

# BRADLEY SCOTT AMBROSE

Department of Physics  
Grand Valley State University  
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## EDUCATION

**University of Washington** **Seattle, Washington**

*Ph.D. in Physics, March 1999.*

Advisor: Professor Lillian C. McDermott. Dissertation title: "Investigation of student understanding of the wave-like properties of light and matter."

*M.S. in Physics, January 1993.*

**Yale University** **New Haven, Connecticut**

*B.S. in Physics, cum laude, May 1991.*

## RESEARCH EXPERIENCE

**Grand Valley State University** **Allendale, Michigan**

*Associate Professor, August 2005 – present.*

*Assistant Professor, August 1999 – August 2005.*

Currently conducting investigations of student understanding of modern physics and intermediate mechanics. Developing, testing, and assessing research-based curricular materials. Supervising senior research projects in physics education research.

**University of Washington** **Seattle, Washington**

*Research Associate, Physics Education Group, March 1999 – August 1999.*

*Research Assistant, Physics Education Group, September 1992 – February 1999.*

Directed and conducted systematic investigations of student understanding in mechanics, optics, and quantum physics. Developed, tested, and assessed research-based curricular materials. Led workshops for college and university faculty.

## TEACHING EXPERIENCE

**Grand Valley State University** **Allendale, Michigan**

*Associate Professor, August 2005 – present.*

*Assistant Professor, August 1999 – August 2005.*

Currently responsible for teaching department courses at all levels, from introductory level courses to those for students pursuing M.Ed. with concentration in physics. Adapting and incorporating research-based materials to enhance instruction.

**University of Washington** **Seattle, Washington**

*Lecture Instructor, September 1998 – June 1999.*

*Lead Teaching Assistant for Physics Department, September 1996 - December 1997.*

Assumed leadership role in training teaching assistants (TAs). Observed and evaluated TAs.

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### PROFESSIONAL AFFILIATIONS

American Physical Society (APS)  
American Association of Physics Teachers (AAPT)  
Michigan Section of the American Association of Physics Teachers (MiAAPT)  
Physics Education Research Topical Group (PERTG)  
Michigan Science Teachers Association (MSTA)

### COURSES TAUGHT AT GRAND VALLEY STATE UNIVERSITY (GVSU)

*Inquiry: The Mechanical and Thermal World (PHY 201),*

*Inquiry: Electricity, Magnetism, and Optics (PHY 204),*

*Integrated Physical Science for K-8 Teachers (SCI 226)*

Inquiry-based physical science courses designed primarily for pre-service K-8 teachers

*Math Topics in Physics (PHY 210)*

Seminar introductory level course designed to help students integrate calculus with concepts in mechanics

*General Physics I and II (PHY 220 – 221)*

Algebra-based introductory courses, including lectures, tutorials, and laboratories

*Introduction to Modern Physics (PHY 302)*

Junior-level course in relativity and quantum physics, including lectures and laboratories

*Intermediate Mechanics (PHY 330)*

Junior-level course in classical mechanics for physics majors and minors

*Electromagnetic Fields (PHY 340)*

Junior-level course in classical electromagnetism for physics majors and minors

*Senior Physics Project (PHY 485 – 486)*

Capstone sequence for senior majors; served as project advisor and capstone coordinator

*Physics by Inquiry (PHY 601)*

Graduate-level course for K-12 teachers on inquiry-based physics and physical science

*Teaching Conceptual Physics (PHY 630)*

Graduate-level course for K-12 teachers on methods to develop and assess student conceptual learning

*Software and Interactive Physics (PHY 650)*

Graduate-level course for K-12 teachers on effective use of technology in the physics classroom

*Readings in Physics Education Research (PHY 660)*

Graduate-level course for high school teachers to become familiar with the literature of physics education research and use the literature as a resource for teaching

*Modern Physics with Computer Visualization (PHY 670)*

Graduate-level course for high school teachers on selected topics in modern physics

*The Human Body in Motion (HNR 243 – 244)*

Team-taught interdisciplinary sequence of courses for non-science majors in GVSU Honors College

*Becoming a Teacher (ED 601)*

Team-taught course in Woodrow Wilson-W. K. Kellogg Teaching Fellowship program at GVSU

**COURSES TAUGHT AT OTHER INSTITUTIONS**

*General Physics (Physics 114 – 116), University of Washington (1998 – 1999)*

*Dynamics (Physics/Engineering 3841), Seattle Pacific University (2006)*

**STUDENT RESEARCH SUPERVISED**

K. Barber: *Student learning of wave mechanics through an inquiry-based approach*, 2011.

E. Michel: *Effectiveness of structured learning assistance instruction in rotational kinematics*, 2010.

B. Farlow: *Making connections: Investigating the effectiveness of laboratory instruction techniques on student conceptual understanding of DC resistive circuits*, 2009.

T. Major: *An exploration of student understanding of equations using work and the law of conservation of energy*, 2008.

K. Pachla: *An analysis of two non-traditional instructional methods*, 2008.

C. Carabulea: *Experimental modal analysis of an acoustic guitar*, Fall 2005 (with Dr. Karen Gipson).

K. Trebesh: *Investigating student understanding of Newton's laws in relation to fluids*, 2004.

N. Immekus: *Assessing student learning in the introductory physics laboratory: Friction and conservation of linear momentum*, 2003 (Summer Student Scholars grant).

G. Gabrielse: *Physics laboratory assessments: Dynamics of uniform circular motion*, 2003.

G. Huizenga: *Assessing student conceptual understanding in introductory mechanics labs*, 2002.

M. Jones: *Using research as a guide to improve instruction in introductory optics labs*, 2000.

**UNIVERSITY SERVICE**

Physics Department Assistant Chair, 2007 – 2010, 2011 – present

Affiliate Faculty Search Committee Chair, 2011 – present

Physics Department Advisory Committee, 2007 – present

Physics Department Interim Chair, 2010 – 2011

Barry M. Goldwater Scholarship Review Committee, 2010 – 2011

Physics Department Search Committee, annually 1999 – 2004, 2006 – 2009

Integrated Science Program Faculty (Science Education Group), 2000 – present

Honors College Faculty Council, 2009 – present

Integrated Science Search Committee, 2002 – 2004

Center for Excellence in Science and Math Education (CESME) Advisory Board, 2003 – present

**NATIONAL AND REGIONAL LEADERSHIP AND SERVICE**

President, MiAAPT, 2011 – present.

First Vice President, MiAAPT (Program Chair for Fall 2010 & Spring 2011 Meetings), 2010 – 2011.

Second Vice President, MiAAPT, 2009 – 2010.

Co-chair, 2008 Gordon Research Conference, Physics Research and Education, 2006 – 2008.

Co-vice chair, 2006 Gordon Research Conference, Physics Research and Education, 2004 – 2006.

## **GRANTS AND AWARDS**

Consultant support from NSF CCLI Phase II Grant (2011 – 2013): “Developing Research-Based Tutorials in Upper-division Electricity and Magnetism”

Project directors: S. Pollock and K. Perkins (Univ. Colorado-Boulder). Development and assessment of inquiry-based materials for the teaching of upper-level electromagnetism.

2009 GVSU Presidential Teaching Initiative Award: “Curricular revision of SCI 225 Integrated Life Science for K-8 Teachers and SCI 226 Integrated Physical Science for K-8 Teachers”

With other members of the GVSU Integrated Science Program Faculty. Revitalization of integrated science courses designed for pre-service K-8 teachers who are non-science majors.

2006 GVSU Pew Teaching Excellence Award

One of six awards in 2006 given to faculty to recognize outstanding teachers across the university.

NSF CCLI-EMD Grant DUE-0441426 (2005 – 2007): “Developing a Tutorial Approach to Enhance Student Learning of Intermediate Mechanics”

Collaborative project with M. Wittmann (Univ. of Maine), totaling approx. \$75,000. Development and preliminary assessment of inquiry-based materials for the teaching of upper-level mechanics.

Pilot site support from NSF CCLI-EMD Grant (2004 – 2007): “Research-based Laboratories for Introductory Physics”

Project directors: M. Loverude (California State Univ.-Fullerton), S. Kanim (New Mexico State Univ.), L. Ortiz (Arizona State Univ.). Oversight of pilot-testing and assessment at GVSU of new and existing curricular materials for use in introductory physics labs.

2003 GVSU Summer Student Scholars Award: “Assessing Student Learning in the Introductory Physics Laboratory: Friction and Conservation of Linear Momentum”

With Nathan Immekus (GVSU '04). Investigation of the effectiveness of active-learning strategies incorporated into introductory labs in mechanics.

2002 GVSU Presidential Teaching Initiative Award: “Redesigning the Group Science Major”

With other members of the GVSU Science Education Group. Development of assessment plan for new Integrated Science Major that aligns with new endorsement standards for K-8 teachers.

2001 GVSU Presidential Teaching Initiative Award: “Revitalizing Undergraduate Physics Labs”

With J. Thompson and K. Gipson (PHY). Implementation and assessment of research-based instructional strategies incorporated into the introductory calculus-based physics labs.

Pilot site support from FIPSE Funds for Dissemination Project (2001–2003): “Redefining the Teaching of Applied Quantum Mechanics through the Dissemination of a Proven Reform”

Project director: R. Steinberg, (CUNY). Oversight of pilot-testing and assessment at GVSU of active-learning strategies for the teaching of modern physics and quantum mechanics.

2000 GVSU Presidential Teaching Initiative Award: “The Human Body in Motion”

With F. Burns (CHM), J. Callahan (HS), B. Curry (HS), S. Schaertel (CHM), and J. Scott (MOV), for the design and implementation of a new integrated science course for GVSU honors students.

**PUBLICATIONS**

**B.S. Ambrose**, “Learning about student learning in intermediate mechanics: Using research to improve instruction,” *Physics Education Research Conference-2009*, ed. C. Henderson, M. Sabella, and C. Singh, AIP Conference Proceedings 1179, American Institute of Physics, Melville, NY, 2009, pp. 3 – 6.

W. Christian and **B.S. Ambrose**, “An introduction to the theme double-issue,” *Am. J. Phys.* **76**, 293 – 295 (2008). (Introduction and guest editorial to the special theme issue of the *American Journal of Physics* published in conjunction with the 2008 Gordon Research Conference.)

**B.S. Ambrose**, “Probing student reasoning and intuitions in intermediate mechanics: An example with linear oscillations,” *Physics Education Research Conference-2006*, ed. L. McCullough, L. Hsu, and P. Heron, AIP Conference Proceedings 883, American Institute of Physics, Melville, NY, 2007, pp. 30-33.

J. R. Thompson and **B.S. Ambrose**, “A literary canon in physics education research,” *APS Forum on Education Newsletter*, Fall 2005, ed. K. Cummings.

**B.S. Ambrose**, “A repeat performance? Challenges in developing robust conceptual understanding among advanced students,” *Physics Education Research Conference-2004*, ed. J. Marx, S. Franklin, and P. Heron, AIP Conference Proceedings 790, American Institute of Physics, Melville, NY, 2005, pp. 27-30.

**B.S. Ambrose**, “Investigating student understanding in intermediate mechanics: Identifying the need for a tutorial approach to instruction,” *Am. J. Phys.* **72**, 453 – 459 (2004).

S. Vokos, P.S. Shaffer, **B.S. Ambrose**, L.C. McDermott, “Student understanding of the wave properties of matter: Diffraction and interference of particles,” *Phys. Ed. Res., Am. J. Phys. Suppl.* **68**, S42 – S51 (2000).

**B.S. Ambrose**, P.R.L. Heron, S. Vokos, L.C. McDermott, “Student understanding of light as an EM wave: Relating the formalism to physical phenomena,” *Am. J. Phys.* **67**, 891 – 898 (1999).

**B.S. Ambrose**, P.S. Shaffer, R.N. Steinberg, L.C. McDermott, “An investigation of student understanding of single-slit diffraction and double-slit interference,” *Am. J. Phys.* **67**, 146 – 155 (1999).

**B.S. Ambrose**, “Investigation of student understanding of the wave-like properties of light and matter,” Ph.D. dissertation, Department of Physics, University of Washington, 1999 (unpublished).

Contributions to the development, assessment, and publication of curricular materials for mechanics, waves, and optics: *Tutorials in Introductory Physics*, L.C. McDermott, P.S. Shaffer, and the Physics Education Group at the University of Washington (Prentice Hall, 1998 and 2004).

Contributions to the development, assessment, and publication of curriculum: *Physics By Inquiry*, L.C. McDermott and the Physics Education Group at the University of Washington (Wiley, 1996).

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### WORKSHOPS FACILITATED

- GVSU Fall Science Update, November 16, 2011** **Grand Rapids, MI**  
Workshop: “Thinking like a scientist: Testing experimental variables”
- Regional AAPT Meeting for Michigan Section, April 16, 2011** **Allendale, MI**  
Workshop: “Using guided inquiry to improve learning in intermediate mechanics”
- GVSU Fall Science Update, November 17, 2010** **Grand Rapids, MI**  
Workshop: “Making important connections with batteries and bulbs”
- GVSU Fall Science Update, November 18, 2009** **Grand Rapids, MI**  
Workshop: “Helping students see the light: A guided inquiry activity in light and shadow”
- AAPT Summer National Meeting, July 29, 2009** **Ann Arbor, MI**  
With M. Wittmann (University of Maine), Dawn Meredith (University of New Hampshire), and Carrie Swift (University of Michigan-Dearborn), panel session GE: “Tutorials in Intermediate Mechanics”
- CESME Workshop on Learning by Inquiry in Science and Mathematics, August 2008** **Grand Rapids, MI**  
Workshop: “Teaching college-level physics more effectively: Connecting research to practice”
- AAPT Summer National Meeting, July 21, 2008** **Edmonton, Alberta**  
Tutorial session AD: “Tutorials in Intermediate Mechanics”
- MSTA Annual Conference Physics Strand Day, March 2008** **Lansing, MI**  
Workshop: “Some lessons learned from physics education research”
- NSTA Area Conference Physics Strand Day, October 18, 2007** **Detroit, MI**  
With C. Henderson (Western Michigan University), workshop: “How can physics education research help me teach more effectively?”
- Midwest Symposium on Excellence in Teaching Mathematics and Science: Research and Practice, October 14, 2007** **Chicago, IL**  
Breakout session: “Using research to improve student learning in upper division physics: An example in intermediate mechanics”
- AAPT Summer National Meeting, July 30, 2007** **Greensboro, NC**  
Tutorial session AB: “Tutorials in Intermediate Mechanics”
- Regional AAPT Meeting for Michigan Section, March 2007** **Grand Rapids, MI**  
With N. Armstrong (GVSU), workshop: “Intermediate Mechanics Tutorials”
- Joint AAPT-AAS National Meeting, January 2007** **Seattle, WA**  
With M. Wittmann (University of Maine), workshop W26: “Intermediate Mechanics Tutorials”

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**NW Ohio Symposium on Science, Math and Technology Teaching, Toledo, OH  
November 2006**

Workshop G-7: “Using research to improve learning in a junior-level university mechanics course: Investigating student understanding of oscillations”

**GVSU Regional Math & Science Center Workshops, Nov. – Dec. 2005 Allendale, MI**

With K. Oliver (PHY): “Einstein’s Universe,” a series of three (3) inquiry workshops on Einstein’s contributions to relativity, the photon nature of light, and astronomy

**NW Ohio Symposium on Science, Math and Technology Teaching, Toledo, OH  
November 2005**

Workshop B-7: “Because physics majors encounter conceptual difficulties too: Incorporating inquiry-based teaching in an upper level mechanics course”

**Lilly Seminar, Michigan State University, February 2005 East Lansing, MI**

With L.C. McDermott, P.R.L. Heron, and P.S. Shaffer (U. of Washington): “Helping students learn: A workshop for science and mathematics faculty”

**GVSU Pew Faculty Workshop, February 2004 Allendale, MI**

With N. Beyer (GVSU): “Research as a guide for enhancing instruction: An example in balancing,” as part of a CESE workshop *Guided-Inquiry Methods of Teaching Science*

**GVSU Fall Science Update Seminar, November 2003 Allendale, MI**

With K. Oliver (GVSU), workshop B18: “Computer simulations in the modern physics classroom”

**AAPT Workshop for New Physics & Astronomy Faculty, November 2003 College Park, MD**

With L.C. McDermott, P.R.L. Heron, and P.S. Shaffer (U. of Washington), plenary session: “Research as a guide to improving student learning”

**AAPT Summer National Meeting, August 2003 Madison, WI**

With M. Wittmann (University of Maine), workshop W57: “A new model course in applied quantum physics”

**GVSU Pew Faculty Teaching Conference, August 2003 Allendale, MI**

With F. Burns and J. Scott (GVSU), workshop: “Models of interdisciplinary teaching”

### INVITED PAPERS, COLLOQUIA, AND INVITED POSTERS

**Physics Education Research Conference, August 4, 2011 Omaha, NE**

Targeted poster: “Assessing student learning and teaching effectiveness in intermediate mechanics,” part of targeted poster session: “Formative and Summative Assessment in Upper-Level Physics”

**Physics Colloquium, Rochester Institute of Technology, May 3, 2011 Rochester, NY**

Invited seminar: “Using research to improve learning in upper division physics courses: An example in intermediate mechanics”

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- APS National Meeting, March 22, 2011** **Dallas, TX**  
Invited paper in session on Physics Education Research in Upper Division Physics  
Courses: “Using research to enhance student learning in intermediate mechanics”
- College of Liberal Arts and Sciences Teaching Showcase** **Allendale, MI**  
**GVSU, November 22, 2010**  
Invited roundtable discussion: “Using inquiry methods to improve learning  
in upper division science courses: An example in advanced mechanics”
- AAPT Summer National Meeting, July 2010** **Portland, OR**  
Invited panelist presentation: “A research-tested tutorial approach to teach  
intermediate mechanics,” as part of a panel session: “Interactive Methods for  
Teaching Mechanics: Tutorials, Computation, and Experimentation”
- Joint APS-AAPT National Meeting, February 15, 2010** **Washington, DC**  
Invited paper: “Using research to enhance student learning in intermediate mechanics”
- Physics Colloquium, DePaul University, September 30, 2009** **Chicago, IL**  
Invited seminar: “Because physics majors have conceptual difficulties too:  
Development of a tutorial approach to teaching intermediate mechanics”
- Physics Education Research Conference, July 30, 2009** **Ann Arbor, MI**  
Targeted poster TP-A2: “Learning about student learning in intermediate  
mechanics: Using research to improve instruction,” part of targeted poster  
session TP-A: “Cognitive Issues in Upper-Level Physics Education Research”
- Joint Texas APS-AAPT Section Meeting, April 4, 2009** **Tarleton, TX**  
Plenary presentation: “Because physics majors have conceptual difficulties too:  
Development of a tutorial approach to teaching intermediate mechanics”
- APS National Meeting, March 16, 2009** **Pittsburgh, PA**  
Invited paper in session on Computational Physics in Research and Teaching:  
GRC Themes and Topics: “Innovations in teaching with computers: What works,  
what doesn’t, and how we can tell”
- Joint AAAS-AAPT National Meeting, February 16, 2009** **Chicago, IL**  
With M. Wittmann (University of Maine), invited paper: “Connecting physics  
and mathematics: Probing student learning in intermediate mechanics”
- Foundations and Frontiers in Physics Education Research Conference,** **Bar Harbor, ME**  
**August 2007**  
Targeted poster: “Examining the ‘many paths’ to introducing students to quantum  
mechanics: Probing initial student thinking about probability,” part of targeted poster  
session: “What Should We Be Teaching in Quantum Mechanics, and Why?”
- College of Liberal Arts and Sciences Sabbatical Showcase** **Allendale, MI**  
**GVSU, April 17, 2007**  
Invited poster: “Assessing and refining an inquiry-based approach to  
teach intermediate mechanics”



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- Physics Colloquium, Western Michigan University, October 2006** **Kalamazoo, MI**  
Invited seminar: “Because physics majors encounter conceptual difficulties too:  
Refining an inquiry-based approach to teach intermediate mechanics”
- College of Liberal Arts and Sciences Research Colloquium** **Allendale, MI**  
**GVSU, September 2006**  
Invited paper: “Because physics majors encounter conceptual difficulties too:  
Refining an inquiry-based approach to teach intermediate mechanics”
- Physics Education Research Conference, July 2006** **Syracuse, NY**  
With C. Singh (U. Pittsburgh), co-organizer for targeted poster session TP-C:  
“Investigations of Student Learning in Upper Division Courses that Link  
Physics, Chemistry, and Engineering”  
Targeted poster TP-C1: “Probing student understanding of intermediate mechanics  
and its applications: An example with linear oscillations”
- Physics Education Group Seminar, University of Washington, April 2006** **Seattle, WA**  
Invited seminar: “Investigating student understanding of mechanical oscillations”
- Natural Sciences Capstone Seminar, Seattle Pacific University, April 2006** **Seattle, WA**  
Invited seminar: “Lessons learned about teaching physics: An example  
on teaching center of mass”
- AAPT Summer National Meeting, August 2005** **Salt Lake City, UT**  
Invited paper: “Utilizing tutorials to investigate and enhance student learning  
in intermediate mechanics”
- APS National Meeting, March 2005** **Los Angeles, CA**  
Invited paper: “Challenges in enhancing student learning in intermediate  
mechanics: Identifying the need for a tutorial approach to instruction”
- Physics Education Research Conference, August 2004** **Sacramento, CA**  
With C. Singh (U. Pittsburgh), co-organizer for targeted poster session TP-C:  
“Going Up? Learning Transfer among Students in Upper-Level Physics Courses”  
Targeted poster TP-C2: “A repeat performance? Challenges in developing robust conceptual  
understanding among advanced students”
- Gordon Research Conference in Physics Research and Education** **South Hadley, MA**  
**Mount Holyoke College, June 2004**  
Invited paper: “Investigating student understanding of intermediate  
mechanics: Identifying the need for a tutorial approach to instruction”
- Physics Colloquium, Chicago State University, April 2004** **Chicago, IL**  
Invited seminar: “Student understanding of probability in classical and  
quantum mechanics”
- Physics Colloquium, Seattle Pacific University, March 2004** **Seattle, WA**  
Invited seminar: “Student understanding of probability in classical and  
quantum mechanics”
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- AAPT Winter National Meeting, January 2004** **Miami, FL**  
Invited paper: “Incorporating physics education research into physics courses for in-service teachers”
- Colloquium, Center for Science and Mathematics Education Research University of Maine, June 2003** **Orono, ME**  
Invited paper: “Student understanding of probability in classical and quantum mechanics”
- APS National Meeting, April 2003** **Philadelphia, PA**  
Invited paper: “Student understanding of probability in the classical and semiclassical regime”
- Gordon Research Conference in Physics Research and Education Mount Holyoke College, June 2002** **South Hadley, MA**  
With S. Vokos (Seattle Pacific University), invited paper: “Student understanding of the semiclassical limit of quantum mechanics”
- GVSU Science & Math Division Colloquium, November 2001** **Allendale, MI**  
Invited paper: “Incorporating active learning strategies in an introductory physics course: An example in two-dimensional kinematics”
- Physics Education Research Group Seminar Ohio State University, April 2001** **Columbus, OH**  
Invited seminar: “Using research to assess a tutorial approach in teaching modern physics”
- AAPT Summer National Meeting, July 2000** **Guelph, Ontario**  
Invited paper: “Incorporating a tutorial approach in an introductory algebra-based physics course”
- Physics Colloquium, University of Cincinnati, February 1999** **Cincinnati, OH**  
Invited paper: “Investigation of student understanding of physical optics”
- CONTRIBUTED PAPERS AND POSTER PRESENTATIONS**  
*\* Denotes presentations delivered by undergraduate students*
- 24<sup>th</sup> National Conference for Undergraduate Research, April 15, 2010** **Missoula, MT**  
With Elliot Michel, contributed paper\*: “Effectiveness of SLA instruction in rotational kinematics”
- AAPT Summer Meeting, July 27, 2009** **Ann Arbor, MI**  
With C. Swift (U. Michigan-Dearborn), contributed poster:  
“Great expectations? Probing the relationship between implementers and innovators during instructional reform in intermediate mechanics”
- Regional AAPT Meeting for Michigan Section, April 12, 2008** **Kalamazoo, MI**  
Contributed paper: “Two bodies are tough enough: Helping students learn orbital mechanics”  
With Kristofer Pachla, contributed paper\*: “An analysis of two non-traditional instructional methods on student learning”

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With Tim Major, contributed paper\*: “Exploring student understanding of equations through the conservation of energy”

**Foundations and Frontiers in Physics Education Research Conference, August 2007** Bar Harbor, ME

Contributed poster: “New dimensions to probing student thinking about oscillations in two dimensions”

**Physics Education Research Conference, August 1, 2007** Greensboro, NC

Contributed poster: “New dimensions to probing student thinking about oscillations in two dimensions”

**Regional AAPT Meeting for Michigan Section, March 17, 2007** Grand Rapids, MI

Contributed paper: “The frequency of conceptual difficulties with frequency: Helping students understand 1-D and 2-D oscillations”

**Regional AAPT Meeting for Michigan Section, October 2006** Dearborn, MI

Contributed paper: “Because physics majors encounter conceptual difficulties too: Refining an inquiry-based approach to teach intermediate mechanics”

**Gordon Research Conference in Physics Research and Education Mount Holyoke College, June 2006** South Hadley, MA

Contributed poster: “Challenges in helping students understand the physics behind the formalism: An example with conservative forces”

**Regional AAPT Meeting for Michigan Section, October 2005** Roscommon, MI

Contributed paper: “The weight issue of center of mass: Investigating and enhancing understanding”

**Foundations and Frontiers in Physics Education Research Conference, August 2005** Bar Harbor, ME

Contributed poster: “Investigating student understanding of oscillatory motion in one and two dimensions”

**Joint Michigan AAPT-Ohio APS Meeting, October 2004** Rochester, MI

Contributed paper: “A repeat performance? Challenges in addressing conceptual difficulties in quantum physics”

**AAPT Summer National Meeting, August 2004** Sacramento, CA

Contributed paper: “Challenges in measuring conceptual understanding in upper-level physics courses”

**Regional AAPT Meeting for Michigan Section, October 2003** Lansing, MI

Contributed paper: “The second lap around the track: Probing student understanding of mechanics of upper level physics majors”

**AAPT Summer National Meeting, August 2003** Madison, WI

Contributed paper and poster: “Incorporating a tutorial approach in an advanced mechanics course for physics majors”

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- Regional AAPT Meeting for Michigan Section, October 2002** **Traverse City, MI**  
Contributed paper: “Investigating student learning of kinematics: New dimensions to motion in two dimensions”
- AAPT Summer National Meeting, August 2002** **Boise, ID**  
Contributed paper: “Student understanding of probability in the classical and semi-classical regimes”  
Poster: “Incorporating inquiry into an integrated science course for nonmajors”
- Gordon Research Conference in Physics Research and Education** **South Hadley, MA**  
**Mount Holyoke College, June 2002**  
Contributed poster: “Student understanding of probability in the classical and semi-classical regimes”
- Regional AAPT Meeting for Michigan Section, April 2002** **Kalamazoo, MI**  
Contributed paper: “Development and assessment of inquiry-based activities in an interdisciplinary science course for non-science majors”
- AAPT Summer National Meeting, July 2001** **Rochester, NY**  
Contributed paper: “Student understanding of probability in classical and modern physics”
- Regional AAPT Meeting for Michigan Section, April 2001** **Lansing, MI**  
Contributed paper: “Investigating student understanding of probability in classical and modern physics”  
With Matt Jones, contributed paper\*: “Comparing traditional and tutorial styles of instruction: An example in optics”
- Regional AAPT Meeting for Michigan Section, October 2000** **Lansing, MI**  
Contributed papers, with J.R. Thompson: “Student understanding of two-dimensional kinematics”
- Regional AAPT Meeting for Michigan Section, March 2000** **Detroit, MI**  
Contributed paper: “Investigation of student understanding of light and optics”
- Annual AAPT Meeting for Washington Section, October 1998** **Seattle, WA**  
Contributed paper, with P.R.L. Heron, S. Vokos, and L.C. McDermott: “Identifying and addressing student difficulties in understanding common representations of electromagnetic waves”
- AAPT Summer National Meeting, August 1997** **Denver, CO**  
Contributed paper, with S. Vokos, P.S. Shaffer, and L.C. McDermott: “Student understanding of the wave function in quantum mechanics”
- AAPT Summer National Meeting, August 1996** **College Park, MD**  
Contributed paper, with S. Vokos, P.S. Shaffer, and L.C. McDermott: “Student understanding of the wave-like properties of matter”
- AAPT Winter National Meeting, January 1996** **Reno, NV**  
Contributed paper, with S. Vokos, Tara E. O’Brien-Pride, and L.C. McDermott: “Investigating student understanding of Galilean and special relativity”
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**AAPT Summer National Meeting, August 1995**

**Spokane, WA**

Contributed paper, with R.N. Steinberg, P.S. Shaffer, and L.C. McDermott:  
“Investigating student understanding of physical optics and the wave properties of matter”

**AAPT Summer National Meeting, August 1994**

**South Bend, IN**

Contributed paper, with R.N. Steinberg, P.S. Shaffer, and L.C. McDermott:  
“Investigating student understanding of the dynamics of rigid bodies”

### REFERENCES

Available upon request