

Michael E. Goggin, Ph.D.
Physics Department
Truman State University
Kirksville, MO 63501
phone: (660)785-4410, e-mail: mgoggin@truman.edu

EDUCATION

Ph.D. 1988, University of Arkansas, Fayetteville, AR Major: Physics
Primary Subfields: Nonlinear Dynamics, Quantum Optics
B.S. 1983, Oakland University, Rochester, MI Major: Physics Minor: Mathematics

SUMMARY OF PROFESSIONAL EMPLOYMENT

8/03 - present Associate Professor, Physics Department, Truman State Univ., Kirksville, MO
6/03 - present Visiting Scientist, Physics Department, Univ. of Illinois at Urbana-Champaign, Urbana, IL
8/98 - 8/03 Assistant Professor, Physics Department, Truman State Univ., Kirksville, MO
8/92 - 6/98 Assistant Professor, Physics Department, Univ. of Southern Indiana, Evansville, IN
9/90 - 12/92 College Assistant Professor and Adjunct Assistant Professor, New Mexico State Univ., Las Cruces, NM
2/90 - 7/92 Optical Engineer, PSR Services, Inc., White Sands Missile Range, NM
11/89 - 1/90 Substitute Teacher, Tempe, Paradise Valley, and Mesa, AZ School Districts
10/88 - 9/89 Postdoctoral Research Associate, Physics Dept., New Mexico State Univ., Las Cruces, NM
6/88 - 9/88 Summer Research Scholar, Quantum Optics Branch, Air Force Weapons Laboratory, Kirtland AFB, NM
5/86 - 6/88 Graduate Research Assistant, Physics Dept., Univ. of Arkansas, Fayetteville, AR (Work performed at Los Alamos National Lab, Los Alamos, NM)
8/84 - 5/86 Graduate Teaching Assistant, Physics Dept., Univ. of Arkansas, Fayetteville, AR

COURSES TAUGHT

- PRIMO College Prep Academy (a course for college bound high school students): Summer 2000, Summer 2001
- Physical Science for Elementary Teachers (PSET): Fall 1985, Spring 1985
- Introduction to Physical Science (physics for non-science-majors): Summer 1993, Spring 1994, Spring 1995, Spring 1996, Summer 1996, Fall 1996, Spring 1997, Spring 1998, Summer 1998
- Concepts of Physics (physics for non-science majors): Fall 2002, Fall 2003, Spring 2004, Fall 2004, Spring 2005, Fall 2005
- Concepts of Physics Laboratory: Fall 2002, Fall 2003, Spring 2004, Fall 2004, Spring 2005, Fall 2005
- College Physics I (non-calculus introductory class): Summer 1985, Fall 1992, Fall 1993, Fall 1994, Summer 1995, Fall 1995, Fall 1996, Summer 1997, Fall 1997
- College Physics I Laboratory: Fall 1992, Fall 1993, Fall 1994, Summer 1995, Fall 1995, Summer 1997, Fall 1997
- College Physics II (non-calculus introductory class): Spring 1989, Fall 1992, Spring 1993, Spring 1994, Spring 1995, Summer 1995, Spring 1996, Spring 1997, Summer 1997, Spring 1998

- College Physics II Laboratory: Fall 1992, Spring 1993, Spring 1994, Spring 1995, Summer 1995, Spring 1996, Spring 1997, Summer 1997, Spring 1998
- Intermediate Physics I (calculus-based introductory class): Fall 1994, Fall 1995, Fall 1998, Fall 1999, Fall 2000, Fall 2001
- Intermediate Physics I Laboratory: Fall 1994, Fall 1995, Fall 1998, Fall 1999, Fall 2000, Fall 2001
- Intermediate Physics II (calculus-based introductory class): Spring 1995, Spring 1996, Spring 1999, Spring 2000, Spring 2001, Spring 2002 Spring 2003
- Intermediate Physics II Laboratory: Spring 1995, Spring 1996, Spring 1999, Spring 2000, Spring 2001, Spring 2001, Spring 2003
- Analytical Mechanics: Fall 1994, Fall 1995
- Electromagnetic Fields: Spring 1993, Fall 1997
- Modern Physics I: Fall 1993, Fall 1998, Fall 1999, Fall 2000, Fall 2001, Fall 2002
- Modern Physics II: Spring 2000, Spring 2001, Spring 2002, Spring 2003
- Advanced Laboratory I: Fall 2003, Fall 2004, Fall 2005, Spring 2006
- Advanced Laboratory II: Fall 2003, Fall 2004
- Physics and Human Thought: Fall 1997
- Quantum Mechanics I: Fall 1996
- Advanced Topics - Chaos: Spring 1999
- Advanced Topics - Optics: Spring 2004, Spring 2006
- Advanced Topics - Quantum Information Theory: Spring 2005
- Nonlinear Dynamics (graduate course): Spring 1992

COURSES ASSISTED FOR AS A GRADUATE STUDENT

Engineering Physics I & II (same as Intermediate Physics I & II): Fall 1985, Spring 1986

EXPANDED EMPLOYMENT HISTORY

Associate Professor, Physics Department, Truman State University, Kirksville, MO

Duties: Same as for Assistant Professor.

Visiting Scientist, Physics Department, University of Illinois at Urbana-Champaign, Urbana, IL

Duties: Develop diode-laser pumped spontaneous parametric downconversion entangled-photon source. Construct single-photon counting modules using avalanche photodiodes with active-quenching. Assist on other experiments as needed.

Assistant Professor, Physics Department, Truman State University, Kirksville, MO

Duties: Teach undergraduate physics courses, advise students, conduct research, and serve on committees. The teaching load is 12 contact hours per semester although my load has been 13 contact hours per semester since I started. In addition to teaching my classes I have supervised a number of different student research projects:

- construction of an aurora detector
- develop nitrogen-laser/dye laser spectroscopy experiment
- apply nonlinear dynamical methods to biological time series
- build and analyze a set of coupled pendula

- calculate the equi-Wigner curves for the square potential barrier (ongoing)
- calculating short-time Lyapunov exponents (ongoing)
- laser cooling and trapping of rubidium (ongoing)

I am also in charge of our department computer lab consisting of 3 Windows NT machines and 1 Linux machine. I have participated in other departmental and divisional service capacities:

- chaired a departmental search committee for two tenure-track positions
- wrote our Discipline Action Plan (something every discipline at Truman must do each year)(3years)
- screened student abstracts for the NCUR meeting
- member of Ad Hoc Faculty Compensation Committee
- read student portfolios (3 years)
- took Society of Physics Students group to Chicago and Fermilab
- alternate Science representative to Undergraduate Council

Assistant Professor, Physics Department, University of Southern Indiana, Evansville, IN

Duties: Teach undergraduate physics courses, maintain laboratory and demonstration equipment, advise students, conduct research, and serve on committees. The teaching load is 12 credit hours per semester, which is typically 15 contact hours. I revised the lab manual for the first semester introductory courses. I initiated "computerizing" the introductory labs. I developed a "liberal arts physics course" for advanced students of any major. In addition to teaching, I was a major contributor, as Chair of the Computer Committee, to improving the computing facilities for faculty and students in the School of Science and Engineering Technology (SET). I was also *de facto* webmaster and system administrator for the internet server before I left. I was involved in the following university and community committees, programs, and organizations:

- Faculty advisor to the Acolytes of Space and Time, the USI physics club.
- University Economic Benefits Committee, 3 years (Chair 1 year).
- Chair of the SET Computer Advisory Committee, 5 years.
- University Honor Student Symposium, Participant 3 years, Organizer 1 year.
- Search Committee for a new dean of the School of Science and Engineering Technology.
- Contributor to the physical science subject matter guidelines for the Indiana Tech Prep Program.
- Member of ChemQuery (a group of local scientists and physicians that informs the public on scientific matters, particularly those involving the environment and health).

Optical Engineer, PSR Services, Inc., White Sands Missile Range, NM

Duties: Designed and used setups to perform optical measurements. Developed improved technique for measuring optical density of optical equipment. Redesigned and set up an optical bench for performing measurements in the visible and near-infrared. Although I am prohibited from explaining what I did or measured I can say that the work involved lasers of various type, CCD imagers, interferometers, and sundry other optical elements, including aligning an off-axis parabolic mirror.

College Assistant Professor and Adjunct Assistant Professor, New Mexico State Univ., Las Cruces, NM

Duties: Taught a graduate course in nonlinear dynamics and supervised a Ph.D. student in nonlinear dynamics.

Substitute Teacher, Tempe, Paradise Valley, and Mesa, AZ School Districts

Duties: Substituted for several science teachers. Was preferred science substitute at Corona del Sol High School, Tempe, AZ.

Postdoctoral Research Associate, New Mexico State University, Las Cruces, NM

Duties: Taught second semester non-calculus introductory physics. Studied the logistic map with quantum correlations and sensitive dependence in quantum systems.

Summer Research Scholar, Quantum Optics Branch, Air Force Weapons Lab, Kirtland AFB, NM

Duties: Performed theoretical research in quantum optics. Studied the effects of the field distribution, detuning, and coupling strengths on collapse and revival phenomena in atoms.

Graduate Research Assistant, University of Arkansas, Fayetteville, AR

Duties: Performed research at Los Alamos National Laboratory for Dr. Peter Milonni of the T-12 Group. Studied the quantum-mechanical aspects of classically chaotic driven systems.

Graduate Teaching Assistant, University of Arkansas, Fayetteville, AR

Duties: Taught (i.e. had full responsibility for the class) first semester non-calculus introductory physics once and Physical Science for Elementary Teachers (PSET) twice. The PSET class was a combination lecture, demonstration, and laboratory class designed to introduce future elementary school teachers to the concepts and methods of physical science. Conducted problem sessions (i.e. was a TA) for both semesters of Calc-based Physics.

PROFESSIONAL SOCIETY MEMBERSHIPS

Sigma Xi

- President Kirksville Chapter, 2001-2002
- President-elect Kirksville Chapter, 1999-2001
- delegate to annual meeting, 1999 and 2000

American Association of Physics Teachers

- Vice President Indiana Section 1997-1998

Sigma Pi Sigma

American Physical Society

Council on Undergraduate Research

Optical Society of America

STUDENT PROJECTS MENTORED

Measurement and Analysis of Power Distribution in Diffraction Gratings as a Function of Incidence Angle
Student: Raghav Chhetri

Construction of an Aurora Detector
Student: David Kiblinger

Experiments in spectroscopy using a nitrogen-laser pumped dye laser
Student: Phil Schiff

Laser Cooling and Trapping of Rubidium
Students: Kevin Koch, Danielle Camarota, Adam Bauer, Bryan Bichsel, Nicole Jones, Suzanne Leslie, Michael Cone, Lucas Ward, Bryan McClellan, Kyle Bailey, Marek Haruza, Stan Park, David Kiblinger, Ross Coleman, Adam Gouge, Nirjal Sapkota

Plotting Semi-Classical Trajectories for Simple Quantum-Mechanical Systems with the Wigner Quasi-Distribution Function

Students: Kenny Boyce, Kevin Haworth, Kirt Page

Simulating Quantum Photon Communication Through Free Space

Student: Michelle Hannon

Phase-Space Dependence of Short-Time Lyapunov Exponents

Student: Heather Mollé, Cameron Moore

Nonlinear Systems of Coupled Pendulums

Student: Adam Woodson

Analyzing Neural Systems Using Chaos Theory

Student: Francesca Gervascio

STUDENT PRESENTATIONS FOR WHICH I WAS MENTOR

David Kiblinger, “Construction of an Aurora Detector,” at the Annual Meeting of the Missouri Academy of Sciences, Kirksville, MO (April 21, 2006). *This presentation won First Place in the Physics Session of the Collegiate Division.*

Raghav Chhetri, “Measurement and Analysis of Power Distribution in Diffraction Gratings as a Function of Incidence Angle,” at the Truman State University Student Research Conference, Kirksville, MO (April 20, 2006).

David Kiblinger, “Construction of an Aurora Detector,” at the Truman State University Student Research Conference, Kirksville, MO (April 20, 2006).

David Kiblinger, “Construction of an Aurora Detector,” at the National Undergraduate Research Conference, Asheville, NC (April 7, 2006).

Marek Haruza, Ross Coleman, David Kiblinger, and James H. Park, “External Cavity Diode Laser Development,” at the National Undergraduate Research Conference, Asheville, NC (April 6, 2006). (POSTER)

Marek Haruza, Ross Coleman, David Kiblinger, and James H. Park, “External Cavity Diode Laser Development,” at the Arkansas INBRE Spring Undergraduate Research Conference, Fayetteville, AR (February 24, 2006). (POSTER) *This poster won Third Place in the Physics Section.*

David Kiblinger, “Construction of an Aurora Detector,” at the Winter Meeting of the American Association of Physics Teachers, Anchorage, AK (January 23, 2006).

Marek Haruza, Ross Coleman, David Kiblinger, and James H. Park, “External Cavity Diode Laser Development,” at the Truman State University Student Research Conference, Kirksville, MO (April 14, 2005). (POSTER)

Cameron C. Moore, “Exploring Regions of ‘Chaos’ in the Logistic Map,” at the Truman State University Student Research Conference, Kirksville, MO (April 14, 2005).

Lisa S. Leslie, Stan Park, Kyle Bailey, and Bryan McClellan, “Cooling and Trapping of Rubidium Atoms,” at the Truman State University Undergraduate Research Conference, Kirksville, MO (April 6, 2004). (POSTER)

Michelle A. Hannon, “Simulating Quantum Photon Communication Through Free Space,” at the Truman State University Undergraduate Research Conference, Kirksville, MO (April 10, 2003).

Kevin J. Haworth, “Plotting Semi-Classical Trajectories for Simple Quantum Mechanical Systems with the wigner Quasi-Distribution Function,” at the Truman State University Undergraduate Research Conference, Kirksville, MO (April 10, 2003).

Michael Cone, Todd J. Lansford, Lisa Suzanne Leslie, and Lucas Ward, “Laser Cooling and Trapping of Rubidium Atoms,” at the Truman State University Undergraduate Research Conference, Kirksville, MO (April 10, 2003). (POSTER)

Heather Mollé, “Exploring Phase Space Using Short Term Lyapunov Exponents,” at the Truman State University Undergraduate Research Conference, Kirksville, MO (April 10, 2003).

Philip R. Schiff, “Experiments in Atomic and Molecular Spectroscopy,” at the Truman State University Undergraduate Research Conference, Kirksville, MO (April 10, 2003).

Michael Cone, Todd J. Lansford, Lisa Suzanne Leslie, and Lucas Ward, “Laser Cooling and Trapping of Rubidium Atoms,” at the National Undergraduate Research Conference, Salt Lake City, UT (March 12-15, 2003). (POSTER)

Michael Cone, Nikki Jones, Todd Lansford, Suzanne Leslie, Lucas Ward, “Laser Cooling and Trapping of Rubidium,” at the Truman State University Undergraduate Research Conference, Kirksville, MO (April 11, 2002). (POSTER)

Adam Bauer, Danielle Camarota, Lucas Ward, Nicole Jones, and Todd Lansford, “Laser Cooling and Trapping of Rubidium,” at the Truman State University Undergraduate Research Conference, Kirksville, MO (March 29, 2001). (POSTER)

Kevin Koch, “Laser Cooling and Trapping of Atoms Using Electronic Detuning,” at the Truman State University Undergraduate Research Symposium, Kirksville, MO (March 22, 2000).

Adam Woodson, “Spatiotemporal Chaos in a Numerical Coupled Oscillator System,” at the Truman State University Undergraduate Research Symposium, Kirksville, MO (March 22, 2000). (POSTER)

PRESENTATIONS

“Deterministic Chaos and the Jurassic Park Hypothesis”, public lecture at the Linda Hall Library of Science and Technology, Kansas City, MO, April 19, 2001.

“Simple Derivation of Axis-Scaling in Spacetime Diagrams,” at the Fall 2000 meeting of the Missouri section of the American Association of Physics Teachers, Rolla, MO, October 21, 2000.

“Physics and Human Thought: Reflections on a New Course’, at the 1998 Winter Meeting of the American Association of Physics Teachers, New Orleans, LA, January 4-8, 1998.

“Physics in Film”, at the 1997 Winter Meeting of the American Association of Physics Teachers, Phoenix, AZ, January 7, 1997. Also at the Annual Meeting of the Indiana Section of AAPT, W. Lafayette, IN April 10, 1997.

“Quantum Chaos. What is it?”, at the 1995 Annual Meeting of the Indiana Section of the American Association of Physics Teachers, Indianapolis, IN, April 8, 1995.

“Chaos in quantum optics: the contributions of Jay Ackerhalt”, an invited presentation for a Memorial Session Celebrating Contributions of Jay R. Ackerhalt at the 8th Interdisciplinary Laser Science Conference, Albuquerque, NM, September 23, 1992.

“Classical and Quantum Chaos in Nonlinear Driven Systems” at the Conference on Periodic Orbits, Phase Space Structures, and Chaos in Quantum Systems, Los Alamos, NM, December 17, 1987.

Various colloquia given at the University of Missouri, St. Louis; Truman State University; Indiana University-Purdue University, Indianapolis; the University of the South; the University of Southern Indiana; New Mexico State University; the University of New Mexico; the Air Force Weapons Lab; and Los Alamos National Laboratory

PUBLICATIONS

N. A. Peters, J. T. Barreiro, M. E. Goggin, T.-C. Wei, and P. G. Kwiat, "Remote State Preparation: Arbitrary remote control of photon polarizations for quantum communication", in *Free-Space Laser Communications V*. Edited by Voelz, David G.; Ricklin, Jennifer C. Proceedings of the SPIE, Volume 5893, pp. 52-61 (2005).

Nicholas A. Peters, Julio T. Barreiro, Tzu-Chieh Wei, Michael E. Goggin, and Paul G. Kwiat, "Arbitrary Remote State Preparation of Photon Polarization," in *Conference on Lasers and Electro-Optics/Quantum Electronics and Laser Science and Photonic Applications, Systems and Technologies 2005* (Optical Society of America, Washington, DC, 2005), presentation QTuG6.

Nicholas A. Peters, Julio Barreiro, Michael E. Goggin, Tzu-Chieh Wei, and Paul G. Kwiat, "Remote state preparation: Arbitrary remote control of photon polarization", *Phys. Rev. Lett.* **94**, 150502 (2005).

P.G. Kwiat, J.B. Altepeter, J.T. Barreiro, M.E. Goggin, E. Jeffrey, N.A. Peters, and A. VanDevender, "The Conversion Revolution: Down-, Up- and Sideways-", *AIP Conf. Proc.* **734**, 337 (2004) (Proceedings of the Seventh International Conference on Quantum Communication, Measurement and Computing (QCMC), Strathclyde, UK, July 25-29, 2004).

M.E. Goggin and R.H. Dalling, "A Response to D. Auerbach's "Comment on 'Chaos is not an artifact of finite-digit arithmetic'"", *Am. J. Phys.* **63**, 277 (1995).

R.H. Dalling and M.E. Goggin, "Chaos Is Not An Artifact of Finite-Digit Arithmetic", *Am. J. Phys.* **62**, 563 (1994).

M.E. Goggin, "M22 OD Measurement Result", PSRS Note 148 (PSR Services, WSMR, NM 1991).

M.E. Goggin, S.Z. Peplinski, and M. Gallardo, "An Improved Optical Density (D) Measurement Method", PSRS Note 143 (PSR Services, WSMR, NM 1990).

M.E. Goggin, B. Sundaram, and P.W. Milonni, "The Quantum Logistic Map", *Phys. Rev.* **A41**, 5705 (RC) (1990).

R.L. Ingraham, M.E. Goggin, and P.W. Milonni, "Sensitivity to Initial Conditions in Classical and Quantum Dynamics", in *Coherence and Quantum Optics VI* ed. by J.H. Eberly et al. (Plenum, NY, 1990).

M.E. Goggin, M.P. Sharma, and A. Gavrielides, "Effects of the Binomial Field Distribution on Collapse and Revival Phenomena in a Three-Level Atom", *J. Mod. Optics* **37**, 99 (1990).

P.W. Milonni, J.R. Ackerhalt, and M.E. Goggin, "Notes on Classical and Quantum Theories of Driven Nonlinear Systems", in *Lasers Molecules and Methods* ed. by J.O. Hirschfelder, R.E. Wyatt and R.D. Coalson (Wiley, NY, 1989). (A.k.a. *Adv. Chem. Phys.* **73**, 867 (1989) ed. by I. Prigogine and S.A. Rice.).

Michael E. Goggin, "Classical and Quantum Chaos of Nonlinear Driven Systems", Ph.D. dissertation, unpublished, University of Arkansas, Fayetteville, AR 1988.

M.E. Goggin and P.W. Milonni, "Driven Morse oscillator: Classical chaos and quantum theory for two-frequency excitation", *Phys. Rev.* **A38**, 5174 (1988).

P.W. Milonni, R.J. Cook, and M.E. Goggin, "Radiation Pressure from the vacuum: Physical interpretation of Casimir force", *Phys. Rev.* **A38**, 1621 (1988).

M.E. Goggin and P.W. Milonni, "Driven Morse oscillator: Classical chaos, quantum theory, and photodissociation", *Phys. Rev.* **A37**, 796 (1988).

P.W. Milonni, J.R. Ackerhalt, and M.E. Goggin, "Quasiperiodically kicked quantum systems", *Phys. Rev.* **A35**, 1714 (1987).

P.W. Milonni, J.R. Ackerhalt, and M.E. Goggin, "Quantum-Mechanical Aspects of Classically Chaotic Driven Systems", in *Proceedings of the Fourth International Conference on Multiphoton Processes*, ed. by P.L. Knight and S.J. Smith (Cambridge University Press, 1987).