Education

Wilson, French testify on teaching needs to NSB panel

On 20 November, Robert R. Wilson of Cornell and Anthony P. French of MIT testified on important needs in undergraduate physics education to a panel of the National Science Board. The NSB Task Committee on Undergraduate Science and Engineering Education was established last year to advise the board on whether and how NSF might play a more active role in science education at the college level. The panel, headed by Homer A. Neal of the State University of New York, Stony Brook, is to report to the board by March and NSB is to report in turn to the National Science Foundation next summer.

"NSF and other agencies have comprehensive programs at both the graduate and pre-college levels," NSB chairman Roland W. Schmitt said in his charge to the task committee, but "currently no systematic Federal leadership or support exists for science, engineering and mathematics education at the undergraduate level." NSF support for college programs currently is confined for all practical purposes to about $5 million it spends each year to improve instructional equipment at predominantly undergraduate institutions.

Wilson, in a written statement he made to the NSB panel in his capacity as last year's APS president, stressed the declines in recent years in the quantity and quality of students enrolled in physics programs. He attributed the declines to the small pool of high-school graduates motivated and equipped to study science, the increased attraction of computer science, engineering, medicine and law, the poor state of undergraduate physics laboratories, uneven teaching and the dearth of opportunities for undergraduates to participate in research.

In his more informal oral testimony Wilson talked about how he got "really hooked" into physics by the direct exposure he had as an undergraduate at the University of California to the working physicists at Ernest O. Lawrence's Radiation Laboratory. Wilson proposed "that a two-way visiting scientist–visiting student program between the large universities, industrial and governmental laboratories and the nonresearch colleges be instituted."

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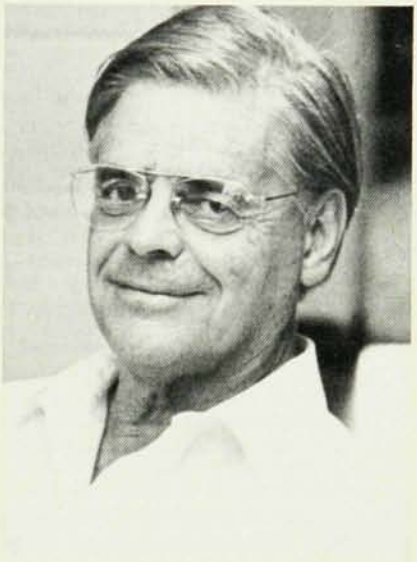

WILSON

French, testifying as president of the American Association of Physics Teachers, noted that high-school physics education in the United States is "appallingly meager" by international standards. It therefore is of vital importance, he said, not to imperil the fine job that US colleges and universities have been doing despite the constraints under which they operate.

Top priorities. Both French and Wilson told the NSB panel that the two highest priorities in undergraduate physics education are improved laboratory instrumentation and more support for undergraduate research participation. Referring to the instrumentation problem, Wilson said that "although the needs are huge, a significant start could be made with an annual program at the $50-million level." As for research, Wilson said that grants should be made competitively, that support should go to universities as well as four-year colleges and that students and faculty from nonresearch institutions should be given opportunities to visit research institutions.

Wilson said that special attention also should be paid to the need for more minorities and women in physics and the other sciences. Specifically, he thought that minority students and women "need more role models and they need more material and financial support."

French, in addition to calling for improved instrumentation and more research-participation opportunities for undergraduates, said that computer access is a significant new worry. "When addressing curriculum concerns," French said, "NSF should focus on questions of ensuring computer access and integrating computer and videodisc technology into the undergraduate programs." French said that NSF also should initiate faculty-development programs that would attract young faculty, allow faculty at four-year colleges to interact more with research scientists and increase the participation of women and minorities in teaching.

Wilson and French emphasized that among chairmen of physics departments around the US there are no appreciable differences in perception of the problems afflicting departments or the main priorities for improvement.

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A new physics teaching facility

The University of Chicago's traditional Gothic style is carried on in glass and steel in its new Kersten Physics Teaching Center, which was dedicated last fall. The building is the new home for undergraduate physics and astronomy lectures and labs and was designed specifically to stimulate enthusiasm among students being exposed for the first time to serious physics. Opinion among chairmen of physics departments is virtually unanimous, it was found in a recent APS–AAPT survey, that funding for improved laboratory and demonstration equipment would do much to attract students into physics. The new building at the University of Chicago houses 12 teaching laboratories, x-ray equipment, bubble chambers, a heliostat for indirect observation of the Sun, a computer-controlled telescope and other specialized equipment. It was built with help of a multimillion-dollar gift from Samuel and Elaine Kersten, who announced the gift at Samuel Kersten's 50th-year class reunion in May 1985. Kersten is the founder of the Water Saver Faucet Company, currently the largest manufacturer of laboratory faucets and valves in the country. Ryerson Hall, Chicago's old physics building, where Robert A. Millikan performed his oil-drop experiments and Albert A. Michelson did some of his most precise measurements of the speed of light, is being renovated to provide space for the departments of computer science, mathematics and statistics. The physics departmental offices are now in Kersten, but most faculty members have their offices and labs in the Enrico Fermi and James Franck Research Institutes, which are linked to the Kersten Physics Teaching Center by a bridge spanning 57th Street.

They explained that they could make this claim with confidence based on the outcomes of the two conferences of department chairmen held in Washington, DC, in 1983 and 1985 and last year's survey of department chairmen (PHYSICS TODAY, July, page 70). The survey was sponsored by the APS education committee and done in cooperation with AAPT. Robert Resnick of Rensselaer Polytechnic Institute, the newly elected vice-president of AAPT for 1986, was mainly responsible for the preparation, analysis and summary of the survey.

The APS–AAPT survey made inquiries about types of course offerings, their perceived effectiveness and chief needs. Asked to evaluate the success different course offerings have in attracting physics majors, respondents generally had a low opinion of broad-appeal courses, courses in "hot" contemporary topics and programs based on the philosophy "less is more," though such courses and programs were considered to serve other purposes well.

Joint BS–MS programs in physics and engineering were ranked very high in appeal both by departments that have them and departments that do not. Other joint majors, on the other hand, were considered quite desirable by departments that have them but almost completely uninteresting by departments that do not.

Department chairmen were strongly in agreement that involvement in research is the most effective way to get high-caliber undergraduates into physics and to keep them there. Laboratory equipment, however, was considered to have the most need for added funding. Asked to rank areas in which new initiatives from funding agencies would be desirable, department chairmen put the need for laboratory equipment at the top—giving it a score of 2 on a 3-point scale. Funding undergraduate research programs was given 1 point. Down by another factor of two were three closely rated needs: computer access, curricular development and new educational materials.

Department chairmen considered the quality of individuals currently majoring in physics somewhat lower than ten years ago but better than five years ago. Current majors were considered "decidedly superior" to those in computer science and "significantly better" than those in engineering overall, but the chairmen noted the increasing number of "marginal" majors who elected physics after failing to be admitted to crowded and restrictive engineering and computer-science departments. Furthermore, Resnick notes, physics majors no longer necessarily get the highest grades in introductory physics courses—pre-med and electrical-engineering students have often done better since the mid-1970s, for example.

Following presentation of the survey at the chairmen's conference last May in Washington, Resnick did a further analysis of the data in cooperation with AAPT in an attempt to elucidate a few somewhat puzzling findings. Chairmen at large schools were more concerned about computer access than those from small schools, for example, and while visiting-scientist programs were generally considered quite effective, the chairmen placed little emphasis on additional funding for such programs.

The results of the added analysis were not altogether unexpected, Resnick told us. On computer access, the big departments were found to be more alarmed than small departments because of the sheer magnitude of the investment they would need to make in new equipment. Visiting-scientist programs were largely considered a professional-society or a local, not Federal, responsibility.

Revised versions of Resnick's summary and analysis will be published soon in the proceedings of the second physics-chairmen's conference, and Resnick will give an interpretive talk about the survey as an invited paper in a session on 3 April at the APS meeting in Las Vegas.

—WILLIAM SWEET