that plagued quantum electrodynamics (QED). Niels Bohr insisted that quantum mechanics applied only at the atomic scale. The new theory needed at the nuclear scale would be as different from QM as QM was different from Newtonian mechanics. David Bohm tried hard to find such a theory. But so far QM still holds far below the nuclear scale.

Then one great theorist, Willis Lamb, decided that new experimental input was needed, and measured the Lamb shift in an incredible tour de force. I remember the colloquium describing his plans and thinking that he was crazy. Nobody could make that complicated experiment work. But he did. The significance of this work was emphasized this year by President Clinton's award of one of 12 national medals to Lamb.

The most exciting result immediately following World War II was that the Lamb shift was indeed finite and measurable. Its completely unpredicted value started Hans Bethe, Richard Feynman, and others on the way to a new predictive formulation of QED.

Despite the great respect many theorists held for this new formulation, Feynman deprecated it as "bookkeeping," not physics. He regarded the conserved vector current as his major discovery in "real physics."

Tsung-Dao Lee and Chen Ning Yang deserve the highest praise for their proposal that parity was violated in the weak interaction and for pushing the experiment of C. S. Wu. But this is not "theory." This is phenomenology, analyzing the latest puzzling "who-ordered-that" data and pointing directions for further experiments. They had no theory. The initial "who-ordered-that" experimental parity violation in kaon decay that started the tau–theta puzzle was not explained by the V – A theory and was not understood by theorists until many years later, when it became clear that kaons and pions were not elementary bosons but were made of quarks.

Unfortunately, the great advances made by phenomenologists in pushing back the frontiers of knowledge have generally been undervalued. Another example of great phenomenology was the 1975 six-quark, six-lepton model of Haim Harari, who introduced and named the top and bottom quarks. The six–six model fit the data, explained all perplexing puzzles while nothing else did, and told experimenters what to look for next.

I began my physics career with an experiment, the first test of whether relativistic positrons obeyed the Dirac equation. But such tests did not yield clues to the new theory that Niels Bohr said would replace quantum mechanics. Now we are back at another level looking for clues to new physics beyond today's Standard Model. Collaboration between theory and experiment is certainly needed. But let us not forget the crucial role of phenomenology.

Reference

1. H. J. Lipkin, *Nature* **406**, 127 (2000).

Harry J. Lipkin
(harry.lipkin@weizmann.ac.il)
Weizmann Institute of Science
Rehovot, Israel

Electronic Publishing Steps Up the Pace

I read with great interest James Langer's article in the August 2000 issue of Physics Today (page 35) about changes in the electronic publishing business. I agree with most of Langer's analysis of the electronic publishing industry but feel his article has omitted an important point regarding its potential.

Most Internet use today is in the form of one-way communication; essentially a faster version of the printing press or a high-speed advertising vehicle. A fundamental strength of the Internet which has yet to be fully realized is the potential for interactive communication among several parties—that is, collaboration. Our campus houses the internationally known Collaborative Bibliography of Women in Philosophy (http://billyboy.ius.indiana.edu/WomeninPhilosophy/WomeninPhilo.html), which runs on a single computer and is maintained by one student working part time. No one person created this bibliography. Hundreds of people from around the world have contributed, and continue to do so. As a result, the online, searchable bibliography is the most extensive and up-to-date one of its kind, created from the expertise of the entire community of philosophers.

Why do we do peer review? One distinguishing feature of doing science, as contrasted with literature, art, or philosophy, is a commitment to agreement, whether as collaboration among a research group, competitive collaboration between groups, or historical collaboration by improving on past efforts. Peer review is an attempt to reach widespread consensus, although this is easy to forget in the heat of the review process.

Can the new electronic media help us with peer review? As Langer points out, articles of low interest published on the Los Alamos e-print archive are ignored; he indicates this is a form of peer review. Why not formalize this process, making it possible for readers to submit comments, reviews, and reference links for an article they find interesting or relevant? Articles that generate lots of discussion, either positive or negative, would be perceived as important based on the number and quality of the comments. The extent of interest generated by an article might even be used in tenure and promotion decisions.

I have used the Web for peer review of student papers (students were allowed to rewrite papers for a higher grade after anonymous online feedback from others in the class). Such review is used currently in several English courses here.

Using a similar mechanism, authors could clarify, answer questions, and extend their work in response to criticism. An obvious role would exist for an editor/monitor, but less so than with most printed journals. I encourage the American Physical Society and the American Institute of Physics to break out of the printing-press mind-set and think of ways to use the new electronic media for more than one-way communication. Let's create a genuinely interactive—and democratic—electronic journal similar to the Los Alamos archive, where almost anything can be submitted, but where any peer can review or comment on it, as occurs, for instance, in really good list server discussions.

Kyle Forinash
(kforinas@ius.edu)
Indiana University Southeast
New Albany, Indiana

The future of electronic publishing is indeed bright, but two changes in current approach will be important.

First, the paper in our "paperless" offices multiplies every time we touch the computer. Reading a paper on the computer screen is uncomfortable, hard on the eyes, and does not allow marginal notes. And an article pulled from the Web is usually printed single sided instead of double sided. Because information on the Web sprawls over several pages when one page would do, wasting paper is too easy. Serious digital publication will require compact formatting and the near-universal use of two-sided printers.

Second, as anyone who uses e-mail can attest, electronic communication is too easy. Surely users can be strongly tempted to throw some half-digested results up on the Web with a few keystrokes. Perhaps this problem has solved itself among string theorists, but can we trust ourselves to objectively review our own work?

Cynthia Cudaback
(cudaback@lifesci.ucsb.edu)
Marine Science Institute
University of California
Santa Barbara

Langer replies: I agree with Kyle Forinash's remark that a fundamental strength of the Internet is its potential for interactive communication among several parties. In fact, taking advantage of this strength was what I had in mind when I predicted that the American Physical Society is headed toward some powerful combination of the unrefereed e-print archives (which already include lots of online interaction) and the refereed journals. But it's not yet clear to me how this merger will work. Our main