 1999.

23. "High Resolution Scanned Probe Magnetic Resonance Microscopy," Physics Colloquium, The Ohio State University, Columbus, OH, November 2, 1999.

24. "Inhomogeneous Low Frequency Spin Dynamics in $La_{1.8-x}Eu_{0.2}Sr_xCuO_4$," Physics Colloquium, University of California, San Diego, 8 March, 2000.

25. "The Silicon-Based Nuclear Spin Quantum Computer," presented at the Physics Colloquium, Boston College, April 26, 2000.

26. "Glassy Spin Freezing and Stripe Order in Lanthanum Cuprate," presented at the UCLA Solid State Seminar, May 10, 2000.

27. "Glassy Spin Freezing in Lanthanum Cuprate," presented at the University of Köln, Köln, Germany, October 2, 2000.

28. "Magnetic Resonance Readout in the Silicon-Based Nuclear Spin Quantum Computer," presented at the University of Stuttgart, Stuttgart, Germany October 4, 2000.

29. "Glassy Spin Freezing in Lanthanum Cuprate," presented at the Max Planck Institute, Stuttgart, Germany, October 5, 2000.

30. "The Magnetic Resonance Force Microscope: Imaging Magnetic Materials," presented at the Ohio State University, November 20, 2000.

31. "Glassy Spin Freezing in Lanthanum Cuprate," presented to the Applied Physics Department, Stanford University, November 30, 2000.

32. "Magnetic Resonance Readout in the Silicon-Based Nuclear Spin Quantum Computer," presented at the University of California, San Diego, La Jolla, CA, February 14, 2001.

33. "High Resolution Scanned Probe Magnetic Resonance," presented to the Department of Radiology, The Ohio State University, Columbus, OH, May 29, 2001.

34. "Force Detected Scanned Probe Magnetic Resonance: The Magnetic Resonance Force Microscope," presented at the University of California, Santa Barbara, May 25, 2001.

35. "Force-Detected Scanned Probe Magnetic Resonance Microscopy," presented at the University of Illinois at Urbana/Champaign on October 29, 2001, Urbana, Illinois.

36. "Force-Detected Scanned Probe Magnetic Resonance Microscopy: The Magnetic Resonance Force Microscope," presented at Cornell University on December 18, 2001, Ithaca, NY.

37. "Force-Detected Scanned Probe Magnetic Resonance Microscopy," Department of Physics Colloquium presented at the University of Akron September 4, 2003

38. "Force-Detected Scanned Probe Magnetic Resonance Microscopy," Physics Colloquium, Kenyon College, January 23, 2004

39. "Force-Detected Scanned Probe Magnetic Resonance Microscopy," Physics Colloquium, University of Wisconsin-Madison, January 30, 2004

40. "Scanned Probe Magnetic Resonance: The Magnetic Resonance Force Microscope," Condensed Matter Physics Seminar presented at Case Western Reserve University, April 18, 2005.

41. "Force-Detected Scanned Probe Magnetic Resonance Microscopy," Colloquium presented at Miami University of Ohio, October 19, 2005.

42. "Ultrasensitive Magnetic Resonance Detection with Micromechanical Cantilevers" Seminar presented at the Institute for Solid State Research of the Leibniz Institute for Solid State and Materials Research, Dresden, Germany, September 1, 2006.

43. "Submicron Ferromagnetic Resonance Imaging Using Scanned Probe MRFM," Solid state seminar presented at the Department of Physics, Cornell University, Ithaca, NY, 14 November 2006.

44. "Submicron Ferromagnetic Resonance Imaging Using Scanned Probe MRFM," presented at the Los Alamos National Lab Materials Colloquium, Los Alamos, NM, 21 February, 2007

45. "Scanned Probe Magnetic Resonance Imaging for Magnetoelectronics," Colloquium, Department of Physics, Kent State University, Kent, OH, 12 April, 2007

46. "Scanned Probe Magnetic Resonance Imaging for Magnetoelectronics," Seminar presented at the Leibniz Institute for Solid State and Materials Research, Dresden, Germany, 5 July, 2007

47. "Scanned Probe Magnetic Resonance Imaging for Magnetoelectronics," Colloquium, Department of Physics, Carnegie Mellon University, Pittsburgh, PA, 10 September, 2007

48. "Scanned Probe Magnetic Resonance Imaging for Magnetoelectronics," Colloquium, Department of Physics, Wayne State University, Detroit, MI, 6 December 2007

49. "Scanned Probe Magnetic Resonance Imaging for Magnetoelectronics," Colloquium, Department of Physics, Northwestern University, Evanston, IL, 1 February 2008

50. "Scanned Probe Ferromagnetic Resonance," Condensed Matter Seminar, Department of Physics and Astronomy, Michigan State University, East Lansing, MI, October 13, 2008

51. "Scanned Probe Magnetic Resonance", Colloquium, University of Illinois, Urbana-Champaign, IL, January 30, 2009

52. "Scanned Probe Magnetic Resonance Imaging for Magnetoelectronics," Colloquium, Department of Physics, Penn State University, 19 February 2009

53. "Scanned Probe Ferromagnetic Resonance Imaging," Condensed Matter Physics Seminar, University of California, Riverside, 20 April, 2011

54. "Scanned Probe Ferromagnetic Resonance Imaging," Physics Department Colloquium, University of California, Irvine, 21 April, 2011

55. "Scanned Probe Ferromagnetic Resonance Imaging," Center for Nonlinear Studies Colloquium, Los Alamos National Laboratory, Los Alamos, NM, 31 May 2011

56. "Spin Transport Driven by Magnetization Dynamics," Colloquium presented at Boston College Department of Physics, Chestnut Hill, MA, December 5, 2012

57. "Spin dynamics and transport in nanoscale volumes," Condensed Matter Physics Seminar, UCLA Department of Physics & Astronomy presented 17 January 2014, Los Angeles, CA

58. "Spin dynamics and transport in nanoscale volumes," Materials Colloquium, Los Alamos National Laboratory, 22 January, 2014, Los Alamos, NM

Publications

1. "Spin aligned hydrogen: Some considerations for ESR vs. NMR experiments and preliminary observation of H↑ at low temperature," B. Yurke, D. Igner, E. Smith, B. Johnson, J. Denker, C. Hammel, D. Lee and J. Freed, *Journal de Physique (Paris) Colloque* **41**, C7-177 (1980).

2. "Fabrication of 0.25 μm metal particles," P. Chris Hammel and Robert C. Richardson, *Physica* **107**B, 611 (1981).

3. "Magnetic coupling between ^{3}He and ^{19}F at low temperatures," P.C. Hammel, M.L. Roukes, Y. Hu, T.J. Gramila, T. Mamiya and R.C. Richardson, *Phys. Rev. Lett.* **51**, 2124 (1983).

4. "Relaxation as an interface probe in ^{3}He-substrate systems," P.C. Hammel, T.J. Gramila, Y. Hu and R.C. Richardson, Proc. of the *17*$^{\text{th}}$ *International Conference on Low Temperature Physics* (North-Holland, Amsterdam, 1984), p. 753.

5. "Surface relaxation of ^{3}He on CaF_2," T.J. Gramila, Y. Hu, P.C. Hammel, and R.C. Richardson, *ibid*, p. 755.

6. "Relaxation of nuclear magnetization of liquid ^{3}He-substrate systems," P.C. Hammel and R.C. Richardson, *Phys. Rev. Lett.* **52**, 1441 (1984).

7. "^{19}F nuclear relaxation at the interface between liquid ^{3}He and a solid substrate at high field and low temperature," P.C. Hammel, P.L. Kuhns, O. Gonen and J.S. Waugh, *Phys. Rev.* B **34**, 6453 (1986).

8. "Unexpectedly rapid ^{19}F spin-lattice relaxation in CaF_2 below 1K," P.L. Kuhns, P.C. Hammel, O. Gonen, and J.S. Waugh, *Phys. Rev.* B **35**, 4591 (1987).

9. "Nuclear spin lattice relaxation in ^{3}He-^{4}He mixtures," Mary Lowe, P.C. Hammel, R.E. Ecke, K. Bedell and M. Takigawa, *Phys. Rev.* B **37**, 2281 (1988).

10. "Copper nuclear quadrupole resonance in $GdBa_2Cu_3O_7$: Determination of Site Assignment," P.C. Hammel, M. Takigawa, R.H. Heffner and Z. Fisk, *Phys. Rev.* B **38**, 2832 (1989).

11. "Anisotropic Cu Knight shift and magnetic susceptibility in the normal state of $YBa_2Cu_3O_7$," M. Takigawa, P.C. Hammel, R.H. Heffner, Z. Fisk, J.L. Smith, and R.B. Schwarz, *Phys. Rev.* B **39**, 300 (1989).

12. "Spin susceptibility in superconducting $YBa_2Cu_3O_7$ from ^{63}Cu Knight shift," by M. Takigawa, P.C. Hammel, R.H. Heffner and Z. Fisk, *Phys. Rev.* B **39**, 7371 (1989).

13. "Anomalous temperature dependence of Cu NMR line width and magnetization in $YBa_2Cu_3O_{7-\delta}$," M. Takigawa, P.C. Hammel, R.H. Heffner, Z. Fisk, J.D. Thompson and M. Maley, *Physica C* **162**–**164**, 175 (1989).

14. "NMR relaxation rates at copper and oxygen sites in $YBa_2Cu_3O_7$," P.C. Hammel, M. Takigawa, R.H. Heffner, Z. Fisk and K.C. Ott, *Physica C* **162**–**164**, 177 (1989).

15. " NMR study of $YBa_2Cu_3O_{7-\delta}$," M. Takigawa, P.C. Hammel, R.H. Heffner, Z. Fisk, K.C. Ott, and J.D. Thompson, *Physica C* **162**–**164**, 853 (1989).

16. "^{17}O NMR study of local spin susceptibility in aligned $YBa_2Cu_3O_7$ powder," M. Takigawa, P.C. Hammel, R.H. Heffner, Z. Fisk, K.C. Ott and J.D. Thompson, *Phys. Rev. Lett.* **63**, 1865 (1989).

17. "Spin dynamics at oxygen sites in $YBa_2Cu_3O_7$," P.C. Hammel, M. Takigawa, R.H. Heffner, Z. Fisk and K.C. Ott, *Phys. Rev. Lett.* **63**, 1992 (1989).

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