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Recharging the batteries FREE

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left the Berkeley physics community in 1950–51. My authority for including him with the others who left because of the loyalty oath was Raymond T. Birge's history of the Berkeley physics department (my reference 2). As Crease says, Serber's situation was more complex. It is clear from reading Serber's memoir that the loyalty oath was a significant, if not the only, factor in his decision to leave. Indeed, in Crease's own National Academy of Science biographical memoir of Serber,[1] after describing Serber's unhappiness at the forced departure of colleagues, he writes "Growing antagonism between his friends Ernest Lawrence and Oppenheimer, however, seems to have contributed to Serber's decision to leave Berkeley."

Reference

1. R. Crease, "Robert Serber, 1909–1997: A Biographical Memoir," http://books.nap.edu/ html/biomems/rserber.pdf.

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Physics contest could honor student, school

"And we compel men to exercise their bodies not only for the games, . . . but to gain a greater good from it for the whole city, and for the men themselves."
Lucian, Anacharsis, ca AD 170

Being victorious in the Olympic games in ancient Greece was a major achievement that brought honor not only to the athlete but to his city-state as well. Personal achievement could not be imagined without the contribution and acknowledgment of the athlete's city-state. All Greek city-states could send official missions to attend the games, where famous poets and historians promoted their works and famous philosophers exchanged and debated ideas. Those national gatherings promoted cultural consciousness and strengthened Greek identity.

In an article in the December 1921 issue of *Harvard Graduates' Magazine*, William Lowell Putnam wrote about the great potential in undergraduate students:

> The idealism of the undergraduate student, his eagerness to achieve something for his college, for his country or for any cause which fills him with enthusiasm is constantly referred to with admiration by those in charge of universities. . . . In none of these cases is the undergraduate primarily interested in winning honor for himself. He is anxious . . . and very glad to play a useful . . . part in the preparation of the team by which her victory is secured.

Putnam proposed the establishment of a mathematical competition at the college and university level. His vision was finally realized in the William Lowell Putnam Mathematical Competition, established in 1927 by his widow, Elizabeth Lowell Putnam, after his death.

The mathematical community in North America is well informed about the Putnam Competition, which "has undoubtedly played no small part in raising the status, the level and standards of mathematical education."[1] The competition has promoted mathematical awareness and knowledge, strengthened cooperation among colleges and universities, and served to establish uniform mathematical standards. Personal victory is identified with the victory of the college or university.

Given the prestigious 70-year history of the Putnam Competition, it is remarkable that similar competitions have not been extended to other fields—physics in particular. In Putnam's words, "No opportunity is offered a student by diligence and high marks in examinations to win or help in winning honor for his college. All that is offered to him is the chance of personal reward. Little appeal is made to high ideals or to unselfish motives."

Although there are several local competitions along the lines of the Putnam Competition, I highlight for the physics community the failure to include such an important global activity at the collegiate level. We know from the list of Putnam winners[2] that physics students value the competition highly. The list includes Richard Feynman (1939), Robert Mills (1948), James Bjorken (1954), Kenneth Wilson (1954, 1956), and Stephen Adler (1959).

I was fortunate enough to have won a prize in a national mathematics competition and to have participated subsequently in the 24th International Mathematics Olympiad. However, I have always felt sorry that I never had the chance to compete in a physics olympiad.

A physics competition modeled after the Putnam Competition would have similar great benefits: promoting awareness, strengthening academic cooperation, and increasing the number of physics students in a time when such an outcome is highly desirable.

Establishing a competition syllabus that would be fair for all colleges and universities is not an easy task. For thoughtful treatments of that issue, see references 1 and 3. Perhaps a syllabus from the Putnam Mathematical Competition could be adapted, with appropriate content adjustments, to become the guide for a possible Putnam theoretical physics competition.

Separate content, and perhaps a separate competition, could be established for experimental physics.

References

1. L. J. Mordell, *Am. Math. Monthly*, May 1963, p. 481.
2. G. Birkhoff, *Am. Math. Monthly*, May 1965, p. 469.
3. L. M. Kelly, *Am. Math. Monthly*, May 1963, p. 491.

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Recharging the batteries

I am curious about the use of terms in the article "Batteries and Electrochemical Capacitors" by Héctor Abruña, Yasuyuki Kiya, and Jay Henderson (PHYSICS TODAY, December 2008, page 43). When I went to college many years ago, the words "anode" and "cathode" referred to function and not polarity. Electrons always come out of the anode. When a battery switches from charge to discharge, the anode switches from positive to negative terminal (or vice versa). Are the terms no longer used that way?

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Abruña replies: From an electrochemical point of view, anodes are where oxidations take place, and cathodes are where reductions take place. But in discussing batteries, the terms "anode" and "cathode" typically relate to the discharge process of a rechargeable battery: Anode and cathode correspond to negative and positive electrodes, respectively.

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Correction

April 2009, page 88—In the first paragraph, "dense oil deposits surrounded by lighter limestone or clay" should read "lighter oil deposits surrounded by denser limestone or clay." In the third paragraph, 1 milligal = 0.001 cm/s^2. ■