

CURRICULUM VITAE

NAME: Michael A. Morrison
Date of Birth: April 5, 1949
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EDUCATION:

1971 B.S. (Summa Cum Laude) Rice University, Houston, Texas
1974 M.A. Rice University
1977 Ph.D. Rice University

PROFESSIONAL EXPERIENCE:

April 1993–present	David Ross Boyd Professor, University of Oklahoma
Fall 1999–Fall 2004	Presidential Professor, University of Oklahoma
May 1991–July 1992	Visiting Fellow, Joint Institute For Laboratory Astrophysics
July 1991–April 1993	Professor of Physics & General Education, Univ. of Oklahoma
July 1991–present	Adjunct Professor of English, University of Oklahoma
June 1988–June 1989	Faculty Administrative Fellow (Office of the Provost)
July 1986–June 1991	Professor of Physics, University of Oklahoma
Summer 1986	Visiting Scientist, Joint Institute For Laboratory Astrophysics
July 1981–June 1986	Associate Professor, University of Oklahoma
August 1977–June 1981	Assistant Professor, University of Oklahoma
Summers 1979, 1982, 1984, 1989	Visiting Research Fellow, Australian National University
June 1976–July 1977	Postdoctoral Fellow, Los Alamos Scientific Laboratory

ADDITIONAL AFFILIATIONS:

January 1983–August 1995	Member, Editorial Board <i>Australian Journal of Physics</i>
August 1977–present	Visiting Staff Member, Los Alamos National Lab
August 1999–present	Member, Executive Advisory Committee, Research Corporation

PROFESSIONAL SOCIETY MEMBERSHIPS:

American Association of Physics Teachers
Sigma Xi
American Physical Society (elected Fellow: November 1987)
Phi Beta Kappa (elected 1970)
Institute of Physics
Sigma Pi Sigma (elected 1970)
Division of Atomic, Molecular, and Optical Physics of the A. P. S.

HONORS AND FELLOWSHIPS:

OU Presidential Professorship (1999)
Oklahoma Medal for Excellence in Teaching (1997)
Selected for *American Men & Women of Science* (1997)
Fulbright Senior Scholar Grant (1996)
David Ross Boyd Professorship (1993)
Fred Jones Foundation Master Teaching Award (April, 1989)
Fellow of the American Physical Society (elected: November, 1987)
University of Oklahoma Regent's Award for Excellence in Teaching (1984)
University of Oklahoma Associate's Distinguished Lectureship (1984 and 1987)
Sigma Xi Research Award (1982)
NSF Energy-Related Postdoctoral Fellowship (1976–1977)

PUBLICATIONS

BOOKS

Michael A. Morrison, Thomas L. Estle and Neal F. Lane, *Quantum States of Atoms, Molecules and Solids* (Prentice-Hall Inc., Englewood Cliffs NJ, 1977) 575pp.

Michael A. Morrison, *Understanding Quantum Physics: A User's Manual* (Prentice-Hall Inc., Englewood Cliffs, NJ, 1990) 668pp.

Michael A. Morrison, Thomas L. Estle and Neal F. Lane, *Understanding More Quantum Physics (Preliminary Edition)* (Prentice-Hall Inc., Englewood Cliffs NJ, 1991) 264pp.

Tony Magistrale and Michael A. Morrison, *A Dark Night's Dreaming: Contemporary American Gothic Fiction*. (Charleston, SC: University of South Carolina Press, January 1997).

Michael A. Morrison, *Trajectories of the Fantastic* (Westport, CN: Greenwood Press, 1998).

Michael A. Morrison, *The Joy of Quantum Physics: A Second User's Manual* (2007).

Michael A. Morrison, R. E. Robson, and R. D. White, *Low-energy Charged Particles in Atomic and Molecular Gases* (Princeton University Press).

REFEREED RESEARCH PAPERS

Michael A. Morrison, L. A. Collins and P. L. Donoho, "Advanced Undergraduate Laboratory Experiment in Electron Spin Resonance in Single-Crystal Ruby," *Amer. J. Phys.* **42**, 560 (1974).

Michael A. Morrison and N. F. Lane, "Pseudo-Bound-State Study of Low-Energy Electron-Molecule Collisions: Elastic e-H₂ Scattering," *Phys. Rev. A* **12**, 2361 (1975).

Michael A. Morrison, L. A. Collins and N. F. Lane, "Theoretical Study of Low-Energy Electron-CO₂ Scattering," *Chem. Phys. Lett.* **42**, 356 (1976).

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Michael A. Morrison and N. F. Lane, "A Theoretical Calculation of Cross Sections for Rotational Excitation in e-CO₂ Scattering," *Phys. Rev. A* **16**, 975 (1977).

Michael A. Morrison and B. I. Schneider, "Electron-Molecule Scattering Theory: An R-Matrix Study of Low-Energy Elastic e-N₂ Collisions in the Static-Exchange Approximation," *Phys. Rev. A* **16**, 1003 (1977).

D. C. Cartwright, Michael A. Morrison and G. Csanak, "The Application of First-Order Many-Body Theory to the Excitation of Spin-Degenerate Targets," *Supp. de Ciencia e Cultra (Brazil)* **29**, 7 (1977).

Michael A. Morrison and A. E. Greene, "Electron Cooling by Excitation of CO₂," *J. Geophys. Res.* **83**, 1172 (1978).

Michael A. Morrison and L. A. Collins, "Exchange in Low-Energy Electron-Molecule Scattering: Free-Electron-Gas Model Exchange Potentials and Applications to e-H₂ and e-N₂ Collisions," *Phys. Rev. A* **17**, 918 (1978).

- Michael A. Morrison and P. J. Hay, "Ab-Initio Static Polarizabilities of N₂ and CO₂ in the Hartree-Fock Approximation: Variation with Internuclear Separation," *J. Phys. B* **10**, L647 (1977).
- L. A. Collins, W. D. Robb and Michael A. Morrison, "Low-Energy Electron Scattering by H₂ and N₂: An Iterative Static-Exchange Calculation," *J. Phys. B* **11**, L777 (1978).
- Michael A. Morrison and P. J. Hay, "Molecular Properties of N₂ and CO₂ as Functions of Nuclear Geometry: Polarizabilities, Quadrupole Moments and Dipole Moments," *J. Chem. Phys.* **70**, 4034 (1979).
- Michael A. Morrison and P. J. Hay, "Initio Adiabatic Polarization Potentials for Low-Energy Electron-Molecule and Positron-Molecule Collisions: the e-N₂ and e-CO₂ Systems," *Phys. Rev. A* **20**, 740 (1979).
- Michael A. Morrison and N. F. Lane, "Threshold Structure in the Vibrational Excitation of CO₂ by Low-Energy Electrons," *Chem. Phys. Lett.* **66**, 527 (1979).
- L. A. Collins, W. D. Robb and Michael A. Morrison, "Electron Scattering by Diatomic Molecules: Iterative Static-Exchange Techniques," *Phys. Rev. A* **21**, 488 (1980).
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- T. L. Gibson and Michael A. Morrison, "Comparison of Model Exchange Potentials for Low-Energy e-H₂ Collisions," *J. Phys. B* **14**, 727 (1981).
- John R. Rumble, Donald G. Truhlar, and Michael A. Morrison, "Calculation of Vibrational Excitation of N₂ by Electron Impact at 5–50 eV Using Extended-Basis-Set Hartree-Fock Wavefunctions," *J. Phys. B* **14**, L301 (1981).
- Andrew N. Feldt and Michael A. Morrison, "Breakdown of the Adiabatic-Nuclear-Rotation Approximation for Near-Threshold e-H₂ Collisions," *J. Phys. B* **15**, 301 (1982).
- Michael A. Morrison, "Interpretation of the Near-Threshold Behavior of Cross Sections for e-CO₂ Scattering," *Phys. Rev. A* **25**, 1445 (1982).
- T. L. Gibson and Michael A. Morrison, "A Parameter-Free Non-Adiabatic Polarization Potential for Low-Energy e-H₂ Collisions," *J. Phys. B* **15**, L221 (1982).
- R. W. Crompton and Michael A. Morrison, "On the Possibility of Ramsauer-Townsend Minima in e-H₂ and e-N₂ Scattering," *Phys. Rev. A* **26**, 3695 (1982).
- L. A. Collins and Michael A. Morrison, "Exchange in e-CO₂ Collisions," *Phys. Rev. A* **25**, 1764 (1982).
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- J. R. Rumble, D. G. Truhlar, and Michael A. Morrison, "State-to-State Differential Cross Sections for Vibrational-Rotational Excitation and Elastic Scattering of Electrons by N₂ at 5-50eV: Calculations Using Extended-Basis-Set Hartree-Fock Wavefunctions," *J. Chem. Phys.* **79**, 1846 (1983).
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- Michael A. Morrison, T. L. Gibson, and D. M. Austin, "Polarization Potentials for Positron-Molecule Collisions: Positron-H₂ Scattering," *J. Phys. B* **17**, 2725 (1984).
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- Weiguo Sun, Michael A. Morrison, William A. Isaacs, Wayne K. Trail, Dean T. Alle, R. J. Gulley, Michael J. Brennan, and Stephen J. Buckman, "A Detailed Theoretical and Experimental Analysis of Low Energy Electron-N₂ Scattering," *Phys. Rev. A* **52**, 1229 (1995).
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- Michael A. Morrison, Weiguo Sun, William A. Isaacs, and Wayne K. Trail, "Ultra-simple Calculation of Very-Low-Energy Momentum Transfer and Rotational Excitation Cross Sections: e-N₂ Scattering," *Phys. Rev. A* **55**, 2786 (1997).
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- Stephane Mazevet, Michael A. Morrison, and R. K. Nesbet, "Application of the Non-adiabatic Phase Matrix Method to Vibrational Excitation near a Short-Lived Resonance: The Case of e-H₂ Scattering," *J. Phys. B* **31**, 4437-4448 (1998).
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- Neil E. Shafer-Ray, Michael A. Morrison, and Gregory A. Parker, "A classical ensemble model of three-body collisions in the point contact approximation and application to alignment effects in near-resonant energy transfer collisions of He atoms with Rydberg Ca atoms," *J. Chem. Phys.* **113**, 4274–4289 (2000).
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- Eric G. Layton and Michael A. Morrison, "Semiclassical Theory of Alignment Effects in Near-Resonant Energy Transfer Collisions of Rare-Gas Atoms with Aligned Rydberg Atoms," *Phys. Rev. A* **63**, 052711 (2001).
- Stephane Mazevet, Michael A Morrison, Lesley A. Morgan, and Robert K. Nesbet, "Virtual state effects in elastic scattering and vibrational excitation of CO₂ by electron impact," *Phys. Rev. A* **64**, 040701 (2001).
- Robert K. Nesbet, Stephane Mazevet, and Michael A Morrison, "Procedure for correcting variational R-matrix calculations for polarization response," *Phys. Rev. A* **64**, 034702 (2001).
- R. D. White, Michael A. Morrison, and B. A. Mason, "On the Use of Classical Transport Analysis to Determine Cross Sections for Low-energy e–H₂ Vibrational Excitation," *J. Phys. B* **35**, 605–626 (2002).
- R. E. Robson, R. D. White, and Michael A. Morrison, "Some fundamental questions concerning the kinetic theory of electrons in molecular gases and the e–H₂ vibrational cross section controversy" *J. Phys. B* **36**, 4127–4143 (2003).
- R. D. White, R. E. Robson, B. Schmidt, and Michael A. Morrison, "Is the Classical Two-term Approximation of Electron Kinetic Energy Satisfactory for Swarms and Plasmas?" *J. Phys. D* **36**, 3125–3131 (2003).
- Hao Feng, Weiguo Sun, and Michael A. Morrison, "A parameter-free nonadiabatic correlation-polarization potential for vibrational excitation in electron-molecule scattering: Application to e–N₂ collisions" *Phys. Rev. A* **68**, 062709 (2003).
- Djamal Rabli and Michael A. Morrison, "The importance of non-resonant scattering in low-energy dissociative electron attachment to molecular hydrogen," *Phys. Rev. Lett.* **97**, 013201 (2006).
- Thushari Jayasekera, Niti Goel, Michael A. Morrison, and Kieran Mullen, "Theoretical calculation of magneto-transport properties in semiconductor devices and comparison to experimental data," *Physica E* **24**, 584 (2006).
- Michael A. Morrison and Andrew N. Feldt, "Through Scattering Theory with Gun and Camera: Coping with Conventions in Collision Theory," accepted for publication in *American Journal of Physics* (2006).
- Bryan J. Bichsel, Michael A. Morrison, Neil Shafer-Ray and E. R. I. Abraham, "Experimental and theoretical investigation of the Stark effect for trapping cold molecules: application to nitric oxide," submitted for publication in *Physical Review A* (2006)
- Thushari Jayasekera, Michael A. Morrison and Kieran Mullen, "Evaporative Cooling of Electrons in Semiconductor Devices," submitted for publication in *Physical Review B* (2006).
- Djamal Rabli, and Michael A. Morrison, "Differential cross sections for dissociative attachment in low-energy e–H₂ scattering," to be submitted to *Physical Review A* (2006).

Thushari Jayasekera, Michael A. Morrison and Kieran Mullen, “R-matrix theory for two-dimensional quantum devices,” *Physical Review B* (2006).

Djamal Rabli, Michael A. Morrison, and R. K. Nesbet, “Dissociative attachment in electron-molecule collisions: Application of the nonadiabatic phase matrix method to low-energy e-H₂ scattering,” to be submitted to *Physical Review A* (2006).

Djamal Rabli, Michael A. Morrison, and R. K. Nesbet, “An improved spline-delta method for solving the Bloch eigenvalue equation of R-matrix theory,” to be submitted to *Journal of Physics B* (2006).

R. D. White, R. E. Robson, and Michael A. Morrison, “Boltzmann equation treatment of Pauli-blocking effects for electrons in neutral gases.”

REVIEWS

Michael A. Morrison, “The Physics of Low-energy Electron-Molecule Collisions: A Guide for the Perplexed and Uninitiated,” *Aust. J. Phys.* **36**, 239–86 (1983).

Michael A. Morrison “Near-threshold Electron-Molecule Scattering,” *Adv. At. Mol. Phys.* **24**, 51–156 (1988).

Michael A. Morrison and Weiguo Sun, “How to Calculate Rotational and Vibrational Cross Sections for Low and Very-low Energy Electron Scattering from Diatomic Molecules Using Close-coupling Techniques,” in *Computational Methods of Electron-Molecule Scattering Theory*, ed. by W. Huo and F. Gianturco (New York: Plenum, 1995), Chap. 6., pp. 131–190.

BOOK CHAPTERS

Michael A. Morrison, “The Coupled-Channels Integral-Equations Method in the Theory of Low-Energy Electron-Molecule Scattering,” in *Electron- and Photon-Molecule Collisions*, ed. by T. N. Rescigno, B. V. McKoy and B. I. Schneider (New York: Plenum Press, 1979), p 15ff.

Michael A. Morrison, “Perspectives on Polarization in Positron-Molecule Collisions,” in *Positron (Electron)-Gas Scattering*, ed. by W. E. Kaupilla, T. S. Stein, and J. M. Wadehra (Singapore: World Scientific Publishing Co., 1986).

R. W. Crompton and Michael A. Morrison “Threshold Rotational and Vibrational Excitation of H₂ by Electron Impact: Theory and Experiment,” in *Swarm Studies and Inelastic Electron-Molecule Collisions*, ed. by L. C. Pitchford, B. V. McKoy, A. Chutjian, and S. Trajmar (New York: Springer-Verlag, 1986), pp 43–166.

INVITED TALKS

Michael A. Morrison, “The Coupled-Channels Integral-Equations Method in the Theory of Low-Energy Electron-Molecule Scattering,” Electron- and Photon-Molecule Collisions Workshop (Pacific Grove, California, August 1-4, 1978).

Michael A. Morrison, “Recent Advances in Electron-Molecule Collision Theory and Applications: Coupled-Channel and Model Potential Methods,” Eleventh Annual Meeting of the Division of Electron and Atomic Physics (December 1979), *Bull. Am. Phys. Soc.* **24**, 1184 (1979).

Michael A. Morrison, "An Overview of Theoretical Techniques for the Calculation of Continuum States in Electron-Molecule Scattering," 1983 Gordon Conference on Atomic Physics, New London, New Hampshire, July 4–8, 1983.

Michael A. Morrison, "Perspectives on Polarization in Positron-Molecule Collisions," Third International Workshop on Positron (Electron)-Gas Scattering, Wayne State University, Detroit, Michigan, July 16–18, 1985.

Michael A. Morrison, "Threshold Rotational and Vibrational Excitation of H₂ by Electron Impact: Theory," Joint Symposium on Swarm Studies and Inelastic Electron-Molecule Collisions of the XIVth International Conference on the Physics of Electron and Atomic Collisions, Tahoe City, California, July 19–23, 1985.

Michael A. Morrison, "Variations on an Enigma: Theory and Experiment Tackle Electron-Molecule Scattering," 1992 Annual Meeting of the Division of Molecular, Atomic, and Optical Physics (20–22 May 1992, Chicago, Illinois); *Bull. Am. Phys. Soc.* **37**, 1086 (1992).

Michael A. Morrison, "The ANU/OU Electron-Molecule Project: The First Twenty (!) Years," 1996 Meeting of the Australian Academy of Sciences and the Australian Institute of Physics Honoring Professor Robert W. Crompton (14 June, 1996).

Michael A. Morrison, "A Theoretical Methodology for Studying Near-Threshold Vibrational and Rotational Excitation in Molecules," Research Workshop on Electron Interactions with Atoms and Molecules (Australian National University, 12 June–28 June, 1996).

FUNDED RESEARCH PROPOSALS

Research Corporation, "Theoretical Explorations of Low-Energy Electron and Positron Scattering," November, 1978–1980.

Department of Energy, "Experimental and Theoretical Study of Very-low-energy Inelastic Processes in Electron-Molecule Collisions," (co-P. I. with D. E. Golden), May, 1979–June, 1984.

Department of Energy: "New Theoretical Methods for Near-Threshold Electron-Molecule Collision Studies," July, 1984–May, 1985.

National Science Foundation: "Experimental/Theoretical Investigation of Low energy Electron Scattering Processes," (Joint U. S. Australia Cooperative Science Program), May, 1983–October 1984.

National Science Foundation: "Theoretical Study of Near-Threshold Electron-Molecule Collisions," June, 1985–July 1988.

National Science Foundation: "Low-Energy Vibrational Excitation of Molecules by Electron Impact," July 1988–August 1991.

National Science Foundation: "Low-Energy Vibrational Excitation of Molecules by Electron Impact," July 1991–August 1994.

National Science Foundation: "Scattering Processes Involving Low-Energy Electrons," August 1994–July 1997.

National Science Foundation: "Scattering Processes Involving Low-Energy Electrons," August 1997–July 2000.

National Science Foundation: "Quantum Scattering Processes Involving Low-Energy Electrons," July 2000–June 2004.

National Science Foundation: "Effects of Molecular Vibration and Electron Correlation in the Quantum Theory of Dissociative Attachment and the Kinetic Theory of Electron Swarms," July 2004–June 2006.

ABSTRACTS AND PROCEEDINGS

Michael A. Morrison and N. F. Lane, "Electron-Molecule Scattering Studies Using Standard Bound-State Procedures," Fifth Annual Meeting of the Division of Electron and Atomic Physics (December 1973), *Bull. Am. Phys. Soc.* **18**, 1530 (1973).

Michael A. Morrison and N. F. Lane, "Vibrational and Rotational Excitation of CO₂ by Low-Energy Electrons," Twenty-Seventh Annual Gaseous Electronics Conference (October 1974), *Bull. Am. Phys. Soc.* **20**, 240 (1974).

Michael A. Morrison, J. A. Haggard and N. F. Lane, "Bound-State Approach to Electron-H₂ Scattering: Vibrational Excitation," Sixth Annual Meeting of the Division of Electron and Atomic Physics (December 1974), *Bull. Am. Phys. Soc.* **19**, 1186 (1974).

Michael A. Morrison, L. A. Collins and N. F. Lane, "Low-energy Scattering of Electrons by Triatomic Molecules," Seventh Annual Meeting of the Division of Electron and Atomic Physics (December 1975), *Bull. Am. Phys. Soc.* **20**, 1470 (1975).

Michael A. Morrison, L. A. Collins and N. F. Lane, "A Coupled-Channels Calculation of Low-Energy e-CO₂ Scattering Cross Sections," Abstracts of the Fifth International Conference on Atomic Physics, R. Marrus, M. H. Prior and H. A. Shugart (eds.), 80, (1976).

Michael A. Morrison, L. A. Collins and N. F. Lane, "Theory of Low-Energy Electron-Molecule Collisions: A Comparison of Electron-CO₂ and Electron-N₂ Elastic and Rotational-Excitation Cross Sections," Abstracts of the Tenth International Conference of the Physics of Electronic and Atomic Collisions (Commissariat à l'Énergie Atomique: Paris, 1976), 478.

Michael A. Morrison, B. I. Schneider and P. J. Hay, "Recent Applications of the *R*-Matrix Method to Problems in Low-Energy Electron-Diatomic-Molecule Scattering," Abstracts of the Tenth International Conference on the Physics of Electronic and Atomic Collisions (Commissariat à l'Énergie Atomique: Paris, 1976), 494.

B. I. Schneider, Michael A. Morrison and P. J. Hay, "Elastic and Inelastic Scattering of Electrons from H₂ in the *R*-Matrix Method," Eighth Annual Meeting of the Division of Electron and Atomic Physics (December 1976), *Bull. Am. Phys. Soc.* **21**, 1257 (1976).

L. A. Collins and Michael A. Morrison, "Low-Energy e-N₂ Scattering," Eighth Annual Meeting of the Division of Electron and Atomic Physics (December 1976), *Bull. Am. Phys. Soc.* **21**, 1257 (1976).

Michael A. Morrison and N. F. Lane, "Coupled-Channel Calculation of Rotational Excitation Cross Sections for Low-Energy e-CO₂ Collisions," Eighth Annual Meeting of the Division of Electron and Atomic Physics (December 1976), *Bull. Am. Phys. Soc.* **21**, 1257 (1976).

Michael A. Morrison and B. I. Schneider, "Static-Exchange Calculations of e-N₂ Scattering in the *R*-Matrix Method," Eighth Annual Meeting of the Division of Electron and Atomic Physics (December 1976), *Bull. Am. Phys. Soc.* **21**, 1258 (1976).

Michael A. Morrison and L. A. Collins, "Ab-Initio Polarization Potentials for e-N₂ and e-CO₂ Scattering," Ninth Annual Meeting of the Division of Electron and Atomic Physics (December 1977), *Bull. Am. Phys. Soc.* **22**, 1331 (1977).

Michael A. Morrison and N. F. Lane, "Vibrational Excitation in e-CO₂ Collisions," Tenth Annual Meeting of the Division of Electron and Atomic Physics (December 1978), *Bull. Am. Phys. Soc.* **23**, 1082 (1978).

L. A. Collins, W. D. Robb and Michael A. Morrison, "Low-Energy e⁻-Diatomic Molecule Scattering: An Exact Static-Exchange Close-Coupling Method," Tenth Annual Meeting of the Division of Electron and Atomic Physics (December 1978), *Bull. Am. Phys. Soc.* **23**, 1082 (1978).

J. R. Rumble, Jr., D. G. Truhlar and Michael A. Morrison, "Low-Energy Electron Scattering by N₂," Tenth Annual Meeting of the Division of Electron and Atomic Physics (December 1978), *Bull. Am. Phys. Soc.* **23**, 1082 (1978).

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