

Overview

This document is a summary of conversations held March 19, 2004 between Robert Beichner of NC State University and people at the APS Editorial Office (Martin Blume, Stanley Brown, Chris Wesselborg, Debbie Brodbar, and Robert Kelly), including telephone calls with Bernie Khoury of AAPT and Jan Tobochnik, editor of *Am. J. Phys.* The topic of discussion was the possibility of establishing a new journal serving the needs of the Physics Education Research (PER) community.

The need for publication venues is readily apparent. Over the past six years there has been an average of 10 tenure-track PER faculty hires per year. This has resulted in an atypically large fraction of junior faculty in the field. These people will not receive tenure if they are not able to find a recognized journal to publish their papers. The current preferred route is the PER section of *Am. J. Phys.* The editor (and AAPT as a whole) has been very accommodating, given that the journal's mission statement explicitly excludes the publication of original research. At the moment, 64 pages per year are devoted to the PER section. Additional PER-related articles appear irregularly in the main body of the journal. Because of concerns that the general readership will not be particularly interested in the topic (along with the inherent conflict with the mission statement) lengthy, detailed reports of PER studies are not possible. Of course, there are other avenues for publication such as proceedings and non-specialized education journals, but these are not as valued for tenure and promotion and they can be quite difficult to access.

This situation is strikingly parallel to that which led to the establishment of *Phys. Rev. Special Topics—Accelerators and Beams*. Accelerator-related papers were (and still are) published in *Phys. Rev. E* and *Phys. Rev. Letters*, but these articles are too short and lack the technical details often needed by researchers in the field. Many articles on instrumentation, etc. are simply inappropriate. *PRST-AB* has satisfied this need and now publishes 100 articles (~10 pages each) per year at an annual cost of roughly \$200,000. While this is a small fraction of the 13,000 APS articles published (out of 27,000 received), it has become very important to the accelerator physics community.

Discussions

Everyone agreed that a joint effort of APS (via the Forum on Education) and the AAPT might be able to address the needs for additional PER publication. Issues related to the operation and sustainability of a new journal were discussed at length. The name of the journal would be *Physical Review Special Topics—Physics Education Research*. (It was noted with some pleasure that the acronym *PRST-PER* sounds like “Phys Rev-Stupor”!) The publication would be modeled after *PRST-AB*, an all-electronic journal with a University-based volunteer editor and a strong editorial board. It was noted that APS provides some support for the office of *PRST-AB* editor Robert Siemann of SLAC. Beacon Press is hired (at \$42 per page) to compose PDF and XML documents that are then stored on the APS's PROLA server, with a mirror server at Cornell. There have been ongoing discussions of details like having single column screen display versus double column hardcopy formatting, and generally the arrangement with Beacon has worked well. Articles are published within two days of receiving the author's final approval of

the proofs. The PER journal raises interesting issues in that there might be an increased desire for incorporating multimedia into articles, including audio and video clips from interviews. This raises concerns about costs, but is an avenue that APS has been interested in exploring. A new journal needing these features would “force the issue” to the forefront. The administrative overhead in managing the author-charges process and in defining the rules and workflows to manage multimedia rights and permissions has not yet been established. Relevant standards will have to be addressed.

A funding model would have to account for the fact that current costs are approximately \$2000/article. APS expenses last year were \$28M for 27k articles received and 15k published. Income from publications was \$31M. (It is actually quite costly to handle rejected articles because of additional author communications, managing resubmissions, etc. Current acceptance rates range from 30% for *PR Letters* to 80% for *PR C* and *PRST-AB*.) It is interesting to note that there is little difference in cost between the all-electronic and primarily paper-based journals. *PRST-AB* receives a substantial portion of its costs (~\$80k/yr) from irregular payments from the large national labs, which recognize its value to the field. There is no analog for the PER community. Nonetheless, there is a strong desire that the new journal be available with no subscription fees. Even though it will contain technical papers, many non-PER physicists could be interested in the results and perhaps gain insight into how this type of research is conducted, since it is very different from that done in the other physics subfields.

A quick review of the numbers illustrates the cost concerns. If 50 articles per year are published, the cost could be expected to be near \$100,000. With no large “national PER labs” to provide sponsorship, page charges to authors would be prohibitively high. Jan Tobochnik noted that several hundred dollars per article might be acceptable, but all acknowledged that page charges are unpopular. Currently, only 40% of authors pay the voluntary charges associated with *Phys. Rev. Letters*. The other *Phys. Rev.* journals do not have page charges for properly prepared compuscripts (using *REVTEX4* or a specially-prepared *Microsoft Word* template). However, it is doubtful there is a large enough subscriber base to fund the new journal and libraries are reticent to purchase subscriptions to new journals, so page charges are the only option. The logical conclusion is that a mechanism must be found to drastically cut costs.

This could be accomplished if authors were required to submit articles in the web equivalent of “camera-ready” form. *PRST-AB* has not been overly successful in this effort, but a PER journal might have better luck because of the critical need many authors feel to secure publications. The “Physical Review” name implies high quality and this is especially valuable to PER researchers. Most of the people who review their performance are not familiar with PER methodology. Often they do not recognize the names or value the contents of education journals, even those with very high rejection rates. Having the *Physical Review* journal series include PER among its offerings would greatly advance the field and help those working in it.

The creation of an APS article’s PDF file and XML wrapper with embedded CrossRef links is currently handled by Beacon Press. There is a substantial cost for this

service, which the new journal probably could not afford. The editor and staff will need to do this themselves. This and copyediting will take a considerable amount of work, but should be manageable for the smaller number of articles expected (~ 1 per week).

Peer Express (AIP's editor assistance system) was discussed, but it is probably overly complex for the needs of the new journal. APS's database of reviewers, while substantial, probably has very few names that could be called upon to review education-related research. Jan Tobochnik has offered to share his *FileMaker Pro* reviewer database, which should contain many possible reviewers. He also suggested that the new journal and *Am. J. Phys.* provide a cross-list of articles as appropriate.

It is clear this must be a joint effort of APS and the AAPT. It may even be possible to include *Am. J. Phys.* in a subheading on the new journal's titlepage. The goal is not to replace *Am. J. Phys.* for the publication of PER articles, but to add an additional, highly focused place for authors to share their research. Because both journals will publish PER-related articles, a guide for authors indicating the different coverage of *Am. J. Phys.* and *PRST-PER* is important. A first attempt is in the appendix. Basically, classroom and curricular applications of PER would be published in *Am. J. Phys.*, with technical articles reserved for the research journal. (It was noted that some established authors are not producing articles, but instead present their work at conferences, so they don't consume the limited number of pages currently available. This highly undesirable situation would be eliminated with the new journal. Additional types of studies—replications, research techniques, methodology comparisons and critiques, the educational equivalent of instrument design, etc.—will also now be publishable. This will increase the rigor in the field and indirectly add to its acceptance by the rest of the physics community.)

Members of the governing bodies of both APS and AAPT must be kept apprized of the discussions being held in this area and have oversight of any journal that results from those efforts. Bernie Khoury will contact members of the AAPT Executive Board and Publications Committee. Marty Blume will inform the APS Council and Publications Oversight Committee. Beichner was directed by the AAPT's Research in Physics Education Committee to commence these talks, so he will report to them and to the PER community at large. This document will be distributed to interested parties.

The appendix contains five parts. The first is a proposal to be made to the APS and AAPT about the new journal. The second section is an aggressive timeline that would permit first publication in January 2005. Next is an opinion letter from Carl Wieman, 2001 Nobel Laureate and "highly interested bystander." In part four, wording is suggested that would guide authors to the appropriate journal for their physics education-related papers, whether they are instructional in nature or deal with research. The last part of the appendix is a business plan for the journal.

Appendix

1. For consideration by APS and AAPT

We propose the creation of a new journal, *Physical Review Special Topics—Physics Education Research*, published by APS and jointly sponsored by the APS Forum on Education and AAPT. There would be no subscription fee for this journal, but there would be author charges of \$500 per article. These charges would be voluntary, as they are for *Phys. Rev. Letters*, but authors (especially those with grant support) would be strongly encouraged to pay them.

The editor would be a non-paid volunteer selected by a search committee co-chaired by Martin Blume and Jan Tobochnik. The editor would choose an editorial board, based on input from APS and AAPT. The board should include (among others) the *Am. J. Phys.* editor, that journal's PER editor, and the chair of the AAPT Research in Physics Education Committee. The editor's institution will be asked to supply clerical support and office space. Additional co-editors for special topics will be designated occasionally. Publication and editorial policies will be those of the rest of the *Physical Review* journals. The same high standards must be maintained.

The actual files for the journal will be stored on the AAPT's servers, with connection to the World Wide Web handled by the APS Link Manager.

Nearly all article composition will have to be done by authors, and this will be a provision for publication acceptance. Final copyediting and production will be carried out at the University-based editorial office. Submissions will follow *Physical Review* standards, using *REVTEX4* or *Microsoft Word*. Multimedia files will be stored in the AIP EPAPS archive. (This may change in the future, as capabilities are added to the APS publication system.) The formatted PDF and an article's XML wrapper with embedded CrossRef links will be created by the journal editor and staff.

2. Timeline

March 2004

- a. This document is sent for comments from meeting/telephone participants Marty Blume, Jan Tobochnik, Bernie Khoury, Chris Wesselborg, Stanley Brown, Robert Kelly, and Debbie Brodbar. Also sent to Karen Cummings, editor of *Am. J. Phys.* PER section and Karl Mammola, editor of the *Physics Teacher*.
- b. Iterative refinement of document

April

- a. Final document sent to the above list, plus Fred Stein (APS Director of Education), Jack Hehn (AAPT Education Manager), Beth Cunningham (APS Committee on Education Chair), Gay Stewart (APS Education Forum chair), Ramon Lopez (upcoming Forum Chair), Scott Franklin (RIPE chair). Recipients will be asked to distribute the document to interested parties, eg. Joe Redish, Lillian McDermott, Ted Hodapp, etc.
- b. Final document revisions and distribution to APS Council, AAPT Executive Board, APS & AAPT Publications Committees, AAPT RIPE Committee
- c. APC Council (and Publications Oversight Committee?) discussion and vote.

May

- a. Any revisions/comments from APS distributed

August

- a. Discussion and vote by AAPT Executive Board & Publications Committee
- b. Workshop on *REVTeX* and reviewing guidelines at PER Conference
- c. Collect reviewer information, solicit articles

September

- a. Editor search committee formed with Blume & Tobochnik chairing
- b. Editor selected, editorial board named

October

- a. Editorial policy and procedures established, with close guidance from APS and AAPT editors and staff
- b. Editorial office assistant and secretary hired
- c. Articles begin to be received and distributed for review

November-December

- a. Articles processed into final PDF and XML formats for publication, DOI linkages established, etc.

January 2005

- a. Online with first issue

3. E-mail from Carl Wieman, received January 28, 2004

Dear Bob,

As a highly interested bystander, I wanted to offer some of my personal opinions on the publication questions currently facing the PER community. I do not claim to be an expert on the subject, but I have talked with you, Jan Tobochnik, Jose Mestre, and several others about the publication problems in PER. I also regularly interact with several other sub-disciplines in physics because of my eclectic research interests and my long-time service on the NRC Board on Physics and Astronomy. So I think I have a reasonable idea as to the broader physics community's attitudes about publication.

First, let me say that I believe that there is a very real problem with publication in the PER field. As someone trying to learn about work in the field, it has been very hard for me to find materials because they are scattered through many different journals and are so slow to get into print. Also, I regularly preach to physicists and other scientists the value of using the lessons from PER in their own teaching, but this usually results in my being asked where they can read about current work in the field. I have to respond, that, unlike in their own sub-fields, there really is no clear place to find PER work. Finally, I am frustrated at the frequency with which I will hear about some interesting PER work, only to find that it has not been published when I try and find out more details. All of these characteristics are very different from other areas of physics research. They must be changed before the broader physics community will accept PER as a standard sub-discipline that is treated like all the others found in physics departments, and will look regularly to PER literature for insight.

Let me offer my perspectives as to the attitude of the broader physics community with regard to publication in general. First, in all the sub-disciplines with which I am familiar (condensed matter, AMO, elementary particle, quantum information), the primary format for distribution of results is the electronic preprint. This is primarily through the Los Alamos (now moved to Cornell) preprint server. Much of the community stays current by regularly checking their favorite preprint server for the latest postings in their field. The reviewed journals still play an important role as the stamp of legitimacy, but by the time important papers come out in the peer-reviewed journals, they are usually already widely known and distributed in the community. Any work that is not submitted to a peer-reviewed journal however is not taken seriously nor referenced, and so no one would have credibility if they did not routinely submit their papers for peer review, and have them published in the most prominent peer reviewed journals.

In an attempt to continue to play a more meaningful role in physics publication, more and more journals are moving to online versions, either without paper versions, or paper versions that serve a very minor role. The younger and more rapidly developing the field, the less significant a role paper journals play. In an extreme case like quantum information science, publication in a paper journal now seems to be something of a black mark. It is an admission that the work is not really very significant, and hence the author is willing to accept the slow pace of paper publication rather than publishing more rapidly on-line.

I have heard that some PER folks have questioned whether publication in an online journal will have the credibility of a paper journal to the broader physics community in tenure decisions. I do not believe this is an issue, because on-line publication and distribution is so ubiquitous in physics. I would bet that if you polled physicists under the age of forty in the fields I listed above, most would be very hard-pressed to tell you whether or not there existed a paper version of their favorite journals. The credibility of a journal will depend only on its review standards and its perceived prominence in the PER community, not on its publication format.

A more likely issue will be the credibility of publications in print journals that are not readily available online, which is the case for a number of education journals. Most members of the physics community go immediately to the web to examine the papers of a candidate who is up for tenure. I am reasonably sure that any papers that are only available in print or through special paid single issue access, rather than being immediately available on-line like all the major physics journals, are likely to be considered "not serious publications". Of course, the same

considerations apply to how likely PER publications are to be read by and impact the broader physics community.

Another useful aspect of on-line publications is that they tend to be much more international, because they are so much more widely available. From some of my own past publications in AJP, I know that access to AJP in other countries has been a problem. If online journals in other fields of physics are any guide, if a journal has a major on-line presence and is seen to be the primary journal for publication of PER research, it will likely attract many more international contributions than AJP ever could or would want to.

A final question I gather that has been debated is whether or not to have page charges for a PER journal. My opinion on this is that if PER wants to be treated like a valid sub-discipline of physics, it has to act like one, and that includes living with page charges. Nearly all of the non-PER physics journals that I know about that do not have page charges are very much 'for-profit' operations, and are viewed almost as "vanity press". Their review standards are notoriously lax so that they can attract the maximum number of authors who will then insist that their libraries purchase the journal. It is accepted in the larger physics community that in order to have rapid and efficient publication and high standards, page charges are a necessary evil. Of course virtually every journal that has page charges also has ways of dealing with suitably high quality papers from authors unable to pay the charges, but paying page charges is the norm. Page charges have another virtue, which is that they strongly encourage authors to strive for brevity. I do notice that PER papers tend to be quite a bit more loquacious than the general physics standard. This difference in norms does get noticed (usually none too favorably) by none-PER physicists when reading PER publications, either for general interest or when evaluating candidates for hiring or promotion in physics departments.

I salute your efforts to solve the problem of publication of PER research. I hope you can make rapid progress.

Carl Wieman
Distinguished Professor of Physics and Fellow of JILA

4. Author guide for deciding to submit to *Physics Teacher*, *Am. J. Phys.* or *PRST-PER*

The Physics Teacher

TPT does not publish research papers. It does, however, publish papers about research findings, including those of PER. The primary purpose of such papers is to make teachers aware of important and interesting research articles that have been published elsewhere and could be useful to the *TPT* audience. Such papers are rather brief, generally no longer than three or four pages. They are primarily descriptive summaries that do not include detailed discussions of research methods, extensive data tables, or statistical analysis. Rather, they refer interested readers to the original published article(s).

American Journal of Physics

AJP is particularly interested in manuscripts that apply the findings of PER to the classroom. Your paper should be relevant and interesting to users of PER as well as to the physics education research community. Typically, papers should not exceed about 8 journal-formatted pages (approximately 24 pages of double spaced, 12 point text inclusive of figures and references). Papers that must significantly exceed this length recommendation should likely be submitted to *PRST-PER* or elsewhere for use by an audience requiring this increased level of detail, depth and/or breadth. We encourage the use of EPAPS for referral to additional information or data on-line. See <http://www.aip.org/pubservs/epaps.html> for more information on EPAPS. We also encourage the submission of short but important and useful papers. However, some background on research methodology should be provided for those physicists who might use the results of PER in the classroom without having expertise in the field. It is important that PER articles in *AJP*, like other articles in *AJP*, be mostly self-contained so that a significant number of college physics teachers will find the articles interesting and useful for improving physics education.

Physical Review Special Topics—Physics Education Research

PRST-PER is the archival education research journal of the American Physical Society and the American Association of Physics Teachers. Articles submitted to *PRST-PER* must be original research that has not been published elsewhere. They should deal with the teaching and/or learning of physics and may cover the full range of experimental and theoretical research. Review articles, replication studies, descriptions of the development and use of new assessment tools, presentation of research techniques, and methodology comparisons/critiques are welcomed. Presentations of curriculum development, new teaching techniques, etc. are not appropriate unless there is a strong, explicitly discussed basis in PER. Authors of such articles may want to consider submission to the *American Journal of Physics* or the *Physics Teacher*.

5. Business plan for PRST-PER

The long-term viability of the journal rests on the ability to reduce costs substantially from the current model. There are several things that can be done to accomplish this.

1. Nearly web-ready copy must be required from the authors. They will have to use *RevTeX* or the APS-developed *Microsoft Word* template as a condition of article acceptance. If possible, *Scientific Word* (a WYSIWYG *TeX* editor) will be utilized to make this as easy as possible. Beichner will offer workshops on producing satisfactory manuscripts as well as methods for systematically reviewing articles. Arrangements have been made with the publisher of *Scientific Word* to offer 30% discounts off list prices. If there is sufficient funding available, a limited number of packages will be purchased and given to prospective authors at the workshops.

2. Final copyediting and production of the formatted PDF and XML wrapper files will be done by the editor and staff at the editor's institution, along with DOI submissions to CrossRef. Even though this work is not carried out by the APS Editorial Offices, it is critical that the "look and feel" of *Physical Review* be maintained. (A half-day's proof of concept effort successfully produced a properly formatted PDF file with XML wrapper from an actual *REVTeX* file that had been submitted to *PRST-AB*, including links to references in the SPIN and INSPEC databases.) The new journal will follow the lead of *Phys. Rev. ST— Accelerators and Beams* as new display formats are developed. The APS Publications Oversight Committee and the AAPT Publications Committee will each ensure that the journal meets their organization's standards. Funding from the NSF's National Science Digital Library PER-CENTRAL project will outfit the editor's office with the necessary start-up hardware and software. \$10,000 per year for 3 years is also available to pay for an additional assistant or consultant to get the editorial office fully operational with *REVTeX4* and the details of electronic publishing. Beichner has funding for a total of four summer months of effort on the PER-CENTRAL project. Some of this effort would go toward the editorial process if he is selected as the editor. If a different person is named editor, half of this funding (two summer months) would revert to them.

3. The physical files (PDF and XML) for the journal will reside on servers provided and maintained by AAPT. Start-up funding (Year 1 = \$12k, Year 2 = \$28k, Year 3 = \$20k) has been allocated to AAPT's comPADRE project as part of the PER-CENTRAL effort. The comPADRE PI will receive one summer month per year for three years, $\$6400 * 3$. Total start-up funding to AAPT (for all aspects of the PER-CENTRAL project, including the new journal) = \$79k.

4. The APS Editorial Office will cover periodic review of the journal, establish the Link Manager connections to the journal files from their website, provide technical support for use of *REVTEX4*, etc. Methods of managing and archiving multimedia files still need to be developed. The new journal will work with the APS office to see how this can best be handled. CrossRef membership costs \$250/year (and we may be able to piggyback on an existing APS account since this would be an APS journal). Depositing an article's metadata with CrossRef (thus establishing a DOI) is \$1 per article.

5. The editor of *American Journal of Physics* will provide his database of reviewers. Many of these records should be applicable to the new journal. The journal's demands are small enough that the APS web-based reviewing and author status system will not be needed. The editor and PER editor for *AJP* will collaborate with the editor of the new journal to ensure the best service to all their readers.

We propose a \$500 voluntary charge per published article. Because the field recognizes the importance of the journal, we expect a higher payment rate than *Phys. Rev. Letters*. While this is entirely an estimate, we believe 2/3 of authors will be able to pay the charges. Assuming 50 articles per year, this comes to approximately \$17,000 annually. This will be used by the institutional editorial office to hire part-time staff to do the final copyediting, maintain a reserve for hardware/software upgrades, and handle miscellaneous costs. The editor's institution will need to provide a part-time secretary (~1 day/week) and office space. The editor will provide their time free of charge. The finances will be reviewed periodically and adjustments made as needed.