

GERALD B. ARNOLD

PROFESSOR

AT NOTRE DAME SINCE 1978

BORN: August 12, 1946

AT: Washington, D.C.

Northwestern University, Evanston, Illinois; 1969; B.S.
UCLA, Los Angeles, California; 1972; M. S.
UCLA, Los Angeles, California; 1977; Ph. D.

NROTC Scholarship; 1965-1969

Teaching Assistant, UCLA, 1972
Research Assistant, UCLA, 1972-1976
Postdoctoral Research Associate, Indiana University, 1976-1978
Instructor, Indiana University, Summer, 1978
Assistant Professor, University of Notre Dame, 1978-1983
Associate Professor, University of Notre Dame, 1983-1990
Professor, University of Notre Dame, 1990-present
Consultant, Naval Research Laboratory, Space Sciences Division, 1990-1992
Fellow, American Association for the Advancement of Science, September 1995

Research Area:

Condensed Matter Theory

Invited Addresses

1. "Theoretical Aspects of the Proximity Effect and Proximity Effect Tunneling," invited talk, Symposium of the Division of Condensed Matter Physics: Proximity Effect Tunneling. March meeting of the American Physical Society, New York, N. Y., March 26, 1980.
2. "Transport in Strong-Coupling Superconductors," invited talk, Midwest Solid State Theory Symposium, Indiana University, Bloomington, Indiana, October 28, 1980.
3. "Superconducting Superlattices," invited talk, Indiana University, Bloomington, Indiana, April 9, 1982.
4. "Proximity Effect Tunneling: Theory and Applications," invited talk, IBM Thomas J. Watson Research Center, Yorktown Heights, N. Y., June 8, 1982.
5. "Proximity Effect Tunneling in Superconducting Superlattices," invited talk, Bell Laboratories, Murray Hill, New Jersey, June 10, 1982.
6. "Bimetallic Superlattices," invited talk, Midwest Solid State Theory Symposium, Michigan State University, East Lansing, Michigan, October 9, 1982.

7. "Beyond the Tunneling Hamiltonian Approximation," invited talk, University of Minnesota, Minneapolis, Minnesota, April 19, 1984.
8. "Superconducting Tunneling Without the Tunneling Hamiltonian," invited talk, Ford Motor Company Research Labs, May 24, 1984.
9. "Theory of Superconductivity in Bimetallic Superlattices," invited talk, International Conference on Superlattices, Microstructures, and Microdevices, August 12-16, 1984.
10. "Layered Superconductors: Quantum Wells for Cooper Pairs," invited talk, Naval Research Laboratory, Washington, D.C., January 10, 1985.
11. "Theory of Superconducting Tunneling Without the Tunneling Hamiltonian," invited talk, Thirty-Fourth Annual Midwest Solid State Conference, St. Louis, Missouri, October 24 and 25, 1986.
12. "The Electron-Phonon Interaction at Interfaces," invited talk, International Workshop on Novel Mechanisms of Superconductivity, Berkeley, California, June 22-26, 1987.
13. "The Superconducting Proximity Effect," invited talk, Naval Research Laboratory, Space Science Division, Washington, DC, January 5, 1990.
14. "Suppression of Antiferromagnetic Order in Two Dimensions," invited talk, 119th TMS Annual Meeting, Anaheim, California, February 18-22, 1990.
15. "Single Electron Charging Effects: Negative Differential Conductance in Tunneling Between Two Mesoscopic Particles," invited talk, Indiana University, Bloomington, Indiana, October 11, 1994.
16. "Negative Differential Conductance in Tunneling Between Small Particles," invited talk, Raymond L. Orbach Symposium, University of California, Riverside, March 18, 1995.
17. "Tunneling Between Small Metal Particles," invited talk, XIX International Workshop on Condensed Matter Theories, Caracas, Venezuela, June 12-17, 1995.
18. "Theories of Josephson Tunneling," invited talk, The CRL International Symposium on Physics and Applications of Mesoscopic Josephson Junctions, Tokyo, Japan, March 6-7, 1997.
19. "Superconducting Proximity Effects in Magnetic Metals," invited talk, Johns-Hopkins University, Baltimore, MD, March 26, 1997.
20. "Superconducting Proximity Effects in Magnetic Metals," invited talk, Midwest Solid State Theory Symposium, 1997.
21. "Superconducting Proximity Effects in Magnetic Metals," invited talk, Iowa State University, 1998.

Dissertations Supervised

1. "Bimetallic Superlattices: Density of States and Superconducting Phase Boundary for Model Systems," Madhu Menon, December 1984.
2. "Inhomogeneous Superconductors in the Presence of the Magnetic Exchange Interaction," Michael J. DeWeert, October 1985.
3. "Theoretical Study of Tunneling Phenomena in Heterostructures and Theory of Pair Impurities in Semiconductors," Gyungock Kim, April 1988.
4. "The Dynamical Susceptibility of Square Lattice Antiferromagnets," Chan-Yun Lee, April 1994.
5. "Macroscopic Quantum Tunneling in One Dimensional Superconductors," Yongmin Chang, April 1994.

Workshops Attended as Participant

1. "Field Theories in Condensed Matter Physics," November 3-5, 1988, Department of Physics and Astronomy, The Johns Hopkins University, Baltimore, MD.

Gerald B. Arnold

List of Scientific Publications in Refereed Journals

1. "Upper Critical Field and Critical Temperature for Superconducting Alloys Described by the Anderson Model," Gerald B. Arnold, Phys. Rev. B10, 105 (1974).
2. "Faraday Rotation of Small Polarons," Gerald B. Arnold, T. Holstein, Phys. Rev. Lett. 33, 1547 (1974).
3. "Phonon Structure on the Tunneling Characteristics of Thin Proximity Effect Sandwiches," P.M. Chaikin, Gerald B. Arnold, P.K. Hansma, J. Low Temp. Phys. 26, 229 (1977).
4. "Theory of Tunneling in Superconductors," Gerald B. Arnold, Phys. Rev. B17, 3576 (1978).
5. "Theory of Thin Proximity Effect Sandwiches," Gerald B. Arnold, Phys. Rev. B18, 1076 (1978).
6. "A Resolution of the Controversy on Tunneling in Nb," Gerald B. Arnold, J. Zasadzinski, E.L. Wolf, Phys. Lett. 69A, 136 (1978).
7. "Quantitative Proximity Tunneling Spectroscopy," E.L. Wolf, J. Zasadzinski, J.W. Osmun, Gerald B. Arnold, Solid State Commun. 31, 321 (1979).
8. "Proximity Electron Tunneling Spectroscopy I: Experiments on Nb," E.L. Wolf, J. Zasadzinski, J.W. Osmun, Gerald B. Arnold, J. Low Temp. Phys. 40, 19 (1980).
9. "Proximity Electron Tunneling Spectroscopy II: Effects of the Induced N Metal Pair Potential on Calculated S Metal Properties," Gerald B. Arnold J. Zasadzinski, J.W. Osmun, E.L. Wolf, R.J. Noer, Gerald B. Arnold, J. Low Temp. Phys. 40, 227 (1980).
10. "Proximity Electron Tunneling Spectroscopy III: Electron-Phonon Coupling in the Nb-Zr System," E.L. Wolf, R.J. Noer, and Gerald B. Arnold, J. Low Temp. Phys. 40, 419 (1980).
11. "The Current Status of Experimental Tunneling Results on Niobium," J. Bostock, M.L.A. MacVicar, Gerald B. Arnold, John Zasadzinski, E.L. Wolf, Superconductivity in d- and f-band metals, eds. Suhl and Maple (Academic Press, New York, 1980) p. 153.
12. "A Proximity Electron Tunneling Study of V and V₃ Ga," J. Zasadzinski, W.K. Schubert, E.L. Wolf, G.B. Arnold, Superconductivity in d- and f-band metals, eds. Suhl and Maple (Academic Press, New York, 1980) p. 159.
13. "Tunneling and the Electron-Phonon-Coupled Superconductivity of Nb₃Sn," W.L. Wolf, J. Zasadzinski, G.B. Arnold, D.F. Moore, J.M. Rowell, M.R. Beasley, Phys. Rev. B22, 1214 (1980).
14. "Inapplicability of the Anderson Theorem to Elastic Scattering in Superconducting Proximity Effect Sandwiches," Gerald B. Arnold. Phys. Lett. 77A, 481 (1980).

15. "Proximity Electron Tunneling Spectroscopy of Ta: Inapplicability of an 'Empirical Model' ," E.L. Wolf, R.J. Noer, D. Burnell, Z.G. Khim, and G.B. Arnold, J. Phys. F11, L23-27 (1981).
16. "Theory of Thin Proximity-Effect Sandwiches II. Effects of S-Wave Elastic Scattering," Gerald B. Arnold, Phys. Rev. B23, 1171 (1981).
17. "Influence of Transport Corrections on the Infrared Absorption in Superconductors," Gerald B. Arnold and James C. Swihart, Solid State Commun. 37, 303 (1981).
18. "Higher-Order Effects in Hopping-Type Transport of Small Polarons," G.B. Arnold and T. Holstein, Annals of Physics 132, 163-211 (1981).
19. "Vertex Corrections in Infrared Absorption in Superconducting and Normal Metals," J.C. Swihart and G.B. Arnold, Physica B+C 107, 723 (1981).
20. "Origin of Anomalous Mass Renormalizations Inferred from Proximity Tunneling Experiments," S. Shih, Z.G. Khim, G.B. Arnold, and W.J. Tomasch, Phys. Rev. B24, 6440 (1981).
21. "The Local Phonon Density of States and Its Influence on Superconducting Properties," G.B. Arnold and M. Menon, J. Phys (Paris) C6, Supp. 12, 337 (1981).
22. "Locality of Information Obtained from Proximity-Electron Tunneling Spectroscopy," G.B. Arnold and E.L. Wolf, Phys. Rev. B25, 1541 (1982).
23. "Superconducting Tunneling Study of Vanadium," J. Zasadzinski, D.M. Burnell, E.L. Wolf, and G.B. Arnold, Phys. Rev. B25, 1622 (1982).
24. "Tunneling Evidence of Paramagnon Suppression of Superconductivity in Transition Metals," D.M. Burnell, John Zasadzinski, R.J. Noer, E.L. Wolf, and G.B. Arnold, Solid State Commun. 41, 637 (1982).
25. "Transmission Coefficient of a Metal-Metal Interface in the Tightbinding Model," Gerald B. Arnold, Phys. Rev. B25, 5998 (1982).
26. "Proximity Electron Tunneling Spectroscopy," E.L. Wolf and G.B. Arnold, Physics Reports 91, 31-102 (1982).
27. "Calculation of the Tunneling Density of States for a Superconducting Nb/Ta Superlattice," G.B. Arnold, W.J. Gallagher, and E.L. Wolf, Superconductivity in d- and f-band Metals - Kernforschungszentrum, Karlsruhe 305-309 (1982).
28. "Model Calculations of Local Electron and Phonon Densities of States in Bimetallic Superlattices," M. Menon and G.B. Arnold, Phys. Rev. B27, 5800 (1983).
29. "Theory of Proximity Effect Sandwiches with Magnetic Impurities," M.J. DeWeert and G.B. Arnold, Phys. Rev. B30, 5048 (1984).

30. "Tunneling observation of vortex nucleation in parallel fields," H.-J. Tao, E.L. Wolf, G.B. Arnold, pg. 849, LT-17, eds. Eckern, Schmid, Weber, Wuhl (Elsevier Science Publishers B.V., 1984).
31. "Tunneling in Ta surface layers on Nb," S.T. Ruggiero, G.B. Arnold, E. Track, D.E. Prober, pg. 847, LT-17, eds. Eckern, Schmid, Weber, Wuhl (Elsevier Science Publishers B.V., 1984).
32. "Critical Current Behavior and Oxide Barrier Properties of Ta Surface Layers on Nb," S.T. Ruggiero, G.B. Arnold, E. Track, and D.E. Prober, IEEE Transactions on Magnetics, Vol. MAG-21, 850 (1985).
33. "Superconducting Tunneling Without the Tunneling Hamiltonian," G.B. Arnold, J. Low Temp. Phys. 59, 143-183 (1985).
34. "Electronic Density of States at the Surface of a Superconductor in Contact with a Magnetic Insulator," F. Stageberg, R. Cantor, A.M. Goldman, G.B. Arnold, Phys. Rev. 3292 (1985).
35. "The Superconducting Phase Boundary of Bimetallic Superlattices," M. Menon and G.B. Arnold, Superlattices and Microstructures 1, 451-462 (1985).
36. "Superconducting-Quasiparticle Interface States," M.J. DeWeert and Gerald B. Arnold, Phys. Rev. Lett. 55, 1522 (1985).
37. "Quasiparticle Tunneling Through Rare Earth Trihydroxide Barriers," F.E. Stageberg, R. Cantor, A.M. Goldman, and G.B. Arnold, J. Low Temp. Phys. 60, 437 (1985).
38. "Tunneling through rare earth trihydroxide barriers," F.E. Stageberg, R. Cantor, A.M. Goldman, G.B. Arnold, Physics B&C 135B+C 224-226 (1985).
39. "Electron Tunneling in Tantalum Surface Layers on Niobium," S.T. Ruggiero, E.K. Track, D.E. Prober, G.B. Arnold, and M.J. DeWeert, Phys. Rev. B34, 217 (1986).
40. "Superconducting Tunneling Without the Tunneling Hamiltonian II. Subgap Harmonic Structure," Gerald B. Arnold, J. Low Temp. Phys. 68, 1-27 (1987).
41. "Internations at Interfaces in Layered Systems," Novel Superconductivity Proceedings of the International Workshop on Novel Mechanisms of Superconductivity, Berkeley, California, 22-26 June, 1987, 323-331 (Plenum, 1987).
42. "Theoretical Study of the Influence of Quantum Size Effects and Tunnel Barrier Structure on the Tunneling Current in Metal/Semiconductor/Metal Junctions," G. Kim and G.B. Arnold, Phys. Rev. B38, 3241 (1988).
43. "Theoretical Study of Tunneling Phenomena in Double-Barrier Quantum Well Heterostructures," G. Kim and G.B. Arnold, Phys. Rev. B38, 3252 (1988).
44. "Short-range correlations in magnetic systems: effective cluster approach," G.J. Mata, G.B. Arnold, Phys. Rev. B39, 252 (1989).

45. "Angle dependence of the Upper Critical Field of Superconducting Superlattices," Joseph P. Estrera and Gerald B. Arnold, Phys. Rev. B39, 2094 (1989).
46. "Theory of Superconducting Quasiparticle Interface States," M.J. DeWeert and G.B. Arnold, Phys. Rev. B39, 11307-11319 (1989).
47. "Energy gap, dynamic correlations, and correlation length in two-dimensional antiferromagnets," G.J. Mata and G.B. Arnold, Phys. Rev. B39, 9768-9771 (1989).
48. "Evidence for long-range order in the Heisenberg antiferromagnet on a triangular lattice," G.B. Arnold and G.J. Mata, Phys. Rev. B42, 8638-8639 (1990).
49. "Bosonic mechanism for high temperature superconductors," F.M. Mueller, G.B. Arnold, and J.D. Swihart, in *High Temperature Superconductivity: Physical Properties, Microscopic Theory, and Mechanisms*, edited by J. Ashkenazi, S.E. Barnes, F. Zuo, G.C. Vezzoli, and B.M. Klein (Plenum, New York, 1991), 417-424.
50. "Angle-Resolved Photoemission as a Probe of α^2F in High-Temperature Superconductors: A Study of $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$," G.B. Arnold, F.M. Mueller, and J.C. Swihart, 2569-2572 (1991).
51. "Boson Linewidth in high-temperature superconductors," James C. Swihart, William H. Butler, Fred M. Mueller, and Gerald B. Arnold, Phys. Rev. B46, 5861-5863 (1992).
52. "A functional integral approach to quantum spin systems," G.J. Mata, G.B. Arnold, Journal of Magnetism and Magnetic Materials 104-107, 855-856 (1992).
53. "Retardation effects at low doping in the spin-bag mechanism of high- T_c superconductivity," Harold Steinacker and G.B. Arnold, Phys. Rev. B46, 3581-3599 (1992).
54. "Observation of Multiple Andreev Reflections in Superconducting Tunnel Junctions," A.W. Kleinsasser, R.E. Miller, W.H. Mallison, G.B. Arnold, Phys. Rev. Lett. 72, 1738-1741 (1993).
55. "Green's-function approach to the electronic structure of double-barrier quantum-well heterostructures," Gyungock Kim, Young-Wan Choi, Pyoung Woon Park, Hye Yong Chu, El-Hang Lee, and Gerald B. Arnold, Phys. Rev. B50, 7582-7586 (1994).
56. "Electrical characterization of Nb/Al-oxide/Nb Josephson junctions with high critical current densities," A.W. Kleinsasser, W.H. Mallison, R.E. Miller, G.B. Arnold, IEEE Transactions on Applied Superconductivity, 5, 2735-2738 (1995).
57. "Superconducting Proximity Effects in Magnetic Metals," E.A. Demler, G.B. Arnold, and M.R. Beasley, Phys. Rev. B55, 15174 (1997).
58. "Proximity Effect and Josephson Coupling in the $\text{SO}(5)$ Theory of High- T_c Superconductivity," E.A. Demler, A.J. Berlinsky, C. Kallin, G.B. Arnold, M.R. Beasley, and S.C. Zhang, Phys. Rev. Lett. 80, 2917 (1998).

59. "Experimental tests of the SO(5) theory of high temperature superconductivity," A.J. Berlinsky, G.B. Arnold, D. Arovas, M. Beasley, C. Kallin, E. Demler, *J. Phys. Chem. Solids* **59**, 1794-1797 (1998).
60. "Coherent versus incoherent c-axis Josephson tunneling between layered superconductors," R.A. Klemm and G.B. Arnold, *Phys. Rev. B* **58**, 14203-14206 (1998).
61. "Theories of Josephson Junctions without the Tunneling Hamiltonian," G.B. Arnold, *The CRL International Symposium, Physics and Applications of Mesoscopic Josephson Junctions*, 39-53 (1999) ed. Hiroshi Ohta, Chikara Ishii (The Physical Society of Japan).
62. "c-Axis Twist $Bi_2Sr_2CaCu_2O_{8+\delta}$ Josephson Junctions: A New Phase-Sensitive Test of Order Parameter Symmetry," Richard A. Klemm, Gerald Arnold, Andreas Bille, Carsten T. Rieck, and Kurt Scharnberg, *International Journal of Modern Physics B* **13**, (29-31), 3449-3454 (1999).
63. " $Bi_2Sr_2CaCu_2O_{8+\delta}$ c-axis twist Josephson junctions: a new phase-sensitive test of order parameter symmetry," R.A. Klemm, A. Bille, C.T. Rieck, K. Scharnberg, G. Arnold, *J. Low Temp Phys.* **117** (3/4), 509-513 (1999).
64. "Theory of coherent c-Axis Josephson tunneling between layered superconductors," G.B. Arnold, R.A. Klemm, *Phys. Rev. B* **62**, 661-670 (2000).
65. "Josephson (001) tilt grain boundary junctions of high temperature superconductors," G.B. Arnold and R.A. Klemm, *Philosophical Magazine* **86**, 2811-2833 (2006).