

Education

Department chairs confront issues in education of physicists

"Those who cannot remember the past are condemned to repeat it." Neither George Santayana's words nor his meaning were forgotten by about 170 college physics-department chairmen and administrators who met last fall to discuss the education of physicists.

A number of concerns—rising from competition from high-technology industries abroad, outmoded research and teaching equipment in US colleges and universities, low enrollment levels in physics programs—bear a striking resemblance to the 1950s, when the launching of Sputnik spurred the Federal government to increase education funding. But things have changed, especially for physics. This conference of physics department chairmen, co-sponsored by the American Association of Physics Teachers and the Education Committee of The American Physical Society, was held in Arlington, Virginia, 30 September to 1 October, to look at the problems and opportunities now facing physics departments. The tone of the whole meeting, moreover, was to ask not just what could be done about these problems, but what could be done by physics departments and physicists.

Presidential Science Adviser George A. Keyworth told the meeting that the Administration is emphasizing the need to strengthen the nation's scientific and technical personnel base. To that end the budget for science research in FY 1984 was increased and NSF established the Presidential Young Investigators Awards. Concerning precollege science education, Keyworth said that the Administration has been "wrestling with the problems" for two years. "We haven't heard many good ideas yet. But during the same time we've seen something far more important than new Federal programs—a groundswell of public and political support for better education—especially in science and math.... It would be just awful if we wound up smothering that initiative with a Federal blanket of new billion-dollar block-grant programs."

During his address at the conference, NSF director Edward Knapp announced that he was reestablishing the

NSF directorate for science and engineering education. The acting assistant director is Laura Bautz, who is director of the NSF division of astronomical sciences. Knapp said that last summer NSF established two programs for precollege science and mathematics teacher effectiveness: One is to help scientists and science educators develop, test and disseminate new instructional materials. The other, the Honors Workshops for Precollege Teachers of Science and Mathematics, will conduct workshops for teachers of proven excellence to update their knowledge of science, math and technology. Also, in 1983 NSF began a program called Research in Undergraduate Institutions to support faculty research in the colleges.

Small group meetings. During other sessions, those attending split into smaller groups to review curriculum, undergraduate research and equipment needs, the role of the small college and university, and the Federal role in the education of the physicist. A fifth group, established by popular demand, discussed the education of physics teachers and science education for the general public.

Two themes were frequently repeated in the discussion on physics curriculum, led by Anthony French (MIT) and Peter Kahn (Stony Brook). College physics students are not introduced to topics in contemporary 20th-century physics—quarks, quantum mechanics, modern electronics, black holes, gravity waves, the origin of the Universe—until they are juniors or seniors, thus reinforcing the perception that physics is neither exciting nor new. The physics BS is not seen as a particularly useful degree, either by employers (who regularly hire those with a bachelor's in engineering but not in physics) or by the students.

Robert Resnick (Rensselaer Polytechnic Institute) said that RPI started a successful series of one-credit courses on "hot" topics in modern physics that could be taken either by themselves or as a supplement to the core physics program. About 80% of all students who graduated last year had taken at

least one of these courses, he said.

Physics departments need to review their curricula to determine what is relevant and necessary for doing physics, perhaps with the ideal of developing flexible programs that can adapt to the individual needs of students, said French.

Concern about the status of the physics degree and BS-granting institutions led the participants to recommend that AAPT develop specific guidelines for minimal lab requirements both for service courses and for advanced courses and also to develop cost estimates for what it would take to upgrade undergraduate labs to meet these minimal requirements. Such guidelines may help to establish the physics BS as a useful degree in the eyes of an employer and, for smaller schools, may help in justifying the necessary expenditures on equipment and teachers.

The group on undergraduate research and equipment needs, led by Robert Tribble (Texas A&M University) and William H. Kelly (Iowa State), emphasized the extreme deterioration or absence of lab equipment used in teaching. Anecdotes abounded on how to adapt 40-year-old equipment with ingenuity, prayer and glue. The extreme need, the group found, is for equipment to teach basic skills, not to do research. The group found the present situation "critical." The conference as a whole passed a resolution calling on AAPT, APS, AIP and NSF to work together to gather information about the severity of the need for lab equipment and to work together to develop ways of addressing this need.

The group on the role of the small college and university was led by Rexford Adelberger (Guilford College) and Frederick Culp (Tennessee Technological University). The participants felt that a physics bachelor's degree is an excellent degree for general education. Some suggested that an evaluation system should be developed for physics departments in small colleges. Adelberger mentioned that in North Carolina there is a consortium with a shopping list, looking for equipment gifts

from industry.

The group on the Federal role in the education of physicists was led by Mildred Dresselhaus (MIT) and Ralph Simmons (University of Illinois). In FY 1984, 600 new NSF fellowships will be offered, an increase of 20%. Some of the participants felt the fellowships might be more cost-effective if they were only for one year. The group discussed the reestablishment of a commission on college physics, a body to focus attention on education and to gather community opinion, something like peer review without the elements of isolation.

John Layman (University of Maryland) and Robert Bauman (University of Alabama) led the group on education of physics teachers and education for the general public. Participants felt that we must encourage members of the public not to leave technological decisions to experts. One way of increasing the number of persons literate in physics is to make high-school physics more attractive, perhaps dealing with atomic physics, astronomy and computer science. Physics teachers would like to learn to explain how technology relates to life and to physics. We should not assume that we know how to teach physics just because we understand it; students learn at different levels. The group spent a lot of time discussing elementary schools because they play a critical role in shaping attitudes towards science in later study.

Perceptions. There was a general recognition among the conference participants that the public perception of physics is dramatically different today from what it had been in the 1950s. Physics then, and for many years after, was seen as the exciting leading edge of new knowledge. Now physics is more often thought of as a quaint backwater for the scientifically curious, or worse, as the field that spawned and continues to spawn nuclear weapons.

Entering college science students also view physics as too hard and less relevant to contemporary issues than other sciences. Dan Quisenberry (Mercer University) said, "We now offer a preparatory course before the introductory physics course and have found that students who take it and get at least a C do well in the introductory course. Without it, 60% of the students in introductory physics were getting Ds and Fs." The perceived difficulty of physics may be due largely to a lack of adequate science and math background, but many people also described the "density" of present curricula as a problem.

At colleges that give engineering degrees, physics department chairs find it difficult to recruit physics majors because of the competition. At

colleges that do not give engineering degrees, the physics department chairs find it difficult to maintain a large department because of the small number of students taking service courses. Further, many participants provided anecdotal evidence that bright students interested in studying physics became engineering or computer-science majors instead, because of both the comparative poverty of the physics department and the poorer prospects for employment with a physics BS degree.

Some statistical trends suggest that these perceptions and other factors are leading fewer and fewer young people to study physics. H. William Koch (director of the American Institute of Physics), using data from the AIP Manpower Statistics Division, com-

pared physics to the other natural sciences and engineering:

► The relative number of physics PhDs to all PhDs in the sciences and engineering has drastically declined since the 1950s.

► Over the past decade, the percentage of engineering PhDs granted to women has quadrupled; in the same decade, the percentage of physics PhDs granted to women has not even tripled.

► The percentage of young physics faculty, those within seven years of their PhDs, is declining for physics, while growing for the other sciences and for engineering.

► The number of BS degrees in physics has declined 20% from 1970 to 1980, while in other fields, such as in computer science, the number has more than doubled.

—JC & GBL

Education

Conference on summer institutes

The Committee on Education of The American Physical Society and the American Association of Physics Teachers are sponsoring a conference on the planning of summer institutes and supplementary courses for high-school physics teachers. It is to be held in Washington, D.C., 13-14 April.

The organizers—Peter Lindenfeld (Rutgers) and Jack Wilson (AAPT)—hope to bring together those intending to plan such courses, those who have had experience with them in the past, and personnel from NSF and other funding agencies.

According to Lindenfeld, "A number of years ago the NSF was heavily

engaged in funding such institutes and was, in fact, instrumental in changing the nature of high-school physics education. The time has come for a renewed effort that brings together the schools, the colleges and the government. Especially with the reestablishment of the NSF education directorate there is hope again for Federal support."

The conference will deal with the nature of the population from which the participants will be drawn, the philosophy and aims for such workshops, the level of math and physics to be used, budget and logistics, and means of continuing the associations begun among participants and faculty.

Richter to be SLAC director

Burton Richter will succeed Wolfgang Panofsky as director of SLAC effective 1 September. Panofsky, who is retiring at the age of 65, has been director of SLAC since its inception. He will remain at SLAC working on accelera-

tor problems. Richter has been technical director of SLAC since 1982 and had been expected to succeed Panofsky.

Richter is one of that rare breed who are active both in accelerator physics and experimental particle physics. He

At the groundbreaking for the SLAC Linear Collider in October, Energy Secretary Donald P. Hodel wields the shovel with a spiritual assist from SLAC Director Wolfgang Panofsky. Applauding the effort at the far left is William Kimball, President of the Stanford Board of Trustees.

