

College Physics Conference

By Frank Verbrugge

THE development of physics teaching in the United States, both as to content and improved methods of teaching, has largely been the result of individual efforts at colleges and universities. Only in the past twenty-five years, and particularly in the past decade, has a degree of coordination between individuals and groups been established. The increasing role of physics in our scientific advances, in our technology, and in our society and culture, together with the rapid advances taking place within physics itself, demand consideration of new approaches, broadly coordinated and national in scope. Accordingly, a series of discussions between interested individuals and representatives of the National Science Foundation last summer resulted in a proposal for a series of three conferences, sponsored by the American Association of Physics Teachers and supported by the National Science Foundation.

The first of these conferences was held at the Massachusetts Institute of Technology on December 17-19. Sixty-three participants attended the conference. They were broadly representative of the various professional societies in physics; they included physicists from a wide range of colleges and universities and from research laboratories of industrial concerns employing physicists. The steering committee for the conference consisted of the following: Francis Bitter, Francis L. Friedman, Walter C. Michels, Francis W. Sears, Frank Verbrugge, and Jerrold R. Zacharias.

At its opening session, the general plan of the conference was outlined by its cochairmen, F. W. Sears and J. R. Zacharias. There was early consensus at the conference that in any consideration of the content of physics courses, the importance of clearly formulated aims was a primary consideration and that aims, methods, and content should receive full discussion before the details and scope of a national program could be considered.

In order to relate the present series of conferences to previous activities, several participants gave reports on previous conferences and committee activities. Gerald Holton reviewed the Carleton Conference on Improving the Quality and Effectiveness of Introductory Physics Courses and some of the activities which had taken place subsequent to that conference. Vernet Eaton reported on the Wesleyan Conference on Lecture Demonstrations. The Storrs Conference on Laboratory Instruction was also briefly reviewed. S. C. Brown reported on the various activities of the AAPT Committee on Apparatus. F. L. Friedman reviewed the experiences of the Physical Science Study Committee

in its development of a physics course at the secondary-school level and indicated areas of activity which had been particularly successful and those which still presented problems. J. R. Zacharias reviewed some of the special activities of PSSC, particularly films and laboratory equipment. As an example, he exhibited a new high-vacuum kit by which students can make their own vacuum tubes and summarized some experiments which become possible through the development of this tube. A showing of some of the PSSC films was available to participants on two evenings of the conference.

A considerable portion of the first two days of the conference consisted of a lively discussion of the aims of the conference and its scope, and of the nature of a national program that might develop out of this and succeeding conferences. Several of the participants gave descriptions of new approaches to physics courses which they are developing at their institutions. These reports indicated a wide variety of approaches, many of them involving course modifications which are very extensive in character. The conference participants agreed with the recommendations of the Carleton Conference that courses should (1) consist of sufficiently few topics so that each can be treated with thoroughness and intellectual rigor, (2) present both classical and modern physics as growing subjects having present-day frontiers in all areas, and (3) contribute to an understanding and appreciation of the unity of physics.

On Friday morning Julius H. Stratton, President of Massachusetts Institute of Technology, addressed the conference. He pointed out that physics is assuming a new and expanding role in research, in an immediate application in technology, as a basic supporting science for other sciences, and as an important component of present-day developments in our society and culture. He expressed the opinion that this expanding role could not be resolved by minor modifications in physics courses but required not only a major reorganization of physics courses but an increasingly active liaison with the other basic sciences, with the humanities, and with the engineering sciences. Following his address he remained at the conference for a time to answer questions and to participate in the discussion.

The conference next turned its attention to the nature of the activities which should be included in a coordinated national program. It was recognized that a further discussion of aims was also essential. It was the consensus, however, that with respect to aims, a better way to proceed was to request a study of aims by one or more of the subgroups to be appointed between the first and second conferences and to have these subgroups report at the second conference. With regard to the character of a national program it was

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agreed that such a program should not include a preparation of a specific course, its texts and its various teaching aids. It was agreed that the orientation of a coordinated program should rather be in the development of teaching resources for physics, by which various course developments could be encouraged and made possible.

These teaching resources should include the following:

- (1) Reference literature both for college teachers and for college students.
- (2) Laboratory equipment for new experiments, particularly in such areas as quantum physics, special relativity, and nuclear and atomic physics; there was discussion also of the need of a coordinated national program by which enough colleges and universities would be encouraged to use these new forms of apparatus so as to make their availability through commercial channels feasible.
- (3) Lecture and corridor demonstrations.
- (4) Tests. It was agreed that the development of tests should include programs of testing for course content and student learning in both the classroom and the laboratory. It was agreed that in the development of a testing program, active consideration should be given to student knowledge with physics both as a process of inquiry and as a body of knowledge and of concepts.
- (5) Visual aids—this to include not only the development of specific visual aids such as films but also the development of modern teaching techniques in physics teaching.

In addition to the areas specified above there was agreement that other activities of a fundamental nature should be included in the consideration of a national program. Some of the areas of interest proposed by participants and discussed by the conference included the following: (1) the encouragement of younger faculty members to become actively involved in the teaching program in the developmental sense, and means by which physics departments and graduate schools can be encouraged to consider creative contributions to the teaching of physics on a comparable basis with creative contributions to physical research, (2) the collection of accurate tables of data for use by teachers and students for the verification of laws, (3) the promotion of liaison with other science departments and with the humanities and the social sciences, (4) the consideration of means of stimulating communication both within large departments and between colleges and universities, (5) a consideration of means by which younger staff members can be released from their regular responsibilities to become involved in a national developmental program either on a part-time or full-time basis, (6) the development of special programs such as a four-semester elective physics course for nonscience majors and special programs for the gifted students.

It was agreed that though the primary emphasis of a national program might be on the introductory physics courses—at least, in its initial phases—the

discussions and planning at the conferences could, as a minimum, include undergraduate work in physics at the junior-senior level.

Most of the Saturday sessions concerned themselves with a consideration of "homework" for the participants between the first and second conferences. For this purpose the conference participants were divided by geographical areas as indicated below. The course content of physics was divided arbitrarily into fourteen headings, and an activities diagram was prepared (a 14 by 5 matrix, using the five specific activities areas listed above). The regional subgroups then were asked to meet separately and to specify their areas of greatest interest with the understanding that no fixed boundaries of activity were imposed and that many subgroups might wish to consider programs of action other than those related to specific course content and teaching aids and techniques. These might include the six supplementary areas of interest indicated above. The conference then reconvened in full session and considered the individual reports of proposed activities. It was agreed that individual geographical groups should encourage and solicit the participation by other physicists in the areas involved. It was agreed also that summaries of all proposed activities of the individual subgroups should be duplicated in not less than 100 copies and sent to F. W. Sears for distribution to the conference participants prior to the second conference. Each subgroup appointed a convener who would be responsible for bringing the regional groups together and preparing the individual reports.

The thirteen geographical areas and the conveners are as follows:

<i>Region</i>	<i>Convener</i>
Southeast	G. Schwarz
South Central—Mountain Region	M. Phillips
Northwest	K. E. Davis
San Francisco Bay Area	P. Kirkpatrick
Ohio	T. Manning
Southern California	E. Creutz—M. Sands
Western New York	E. M. Hafner
Illinois—Indiana	S. K. Allison
Cambridge	F. Bitter
New Jersey—Eastern Pennsylvania	C. A. Whitmer
Upper Midwest	F. Verbrugge
Connecticut Valley—Eastern New York	W. T. Scott
New York City	A. M. Sachs

The second conference on college physics will be held in St. Louis on February 25–27, with Washington University serving as the host institution; the third is planned for the University of Minnesota on May 5–7. By action of the conference participants, the steering committee for the first conference will also plan these two conferences. It was agreed that a report on the first conference should be given at the January meeting of the American Association of Physics Teachers, and that extensive communication of conference discussions and proposals should be provided for, both at professional meetings and in physics journals.