

Curriculum Vitae

Michael E. Goggin, Ph.D.

Physics Department
Truman State University
Kirksville, MO 63501
phone: +1-660-785-4410, e-mail: mgoggin@truman.edu

EDUCATION

Ph.D. 1988, University of Arkansas, Fayetteville, AR Major: Physics
Dissertation: "Classical and Quantum Chaos of Nonlinear Driven Systems"
Advisor: Peter Milonni
B.S. 1983, Oakland University, Rochester, MI Major: Physics Minor: Mathematics

SUMMARY OF PROFESSIONAL POSITIONS

6/21 - present Chair, Physics Dept. Truman State Univ., Kirksville, MO
8/10 - present Professor, Physics Dept., Truman State Univ., Kirksville, MO
1/16 - 7/16 On sabbatical at the Physics Dept., Univ. of Illinois at Urbana-Champaign, Urbana, IL
9/15 - 12/15 On sabbatical at the Physics Dept., Univ. of Queensland, Brisbane, QLD, Australia
8/03 - 8/10 Associate Professor, Physics Dept., Truman State Univ., Kirksville, MO
1/08 - 7/08 On sabbatical at the Physics Dept., Univ. of Queensland, Brisbane, QLD, Australia
5/07 - 12/07 On sabbatical at the Physics Dept., Univ. of Illinois at Urbana-Champaign, Urbana, IL
Summers, 6/03 - present Visiting Scientist, Physics Dept., Univ. of Illinois at Urbana-Champaign, Urbana, IL
12/06 - 6/07 Physics Consultant, A. T. Still Research Institute, A. T. Still University, Kirksville, MO
8/98 - 8/03 Assistant Professor, Physics Dept., Truman State Univ., Kirksville, MO
8/92 - 6/98 Assistant Professor, Physics Dept., Univ. of Southern Indiana, Evansville, IN (tenure approval, 1998)
9/90 - 12/92 College Assistant Professor & 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

PROFESSIONAL SOCIETIES

Sigma Pi Sigma	Phi Kappa Phi (Life Member)
Optical Society of America	American Physical Society
Sigma Xi (Life Member)	Council on Undergraduate Research (CUR)
- President Kirksville Chapter, 2001-2002, 2011-2013	American Association of Physics Teachers
- President-elect Kirksville Chapter, 1999-2001, 2010-2011	- Vice President Indiana Section 1997-1998
- Webmaster for the Kirksville Chapter, 2003-2018	
Kirksville Sigma Xi Researcher of the Year Award - 2010	
CUR Goldwater Scholar Mentor Award, Truman State University nominee - 2013, 2014	

Curriculum Vitae
Michael E. Goggin, Ph.D.

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, Fall 2006, Spring 2007, Spring 2009, Spring 2012, Spring 2015, Spring 2017, Spring 2018, Spring 2021
- Concepts of Physics Laboratory: Fall 2002, Fall 2003, Spring 2004, Fall 2004, Spring 2005, Fall 2005, Fall 2006, Spring 2007, Spring 2009, Spring 2012, Spring 2015, Spring 2017, Spring 2018, Spring 2021
- Physics Seminar (first-year seminar for majors): Fall 2002, Fall 2003, Fall 2008, Fall 2009, Fall 2011, Fall 2012
- 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
- Physics with Calculus I (calculus-based introductory class): Fall 1994, Fall 1995, Fall 1998, Fall 1999, Fall 2000, Fall 2001, Spring 2019
- Physics with Calculus I Laboratory: Fall 1994, Fall 1995, Fall 1998, Fall 1999, Fall 2000, Fall 2001, Spring 2019, Spring 2020
- Physics with Calculus II (calculus-based introductory class): Spring 1995, Spring 1996, Spring 1999, Spring 2000, Spring 2001, Spring 2002, Spring 2003, Fall 2013, Fall 2014, Fall 2016, Fall 2017, Fall 2018, Fall 2019, Fall 2020
- Physics with Calculus II Laboratory: Spring 1995, Spring 1996, Spring 1999, Spring 2000, Spring 2001, Spring 2001, Spring 2003, Fall 2013, Fall 2014, Fall 2016, Fall 2017, Fall 2018, Fall 2019
- 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, Fall 2011, Fall 2012
- Modern Physics II: Spring 2000, Spring 2001, Spring 2002, Spring 2003
- Electronics: Fall 2006, Fall 2008, Fall 2009, Fall 2010, Spring 2011, Fall 2011, Fall 2012, Fall 2013, Fall 2014, Fall 2016, Fall 2017, Fall 2018, Fall 2019, Fall 2020
- Advanced Laboratory I: Fall 2003, Fall 2004, Fall 2005, Spring 2006, Spring 2007, Spring 2009, Spring 2010, Fall 2010, Spring 2011, Spring 2012, Spring 2013, Spring 2014, Spring 2015, Spring 2017, Spring 2018, Spring 2019, Spring 2020, Spring 2021
- Advanced Laboratory II: Fall 2003, Fall 2004
- Junior Seminar: Spring 2013
- Physics Research I: Spring 2010, Spring 2011, Spring 2012, Spring 2014, Fall 2014, Fall 2016

Curriculum Vitae Michael E. Goggin, Ph.D.

- Physics Research II: Spring 2010, Fall 2012, Fall 2014, Spring 2017
- Physics Research III: Spring 2015
- Senior Research I: Fall 2008, Fall 2009
- Senior Research II: Spring 2009, Spring 2010
- Physics and Human Thought: Fall 1997
- Quantum Mechanics I: Fall 1996
- Advanced Topics - Chaos: Spring 1999
- Advanced Topics - Optics: Spring 2004, Spring 2006, Spring 2007, Spring 2010
- Advanced Topics - Quantum Information Theory: Spring 2005
- Advanced Topics - Physics of Information: Spring 2013
- Advanced Topics - Modern Optics: Spring 2018
- Nonlinear Dynamics (graduate course): Spring 1992

EXPANDED EMPLOYMENT HISTORY

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

Duties: Teach undergraduate physics courses, advise students, conduct research, and contribute to institutional service activities. The teaching load is 12 contact hours per semester but I have had many semesters with greater than 12 contact hours. In addition to teaching my classes I have supervised a number of different student research projects, the details of which are given below.

I have contributed in the following service capacities:

- Chair, Faculty Conduct Committee, 2020-2021 academic year.
- Member, STEM Perspectives Committee, 2018-2019 academic year.
- Member, Departmental search committee for tenure-track position 2017-2018 academic year.
- Member, University search committee for a Dean of the School of Science and Mathematics (2017, 2018).
- Member Departmental search committee for two one-year temporary positions 2014-2015 academic year.
- Interim Director, Office of Student Research, 2013-2104 academic year plus summer 2013.
- Reviewed manuscripts for the following journals: *Nature Communications*, *Nature Scientific Reports*, *Optica*, *Optics Letters*, *Optics Express*, *Physics Letters A*, *Quantum Information Processing*, *IET Circuits, Devices & Systems*, and *International Journal of Modern Physics C*.
- Responsible for the Advanced Laboratory classroom and equipment including the associated computers and software including a departmental license for LabVIEW, 2003-present.
- Responsible for the Electronics Laboratory classroom and equipment, 2006-present.
- In charge of the Physics Department Demo Room and demonstrations, 2016-present.
- In charge of the Physics Department computer lab consisting of 3 Windows machines and 1 Linux machine. This is in addition to the computers mentioned above, 1998-present.
- In charge of Physics Department 3-D Printer, 2016-present.

Curriculum Vitae Michael E. Goggin, Ph.D.

- Drove Women in Physics group to Boulder, CO so they could attend the 2017 American Physical Society Conference on Undergraduate Women in Physics, January 2017.
- Member, Faculty Research Celebration organizing committee, 2014, 2017-2019.
- Chair, School of Science and Mathematics Science Education Committee, 2009-2010 academic year.
- Member, Truman Faculty Forum Committee, 2005-2007, 2009-2014, and 2017-present.
- Member, Truman Faculty Research Conference Organizing Committee, 2009-2013.
- Chair, University confidential committee, 2010-2011 academic year (may be verified with the Provost's office).
- Chair, University confidential committee, 2009-2010 academic year (may be verified with the Provost's office).
- Member, University confidential committee, 2008-2009 academic year (may be verified with the Provost's office).
- Member, College of Arts and Sciences confidential committee, 2008-2009 academic year (may be verified with Adam Davis, Associate Dean for CAS at the time).
- Drove Society of Physics Students group to Chicago to visit Argonne National Lab and Fermilab, March 2007.
- Co-organizer (with Matt Beaky) of the Annus Mirabilis Colloquium Series at Truman State University. Additionally, I created, with some input from Winston Vanderhoof, the publicity poster for the series of talks.
- Actively involved with the TSU Society of Physics Students student group
- Faculty advisor for the TSU Women in Physics student group, 2016-present,
- Hosted faculty/student BBQ's at my home twice a year (beginning and end of year) almost every year except during and immediately following sabbatical, 1999-2015.
- Make presentations to prospective students (multiple times per year).
- Chaired a departmental search committee for two tenure-track positions, 1999-2000 academic year.
- Mentor for two newly hired faculty members, 2000-2001 academic year.
- Wrote our Discipline Action Plan (co-author with Peter Rolnick)(5 years).
- Screened student abstracts for the NCUR meeting (2 years).
- Member of Ad Hoc Faculty Compensation Committee.
- Read student portfolios (3 years).
- Drove Society of Physics Students group to Chicago to visit Fermilab, the Museum of Science and Industry, and Adler Planetarium, March 2000.
- Taught PRIMO College Prep Academy, Summer 2000 & 2001.
- Alternate Science representative to Undergraduate Council, 2000.
- Drove (with Michael Ottinger) several Physics students to the Centennial Meeting of the American Physical Society in Atlanta, GA, March 1999.

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

Duties: Assist on experiments as needed. Have worked on several different projects. For example, developed diode-laser pumped spontaneous parametric downconversion entangled-photon source.

Physics Consultant, A. T. Still Research Institute, A. T. Still University, Kirksville, MO

Curriculum Vitae Michael E. Goggin, Ph.D.

Duties: Perform a physical/optical analysis of the *Intra- and Interobserver Reliability Protocol for use with the Digital Camera Measuring System (DCMS)* and report on it.

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 Calculus-based Physics.

STUDENT PROJECTS MENTORED

Improved Type I SPDC Photon-polarization Entanglement Using a CW-diode Laser
Student: Nathan Aden, Jacob Ohlhausen

Towards Observing Down-Conversion in BiBO
Student: Manisha Shrestha

Theoretical Modeling of Downconversion in Biaxial Crystals
Student: Gaurab Rimal

Theoretical Modeling of Ghost Imaging Involving Polarization Sensitive Optics
Student: A.J. Alexander

Modified Littrow Configuration External Cavity Diode Laser with Fixed Output Beam
Students: Nirjal Sapkota, Om Goit

Measurement and Analysis of Power Distribution in Diffraction Gratings as a Function of Incidence Angle
Students: Raghav Chhetri, Violet Poole, Nathan Klessig, Anne Ahlvers, Aaron Thompson, Kevin Satzinger, Eric Laugeman, Nathan Aden, Therese Galbraith, Luke Cain, Mitchell Gegg, Kasey Hancock, Wade McCormick, Devon Russell, Abhishek KC, Kevin Barrow, Neal Thompson, Curtis Womach, Jon Blaine

Construction of an Aurora Detector
Students: David Kiblinger, Isaac Angert, Eric Laugeman

Synchronization of Chaotic Circuits
Student: Mark Kirchhoff

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, L. Suzanne Leslie, Michael Cone, Lucas Ward, Bryan McClellan, Kyle Bailey, Marek Haruza, Stan Park, David Kiblinger, Ross Coleman, Adam Gouge, Nirjal Sapkota, Tom Hogan

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

Curriculum Vitae
Michael E. Goggin, Ph.D.

STUDENT PRESENTATIONS FOR WHICH I WAS MENTOR

Richard W. McCormick, "The Effect of Surface Plasmons on Diffraction Gratings", Truman State University Student Research Conference, Kirksville, MO (April 5, 2018).

Mitchell Gegg, "Power Loss from Reflection Diffraction Gratings", Truman State University Student Research Conference, Kirksville, MO (April 20, 2017).

Nathan Aden, "Improved Type I SPDC Photon-polarization Entanglement Using a CW-diode Laser", Truman State University Student Research Conference, Kirksville, MO (April 14, 2015).

Nathan Aden, "Improved Type I SPDC Photon-polarization Entanglement Using a CW-diode Laser", National Conference on Undergraduate Research, Eastern Washington University, Cheney, WA (April 17, 2015).

Eric Laugeman, "Data Acquisition Automation for a Diffraction Grating Experiment", Truman State University Student Research Conference, Kirksville, MO (April 16, 2013).

Manisha Shrestha, "Towards Observing Down-Conversion in BiBO", Truman State University Student Research Conference, Kirksville, MO (April 12, 2012).

Manisha Shrestha, "Towards Observing Down-Conversion in BiBO", National Conference on Undergraduate Research, Weber State University, Ogden, UT (March 30, 2012)

Anne M. Ahlvers, "Power absorption in Diffraction Gratings", Truman State University Student Research Conference, Kirksville, MO (April 12, 2011).

Zachary O. Haralson, "Construction of a Dichroic Atomic Vapor Laser Lock", Truman State University Student Research Conference, Kirksville, MO (April 12, 2011).

Gaurab Rimal, "Theoretical Modeling of Downconversion in a Biaxial Crystal", Truman State University Student Research Conference, Kirksville, MO (April 12, 2011).

Aaron M. Thompson, Anne M. Ahlvers, Kevin J. Satzinger, "Power Losses in Diffraction Gratings", National Conference on Undergraduate Research, Ithaca, NY (April 1, 2011). (POSTER)

A. J. Alexander, "Theory of 'Ghost Imaging' experiments with polarization dependent optical devices", National Conference on Undergraduate Research, Missoula, MT (April 15, 2010).

Isaac Angert and David Kiblinger, "An Optical Aurora Detector to Aid Mid-latitude Viewing of the Northern Lights", at the Truman State University Student Research Conference, Kirksville, MO (April 13, 2010).

Thomas C. Hogan, "Implementing a Dichroic Atomic Vapor Laser Lock for Use in Laser Cooling Gaseous Rb", Truman State University Student Research Conference, Kirksville, MO (April 13, 2010).

Andrew J. Alexander, "Theory of 'Ghost Imaging' Experiments with Polarization Dependent Optical Devices", Truman State University Student Research Conference, Kirksville, MO (April 13, 2010).

Nathan Klessig, "Measurement and analysis of power distribution in all orders as a function of incidence angle for a series of diffraction gratings", National Conference on Undergraduate Research, La Crosse, WI (April 17, 2009).

Nathan Klessig, "Measurement and Analysis of Power Distribution in all Orders as a Function of Incidence Angle for a Series of Diffraction Gratings", Truman State University Student Research Conference, Kirksville, MO (April 7, 2009).

Violet Poole and Raghav Chhetri, "Measurement and Analysis of the Power Distribution in Diffraction Gratings as a Function of Incident Angle and Wavelength", National Conference on Undergraduate Research, San Rafael, CA (April 14, 2007).

Curriculum Vitae Michael E. Goggin, Ph.D.

Nirjal Sapkota, "Modified Littrow Configuration External Cavity Diode Laser with Tunable Fixed Output Beam", National Conference on Undergraduate Research, San Rafael, CA (April 14, 2007).

Violet M. Poole and Raghav Chhetri, "Measurement and Analysis of the Power Distribution in Diffraction Gratings as a Function of Incident Angle and Wavelength", Truman State University Student Research Conference, Kirksville, MO (April 3, 2007).

Nirjal Sapkota, "Modified Littrow Configuration External Cavity Diode Laser with Tunable Fixed Output Beam", Truman State University Student Research Conference, Kirksville, MO (April 3, 2007).

Raghav Chhetri, "Measurement, Analysis and Theoretical Basis of Power Distribution in Diffraction Gratings as a Function of Incident Angle", Symposium on Undergraduate Research, Division of Laser Science of the American Physical Society, LS XXII, Rochester, NY (October, 9 2006).

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", Truman State University Student Research Conference, Kirksville, MO (April 20, 2006).

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

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

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

Cameron C. Moore, "Exploring Regions of 'Chaos' in the Logistic Map", Truman State University Student Research Conference, Kirksville, MO (April 14, 2005).

L. Suzanne 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", 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", Truman State University Undergraduate Research Conference, Kirksville, MO (April 10, 2003).

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

Curriculum Vitae

Michael E. Goggin, Ph.D.

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

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

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

Michael Cone, Nikki Jones, Todd Lansford, L. Suzanne Leslie, Lucas Ward, "Laser Cooling and Trapping of Rubidium", 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", Truman State University Undergraduate Research Conference, Kirksville, MO (March 29, 2001). (POSTER)

Kevin Koch, "Laser Cooling and Trapping of Atoms Using Electronic Detuning", 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

"Quantum mechanics, what is it good for?", Truman Faculty Forum presentation, Truman State University, Kirksville, MO, 6 February 2018.

"Polarization Independent Photon Storage with Variable Time Delay", Jia Jun Wong, Bradley G. Christensen, Paul G. Kwiat, Michael Goggin, Katherine Crimmins, and Kevin T. McCusker, Second International Conference on Quantum Information and Measurement, Rochester, NY, 19 June 2013. (POSTER)

"Physics and Information", Michael Goggin, Kirksville Sigma Xi Researcher of the Year presentation, A.T. Still University, Kirksville, MO, 13 December 2012.

"Estimation of a quantum interaction parameter using weak measurements: Theory and experiment", Michael Goggin, Holger Hoffmann, Marcelo Alameida, and Marco Barbieri, DAMOP 2012, the annual meeting of the Division of Atomic, Molecular, and Optical Physics of the American Physical Society, Anaheim, CA, 4-8 June 2012. (POSTER)

"Physics and Information", Michael Goggin, Faculty Research Conference, Truman State University, Kirksville, MO, 12 September 2009.

"Experimental investigation of the connection between weak measurements and violation of the Leggett-Garg Inequality", Michael Goggin, Marcelo Almeida, Marco Barbieri, Benjamin Lanyon, Jeremy O'Brien, Andrew White, Geoff Pryde, DAMOP 2009, the annual meeting of the Division of Atomic, Molecular, and Optical Physics of the American Physical Society, Charlottesville, VA, 20-23 May 2009. (POSTER)

"Quantum computing with zero entanglement", B. P. Lanyon, M. Barbieri, M. P. Almeida, A. G. White, and M. E. Goggin, Frontiers in Optics 2008, Rochester, NY, 19-23 October 2008.

"Entangled Sources and Gates for (Real World) Quantum Computing", Michael E. Goggin, Gleb Akselrod, Marcelo P. Almeida, Marco Barbieri, Geoff Gillett, Ben Lanyon, Radhika Rangarajan, Andrew White, Paul G. Kwiat, ARO/NSA/IARPA Quantum Computing & Quantum Algorithms Program Review, Buckhead, GA, 11-15 August 2008. (POSTER)

"Measuring the fault-tolerance of an experimental optical quantum gate", Till J. Weinhold, Kevin J. Resch, Geoff J. Pryde, Jeremy L. O'Brien, Andrew G. White, and Michael E. Goggin, ICO-21, 21st Congress of the International Commission for Optics (ICO), Sydney, Australia, 7-10 July 2008.

Curriculum Vitae Michael E. Goggin, Ph.D.

“Improved 405-nm Diode-Pumped Downconversion Entanglement Source”, M. E. Goggin, N. A. Peters, J. T. Barreiro, J. A. Yasi, R. Rangarajan, and P. G. Kwiat, *Frontiers in Optics* 2006, Rochester, NY, 8-12 October 2006. (POSTER)

“Light Quanta: A Worldline”, Michael Goggin, *Annus Mirabilis Colloquium*, Truman State University, Kirksville, MO, 15 February 2005.

“Deterministic Chaos and the Jurassic Park Hypothesis”, public lecture at the Linda Hall Library of Science and Technology, Kansas City, MO, 19 April 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, 21 October 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, 4-8 January 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 10 April 1997.

“Quantum Chaos. What is it?”, at the 1995 Annual Meeting of the Indiana Section of the American Association of Physics Teachers, Indianapolis, IN, 8 April 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 Truman State University; Western Illinois University; University of Missouri, Columbia; University of Missouri, St. Louis; Indiana University-Purdue University, Indianapolis; University of the South; University of Southern Indiana; New Mexico State University; University of New Mexico; the Air Force Weapons Lab; and Los Alamos National Laboratory.

PUBLICATIONS

Courney Krafczyk, Andrzej N. Jordan, Michael E. Goggin, and Paul G. Kwiat, “Enhanced weak-value amplification via photon recycling”, *Physical Review Letters*, to be published.

Uttam Paudel, Jia Jun Wong, Michael Goggin, Paul G. Kwiat, Allan S. Bracker, Michael Yakes, Daniel Gammon, and Duncan G. Steel, “Direct excitation of a single quantum dot with cavity-SPDC photons”, *Optics Express* **27**, 16308 (2019).

Martin Ringbauer, Fabio Costa, Michael E. Goggin, Andrew G. White, and Alessandro Fedrizzi, “Multi-time quantum correlations with no spatial analog”, *npj Quantum Information* **4**, 37 (2018).

Fabio Costa, Martin Ringbauer, Michael E. Goggin, Andrew G. White, and Alessandro Fedrizzi, “A Unifying Framework for spatial and temporal quantum correlations”, *Physical Review A* **98**, 012328 (2018). An earlier draft is available at arXiv:1710.01776 (2017).

Holger F. Hofmann, Michael E. Goggin, Marcelo P. Almeida, and Marco Barbieri, “Estimation of a quantum interaction parameter using weak measurements: Theory and experiment”, *Physical Review A* **86**, 040102(R) (2012).

Michael E. Goggin, “Lab Course Goals: Science or Writing?”, *Science* **333** 524 (2011). (Letter to the Editor)

Curriculum Vitae Michael E. Goggin, Ph.D.

- J. O. Owens, M. A. Broome, D. N. Biggerstaff, M. E. Goggin, A. Fedrizzi, T. Linjordet, M. Ams, G. D. Marshall, J. Twamley, M. J. Withford and A. G. White, "Two-photon quantum walks in an elliptical direct-write waveguide array", *New Journal of Physics*, **13** 075003 (2011).
- M. E. Goggin, M. P. Almeida, M. Barbieri, B. P. Lanyon, J. L. O'Brien, A. G. White, and G. J. Pryde, "Violation of the Leggett-Garg inequality with weak measurements of photons", *Proceedings of the National Academy of Sciences of the USA* **108**, 1256 (2011). An earlier draft is available at arXiv:0907.1679v1 (2009).
- B. P. Lanyon, J. D. Whitfield, G. G. Gillett, M. E. Goggin, M. P. Almeida, I. Kassal, J. D. Biamonte, M. Mohseni, B. J. Powell, M. Barbieri, A. Aspuru-Guzik, and A. G. White, "Towards quantum chemistry on a quantum computer", *Nature Chemistry* **2**, 106 (2010).
- R. Rangarajan, M. Goggin, and P. Kwiat, "Optimizing type-I polarization-entangled photons", *Optics Express* **17**, 18920-18933 (2009).
- B. Lanyon, J. Whitfield, G. Gillett, M. Goggin, M. Almeida, I. Kassal, J. Biamonte, M. Mohseni, B. Powell, M. Barbieri, A. Aspuru-Guzik, and A. White, "Quantum Chemistry on a Quantum Computer: First Steps and Prospects", in *Frontiers in Optics, OSA Technical Digest (CD)* (Optical Society of America, 2009), paper JWD3.
- M. Barbieri, M. E. Goggin, M. P. Almeida, B. P. Lanyon, and A. G. White, "Complementarity in variable strength quantum non-demolition measurements", *New Journal of Physics* **11**, 093012 (2009). (Chosen by the editors of Institute of Physics (IOP) journals to be included in IOP Select.)
- B. Lanyon, M. Barbieri, M. Almeida, A. White, and M. Goggin, "Quantum Computing with Zero Entanglement", in *Frontiers in Optics, OSA Technical Digest (CD)* (Optical Society of America, 2008), paper FTuC7.
- Michael E. Goggin, "Review of the Intra- and Interobserver Reliability Protocol for use with the Digital Camera Measuring System (DCMS)", technical report submitted to A. T. Still Research Institute, Kirksville College of Osteopathic Medicine (July 2007).
- M. Goggin, N. Peters, J. Barreiro, J. Yasi, R. Rangarajan, and P. Kwiat, "Improved 405-nm Diode-Pumped Down-conversion Entanglement Source", in *Frontiers in Optics, OSA Technical Digest (CD)* (Optical Society of America, 2006), paper JWD73.
- 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", *Physical Review Letters* **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'"", *American Journal of Physics* **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). (Selected for inclusion in **Chaos and Nonlinear Dynamics** edited by Robert C. Hilborn and Nicholas B. Tufillaro (American Association of Physics Teachers, 1998))

Curriculum Vitae Michael E. Goggin, Ph.D.

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", *Physical Review* **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", *Journal of Modern 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. *Advances in Chemical Physics* **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", *Physical Review A* **38**, 5174 (1988).

P.W. Milonni, R.J. Cook, and M.E. Goggin, "Radiation Pressure from the vacuum: Physical interpretation of Casimir force", *Physical Review A* **38**, 1621 (1988).

M.E. Goggin and P.W. Milonni, "Driven Morse oscillator: Classical chaos, quantum theory, and photodissociation", *Physical Review A* **37**, 796 (1988).

P.W. Milonni, J.R. Ackerhalt, and M.E. Goggin, "Quasiperiodically kicked quantum systems", *Physical Review A* **35**, 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).

GRANTS AND EXTERNAL FUNDING

Compensation for academic year sabbatical salary reduction, summer salary, and housing for 2015 and 2016, by the University of Illinois and the University of Queensland under various grants for research activities undertaken at those institutions.

Travel expenses and housing for a month were covered by the University of Queensland for work done there mid-July through mid-August 2010.

Compensation for academic year sabbatical salary reduction, summer salaries, and housing for 2007 and 2008, as well as round-trip travel costs for myself and my family to Australia were covered by the University of Illinois and the University of Queensland under various grants for research activities undertaken at those institutions.

Summer Salaries and housing expenses for various fractions of the Summers of 2003, 2004, 2005, 2006, 2007, 2010, 2011, 2012, 2013, 2014, 2016, 2017, 2018, and 2019 were paid by the University of Illinois under various grants for research activities undertaken there.

Curriculum Vitae
Michael E. Goggin, Ph.D.

Faculty Stipends to mentor summer research students: Summer 2006, \$1000 to mentor Raghav Chhetri on his project, "Theoretical Basis for the power loss in diffraction gratings".

Summer 2005, \$3500 to mentor David Kiblinger on his project, "Construction of an Aurora Detector". Funding provided by NSF through Truman's STEP grant.

Summer 2002, \$1000, to mentor Philip R. Schiff on his project, "Experiments in Atomic and Molecular Spectroscopy".

2001 - Major Research Instrumentation proposal written with Matt Beaky for the purchase of a femtosecond pulse mode-locked Ti:Sapphire laser system with a solid state pump laser and a suite of related equipment for use in Atomic, Molecular, and Optical (AMO) Physics research - not funded. Requested \$130,000. Not funded.

1999 - "Nonlinear Analysis Applied to the Brain, Faculty Research Grant, Truman State University. Requested \$3500. Funded for \$3500.