

# Alberto G. Rojo

Department of Physics  
Oakland University  
Rochester, MI 48309  
(248)-370-3422  
rojo@oakland.edu

## Education

1990 Ph.D. in Physics, Instituto Balseiro, Argentina  
1985 B.S., Instituto Balseiro, Argentina

## Professional Experience

2007 Jack Williamson Professor of Science and Humanities, Eastern New Mexico University  
2003- Associate Professor, Department of Physics, Oakland University  
1994-2002 Assistant Professor, Department of Physics, University of Michigan  
1992-1993 Post-doctoral Research Associate, University of Chicago  
1990-1992 Post-doctoral Research Associate, University of Tennessee and Oak Ridge National Lab.

## Awards

2004 University of California at Santa Barbara, KITP Scholar  
1999 Argentine Book Fair Award for the essay "Jorge Luis Borges and Quantum Physics"

## External Support

2004 Research Corporation, "Sequential fragmentation and the origin of columnar quasi-hexagonal patterns", \$32,500  
2009 Fundacion para el Desarrollo Tecnologico (Argentina). Travel funds to support a science column in argentinean TV, \$1,000  
1998 General Motors Corporation/DARPA (CoPI with C Uher) "Semiconductors and Intermediate Valence compounds in Thermoelectric Cooling Applications". \$458,712  
1996 National Science Foundation, "Studies of Strongly Disordered Anisotropic Superconductors and Non-Adiabatic Spin-Phonon Effects". \$10,000

## Publications

1. A dimerized Kronig-Penney model, A.Goni, A.G.Rojo and E.N.Martinez, Am. J. Phys **54**, 1018 (1986)
2. Transport in a random conducting-insulating system: a simplified approach, A.G.Rojo, Phys. Rev. A **34**, 651 (1986)
3. Correlation effects in the electronic structure of high Tc superconductors, E.Gagliano, A.G.Rojo, C.Balseiro and B.Alascio, Solid State Comm. **64**, 901 (1987)
4. A green function approximate solution of the Kondo problem, A.S.R.Simoes, J.R.Iglesias, A.G.Rojo and B.Alascio, J. Phys. C **21**, 1941 (1988)
5. Quantum origin of half-flux periodicity in the magnetoresistance of metallic cylinders, H.Pastawski, A.G.Rojo and C.A.Balseiro, Phys. Rev. B **37**, 6246 (1988)

6. Pairing mechanism in high Tc superconductors, C.Balseiro, A.G.Rojo, E.Gagliano, and B.Alascio, Phys. Rev. B (Rapid Comm.) **38**, 9315 (1988)
7. A mechanism for attractive interaction between holes in high Tc superconductors, C.Balseiro, A.G.Rojo, E.Gagliano and B.Alascio, Physica C **153–155**, 1223 (1988)
8. Superconductivity and charge transfer excitations in high Tc superconductors, C.Balseiro, B.Alascio, E.Gagliano and A.G.Rojo, Ann. Phys. Fr. **13**, 415 (1988)
9. Effective-medium approach for the conductivity of dispersed ionic conductors, A.G.Rojo and H.E.Roman, Phys. Rev. B **38**, 3696 (1988)
10. Ordering of oxygen vacancies in Y-Ba-Cu-O, A.A.Aligia, A.G.Rojo and B.Alascio, Phys. Rev. B **38**, 6604 (1988)
11. Ordering of oxygen atoms in Y-Ba-Cu-O, A.A.Aligia, A.G.Rojo and B.Alascio, Proc. of the First Latin Am. Conf. on High Tc. Supercond., (1 LACHTS), World Scientific, p.406
12. Surface impurity in the Hubbard model: a renormalization group study, A.G.Rojo, R.Allub and M.C.Passeggi, Phys. Rev. B **39**, 2685 (1989)
13. Electronic properties of high superconductors, C.Balseiro, M.Avignon, A.G.Rojo and B.Alascio, Phys. Rev. Lett. **62**, 2624 (1989)
14. Oscillatory magnetoconductance of quantum double well channels, A.G.Rojo, N.Kumar and C.Balseiro, Solid State Comm. **70**, 485 (1989)
15. Electronic properties of highly correlated copper oxides, A.G.Rojo, C.Balseiro, M.Avignon and B.Alascio, Current Trends in Condensed Matter Physics, World Scientific, p.101 (1990)
16. Single particle excitations in strong coupling superconductors: a new realization of the t- -J model, A.G.Rojo, J.O.Sofa and C.A.Balseiro, Phys. Rev. B. **42**, 10241 (1990)
17. Flux phases in polarized spin liquids, K.Hallberg, A.G.Rojo and C.A.Balseiro, Phys. Rev. B. (Rapid Comm.) **42**, 4827 (1990)
18. On the electronic structure of high Tc materials and related compounds, A.G.Rojo, C.A.Balseiro, B.Alascio and M.Avignon, "Properties of High Tc superconductors" edited by B.Chakraverty, France, (1990)
19. One hole in the polarized t-J model: dynamical properties, K.Hallberg, A.G.Rojo, and C.Balseiro, Physica B **82** (1991)
20. Dynamics of one hole in the polarized t-J model, K.Hallberg, A.G.Rojo, and C.Balseiro, Phys. Rev. B **43**, 8005 (1991)
21. Ordering of chirality for many planes of anyons, A.G.Rojo and G.S.Canright, Phys. Rev. Lett. **66**, 949 (1991)
22. Antiferromagnetic ordering of symmetry breaking in multiple planes, A.G.Rojo and G.S.Canright, Int. J. Mod. Phys. B **5**, 1565 (1991)
23. Two phases of the Anyon gas and broken T symmetry: some exact results. G.S.Canright and A.G.Rojo, Int. J. Mod. Phys. B **5**, 1553 (1991)
24. On the sign of the coupling between T-violating systems in second order perturbation theory, A.G.Rojo and A.J.Leggett, Phys. Rev. Lett. **67**, 3614 (1991)

25. Some consequences of PT symmetry for optical rotation Experiments, G.S. Canright and A.G.Rojo, Phys. Rev. Lett. **68**, 1601 (1992)
26. Current dependence of the van der Waals interaction, A.G.Rojo and G.D.Mahan, Phys. Rev. Lett. **68**, 2074 (1992)
27. Ellipsometry and broken T symmetry in the high-temperature superconductors, G.S. Canright and A.G.Rojo, Phys. Rev. B **46**, 14078 (1992)
28. On some consequences of PT symmetry for optical rotation experiments, G.S. Canright and A.G.Rojo, Phys. Rev. Lett., (C) **69**, 3133 (1993)
29. Sign of equilibrium Hall conductivity in strongly correlated systems, A.G.Rojo, Gabriel Kotliar and G.S. Canright, Phys. Rev. B (RC) **47**, 9140 (1993)
30. Nonlinear polarizability of correlated one dimensional systems, A.G.Rojo and G.D.Mahan, Phys. Rev. B **47**, 1794 (1993)
31. Model for c-axis transport in high Tc oxides, A.G.Rojo and K. Levin, Phys. Rev. B (RC) **48** 16861 (1993)
32. Hyperpolarization of conjugated polymers, G. D. Mahan and A.G.Rojo, Phys. Rev. B **50**, 2462, (1994)
33. Field theory of the Heisenberg model using a Generalized Wigner-Jordan Transformation, Ana Lopez, A.G.Rojo and Eduardo Fradkin, Phys. Rev. B **49**, 15139 (1994)
34. Tunneling edges at strong disorder, Jonathan Miller and A. G. Rojo, Phys. Rev. B, (RC) **52** 11634 (1995)
35. Faraday rotation and the Hall constant in strongly correlated Fermi systems, Adriana Moreo and A.G.Rojo, Phys. Rev. Lett **74**, 3085 (1995)
36. Two magnon scattering and the spin-phonon interaction beyond the adiabatic approximation, Mathew Reilly and A. G. Rojo, Phys. Rev. B, **53** 6249 (1996)
37. Absence of gap for infinite half-integer spin ladders with an odd number of legs, A. G. Rojo, Phys. Rev. B, **53**, 9172 (1996)
38. Persistent moment of rotating mesoscopic rings and cylinders, A. G. Rojo and R. Merlin, Phys. Rev. B **54**, 1877 (1996)
39. Anomalous dimension and spatial correlations in a point-island model, Ji Li, A. G. Rojo and Leonard Sander, Phys. Rev. Lett. **78** 1747 (1997)
40. Magnetothermal conductivity of LaCa Mn O<sub>3</sub>, B. Chen, A. G. Rojo, C. Uher, H. L. Ju and R. L. Greene, Phys. Rev. B **55**, 14471 (1997)
41. Vacuum squeezing of solids: macroscopic quantum states driven by light pulses, G. A. Garret, A. G. Rojo, A. K. Sood, J. F. Whittaker, and R. Merlin, Science, **275**, 1638 (1997)
42. Localized d-wave superconductors. A. G. Rojo and C. A. Balseiro, J. Phys. C **10**, 7587 (1998)
43. Compresion Optica, mas alla del limite cuantico, Investigacion y Ciencia (Spanish version of Scientific American), page 36, august (1998)
44. Universalities in vortex transport at the melting transition, A. G. Rojo, A. J. Sood and C. A. Balseiro, Solid State Comm. **107**, 401 (1998)

45. Universalities in vortex transport at the melting transition, A. G. Rojo, A. K. Sood and C. A. Balseiro, *Rev. Mex. Phys.* **3**, 49 (1998)
46. Electron drag effects in coupled electron systems, A. G. Rojo, Review article, *J. Phys. Condens. Matter* **11** R31 (1999)
47. Slave fermion theory of confinement in strongly anisotropic systems, A. G. Rojo and C. A. Balseiro, *Phys. Rev. B* **60**, 84 (1999)
48. Effect of disorder on the non-dissipative drag, J. Baker, G. Vignale and A. G. Rojo, *Phys. Rev. B* **60**, 8804 (1999)
49. Talbot oscillations in a one-dimensional condensate, A. G. Rojo, J. Cohen and P. Berman, *Phys. Rev. A* **60**, 1482 (1999)
50. Enhanced vortex damping by eddy currents in superconductor-semiconductor hybrids. M. Danckwerts, A. R. Goni, C. Thomsen, K. Eberl and A. G. Rojo. *Phys. Rev. Lett.* **88**, 3702 (2000)
51. Ground State and Quasiparticle Spectrum of a Two Component Bose-Einstein Condensate, C. P. Search, A. G. Rojo and P. R. Berman, *Phys. Rev. A* **64**, 013615 (2001)
52. Coulomb Drag between One-Dimensional Wigner Crystal Rings, J. Baker and A. G. Rojo, *J. Phys. C* **13**, 5313 (2001)
53. Control of Squeezed States, A. Bloch and A. G. Rojo, Proceeding of the 2000 American Control Conference, (preprint cond-mat/0002345)
54. Instabilities in a two component condensate, A. G. Rojo, *Phys. Rev. A* **64**, 033608-1 (2001)
55. Experiments on vortex damping in novel superconductor-2D-electron-gas hybrid structure. A. R. Goni, M. Danckwerts, C. Thomsen, K. Eberl and A. G. Rojo. *Phys. Stat. Solidi B* **220**, 91 (2000)
56. Vortex viscosity due to Eddy currents in superconductor-semiconductor hybrids, J. Baker and A. G. Rojo, *Phys. Rev. B* **64**, 014513-1 (2001)
57. The origin of columnar quasi-hexagonal patterns: from cornstarch to the Giants Causeway. E. Jagla and A. G. Rojo, *Phys. Rev. E* **65**, 026203 (2002)
58. Control of squeezed phonon and spin states, A. M. Bloch and A. G. Rojo Proc. IFAC. Conf. on Lagrangian and Hamiltonian Methods in Control (2003)
59. Optimally Squeezed Spin States, A. G. Rojo, *Phys. Rev. A* **68**, 013807 (2003)
60. Spin squeezing via atom-cavity field coupling, Claudiu Genes, P. R. Berman and A.G.Rojo, *Phys. Rev. A* **68**, 043809 (2003)
61. Gyroscopically Stabilized Classical and Quantum Oscillators and Heat Baths, A. M. Bloch, P. Hagerly, A. G. Rojo and M. I. Weinstein, *J. Stat. Phys.* **115**, 1073 (2004)
62. Quantum Sub-Riemannian Dynamics, A. M. Bloch, R. Brockett A.G. Rojo, Lecture Notes in Control and Information Sciences, **321**, 15-26 (2004)
63. Hamilton's principle: Why is the Integrated Difference Between Kinetic and Potential Energy Minimized? A.G.Rojo, *American Journal of Physics*, **9**, 831-836(2005)
64. The Pendulum-A Case Study in Physics, A. G. Rojo, *Science* **310**, 1620, (2005) 66. The Garden of Forking Worlds: Borges and Quantum Mechanics, A. G. Rojo, *Oakland University Journal*, **9**, 69 (2005)

65. Einstein, 1905: Fiction Becomes Reality, A. G. Rojo, Oakland University Journal (2006)
66. Tonks-Girardeau Gas in the Presence of a Local Potential, Hao Fu and A. G. Rojo, Phys. Rev. A, **74** 01362 (2006)
67. Quantization of a Non Holonomic System, A. M. Bloch and A. G. Rojo, Phys. Rev. Lett. **101** 030402 (2008)
68. The Parallelometer, a mechanical device to measure curvature, A.G. Rojo and David Garfinkle. Canadian Journal of Physics, **87**, 6, pp. 615-617 (2009)
69. Nonholonomic double-bracket equations and the Gauss thermostat. A. G. Rojo and A. M. Bloch. Phys. Rev. E (Rapid. Comm) **80**, 025601 (2009)
70. Rayleigh scattering revisited, from liquids to solids. A. G. Rojo and P. R Berman. American Journal of Physics **78**, 94 (2010)
71. The rolling sphere and the quantum spin, A. G. Rojo and A. M. Bloch. American Journal of Physics **78**, 1014 (2010)
72. Kinematics of the Rolling Sphere and the Quantum Spin, A. G. Rojo and A. M. Bloch, Communications in Information and Systems, **4** 221, (2010)

## Books

- “La Fisica en la Vida Cotidiana (The Physics of Everyday Life, in Spanish). Siglo XXI Editores (Argentina), 2007. RBA Libros, Barcelona (Spain), 2010
- “Borges e a Mecanica Quantica (Borges and Quantum Mechanics, in Portuguese), Editora Unicamp, University of Campinas (Brazil), 2011
- “The History and Physics of the Principle of Least Action, in collaboration with A. M. Bloch to be published by Cambridge University Press
- “Art and Physics”, Book Chapter in “Arte y Ciencia: Mundos Convergentes, Plaza y Valdez, Madrid, 2010

## Invited Talks at Conferences

- “Electronic structure of High Tc oxides, International Conference on High Tc Superconductivity, Brasilia (Brasil), January 1990.
- “Ordering of chirality for many planes of anyons, Workshop on the Mathematics and Physics of Anyons, Houston, February 1991.
- “Non-dissipative current drag, March Meeting of The American Physical Society, Kansas, 1997.
- “Phonon Squeezing, Fifth International Conference on Squeezed States, Balatonfured, Hungary, May 1997.
- “Non-dissipative current drag, Latin American Solid State Symposium, Oaxaca, Mexico, January 1998.
- “Effect of Disorder on the non-dissipative current drag, International Workshop on Low dimensional systems Scuola Normale, Pisa, Italy, June 1998.
- “Squeezed states in condensates Matter, Sixth International Conference on Squeezed States, Naples, May 1999.

- “Coherence vs. Incoherence on interlayer drag, The First Stag Lindquist Research Conference on The Advancing Frontiers in Condensed Matter Physics, Trieste, Italy, July 1999.
- “Quantum noise in condensed matter, Annual Meeting of The Argentinean Physical Society, Toucan, Argentina, September 1999.
- “Eddy current coupling in hybrid systems, 15th Latin American Symposium on Solid State Physics, Cartagena de Indias, Colombia, November 1999.
- “Electron Drag, Pan American Advance Studies Institute Conference on Physics and Technology at the Nanometer Scale, San Jose, Costa Rica, June 2001.
- “Control of Squeezed States”, SIAM Control Conference, San Diego, July 2001.
- “ Optimally Squeezed Spin States, Frontiers in Condensed Matter, Pennsylvania State University, June 2003
- “Optimally Squeezed Spin States, Frontiers in Magnetism, Bariloche, July 2003
- “Crecimiento y Desarrollo, Ushuaia, Argentina, in the Segundo Encuentro Federal Conocimiento y Desarrollo: un Desafio para la Politica, organized by the Gobierno de la Provincia de Tierra del Fuego, Antartida e Islas del Atlantico Sur Consejo Federal de Inversiones (CFI), May 12, 2005.
- “Einstein 1905: La Ficcion Hecha Ciencia, Feria Internacional del Libro de Buenos Aires, April 28, 2005
- “Creatividad en el Arte y La Ciencia National Hispanic Cultural Center, Albuquerque, New Mexico, Seminario Interamericano sobre Nuevas Tecnologias as en la Educacion Artistica y Cultura organized by the Inter-American Institute for Advance Studies Organization of American States (OAS). March 2006
- “De la Fisica a la Musica Feria Internacional del Libro de Buenos Aires, April 25, 2006.
- “Casualidades y Cusalidades en la Fisica Feria Internacional del Libro de Buenos Aires, April 27, 2006.
- Fisica del Cantautor Universidad Menendez Pelayo, Valencia November 2008.

## Seminars and Colloquia

- “Origin of half flux periodicity on disordered cylinders, Grenoble, France, 1988.
- “Ordering of Oxygen vacancies in high Temperature superconductors, Trieste, 1988.
- “Ordering of chirality for many planes of anyons, University of Tennessee, 1991.
- “Ordering of chirality for many planes of anyons, University of Illinois at Urbana–Champaign April 1991.
- “Electrostatic antiferromagnetism and implications for ordering time reversal breaking in high  $T_c$  superconductors”. AT & T Bell Laboratories, January 1992.
- “Electrostatic antiferromagnetism and implications for ordering time reversal breaking in high  $T_c$  superconductors. Harvard University, January 1992.
- “Ordering time reversal breaking in high  $T_c$  superconductors. The University of Chicago, January 1992.
- “Ordering time reversal breaking in high  $T_c$  superconductors. Indiana University, January 1992.

- Electrostatic antiferromagnetism and implications for ordering time reversal breaking in high  $T_c$  superconductors'. MacMaster University, Ontario, Canada, April 1992.
- Model for c-axis conduction in high  $T_c$  superconductors, The University of Chicago, October 1993.
- "Sign of the Hall effect in strongly correlated systems, University of Michigan, March 1993. 8
- "Random flux and localization, Bariloche, Argentina, June 1994.
- "Superconductor insulator transition in d-wave superconductors, University of Michigan, September 1994.
- "Edge states at strong disorder, Michigan State University, November 1994.
- "Superconductor insulator transition in d-wave superconductors", Ohio State University, February 1995.
- "Superconductor insulator transition in d-wave superconductors, Purdue University, August 1995.
- "Non-dissipative current drag, Colloquium at the University of Missouri, March 1996.
- "Non-dissipative current drag", University of Notre Dame, August 1997.
- "Non-dissipative current drag, Michigan State University, November 1997.
- "Phonon squeezing Bariloche, Argentina, November 1997.
- "Universalities in vortex transport at the melting transition, University of Michigan, April 1998
- "Universalities in vortex transport at the melting transition, Argonne National Lab., April 1998.
- "Universalities in vortex transport at the melting transition, University of Illinois at Urbana, April 1998.
- "Eddy current coupling in superconductor-normal systems, Technische Universitat, Berlin, June 1999.
- "Sequential fragmentation and the origin of quasi-hexagonal patterns, Michigan State University, March 2000.
- "Control of Squeezed States", Wayne State University, February 2002.
- "Squeezing and Quantum Noise", Oakland University, February 2002.
- "Spin Squeezing", Entanglement and Non-extensivity Conference, Rio de Janeiro, December 2002.
- "Borges and Quantum Mechanics, University of Bahia Blanca, July 2003.
- Sequential fragmentation and the origin of quasi-hexagonal patterns, Colloquium at Los Alamos National Laboratory, 10 November 2003.
- "Spin squeezing and quantum Noise American Physical Society Meeting, Montreal, March 2004 (Contributed)
- "Optimal Spin Squeezing, Colloquium at Toledo University, Michigan, February 10, 2005 9
- "Optimal Spin Squeezing, Colloquium at University of Washington, Seattle, February 14, 2005
- Fisica de las Formas, Planetario Galileo Galilei, Buenos Aires, Argentina, May 8, 2005.
- "Borges and Quantum Physics, Saint John s College, April 17, 2007
- "Quantum Non-Holonomic Systems Oakland University, September 20, 2008

- “Quantum Non-Holonomic Systems Indiana University, January 26, 2009

## Miscellaneous

- More than 50 popular science articles published in Argentinean newspapers Critica de Argentina, La Nacion and Pagina 12.
- Weekly columnist on TV program “Manana Vemos” on Canal 7, Argentina, explaining Everyday Physics (2009–2010).
- Creator and host of the TV series “Artistas de la Ciencia” that aired in April 2011 on the Educational station “Encuentro”. Funded by the Argentine Ministry of Education.
- Selected to deliver a public physics lecture in which the Argentine president Cristina Kirchner gave netbooks to high school students as part of the project “Conectar Igualdad”.