



## Spring 2009 Newsletter

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### Welcome

The third annual newsletter of the Physics Education Research Topical Group (PERTG) within the American Association of Physics Teachers is brought to you by the Physics Education Research Leadership and Organizing Council (PERLOC) of the PERTG: Noah Finkelstein , Paula Heron (ex-officio as chair of AAPT RIPE committee), Jose Mestre, Valerie Otero, Rachel E. Scherr, John Thompson, and Michael C. Wittmann.

PERLOC is empowered to undertake leadership and organizing activities for the PER community. We invite members of the community to identify important issues and help us facilitate communication between PERLOC and the members of PERTG. Get involved!

### Web presence

The Physics Education Research Topical Group has a new and growing web presence. You can get there via several routes: <http://www.pertg.org/> and <http://www.per-central.org/pertg/> both point to the same location..

At our website, you'll find information about PERTG membership, upcoming events and programs, and links to information about journals and jobs in PER. Information about PERLOC is also posted, including how PERLOC differs from the AAPT committee on Research in Physics Education and how elections are held. We are also posting minutes of PERLOC meetings so that members of the PERTG can follow what we're discussing and add input.

These pages are hosted at PER-Central, <http://www.per-central.org/> . PER-Central is a part of ComPADRE, the National Science Digital Library which acts as a clearinghouse for information on physics learning, teaching, and education research. PERLOC supports continued funding of ComPADRE (see appendix).

### Electing new PERLOC members

This Fall, 2009, we will again hold an election to replace two members to PERLOC. Last year, Jose Mestre and John R. Thompson were elected, replacing Lillian McDermott and Melissa Dancy on the council. Their term of service is until December 31, 2011.

We hold elections on a yearly basis in the fall. More information on elections can be found at <http://www.pertg.org/>.

## Strategic Plan

We are crafting a strategic plan to inspire and prioritize our efforts. We expect the strategic plan to help us stay focused and productive as we engage in an increasingly broad range of activities. We would like to articulate PERTG's values (shared beliefs that drive our culture and priorities), vision (desired future state), and mission (path to realize the vision). Other professional organizations such as APS and GIREP provide useful models.

Reaching a meaningful consensus on these matters requires substantial discussion. As we agree on particular statements, we will post them on the PERTG website. We invite your feedback on the results as they emerge.

## Finances

As the Physics Education Research Topical Group (PERTG) and the annual Physics Education Research Conference (PERC) continue to grow, funds are becoming available to support a wider variety of PER-related activities. As of March 31, 2009, PERTG had 760 registered members. While PER registration fees cover most of the costs of running PERC, PERTG membership dues supplement costs of running the PERC conference, particularly costs associated with the PERC Proceedings. Currently, PERTG funds are used to support our web presence on both ComPADRE (PER-Central) and AAPT. In the near future, PERTG funds will be used for student travel grants, to subsidize PRST-PER, and for a new PERTG mini-grant program which will be available by Spring 2010. Keep an eye to the PERLOC / PERTG website for updates!

## PERLOC supports modifications to the AP Test in Physics

PERLOC has sent a letter to the president of the College Board expressing our support for proposed changes to the AP Physics B exam. The proposed modifications are outlined here for your information. PERLOC's letter of support is reproduced in the Appendix to this newsletter.

### The current algebra-based physics design (AP Physics B)

The AP Physics B test currently covers all areas of physics in a typical introductory university algebra-based course. The College Board recommends that it only be offered to students who have completed a first year of high school physics as a pre-requisite. It provides preparation for state-wide or end-of-course assessments with a breadth that exceeds state standards. Approximately two-thirds of students currently taking AP Physics B report that they took it as a first high school physics course without the necessary pre-requisite.

### Proposed Redesign of AP algebra-based physics

The following are recommendations from panels supported by NSF and the College Board and charged with the redesign composed of secondary and post-secondary members of the Physics community:

- AP Physics B will be divided into two courses, AP Physics 1 and AP Physics 2.
- All areas of physics in the typical introductory university algebra-based course will be covered in these two courses.
- A separate AP Exam will be offered for each of the two algebra-based physics courses and the AP Exam dates will be different.
- Unlike the current recommendation for AP Physics B, no prior high school physics experience will be assumed for enrollment into AP Physics 1.
- Assumed level of mathematics for entry into AP Physics 1 will be the content of a typical first high school course in algebra and right-angle trigonometric functions.
- AP Physics 1 contains the content required to meet state standards and to prepare students for state-wide assessments.

PERLOC supports these changes because we believe the B Exam covers content that is too extensive for students to master with depth of understanding. Covering less content per year, but in more depth, will provide time for hands-on activities and collaborative active learning. The goal is to help teachers give students opportunities to achieve deeper understanding and experience in the practice of science.

## PER at the AAPT Summer Meeting 2009

We have collected information about sessions related to PER at the AAPT summer meeting in Ann Arbor. This list is subject to change.

### **Monday**

#### Committee Meetings:

- Teacher Preparation Committee  
Monday, 12–1:30 p.m.

#### Poster:

- PST<sub>1</sub> Introductory Labs, Upper Division Labs, Pre-High School, Teacher Training, Implementing & Evaluating Curriculum, PER Methods, & Assessments, Conceptual Understanding & Reasoning  
Monday, Posters up 8:30 a.m.–10 p.m. Authors present: 8:30–10 p.m.

#### Sessions:

- AC Giving More Than One Test: A Closer Look at Physics Students' Understanding and Reasoning  
Monday, 8:30–11:30 a.m.
- AG Physics Education Research Tools: Techniques and Broad Implications  
Monday, 9:30–10:30 a.m.
- BC Issues in Student Problem Solving  
Monday, 1:30–3:30 p.m.
- BE Data Mining to Study Learning  
Monday, 1:30–3:30 p.m.
- CB Research Regarding Student Interactions and Collaborations  
Monday, 4:30–6 p.m.

#### Crackerbarrel:

- BBC Professional Concerns of PER Faculty – Crackerbarrel  
Monday, 12:00–1 p.m.

### **Tuesday**

#### Committee Meetings:

- Research in Physics Education Committee  
Tuesday 7–8:30 a.m.

#### Posters:

- PST<sub>2</sub> High School Physics, Particle Physics for High School, Physics & Society Education, Physics & Life Science, Introductory Physics, Upper Division, Technology in the Into Course, comPADRE, Teaching with Technology, Evaluation of Technology, Innovations in Teaching Astronomy, Problem Solving, General Topics of Interest in PER, Scientific Reasoning, Expectations & Gender Issues  
Tuesday, Posters up 8:30 a.m.–10 p.m. Authors present: 8:30–10 p.m.

#### Sessions

- DB Student Conceptual Difficulties: Introductory and Upper-Level Topics  
Tuesday, 8:30–10:30 a.m.
- DD Assessment of Effectiveness of Educational Technology in Instruction  
Tuesday, 8:30–10:30 a.m.
- DH Successful Strategies for Dissemination and Implementation of PER-Based Materials and Research Findings Beyond "Traditional PER Faculty"  
Tuesday, 8:30–10:30 a.m.
- EC The Art and Science of Physics Teaching  
Tuesday, 1–2:30 p.m.
- FC Students' Reasoning, Understanding, and Mental Models  
Tuesday, 4:15–6 p.m.

#### Crackerbarrel:

- EEE Professional Concerns of PER Solo Faculty – Ckrbrl  
Tuesday, 11:30 a.m.–1 p.m.
- EEG Professional Concerns of Graduate Students – Ckrbrl  
Tuesday, 11:30 a.m.–1 p.m.

## Wednesday

Committee Meetings:

- PERTG  
Wednesday, 12–12:45 p.m.

Sessions:

- GB Getting Started in Physics Education Research  
Wednesday, 10 a.m.–12 p.m.
- GD Physics Education Research Around the World  
Wednesday, 10 a.m.–12 p.m.
- GE Tutorials in Intermediate Mechanics  
Wednesday, 10 a.m.–12 p.m.
- HB PIRA Session: Demonstrations & Misconceptions  
Wednesday, 12:45–2:45 p.m.
- HH Teacher Preparation: Research on Teacher Quality Instruments  
Wednesday, 12:45–2:45 p.m.
- HG PERC Bridging Session  
Wednesday, 3:30–5:30 p.m.

## Foundations and Frontiers of Physics Education Research 2009

Paula Heron, Rachel E. Scherr, and Michael C. Wittmann are co-organizing the third bi-annual conference on the Foundations and Frontiers of Physics Education Research in Bar Harbor, Maine. The dates are June 15–19, 2009. Meeting registration is closed.

Information about the meeting can be found at <http://perlnet.umaine.edu/~ffper/2009/>.

## PERC 2009

The 2009 PERC, to be held in Ann Arbor, MI, has been organized by Nathaniel Lasry, Marina Milner-Bolotin, and Tetyana Antimirova. The topic of the meeting is “Physics Education Research across Paradigms.” Invited speakers to the meeting are Andy diSessa, Kevin Dunbar, Michael Posner, and Anna Sfard.

To submit a poster, targeted poster session, workshop or roundtable discussion, go to the PERC 2009 website at <http://www.per-central.org/conferences/2009/>. The deadline for submissions has been extended to June 5, 2009.

We are attempting to keep the registration fees low. The full registration includes the banquet dinner and copy of the Proceedings. We have changed the registration process for the PERC to include the following changes:

- we have an undergraduate registration
- the banquet option provides an opportunity to include guests.

The registration costs for the PERC are now as follows:

- Full Meeting - \$150 (includes banquet)
- Full Meeting - Undergraduate - \$50 (includes banquet)
- Banquet ONLY - \$35 [guests]

Registration is through the AAPT website, and requires a minimum of 1-day AAPT registration:  
<http://www.aapt.org/Events/SM2009/registration.cfm>

## PERC 2010: Call for Organizers

The Physics Education Leadership Organizing Council (PERLOC) is seeking proposals from a team (of nominally two individuals) from within the PER community who would like to organize the PERC 2010. The PERC 2010 team will establish the content / theme for the meeting, and then collaborate with the organizers from PERC 2009 in order to organize PERC 2010. The organizing team will select and invite speakers, organize conference sessions, and

coordinate with AAPT. You may want to talk to a previous conference organizer to find out more about what the job entails before submitting a proposal.

Funding and assistance from the PERLOC is available, though primary ownership of ideas, framing etc. will be the purview of the PERC organizers.

If you are interested, and you think that you have an idea for a theme that will be of interest to our community, we'd love to hear from you.

**By July 3 we seek:**

1-2 page proposal describing your interest in leading PERC2010. You may include whatever you wish, but helpful information would include the names of proposed organizers, theme / approach to PERC2010, potential (but not confirmed) speakers, formats, and justifications for your approach & interest.

Proposals should be submitted by email / web-link to: [noah.finkelstein@colorado.edu](mailto:noah.finkelstein@colorado.edu)

A partial list of anticipated issues that need to be sorted out in organizing PERC are listed below. They need not all be addressed in the proposal.

Content Issues to include, but not limited to having the organizers:

- establish a theme
- lead in the organization of invited sessions
- organize the structure of what types of sessions are run,
- identify appropriate formats and timing

Structural mechanisms to include, but not limited to having the organizers:

- make sure the theme is announced before AAPT submission deadline,
- post info to the web,
- solicit abstracts etc in a timely fashion
- coordinate with the AAPT on bridging session (and making sure in paper sort that the bridging session does not conflict with other RIPE sessions, and the like)
- coordinate with the venue to make sure there are appropriate spaces / times
- coordinate with the Proceedings editors

PERLOC will discuss all proposals and will select an organizing team based on the quality of the proposals and on the abilities of proposing team to execute the proposal. PERLOC will contact all proposers as part of our process of selecting and confirming PERC 2010, and will announce our selection and the theme of the conference at PERC 2009.

Please feel free to ask prior PERC organizers about what a valuable and rewarding experience this is, and to discuss your questions or concerns with any members of PERLOC.

Some Recent Conference Organizers:

- Nathaniel Lasry  
[lasry@seas.harvard.edu](mailto:lasry@seas.harvard.edu)
- Marina Milner-Bolotin  
[mmilner@ryerson.ca](mailto:mmilner@ryerson.ca)
- Tetyana Antimirova  
[antimiro@ryerson.ca](mailto:antimiro@ryerson.ca)
- Mel Sabella  
[msabella@csu.edu](mailto:msabella@csu.edu)
- John Thompson  
[John\\_Thompson@umit.maine.edu](mailto:John_Thompson@umit.maine.edu)
- Nicole Gillespie  
[ngillespie@kstf.org](mailto:ngillespie@kstf.org)
- Chandralekha Singh,  
[clsingh@pitt.edu](mailto:clsingh@pitt.edu)
- Michael Loverude,  
[mloverude@fullerton.edu](mailto:mloverude@fullerton.edu)
- Steve Kanim,  
[skanim@nmsu.edu](mailto:skanim@nmsu.edu)
- Rebecca Lindell,  
[rlindel@SIUE.EDU](mailto:rlindel@SIUE.EDU)
- Michael Wittmann,  
[wittmann@UMIT.MAINE.EDU](mailto:wittmann@UMIT.MAINE.EDU)
- Rachel Scherr  
[rescherr@gmail.com](mailto:rescherr@gmail.com)
- Sanjay Rebello  
[srebello@phys.ksu.edu](mailto:srebello@phys.ksu.edu)

Prior PERC Site and Links to Prior Years:

<http://web.phys.ksu.edu/perc2007/> or <http://www.per-central.org/conferences/>



American Association of Physics Teachers  
Physics Education Research Topical Group

April 14, 2009

To Whom It May Concern:

The Physics Education Research (PER) community is an active and growing group of researchers and practitioners who are engaged in expanding the understanding of the learning of physics and increasing the effectiveness of physics classes and curricula. PER is an interdisciplinary field of study, anchored mostly in physics departments and schools of education with the long-term goal of creating materials that affect the teaching and learning of physics from preschool through graduate school. Historically, most work in PER was in one of four areas: defining specific student difficulties as measured by written tests and surveys and interviews, and addressing these difficulties through curricular materials design; survey design and analysis; what teachers needed to know to more effectively teach physics; and the study of computers in education. Many research and teaching materials have been created over the past 3 decades of active research; having access to each other's work has always been a problem, since publishing in archival journals is an inappropriate method for sharing curricular materials, and these materials are rarely published with research results.

The PER community has been most active within the American Association of Physics Teachers (AAPT). The Physics Education Research Topical Group (PERTG) is a topical group within the (AAPT), formed for those with a special interest in research on the teaching and learning of physics. The Physics Education Research Leadership and Organizing Council (PERLOC) is elected by the members of the PERTG to serve as the representative body for community decision-making.

Our mission is to promote physics education research within and beyond the AAPT. As such, PERLOC has a strong interest in the promotion and success of national digital libraries that help us share information with the practitioners and the consumers of PER. Creating a central repository of information is key to our success as a research community and as developers who have created research-based curricular materials. PER-CENTRAL, a community web site hosted and supported by the ComPADRE NSDL Pathway, has become a vital tool in these communication efforts. PER-CENTRAL holds a growing bibliography of PER literature and database of PER theses and dissertations. This web site also hosts tools to support the growth of the community, including user-controlled listings of PER groups, discussions, blogs, and wikis, review articles on advances in PER, and information databases such as job openings in the field. Most importantly, PER-CENTRAL has begun hosting the web presence for the annual PER Conference, including the processes of abstract and paper submission and review. In addition to supporting the conference itself, this also provides an open and accessible repository for the presentations made at this conference.

The PERTG and ComPADRE will continue to explore ways to collaborate in the support of the PER community. We will negotiate the proper level of funding through membership dues and conference fees to develop and maintain the ComPADRE services for the PER community. The PERTG leadership feels that PER-CENTRAL and ComPADRE are a necessary collecting point for the physics teaching and physics education research communities. We strongly support the Phase II funding of this NSDL Pathway project.

Sincerely,

*The Physics Education Research Leadership and Organizing Council*

Noah Finkelstein, Paula R. L. Heron, Jose Mestre, Valerie Otero, Rachel E. Scherr,  
John R. Thompson, and Michael C. Wittmann



American Association of Physics Teachers  
Physics Education Research Topical Group

March 10, 2009

Gaston Caperton  
President, The College Board  
45 Columbus Avenue  
New York, NY 1023-6917  
(cc: Trevor Packer, Vice President; Marcia Wilbur, John Eggebrecht)

Dear Dr. Caperton:

We have heard, in broad outline, about some changes you are considering for the Advanced Placement Physics B course. As elected representatives of the 750-member Physics Education Research Topical Group within the American Association of Physics Teachers, we would like to express our strong and unanimous support for two aspects of those changes:

- (1) Spreading the course material over 2 years, and
- (2) Increasing the emphasis on conceptual understanding as opposed to algorithmic problem solving.

Our support for (1) stems from decades of physics education research showing that, in order for most students to master the material, they must work individually and/or collaboratively to build up their own an understanding, rather than simply receiving information and practicing routines. Although this kind of *interactive engagement* has been incorporated into various physics curricula in many different ways, all of them require more time than traditional lecture and practice do. The breadth of AP Physics B severely limits the time that teachers can allow their students to interactively engage with the material.

The new 2-year sequence, by contrast, will give teachers the breathing room they need to incorporate extensive interactive engagement into their classrooms.

Our support for (2) relates closely to our support for (1). Physics education research shows that many students who can correctly solve standard quantitative physics problems do not, in fact, understand the underlying concepts. To be clear, we are not questioning the importance of quantitative problem solving. Expert-novice research shows, however, that “good” problem solving is integrated with — and in a sense flows from — a deep conceptual understanding. Without the relevant conceptual understanding, a student’s ability to solve a given kind of problem is fragile; it transfers poorly to new scenarios, and it often gets corrupted or forgotten over time. Increasing students’ conceptual understanding is important in its own right *and also* scaffolds robust, flexible problem solving. Changes (1) and (2) would increase our confidence that students who score highly on the AP Physics B exam understand physics.



As physics teachers, our support for your proposed curricular changes also stems from our deepest goals and motivations. We don't just want our students to understand something about, say, momentum conservation and electrostatic repulsion. We also want students to get a sense of what physics *is* and how to learn it. For instance, we want students to see physics as an interconnected, coherent web of ideas rather than disconnected facts and formulas. We want students to approach the learning of physics as making sense of experimental result and personal experiences rather than absorbing (and later regurgitating) information. Our members' research shows that students develop more sophisticated beliefs about physics knowledge and learning only when conceptual understanding is emphasized and rewarded, and only when the pace of the course enables students to gain a good conceptual understanding. The new AP Physics B could afford that opportunity to tens of thousands of students.

Sincerely,

Rachel Scherr, Chair  
Physics Education Research Leadership and Organizing Council