Dean A. Zollman

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Positions at Kansas State University

University Distinguished Professor &
University Distinguished Teaching Scholar, Kansas State University

Education

Bachelor of Science, Indiana University, Bloomington, Physics, 1964
Master of Science, Indiana University, Bloomington, Physics, 1965
Doctor of Philosophy, University of Maryland, College Park, Theoretical Nuclear Physics, 1970
Dissertation: Pion Production in Threshold Nucleon-Nucleon Collisions
Advisors: Carl Levinson (Deceased) & Manoj Banerjee (Deceased)

Experience

Assistant Professor, Kansas State University 1970-1977
Staff Physicist, American Association of Physics Teachers, 1975-77
Associate Professor, Kansas State University 1977-1982
Visiting Associate Professor and NSF Faculty Fellow, University of Utah 1981-82
Professor, Kansas State University, 1982- 2001
Guest Professor, University of Munich, 1989
Distinguished University Teaching Scholar, Kansas State University, 1997-
Big 12 Faculty Fellow, University of Colorado, Boulder, 1997
Guest Professor, Institute for Science Education, Kiel, Germany, 1998
University Distinguished Professor, Kansas State University, 2001-
Head, Department of Physics, Kansas State University, 2001-
Guest Professor, University of Munich, 2006
Guest Professor, Institute for Science Education, Kiel, Germany, 2007
William & Joan Porter Professor and Head, Department of Physics of Physics, 2001-2011

Awards

Distinguished Service Citation, American Association of Physics Teachers, 1986
Fulbright Research Fellowship, 1989
William Stamey Outstanding Teaching Award, 1989
Included in "Success Stories on Technology in Higher Education," EDUCOM, 1991
Burlington Northern Faculty Achievement Award, 1992
AAPT Apparatus Competition for Advanced Undergraduates, Second Place, 1993
AAPT Robert A. Millikan Medal, 1995
Doctoral University National Professor of the Year, Carnegie Foundation for the Advancement of Teaching and Council for Advancement and Support of Education, 1996
Outstanding Educational Software for *Spectroscopy Suite* presented by the AIP, 1997
Outstanding Educational Software, Honorable Mention for *Semiconductor Device Simulator Suite* presented by the AIP, 1997
Award for Integration of Research and Education, National Science Foundation, 1997 (Leader of KSU effort)
Fellow of the American Physical Society for contributions to physics education, 1997**)**
Big 12 Faculty Fellowship, 1997
Fulbright Research Fellowship, University of Kiel, 1998
Outstanding Educational Software for *Energy Band Creator,* presented by the AIP, 1998
Outstanding Educational Software, Honorable Mention for *Scanning Tunneling Microscope Simulator*, presented by the AIP, 1998

Outstanding Educational Software, Honorable Mention for *Wave Function Suite*, presented by the AIP, 1998
KSU University Distinguished Professor, 2001
National Science Foundation Director's Award for Distinguished Teaching Scholars, 2004
KSU Outstanding Department Head, 2006
American Association of Physics Teachers Oersted Medal, 2014

Professional Societies

American Physical Society
American Association of Physics Teachers
Groupe International de Recherche sur l'Enseignement de la Physique
National Association for Research in Science Teaching
National Science Teachers Association

Current & Recent International Positions

Advisory Committee, International Conference of Groupe International de Recherche sur l'Enseignement de la Physique Education and Multimedia in Teaching and Learning Physics Conference, 2014
Advisory Committee, International Conference on Physics Education, Prague, 2013
Co-coordinator, PHYSWARE: Second Collaborative Workshop on Low-cost Equipment and Appropriate Technologies that Promote Undergraduate Level, Hands-on Physics Education throughout the Developing World, Miranda House, University of Delhi, December 2012
Steering committee, World Conference on Physics Education, Istanbul, 2012
Committee on International Physics Education, American Association of Physics Teachers 2011-2013 (Vice chair 2012, Chair designate 2013)
US Representative, International Commission on Physics Education, 2003-2011 (Secretary, 2006-2011)
National Academy of Sciences International Liaison Committee for Physics 2003-2011, Executive Council, 2008-2011
Organizing Committee, *AIP Industrial* Physics *Forum* 2012: Capacity Building for *Industrial* Physics in Developing and Emerging Economies, International Centre for Theoretical Physics, Trieste, Italy, 2012
Advisory Committee, International Conference on Physics Education, Mexico City, 2011
Advisory and Review Committees, International Conference of Groupe International de Recherche sur l'Enseignement de la Physique, Reims, France, 2010
Co-coordinator, PHYSWARE: A Collaborative Workshop on Low-cost Equipment and Appropriate Technologies that Promote Undergraduate Level, Hands-on Physics Education throughout the Developing World, International Centre for Theoretical Physics, Trieste, Italy, 2009
Member, US Delegation, General Assembly of the International Union of Pure and Applied Physics, 2002, 2008

Graduate Students Supervised

James Baughman, MS, 1975
Thesis topic: The development and evaluation of materials to teach laboratory physics to blind high school students.
Present Position: retired

Sadiah Yusof, MS, 1985
Thesis Topic: The development and evaluation of a method to provide rapid feedback to laboratory instructors on conceptual weaknesses and strengths of the students in the class.
Present Position: High School Physics Teacher, Sha Alam, Malaysia

Jerry Hester, MS, 1992
Thesis Topic: Learning styles in Concepts of Physics: An examination of an introductory physics course and the way in which it meets the needs of a diverse student group.
Present Position: Director of Instructional Laboratories, Clemson University

John Brungardt, PhD, 1993
Thesis Topic: The influence of interactive videodisc instruction using real-time analysis on kinematics graphing skills on high school physics students.
Present Position: Bishop of the Dodge City, KS, Dioceses

David Iverson, MS, 1994
Thesis Topic: A non-linear torsional pendulum for the undergraduate study of chaos.
Present Position: Physics Teacher, Green Mountain High School, VT

Jaafar Jantan, PhD, 1994
Thesis Topic: Differences and similarities in teachers' information exploration strategies for lesson planning using the Physics InfoMall - a large physics database on CD-ROM.
Present Position: Associate Professor, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia

Roger Key, MS, 1995
Thesis Topic: Implementation of microcomputer based laboratory activities in the first semester calculus based introductory physics course at Kansas State University.
Present Position: Director of Laboratories, Fresno State University, CA

Lawrence Todd Escalada, MS, 1995
Thesis Topic: An investigation on the effects of using interactive digital video in a physics classroom on student learning and attitudes.
Present Position: Professor of Physics & Science Education, University of Northern Iowa, IA

David Johnson, MS, 1995
Thesis Topic: The effects of a student response system on student participation and learning in a physics course.
Present Position: Television Station, New Orleans, LA

Gerald Pilj, MS, 1995
Thesis Topic: Evaluation and analysis of the Physics InfoMall Field Test Version 3
Present Position: Software Engineer, Federal Aviation Agency, Blanchard, Oklahoma

Ridvan Unal, MS, 1996
Thesis Topic: An Investigation on How Students Describe an Atom: A Phenomenographic Approach
Present Position: Professor of Physics, Afyon Kocatepe University, Turkey

Teresa Larkin, PhD, 1997
Thesis Topic: Student Cognition and Learning in Physics and Student Learning Styles
Present Position: Professor of Physics, American University. DC

Heidi Mauk, PhD, 1997
Thesis Topic: A Study of the Cognitive and Affective Impact of the Cockpit Physics Curriculum on Students at the United States Air Force Academy
Present Position: Professor of Physics, US Air Force Academy, CO

Lawrence Todd Escalada, PhD, 1997
Thesis Topic: The Development and Evaluation of Instructional Materials that Utilize LEDs to Introduce Quantum Physics in Secondary Physics Classrooms
Present Position: Associate Professor of Physics, University of Northern Iowa, IA

Albena Dimitrov, MS, 1998
Thesis Topic: Development and Evaluation of Instructional Units on Potential Energy Diagrams
Present Position: Teacher, New Mexico Public Schools)

Kastro M. Hamed, Ph.D., 1999
Thesis Topic: Investigating Students' Understanding of Surface Phenomena
Present Position: Professor & Department Head, Florida Institute of Technology

Gabi Mihalcea, M.S., 1999
Thesis Topic: Development and Evaluation of a Teaching Unit on Waves
Present Position: Laboratory Coordinator, DePaul University, Chicago

Seunghee Lee, Ph.D., 2002
Thesis Topic: Students' Understanding of Spectra
Present Position: Instructor, Community College, Tennessee

Alice Churukian, Ph.D., 2002
Thesis Topic: Interactive Engagement in an Introductory University Physics Course: Learning Gains and Perceptions
Present Position: Lecturer in Physics, University of North Carolina

Waldemar Axmann, PhD, 2002
Thesis Topic: Research Development and Preliminary Testing of Interactive Engagements for Teaching Quantum Mechanics to Undergraduate Physics Majors
Present Position: Assistant Professor, Wichita State University

Zdeslav Hrepic, M.S., 2002
Thesis Topic: Identifying Students' Models of Propagation of Sound
Present Position: Assistant Professor, Columbus State University, Georgia

Alicia Allbaugh, Ph.D., 2003
Thesis Topic: The Problem Context Dependence of Students' Application of Newton's Second Law
Present Position: Staff Scientist, Jet Propulsion Laboratory

Zdeslav Hrepic, Ph.D., 2004
Thesis Topic: Development of Real-time Analysis of Students' Mental Models of Sound
Present Position: Assistant Professor, Columbus State University, Georgia

Bijaya Aryal, Ph.D., 2007
Thesis Topic: Transfer Of Learning With An Application To The Physics Of Positron Emission Tomography
Present Position: Assistant Professor, University of Minnesota - Rochester

Spartak Kalita, Ph.D., 2008
Thesis Topic: Transfer of Students' Learning about X-Rays and Computer-Assisted Tomography from Physics To Medical Imaging
Present Position: Assistant Professor, Sevastopol National University of Nuclear Energy and Industry, Ukraine

Dyan Jones, Ph.D. 2009
Thesis topic: Transfer of Learning from Traditional Optics to Wavefront Aberromtery
Present Position: Assistant Professor, Mercyhurst University, Erie, PA

Mojgan Matloob-Haghanikar, PhD, 2012
Thesis Topic: Scientific reasoning patterns of future elementary school teachers
Present Position: Assistant Professor, California Polytechnic State University, San Luis Obispo

Christopher Nakamura, PhD, 2012
Thesis topic: Student learning paths in an online multimedia learning environment
Present Position: Assistant Professor, Saginaw Valley State University . Michigan

Award to Student:
M.S. Thesis of Lawrence Escalada, *An investigation on the effects of using interactive video in a physics classroom on student learning and attitudes.* Outstanding M.S. Thesis, National Association for Research in Science Teaching, 1996

Postdoctoral Research Associates

S. Raj Chaudhury, 1990-92
Present Position: Associate Director, Biggio Center for the Enhancement of Teaching and Learning. Auburn University

Robert Grabhorn, 1993-94
Present Position: Software Engineer, State of Washington

N. Sanjay Rebello, 1995-98
Present Position: Professor of Physics, Kansas State University

Michael Thoresen, 1997-1999
Present Position: Software Design Supervisor, Epic Systems Corp, Madison, WI

Lei Bao, 1999-2000
Present Position: Professor of Physics, Ohio State University

Kirsten Hogg, 1999-2001
Present Position: High School Teacher, Sydney, Australia

Salomon Itza-Ortiz, 2001-2003
Present Position: Assistant Professor of Physics, University of the Ozarks

Brian Adrian, 2003-2008
Present Position: Sales Manager, Geil Marketing

Ashok Mody, 2008-2009
Present position: Instructor, Mithibai College, University of Mumbai, India

Sytil Murphy, 2008-2011
Present Position; Assistant Professor of Physics, Shepherd University, Shepherdstown, West Virginia

Grants

"Equipment for Physics Activities Center," National Science Foundation, 1973-75, Role: Principal Investigator, Amount: $8,000

This grant provided initial funds to equip the Physics Activities Center.

"Activity-Based Physics for Elementary Education Majors," National Science Foundation, 1979-81, Role: Principal Investigator, Amount: $26,000

This Local Course Improvement grant enabled me to develop the course that is now called Concepts of Physics.

"Low Cost Approach to Videodisc Education," (with R. G. Fuller and T. C. Campbell) National Science Foundation, 1979-81, Role: Senior staff, Amount: $76,000 to the University of Nebraska-Lincoln

The funds were used to prepare the videodisc *The Puzzle of the Tacoma Narrows Bridge Collapse*. This videodisc became the first science instructional videodisc to be published by a major publishing company.

"Junior High Science Materials Using Space Films," (with T. C. Campbell and R. G. Fuller) National Science Foundation, 1979-81, Role: Senior staff, Amount: $50,000 to Illinois Central College

The product of this grant was a series of four learning modules on the physics of weightlessness. The materials were aimed at middle school students.

Science Faculty Grant, National Science Foundation, 1981-82, Role: Principal Investigator, Amount: $30,000

A faculty grant provided partial salary, travel, and modest research expenses for a sabbatical year. During this year the videodisc *Physics and Automobile Collisions* was completed.

"Physics Labs with Videodisc-Computer Systems," National Science Foundation, 1981-83, Role: Principal Investigator, Amount: $20,000

This equipment grant provided funds to establish an eight-station interactive video center as part of the Physics Activities Center.

"Instructional Videodiscs for Science Laboratories," Annenberg Corporation for Public Broadcasting Program, 1981-84 Role: Co-principal investigator on a subcontract from Nebraska Educational Television, Amount: $200,000

Robert Fuller and I prepared scripts and lessons for the two physics videodiscs, *Energy Transformations* and *Studies in Motion*, which were parts of this project. The project was an exploration into the use of interactive video in undergraduate science courses.

"Analysis of Real-World Problems in Calculus-Based University Physics Using a Computer-Controlled Videodisc," National Science Foundation, 1983-86, Role: Principal Investigator, Amount: $56,000

Provided funds for the development of interactive video lessons for calculus-based physics laboratories.

"A Novel Continuing Education Science Update Program for Kansas High School Teachers," National Science Foundation, 1985-86, Role: Senior Investigator then later became Principal Investigator, Amount: $67,000.

A grant to present content and teaching materials to 30 junior and senior high school teachers. The program involved a summer workshop and follow-up sessions via a telephone conferencing system.

"Video Material Using Athletic Setting to Enhance Physics Teaching," National Science Foundation, 1985-87, Role: Co-Principal Investigator, Amount: $202,000

The result of this grant was a videodisc on topics in physics and sports and a student manual to

enable students to analyze the motion of athletes from the images on the video screen.

"A Regional Continuing Education Program on Modern Genetics for Secondary School Teachers," National Science Foundation, 1987-90, Role: Co-Principal Investigator with Tom Manney and Angelo Collins, Amount: $290,000

We introduced teachers to the use of modern genetics in their classes. To accomplish this we presented two summer workshops and follow-up during the academic year through teleconferences as well as a computer bulletin board.

"Distance Education for Certification in Physics," Title II of the Education for Economic Security Act, (Department of Education funds administered by the Kansas Board of Regents) 1987-89, Role: Principal Investigator, Amount: $26,000

We provided in-service teachers the opportunity to take Contemporary Physics by videotaping the on-campus classes and sending the tapes to the teachers. Recitations were completed via teleconferences and a computer bulletin board.

"Software Development for the Videodisc Versions of *The Mechanical Universe* Series," IBM, 1987-89, Role: Principal Investigator on a subcontract with Cal Tech, Amount: $55,000 + Equipment

We developed software to convert one of the *Mechanical Universe* programs, "*The Falling of Bodies*," to an interactive lesson.

Research Fellowship; Fulbright Commission of the Federal Republic of Germany, 1989

I spent six months at the Lehrstuhl fur Didaktik der Physik, University of Munich, and worked on a project that used a video camera and a microcomputer to collect data for physics instruction.

"Large Scale Use of Computer Interfaced Measuring Devices and Analytic Tools in Student Laboratories," An Equipment Grant for Engineering Physics Labs, National Science Foundation, 1991-93, Role: Co-Principal Investigator with Jim Legg and Barry Adams, Amount: $22,050

We used this equipment grant to introduce computer acquisition and analysis of data in the laboratories of the calculus-based physics course for science and engineering students.

"Exploration of Digital Video - Interactive as a Teaching Tool in Physics," IBM, 1992-92, Role: Principal Investigator, Amount: approximately $40,000 in equipment and services.

We developed tools and techniques that exploited the unique capabilities of digital video in the teaching of physics.

"The Development of an Innovative Model for the Preservice Preparation of Elementary Teachers for Enhanced Science, Mathematics, and Technology Training," National Science Foundation, 1991-96, Role: Co-principal Investigator with Bill Parker (Math), Nancy Thompson (USD383), and Emmett Wright (Education), Amount: $1,600,000

This project created a model for the education of future elementary school teachers. The model includes close coordination of courses and studies in the sciences, mathematics and education.

"Every Physics Teachers' CD-ROM Toolkit," National Science Foundation, 1992-96, Role: Co-principal Investigator with R. Fuller (Univ. of Nebraska) Amount: KSU portion approximately $400,000

We developed a large database that can be used by under-prepared high school physics teachers.

"Contemporary Physics Laboratories for Future Secondary Science Teachers," National Science Foundation, 1992-94, Role: Principal Investigator, Amount: $27,373

This equipment grant provided funds to create a laboratory that concentrated on contemporary concepts in physics and was directed toward future science teachers in the secondary schools. This grant enabled us to create a laboratory for Contemporary Physics and to significantly upgrade our advanced lab for physics majors.

"Digital Video Interactive, A Case Study in Physics," National Science Foundation, 1992-95, Role: Principal Investigator, Amount: $630,000

This project explored the use of digital video in the teaching of contemporary topics in physics. Results of the grant included ways to teach synthetic video processing, space-time diagrams and how to use video and computers in the teaching of quantum physics.

"International Conference on the Bicycle in Culture, Technology and Science," Association of Big Eight Universities, 1994, Role: Co-principal Investigator with R. Fuller (Univ. of Nebraska), Amount: $5,000

The grant provided funds to convene a conference on teaching with the bicycle. Representatives from the United States, Great Britain and The Netherlands discussed collaboration by combining teaching materials from curricula in each country.

"Visual Quantum Mechanics," National Science Foundation, 1995-2000, Role: Principal Investigator, Amount: $807,000

This grant developed a series of teaching materials to help non-science students learn quantum physics. The materials involve multimedia as well as hands-on experiments. Mathematics was de-emphasized in favor of visualization and conceptual understanding.

"International Workshops on Teaching Science with the Bicycle," National Science Foundation, 1995-96, Role: Principal Investigator, Amount: $14,000

This grant enabled a delegation of physics and engineering faculty to attend workshops in Great Britain and The Netherlands.

“Teaching about Lasers and Quantum Science for Middle and High School Students,” Eisenhower Professional Development Program, 1997-99, Role: Principal Investigator, Amount: $56,335

This project introduced middle and high school teachers to quantum science and its applications, such as lasers, some of the most important concepts developed in Twentieth Century Science. The teachers learned about the contents of the instructional materials and our pedagogical approach as we worked with them to implement the new materials in their classes.

"Recognition Award for Integration of Research & Education," National Science Foundation, 1997-2000, Role: Co-principal Investigator, Amount: $500,000

This award provided assistance to science faculty who wished to transfer the content and process of their research activities to lower division undergraduate courses and teacher preparation enhancement programs. Building upon knowledge and experiences from well-established research-to-instruction examples, the Program to Integrate Education and Research provided planning and implementation support.

"Creating a Modern Physics Course: Visualization and Computation for Undergraduate Physics Majors," National Science Foundation, 1997-2000, Role: Principal Investigator, Amount: $314,600

This project built on existing work to create a new Modern Physics course for science and engineering majors utilizing contemporary teaching-learning methods, computational and visualization techniques and recent fundamental research results. The result was a set of modern learning materials that provide the opportunity for science and engineering students to learn about contemporary physics.

"Scientific and Cultural Aspects of the Bicycle: Investigations with International Teams Using Multimedia," Fund for the Improvement of Post Secondary Education and the European Community, 1997-2000, Role: Investigator, Amount: $350,000 grants to Kalamazoo College and the University of Amsterdam

Five faculty members from the U.S. collaborated with faculty from five European countries to exchange students and develop instructional materials. Using the bicycle as both an application of physics and the way technology affects cultures was the focus of the project.

Conference on "Shaping the Future," National Science Foundation, 1997-2000, Role: Principal Investigator, Amount: $20,000

Funds were used to organize a regional conference on NSF recommendations for future directions in science, math, engineering and technology education.

Big 12 Fellowship, 1997, Amount: $2400

This award enabled me to be a visitor at the University of Colorado, Boulder. I worked with John Taylor on issues related to teaching quantum mechanics and Martin Goldman on web-based instruction.

“Strengthening Undergraduate Education in the Biological Sciences,” Howard Hughes Medical Institute, 1998-2002, Role: Member of Steering Committee, Amount: $1,800,000

Most of the funds were used to improve instruction for biology and pre-professional students. My role was to develop a course on the applications of modern physics to medical diagnosis and to help future biology teachers become active in research and education.

Research Fellowship, Fulbright Commission of the Federal Republic of Germany, 1998, Amount: $6,000

The grant enabled me to study at the Christian Albrechts University in Kiel with Manfred Euler. Both of us developed materials to help students better understand physics. Euler's work focused on the physics and biophysics of hearing, the perception of sound, waves and wave motion. My work included materials on waves and wave motion. We wished to look at these two different sets of materials and bring them together. The focus was on making two different sets of teaching materials work together to teach topics related to waves.

“Kansas Collaborative for Excellence in Teacher Preparation,” National Science Foundation, Amount $4,200,000

The project sought to improve the quality of education for pre-service science, mathematics, and technology teachers. It was a collaborative effort among KSU, KU, four community colleges and several school districts. My roles were co-principal investigator and coordinator of the science-math content courses across the six post-secondary institutions.

“Enhancing the Teaching of Contemporary Physics Through Online Instruction for Teachers,” Eisenhower Professional Development Program, 2001-02, Role: Principal Investigator, Amount: $23,000

This project assisted underprepared physics and/or physical science teachers in Kansas. Through a professional development strategy we brought contemporary physics knowledge and concepts to underserved students using sound science pedagogy. We offered in-service teachers a convenient opportunity to increase their knowledge, proficiency and confidence in physics and obtain certification. We transferred pedagogical strategies and teaching materials on contemporary physics to Kansas’ classrooms through collaborative effort and built a supportive community for physics teachers.

“Technology & Model-Based Conceptual Assessment: Research in Students’ Applications of Models in Physics & Mathematics,” National Science Foundation, 2001-03, Role: Principal Investigator, Amount $979,723

In this project, we are using several different techniques which have been developed to analyze the way in which students understand and apply models related to scientific concepts. The research investigates how one can use existing hardware and software systems to learn about how students are applying scientific models and how a faculty member can develop means of analyzing his or her students’ situations in terms of the context and of the frequency with which the students are able to apply different components of the model.

"Collaborative Research: Physics Teaching Web Advisory (Pathway)--A Digital Video Library for Physics Teaching," National Science Foundation, 2002-05, Role: Principal Investigator, Amount $276,382

In this project we will create a proof-of-concept demonstration of a new type of digital library for physics teaching. Combining Carnegie Mellon University's digital video library technology with pedagogical advances developed at Kansas State University and with materials contributed by master teachers, the Pathway concept goes beyond simply creating a collection of teaching and learning materials. It provides continuously improving assistance and expertise for teachers and students of all levels. Pathway builds on a unique collaboration between several longstanding research projects in digital video libraries, advanced distance learning technologies, collaboration technologies and nationally known experts in physics pedagogy and high quality content.

"Modern Medical Miracle Machines: Research Based Curriculum Enhancements for the Pre-Med Physics Course," National Science Foundation Distinguished Teaching Scholar Award, 2004-08, Role: Principal Investigator, Amount $302,281

We will complete a two stage effort involving both research on student learning and development of educational materials. During the first stage we will conduct research on the reasoning and models that students use as they transfer basic physics knowledge to the application of physics in contemporary medicine. The results of this research will then be used to develop active engagement teaching-learning materials to help students learn about the applications of 20^{th} and 21^{st} Century physics to contemporary medical diagnosis and procedures.

"Collaborative Research: PATHWAY II: Addressing the Needs of the Nation's Physics Teachers through State-of-the-Art Video Applications and Contemporary Pedagogy," National Science Foundation, 2005-07, Role: Principal Investigator, Amount $333,575

We will build on the original Pathway project to help teachers take materials from the Pathway library for their classroom use, to contribute lessons, videos, and other materials that they have developed. However, very recent advances in cooperative on-line textual documents, "Wikis" point the way toward an exciting enhancement of Pathway, the Pathway Cooperative. We will enhance Wiki software so that users may add media from our collection or others and create their own Synthetic Interviews. Then Synthetic Interview answers can be tied to simulations and time synchronization will control external objects such as text, images, video, and audio, including contributions in our digital library.

"Collaborative Research: Coupling Conversational Interactivity with Multimedia in Support of Physics Learning," National Science Foundation, 2006-2009, Role: Principal Investigator, Amount $329,328

A variety of interfaces have been used to enable students to interact with learning technologies. In addition to point and click, text and various media are in common use. However, these technologies seldom attempt to provide an interface that is similar to a conversation between two people. Building on work at the Carnegie Mellon Human-Computer Interaction Institute, we have applied such a conversational interface to the enhancement of physics teaching and incorporated it into the Physics Teaching Web Advisory (Pathway). We are extending this unique learning environment; formally studying student learning within this environment; and establishing, through research, informed development design principles specifically targeted to this new medium.

"Facilitating Case Reuse during Problem Solving," National Science Foundation, 2006-2008, Role: Co-Principal Investigator, Amount $117,826

This project conducts design-based research on methods for supporting case reuse when learning to solve problems in STEM disciplines, develop more and scalable comprehensive methods for assessing different dimensions of problem-solving performance; design, develop and disseminate instructional materials for supporting problem-solving in different STEM disciplines; and contribute to a developing theory of problem solving in STEM disciplines.

"Undergraduate Science Course Reform Serving Pre-service Teachers: Evaluation of a Faculty Professional Development Model," National Science Foundation 2006-2010**,** Role: Co-Principal Investigator, Amount $2,500,000

This project focuses on critical needs in the preparation and lifelong development of K-6 teachers. The goal is to investigate the impact on students in a national sample of standards-based reform undergraduate science courses already developed by participants in the NOVA higher education professional development model. The study investigates pre-service teachers in these courses as a subgroup and studies the quality and competence of selected graduates who are in-service K-6 teachers.

"Investigating Trajectories of Learning & Transfer of Problem Solving Expertise from Mathematics to Physics to Engineering," National Science Foundation , 2008-2011, Role: Co-Principal Investigator, Amount $999,955

This project is a step in creating a knowledge base on the evolution of students' problem solving skills over the span of three years of STEM courses. We investigate the development and transfer of problem solving skills in undergraduate mathematics, physics and engineering courses. First we use individual semi-structured interviews to capture fine grained data about individual student's problem solving. Based on these insights we enhance an adaptive online system to collect data from large numbers of students and map students' learning trajectories as they build toward problem solving expertise. In each phase, we conduct longitudinal as well as cross-sectional studies in multiple courses in mathematics, physics and engineering. Over three years we will investigate problem solving by over 3000 students in seven different courses in mathematics, physics and engineering.

"PHYSWARE: A Collaborative Workshop on Low-cost Equipment and Appropriate Technologies that Promote Undergraduate Level, Hands-on Physics Education throughout the Developing World International Centre for Theoretical Physics" 2009, Role: Co-Coordinator. Several funding sources with in-kind contributions

The goal of this workshop was to be the first in a series that would enhance the quality of physics understanding for students in the developing countries. This workshop will focus on mechanics teaching as the first in a series of international and regional workshops on important physics topics. The Workshop was held at the International Centre for Theoretical Physics, Trieste, Italy

"Infusing Pedagogical Content Knowledge into a Physics Course for Future Elementary Teachers" National Science Foundation, 2012-2015, Role: Co-Principal Investigator, Amount: $199,993.

This project will integrate pedagogical content knowledge with physics content in a physics course for future elementary teachers. The learning and teaching for both the physics content and the PCK will be evidence-based.

"Collaboration with Physics Education Faculty at University of Cordoba, Argentina," KSU Research Office, 2012, Role: Principal Investigator, Amount $2000

Travel grant to begin collaboration on physics teaching and learning

"Travel Grant to India" The American Physical Society and The Indo-U.S. Science & Technology Forum Professorship Awards in Physics, 2012, Role: Principal Investigator, Amount $4000

The grant provided travel funds to participate in PhysWare 2 and to begin collaborations with faculty at the Homi Bhabha Centre for Science Education in Mumbai.

"PHYSWARE 2: A Regional Collaborative Workshop on Low-cost Equipment and Appropriate Technologies that Promote Undergraduate Level, Hands-on Physics in the Indian Sub-continent" 2012, Role: Co-Coordinator. Supported by several funding sources with in-kind contributions

The goal was identical to the PHYSWARE which is described above. The Workshop was held at Miranda House, University of Delhi, India.

Development of Contemporary Physics On-Line, KSU Division of Continuing Education, 2013-2015, Role: Principle Investigator, Amount: $15,723

This project will transfer a popular modern physics course for non-physics students to an on-line environment. The result will include hands-on activities and interactive visualizations as well as more traditional forms of online learning.

Teaching Experience

Computereinsatz im Physikunterricht (Ludwig-Maximilian University), 2006

A one semester course on the use of computer measurements in the teaching of physics at the secondary school level

General Physics 2, 2004

The second semester of an algebra-based physics course for pre-professional students.

Principles of Contemporary Physics 1986-1988, 1992-1997, 1999-2003, 2005-2006, 2008-2011
Contemporary Physics: Problems & Principles 1986-1988, 1992-1997, 1999-2003, 2005-2006, 2008, 2009
Contemporary Physics On-Line 2000, 2001, 2002

These courses are one-semester modern physics courses for non-majors and non-science students. They share common lectures with a separate laboratory for the Problems and Principles section. They provide an elective course in twentieth century physics for students not majoring in physics.

Concepts of Physics 1977-1995, 1999-2000, 2002, 2004-2006, 2008-11

Concepts of Physics is a one-semester course for elementary education majors and was developed with a Local Course Improvement grant from NSF. The course serves about 120 students each fall semester. The teaching method is based on Piaget's model of intellectual development and uses a variation on the learning cycle developed by Karplus.

Modern Medical Miracle Machines, 2001

The course provides an opportunity to study the underlying physics and its applications in diagnosis and therapy. The “machines” that will be the focus of study are positron emission tomography (PET), magnetic resonance imaging (MRI), the laser, and particle accelerators. PET and MRI are used in diagnosis. They are particularly useful techniques for being able to see inside a patient’s body without the need to make an incision. Lasers have been used in a very wide variety of surgical techniques while particle accelerators are now becoming a method for the treatment of deep-seated cancers. Each of the instruments involves a somewhat different set of principles of physics so that we will need to study the underlying principles in small sections and see how each of them is applied to the device under discussion.

Developing Scholars Seminars, 2000

The K-State Developing Scholars Program is a new effort to increase the involvement of selected students with KSU faculty and their scholarly activities. The primary goal of this seminar is to prepare students to take maximum advantage of the opportunities available at a research university such as K-State. During this two-credit, academic seminar they will begin to participate in university scholarly activities. This seminar will help them excel in the classroom and in the scholarly work that they will do with the faculty mentor.

Modern Physics, 2000

This is a one-semester course in which the models that have been developed and experiments that have been performed by physicists during the Twentieth Century are discussed. The course begins by considering the observing light emitted by a variety of everyday objects. Then students will learn how the properties of that light can help build models of very small objects such as atoms and molecules. Next students will see how a fundamental model (quantum mechanics) can be used to explain the observations and

describe very small objects. Then, students will apply this model to molecules, atoms and objects smaller than atoms.

Teaching University Physics 1996, 1998, 2000, 2002

Student discuss techniques which aid in the development of understanding of the concepts in physics. Emphasis is placed on models of learning and teaching techniques that can be applied to the teaching of contemporary physics to university students. These model techniques are used to analyze a teaching approach of a topic, such as quantum mechanics, which is important to today's physicist.

Journal Club 1990-91, 1995

A course to help first year graduate students become familiar with the literature in physics and learn proper techniques for presenting talks at scientific meetings.

Computational Tools for Physics 1990-91

Undergraduate physics majors were introduced to the use of commercial software such as spreadsheets, symbolic manipulators and graphical packages. These programs were introduced in the context of their value in physics and their use in the study of physics. This course was offered on an experimental basis in 1990 and 1991. It has now been integrated into the physics curriculum.

Space-time Physics: Special Relativity 1990

This one semester course was offered to undergraduate physics majors as part of a nationwide experiment. Students at KSU met in class here. In addition, they became involved in discussion and problem solving with students and faculty of several other universities by using BITNET.

Undergraduate Seminar, 1986

A course for freshman physics majors in which we introduce some interesting topics in physics. The topic was physics of the early universe

Science Honors Colloquium, 1985-1990

This two-credit seminar was offered to high school honors students via a telephone conferencing system. Students interacted with the instructor and other students via a two-way telephone link. High school honors students throughout Kansas and Alaska enrolled in the colloquium.

Modern Physics, 1984

Undergraduate physics majors are introduced to recent topics in physics.

Nuclear Physics, 1983

An introduction to nuclear physics for beginning graduate students.

Physics for Science Teachers, 1972-74, 1978, 1984, 1988, 1990, 1991, 1997-99

This topics course is generally offered in conjunction with a summer workshop for teachers. Topics have varied according to the needs of the teachers.

Planetarium for Teachers, 1981

A course to prepare teachers to use the planetarium as part of lessons on astronomy was offered on an experimental basis. The course was not integrated into the curriculum due to budgetary limitations.

The Physical World 1 & 2, 1971-1975

A two-semester sequence for non-science students. The first semester is a study of physics; the second, other physical sciences.

Quantum Field Theory, 1972

This one-semester course was offered to advanced graduate students.

Administrative Experience

Physics Department Head 2001-2011

Head of a research extensive physics department. Annual state budget of about $3 million and externally funded research budget of about $9 million.

Introductory Physics Laboratories

From 1972 to 1988 I served as the Director of Introductory Laboratories for the Physics Department. In this capacity I directed all aspects of the introductory physics laboratory program. Approximately 1600 students enroll in introductory physics laboratories each semester. The total budget for the laboratory program was slightly over $100,000 per year. Most of the funds were paid in salaries with a small fraction going to operating expenses and the purchase of equipment.

Lecture Demonstrations Supervision

From 1977 to 1988 I supervised the lecture demonstration operation for the Physics Department.

Math/Physics Branch Library

For four years I was the library liaison for the physics branch of the University Libraries. I also supervised the expansion of the library to include the mathematics and physics collection.

K.S.U. Planetarium

From about 1979 until the Department's Planetarium was closed to the public in 1985 (due to budget priorities) I supervised its operation.

Staff Physicist, American Association of Physics Teachers, 1975-77

While I served at the AAPT Executive Office, I was responsible for most of the Executive Office functions except for matters directly related to the budget and the journals. My duties included arranging and conducting the Association's national meetings, preparing copy for the AAPT Announcer, preparing other publications and generally communicating with the membership about issues related to physics teaching at the high school and undergraduate levels.

Publications

Textbooks

1. The Fascination of Physics (with J. D. Spears), Addison-Wesley, Reading, MA, 1985
2. Teachers' Guide for The Fascination of Physics (with J. D. Spears), Addison-Wesley, Reading, MA, 1985
3. Resource Manual for Physics to Accompany the Student Edition of Derive, Addison-Wesley, Reading, MA, 1992

Videodiscs

1. The Puzzle of the Tacoma Narrows Bridge Collapse (with R. G. Fuller and T. C. Campbell), John Wiley and Sons, New York, NY, 1982
2. Physics and Automobile Collisions, John Wiley and Sons, New York, NY, 1984
3. Studies in Motion (with R. G. Fuller), Great Plains Television Library, Lincoln, NE, 1984
4. Energy Transformations (with R. G. Fuller), Great Plains Television Library, Lincoln, NE, 1984
5. Physics and Sports (with M. Larry Noble) Videodiscovery, Inc., Seattle, WA, 1989
6. Physics: Cinema Classics-Side F: Modern Physics, Ztek, Louisville, KY, 1992

Slide Set

"The Lights on Campus," American Association of Physics Teachers, College Park, MD, 1977

CD-ROM

"Physics InfoMall," (with R. G. Fuller), The Learning Team, Armonk, NY, 1996

Report

Adapting to a Changing World--Challenges and Opportunities in Undergraduate Physics Education (as a member of the National Research Council's Committee on Undergraduate Physics Education Research and Implementation)

Instructional Materials with Print, Hands-on Activities and Interactive Visualizations

1. *"Visual Quantum Mechanics,"* (with Sanjay Rebello, *et al.*), Ztek, Lexington, KY, 2003
2. Hebrew Translation of *Visual Quantum Mechanics* (with Rami Arieli, *et al.*), Weismann Institute of Science, Rehovot, Israel, 2003

Journal Articles & Book Chapters

1. "Sb^{142} Spectrum Shape," (with S. T. Hsue, L.M. Langer, and S. M. Tang) *Nuclear Physics* ***73***, 370 (1965).
2. "Pion Production and the Two Nucleon Interaction," *Physical Review C* ***2***, 2128 (1970).
3. "Nonrelativistic Hard Pion Production and Current-Field Algebra," (with M. K. Banerjee, C. A. Levinson, and M. D. Shuster) *Physical Review C* ***3***, 509 (1971).
4. "The Relation of Technical and Political Problems in Safeguards," (with D. W. Brady) *Proceedings of the 12th Annual Meeting of the Institute of Nuclear Materials Management* (INMM, Columbus, 1972) Volume II, pp.794-801.
5. "International Safeguards-A Study in the Influence of Technology on Political Decisions," in *Preventing Nuclear Theft: Guidelines for Government and Industry*, R. Leachman and P. Althoff, editors (Praeger Press, New York, 1972) pp. 131-148.
6. "Resolution-A Simple Demonstration," *The Physics Teacher* ***12***, 01 (1974).
7. "The Physics Activities Center-A Mini-Exploratorium," *The Physics Teacher* ***12***, 213 (1974).
8. "The Physics of Bing-Bang-Boing," *The Physics Teacher* ***12***, 358 (1974).
9. "Absorption of Radiation: A Lecture-Sized Demonstration," *The Physics Teacher* ***12***, 563 (1974).
10. "Orientation for the New Teaching Assistant-A Laboratory-Based Program," (with J. D. Spears) *American Journal of Physics* ***42***, 1062 (1974).
11. "Spin Art: A Rotational Effects Demonstration," *The Physics Teacher* ***13***, 106 (1975).

12. "The Car, the Beer Can and the Brick Wall," *The Physics Teacher **13***, 173 (1975).
13. "A Variation on the Motor Principle," *The Science Teacher **42***, 45 (1975).
14. "What's Physics?" *The Physics Teacher **14***, 25 (1976) and ***14***, 315 (1976).
15. "Variations on the Bicycle Generator," (with George Athey) *The Physics Teacher **14***, 61 (1976).
16. "An Experiment for a Sunny Winter Day," *The Physics Teacher **14***, 104 (1976).
17. "The Electronic Music Synthesizer: An Extraordinary Wave Demonstrator," *The Physics Teacher **14***, 145 (1976).
18. "A Rotating Reference System," (with George Athey) *The Physics Teacher **14***, 178 (1976).
19. "Portable Storage Unit from a Coat Rack," *The Physics Teacher **14***, 306 (1976).
20. "The Influence of Structured Versus Unstructured Laboratory on Students' Understanding the Process of Science," (with J. D. Spears) *Journal of Research in Science Teaching **14***, 33 (1977).
21. “Filming Physical Phenomena,” (with Thomas Campbell and Robert Fuller) *American Association of Physics Teachers*, Stony Brook, NY, 1976.
22. "Nonrelativistic Hard Pion Production and Current Field Algebra II: Reactions with Composite Targets," (with M.K. Banerjee, C. A. Levinson and M. D. Shuster) *Physical Review C**14***, 2444 (1976).
23. "Corridor Display of Line Spectra," (with George Athey) *The Physics Teacher **15***, 251 (1977).
24. "Physics Labs for Blind Students," (with James Baughman, Jr.) *The Physics Teacher **15***, 339 (1977).
25. "Pedagogical Films During Future Space Missions," *The Physics Teacher 16*, 212 (1979).
26. "Meet Your New AAPT President," *The Physics Teacher **18**,* 98 (1980).
27. "Teaching Reference Frames with Videotaped Instant Replays," *The Physics Teacher **18***, 393 (1980).
28. "Demonstrating Magnetic Properties of Recording Tape," *The Physics Teacher **18***, 395 (1980).
29. "A Quantitative Demonstration of Relative Velocities," *The Physics Teacher 19*, 44 (1981).
30. "Critical Review of Research in Methods of Teaching Science Process Activities," *Investigations in Science Education, **6/3***, 19 (1980).
31. "Critical Review of Research in Mental Structures of Electricity and Magnetism," *Investigations in Science Education*.
32. "Workshop on Student Confidence in Physics," Preliminary Version," (with Robert Fuller, et al.) American Association of Physics Teachers, Stony Brook, 1980
33. "So You Want to Produce a Videodisc," (with R. G. Fuller and T. C. Campbell) *Videodisc News, **2/11***, 8 (1981).
34. "VIP Labs," *Videodisc News **3/3***, 5 (1982).
35. "The Puzzle of the Tacoma Narrows Bridge Collapse: An Interactive Videodisc Program for Physics Instruction," *Creative Computing, **10/10***, 100 (1982).
36. "Videodisc Interfaces," *Educational Technology **24/1***, 25 (1984).
37. "Interactive Videodiscs: A New Technology for Motion Analysis," *in Proceedings of Second National Symposium on Teaching Kinesiology and Biomechanics of Sport* , U.S. Olympic Committee, Colorado Springs (1984).
38. "Computer Games for Projectile Motion Instruction," *The Physics Teacher **22***, 514 (1984).
39. "Videodisc Interfaces and Software," in *The Videodisc Book*, R. Daynes and B.Butler eds. John Wiley & Sons, New York (1984).
40. "Interactive Videodiscs for Teaching Classical Mechanics," (with R. G. Fuller) in *The Many Faces of Teaching and Learning Mechanics*, P. L. Lijnse, ed. W.C.C., Utrecht, The Netherlands (1985).
41. "Interactive Video: The Combination of Microcomputers and Videodiscs," in *Microcomputers in Science Education*, George Marx and Paul Szucs, eds. International Centre for Educational Technology, Veszprem, Hungary, (1985).
42. "Skylab Physics: Lessons for 12-14 Year Old Pupils," in *Cosmos: An Educational Challenge,* P. Thompsen and N. Hornstrip, eds. European Space Agency pp. 37-42 (1986).

43. "Interactive Video for Teaching Space Science," in *Cosmos: An Educational Challenge*, P. Thompsen and N. Hornstrip, eds. European Space Agency pp. 77-80 (1986).
44. "Modeling the Motion of an Athlete: An Interactive Video for Teaching Physics," *Journal of Educational Technology Systems* ***15***, 249-258 (1987).
45. "Die Bildplatte in Physikunterricht," in *Wege in der Physikdidaktik,* W. Schneider, ed., Palm & Enke, Erlangen, pp. 206-213 (1989).
46. "Physics of Sports: An Interactive Videodisc for Analyzing the Motion of Athletes," in *Proceedings of ISBS: Sports Biomechanics*, (with Larry Noble and Miriam Satern) E. Kreighbaum, ed., Delmar, California, Research Center for Sports (1990).
47. "Beyond TV-Interactive and Digital Video in Physics Teaching," *Computers in Physics Instruction*, John Risley and E.F. Redish ed., Addison-Wesley, Reading, MA (1989).
48. "Galloping Gertie: The Tacoma Narrows Bridge Collapse," (with Robert Fuller) in *Physics For Scientists and Engineers*, second edition by R.A. Serway, Saunders College Publishing, Philadelphia, pp. 352-357 (1990).
49. "Learning Cycles in a Large Enrollment Class," *The Physics Teacher* ***28***, 20-25 (1990).
50. "Interactive Programs for a Multi-Lingual Environment," *Journal of Educational Technology Systems* ***18***, 261-272 (1990).
51. "Introducing Physics Majors to Computational Tools," in *Proceedings of Computation in Advanced Undergraduate Physics*, David Cook ed., Lawrence University, Appleton, WI (1990).
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63. "Computer Simulation of P-N Junction Devices," (with N.S. Rebello, C. Ravipati, and L.T. Escalada) *American Journal of Physics* ***65*** (8) 765-773 (1997).
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66. "Web Activities in an Introductory Class" (with Kevin Zollman) *International Journal of Modern Physics C****8***, 97-105 (1997).

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68. "An Activity Based Physics Course for Elementary Education Majors", in Preliminary Case Studies in Information Technology, National Research Council (1997).
69. "Learning Cycle Physics," in *The Changing Role of Physics Departments in Modern Universities, pp 1137-1150,* E.F. Redish & John Rigden eds., American Institute of Physics (1997).
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71. "Simulating the Spectra of Light Sources," (with N.S. Rebello, C. Cumaranatunge and L.T. Escalada) *Computer in Physics* ***12*** (1) 28-33 (1998).
72. "Visualizing Motion in Potential Wells," (with P. Jolly, N.S. Rebello, and A. Dimitrova) *American Journal of Physics* ***66*** (1) 57-63 (1998).
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76. "Digital Video, Learning Styles, and Student Understanding of Kinematics Graphs," (with T. Larkin-Hein) *Journal of SMET Education* **1**/**1** 4-17 (2000).
77. "Unterschung von Bewegungsvorgängen beim Fahrrad mit Hilfe der Soundkarte," (with G. Braune, M. Euler, and S. Schaal) Physik in der Schule **38**/4 263-268 (2000).
78. "Physics" in Handbook on Information Technologies for Education and Training, (with H.H. Adelsberger, B. Collis, J.M. Pawlowski,) Springer-Verlag, Berlin, 2002, pp 459-470.
79. "Quantum mechanics for everyone: Hands-on activities integrated with technology (with Sanjay Rebello and Kirsten Hogg) *American Journal of Physics* **70**, 252-259 (2002)
80. "Model Analysis of Fine Structures of Student Models: An Example with Newton's Third Law" (with Lei Bao and Kirsten Hogg) *American Journal of Physics* **70**, 766-778 (2002)
81. Students' Mental Models of Newton's Second Law: Mechanics to Electromagnetism, (with N. Sanjay Rebello and Salomon F. Itza-Ortiz) NARST Proceedings (2003).
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84. "Modern miracle medical machines: A course in contemporary physics for future physicians," Proceedings of Groupe International de Recherche sur l'Enseignement de la Physique (GIREP) Lund, Sweden, http://www.girep.fysik.lu.se/arkivet/filer/Fr1.pdf
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88. "Student Explorations of Quantum Effects in LEDs and Luminescent Devices" (with L.T. Escalada and N. S. Rebello) *The Physics Teacher* **42**, 173-179 (2004).

89. "A Model for Reform in Teaching Physics: Large Enrollment Physics Classes", in D.W. Sunal, E. L. Wright, & J. Bland (Eds.) *Research in Science Education: Reform in Undergraduate Science Teaching for the 21st Century*. Greenwich, CT: Information Age Publishing Inc. (2004).
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92. "A Framework for the Dynamics of Student Reasoning in an Interview," (with S.F. Itza-Ortiz, A.R. Allbaugh, P.V. Engelhardt, K.E. Gray, Z. Hrepic and N.S. Rebello), Proceedings of the NARST 2004 Meeting, Vancouver, Canada (2004).
93. "Physics & the History of the Bicycle: An example of the Interaction of Science, Industry & Society," GIREP 2004 Proceedings, Ostrava, Czech Republic, July 19-23 (2004).
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98. "Investigating Students' Ideas of X-Rays While Developing Teaching Materials for a Medical Physics Course," Spartak Kalita and Dean Zollman, Proceedings of the Physics Education Research Conference (2006).
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4. Gravity Waves (film), *The Physics Teacher* ***16***, 254 (1978).
5. The Metric Film, *The Physics Teacher* ***16***, 333 (1978).
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4. "Teaching Atomic Spectra with Street Lights," Dean Zollman NSTA National Meeting Program p. 22 (1978).
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7. "Student Confidence in Physics," R. G. Fuller, Dean Zollman, et al. *AAPT Announcer* ***9/4***, 66 (1979) and ***10/2***, 64 (1980).
8. "The Tacoma Narrows Bridge Videodisc," R. G. Fuller, Dean Zollman and T.C. Campbell Second National Videodisc Symposium, October, 1981.
9. "Disco Physics or Laser Vision Meets the Tacoma Narrows Bridge," R.G. Fuller & D. A. Zollman, *AAPT Announcer* ***11/2***, 87, 1981.
10. "Intelligent Videodisc Systems," D. A. Zollman *AAPT Announcer* ***11/4*****,** 112, 1981.
11. "Videodiscs in Physics Education," D. A. Zollman & R. G. Fuller, Third National Videodisc Symposium, 1982.
12. "Clinic on Training Teaching Assistants," L. Jossem, D. A. Zollman ,et al. *AAPT Announcer* ***12/4***, 80 (1982).
13. "Interactive Videodiscs for College Physics," Dean A. Zollman, CompuFair '83 Tacoma, Washington, 1983.
14. "Videodiscs in Education," Dean Zollman Gary Carlson, Seminar on Computer Aided Design for Publishing, Pratt Center for Computer Graphics in Design, New York, 1983.
15. "Videodiscs in Education," Dean Zollman, National Computing Conference, Anaheim, CA, 1983.
16. "Educational Uses of Interactive Videodiscs in the United States," Dean Zollman, Symposium on Interactive Video, British Open University, Milton Keynes, England, 1983.
17. "Videodiscs in Education," Dean Zollman, LOGON '83, Bozeman, MT 1983.
18. "Video-It Is No Longer Just TV," Dean Zollman, *AAPT Announcer* ***13/4***, 96 (1984).
19. "Interactive Videodiscs for Teaching Classical Mechanics," Robert. G. Fuller & Dean Zollman Groupe International de Recherche sur l'Enseignement de la Physique, Utrecht, The Netherlands, 1984.
20. "Interactive Video-The Combination of Videodisc and Microcomputers," Dean Zollman,

Microscience Conference, Balaton, Hungary, 1985.

21. "Recent Developments in Videodiscs for Physics," Dean Zollman, Communicating Physics Conference, International Commission on Physics Education, Duisburg, Germany, 1985.
22. "Skylab Physics: Lesson for 12-14 year old Pupils," Dean Zollman, Groupe International de Recherche sur l'Enseignement de la Physique, Copenhagen, Denmark 1986.
23. "Interactive Video for Teaching Space Science, Dean Zollman, " Groupe International de Recherche sur l'Enseignement de la Physique, Copenhagen, Denmark, 1986.
24. "Interactive Video in High School and College Physics Teaching," Dean Zollman, National Videodisc Symposium for Education, Lincoln, NE, 1986.
25. "Interactive Video in Physics Teaching," Dean Zollman, American Association for the Advancement of Science Annual Meeting, Chicago, IL, 1987.
26. "Using Examples from Sports to Teach Physics," Dean Zollman, AAPT Summer Meeting, Ithaca, NY. 1988.
27. "Beyond TV-Interactive and Digital Video in Physics Teaching," Dean Zollman, Conference on Computers in Physics Instruction, Raleigh, NC, 1988.
28. "Electronic Bulletin Board and Networks in Teaching," Dean Zollman, Annual Videodisc Symposium, Lincoln, NE, 1988.
29. "Interactive Video for Complex Motion Analysis," Dean Zollman, National Educational Computer Conference, Boston, MA, 1989.
30. "Building Models and Testing Hypothesis: Examples from Interactive Video," Dean Zollman, NATO Advanced Workshop on Student Development of Physics Concepts, Pavia, Italy, 1989.
31. "Repurposing Broadcast Television for Interactive Instruction," Dean Zollman, Tenth Annual Nebraska Videodisc Symposium, Lincoln, NE, 1990.
32. "The Interactive Video Component of CUPLE," Dean Zollman, AAPT Winter Meeting, San Antonio, TX, 1991.
33. "Teaching Modern Physics with Physics: Cinema Classics and a Bar Code Reader," Dean Zollman, AAPT Winter Meeting, San Antonio, TX, 1991.
34. "Interactive Video as an Integral Component of Laboratory Activities," Dean Zollman, Plenary Presentation, Computers en Nieuwe Media in Het Onderwijs, Amsterdam, The Netherlands 1991.
35. "Using New Technologies to Improve Physics Teaching," Robert. Fuller, Dean Zollman, and others) AAPT Summer Meeting, Vancouver, Canada, 1991.
36. "Multimedia as an Integral Part of a Learning Cycle Physics Course," Dean Zollman, AAPT Summer Meeting 1991.
37. "Interactive Video as an Integral Part of a Physics Course," Dean Zollman, Eleventh Annual Nebraska Videodisc Symposium, Lincoln, NE, 1991.
38. "Teaching Physics with Computers in the US and Japan," Dean Zollman, US-China-Japan Conference on Physics Teaching, Fuji Conference Center, Japan 1991.
39. "Making Physics Understandable," (Keynote Address) Dean Zollman, International Conference on Physics Teachers' Education, University of Dortmund, Germany, 1992.
40. "Using DERIVE to Teach Physics," Dean Zollman, AAPT Summer Meeting 1992.
41. Workshop on Computers in Physics Teaching, Dean Zollman, Coordinator, US-Japan-China Conference on Physics Teaching, Zhao Qing, China (1993).
42. "Modern Physics, Computer Algebra and Digital Video," , Dean Zollman & S. Raj Chaudhury AAPT Summer Meeting, 1993.
43. "Knowledge Retrieval in the Physics InfoMall," , Dean Zollman & S.R. Chaudhury, AAPT Winter Meeting 1993.
44. "Databases, Scientific Results, and Curricular Materials: A Look at Some CD-ROMs for Physics Teaching," , Dean Zollman, AAPT Winter Meeting 1993.
45. "Interactive Multimedia Application of Digital Video in Physics Instruction," S. Raj Chaudhury & , Dean Zollman AAPT Winter Meeting, 1993.
46. "Teaching Physics with Emerging Technologies: Digital Video and CD-ROM," , Dean Zollman, Workshop on New Technologies in Physics Teaching, Al-Ain, United Arab Emirates, 1993.
47. "From Concrete to Abstract: How Video Can Help," , Dean Zollman Conference on the

Introductory Physics Course, Troy, NY,, 1993.

48. "Teaching Physics with Digital Media," Keynote Address , Dean Zollman, National Conference on Computers in Physics Teaching, Torun, Poland, 1994.
49. "Physics InfoMall: A CD-ROM for All Seasons," R. Fuller & D. Zollman AAPT Summer Meeting, 1994.
50. "Invited Panel Discussion on Using the Physics InfoMall," , Dean Zollman, R. Grabhorn, M. Ellenstein, D. Replogle, C. Lehman and C. Chiaverina AAPT Summer Meeting, 1994.
51. "Do They Just Sit There? Reflections on Helping Students Learn Physics," Millikan Medal Lecture, , Dean Zollman, AAPT Summer Meeting, 1995.
52. "Visual Quantum Mechanics: Modern Physics for the High School and Introductory College Student," , Dean Zollman, AAPT Winter Meeting, 1996.
53. "Visual Space-Time: A Synthetic Video Approach to Teaching Relativity," , Dean Zollman, AAPT Winter Meeting,, 1996.
54. "Hands-on Activities for Teaching Quantum Mechanics Workshop," Dean Zollman, AAPT Winter Meeting, 1996.
55. "Spectroscopy," N. S. Rebello, C. Cumaranatunge, L.T. Escalada & , D. Zollman, AAPT Winter Meeting, Phoenix, AZ, 1997.
56. "Semiconductor Device Simulator," N.S. Rebello, C.M. Ravipati & , D. Zollman, AAPT Winter Meeting Phoenix, AZ, 1997.
57. "The Influence of the Science Standards on College-level Physics Courses for Elementary Education Majors," L.T. Escalada & , D. Zollman, AAPT Winter Meeting, Phoenix, AZ, 1997.
58. "Hands-on Quantum Mechanics Workshop," , D. Zollman, N.S. Rebello, L.T. Escalada and H. Gruner AAPT Winter Meeting, Phoenix, AZ, 1997.
59. "Atoms through the Ages," , Dean Zollman, CASE Professor of the Year Lecture Series, Smithsonian Institute, 1997.
60. "Remember When? The Past 25 Years of Interactive, Instructional Media in Physics," , Dean Zollman , AAPT Summer Meeting, Denver, CO, 1997.
61. "Hands-on Quantum Mechanics Workshop," , Dean Zollman, S. Rebello, L.T. Escalada and H. Gruner, AAPT Summer Meeting, Denver, CO, 1997.
62. "Hands-on Quantum Mechanics Workshop," , Dean Zollman, Asian Physics Educators Network Meeting, Shah Alam, Malaysia, 1997.
63. "Multimedia in Physics Teaching," Dean Zollman, Plenary lecture at Asian Physics Educators Network Meeting, Shah Alam, Malaysia, 1997.
64. "Multimedia in Physics Teaching," , Dean Zollman, Plenary lecture at Teaching Science with New Median Conference at Malaysian Science University, Pengnan, Malaysia, 1997.
65. "Teaching with Multimedia," , Dean Zollman, Malaysian National Science Museum, Kuala Lumpur, 1997.
66. "Atoms through the Ages" , Dean Zollman, Malaysian National Planetarium, Kuala Lumpur, 1997.
67. "Interactive Web-based applications using ActiveX controls and scripting," N. S. Rebello& , D. Zollman, AAPT Winter Meeting, New Orleans, LA, 1998.
68. "Energy Band Creator," N. S. Rebello, C. Cumaranatunge, L.T. Escalada & , D. Zollman, AAPT Winter Meeting, New Orleans, LA, 1998.
69. "Scanning Tunneling Microscope, STM Simulator," N. S. Rebello, K. Sushenko & , D. Zollman, AAPT Winter Meeting, New Orleans, LA, 1998.
70. "Wave Function Suite," N. S. Rebello, C. Cumaranatunge and G. Dong, & , D. Zollman, AAPT Winter Meeting, New Orleans, LA, 1998.
71. "Recent Advances in Multimedia," Keynote Address, Dean Zollman, Working Group on Multimedia in Physics Teaching Annual Conference, Kiel, Germany, 1998.
72. "Hands-on Quantum Mechanics," Plenary Lecture and Invited Workshop, Dean Zollman, GIREP Bi-annual Meeting, Duisburg, Germany, 1998.
73. “Discussion of Interactive Methods for Lecture Classes” Dean Zollman, Ruth Dyer and Talat Rahman American Association of Higher Education Conference on Institutional Change, 1998.

74. “Qualitative Quantum Mechanics: Visualizations to Facilitate Learning about the Waves of Matter,” Dean Zollman, AAPT Winter Meeting, Anaheim, CA, 1999.
75. "Energy Diagram Explorer," N. S. Rebello, C. Cumaranatunge & Dean Zollman, AAPT Winter Meeting, Anaheim, CA, 1999.
76. “Strategies that Enhance Student Learning: Building on the Past, Looking to the Future. Overview--What Worked and Stuck and What Didn't,” Dean Zollman, APS Centennial Meeting, 1999.
77. "Interactive Inquiry Teaching in Large Enrollment Classes" Dean Zollman, Sigma XI Annual Meeting, Minneapolis, MN, 1999.
78. “Visualizing with Video and Virtual Reality,” Dean Zollman, AAPT Summer Meeting, San Antonio, TX, 1999.
79. “Learning the Physics of a Scanning Tunneling Microscope, STM Using a Computer Program,” N.S. Rebello & Dean Zollman, AAPT Summer Meeting, San Antonio, TX, 1999.
80. “Hands-on Quantum Mechanics Workshop,”, Dean Zollman, M. Thoresen and K. Hamed AAPT Summer Meeting, San Antonio, TX, 1999.
81. “Quantum Mechanics for Everyone: Can It Be Delivered Through Technology?,” Dean Zollman, Conference on Simulation and Multimedia in Engineering Education, H. Vakilzadian & C. Wie, eds, Society for Computer Simulation, San Diego, CA, 2000.
82. “Helping Students Build Models: White LED & IR Detection,” Dean Zollman, Australian Institute of Physics Congress, Adelaide, South Australia, 2000.
83. “Teaching Quantum Mechanics to Everyone: Can It Be Done with Technology?” Keynote Address Dean Zollman Australian Institute of Physics Congress, Adelaide, South Australia, 2000.
84. “Teaching Quantum Mechanics to Everyone: Can it be done with Technology?” Dean Zollman New Zealand Institute of Physics Bi-annual meeting, 2001.“Can Physics be Fascinating?” Dean Zollman New Zealand Institute of Physics Bi-annual meeting, Keynote Address, 2001.“Modeling Real World Events & Video Data Collection” Dean Zollman New Zealand Institute of Physics Bi-annual meeting, 2001.“Advanced Visual Quantum Mechanics: Interactive Engagements for Upper-Level Undergraduate Courses,” Waldmar Axmann & Dean Zollman, AAPT Summer Meeting, Rochester, NY, 2001.
88. “The Formal Reasoning of Quantum Mechanics: Can we make it concrete? Should we?” Dean Zollman, Groupe International de Recherche sur l'Enseignement de la Physique, Udine, Italy, 2001.
89. “Using Visualization to Teach Quantum Mechanics,” Dean Zollman, Gordon Research Conference, Mount Holyoke College, Boston, MA, 2002.“Courses in Modern Physics for Non-Science Majors, Future Science Teachers & Biology Students,” Dean Zollman, National Changhua University of Education, Taiwan, 2002.
91. “Teaching Quantum Mechanics to Everyone: Can It Be Done With Technology, Dean Zollman, National Chiao Tung University, Taiwan, 2002.
92. “Modern Miracle Medical Machines: A Contemporary Physics for Future Physicians,” Dean Zollman, Groupe International de Recherche sur l'Enseignement de la Physique, Lund, Sweden,, 2002.
93. "An On-line Modern Physics Course for In-service Teachers” Kevin Zollman, Kirsten Hogg Salomon Itza-Ortiz & Dean Zollman, AAPT Winter Meeting, Austin, TX, 2003.
94. "Modern Miracle Medical Machines," Dean Zollman, NSF Distinguished Teaching Scholars, NSF, Washington, DC, 2004.
95. “Physics & the History of Bicycles: An example of the interaction of science, industry and society” Dean Zollman ,Groupe International de Recherche sur l'Enseignement de la Physique University of Ostrava, Czech Republic, 2004.
96. “Quantum Mechanics for Everyone: Can it be done with Technology?” Dean Zollman, International Conference: What Physics Should We Teach? University of Natal in Durban, South Africa, July, 2004 “Physics and the History of Bicycles,” AAPT Summer Meeting, Sacramento, CA, 2004.

97. "The Bicycle: A Vehicle for Teaching Physics," Dean Zollman, Joint Indo-US Initiative for Research in Physics Education, Delhi, India, 2005.
98. "Modern Miracle Medical Machines: Introducing Contemporary Physics in the Context of Medical Applications," Dean Zollman, Joint Indo-US Initiative for Research in Physics Education, Delhi, India, 2005.
99. "Transfer of Students' Learning: Physics to Medical Imaging," Dean Zollman, Bijaya Aryal & Spartak Kalita, Proceedings of the International Conference on Physics Education: Toward Development of Physics for All, Tokyo, 2006.
100. "Reflections on Physics for All" Dean Zollman, Proceedings of the International Conference on Physics Education: Toward Development of Physics for All, Tokyo, 2006.
101. "The Future of Modelling in Physics and Physics Education" Dean Zollman and Helmut Kühnelt, Modelling in Physics and Physics Education, GIREP, Amsterdam, 2006.
102. "Activities for Teaching Physics of Medical Imaging," Keynote Address, Dean Zollman, Interreg III, Udine, Italy , 2006.
103. "Extending Student Resources with Information Technology," Dean Zollman, Improving Education in Secondary Science in Europe, IMPRESSE Executive Committee, Gulpen, The Netherlands, 2006.
104. Beyond Clickers: Web-Based Wireless Interactivity for the Physics Classroom," Dean Zollman, N. Sanjay Rebello and Zdeslav Hrepic, Invited Talk, AAPT Winter Meeting, Baltimore, MD, 2008.
105. "Laboratories with Biomedical Applications Workshop" Nancy Beverly, Dean Zollman, et al., AAPT Winter Meeting, Baltimore, 2008
106. "Teaching About the Physics of Medical Imaging," Dean Zollman, GIREP 2008 International Conference, Nicosia, Cyprus, 2008.
107. "Assessment of Short and Long Term Impacts of Reformed College Science Courses on Students: A National Study of Undergraduate Science Courses" Sunal, D., Sunal, C., Mason, C., & Zollman, D. Society for College Science Teachers, New Orleans, LA. 2009
108. "How Educational Technologies Can Reach New and Cross-Over Teachers Who Also Teach Physics, Dean Zollman, Sytil Murphy, Brian Adrian, Scott Stevens, Michael Christel, AAPT Winter Meeting, Chicago, February 2009
109. " Interactions Between the Art & Science of Physics Learning," Dean A. Zollman, AAPT Summer Meeting, Ann Arbor, MI, 2009
110. "Web-based Pedagogical Assistance for Underprepared Teachers of Physics," Dean Zollman, Sytil K. Murphy, Scott Stevens and Michael Christel, Plenary Presentation at GIREP Meeting, Leicester, United Kingdom, August 2009
111. "Interactions Between the Art & Science of Physics Learning," Dean A. Zollman, Syenrgy in STEM: Bringing Mathematics, Physics and Engineering Together, Brooklyn, NY, October 2009.
112. "Teaching about the Physics of Medical Imaging," Dean Zollman, Dyan McBride, Sytil Murphy, Bijaya Aryal, Spartak Kalita and Johannes v.d. Wirjawan, Plenary talk presented at the International Conference on Physics Education, 2009, "Development and Innovation in Physics Education," Bangkok, Thailand, 18-24, October 2009.
113. "Applying physics to solve problems in new contexts and representations: Methods Students Use" Dean Zollman, American Physical Society "April" Meeting, Washington, DC 2010
114. "Conceptual alignment, the spiral approach and development of reasoning" Dean Zollman, AAPT Winter Meeting Washington, DC, 2010
115. "Laboratories with Biomedical Applications Workshop" Nancy Beverly, Dean Zollman, Dyan McBride, et al., AAPT Winter Meeting Washington, DC, 2010
116. Ground-Up Development of Biomedical Labs: Wavefront Aberrometry and PET
Dyan McBride, Dean A. Zollman and Sytil Murphy, Invited Talk, AAPT Summer Meeting, Portland, OR, 2010
117. Development and Refinement of Biomedical Labs: MRI and CT
Sytil K. Murphy, Dean A. Zollman and Dyan McBride, Invited Talk, AAPT Summer Meeting, Portland, OR 2010

118. Contemporary Physics for Students and Teachers with Limited Mathematical Skills Dean Zollman, Gordon Research Conference, S. Hadley, MA 2010
119. Teaching about the physics of medical imaging: Examples of research-based teaching materials" International Cnference onn Physics Education, Mexico City, 2011
120. "The World Conference on Physics Educations and Its Predecessors" Dean A. Zollman, American Association of Physics Teachers Winter Meeting, February 4-8, 2012, Ontario, CA
121. "Introduction to the Education Strand" Dean Zollman, , *AIP Industrial* Physics *Forum* 2012: Capacity Building for *Industrial* Physics in Developing and Emerging Economies, International Centre for Theoretical Physics, Trieste, Italy, 2012
122. Teaching about the physics of medical imaging: Examples of research-based teaching materials," Dean Zollman, US-China Advanced Forum on Physics Education, Beihjing, 2012
123. Panel of Obtaing an Academic Position, American Association of Physics Teachers Summer Meeting, 2013

Invited Talks at Regional Meetings

1. "Teaching Atomic Spectra with Street Lights,", Dean Zollman, Appalachian Section of AAPT 1976 *AAPT Announcer **6/3***, 33, 1977.
2. "Teaching Atomic Spectra with Street Lights," Dean Zollman, New Jersey Section, AAPT. *AAPT Announcer **6/3***, 39, 1977.
3. "The AAPT Slide and Film Exchange," Dean Zollman, New York Section, AAPT, *AAPT Announcer **6/3***, 39, 1977.
4. "Future Opportunities for Physics Teachers," Dean Zollman, Illinois Section, AAPT, *AAPT Announcer **6/3***, 53, 1977.
5. "Physics Laboratories for Blind Students," Dean Zollman, A-O-K Section, AAPT, 1977.
6. "Videodiscs in Physics Teaching," Dean Zollman, A-O-K Section, AAPT, 1982.
7. "Interactive Video and Science Teaching," Dean Zollman, AAAS Southwestern Regional Meeting, Tucson, AZ, 1985.
8. "Physics and Sports: Some Pedagogical Considerations," Dean Zollman, The Jerry Ruggman Lecture, University of Nebraska-Lincoln, 1986.
9. "Interactive Learning in Science," Keynote Address, Dean Zollman, Computers in Science Teaching, Indianapolis, IN, 1988.
10. "Teaching Science with Videodiscs," Dean Zollman, Kansas City Regional Council for Higher Education, Kansas City, MO, 1988.
11. "Modeling in Science," Keynote Address, Dean Zollman, Kansas Junior Academy of Science, 1991.
12. "Science Honors Colloquium," Dean Zollman, KATS Camp, Rock Springs, KS, 1991.
13. "Hands-on Quantum Mechanics Workshop," Dean Zollman, A-O-K Section Meeting, AAPT, 1997.
14. "Multimedia in Teaching," D Dean Zollman, istinguished University Scholar Presentation, Provost's Lecture Series, KSU,, 1997.
15. "Active Learning in Large Enrollment Classes" Dean Zollman, Annual Meeting, New Mexico Collaborative for Excellence in Teacher Preparation, Albuquerque, NM, 2000.
16. "Integrating Research & Education: Beyond the Undergraduate Honors Students," Dean Zollman, Campus-wide Workshop, University of Adelaide, Adelaide, South Australia, 2000.
17. Research Science & K-20 Education in Kansas, Keynote Speech, Dean Zollman, Kansas Internet 2 Day Conference, Wichita, KS, 2004.
18. "Recent Trends in Physics Education Research: A Personal Perspective Focusing Primarily on the United States," Dean Zollman, Widya Mandaka Catholic University, Surabaya, Indonesia, 2009
19. "Research at a U.S. University: An Example of Kansas State University," Dean Zollman, Widya Mandaka Catholic University, Surabaya, Indonesia, 2009
20. "Web-based Pedagogical Assistance for Teachers of Physics" Dean Zollman, SHAPE, University of North Carolina, 2010

Contributed Talks

1. "Search for Post-End Point Electrons and Evidence of Neutrino Degeneracy,", (with S. T. Hsue, L. M. Langer, E.H. Spejewski, and S. M. Tang) *Bull. Am. Phys. Soc.* ***10***, 715, 1965.
2. "Off-Shell Amplitudes from Pion Production,", (with M. K. Banerjee, C. A. Levinson and M. D. Shuster) *Bull. Am. Phys. Soc.* ***15***, 525, 1970.
3. "Pion Production in Nuclear Collisions," (with M. K. Banerjee, C. A. Levinson and M. D. Shuster*) Bull. Am. Phys. Soc.* ***15***, 525, 1970.
4. "Contribution of Heavy Meson Exchanges to Second-Class Effects in Nuclear Beta Decay,", (with F. A. Costanzi) *Bull. Am. Phys. Soc.* ***17***, 608, 1972.
5. "A Mini-Exploratorium," (with C. E. Hathaway) *AAPT Announcer* ***2/4***, 32, 1972.
6. "The Light on Campus-A Study in Atomic Spectra," *AAPT Announcer* ***3/2***,, 1973).
7. "Laboratory Instructor Evaluation," (with J. D. Spears and C. E. Hathaway) *AAPT Announcer* ***3/4***, 23, 1973.
8. "A Self-Paced Laboratory in a Traditional Course," *AAPT Announcer* ***3/4***, 23, 1973.
9. "Orientation for the New Teaching Assistant --- A Laboratory Based Program," (with J. D. Spears*) AAPT Announcer* ***3/4***, 30, 1973.
10. "The Moog Sonic Six --- An Extraordinary Wave Demonstration," *AAPT Announcer* ***3/4***, 26, 1973.
11. "Phase Four and the Physics Teacher,", (with C. E. Hathaway) *AAPT Announcer* ***3/4***, 39, 1973.
12. "Laboratory Teaching and the Process of Science,", (with J. D. Spears) *AAPT Announcer* ***4/4***, 61, 1974.
13. "A Rotating Reference System," *AAPT Announcer 4/4*, 62, 1974.
14. "Announcement of High School Teachers Grants," *AAPT Announcer* ***5/4***, 54, 1975.
15. "Inexpensive Science Material for Visually Handicapped Students,", (with J. Baughman, Jr.) *AAPT Announcer* ***6/2***, 85, 1976.
16. "Clearinghouse for Educational Product Evaluation," *AAPT Announcer* ***6/2***, 94, 1976.
17. "Description of Issue Oriented Modules," *AAPT Announcer* ***6/2***, 94, 1976.
18. "AAPT Videotape Exchange," *AAPT Announcer* ***6/4***, 88, 1977.
19. "Why does....?" *AAPT Announcer* ***8/2***, 75, 1978.
20. "Students' Models of Electricity," *AAPT Announcer* ***8/2***, 75, 1978.
21. "An Activity-Based Physics Course for Elementary Education Majors,", (with James Langford) Southwest Association for the Education of Teachers in Science, 1980.
22. "Physics in Space,", (with T. Campbell, et al.) *AAPT Announcer* ***10/2***, 97, 1980.
23. "Low-Cost Approach to Videodisc Education,", (with R. Fuller and T. Campbell) *AAPT Announcer* ***10/2***, 97, 1980.
24. "Tonight's Half-Time Entertainment is Physics,", (with R. Frank) *AAPT Announcer* ***11/2***, 104, 1981.
25. "Planetarium for Teachers-A Preservice Course,", (with T. Anstrom) AAPT Announcer **11/2**, 110, 1981.
26. "Learning Cycles for Large-Enrollment Classes," *AAPT Announcer* ***11/4***, 80, 1981.
27. "Concepts of Dynamics Held by Elementary and High School Students,", (with J. Langford) *AAPT Announcer* ***11/4***, 103, 1981.
28. "Skylab Films (with Instruction Kits for Junior High Instruction,", (with R.G. Fuller and T. C. Campbell) *AAPT Announcer* ***11/4***, 118, 1981.
29. "Workshop on Videodiscs in Physics Teaching,", (with R. G. Fuller) *AAPT Announcer* ***12/2***, 59, 1982.
30. "Videodiscs in Physics Laboratories,", (with L. Ellsworth, et al.) *AAPT Announcer* ***12/2***, 77, 1982.
31. "Interactive Videodisc Instruction: Alternate Science Laboratories,", (with R. G. Fuller) *AAPT Announcer* ***12/2***, 77, 1982.
32. "Development of a New Undergraduate Physics Laboratory," (with H. Bergeson and R. Ingebretson) AAPT Announcer ***12/2***, 83, 1982.
33. "A Versatile Computer Program for Controlling a Videodisc Player,", (with Larry Kirkpatrick) *AAPT Announcer* ***13/4***, 96, 1983.
34. "Physics of the Tacoma Narrows Bridge Collapse,", (with R. G. Fuller) *AAPT Announcer* ***13/4***, 97,

1983.

35. "Energy Transformations Featuring the Bicycle: An Interactive Videodisc Lesson,", (with R. G. Fuller) *AAPT Announcer **13/4***, 110, 1983.
36. "Studies in Motion: An Interactive Videodisc Lesson,", (with R. G. Fuller) *AAPT Announcer **13/4***, 110, 1983.
37. "Physics and Automobile Collisions: An Interactive Videodisc Lesson," *AAPT Announcer **13/4***, 110, 1983.
38. "Microcomputers and Videodisc in the Introductory Laboratory,", (with J. D. Spangler) *AAPT Announcer **14/4***, 79, 1984.
39. "Radiation and People: An Interdisciplinary Workshop for Secondary School Teachers,", (with J. S. Eck, et al.) *AAPT Announcer **15/4***, 96, 1985.
40. "Radiation and People Teleconference,", (with J. S. Eck, et al.) *AAPT Announcer **15/4***, 98, 1985.
41. "Teaching Modeling (with Interactive Video," Technology in Training and Education, Colorado Springs, CO, 1987.
42. "Videodiscs for Student Data Analysis," Computers in Physics Instruction, Raleigh, NC, 1988.
43. "The Mechanical Universe Videodisc Project,", (with David Campbell and Don Delson), 1988.
44. "Using a Computer Bulletin Board," Computers in Physics Instruction, Raleigh, NC, 1988.
45. "The Kansas State University Videodisc on Physics in Sports,", (with Larry Noble and Miriam Satern) International Seminar on Biomechanics in Sport, Bozeman, MT, 1988.
46. "KSU Film Analysis System,", (with Bing Yu and Larry Noble) Biomechanics Microcomputer Software Session of AAHPERD, Kansas City, MO, 1988.
47. "Using a Videodisc Interactively (without a Computer System,", (with Margaret Bailey) Association for Education Communications and Technology, Annual Conference, 1989.
48. "Two Models of a Ph.D. Program in Physics Education and Educational Physics,", (with R. Fuller) AAPT Summer Meeting, Minneapolis, MN, 1990.
49. "Analyzing the Thomson Model of the Atom: An Exercise for Developing Reasoning Skills," AAPT Winter Meeting, San Antonio, TX, 1991.
50. "Report on Transforming Physics Content Using New Technologies Workshop,", (with R. Fuller and others) AAPT Winter Meeting, San Antonio, TX, 1991.
51. "Retrieval Software for Creating Physics Lessons," AAPT Summer Meeting, Vancouver, Canada, 1991.
52. "Introducing Physics Majors to Computational Tools," AAPT Summer Meeting, Vancouver, Canada, 1991.
53. "Transforming Physics Content Using New Technologies,", (with R. Fuller and others) AAPT Summer Meeting, Vancouver, Canada, 1991.
54. "Digital Video-Interactive: A New Technology for Teaching Physics," AAPT Summer Meeting, 1992.
55. "Using Digital Video-Interactive to Teach Reference Frames,", (with S.R. Chaudhury) AAPT Summer Meeting, 1992.
56. "Visual Quantum Mechanics,", (with W. Axmann) AAPT Summer Meeting, 1992.
57. "Development of Student Concepts in Modern Physics,", (with W. Axmann) AAPT Summer Meeting, 1992.
58. "Interactive Multimedia Applications of Digital Video in Physics Instruction,", (with S.R. Chaudhury) AAPT Winter Meeting, 1993.
59. "Microvideo for Teaching Motion and Relativity,"(with S.R. Chaudhury and W. Axmann) AAPT Winter Meeting, 1993.
60. "Modeling the Human Cannonball: Using Digital Video to Teach Reference Frames,", (with W. Axmann and S.R. Chaudhury) AAPT Summer Meeting, 1993.
61. "The Power of Videodisc vs Random Access Videotape,", (with C.R. Lang and R.G. Fuller) AAPT Summer Meeting, 1993.
62. "Modern Physics, Computer Algebra, and Digital Video,", (with S.R. Chaudhury) AAPT Summer Meeting, 1993.
63. "A Calendar of Physics Events,", (with S.R. Chaudhury, E. Armstrong, and M.A. Clark) AAPT Summer Meeting, 1993.

64. "Using Research Tools from Semantic Theory,", (with W. Axmann) AAPT Winter Meeting, San Diego, CA, 1994.
65. "Modern Physics Knowledge of Physics Majors,", (with W. Axmann) AAPT Winter Meeting, San Diego, CA, 1994.
66. "Every Physics Teachers' CD-ROM Toolkit, The Vision and the Reality: A Hands-on Look at the Physics InfoMall," (with R.G. Fuller) AAPT Winter Meeting, San Diego, CA, 1994.
67. "Comparing Education Students' Perceived Roles of Themselves as Teachers and the Roles of the University Professors,", (with R. Grabhorn) AAPT Winter Meeting, San Diego, CA, 1994.
68. "The Use of Miniature, Infrared-Sensitive Video Cameras in Physics Teaching,", (with R. Grabhorn and C. Stevens) AAPT Winter Meeting, San Diego, CA, 1994.
69. "SharePhys: Distributing Physics Education Shareware over Internet,, (with Kevin Zollman) AAPT Summer Meeting, 1994.
70. "Using Computer Visualization, Digital Video, and Mechanical Wave Demonstrations to Teach Quantum Mechanics,", (with W. Axmann and R. Grabhorn) AAPT Summer Meeting, 1994.
71. "Visualization of a Non-Gravitational Potential Well on an Air Track (with an Ultrasonic Motion Detector,", (with W. Axmann and R. Key) AAPT Summer Meeting, 1994.
72. "The Human Cannonball and Frames of References: A Digital Video Activity,", (with R. Grabhorn and W. Axmann) AAPT Summer Meeting, 1994.
73. "Using Digital Video to Construct Space-Time Diagrams,", (with R. Grabhorn and W. Axmann) AAPT Summer Meeting, 1994.
74. "Physics Educators' Information-Seeking and Exploration Strategies from the Physics InfoMall," (with J. Jantan) AAPT Summer Meeting, 1994.
75. "Contemporary Physics: A Laboratory Course for Future Teachers," AAPT Summer Meeting, 1995.
76. "Using the World Wide Web in Teaching and Curriculum Development," AAPT Summer Meeting, 1995.
77. "The Bicycle in Science, Technology and Culture: A Model for International Cooperation in the Development of Teaching Materials," AAPT Summer Meeting, 1995.
78. "Effects of Using Interactive Digital Video on Student Learning & Attitudes," AAPT Summer Meeting, 1995).
79. "The Physics InfoMall -- What Have We Learned,", (with G. Pilj) AAPT Winter Meeting, 1996.
80. "Learning Quantum Mechanics through Interactive Computer Visualizations,", (with N. Rebello and L. Escalada) AAPT Winter Meeting, 1996.
81. "Learning Quantum Mechanics by Using LEDs and Solar Cells,", (with L. Escalada and N. Rebello) AAPT Winter Meeting, 1996.
82. "Applying Student Facets to Modern Physics,", (with R. Unal) AAPT Winter Meeting, 1996.
83. "Sabbatical Adventures: Experiences of the APS-KR Fellow at Kansas State University,", (with P. Jolly) AAPT Winter Meeting, 1996.
84. "How Students Describe Atoms,", (with R. Unal) AAPT Summer Meeting, 1996.
85. "Using Energy Bands to Understand Solid State Devices,", (with L.T. Escalada and N.S. Rebello) AAPT Summer Meeting, 1996.
86. "Measurement of Magnetic Potential Energy Diagrams,", (with N.S. Rebello and A. Dimitrova) AAPT Summer Meeting, 1996.
87. "A Laboratory Investigation of Motion in Potential Energy Wells,", (with P. Jolly and A. Dimitrova) AAPT Summer Meeting, 1996.
88. "Using Analogies to Teach Quantum Mechanics: A Review of Literature,", (with K. Hamed) AAPT Summer Meeting, 1996.
89. "A Computerized Response System in an Introductory Physics Course,", (with D. Johnson) AAPT Summer Meeting, 1996.
90. *"Solids & Light*: An Instructional Unit on the Quantum Effects in LEDs,", (with N.S. Rebello and L.T. Escalada) AAPT Summer Meeting, 1996.
91. "Applications of Tunneling in Modern Technology,", (with N.S. Rebello and L.T. Escalada) AAPT Summer Meeting, 1996.
92. "Visualizing Motion in Potential Wells: A Novel, or Direct) Measurement using the Hall Probe,",

(with N.S. Rebello and P. Jolly) AAPT Summer Meeting, 1996.
93. "Providing Class Information on the Web: Browsers, Programs, Plug-ins and Links,", (with K. Zollman) AAPT Summer Meeting, 1996.
94. *"Luminescence: It's Cool Light!* An Instructional Unit on Luminescent Materials and Devices,", (with N.S. Rebello and L.T. Escalada) AAPT Winter Meeting, Phoenix, AZ, 1997.
95. "Hands-on Quantum Physics,", (with N.S. Rebello, L.T. Escalada, and H. Gruner) AAPT Winter Meeting, Phoenix, AZ, 1997.
96. *"Is Tele-Transportation Possible?* An Instructional Unit on Wave Functions,", (with N.S. Rebello and R. Grabhorn) AAPT Winter Meeting, Phoenix, AZ, 1997.
97. "Investigating Student Understanding of Kinematics Graphs Following Instruction that Utilized Interactive Digital Video Techniques and the Role that Learning Style Plays in the Process,", (with T. Hein) AAPT Winter Meeting, Phoenix, AZ, 1997.
98. "Using Interactive Digital Video in an Introductory Course for Non-science Majors,", (with T. Hein) American Society for Engineering Education, 1997.
99. "Hands-on Quantum Mechanics,", (with N.S. Rebello and L.T. Escalada) AAPT Summer Meeting, Denver, CO, 1997.
100. "The Applicability of Visual Quantum Mechanics in High School Physics,", (with L.T. Escalada and N.S. Rebello) AAPT Summer Meeting, Denver, CO, 1997.
101. *"Luminescence: It's Cool Light!* An Instructional Unit on Luminescent Materials and Devices,", (with N.S. Rebello and L.T. Escalada) AAPT Summer Meeting, Denver, CO, 1997.
102. "Feedback on an Instructional Unit on Waves and Wave Functions,", (with N.S. Rebello and H.M. Gruner) AAPT Summer Meeting, Denver, CO, 1997.
103. "Attitudes and Learning in Cockpit Physics,", (with H. Gruner) AAPT Summer Meeting, Denver, CO, 1997.
104. "The Effect of the Multiple-Choice Format on Student Performance on the Force Concept Inventory,", (with N.S. Rebello) AAPT Summer Meeting, Denver, CO, 1997.
105. "Using ActiveX in Web-Based Physics Instruction,", (with N.S. Rebello) AAPT Summer Meeting, Denver, CO, 1997.
106. "Introducing Spin,", (with K. Hamed) AAPT Summer Meeting, Denver, CO, 1997.
107. "High School Teacher Course on Lasers and Their Applications,", (with R. Arieli) AAPT Summer Meeting, Denver, CO, 1997.
108. "Digital Video, Learning Styles, and Student Understanding of Kinematics Graphics,", (with T. Hein) AAPT Summer Meeting, Denver, CO, 1997.
109. "Student Understanding of the Atom,", (with R. Unal and N.S. Rebello) AAPT Summer Meeting, Denver, CO, 1997.
110. "Teaching Potential Energy Diagrams (with Inexpensive Equipment,", (with A. Dimitrov and N.S. Rebello) AAPT Summer Meeting, Denver, CO, 1997.
111. "Integrating Interactive Digital Video Techniques in an Introductory Physics Course for Non-Science Majors," Frontiers in Education Conference, 1997.
112. "Replacing Distracters on the Force Concept Inventory (with More Frequently Given Responses, (with N.S. Rebello) AAPT Winter Meeting, New Orleans, LA, 1998.
113. "Scientific and Cultural Aspects of the Bicycle: Investigations (with International Teams Using Interactive Technologies, (with S. Raj Chaudhury, Doyle David, Robert Fuller and David Winch) AAPT Winter Meeting, New Orleans, LA, 1998.
114. "The Bicycle in Research and Education," AAPT Winter Meeting, New Orleans, LA, 1998.
115. "An Investigation of Students' Conceptions of Light, (with N.S. Rebello and Kirsten Hogg) AAPT Winter Meeting, New Orleans, LA, 1998.
116. "The New Look to Solids & Light and Luminescence, (with L.T. Escalada and N.S. Rebello) AAPT Winter Meeting, New Orleans, LA, 1998.
117. "Integrating Research and Evaluation,", (with M. Thoresen) AAPT Winter Meeting, New Orleans, LA, 1998.
118. "Conceptual Understanding of Students After Using the Visual Quantum Mechanics Instructional Materials,", (with N.S. Rebello) AAPT Summer Meeting, Lincoln, NE, 1998.

119. "Visual Quantum Mechanics: A Field-Tester's Perspective,", (with T. Leif and N.S. Rebello) AAPT Summer Meeting, Lincoln, NE, 1998.
120. "Hands-on Quantum Mechanics,", (with N.S. Rebello and M. Thoresen) AAPT Summer Meeting, Lincoln, NE, 1998.
121. "Research on Teaching & Learning Quantum Mechanics," National Association for Research in Science Teaching,, 1998.
122. "Investigating Students' Understanding of Quantum Mechanics Using Concept Maps,", (with N.S. Rebello and K. Hamed) AAPT Winter Meeting, Anaheim, CA, 1999.
123. "Energy Diagram Explorer,", (with N.S. Rebello) AAPT Winter Meeting, Anaheim, CA, 1999.
124. "Tutorials for Introductory Quantum Mechanics,", (with M. Thoresen) AAPT Summer Meeting, San Antonio, TX, 1999.
125. "Investigating Students' Concepts of Surface Phenomena,", (with K. Hamed) AAPT Summer Meeting, San Antonio, TX, 1999.
126. "Quantum Mechanics on the Web for Teachers,", (with M. Thoresen) AAPT Summer Meeting, San Antonio, TX, 1999.
127. "Results from the International Bicycle Project --- Germany, Finland, and Kansas,", (with S. Schaal, L. Bodingbauer, J. Pingenot, and J. Crotts) AAPT Summer Meeting, San Antonio, TX, 1999.
128. "Scientific and Cultural Aspects of the Bicycle: Examples Using Interactive Technologies,", (with D. Winch, D. Davis and R. Fuller) AAPT Summer Meeting, San Antonio, TX, 1999.
129. "Scientific and Cultural Aspects of the Bicycle: Investigations Using Interactive Technologies,", (with D. Winch, D. Davis and R. Fuller) AAPT Summer Meeting, San Antonio, TX, 1999.
130. "Interactive Video-Based Labs vs Microcomputer-Based Labs, a Comparative Study of Conceptual Development,", (with T. Leif) AAPT Summer Meeting, San Antonio, TX, 1999.
131. "The Sub-Dimensions of the Dominant Agent Model on Newton's Third Law: Results from Student Interviews,", (with K. Hogg, L. Bao, and E.F. Redish) AAPT Winter Meeting, Orlando, FL, 2000.
132. "Student Foreign Study Opportunities --- Scientific and Cultural Aspects of the Bicycle: Investigations Using Interactive Technologies,", (with D. Winch, R. Chaudhury, D. Davis and R. Fuller) AAPT Winter Meeting, Orlando, FL, 2000.
133. "Model Analysis on Fine Structures of Student Models: Development of a Survey Instrument,", (with L. Bao, K. Hogg and E.F. Redish) AAPT Winter Meeting, Orlando, FL, 2000.
134. "Medical Imaging and Medical Procedures Used as Tools for Teaching Modern Physics,", (with D. Poole and K. Hogg) AAPT Summer Meeting, Guelph, Canada, 2000.
135. "A Course in Modern Physics for Nonscience Majors and Future Science Teachers,", (with K. Hogg and L. Bao) AAPT Summer Meeting, Guelph, Canada, 2000.
136. "Bridging the Traditional Labs into Formal Course (with Extended Tutorial: A Case Study on Modern Physics,", (with L. Bao and K. Hogg) AAPT Summer Meeting, Guelph, Canada, 2000.
137. "Students' Understanding of Spectra,", (with S. Lee and K. Hogg) AAPT Summer Meeting, Guelph, Canada, 2000.
138. "Attitudes of Future Teachers to Teaching and Learning,", (with K. Hogg) AAPT Summer Meeting, Guelph, Canada, 2000.
139. "Evaluating Students' Learning in a Modern Physics Course,", (with L. Bao and K. Hogg) AAPT Summer Meeting, Guelph, Canada, 2000.
140. "Measuring Conceptual Development in Modern Physics,", (with W. Axmann) AAPT Summer Meeting, Guelph, Canada, 2000.
141. "Which Should Be First: Potential Wells or Potential Steps?", (with L. Bao and K. Hogg) AAPT Summer Meeting, Guelph, Canada, 2000.
142. "Conceptual Quantum Mechanics for Science and Engineering Students,", (with E.F. Redish, M. Wittmann, L. Bao, S. Lee and K. Hogg) AAPT Summer Meeting, Guelph, Canada, 2000.
143. "Developing Scholars Program: An Overview and Preliminary", (with Alicia Allbaugh) AOK Meeting, Hays, KS, 2000.
144. "Perception of Spectra", (with Seunghee Lee & Kirsten Hogg) AOK Meeting, Hays, KS, 2000.
145. "Students Understanding of Spectra", (with S. Lee & K. Hogg) AOK Meeting, Hays, KS, 2000.

146. “Teaching and Learning Contemporary Physics Concepts”, (with K. Hogg) AOK Meeting, Hays, KS, 2000.
147. “Attitudes of Future Teachers to Teaching and Learning”, (with K. Hogg) AOK Meeting, Hays, KS, 2000.
148. “Visual Quantum Mechanics: An Update”, AOK Meeting, Hays, KS, 2000.
149. “Teaching and Learning Contemporary Physics Concepts Online”, (with K. Hogg) AAPT Winter Meeting, San Diego, CA, 2001.
150. “Visual Quantum Mechanics: A Six-Year Review,”, (with K. Hogg, C. Cumarantunge, W. Axmann, D. Pool, L. Bao, L. Escalada, M. Thoresen and N.S. Rebello) AAPT Winter Meeting, San Diego, CA, 2001.
151. “Attitudes of Future Teachers to Teaching and Learning,”, (with K. Hogg and M. O’Shea) AAPT Winter Meeting, San Diego, CA, 2001.
152. “The Effect of Distracters on Student Performance on the Force Concept Inventory,”, (with N.S. Rebello) AAPT Winter Meeting, San Diego, CA, 2001.
153. “Interactive Engagement in a Modern Physics Course,”, (with K. Hogg and L. Bao) AAPT Winter Meeting, San Diego, CA, 2001.
154. “Advanced Visual Quantum Mechanics: Interactive Engagements for Advanced Undergraduate Quantum Courses,”, (with W. Axmann) AAPT Winter Meeting, San Diego, CA, 2001.
155. “Teaching Modern Physics by Integrating Visualization and Experiments,”, (with K. Hogg) AAPT Summer Meeting, Rochester, NY, 2001.
156. “After-Class Evaluation – Can It Gather Information About Student Misconceptions?”, (with T.R. Leif) AAPT Summer Meeting, Rochester, NY, 2001.
157. “Students’ Conceptions of Energy of Lights and Photons,”, (with S. Lee and K. Hogg) AAPT Summer Meeting, Rochester, NY, 2001.
158. “Teaching and Learning Contemporary Physics Concepts Online,”, (with K. Hogg) AAPT Summer Meeting, Rochester, NY, 2001.
159. “Engaging Students to Learn Quantum Mechanics Workshop,”, (with W. Axmann, K. Hogg and S. Lee) AAPT Summer Meeting, Rochester, NY, 2001.
160. Students’ Understanding of Energy of Lights,”, (with S. Lee) AOK Section Meeting of the AAPT, Fayetteville, AR, 2001.
161. “Implications of the Use of Everyday Language on Learning Physics Concepts,”, (with S. Itza-Ortiz and N.S. Rebello) AOK Section Meeting of the AAPT, Fayetteville, AR, 2001.
162. “Faculty Reaction to Innovative Ways of Teaching Physics,”, (with A. Churukian, C. Sorensen and R. Lindell) AAPT Winter Meeting, Philadelphia, PA, 2002.
163. “The Use of Physics Words in Everyday Language and Implications for Student Learning,”, (with S. Itza-Ortiz and N. Rebello) AAPT Winter Meeting, Philadelphia, PA, 2002.
164. “Some Thermodynamics of Cycling,”, (with W. Wehrbein and H. Kuehnelt) AAPT Winter Meeting, Philadelphia, PA, 2002.
165. “Student Reaction to an Innovative Way of Teaching Physics,”, (with A. Churukian & C. Sorensen) AAPT Summer Meeting, Boise, ID, 2002.
166. “Problem Context and Newton’s Second Law: A First Look,”, (with A. Allbaugh and N.S. Rebello) AAPT Summer Meeting, Boise, ID, 2002.
167. “International Bicycle Project: Summary of Student Exchanges & Curriculum Development,”, (with D. Davis, S. Chaudhury, A.J. Ellermiejer, E. Mioduszewska, M. Euler, R. Fuller, G. Kalkanis, H. Kuehnelt, V. Rahkonen, W. Wehrbein, D. Winch and N.S. Rebello) AAPT Summer Meeting, Boise, ID, 2002.
168. “The Effect of Question Order on Student Responses to Multiple-Choice Questions,”, (with K. Gray and N.S. Rebello) AAPT Summer Meeting, Boise, ID, 2002.
169. “Students’ Mental Models of Sound Propagation,”, (with Z. Hrepic & N.S. Rebello) AAPT Summer Meeting, Boise, ID, 2002.
170. “The International Bicycle Project: Five Years of Student Exchanges & Curriculum Development,”, (with D. Davis, S. Chaudhury, A.J. Ellermiejer, E. Mioduszewska, M. Euler, R. Fuller, G. Kalkanis, H. Kuehnelt, V. Rahkonen, W. Wehrbein, D. Winch and N.S. Rebello) Groupe International de Recherche sur l'Enseignement de la Physique, GIREP) Lund, Sweden , 2002.

171. “An Online Modern Physics Course for In-Service Teachers,”, (with Kevin Zollman, Kirsten Hogg and Salomon F. Itza-Ortiz) AAPT Winter Meeting, Austin, TX, 2003.
172. “Mental Models in Energy — Mechanics Contexts,”, (with Salomon F. Itza-Ortiz, Benjamin Lawrence and N. Sanjay Rebello) AAPT Winter Meeting, Austin, TX, 2003.
173. “Problem Context and Newton’s Second Law: A Further Look,”, (with Alicia Allbaugh and N. Sanjay Rebello) AAPT Winter Meeting, Austin, TX, 2003.
174. “The Effect of Question Order on Responses to Interview Questions,”, (with Kara Gray and N. Sanjay Rebello) AAPT Winter Meeting, Austin, TX, 2003.
175. “PATHWAY Digital Video Library,”, (with Scott Stevens) AAPT Summer Meeting, Madison, WI, 2003.
176. “Physics InfoMall: The First Generation,”, (with R. Fuller, S.R. Chaudhury and E.T. Patterson) AAPT Summer Meeting, Madison, WI, 2003.
177. “Students' Understanding and Perceptions of the Content of a Lecture,”, (with Zdeslav Hrepic and N. Sanjay Rebello) AAPT Summer Meeting, Madison, WI, 2003.
178. “Students' Energy Models Mechanics Though Electromagnetism,”, (with Salomon Itza-Ortiz, Benjamin Lawrence and N. Sanjay Rebello) Summer Meeting, Madison, WI, 2003.
179. “Students and Experts Understanding of the Content of a Lecture,”, (with Zdeslav Hrepic and N. Sanjay Rebello) AOK & Nebraska AAPT Section Meeting, Manhattan, KS, 2003.
180. “A Real-Time Assessment of Students’ Mental Models of Sound Preparation,”, (with Zdeslav Hrepic and N.S. Rebello) AAPT Winter Meeting, Miami Beach, FL, 2004.
181. “A PATHWAY to Class Preparation,”, (with Brian Adrian) AAPT Winter Meeting, Miami Beach, FL, 2004.
182. “A Framework for the Dynamics of Student Reasoning in an Interview,”, (with S.F. Itza-Ortiz, A.R. Allbaugh, P.V. Engelhardt, K.E. Gray, Z. Hrepic and N.S. Rebello) NARST 2004 Meeting, Vancouver, Canada, 2004.
183. “Light Bulbs and Complete Circuits: What One Says About the Other,", (with P.V. Engelhardt and K. Gray) APS Meeting, Denver, CO, 2004.
184. **“**Physics & the History of Bicycles: An example of the interaction of science, industry and society,” GIREP Conference, Univ. of Ostrava, Czech Republic,, 2004.
185. “Quantum Mechanics for Everyone: Can it be done (with Technology?,” International Commission on Physics Education Annual Meeting, Durban, South Africa, 2004.
186. “Teaching Interactively in Large and Small Classes,” KSU Teaching Retreat, 2004.
187. “A Summary of the Effects of Question Order,”, (with K. Gray & N. S. Rebello) AAPT Summer Meeting, Sacramento, CA, 2004.
188. “Web Support for Teacher Preparation,”, (with B. Adrian, O. Makhafula and S. Stevens) AAPT Summer Meeting, Sacramento, CA, 2004.
189. “Issues in Addressing and Representing Hybrid Mental Models,”, (with Z. Hrepic and N.S. Rebello) AAPT Summer Meeting, Sacramento, CA, 2004.
190. “Physics & the History of Bicycles: An example of the interaction of science, industry and society,” Physics Colloquium, KSU, Manhattan, KS, 2004.
191. “Students’ Models of X-Rays and Their Interactions,”, (with Spartak Kalita) AOK Section Meeting of the AAPT, Little Rock, AR, 2004.
192. “Modern Miracle Medical Machines: Educational Research Development on the Application of Contemporary Physics to Medical Diagnosis & Treatment,”, (with S. Kalita and B. Aryal) AOK Section Meeting of the AAPT, Little Rock, AR, 2004.
193. “Students’ Knowledge of Structure of Matter,”, (with L. Cui and N. Sanjay Rebello) AOK Section Meeting of the AAPT, Little Rock, AR, 2004.
194. “Quantum Mechanics for Everyone: Can it be done (with Technology?” Joint meeting of the Michigan AAPT and Ohio APS Sections, Oakland University, Rochester, MI, 2004.
195. “Modern Miracle Medical Machines: Introducing Contemporary Physics in the Context of Medical Applications,” AAPT Winter Meeting, Albuquerque, NM, 2005.
196. “Presenting on Both Sides of the Atlantic – Simultaneously,”, (with S. Raj Chaudhury) AAPT Winter Meeting, Albuquerque, NM, 2005.

197. “The Evolving Classroom Response System at KSU: Classtalk, PRS, PDAs,”, (with N. Sanjay Rebello) AAPT Winter Meeting, Albuquerque, NM, 2005.
198. “Pathway – Using a State-of-the-Art-Digital Video Database for Research and Development in Teacher Education,”, (with Brian Adrian) PERC Conference, Salt Lake City, UT, 2005.
199. “A Model for Dynamic Transfer of Learning,”, (with N. Sanjay Rebello), EPEC, 2005.
200. “Web Support for Teacher Development,”, (with Brian Adrian and Scott Stevens) AAPT Summer Meeting, Salt Lake City, UT, 2005.
201. “Students: Models of the Particulate Nature of Matter Across Cultures,”, (with Lili Cui and N. Sanjay Rebello) AAPT Summer Meeting, Salt Lake City, UT, 2005.
202. “Investigating Students' Ideas About X-rays While Developing Innovative Teaching Materials,” Spartak Kalita and Dean A. Zollman, AAPT Summer Meeting, Syracuse, NY, 2006.
203. “Transfer of Knowledge from Everyday Experience to a Complex Situation,” Bijaya Aryal and Dean A. Zollman, AAPT Summer Meeting, Syracuse, NY, 2006.
204. “What Support Do New Physics Teachers Ask For?,” Brian Adrian, Dean Zollman & Scott Stevens, AAPT Summer Meeting, Syracuse, NY, 2006.
205. “Using Optical Analogies While Teaching Physics of X-rays and CAT Scans,” Spartak Kalita & Dean Zollman, A-O-K Section Meeting of the AAPT, Emporia, KS, 2006.
206. “Some Preliminary Views of Students' Models of the Physics of the Eye,” Dyan Jones & Dean Zollman, A-O-K Section Meeting of the AAPT, Emporia, KS, 2006.
207. “How Pathway Helps Teachers Bring Physics Education Research Into Practice,”Mojgan Matloob, Brian Adrian & Dean Zollman, A-O-K Section Meeting of the AAPT, Emporia, KS, 2006.
208. “Online Support for New Physics Teachers,” Brian Adrian, Dean Zollman and Scott Stevens, A-O-K Section Meeting of the AAPT, Emporia, KS, 2006.
209. “Transfer of Prior Reasoning in Understanding Positron Emission Tomography, PET),” Bijaya Aryal & Dean Zollman, A-O-K Section Meeting of the AAPT, Emporia, KS, 2006.
210. “Some Preliminary Views of Students' Models of the Physics of the Eye,” Dyan Jones & Dean Zollman, A-O-K Section Meeting of the AAPT, Emporia, KS, 2006.
211. “A Pathway to Help (with Physics Teaching,” Brian Adrian, Dean Zollman & Scott Stevens, NSTA Meeting, Omaha, NE, 2006.
212. “Teaching About the Physics of Medical Imaging,” Dean Zollman, GIREP International Conference, Cyprus, Greece, 2008.
213. “Investigating Students’ Ideas About Wavefront Aberommetry,” Dyan McBride and Dean Zollman, National Association of Research in Science teaching Annual International Conference, Baltimore, MD, 2008.
214. “Impact of Undergraduate Science Course Reform on Student Outcomes,” Dennis Sunal, Cynthia Sunal, Cheryl Mason, Dean Zollman, Corinne Lardy and Erika Steele, National Association of Research in Science Teaching Annual International Conference, Baltimore, MD, 2008.
215. “Group Interaction in Hands-On Activities Related to Medical Image Reconstruction,” Spartak Kalita and Dean Zollman, National Association of Research in Science Teaching Annual International Conference, Baltimore, MD, 2008)“Peer Scaffolding and Transfer in the Context of Learning,” Bijaya Aryal and Dean Zollman, National Association of Research in Science Teaching Annual International Conference, Baltimore, MD, 2008.
216. “Investigating Dynamic Transfer in Multiple Contexts Symposium,” N. Sanjay Rebello, Edgar Corpuz, Jacquelyn Haynicz, Bijaya Aryal, Dyan McBride, Edward Redish and Dean Zollman, National Association of Research in Science Teaching Annual International Conference, Baltimore, MD, 2008.
217. Undergraduate Reform in Science Courses: Synthesizing Themes from the Research Literature. Sunal, C., Sunal, D., Mason, C., & Zollman, D. American Educational Research Association, New York, NY. 2008
218. “Impact of Course Reform on College” Students. Sunal, D., Sunal, C., Sundberg, C., Zollman, D., Mason, C., Ogletree, G., Steele, E., & Lardy, C. Society for College Science Teachers, National Science Teachers Association, Boston, MA, 2008.

219. "Assessment of Undergraduate Courses in the Sciences: A National Study," D. Sunal, C. Sunal, C. Mason and D. Zollman, Enriching the Academic Experience of College Science Students National Conference, Ann Arbor, MI, 2008.
220. "Categorizing Concepts and Concept-Links to Examine Student Understanding," Dyan McBride & Dean Zollman, AOK Section Meeting of the AAPT, Midwest City, OK, 2008.
221. "ALT-Pathway: A Web-based Synthesis of the Student-Tutor Interaction," C. Nakamura, S. Muphy and D. Zollman, AOK Section Meeting of the AAPT, Midwest City, OK, 2008.
222. "Exploring Students' Patterns of Reasoning," M. Matloob Haghanikar, S. Murphy and D. Zollman, AOK Section Meeting of the AAPT, Midwest City, OK, 2008.
223. "Advancing Web Support for Physics Teachers," Brian Adrian, Dean Zollman and Scott Stevens, American Association of Physics Teachers Summer Meeting, Edmonton, Canada, 2008.
224. "Student Understanding of Wavefront Aberommetry," Dyan L. McBride and Dean A. Zollman, American Association of Physics Teachers Summer Meeting, Edmonton, Canada, 2008.
225. "Investigating Web-Based Synthetic Physics Tutoring: Research on What Works," Chris Nakamura, Dean Zollman, Brian Adrian, Mike Christel and Scott Stevens, American Association of Physics Teachers Summer Meeting, Edmonton, Canada, 2008.
226. Wikis as a Medium for Collaborative Lab Reports," Dean Zollman, American Association of Physics Teachers Summer Meeting, Edmonton, Canada, 2008.
227. "Teaching About the Physics of Medical Imaging," Dean Zollman, Bijaya Aryal, Spartak Kalita and Dyan McBride, American Association of Physics Teachers Summer Meeting, Edmonton, Canada, 2008.
228. "Improved Pathway: Web-Based Pedagogical Support for Teaching," Dean Zollman, Brian Adrian, Scott Stevens and Michael Christel, American Association of Physics Teachers Summer Meeting, Edmonton, Canada, 2008.
229. "Pathway - 24/7 Online Pedagogical Assistance for Teachers of Physics," Dean Zollman, Brian Adrian, Sytil Murphy, Scott Stevens and Mike Christel, AAPT Winter Meeting, Chicago, IL, 2009
230. "Concept Categorization Analysis: Verbal & Written Data Sources," Dyan L. McBride & Dean A. Zollman, , AAPT Winter Meeting, Chicago, IL, 2009
231. "Using Tablet PCs for Interactive Learning in Physics Courses for Pre-service Teachers ," Zdeslav Hrepic & Dean A. Zollman, , AAPT Winter Meeting, Chicago, IL, 2009
232. "Assessment of Short and Long Term Impacts of Reformed College Science Courses on Students: A National Study of Undergraduate Science Courses" Sunal, D., Sunal, C., Mason, C., & Zollman, D. Society for College Science Teachers, New Orleans, LA. 2009
233. " "PHYSWARE: Teaching Mechanics in Developing Countries," Priscilla W. Laws, Dean Zollman, Pratibha Jolly, Elena Sassi, , AAPT Summer Meeting, Ann Arbor, MI, 2009
234. "ALT-Pathway: Synthetic Tutors for Probing Student Learning," Chris Nakamura, Sytil Murphy, Nasser Juma, N. Sanjay Rebello and Dean Zollman, AAPT Summer Meeting, Ann Arbor, MI, 2009
235. "Exploring Students' Patterns of Reasoning," Mojgan Matloob Haghanikar, Sytil Murphy and Dean Zollman, AAPT Summer Meeting, Ann Arbor, MI, 2009
236. "Simulations for Teaching Vision and Wavefront Aberrometry," Dyan McBride, Dean Zollman, Hartmut Wiesner and Alexander Rachel, AAPT Summer Meeting, Ann Arbor, MI, 2009
237. "Study on How College Science Courses Influence Elementary School Teachers' Inservice and Preservice Teacher Preparation," Sytil Murphy, Mojgan Matloob Haghanikar and Dean A. Zollman, AAPT Summer Meeting, Ann Arbor, MI, 2009
238. "An Apparatus for Investigating the Magnetic Field due to a Wire," Sytil K. Murphy and Dean Zollman, AAPT Summer Meeting, Ann Arbor, MI, 2009
239. "Pathway - 24/7 Online Pedagogical Assistance for Teachers of Physics," Dean Zollman, Sytil Murphy, Brian Adrian, Scott Stevens and Mike Christel, AAPT Summer Meeting, Ann Arbor, MI, 2009
240. "Social and Technological Challenges in Creating a Web-Based Tutoring System," Chris M. Nakamura, Sytil K. Murphy, Nasser M. Juma, N. Sanjay Rebello and Dean Zollman, AAPT Summer Meeting, Ann Arbor, MI, 2009

241. Alexander Graham Bell & the Assassination of President Garfield: Teaching the Physics of Early Attempts at Medical Imaging," Johannes v.d. Wirjawan and Dean Zollman, GIREP Meeting,, 2009
242. "Web-based Pedagogical Assistance for Teachers of Physics," Dean A Zollman, Scott M Stevens, and Michael Christel, Association for Science Teacher Education Conference, Sacramento, 2010
243. "Enhancements to Physics Pathway, Web-based Assistance for Teachers of Physics" Dean Zollman, Sytil Murphy, Scott Stevens, and Michael Christel, AAPT Winter Meeting Washington, DC, 2010
244. "Reformed Undergraduate Science Courses: A Nationwide Research Project Investigating the Impact on pK-6 Teachers". Mason, C., Sunal, D., Sunal, C., Zollman, D., & Lardy, C. Association of Science Teacher Educators, International Conference. Sacramento, CA. 2010
245. "Comparing Faculty Perceptions of Teaching Science Concepts with Classroom Observations in Undergraduate Science Courses". Sunal, D., Sunal, C., Sundberg, C., Mason, C., & Zollman, D. Society of College Science Teachers, 2010.
246. "Reform in Entry-Level Undergraduate Science Coursework: Impacts on Pre- and In-Service K-6 Teachers in a National Sample" Sunal, D., Sunal, C., Mason, C., Zollman, D., Lardy, C., Steele, E., Turner, D., Matloob-Haghanikar, M., & Murphy, S., National Association for Research in Science Teaching. Philadelphia, PA, 2010
247. "Using a Backward Design Process in Evaluating Students' Reasoning" Mojgan Matloob Haghanikar, Sytil Murphy and Dean Zollman, AAPT Summer Meeting, Portland, OR 2010
248. "Using a Synthetic Tutor to Build and Assess Knowledge" Chris M. Nakamura, Sytil K. Murphy Nasser M. Juma, Dean Zollman and Mike Christel, AAPT/APS Joint Winter Meeting, Washington, DC 2010
249. "Exploring Students' Patterns of Reasoning" Mojgan Matloob Haghanikar, Sytil Murphy and Dean Zollman, AAPT/APS Joint Winter Meeting, Washington, DC 2010
250. "Web-based Pedagogical Assistance for Under-prepared Teachers of Physics" Dean Zollman, Association of Science Teacher Educators, International Conference. Sacramento, CA., 2010
251. "Reformed Undergraduate Science Courses: A Nationwide Research project Investigating the Impact on pK-6 Teachers C. Mason, D. Sunal, C. Sunal, D. Zollman & C. Lardy Association of Science Teacher Educators, International Conference. Sacramento, CA. 2010
252. "Comparing Faculty Perceptions of Teaching Science Concepts with Classroom Observations in Undergraduate Science Courses." D. Sunal, C. Sunal, C. Sundberg, C. Mason, & D. Zollman, Society of College Science Teachers, 2010.
253. "Reform in Entry-Level Undergraduate Science Coursework: Impacts on Pre- and In-Service K-6 Teachers in a National Sample." D. Sunal, C. Sunal, C. Mason, D. Zollman, C. Lardy, E. Steele, D. Turner, M. Matloob-Haghanikar & S. Murphy, National Association for Research in Science Teaching. Philadelphia, PA, 2010.
254. A Protocol for Classifying Sophistication of Students' Reasoning Mojgan Matloob, Sytil Murphy, Dean Zollman, Cynthia Sunal, Dennis Sunal and Cheryl Mason, AAPT Winter Meeting, January 8-12, 2011, Jacksonville, FL (2011)
255. Evaluation of Physics Pathway, Web-based Assistance for Teachers of Physics
Dean Zollman, Sytil Murphy, Scott Stevens and Michael Christel, AAPT Winter Meeting, January 8-12, 2011, Jacksonville, FL (2011)
256. Research Designs to Test and Refine the Pathway Active Learning Environment
Christopher Nakamura, Sytil Murphy, Scott Stevens, Michael Christel and Dean Zollman, AAPT Winter Meeting, January 8-12, 2011, Jacksonville, FL (2011)
257. Physics REU Students' Understanding of Ethics, Sytil Murphy and Dean Zollman, AAPT Winter Meeting, January 8-12, 2011, Jacksonville, FL (2011)
258. Students' Perceptions of the Pathway Active Learning Environment
Sytil K. Murphy, Christopher M. Nakamura and Dean A. Zollman, AAPT Summer Meeting, July 30-August 3, 2011, Omaha, NE

259. How Students' Conceptual Structure Relates to their Sophistication of Reasoning
Mojgan Matloob Haghanikar, Sytil Murphy and Dean Zollman, AAPT Summer Meeting, July 30-August 3, 2011, Omaha, NE
260. Automated Analysis of Students' responses to Short-Answer Physics Questions
Christopher M. Nakamura, Sytil K. Murphy, Dean A. Zollman, Michael Christel and Scott Stevens, AAPT Summer Meeting, July 30-August 3, 2011, Omaha, NE

Service to Professional Community and University

Professional Committee Activities

Committee on Undergraduate Physics Education Research and Implementation, National Research Council, 2010-2013
Committee on International Physics Education, American Association of Physics Teachers 2011-2013 (Vice chair 2012, Chair 2013)
Advisory Committee, International Conference of Groupe International de Recherche sur l'Enseignement de la Physique Education and Multimedia in Teaching and Learning Physics Conference, 2014
Advisory Committee "Frontiers in Mathematics and Science Education Research" Famagusta, North Cyprus, 2014
Advisory Committee, International Conference on Physics Education, Prague, 2013
Editorial Board, *European Journal of Science and Mathematics Education*, 2012-
Steering Committee, World Conference on Physics Education, Istanbul, 2012
US Representative, International Commission on Physics Education, 2003-2011 (Secretary, 2006-2011)
National Academy of Sciences International Liaison Committee for Physics 2003-2011, Executive Council, 2008-2011
Organizing Committee, *AIP Industrial* Physics *Forum* 2012: Capacity Building for *Industrial* Physics in Developing and Emerging Economies, International Centre for Theoretical Physics, Trieste, Italy, 2012
Advisory Committee, International Conference on Physics Education, Mexico City, 2011
International Advisory Committee for GIREP Conference, Reims, France, August 2010
International Advisory Committee for an International Conference on Physics Education, Bangkok, October, 2009
Co-coordinator: PHYSWARE: A Collaborative Workshop on Low-cost Equipment and Appropriate Technologies that Promote Undergraduate Level, Hands-on Physics Education throughout the Developing World International Centre for Theoretical Physics, February 16-27, 2009
US Representative to the International Union of Pure and Applied Physics General Assembly in Tskuba, Japan, October, 2008
International Advisory Committee for GIREP in Cyprus, 2008
Member of the AP Physics Course Redesign Commission of The College Board, 2006-07
Steering Committee, Workshop on Education Research in STEM Disciplines, National Academy of Sciences, 2005
Member of US Delegation, General Assembly, International Union of Pure and Applied Physics, Cape Town, South Africa, October, 2005
Higher Education Focus Group on Prospering in the Global Economy of the 21st Century, National Academy of Sciences, August, 2005
US Representative to the International Commission on Physics Education, 2003-2012, Secretary, 2006-2012)
Education representative to the US Liaison Committee for the International Union of Pure and Applied Physics, 2002-
International Advisory Committee, International Conference on Physics Education, Delhi, India, September 2005
Executive Committee, American Physical Society Forum on Education, 2000-2003
Editorial Board, Physics Academic Software, 1999-2003
Fellowship Nominating Committee, Forum on Education, American Physical Society, 1998-2003
Advisory Committee to the National Science Foundation on Educational Digital Libraries, 1998-2000
Editorial Board, *Journal of Virtual Reality,* 1995-2000
Editor, Web Mechanics Section, *Computers in Physics,* 1995-2000
Evaluation Committee for National Science Foundation Collaboratives for Excellence in Teacher Preparation, 1998-2000
Advisory Committee to the National Science Foundation on the Future of Instructional Technologies, 1995-1999
Nominating Committee, APS Forum on Education, 1995

Committee on Standards for Science Teaching, National Science Teachers Association, 1992-1994
Advisory Committee, Comprehensive Unified Physics Learning Environment, a curriculum development project of AAPT) 1990-1995
Video Consultant, National Interactive Media Project, (a videodisc development project of AAPT), 1989-1994
Advisory Committee, Assessment Component of Scope, Sequence and Coordination, a grade 7-12 curriculum project of the National Science Teachers Association), 1990-1993
Advisory Committee, "Structures and Interactions," A Model Curriculum for the Introductory University Physics Project, an AIP curriculum development project), 1991-1993
Editorial Board, AAPT Instructional Materials Center, 1987-1989
Advisory Committee, Conference on Computers in Physics Instruction, 1988
AAPT Committee of Computers in Physics Education 1983-1986
Task Force on Student Confidence in Physics, AAPT, 1980-1983
Editor, AAPT Film Repository, 1976-1983
Publications Committee, AAPT, 1976-1983
Task Force on Issue Oriented Modules, AAPT, 1975-1981
Editorial Board, The Physics Teacher, 1975-1978
NSF Pre-College Curriculum Review Panel, 1975

Recent University and Departmental Committees
Physics Department Undergraduate Recruiting Committee (Chair), 2011-
Physics Department Review of Algebra-based Physics Course (Chair), 2011-
ADVANCE Advisory Board, 2006- 2010
Arts & Sciences College Diversity Committee, 2002-2008
Committee for 5-Year review of the Women in Engineering and Sciences Director (Co-Chair), 2009-2010
Committee for selection of University Distinguished Teaching Scholar, 1999-2002, 2008-2009
Committee for selection of University Outstanding Department Head, 2009
Arts & Sciences Search Committee for Associate Dean (Chair), 2004
Physics Department Telefund Coordinator
Developing Scholars Advisory Committee 1998-2003
Physics Undergraduate Affairs, Scholarships & Recruiting Committee
Physics Laboratories & Demonstrations
University Selection Committee for University Distinguished Teaching Scholars, 1999-2001
Information Resource Management Council, 1999-2004
Faculty Senate Committee on Retention, 1999
University Committee on Intellectual Properties, 1997-1999
College of Arts & Sciences Dean's Advisory Committee, 1994-1997
Faculty advisor for the Society of Physics Students, 1995-1997, 2000-2005

Other Professional Service
Frequent National Science Foundation Proposal Reviewer for precollege teacher enhancement, educational technology programs, physics division education proposals, physics education research, and curriculum development
Occasional reviewer for Department of Energy proposals on physics education.
Frequent reviewer of manuscripts for *The Physics Teacher*, *American Journal of Physics*, *Journal of Research in Science Teaching* and *Physical Review Special Topics: Physics Education Research*.