



AAPT 2008 Summer Meeting

July 19-23, 2008

University of Alberta

Edmonton, Alberta, Canada



edmonton festival city
live all year

PHYSICS from the Ground Up

Dear Friends and Fellow Members of AAPT,

Be sure to come to this year's AAPT Summer Meeting July 19-23. It's a winner. We're going international—across the border into Canada. Active and energetic Canadian members, led by Terry Singleton, have drawn us to the beautiful city of Edmonton and the University of Alberta, where they are celebrating the 100th anniversary of the university and its Physics Department.

The meeting's forums, lectures, workshops, and sessions range from the latest in teaching and research to historical reviews of techniques pioneered by Galileo and Rumford. You'll hear physics talks by outstanding practitioners of our profession. Among these will be Michio Kaku, theoretical physicist author of *The Physics of the Impossible* and Eric Mazur, noted Harvard physics professor widely known among physics teachers for his imaginative, ingenious, and effective Concept Questions. Prof. Kaku is this year's recipient of the Klopsteg Memorial Award; Prof. Mazur has been chosen to receive the Robert A. Millikan Award.

An AAPT meeting is always a wonderful occasion. I love to prowl the exhibits; I dote on the demonstrations; I delight in the variety and ingenuity of the workshops, the talks, the posters. It's a fine pleasure to share the interest and enthusiasm of committed teachers, examining the latest classroom trends, ingenious lab techniques, and creative and imaginative ways to help students learn physics. And, best of all, I love just plain schmoozing with new friends and old. Come to Edmonton; share the pleasure.

And while you're there, enjoy the long summer days and the local attractions. Hike in the Rockies; fish in the northern lakes; or, right in the city, go bird-watching along the North Saskatchewan River. Try out the Taste of Edmonton Festival; visit the TELUS World of Science—always a favorite with AAPTers—and Edmonton's other museums.

Don't miss this meeting. See you there.

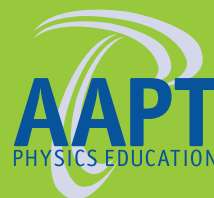

Charles Holbrow

P.S. And remember your passport!

Check our website for updates: www.aapt.org
Photos courtesy of Edmonton Tourism.

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www.aapt.org

Make your reservations now!

Program note: *This special section features a preliminary list of workshops and events. Speakers and workshop descriptions are currently being confirmed. Visit www.aapt.org frequently to find up-to-date information.*

Why you should sponsor a meeting event:

- Great positioning for our organization
- Face-to-face contact with your target market
- The most effective way to showcase your product or service
- A captive audience that wants to learn and succeed

For more information on why this is a win-win opportunity, please contact Kristal Watkins at 301-209-3372 or kwatkins@aapt.org

location & lodging

Edmonton – The Festival City

Described as one of the most beautiful places on earth, Edmonton is part of the Alberta Rocky Mountains in western Canada. This city offers a wide variety of places to go and activities to enjoy at any time of the year. Known as Canada's Festival City (www.festivalcity.ca), Edmonton hosts more than 30 festivals annually that celebrate music, food, culture, sports, theatre and more! With lots of blue sky and sunshine throughout the seasons, you can take advantage of many outdoor activities in the city. You will also find Edmonton to be a brilliant educational community that plays an essential role in advancing the economic success of Edmonton and Alberta. The University of Alberta's revolutionary spirit inspires faculty and students to advance knowledge through research, to seek innovation in teaching and learning, and to find new ways to serve the people of Alberta and the world.

Traveling to Edmonton

IMPORTANT - US Citizens: Passport is required!

By Air

Edmonton International Airport is 25 minutes from the Westin Edmonton Hotel. AAPT has chosen Air Canada as our official Canadian airline for the Summer Meeting. This affiliation entitles AAPT meeting attendees to special discounts. In order to take advantage of these discounted fares, please reference Promotion Code 6FMGYA61. Make your airline reservation now at: www.aircanada.com/en/home.html or by calling 1-800-361-7585.

By Car

Edmonton is situated on the Trans-Canada Yellow Highway, which provides access from Winnipeg through Edmonton to Prince Rupert and Vancouver. Highway 2 is the main highway from the United States through Calgary, Red Deer, Edmonton and Northern Alberta.

Rental Car Information

Avis is proud to offer special rates for the summer meeting. To reserve a car, contact Avis at 1-800-331-1600 and reference the Avis Worldwide Discount (AWD) number J945158.

Ground Transportation

Edmonton Sky Shuttle: <http://tinyurl.com/297lau> or call 780-465-8515. For more information go to www.aapt.org/Events/SM2008/index.cfm.

By Train

VIA Rail's (<http://www.viarail.ca/>) internationally known transcontinental train, The Canadian, stops in Edmonton. Rail passengers can travel from Saskatoon, Winnipeg or Toronto, Jasper, Kamloops and Vancouver. You can make a reservation via <http://www.viarail.ca/>

By Bus

Greyhound Bus Lines (<http://www.greyhound.ca/>) provides excellent service to Edmonton from anywhere in North America. You can make a reservation via <http://www.greyhound.ca/>



The Scotia Place twin office towers, 28 and 21 stories respectively, stand prominently in the center of Edmonton's downtown commercial and retail properties.



When you visit the Devonian Botanic Garden, there will always be something special to see.

Lodging Information

The Summer Meeting will be held at the University of Alberta.

The Westin Edmonton

10135 – 100 Street NW, Edmonton, AB, Canada, T5J 0N7. AAPT has secured a large number of rooms at the Westin Edmonton Hotel. The rate is \$149 per night for single and double occupancy. The Light Rail Transit (LRT) Churchill Station is connected to the hotel and is approximately a 10 minute ride to the meeting site at University of Alberta. To make a reservation visit: <http://tinyurl.com/2l2xca> or call 1-800 WESTIN1.

Located in the heart of downtown and connected to the Shaw Conference Center, The Westin Edmonton is only a few steps from the best shopping, dining, arts and entertainment Edmonton has to offer. The hotel provides a fitness center and heated indoor pool. You can experience regional and international cuisine at Pradera Café or enjoy a cocktail at the Pradera Lounge. Each smoke-free guest room offers a generous workspace and high speed Internet access.

Check-in time: 3:00pm

Check-out time: 12:00pm

Dorms

Rooms are available at the University of Alberta from \$50-\$105 per night. Read more and apply at:

<http://tinyurl.com/2bkghd>

Things to do in Edmonton

West Edmonton Mall: The world's largest entertainment and shopping centre and Alberta's number one tourist attraction, featuring more than 800 stores and services, more than 100 eating establishments, plus nine world class attractions.

Elk Island National Park: Located less than an hour away from Edmonton, Elk Island National Park of Canada protects the wilderness of the aspen parkland, one of the most endangered habitats in Canada. You can find bison, moose, deer and elk roaming freely throughout the park. With the wildlife viewing, hiking, picnicking and overnight camping there is something for everyone.

Devonian Botanical Gardens: This 80 acre garden was established in 1959 and is a component of the Faculty of Agriculture at the University of Alberta. The garden includes an authentic Japanese Garden, attractive floral gardens, collections of native and alpine plants, and ecological reserves, and is situated within a gorgeous rolling landscape of pine trees and wetlands.

Royal Alberta Museum: This museum tells the story of Alberta—the experience of people and places over time and inspires Albertans to discover and understand the world around them. You will find some of the finest cultural and natural history collections in the country.

meeting information

Registration Fees

	(thru 6/5)	(6/6 - 7/19)
AAPT Full Meeting	\$295	\$348
AAPT Retired or Emeritus	\$200	\$225
AAPT One Day	\$150	\$175
Nonmember	\$385	\$410
Nonmember One Day	\$295	\$310
Student: Undergraduate and Graduate	\$25	\$35
High School Student	FREE	FREE

First-Time attending a meeting - 50% reduction

Regional Educator (Applies to following states and provinces:

Montana, Alberta, Saskatchewan and British Columbia) - 50% reduction

International Attendee - 50% reduction

Physics Education Research Conference 2008:

Physics Education Research with Diverse Student Populations

In this session, PER encourages those who are using research-based instructional materials with non-traditional students at either the pre-college level or the college level to share their experiences as instructors and researchers in these classes.

PERC will be held at the University of Alberta, July 23-24, 2008.

Registration fee to attend PERC is \$130 (thru 6/5) and \$175 (6/6 - 7/19), which includes a banquet. See www.aapt.org for more information.

Special Events

Physics Exhibit Show and Daily Poster Session

See modern and historical physics equipment and view the latest research from across the physics education spectrum.

AAPT Summer Picnic and Evening Demo Show

These two popular gatherings feature great food, live music, and physics demonstrations.

Young Physicists Meet and Greet

The place for Generation-X attendees to mix and mingle.

Spouses' Gathering

An opportunity to learn about Edmonton-area activities, shops, and recommended sight-seeing.

First Timer's Gathering

The best time to learn about AAPT and the Summer Meeting and to meet fellow attendees and AAPT leadership.

SPS/AAPT Poster Reception

The Society of Physics Students and AAPT host this reception and a casual discussion of twenty-first century education and research.



award winners

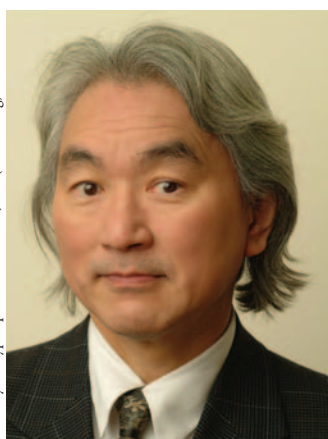


Robert A. Millikan Award

Eric Mazur, Harvard University

The Make-Believe World of Real-World Physics

Eric Mazur is the Balkanski Professor of Physics and Applied Physics at Harvard University. He is an internationally recognized scientist and researcher, who leads a vigorous research program in optical physics. He has strong interests in education, science policy, outreach, and the public perception of science. He believes that better science education for all—not just science majors—is vital for continued scientific progress. He devotes considerable effort to education research and finding verifiable ways to improve science education. In 1990 he began developing Peer Instruction, a method for teaching large lecture classes interactively. His book, *Peer Instruction* has been read widely, and his methods have a large following among AAPT members and others nationally and internationally. The impact of Peer Instruction on physics teaching has been significant. In 2006 Eric Mazur helped produce the award-winning DVD, *Interactive Teaching*. He is a Fellow of the Optical Society of America, a Fellow of the American Physical Society, author or co-author of over 200 scientific publications, and holder of 12 patents.



courtesy of Hyperspace Productions, Inc. (mkaku.org)

Klopsteg Memorial Award

Michio Kaku, City College of New York

Physics of the Impossible

Michio Kaku is a theoretical physicist, best-selling author, and a major popularizer of science in mainstream media. He holds the Henry Semat Professorship in Theoretical Physics at the City University of New York (CUNY), where he has taught for over 25 years. His latest book, *Physics of the Impossible: A Scientific Exploration of the World of Phasers, Force Fields, Teleportation, and Time Travel*, made the *New York Times* Bestseller list. He has appeared on the BBC's TV series *Time*, and the History Channel's *The Universe*, and he hosts the radio shows *Science Fantastic* and *Explorations in Science*. Michio Kaku's other books include *Parallel Worlds—A Journey Through Creation, Higher Dimensions, and the Future of the Cosmos*; *Hyperspace: A Scientific Odyssey Through Parallel Universes, Time Warps, and the Tenth Dimension*; *Visions: How Science Will Revolutionize the 21st Century and Beyond*; and *Einstein's Cosmos: How Albert Einstein's Vision Transformed Our Understanding of Space and Time*. He's the cofounder of string field theory (a branch of string theory), and continues Einstein's search to unite the four fundamental forces of nature into one unified theory.

Excellence in Pre-College Physics Teaching Award

Mark Davids, Grosse Pointe South High School

Best Practices

Mark Davids has been a prime mover in the Michigan Section of AAPT, the Detroit Metropolitan Area Physics Teachers, and the Detroit and Michigan Science Teachers Associations. In 2001, he received a Presidential Award for Excellence in Science Teaching from the White House and National Science Foundation. In 2002-03, he served as an Einstein Fellow in the office of Washington's U.S. Senator Maria Cantwell, working on key issues related to education, science, and technology. Recently, he was chosen by the Michigan Science Teachers Association as its 2008 Outstanding High School Teacher. Mark coauthored *Physics: Principles and Problems* with Paul Zitzewitz and Robert Neff, and *Teaching About Lightwave Communications* with Paul Zitzewitz. He developed a curriculum for high school teachers on the physics of cell phones, to reinforce traditional physics topics and introduce students to information theory, all within an exciting context. Mark's workshops have covered Optics and Shadows, Modeling, Lasers—including holography, and other areas. Mark Davids is an enthusiastic teacher with a storehouse of physics demonstrations and great skills as a presenter.



Excellence in Undergraduate Physics Teaching Award

Corinne Manogue, Oregon State University

The View From the Other Side of the Mountains: Exploring the Middle Division

Corinne Manogue has been a leader in the development and implementation of the Paradigms in Physics Project at Oregon State University. The goals of this project have been a ground-breaking new upper-division curriculum designed to improve students' analytical and problem-solving skills—emphasizing connections between the fields of physics, and incorporating student-centered activities. Corinne has headed the project, developing junior-year modules on Symmetries and Idealizations, Static Vector Fields, and Central Forces. She also developed the senior-year course, Capstone on Mathematical Methods. After a decade of development and use, the Paradigms project has attracted attention at national meetings of both AAPT and APS in sessions on “Revitalizing Undergraduate Physics.” Corinne coauthored an article in *Physics Today* on the Paradigms project, and one in the *American Journal of Physics* on how computational activities are woven into the new Paradigms project courses, which are now being disseminated nationally. She has supervised undergraduate, Master's, and Ph.D. students doing research in physics education.



award winners

2008 AIP Science Writing Award, Broadcast Media Category



Bob McDonald is one of Canada's best-known science communicators. He is in his 16th season as host of *Quirks & Quarks*, Canada's national weekly radio science program. He is also science correspondent for CBC TV's *The National*, and a weekly science commentator for CBC Newsworld. He has won many honors for communicating science, including the Michael Smith Award for Science Promotion from NSERC, and the Sanford Flemming Medal from the Royal Canadian Institute. He has been awarded honorary degrees from three Canadian universities for his work in promoting science.



Pat Senson is a producer with the Canadian Broadcasting Corporation's national radio science program, *Quirks & Quarks*. This is his second time winning the AIP broadcast award, the first was for his look at the physics of time. Physics has always been a secret passion of Pat's, although his scientific credentials lie more in the field of biology, where he honed his scientific skills running many a DNA profile. As well as working behind the scenes at *Quirks & Quarks*, Pat can also be heard weekly across the country on CBC's afternoon shows as their regular science contributor, where he'll discuss anything from the latest discoveries from CERN to the problems of government funding for science. Pat lives in Toronto, Ontario.



Jim Handman has been the Executive Producer of *Quirks & Quarks*, Canada's national weekly radio science program, for the past 9 years. He has been a journalist and radio producer at CBC Radio for more than 20 years. Jim has shared in many awards for science journalism, including the prestigious Walter Sullivan Award from the AGU, and was co-winner of the Science Writing Award from AIP in 2003. He also teaches radio broadcasting at Ryerson University Journalism School in Toronto.

plenary speakers

Robert Wolkow directs research into using scanning tunneling microscopy (STM) and other theoretical methods to examine and control molecules on semiconductor surfaces.

He is a pioneer in STM techniques and instrumentation. At IBM, he pioneered STM for studying surface chemistry. At the NRC Steacie Institute for Molecular Sciences (NRC-SIMS), he and his colleagues used STM and modeling to understand the behavior of organic molecules on semiconductor surfaces. Eventually, they demonstrated self-directed fabrication of organic nano-scaled structures on silicon.

The multidisciplinary Molecular Scale Devices researchers have continued to advance nanoscale structure fabrication, with creation of a single molecule transistor and a reliable method of producing single atom tip probes.

Controlled fabrication of nanoscale structures and devices combining organic chemistry/biological functions with semiconductor-based processors is the goal. Variable-temperature, ultra-high vacuum STM now makes atomic-scale surface chemistry research possible.



Damian Pope is the Senior Manager of Scientific Outreach at Perimeter Institute for Theoretical Physics in Waterloo, Ontario, Canada. He studied in Australia and holds a Ph.D. in theoretical physics from the University of Queensland. After this, he engaged in two years of postdoctoral research in quantum information and the foundations of quantum theory at Griffith University.

Damian also has over a decade of experience in outreach explaining physics to students, teachers and the general public. Most recently, he has been focusing on creating a collection of video-based resources designed to help high school teachers introduce modern physics to their students.



workshops

A Taste of Modeling

A Taste of Modeling is a workshop designed to introduce participants to the modeling method of teaching physics. This workshop is appropriate for physics teachers of all introductory high school physics courses including Physics First. Participants will engage in a sample modeling cycle.

Deborah J. Rice, Rex Rice

Committee on Physics in High Schools

Advanced and Intermediate Instructional Labs

This workshop is appropriate for college and university instructional laboratory developers. At each of six stations, presenters will demonstrate an approach to an advanced or intermediate laboratory exercise. Each presenter will show and discuss the apparatus and techniques used. Handouts will be provided containing sample data and ideas on how to construct or where to purchase the apparatus.

Van D. Bistrow

Committee on Laboratories, Committee on Apparatus

Curricular Materials for Using Visualization in Teaching Introductory E&M

Electromagnetism is one of the most troublesome topics for students to learn. In this workshop, we present an integrated introductory electricity and magnetism curriculum which features three-dimensional visualizations embedded in a guided inquiry environment. Workshop participants will explore a suite of stunning visualizations and will be actively engaged in group work assignments which bridge a pictorial representation to a facet of knowledge.

John Belcher, Carolann Koleci, Sahana Murthy, Peter Dourmashkin, Jennifer George-Palilonis

Committee on Research in Physics Education

Designing a Diagnostic Learning Environment: A Workshop for Teacher Educators

A diagnostic learning environment is one in which assessments are used for formative purposes, i.e., to identify the fine structure of students' understanding and reasoning, and to help the teacher decide which aspects of student thinking might be troublesome so that she/he may address specific student ideas with targeted instruction. Participants of this workshop will experience a diagnostic learning environment and learn about issues that arise in setting up teacher professional preparation programs that are focused on formative assessment. In addition, participants will learn about the Diagnoser Project's free instructional tools to help diagnose pre-college student thinking and guide instructional decisions.

Stamatis Vokos, Lane Seeley and Pam Kraus

**Committee on Research in Physics Education,
Committee on Teacher Preparation**

Effectively Addressing Diversity in Science Courses: Resources and Examples

Engage in four separate activities and leave with an increased awareness of and access to approaches and resources to improve your ability to embrace diversity in your undergraduate and graduate science classrooms. We will work through complex issues of diversity and learn how to address them effectively.

Christine Pfund, Brett Underwood

Committee on Minorities in Physics

EJS and Tippers

TIPERs (Tasks Inspired by Physics Education Research) are a type of problem that is designed to probe student conceptual understanding and help students build their problem-solving skills. Easy Java Simulations (EJS) are modeling and authoring tools that can be used to create dynamical simulations of physical phenomena for teaching. These simulations can be used for computer demonstrations or virtual laboratories, or serve as programming examples and tasks for computational physics. These two pedagogical tools fit together to provide enhanced interactive engagement for students in the classroom. Participants in this workshop will learn how to use and design TIPERs exercises using EJS for their own students.

Tom O'Kuma, Karim Diff, Anne J. Cox

Committee on Physics in Two-Year Colleges

Energy in the 21st Century

Engaging students in predictions of what form and how much energy will be used in the future is a very successful way to generate enthusiasm and further investigation of physics. Participants of this workshop will be introduced to two different group projects that involve designing energy systems. These modeling exercises look at past energy consumption patterns and develop a plan for energy usage in the 21st Century. Other considerations such as population, costs and efficiencies are also used to further expand the discussion and decision-making that takes place.

Pat Keefe, Greg Mulder

Committee on Physics in Two-Year Colleges

Committee on Science Education for the Public

Exploring Atoms & Molecules Using Molecular Workbench

This workshop will focus on using, customizing, and authoring with the Molecular Workbench, a free, open source software environment based on molecular dynamics (<http://mw.concord.org>). MW is used to create a wide range of learning activities based on the atomic-scale mechanisms of basic phenomena in physics. MW has some unique features including chemical bonding, photon-matter interactions, and smart surfaces, so it can produce a very wide range of

emergent phenomena such as phase changes, latent heat, diffusion, solubility, osmosis, and black body radiation.

Robert Tinker

Committee on Educational Technologies

Exploring Easy and Effective Ways to use PhET's Web-based Interactive Simulations in your Physics Course

The Physics Education Technology (PhET) Project has developed over 65 simulations for teaching and learning introductory physics at the high school and college levels. These research-based simulations create animated, interactive, game-like environments that are designed to engage students in active thinking, encourage experimentation, and help develop visual and conceptual models of physical phenomena, emphasizing their connections to everyday life. The simulations are free, and can be run from the PhET website (<http://phet.colorado.edu>) or downloaded to a local computer for off-line use.

Katherine Perkins, Wendy Adams, Noah Finkelstein, and Archie Paulson

Committee on Educational Technologies

Committee on Research in Physics Education

Falsification Labs

Verification labs are a staple in many physics courses, but what about falsification? It is important for students to be able to recognize and test wrong ideas as well as right ones. In this workshop, we will present a number of laboratory exercises based on plausible-but-wrong theories which can be tested in a typical lab period. All of the exercises can be performed with minimal equipment, and are appropriate for high school or introductory college physics labs. Participants will have an opportunity to try the experiments, experience some of the pitfalls involved, and develop similar experiments of their own.

Eric Ayars, Tim Erickson

Committee on Laboratories

Historical Experiments in the Classroom

Every experiment in physics education contains an historical perspective that is usually neglected in favor of the practical elements of the experiment. Consequently, students lack a context for the performance of the experiment. In this workshop, we will re-introduce the context of history back into student experimentation with the use of the interrupted storyline. Many examples including Ohm's law and Rumford's experiments on heat will be presented and participants will experiment with simple apparatus.

Donald E. Metz

Committee on History & Philosophy of Physics

Inquiry-Based Learning for High School Teachers

This is a hands-on workshop designed for teachers interested in using curricular materials that will engage their students in inquiry-based active learning. Participants will work with activities from kinematics, dynamics, energy and optics from the updated *Activity-Based Physics High School* CD (ABP HSCD). The curricula on the ABP HSCD include: RealTime Physics, Tools for Scientific Thinking, Workshop Physics and Interactive Lecture Demonstrations.

Maxine C. Willis, Priscilla Laws and Marty Baumberger

Committee on Physics in High Schools

InterActions in Physical Science: A Coordinated Set of Curriculum and Professional Development Materials for Inquiry-Based Middle School Students and Teachers

InterActions in Physical Science is an NSF-supported, standards-based, guided inquiry physical science curriculum that was built using the research on the teaching and learning of science. In this workshop, participants will be introduced to the InterActions curriculum, experience several activities, watch and analyze video from InterActions classrooms, and work through part of the professional development materials that support teachers and help students do inquiry at the middle school level.

Robert H. Poel

Committee on Physics in Pre-High School Education

Introductory Instructional Labs

This workshop is appropriate for college and university instructional laboratory developers. At each of six stations, presenters will demonstrate an approach to an introductory laboratory exercise. Each presenter will show and discuss the apparatus and techniques used. Handouts will be provided containing sample data and ideas on how to construct or where to purchase the apparatus.

Van D. Bistrow

Committee on Laboratories, Committee on Apparatus

Learning Physics While Practicing Science

Participants will learn how to modify introductory physics courses to help students acquire a good conceptual foundation, apply this knowledge effectively in problem solving, and develop the science process abilities needed for real life work. We provide tested curriculum materials including: The *Physics Active Learning Guide* with 30 or more activities per textbook chapter for use with any textbook in lectures, recitations and homework; a CD with over 200 videotaped experiments and associated questions for use in lectures, recitations, laboratories, and homework; and a set of labs with inexpensive equipment that can be used to construct, test and apply concepts to solve practical problems.

Eugenia Etkina, Alan Van Heuvelen

Committee on Physics in Undergraduate Education

Committee on Teacher Preparation

Lecture Demonstrations 1

Topics in this workshop cover the standard first semester of physics instruction from Mechanics to Thermal. The format allows for and encourages interplay between instructors and participants. It is recommended that both Lecture Demonstrations 1 and 2 be taken as this will cover the complete year of demonstrations needed for a typical course.

Dale Stille, Sam Sampere
Committee on Apparatus

Lecture Demonstrations 2

Topics in this workshop cover the standard second semester of physics instruction from Electricity & Magnetism through Modern Physics with some Astronomy. The format allows for and encourages interplay between instructors and participants. It is recommended that both Lecture Demonstrations 1 and 2 be taken as this will cover the complete year of demonstrations needed for a typical course.

Dale Stille, Sam Sampere
Committee on Apparatus

Low Cost High School Physics Labs

These experiments will employ everyday items or equipment you already have gathering dust in your storeroom. We will make pieces of equipment during the workshop that you can take home with you. The labs will cover many topics from waves to electricity to mechanics.

Diane Riendeau, Shannon Mandel and Jim Hicks
Committee on Physics in High Schools

Mining the Hidden Web

In this digital age, skill in evaluating the information one finds on the Internet is essential. This tutorial is designed to give participants guidelines for fast, efficient searching of the Internet.

Pat Viele

Committee on Professional Concerns
Committee on Physics in Undergraduate Education and
Committee on Graduate Education in Physics

New Physics at the LHC and in your Classroom

The Large Hadron Collider (LHC) at CERN is already ramping up. With a center-of-mass energy of 14 TeV, it is expected to produce new science at the frontiers of particle physics. High school teachers and students can and should be involved in ways that enhance classroom learning. In this workshop, you will learn about LHC physics and about LHC-related investigations that you can bring to your students. The emphasis will be on what can work in your classroom so that students are exposed to particle physics at the horizon of new discovery in a way that engages the very skills, methods, and concepts that you cover in class.

Kenneth Cecire, Kris Whelan
Committee on Physics in High Schools

Newtonian TIPERs

This workshop will deal with various alternative task formats that can be used to make instructional materials which impact and improve student learning and understanding of physics concepts in mechanics. The first part of the workshop will explore various formats, their characteristics, and how they can be used. Participants will work in groups to develop a set of TIPERs that address a concept, principle, or relationship in mechanics. These TIPERs sets will be shared with and critiqued by the group.

Curtis J. Hieggelke, Steve Kanim
Committee on Physics in Two-Year Colleges
Committee on Research in Physics Education

Open Source Physics-Statistical and Thermal Physics

This workshop presents recently developed computer-based curricular material that helps to improve the understanding of statistical and thermal physics concepts and that makes many inaccessible topics accessible to students. Participants will receive a CD containing curricular material from the Statistical and Thermal Physics (STP) project as well as a collection of ready to run Java programs from the Open Source Physics (OSP) project. We will discuss the general pedagogical and technical issues in the design of interactive computer-based tutorials as well as how OSP programs can be adapted to your local institution.

Wolfgang Christian, Mario Belloni, Anne Cox, Harvey Gould, Jan Tobochnik
Committee on Educational Technologies
Committee on Physics in Undergraduate Education

Pedagogical Content Knowledge

Lee Shulman identified pedagogical content knowledge (PCK) as a necessary component of teacher knowledge—a blend of content and pedagogy that distinguishes the understanding of a content specialist from that of the pedagogue. PCK involves knowing students' original ideas and potential difficulties, alternative ways to represent those ideas, and various effective instructional and assessment methods within a particular discipline. In this interactive workshop participants will tackle these questions, reflect on their own PCK and develop some strategies for incorporating the building of teacher PCK into their physics courses, methods courses, and teacher preparation programs.

Eugenia Etkina
Committee on Teacher Preparation

Photon Quantum Mechanical Labs

This is a workshop aimed at introducing the theoretical and the practical aspects of a new type of experiments with correlated photons that we have developed. The experiments illustrate fundamental concepts of quantum mechanics at the undergraduate level. This four-hour workshop will involve

discussions on the fundamentals of the experiments and our experience in implementing them for curricular purposes. It will include a discussion on equipment and costs.

Enrique J. Galvez, Mark Beck

Committee on Apparatus, Committee on Laboratories

Physics and Performance

Stanley Micklavzina has been incorporating dance, circus art, poetry, music, and storytelling into public physics demonstration shows. Wendy Sadler runs her own science communication company in the UK called Science Made Simple, promoting physics and engineering to schools and public audiences. Acting coach Colin Funk is well known for his ability to artfully assist individuals, teams, and organizations to enhance their capacity for creativity and innovation. This workshop will be aimed at developing skills, ideas, and themes for the stage.

Stanley J. Micklavzina, Wendy Sadler and Colin Funk

Committee on Science Education for the Public

Physics and Toys II: Energy, Momentum, Electricity and Magnetism

More than fifty toys will be demonstrated, and the physical principles related to these toys will be discussed. This workshop will concentrate on toys that illustrate the concepts of kinetic and potential energy, linear and angular momentum, electricity and magnetism, pressure and temperature, and properties of materials.

Beverley A. P. Taylor, Ray Turner

Committee on Physics in Pre-High School Education

Committee on Science Education for the Public

Physics Front: Capabilities and Possibilities.

The Physics Front offers K-12 teachers a place online to find and share high-quality physics teaching resources including lesson plans, labs, simulations, and reference materials. All these materials are organized by subject, grade level, and course type. This web site also gives teachers the tools to collaborate and share expertise. Topics covered in this workshop will include: collecting, organizing, and sharing resources from the collection; submitting new resources; navigating and building Physics Front topical units; and Physics Front discussions, comments, and reviews.

Cathy Ezrailson, Caroline Hall

Committee on Physics in High Schools

Piaget beyond Piaget: at the heart of inquiry

In the late 1970s the first AAPT workshop introduced applications of Piaget's ideas to physics teaching. This workshop will draw the participant directly into Piaget's theory of cognitive development, how people develop in their understanding of the world. The participant will learn about Piaget's equilibration theory. In the style of his experimental

method, participants will examine classroom evidence of student understanding of physical phenomena. Instructional practices consistent with the theory and evidence of their effect will be considered.

Dewey I. Dykstra, Jr.

Committee on Physics in Pre-High School Education

Committee on Teacher Preparation

Preparing Pre-College Teachers to Teach Physics by Inquiry

This workshop focuses on how college and university physics faculty can contribute to the professional development of pre-college (K-12) teachers. Participants will have an opportunity to gain hands-on experience with Physics by Inquiry, instructional materials designed to provide teachers with the background needed to teach physics and physical science as a process of inquiry. Excerpts from a video produced by WGBH will be used to illustrate interactions between teachers and instructors during a course based on these instructional materials.

Lillian C. McDermott

Committee on Research in Physics Education

Committee on Teacher Preparation

Research-Based Alternatives to Problem Solving in General Physics

Accumulating research on problem solving in physics clearly indicates that traditional, end-of-chapter exercises in physics texts are not useful and may actually hinder students' learning of important physics concepts. The research also raises questions about the efficacy of such tasks for helping students develop "problem solving skills." In light of these results the question is: What alternative tasks can we use to help students develop problem solving skills and a conceptual understanding? This workshop will review the research and then provide examples of several alternative tasks and their use. Participants will also get practice writing alternative problems for use in their own classrooms.

Kathleen A. Harper, Thomas M. Foster and David P. Maloney

Committee on Research in Physics Education

Teaching Astronomy with Technology

This workshop will survey a variety of educational technologies useful for engaging students in both high school and introductory college classrooms. Special emphasis will be placed on simulation usage and peer instruction. Participants will work on computers gaining familiarity with the astrophysical simulations of the Nebraska Astronomy Applet Project (NAAP) and its web-based assessment capabilities. Participants will also design peer instruction sequences to be used in the classroom using the computer-based modules of the ClassAction Project.

Kevin M. Lee, David Kriegler and Todd Young

Committee on Space Science and Astronomy

TELS—an Online Inquiry-Based Environment for Modeling and Simulation

Appropriate for both high school honors, AP, IB and introductory college courses, the TELS modules are based on an extensive research base in using visualization to help students learn abstract topics in science. Modules in high school chemistry and middle school physical science will also be showcased.

S. Raj Chaudhury

Committee on Educational Technologies

The Classroom of the Future: Human Interaction in an Age of Technology

Participants take part in five “miniclasses”: 1. Use of reflective writing to engage students before class. 2. Critical thinking—Feyerabend’s view. 3. Use of collaborative groups to promote critical thinking. 4. Critique: a writing tool to enhance critical thinking skills. 5. The course dossier—a supplement to or a replacement for a final essay/examination.

Calvin Kalman

Committee on Physics in Undergraduate Education

Committee on Research in Physics Education

Tutorials in Introductory Physics: A Research-Based Approach to Increasing Student Learning

Tutorials in Introductory Physics is a set of instructional materials intended to supplement the lecture, textbook, and laboratory of a standard calculus-based or algebra-based introductory course. The tutorials are designed to address specific conceptual and reasoning difficulties that have been identified through research. In addition to providing hands-on experience with the curriculum, the workshop will include discussions of instructional strategies and results from assessments of student learning. Important aspects related to implementation of the tutorials will be covered, including preparation of graduate teaching assistants, undergraduate peer instructors, and post-docs. Copies of Tutorials in Introductory Physics will be provided to participants.

Lillian C. McDermott

Committee on Research in Physics Education

Using Authentic Data to Teach Astronomy

Today, a number of astronomical projects are making their data available over the Internet; this allows students to access the data at any time with only a high-speed Internet connection. We have developed a series of interactive labs that use data from a map of the universe to teach basic concepts in astronomy, physics, and chemistry. In this workshop, you will learn how to use these labs with your students. You will also have the chance to conduct open-ended astronomy research using authentic data.

Michael J. Raddick

Committee on Space Science and Astronomy

Using Research-Based Curricula and Tools to Revitalize Your Introductory Course

We will introduce new approaches to teaching based on physics education research (PER) in lectures, labs, and recitations as well as studio and workshop environments. Among the approaches presented will be Interactive Lecture Demonstration (ILDs), Web-Based ILDs, RealTime Physics Labs, Activity Based Tutorials, Collaborative Problem-Solving Tutorials, Live Photo Assignments and Workshop Physics, as well as analytic modeling and video analysis tools. Results of studies on the effectiveness of these teaching strategies will also be presented.

David R. Sokoloff, Ronald Thornton and Priscilla Laws

Committee on Research in Physics Education

Committee on Educational Technologies

Using RTOP to Improve Physics and Physical Science Teaching

The Reformed Teaching Observation Protocol (RTOP) is a 25-item rubric that provides a percentile measure of the degree and type of student-centered, constructivist, inquiry-based engagement in an instructional situation. RTOP scores correlate very highly with student conceptual gains. In this workshop, we will score video vignettes of teaching to learn how to use RTOP for guiding personal reflection and improvement and change of our own teaching; for mentoring peers, novice teachers and student teachers; and to establish a vocabulary for discussing reformed teaching practices. If you wish, you may bring a DVD of your own teaching to score.

Kathleen A. Falconer, Paul Hickman and Dan MacIsaac

Committee on Teacher Preparation

Committee on Physics in Undergraduate Education

What Every Physics Teacher Should Know About Cognitive Research

In the past few decades, cognitive research has made major progress in understanding how people learn. We will discuss and explore, in a language accessible to everybody, how the main findings of cognitive research can be applied to physics teaching and assessment.

Chandralekha Singh

Committee on Research in Physics Education

sessions

Committee on Research in Physics Education

Disseminating results and resources in physics education

Leon Hsu

Co-sponsor: Committee on Physics in Undergraduate Education

Down from the Ivory Tower: Physics Teachers and Education Researchers as Activists

Melissa Dancy

Getting Started in Physics Education Research

Kathleen A. Harper and Charles Henderson

Learning to Think Like a Physics Education Researcher (a session to honor Alan VanHeuvelen)

Xueli Zou and Kathy Harper

Co-sponsor: Committee on Physics in Two-Year Colleges

PERC Bridging Session

Mel Sabella, John Thompson and Nicole Gillespie

Professional Concerns of PER Faculty

Tom Foster

Co-sponsor: Committee on Professional Concerns

Professional Concerns of PER Graduate Students

Trevor Smith and Mary Bridget Kustusch

Co-sponsor: Committee on Professional Concerns

Professional Concerns of PER Solo Faculty

Paul Engelhardt

Co-sponsor: Committee on Professional Concerns

Transforming University Physics Departments

Charles Henderson and Melissa Dancy

Tutorial: Interactive Lecture Demonstrations

David Sokoloff and Ronald Thornton

Co-sponsor: Committee on Educational Technologies

Tutorial: Tutorials in Intermediate Mechanics

Bradley S. Ambrose

Co-sponsor: Committee on Physics in Undergraduate Education

Committee on Science Education for the Public

Alternative Energy

Richard Flarend

Bringing Science to the Public

Brian Jones

Co-sponsor: Committee on Apparatus

Cracker Barrel: Physics and Society Education

Jane Flood

Energy and Environment

Steve Shropshire

Hollywood and Science Literacy

Costas Efthimiou

K-12 Partnerships and Community Outreach

John L. Roeder

Committee on Physics in Undergraduate Education

Gordon Research Conference Session: Computation in the Physics Curriculum

Bradley S. Ambrose and Wolfgang Christian

PER Issues in Instructional Reform

PER Assessing Student Understanding

PER Content and Problem Solving

Rethinking the Upper-Level Curriculum

Ernie Behringer

Co-sponsor: Committee on Laboratories

Scientific Communication and Writing

Jean-Francois Van Huele

Co-sponsor: Committee on Science Education for the Public

Teaching and Learning Upper-Level Electricity and Magnetism

Ernie Behringer

The Art and Science of Teaching

Ray A. Burnstein

Co-sponsor: Committee on Research in Physics Education

Undergraduate Student Research

Gary White

Undergraduate Student Research (Poster)

Gary White

Committee on Physics in Two-Year Colleges

Favorite Activities/Lessons in the TYC Physics Classroom

Dwain Desbien

High Energy Physics Projects for High School and Two-Year College Students

William Waggoner

College Physics

Paul D'Alessandris

Physics of Our Hobbies

Scott F. Schultz

Committee on Physics in High Schools

Alternative and Formative Assessment in High School Physics

Wayne Fisher and Laura Nickelson

Curriculum Design, Improvement and Implementation: Reports By CASTLE Teachers

Melvin Steinberg

Professional Concerns of High School Teachers

Patrick Callahan

Co-sponsor: Committee on Professional Concerns

State of Physics Teaching in the United States:

A High School Perspective

Dale Freeland

Middle School and High School Training Strategies

Patrick Callahan

Voices from the Classroom: Past, Present, and Future

Shannon Mandel

Committee on Teacher Preparation**AP Physics B Redesign Update**

Ingrid Novodvorsky

Co-sponsor: Committee on Physics in High Schools

Culturally Responsive Physics Teaching

Ingrid Novodvorsky

How do Master Teachers Help Prepare Teachers of Physics?

Paul Hickman

NSF-Supported Projects in the Preparation of Physical Science Teachers

Fred Goldberg

Use of Research-Based Physics Curricula in Teacher Preparation

Ingrid Novodvorsky and Eugenia Etkina

Physics Teacher Preparation Around the U.S.

Ted Hodapp and Monica Plisch

Committee on Educational Technologies**Best Practices for Teaching with Technology**

Tim Erickson

Clickers in the Classroom

S. Raj Chaudhury

Educational Technology

Vern Lindberg

Co-sponsor: Committee on Apparatus

There Ought to Be... (Technologies I Wish I Had)

Leon Hsu

Committee on Women in Physics**Canadian Women in Science**

Marina Milner-Bolotin

Committee on Minorities in Physics**Cracker Barrel: Recruiting and Retaining Underrepresented****Minorities in Physics**

Daryo S. Khatri

Committee on History & Philosophy of Physics**Historical Experiments in Physics**

Zoltan Berkes

Co-sponsor: Committee on Apparatus

Committee on Graduate Education in Physics**Hot Topics in GeoPhysics**

Steve Turley

Co-sponsor: Committee on Women in Physics

Reports from the Conference "Graduate Education in Physics: Which Way Forward?"

Michael Thoennessen

Committee on Laboratories**The Future of Upper Division Lab Experiences**

David Abbott

Incorporating Writing in the Laboratory

Marsha M. Hobbs

Committee on Space Science and Astronomy**400 Years Since Galileo**

Susana Deustua and Jordan Raddick

Co-sponsor: Committee on History & Philosophy of Physics

Innovations in Teaching Astronomy

Janelle M. Bailey and Doug Lombardi

Seeing the Universe Without Our Eyes

Louis J. Rubbo

Web Resources for Teaching Astronomy—Cracker Barrel

Kevin Lee

Co-sponsor: Committee on Educational Technologies

Committee on International Physics Education**PER Around the World**

Genaro Zavala

Co-sponsor: Committee on Research in Physics Education

Teaching Physics Around the World

Genaro Zavala

Committee on Apparatus**Physics Demonstrations with a Biological Flavor**

Steven Wonnell

PIRA Resource Room

Wayne Easterling, PIRA Vice President,

PIRA officers and Resource Room Committee

Professional Concerns of Instructional Resource Specialists

Dean Hudek

Co-sponsor: Committee on Professional Concerns