DOCUMENT RESUME

ED 022 689 SE 004 995

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THE COLLEGE COMMISSIONS - AGRICULTURE, BIOLOGY, CHEMISTRY, ENGINEERING, GEOGRAPHY, GEOLOGY, MATHEMATICS, PHYSICS.

Commission on Undergraduate Education in Biological Science.
Pub Date Jul 68
Note-16p.
EDRS Price MF-$0.25 HC-$0.72
Descriptors-AGRICULTURE, BIOLOGICAL SCIENCES, *COLLEGE SCIENCE, *CURRICULUM DEVELOPMENT, ENGINEERING, GEOGRAPHY, GEOLOGY, MATHEMATICS, NEWSLETTERS, PHYSICAL SCIENCES

Information concerning the eight science college commissions now in existence is provided. These commissions encompass the fields of agriculture, biology, chemistry, engineering, geography, geology, mathematics and physics. An overview of the primary functions and commitments of the commissions and consulting services offered is presented. Also described are the particular objectives, activities, publications and membership of each commission. (BC)

The COLLEGE COMMISSIONS

AGRICULTURE BIOLOGY CHEMISTRY ENGINEERING GEOGRAPHY GEOLOGY MATHEMATICS PHY

July, 1968

THE COLLEGE SCIENCE COMMISSIONS

The purpose of this publication is to give an overall view of the histories, organizational structures, modes of operation and separate goals of the eight college science commissions. The success of any commission must ultimately be measured in terms of the changes it helps to effect in undergraduate institutions. The substance and number of such changes, in turn, are limited by the degree to which the commission's work becomes known to undergraduate institutions. It is hoped that the present publication will aid in such dissemination.

The primary goal of the eight college science commissions is to bring undergraduate science instruction closer to the research frontiers; their aim is not only to update the content of undergraduate courses but also to bring to bear on the instructional process that spirit of inquiry which marks creative research.

Through their members and through panels, committees, national and regional conferences, and other activities, the commissions involve many imaginative scientists and science educators — often men well-known for their contributions to research — in the task of instructional improvement. The products of this involvement are spread by the commissions well beyond the relatively few institutions with high concentrations of intellectual resources. The example of the concern and activity of commission members and other highly regarded scientists brings to the task of instructional research and development an increased professional status and makes easier the involvement of more and, in particular, younger scientists.

Although most of the college science commissions are independent *ad hoc* organizations, all have strong ties (through *ex officio* representation, etc.) with other organizations within their professions. These connections have led to cooperative efforts and a sharing of responsibilities. This cooperative approach marks intercommission relations as well, particularly at the professional staff level. The commissions' executive officers meet periodically, publications are routinely exchanged, observers are invited to conferences, etc. Identification of a number of problems in science education that transcend discipline boundaries, as well as others that are common to more than one commission, led to the development of several intercommission study groups and panels. These groups permit a joint attack on various problem areas and/or help to minimize unnecessarily redundant activities on the part of the individual commissions.

Just as there are common features in past and present commission operations, the commissions have, in some respects, a common view of the future. All are aware of the necessarily long-term commitments needed to bring about change, of the long time which must pass between identification of a contribution to improve instruction and its wide implementation in academic science. Each of the commissions, therefore, is seeking to invent and bring about the establishment of mechanisms which will make continuing analysis, innovation and self-renewal integral parts of college-level instruction in science.

CONSULTANT SERVICE

Most of the commissions offer a consultant service. This service is made available to an institution desiring advice on course and curriculum improvement. Usually, the consultant spends one or two days on campus and submits a detailed report following the visit.

In all cases, the commissions offer some financial support toward covering the cost of the consultant visit; the precise amount of this support differs among the various commissions. Procedural details are available from each of the individual commissions.

COMMISSION ON EDUCATION IN AGRICULTURE AND NATURAL RESOURCES

The overall purpose of the Commission on Education in Agriculture and Natural Resources (CEANAR) is to stimulate the development of the best possible educational programs in the agricultural and natural resource disciplines and fields.

Specifically, the Commission has two major goals. The first is to foster improvement in the education of undergraduate and two-year students in the agricultural and natural resource fields by continually reviewing trends in education for undergraduate majors, stimulating discussion and evaluation of undergraduate courses and curricula and preparing recommendations for the development of academic programs in the future. The second is to assist in the development of the agricultural and natural resource aspects of general education.

THE COMMISSION

The Commission is part of the Division of Biology and Agriculture of the National Research Council, which is the operating agency for the National Academy of Sciences and the National Academy of Engineering.

The Commissi : was first formed in 1960 as the Committee on Educational Policy in Agriculture of the Agricultural Board, Division of Biology and Agriculture. CEANAR received its current name July 1, 1965.

Members of the Commission are nominated by the Agricultural Board to the Division of Biology and Agriculture and are formally approved for appointment by the President of the National Academy of Sciences. In keeping with Academy tradition, members are appointed for one year, with reappointment as appropriate.

While the Commission believes that both pre-college and graduate education in agriculture and natural resources deserves attention, its activities are limited primarily to the undergraduate and two-year technical programs. CEANAR's attention is directed primarily to course and curriculum content. It is also concerned with teaching materials, instructional technology, preservice and in-service faculty education and related subjects.

The Commission defines "agriculture and natural resources" to include all those fields concerned with the science and management of natural resources—primarily renewable resources—for man's benefit. These include fields that have traditionally been associated with intensive agricultural production, as well as those associated with the less intensive management of natural resources. It includes disciplines based in the biological, physical, social or engineering sciences and disciplines based on a combination of these sciences.

Disciplines and fields that come within the Commission's concern include agricultural chemistry, agricultural economics, agricultural engineering, agronomy (crop science and soil science), animal, dairy and poultry sciences, entomology, fisheries, biology, food sciences, forestry, horticulture, outdoor recreation, plant pathology, range management, rural sociology, wildlife biology and others. Home economics and veterinary medicine are specifically excluded from the Commission's considerations.

The Commission attempts to be catalytic, rather than prescriptive. It cannot enforce the recommendations resulting from its activities, nor is it an accrediting authority. Instead, CEANAR relies on the merit of ideas that result from its activities and encourages trial of those recommendations considered to have value.

To accomplish its objectives, the Commission does the following:

1. Identifies problem areas. It then appoints a panel or a committee to examine the issues and prepare a report on the topic in question.

2. Conducts conferences. Usually lasting two days and involving 40 to 50 persons, these working conferences focus on education in a specific field in agriculture and natural resources. The Commission then attempts to promote widespread consideration of the resulting recommendations.

3. Cosponsors symposia with scientific and professional societies. The purpose of these symposia is to promote discussion of major contemporary issues in education in agriculture and natural resources.

4. Arranges campus visits. These visits, made at the request of individual institutions, are designed to assist colleges in improving their teaching programs. The Visiting Specialist program provides for visits by individuals; costs are shared by the Commission and the host institution. The Visiting Panel program provides for visits by panels consisting of four to six members; all costs are borne by the host institution.

A number of persons participate in Commission activities, including educators and scientists from various types of academic institutions: four-year colleges and universities; public and private institutions; two-year colleges and predominantly Negro colleges. Other participants come from business, government agencies, trade associations, private foundations and scientific and professional societies.

The Commission ordinarily meets three or four times a year. It invites liaison representatives from the National Association of Colleges and Teachers of Agriculture and the National Association of State Universities and Land-Grant Colleges.

The day-to-day activities of the Commission are conducted by a small staff located in Washington, D. C. Funds for the support of the Commission's operation come to the National Academy of Sciences from the National Science Foundation.

COMMISSION ACTIVITIES

Major Commission activities to date have been concerned with the following areas:

Biological, physical, mathematical and social science content of curricula in agriculture and natural resources.

The status of course and curriculum content and closely related matters in several major agricultural and natural resource areas, including the animal sciences, the plant and soil sciences and renewable natural resources. The Panel

on Natural Resource Sciences has prepared a report that makes recommendations for the education of future scientists and managers in renewable natural resources.

The long-range objectives of vocational and technical education in agriculture and the preparation of teachers for this field.

Two-year technical programs in agriculture and natural resources.

The current status of materials available for use in animal science and plant science teaching and needs for the future.

The role of agriculture and natural resources in the education of all college students.

The Commission is aware of the long-term commitments needed to bring about changes in instruction and widespread implementation of these changes. The Commission therefore encourages institutions of higher education and other organizations to expand their efforts so that continuing analysis, innovation and self-renewal will be integral parts of instruction in agriculture and natural resources. CEANAR solicits suggestions and comments on its activities.

The Commission does not publish a newsletter. However, it does maintain a list of current publications and, from time to time, a description of current activities. The Commission maintains mailing lists of all deans, directors of resident instructions and department heads in agriculture and natural resources. Additional names will be placed on the mailing list upon request.

COMMISSION MEMBERS

Commission members are Russell E. Larson (Chairman), Dean, College of Agriculture, The Pennsylvania State University; Hal B. Barker, Dean, School of Agriculture and Forestry, Louisiana Polytechnic Institute; George A. Gries, Dean, Art & Sciences, Oklahoma State University; Carroll V. Hess, Dean, College of Agriculture, Kansas State University; A. R. Hiist, Professor, Department of Agronomy, Purdue University; Roy M. Kottman, Dean, College of Agriculture and Home Economics, Director, Cooperative Extension Service, The Ohio State University, and Director, Ohio Agricultural Research and Development Center; Darrel S. Metcalfe, Director of Resident Instruction, College of Agriculture, University of Arizona; Lloyd E. Partain, Assistant to the Administrator on Recreation, Soil Conservation Service, U. S. Department of Agriculture; and Richard H. Wellman, Vice President and General Manager, Process Chemicals Division, Union Carbide Corporation.

Address all correspondence to Commission on Education in Agriculture and Natural Resources, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, D. C. 20418.

PUBLICATIONS

(Copies are free unless otherwise indicated)

A-1. Teachers of agricultural economics. 1966. Proc., Symposium, Virginia Polytechnic Institute, August 17-20, J. of Farm Econ. 49(1):Part II. pp. 260-338.

A-2. Trends in undergraduate education in renewable natural resources. J. of Forestry. 1967:540-542.

A-3. Training for applied biology. 1967. Issues in the preparation of undergraduates for careers in the agricultural sciences. Am. Bio. Teach. 29(8):628-633.

A-4. The college commissions. 1967. Brief overview of the histories, organizational structures, modes of operation and goals of the eight college science commissions. July.

A-5. Undergraduate education in the biological sciences, agriculture and natural resources. 1967. Symposium cosponsored with CUEBS and Section Q (Education) of the American Association for the Advancement of Science (AAAS). Annual meeting of AAAS, December 27, 1966. Sci. Educ. 51(2):116-129.

A-6. Reports of the action committees of the CUEBS-CEANAR panel on preprofessional training in the agricultural sciences (animal sciences, bioengineering, food sciences, natural resources, plant and soil sciences and social sciences). October, 1967.

A-7. Proceedings of the conference on undergraduate education in dairy science. August 10-11, 1965. Lincoln, Nebraska. J. Dairy Sci. 1966:525-600.

A-8. College education for the fruit and vegetable processing industry. 1966. Food Tech. 20(3):48-52.

A-9. Feed manufacturers of the future. 1965. Based on a pilot study by the Committee on Educational Policy in Agriculture. Feed Age, 15(10):22.

A-10. The agricultural sciences. 1965. The various aspects and distinguishing characteristics of the agricultural sciences. BioScience 15(5):349-353.

A-11. Trends and issues in education in the agricultural sciences. 1965. BioScience 15(11):711-715.

A-12. Report of a seminar on opportunities in business for B.S. graduates of colleges of agriculture. 1964. Committee on Educational Policy in Agriculture. Mimeo Series Publication No. 3, June.

Publications available from the National Academy of Sciences, 2101 Constitution Avenue, Washington, D.C. 20418.

Pub. 1486. Undergraduate teaching in the animal sciences. Proc., Conference, May, 1966. (Price: $3.00).

Pub. 1495. Undergraduate education in the biological sciences for students in agriculture and natural resources. Proc., Conference, November 11-12, 1966. (Price: $3.00)

Pub. 1537. Undergraduate education in renewable natural resources: an assessment. 1967. Panel on Natural Resource Science. (Price: $2.00)

Publications available from other organizations

Threads of life. 1964. Illustrated brochure describing careers in agricultural science, with emphasis on biological science-oriented careers. Available in small quantities from colleges of agriculture; a list of these colleges is available from CEANAR. (Also for sale in quantities of 50 or more by the National Academy of Sciences. 10 cents each for 50-499; 5 cents each for 500 or more, plus small handling charge.)

Conference on undergraduate education in horticultural science. Proc., American Society for Horticultural Sciences. September, 1966. (Price: $2.00 from Society, P.O. Box 109, St. Joseph, Michigan 49085.)

NACTA and the Professional Societies. 1967. Proc., symposium, April 3. J. of NACTA, 11(2-3):22-59. (Price: $3.00 from Association, John A. Wright, Box 4028, Tech Station, Ruston, Louisiana 71270.)

COMMISSION ON UNDERGRADUATE EDUCATION IN THE BIOLOGICAL SCIENCES

The primary concern of the Commission on Undergraduate Education in the Biological Sciences (CUEBS) is to narrow the gap between what is known in biology and what is presented in the undergraduate classroom. In the best institutions, this gap (expressed in temporal terms) may be as little as two or three years; in the poorest, it may be as much as two or three decades. CUEBS' activities are for the most part aimed at the large group of institutions that fall between these two extremes. The overall technique is to stimulate discussion in order to uncover good ideas, to generate imaginative programs in biological education and to communicate these ideas and programs to the biological community as a whole.

CUEBS sees its role as being stimulative and provocative, but in no way prescriptive. It attempts to reflect the best thinking of the biological community and to direct this reflection to the widest possible audience. While the Commission is eager to provide all the help it can to individuals, departments, institutions and even broader groups, it recognizes that effective action depends upon careful translation and adaptation of ideas and recommendations at the local level.

THE COMMISSION AND ITS OPERATION

The Commission consists of approximately 24 biologists elected from a pool of nominations solicited from the various biological societies and from individual biologists; the presidents of the American Institute of Biological Sciences (AIBS) and the Federation of American Societies for Experimental Biology (FASEB) are ex *officio* members. Each elected commissioner serves three years, and terms are staggered so that eight commissioners are replaced each year. An executive office, located in Washington, D.C., manages the affairs of the Commission. The executive staff gathers information for Commission attention, coordinates the activities of CUEBS panels and committees and arranges for the widest possible discussion of the most stimulating and promising ideas.

Important problems relating to courses and curricula, to the human resources necessary for undergraduate instruction and the physical resources (both facilities and materials) in support of that instruction are singled out for special study by panels of interested and knowledgeable biologists. These groups exist for finite periods of time and are disbanded upon completion of their missions. This flexible structure permits CUEBS programs to evolve in an orderly fashion as problems become more sharply defined. At the same time, turnover in personnel provides the Commission a continual influx of new ideas and imaginative approaches.

Ordinarily, the discussions of a panel result in a position statement which then becomes the key factor in the action program that must follow. Often it is sufficient simply to arrange for publication of the statement and to make certain that its central ideas are expressed clearly and forcefully at symposia before national meetings or at the numerous local conferences which CUEBS sponsors. In other cases, the Commission may call for further work within the organization. It usually does this by establishing a special committee or by directing an individual, who may be an executive staff member or a paid consultant, to continue the project. For example, the panel which dealt with the preparation of secondary school biology teachers felt that additional work was needed in the teaching methods course in biology and recommended the formation of the Biomethods Committee. The Committee is currently finishing a detailed report. Similarly, the Panel on Instructional Materials and Methods decided that biologists might best be served in this area by a specially designed information system. Consequently, it recommended a feasibility study on a Center for Biological Education (CBE).

Whatever the means, Commission action always involves many more than 24 people and implementation necessarily becomes a willing response of individual teachers, each working to fit the best of many ideas to his unique situation. The bridge between CUEBS action and individual implementation is the Commission's external relations program, which takes the form of a newsletter, published reports, special publications, symposia, national, regional and local conferences, a consultant bureau*, and booths at national meetings.

SOME CUEBS PROGRAMS

The primary interest of the Commission has always been in the area of courses and curricula. Its most significant contribution to date has probably been a study of the concept of the core curriculum in biology. The report took the form of a detailed analysis of core curricula at four notably innovative institutions. There has been widespread discussion of the many ideas presented, so that consideration is now being given to updating and expanding this important study. Individual panels are also studying the problem of the laboratory and the possibilities of action in interface areas. Other groups are dealing with the role of biology in a liberal education and with the significant problem of incorporating more of the philosophical and historical implications of biology into all types and levels of courses.

Topics relating to human resources have been slower in coming to the top of the CUEBS agenda. In this area are included the early, rather limited study of secondary school teacher preparation, the biomethods project which resulted from it and a currently expanding program concerned with the preparation and continued training of biologists for college teaching. New programs are being initiated to consider the special problem of biology in the burgeoning two-year colleges and to study the administrative structure of biological departments in large universities.

CUEBS has been less concerned with physical resources than it has with curriculum problems and with the human resources available for biological education. However, some panels have been organized in this area and the products of their work are being distributed. A packet of materials on facilities for undergraduate instruction in biology has been distributed in large numbers.** A booklet exploring the

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* The Consultant Bureau is now being administered by the Office of Biological Education of the American Institute of Biological Sciences.

** This is part of the Facilities Consultant Service of the Consultant Bureau.

rationale and techniques of testing in biological sciences and offering some 1400 sample questions of widely varied types was printed in early 1968. A basic library list is also scheduled for early publication, and new thought is being given to CUEB's role in stimulating the production of instructional aids, particularly for the badly neglected interface areas.

FUTURE PLANS

It has been a consistent aim of the Commission to develop self-perpetuating programs or programs that can be assumed by another arm of the biological community. For example, the Consultant Bureau program is now being administered by the Office of Biological Education (OBE) of the American Institute of Biological Sciences (AIBS). Similarly, CUEBS' efforts to interest professional societies within the biological disciplines in developing comprehensive in-service training programs have been transferred to AIBS; action programs will become the responsibility of the individual societies.

By the very nature of its work, then, the Commission is limiting its own life-span. Born in a dynamic spirit which was largely foreign to undergraduate teaching at the time, CUEBS has sought a kind of success that will spell its end. If this success is realized, a more important result will have been the transfer of this very dynamism to the biological community as a whole.

There is no way to predict how long CUEBS will continue to operate or whether the pattern of its activities will change as its programs are transferred to other hands. Many ideas must still be sought and tried, particularly in improving the preparation and retraining of college biology teachers, in solving the problems of interfacing biology with other sciences and in defining and strengthening the role of biology in the two-year colleges. These topics will be given special attention in coming months. Others will probably take shape and assume their places. Certainly CUEBS can never exhaust the supply of problems, nor is it likely to lose contact with its sources of refreshing ideas; but the direct effect it can have will surely decline. As this happens, the role of CUEBS (or its successor organization, which perhaps will be more broadly based), will necessarily become one of continuing searching analysis and critical review of the state of undergraduate biology instruction throughout the nation. Action will then have become the responsibility of the biological community itself.

COMMISSIONERS

Commissioners are Henry Koffler (Chairman)*, Purdue University; Donald S. Farner (Vice-Chairman)*, University of Washington; Richard G. Beidleman, Colorado College; C. Ritchie Bell, University of North Carolina; Martin D. Brown, Fullerton Junior College; Thomas A. Cole, Wabash College; Vincent G. Dethier, Princeton University; Paul R. Ehrlich, Stanford University; Harold E. Finley, Howard University; Sidney W. Fox, University of Miami; Garrett J. Hardin, University of California, Santa Barbara; Adolph Hecht, Washington State University; James H. M. Henderson, Tuskegee Institute; Johns W. Hopkins III*, Washington University; Paul DeHart Hurd, Stanford University; Jerry J. Kollros*, University of Iowa; Henry L. Lucas, Jr., North Carolina State University; Van R. Potter, University of Wisconsin; David M. Prescott, University of Colorado; James T. Robinson, Columbia University; Helen Stafford, Reed College; Alfred S. Sussman, University of Michigan; Charles S. Thornton, Michigan State University; Arnold T. Towe, University of Washington School of Medicine; and Edward Zwilling, Brandeis University.

Ex officio members are William D. McElroy, President, AIBS; Arnold E. Schaefer, President, FASEB; Edward J. Kormondy*, Director, CUEBS and Dana L. Abell*, Associate Director, CUEBS.

PUBLICATIONS

The Commission feels that the successful achievement of its mission depends upon intensive and continuing efforts to communicate with biologists throughout the country. Accordingly, CUEBS publishes a bimonthly newsletter which is distributed free to approximately 12,000 biologists who have asked to be placed on the mailing list. Other publications, reports and reprints pertinent to biological education are distributed free as long as the supply lasts; a list of currently available publications follows:

Publication No. 7**. The Consultant Bureau. 1964-65. Revised, August, 1968 (for those interested in obtaining curriculum consultant service).

Publication No. 8. Report of the Midwestern Regional Conference on Courses and Curricula in the Biological Sciences. February, 1965.

Publication No. 9. Report of the Northeastern Regional Conference on Courses and Curricula in the Biological Sciences. April, 1965.

Publication No. 10. Report of the Southeastern Regional Conference on Courses and Curricula in the Biological Sciences. July, 1965.

Publication No. 12. Preparing the modern biology teacher: a position paper of the Panel on Preparation of Biology Teachers. 1965. BioScience 15(12): 769-772.

Goerdt, Edwin, S. M. 1966. Basic principles of administration. *In* C. Albert Koob (ed.) What is happening to Catholic education? National Catholic Education Association monograph.

Publication No. 15. Biology in a liberal education: report on the Stanford Colloquium. February, 1967.

Publication No. 16**. Guidelines for planning biological facilities. August, 1966 (materials including description of facilities consultant service).

Postlethwait, S. N. and N. Jean Enochs. 1967. Tachyplants—suited to instruction and research. Plant Sci. Bull. 13 (2): 1-5.

Smolker, R. E. 1967. Why biology? . . . a dialogue. Bios XXXVIII(3). 141-144. Reprinted from CUEBS News III(3): 1-3.

Publication No. 18. Content of core curricula in biology. Report of the Panel on Undergraduate Major Curricula. June, 1967.

Pecsok, Robert L. 1967. A new approach to the sophomore course: "bioranalytical" chemistry at UCLA. J. Chem. Educ. 44(6): 322.

Publication No. 19. Biology for the non-major. October, 1967.

Publication No. 20. Testing and evaluation in the biological sciences. November, 1967.

Nanney, D. L. 1968. Some issues in biology teaching. BioScience 18(2): 104-107.

Back copies of CUEBS News are available from February, 1965.

For available publications or further information, contact CUEBS, Suite 403, 1717 Massachusetts Avenue, N.W., Washington, D.C. 20036.

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* Executive Committee members.

** Now available from AIBS Office on Biological Education, Suite 403, 1717 Mass. Ave., N.W., Washington, D.C. 20036.

ADVISORY COUNCIL ON COLLEGE CHEMISTRY

The aim of the Advisory Council on College Chemistry (AC_3) is to provide leadership and stimulus for projects which will result in imaginative, up-to-date curricula, more effective tools for learning, improved textual materials, innovations in the experimental aspects of instruction, better training of faculty and the creation of intellectually stimulating interdisciplinary programs for non-science majors. The AC_3 is thus engaged in collecting and disseminating information about effective ways of improving chemistry instruction in two- and four-year colleges and universities. In this way, it endeavors to be a nerve center for stimulating chemistry curricular activity in undergraduate higher education.

The AC_3 does not propose to prescribe standardized programs or engage in massive curriculum developments. It provides recommendations and advice via conferences of specialists on controversial and timely issues, consultants to individual institutions and regional meetings of academic chemists. A periodic newsletter provides current information on activity in chemical education.

THE COUNCIL

The Advisory Council on College Chemistry is an independent group of academic chemists active in teaching and research. This Council emerged in 1962 from an *ad hoc* conference convened by the National Science Foundation (NSF) to consider how improvement and innovation in undergraduate chemistry curricula and instruction could be implemented in the most effective manner at the national level. Activities of the Council are supported by NSF grants.

The Council elects members for three-year terms. An attempt is made to maintain a reasonable balance of representation among the various types of academic institutions, sections of the country and fields of chemistry.

An Executive Office at Stanford University, the host institution since 1965, manages the routine operation and coordinates the activities of the Council. It also handles the publication and distribution of the AC_3 Newsletter, reports of conferences, resource papers and such other documents as the Council approves.

Standing committees and panels are the Council's media for action. They enlist the services of chemists both in and out of the Council in developing programs, holding conferences and implementing recommendations of the Council.

COMMITTEES AND PANELS

The Council currently has the following standing committees and panels. Additional *ad hoc* committees and panels are formed as needed.

Curriculum and Advanced Courses Committee
Freshman Chemistry Committee
Science for Non-Science Majors Committee
Teaching Aids Committee
Teacher Development Committee
Two-Year College Committee
Liberal Arts College Panel

The AC_3 Consultants Service consists of a panel of 24 qualified chemists who provide consulting services to colleges and universities upon request.

CONFERENCES

The following major conferences and workshops have been held by the Council:

Curriculum Experimentation; The Scope, Depth and Impact of Nontraditional Topics in General Chemistry; Problems of Chemistry Curricula in Junior College; Liberal Arts College; Multi-Disciplinary Courses in Science (with CCP); Topical Analysis of the Undergraduate Chemistry Curriculum; New Experiments for the First-Year College Chemistry Laboratory; Lecture Experiments; Alternatives and Supplements to the Introductory Laboratory; Unified Laboratories; Guidelines for Book List and Library Development; More Imaginative Uses of Teaching Aids; Guidelines for Innovative Uses of Films, T.V. Tapes, and Computer-Assisted Instruction in Chemistry; Instructional Facilities in Chemistry; Film Content and Technique Workshop; Chemistry for Non-Science Majors; Chemical Dynamics; Mathematics for Chemistry (with CUPM); Biochemistry; The Logistics of General Chemistry Teaching in Large Sections; The Use of Junior Staff; and Development of Teachers for Chemistry Programs in the Two-Year Colleges.

One- or two-day conferences involving all colleges in a region are held to appraise college chemistry teachers of important developments and techniques and to obtain feedback for program planning by AC_3. Regional Conferences have been held in Texas, Florida, Kentucky, Pennsylvania, Massachusetts, North Carolina, Idaho-Washington, Mississippi and Virginia. Planned for the coming year are Regional Conferences in Missouri, Ohio, South Carolina, New Jersey, California, Arkansas, Kansas, New York, Tennessee, Minnesota, Louisiana and Pennsylvania.

FUTURE GOALS

Three planned projects, in addition to the continuing programs of AC_3, can have a major impact on the nature of the subject matter of chemistry, the way in which instruction is carried out, and the character that chemical education will assume over the next decade.

Concept Development Units. These units, aimed at the chemistry teacher and centered around several chemistry topics, will contain newly-written material, references to existing material, new and existing laboratory and lecture experiments and demonstrations, transparencies, models, films, etc. Prototype units will be developed by the AC_3 and tested and evaluated by selected teachers and groups. The completed, tested units will then be made available to chem-

istry teachers throughout the country. These units will lead to a recognition of the effectiveness of such major efforts in the evolvement of subject matter and the development of teachers.

The Role and Nature of the Laboratory. A major research and development project is planned that, through cooperation between chemists and educational psychologists, will analyze the goals that can be set for the freshman chemistry laboratory, recognize the routes that can best be taken and mount model laboratory programs in several institutions to implement and test these routes. The effort will not be directed toward the development of any one ideal laboratory course, but rather toward the clarification of valid goals. The existence of these model laboratory programs will serve to guide and motivate other chemistry departments.

A Long-Range Study of Chemical Education. A broad survey, to be conducted by a small *ad hoc* panel of distinguished educators and scientists from both the academic and non-academic communities, will consider trends in subject matter, the increasing sophistication of content at every level of education, changing patterns of financing scientific education, training of chemistry teachers, needs for facilities, equipment and so forth. The panel will have three major responsibilities: (1) to assess the present situation in chemistry education with respect to adequacy of curriculum, facilities for undergraduate instruction and instructors to staff chemistry programs at a quality level; (2) to predict as accurately as possible the major alterations in chemical theory and application which will accrue in the next decade and (3) to specify the major programs and resources required to meet the educational needs in chemistry for 1980.

COUNCIL MEMBERS (as of June, 1968)

L. C. King (Chairman)*, Northwestern University; W. H. Eberhardt (Vice-Chairman)*, Georgia Institute of Technology; G. M. Barrow (Executive Director)*, AC_3; O. T. Benfey, Earlham College; H. A. Bent, University of Minnesota; F. T. Bonner, State University of New York at Stony Brook; R. C. Brasted, University of Minnesota; J. A. Campbell, Harvey Mudd College; W. B. Cook*, Colorado State University; C. F. Curtiss, University of Wisconsin; H. B. Gray, California Institute of Technology; D. N. Hume, Massachusetts Institute of Technology; E. T. Kaiser, University of Chicago; Michael Kasha, Florida State University; E. M. Larsen, University of Wisconsin; H. V. Malmstadt, University of Illinois; W. T. Mooney, Jr., El Camino College; L. O. Morgan, University of Texas; M. S. Newman, Ohio State University; Milton Orchin, University of Cincinnati; R. W. Parry, University of Michigan; A. L. Pratt, State University of New York at Albany; C. C. Price, University of Pennsylvania; R. W. Ramette, Carleton College; C. N. Reilley, University of North Carolina; D. A. Skoog, Stanford University; R. I. Walter, Haverford College; P. E. Yankwich*, University of Illinois; and J. A. Young, King's College.

* Executive Committee members.

Inquiries about AC_3 are welcome at either the Executive Office address or at the Advisory Council on College Chemistry, Department of Chemistry, Stanford University, Stanford, California 94305.

PUBLICATIONS AND FILMS

The Council publishes and distributes the *Newsletter*, reports of conferences, resource papers, occasional opinion papers, and other appropriate documents. Publications originate at the AC_3 Executive Office, 701 Welch Road, Suite 1124, Palo Alto, California 94304. Any person interested in chemical education may request that his name be placed on the mailing list (now exceeding 8000). Publications available are listed below.

Modern teaching aids for college chemistry. January, 1967.

Problems in two-year college chemistry (supplement). April, 1967.

The undergraduate mathematics program of students in chemistry. June, 1967.

Teacher-produced instructional films in chemistry. January, 1968.

Selected reports from AC_3 regional conferences, (in press).

Recommendations and novel ideas for instructional facilities in chemistry (in press).

Topics-aids (in press).

Review of instructional films in chemistry, (in press).

Guidelines and suggested title list for undergraduate chemistry libraries, revised edition (in press).

Resource Papers

These are authoritative, succinct papers on important chemical topics. Comprehensive bibliographies are featured. Resource papers are published in the Journal of Chemical Education, then reprinted and distributed via the AC_3 mailing list.

Cotton, F.A.—Ligand Field Theory, September, 1964.

Nash, L. K.—Elementary Chemical Thermodynamics, February, 1965.

Benson, S. W.—Bond Energies, September, 1965.

Bent, H. A.—Isoelectronic Systems, April, 1966.

Berry, R. S.—Atomic Orbitals, June, 1966.

Sturtevant, J. M.—Biochemistry in the Introductory Chemistry Course, April, 1967.

Anderson, R. C.—Combustion and Flame, May, 1967.

Model Laboratory Experiments

Thermochemical Investigations for a First-Year College Chemistry Course, January, 1965.

Modern Experiments for Introductory College Chemistry, September, 1965.

Newsletters

Newsletters are published bi-monthly. Back issues, beginning with November, 1966, are available.

Films

A film library is maintained for short- and long-term loan to chemistry departments. The list of available films, and instructions for borrowing, may be obtained from the Executive Office.

COMMISSION ON ENGINEERING EDUCATION*

The Commission on Engineering Education (CEE) was organized in 1961 and later incorporated as a nonprofit organization in the District of Columbia. The initial funding provided by the National Science Foundation made possible the establishment of a small office and exploratory meetings and conferences of distinguished engineers representing industry and education. These activities resulted in recommendations for specific programs and action. Most of the programs that materialized were separately financed and eventually turned over to other organizations for continuation or dissemination, with the Commission continuing only as an advisor, monitor or coordinator.

The Commission currently is operating as the Committee on Engineering Education of the National Academy of Engineering. It is dissolving its corporate structure and transferring its staff and assets to the National Academy of Engineering. When this has been accomplished, it will again be known as the Commission on Engineering Education. Members of the Board of Directors (Commissioners) are nominated and elected because they are recognized leaders in engineering education and industry and are not representative of any one discipline, institution or organization. The only exceptions are the two *ex-officio* members who are presidents of the American Society of Engineering Education and the Engineers' Council for Professional Development.

At the present time, there are 20 commissioners elected for three-year terms. One is appointed Executive Director and serves full time, administering the complete program in Washington, D. C.

The Commission functions through its administrative committees, advisory committees and consultants selected for specialized tasks. Administrative committees handle the routine operation of the Commission or, as in the case of the Executive Committee, act as special study groups to make policy recommendations to the commissioners on programs, studies or administration. The Executive Committee consists of the Chairman, the Vice-Chairman and three other members nominated by the Chairman and elected by the commissioners. The Executive Director works closely with this committee. (Membership on all administrative committees is taken from the commissioners.)

Advisory committees are established for each of the major studies and meet as activity warrants. A committee's members may or may not be commissioners; in any event, they are specialists in the matter to which the committee is devoting its attention. The Executive Director may also establish *ad hoc* committees to pursue specialized or short-range inquiries. These may ultimately become associated with one of the major studies, and membership is not necessarily restricted to commissioners.

COMMITTEES

The Commission's present and future program is reflected in the following descriptions of its advisory committees:

Computer Sciences in Electrical Engineering (Cosine). This committee is studying the role of computer-related subjects and the use of computers in teaching in electrical engineering departments. An interim report has been published, emphasizing the use of the computer as a tool for developing understanding of engineering concepts and pointing out how success depends on the wide availability of specialized computer languages tailored for student use.

Engineering Concepts Curriculum Project (ECCP). Although this project for secondary school students was originally developed by CEE, it is now administered by Polytechnic Institute of Brooklyn. An advisory committee is maintained to encourage development of the course for other educational levels, e.g., vocational, technical and liberal arts majors.

Information Processing Committee. This group has been instituted to oversee and coordinate the programs and studies of all CEE committees involved with any phase of the use of computers in education.

Committee on Computer Animation in Educational Films. The main objective of this *ad hoc* committee, whose membership represents various disciplines in addition to engineering, is the dissemination of information concerning this technique.

Teaching aids committee. This committee has been constituted to prepare a study on the feasibility of predicting the impact of educational technology upon society and the economy during the next five to ten years.

Motivation and Guidance Committee. Recognizing that there are numerous factors influencing the choice of a person's career, this committee feels that available opportunities for engineers or that the extent of the involvement of engineers in today's technology is not clearly understood by some faculty and vocational advisors. It seeks ways to establish better communication between industry and schools to rectify this deficiency.

Laboratory Development. CEE is sponsoring a conference to study the feasibility of the establishment of Regional Undergraduate Laboratory Development Centers. These have been proposed to provide an environment for the study and development of laboratory and experimentation materials and for their wide dissemination.

Bi-University Institutional Liaison for Development (BUILD). A conference of engineering educators will be held to discuss the strengths and weaknesses of the current pilot program designed to test the feasibility of combining the engineering resources of a large, well established university with those of a smaller, but rapidly developing university. The recommendations which are expected to evolve from this conference will be used as guidelines for future programs.

PUBLICATIONS

Other than its annual report, which has been published at the time of its annual meeting in late February or early March of each year, CEE does not maintain a regular publishing schedule. In the past, its publications have been issued upon the completion of a project, conference or study.

For further information contact CEE, 1501 New Hamp-

* Currently operating as the Committee on Engineering Education of the National Academy of Engineering.

shire Avenue, N.W., Washington, D.C. 20036. After October 1, 1968, address all inquiries to CEE, 2100 Pennsylvania Avenue, N.W., Washington, D.C. 20037.

COMMISSIONERS

Commissioners are Richard H. Bolt, Bolt Beranek and Newman Inc.; Gordon S. Brown, Dean, School of Engineering, Massachusetts Institute of Technology; Ali Bulent Cambel, Dean, College of Engineering, Wayne State University; Carl C. Chambers*, Vice-President for Engineering Affairs; University of Pennsylvania; Paul F. Chenea, Scientific Director, Research Laboratories, General Motors Corporation; Edward E. David, Jr., Executive Director, Communications Systems Research Division, Bell Telephone Laboratories, Donald N. Frey, Vice President, Product Development, Ford Motor Company; H. H. Goldstine, Consultant to Director of Research, International Business Machines Corporation: Newman A. Hall, Executive Director, Commission on Engineering Education; W. R. Hibbard, Jr., Owens-Corning Fiberglas Corporation; W. R. Marshall, Jr., Associate Dean, College of Engineering, Executive Director, Engineering Experiment Station, University of Wisconsin; Oscar T. Marzke, Vice President, Fundamental Research, United States Steel Corporation; N. M. Newark, Head, Department of Civil Engineering, University of Illinois; Max S. Peters, Dean, College of Engineering, University of Colorado; Andrew Schultz, Jr., Dean, College of Engineering, Cornell University; Chauncey Starr, Dean, College of Engineering, University of California, Los Angeles; Henry L. Thurman, Jr., Dean, Engineering College, Southern University; John G. Truxal, Provost, Polytechnic Institute of Brooklyn; A. W. Weber**, Vice President and Director, Facilities Division, Corning Glass Works, and John R. Whinnery, Department of Electrical Engineering and Computer Sciences, University of California, Berkeley.

* Currently President of American Society for Engineering Education.
** Currently president of Engineers' Council, Professional Development.

COMMISSION ON COLLEGE GEOGRAPHY

The major purpose of the Commission on College Geography (CCG) and its working panels is to work in various ways to improve geographic education at the college level and to make it responsive to the broader educational needs of colleges and universities throughout the nation. This necessitates continual investigation, development and distribution of materials concerning the overall role that modern geography should play in college curricula, including programs of study to which geography should contribute significantly. Specifically, the major objectives of the Commission and its working panels are as follows:

1. to develop approaches to integrate geographic education within the broader higher education context, including contracts with related disciplines and participation in interdisciplinary curriculum efforts;
2. to develop and publish (a) pertinent materials such as resource and technical papers in order to facilitate the incorporation of recent developments and recent research in undergraduate programs and (b) annotated lists of significant core materials to be distributed to departments and libraries;
3. to advise individuals and institutions on strengthening geography curricula;
4. to investigate ways and means to increase the effectiveness of undergraduate teaching, including the development of new instructional patterns and new techniques of presentation; and
5. to generate, discuss and develop new schemes to improve geographic education in undergraduate programs.

THE COMMISSION

The Commission, under the auspices of the Association of American Geographers, is composed of a group of recognized scholars drawn from the field of geography and certain related disciplines. Currently, the Commission consists of fourteen geographers and three persons in related fields of sociology, history and education. The Association of American Geographers appoints commission members to serve on a three-year basis, and terms of service are staggered so that some members are replaced each year. An Executive Office, currently located at Eastern Michigan University, Ypsilanti, Michigan, handles the day-to-day operations of the Commission and coordinates the work of the various panels. *Ex officio* members include the President, Vice-President, Executive Secretary, Secretary and Treasurer of the Association of American Geographers and the Chairman of the High School Geography Project (also under the auspices of the Association of American Geographers and supported by the National Science Foundation).

PANELS

The Commission is divided into working panels which normally consist of a Commission member as chairman and outside specialists. There are six major working panels of the Commission during the 1968-69 period:

1. A **Panel on Resource and Technical Papers** is concerned with the development of a series of resource papers which are designed for the student as well as the instructor. The topics of these documents are concerned with important subject matter which is not normally included in current introductory texts nor readily accessible in current literature. These papers translate recent research developments and conceptual ideas into documents which instructors of beginning courses can select to supplement existing text material. The panel also is concerned with the development of a series of technical papers, designed primarily to aid college and university instructors as they modify their existing courses and programs.
2. A **Panel on Computer Assisted Learning** is concerned, on a pilot and experimental scale, with implementing new subject matter materials. Units are being developed for introductory courses, and one or two will be investigative units—larger in scope—designed to encourage independent learning for students at the advanced level.
3. A **Panel on Junior Colleges** is investigating the problem of improving geography courses and programs in

two-year colleges. It is recognized that many students entering four-year colleges and universities will have had one or two years work at the junior college level. The problems of modern courses and curricula and physical facilities will be investigated by a panel of carefully selected persons. The panel will also consider the critical question of what should be included in the training of teachers of geography in two-year colleges. Panel members will work very closely with the Intercommission Panel on Science in the Two-Year College, as well as other professional organizations. It is hoped that a concrete program can be developed that will provide a framework for improving geography in two-year colleges.

4. A **Panel on Physical Geography** is concerned with the development of additional materials to implement physical geography courses. Although the Commission has developed materials in the area of physical geography, the need for continuing efforts is recognized. Physical geography is well established in college geography programs, and enrollments are very large. The panel is considering the development of a modern natural science course to meet the laboratory needs of general education in the physical sciences as well as considering the problem of developing an approach emphasizing the evaluation of the natural environment for human use and the effects of modern man and society on the physical environment. This panel will work closely with other organizations developing earth science and general geology materials. It is hoped that a concrete program to improve physical geography courses will be developed.
5. A **Panel on Revising the Basic Geographical Library** is currently engaged in revising and expanding CCG Publication No. 2, **A Basic Geographical Library: A Selected and Annotated Book List for American Colleges.** This document has been highly successful and there is a need for revision as the references listed cover only the period up to July, 1965. It is planned that the revised and expanded document will be ready for distribution in the summer of 1969.
6. A **Panel on the Development of Existing Course Outlines** is concerned with the teaching and evaluation of the course outlines developed under the auspices of the Commission at selected institutions. Reports concerning the evaluation of the field trials of the courses are available upon request.

COMMUNICATION

The Commission maintains communication with the academic community by publishing newsletters, presenting programs at the National and Divisional Meetings of the Association of American Geographers, the State Academies of Science and other professional organizations. Normally, the Commission and its working panels hold their meetings on college campuses and informally discuss the work of the Commission and problems in college geography with the staff of the host and neighboring institutions. The Commission participates in intercommission panels, and members of the Commission consult individuals, departments, institutions and college associations upon request. Requests for CCG materials have been received from most colleges and universities in the United States, as well as institutions in Australia, New Zealand and many countries in Europe, Asia, Africa and Latin America.

PROGRAMS

Summer Institutes

For the last several years, the Commission has sponsored jointly with selected institutions several Summer Institutes for College Teachers of Geography. These institutes have been supported by the National Science Foundation or the U.S. Office of Education. During the summer of 1968, a Summer Institute for Trainers of Teachers of Geography will be conducted at the University of Florida from June 15 to July 26. The program of the Institute will focus on the general settlement theme with particular emphasis on the study of agriculture and land use and urban-economic analysis. An evaluation of the existing courses developed under the auspices of the Commission will be included in the program. Several members of the Commission, as well as outside specialists, will comprise the faculty members and lecturers.

For the summer of 1969, a Summer Institute in Climatology for College Teachers is presently being organized (details of the program to be announced in the fall of 1968).

Approaches in Introductory Geography Courses

During the 1967-68 academic year, field trials of the introductory course outlines developed under the auspices of the Commission were conducted in selected institutions. The courses are "Introduction to Geographic Behavior," taught at the University of Cincinnati; "World Regional Geography," at the University of Michigan; and "Introduction to Geography: A Spatial Approach," at the University of Iowa. Cooperative evaluation of the field trials is being conducted with the Center for Instructional Research and Curriculum Evaluation, University of Illinois, during the 1967-68 academic year.

Development of New Course Outlines

The Commission has developed two additional course outlines which will be published and distributed during the summer of 1968. The course outline, "Climatology: An Interdisciplinary Approach," was developed by a panel under the auspices of the Commission and included representatives from the Commission on Undergraduate Education in the Biological Sciences and the Commission on Education in Agriculture and Natural Resources. This course outline emphasizes an interdisciplinary approach and is designed for general education programs as well as for students concentrating in science. A course outline in "Economic Geography" is in the process of development. Both of these course outlines will be taught during the 1968-69 academic year by the authors at selected universities and will be evaluated in a similar manner to the course outlines previously developed.

Computer-Assisted Learning Units

Four to six computer-assisted learning units will be developed at selected universities during the 1968-69 academic year. These units will be designed so that they may be used with or without computer facilities. The units will be developed in the general fields of physical geography and economic geography, both at the introductory and advanced level.

Resource and Technical Papers

During the 1968-69 academic year, six resource papers designed for student as well as instructor use will be de-

veloped. The topics will be chosen from the following: The Spatial Dynamics of Culture; The Diffusion of Ideas and Innovation; Migration Patterns and Processes; The Spatial Expression of Urban Growth; Social Processes in the City; The Political Organization of Space or the Rational Allocation of Space; The Perception of Environmental Quality; and New Perspectives on Landscape Evolution or New Perspectives on Physical Processes.

Three technical papers, designed primarily for instructors' use, will be developed during 1968-69. The topics of these papers will be selected from the following: Empirical Tests; Analog Models in Geography; Experimental Methods; and Computer Cartography.

Junior Colleges

Several meetings are planned during 1968-69 to analyze the status and problems of geography in the two-year colleges. Geographers from four-year and two-year colleges will investigate and recommend concrete programs that will provide a structure to improve geography in the curriculum of the two-year colleges.

Physical Geography

A panel of selected geographers and scientists in related fields will have several meetings during the coming year to analyze the status of physical geography in the four-year and two-year colleges and to recommend the development of specific materials to improve introductory physical geography courses. The role of physical geography in the general field of earth science will be investigated, as well as the possibilities of developing materials and course outlines emphasizing the environmental perception approach.

COMMISSION MEMBERS (As of July, 1968)*

Commission members are Edward B. Espenshade, Jr. (Chairman), Northwestern University; John F. Lounsbury (Project Director), Eastern Michigan University; Richard D. Hecock (Assistant Project Director), Eastern Michigan University; James R. Anderson, University of Florida; Vernon Carstensen, University of Washington; Saul B. Cohen, Clark University; Norton S. Ginsburg, University of Chicago; William A. Hance, Columbia University; John Fraser Hart, University of Minnesota; J. Thomas Hastings, University of Illinois; Robert E. Huke, Dartmouth College; George M. Kish, University of Michigan; Marion J. Levy, Princeton University; J. Ross Mackay, University of British Columbia; Edward T. Price, University of Oregon; Robert H. T. Smith, University of Wisconsin, Madison; and Edward J. Taaffe, The Ohio State University.

Ex officio members are Clyde F. Kohn, President, Association of American Geographers, University of Iowa; John R. Borchert, Vice President, Association of American Geographers, University of Minnesota; John P. Angelli, Secretary, Association of American Geographers, University of Kansas; J. Warren Nystrom, Executive Secretary, Association of American Geographers, Washington, D. C.; Alvin A. Munn, Treasurer, Association of American Geographers, Washington, D. C.; and Gilbert F. White, Chairman, Steering Committee, High School Geography Project, University of Chicago.

* In August, 1968, five new commission members will be appointed to replace current members whose terms of office expire. Also in August, there will be some change in ex officio membership, as new officers at that Association of American Geographers begin their terms of office at that time.

PUBLICATIONS

General or Regular Series

1. Geography in undergraduate liberal education. 1965.
2. A basic geographical library: a selected and annotated book list for American colleges. 1966*.
3. Geographic manpower: a report on manpower in American geography. 1966.
4. New approaches in introductory college geography courses. 1967.
5. Introductory geography: viewpoints and themes. 1967.
6. Undergraduate major programs in American geography. 1968.
7. Climatology: an interdisciplinary approach. 1968.
8. A systems analytic approach to economic geography. 1968**.

Resource Papers

1. Theories of urban location. 1968.
2. Air pollution. 1968.

Technical Papers

1. Field training in geography. 1968.
2. Remote sensing. 1968**.

For further information, write Commission on College Geography, Eastern Michigan University, Ypsilanti, Michigan 48197.

* To be revised and expanded in 1969.
** To be available in late 1968.

COUNCIL ON EDUCATION IN THE GEOLOGICAL SCIENCES

The Council on Education in the Geological Sciences (CEGS), an NSF-supported educational project of the American Geological Institute (AGI), was established in 1964. Specific mandates are to (1) maintain continuous inquiry into the state of geological education at the undergraduate level and to provide detailed recommendations and guidelines in specific areas, (2) encourage and assist the development of new materials and activities, (3) review and evaluate projected programs in geological education, (4) provide for communication and consultation on education improvement in the geological sciences, and (5) involve the widest spectrum of the teaching profession in various projects.

THE COUNCIL

A ten-man council guides CEGS policy. Each member of the Council is appointed for a three-year term by the President of AGI. An elected Executive Committee of three works closely with staff between Council meetings. The Council includes representatives from geoscience departments of large and small, public and private educational institutions and from government and industrial firms that employ geologists and geophysicists.

Each CEGS program is guided by a panel of five persons; panel chairmen are members of the Council. Panels are responsible for developing program activities. Special assistance to CEGS is provided by consultants and contractors, most of whom are college geology teachers. CEGS staff, located at AGI headquarters, implements and coordinates development of programs that are carried out by chosen panelists and paid consultants.

PROGRAMS AND FUTURE ACTIVITIES

The **Analysis of Skills Program** is a mechanism through which CEGS can offer realistic advice to departments on updating their offerings to students. The program will identify information and abilities geologists use and will need in the future. That information will be analyzed in terms of the undergraduate education necessary to meet the basic needs of future graduating geology majors. Employment trends, new geological enterprises and technological changes will be integrated in this analysis.

The results from the Analysis of Skills Program will provide some essential guidelines for the **Curriculum Program,** which is designed to stimulate curriculum improvement. Until results are available from the Analysis of Skills Program, this program will focus on problems related to curricula. CEGS also is organizing a consulting service to provide geology departments and institutional administrations with a means for improvement of their programs.

Through the **Instructional Materials Program,** materials that permit effective use of techniques of allied sciences and problem-oriented approaches are being developed. Each set is developed under CEGS guidance and is classroom-tested prior to publication. Problems generally are chosen from fundamentals when presented to students at the introductory course level, but are open-ended for use at higher levels. Although the products are useful entities in themselves, the primary goal is to stimulate geology teachers to develop their own new approaches. CEGS plans to produce more than a dozen instructional modules, each of different topical treatment and composition.

To assist the teacher and the student, the **Introductory Course Program** is exploring experimental course designs. Position and state-of-the-art papers will be prepared about various instructional aids and media. Junior colleges with physical science programs are to be considered in some of these reports.

Rapid changes in geological concept and technology dictate that teachers spend a certain amount of time in keeping current. To assist the teacher, the **Professional Development Program** is organizing a series of offerings that are organized into self-study and formal study programs. Selected topics are treated in depth through bibliographies, short reviews, short courses, symposia and advanced seminars and institutes.

CEGS maintains liaison with other organizations and persons involved in geological education; for example, CEGS and its secondary school counterpart Earth Science Curriculum Project (ESCP) have a common bond in the problem of teacher preparation, and a computer simulation program for presentation of geological problems to the freshman student is linked to the Instructional Materials Program.

COUNCIL MEMBERS

Council members are Ted F. Andrews, Educational Research Council of America; Brewster Baldwin, Middlebury College; John E. Bowen, Cuesta Junior College; Milton B. Dobrin, United Geophysical Corporation; Robert H. Dott, Jr., University of Wisconsin; John W. Harbaugh, Stanford University; William R. Muehlberger (Chairman), University of Texas at Austin; George R. Rapp, Jr., University of Minnesota; Robert G. Reeves, U.S. Geological Survey; and, Robert J. Weimer, Colorado School of Mines. *Ex officio members* are: Lawrence L. Sloss (President, AGI); John L. Snyder (Director of Education, AGI).

For further information, write CEGS, 1444 N Street, N.W., Washington, D.C. 20005.

PUBLICATIONS (Single copies free.)

Contribution Series in Journal of Geological Education

1. GeoStudy Mathematical Panel. Mathematics recommendations for undergraduate geology students.
2. LaPorte, Leo F. Evolution as a geologic concept: an introductory geology course.
3. Allen, John Elliot. Courses in geology for advanced non-majors.
4. Albritton, Claude and others. Introductory geology in the framework of liberal arts studies.
5. Shea, James H. and others. Earth science teacher preparation.
6. Hayward, O. T. Geology as an interdisciplinary experimental science.
7. Muehlberger, William R. Keeping abreast of the wave.
8. Proctor, Cleo V., Jr. Paperback books for earth science teachers. Introduction by O. T. Hayward.

Review articles published in Journal of Geological Education

1. Wyllie, Peter J. Experimental petrology: an indoor approach to an outdoor subject.
2. Schumm, S. A. The development and evolution of hillslopes.
3. Simmons, Gene. Heat flow in the earth.
4. Short, Nicholas M. Shock processes in geology.
5. Hadley, Richard F. Pediments and pediment-forming processes.
6. Ritter, Dale F. Rates of denudation.
7. Chave, Keith E. Recent carbonate sediments—an unconventional view.
8. Simmons, Gene. High pressure geophysics—equipment and results.

CEGS Programs Publication Series

1. Rapp, G. R., Jr. and others. Problems in physical geology.

Newsletter. Six times a year.

COMMITTEE ON THE UNDERGRADUATE PROGRAM IN MATHEMATICS

The Committee on the Undergraduate Program in Mathematics (CUPM) is a committee of the Mathematical Association of America charged with making recommendations for the improvement of college and university mathematics curricula at all levels and in all educational areas.

CUPM was formed in 1959 as a successor to the Committee on the Undergraduate Program originally appointed in January, 1953. Since 1960 the Committee's activities have been supported by the National Science Foundation.

PANELS AND SUBCOMMITTEES

Until 1965, CUPM's activities were concentrated in the work of four Panels, two *ad hoc* Subcommittees, the CUPM Consultants Bureau and the Advisory Group on Communications (AGC). The AGC published the CUPM **Basic Library List** in 1965. The Consultants Bureau was organized in 1961 to send mathematicians on visits to colleges in response to requests either for advice or for an opportunity to discuss local problems with experts from other schools. The names of the

Panels and Subcommittees indicate the scope of their curricular interests: Panel on Teacher Training, Panel on Pregraduate Training, Panel on Mathematics for the Physical Sciences and Engineering, Panel on Mathematics for the Biological, Management and Social Sciences, *ad hoc* Subcommittee on a General Curriculum in Mathematics and *ad hoc* Subcommittee on Applied Mathematics.

In 1966 there was a major reorganization of CUPM's activities, reflecting the fact that many of the tasks originally undertaken had been completed and new problems had arisen. Of the Panels and Subcommittees listed above, only the Panel on Teacher Training continues on an active basis.

The Panel on Teacher Training is concerned with the problems of teacher preparation at the elementary and secondary levels. Its report, **Recommendations for the Training of Teacher of Mathematics,** has had a significant effect on raising standards of teacher preparation across the country. Current activities of the panel include review and revision of these recommendations for the needs of the next decades.

The two *ad hoc* Subcommittees published curricular recommendations (**A General Curriculum in Mathematics for Colleges** and **A Curriculum in Applied Mathematics**) and were discharged. The Pregraduate Panel published two reports (**Pregraduate Preparation of Research Mathematicians** and **Preparation for Graduate Study in Mathematics**) and asked to be disbanded, having accomplished its original charge. The other two Panels, having produced over half a dozen monographs between them, requested reorganization on the grounds that most of their task was done and that remaining work could better be handled by groups organized specifically for the purpose. Accordingly, in the fall of 1966, CUPM created the Advisory Group on the Applications of Mathematics to oversee the whole area of applications. In addition to this Advisory Group, three new Panels were formed, devoted to applications: Panel on Mathematics for the Life Sciences, Panel on Statistics and Panel on Computing.

CUPM has always been deeply concerned with the role played by mathematics in other disciplines; these changes represent a reorganization of CUPM's activities in this area, based on a reassessment of the relative urgency of the curricular needs among the many fields where mathematics has been found useful.

But there were other changes in CUPM activities much more fundamental than the reorganization of its work concerned with applications. Two new Panels were created to consider the problems of junior colleges and of college teaching in general: Panel on College Teacher Preparation and Panel on Mathematics in Two-Year Colleges.

The deliberations of these two Panels and of *ad hoc* subcommittees that have grown out of them have led, or should soon lead, to reports on these subjects: Qualifications of a College Faculty in Mathematics, A Beginning Graduate Program in Mathematics, Current Practices in Training Teaching Assistants in Mathematics, A University Parallel Curriculum in Mathematics for Two-Year Colleges, Qualifications of a Two-Year College Faculty and a Two-Year College Basic Library List.

These new CUPM activities reflect some phenomenal changes now taking place in undergraduate education in this country. The growth rate for the number of undergraduate majors in mathematics is currently more than three times the growth rate of the whole undergraduate population. Thus the already very serious shortage of qualified teachers of college mathematics courses is rapidly becoming extremely critical. The growth rate of junior college enrollments is nearly twice that for higher education as a whole; the problems of staff, curricula and programs in this area are as critical as any problems faced today. A major part of CUPM's attention is devoted to problems arising from these very profound changes in undergraduate education.

CONFERENCES

CUPM makes use of the medium of conferences, focused on its reports, to provoke discussion at the local level of the issues they raise, as well as to obtain local reactions for guidance in its work.

COMMITTEE MEMBERS

Committee members are Ralph P. Boas (Chairman), Northwestern University; Richard D. Anderson, Louisiana State University; Dorothy Bernstein, Goucher College; Leon W. Cohen, University of Maryland; M. D. Donsker, New York University; Daniel T. Finkbeiner, Kenyon College; Dwight B. Goodner, Florida State University; Franklin A. Graybill, Colorado State University; H. J. Greenberg, University of Denver; I. N. Herstein, University of Chicago; Meyer Jerison, Purdue University; Lowell J. Paige, University of California, Los Angeles; Alex Rosenberg, Cornell University; Edwin H. Spanier, University of California, Berkeley; Robert M. Thrall, University of Michigan; Andre L. Yandl, Seattle University; Gail Young, Tulane University; and Leo Zippin, City University of New York.

Ex officio members are E. G. Begle, Director, School Mathematics Study Group; and Edwin E. Moise, President, Mathematical Association of America.

Executive officers are Malcolm W. Pownall, Executive Director; George Pedrick, Associate Director; and R. F. Jolly, Staff Mathematician.

PUBLICATIONS

Monographs

Hull, T. E. 1966. The numerical integration of ordinary differential equations.

Panel on Teacher Training

Recommendations for the training of teachers of mathematics. Revised 1966.

Course guides for the training of teachers of elementary school mathematics. Revised 1968.

Course guides for the training of teachers of junior high and high school mathematics. 1961.

Teacher training supplement to the basic library list. 1965.

A summary of the forty-one Level I conferences. 1967.

Panel on Pregraduate Training

Pregraduate preparation of research mathematicians. 1963, 1965.

Preparation for graduate study in mathematics. 1965.

Panel on Mathematics for the Physical Sciences and Engineering

Recommendations on the undergraduate mathematics program for engineers and physicists. Revised 1967.

Recommendations on the undergraduate mathematics program for work in computing. 1964.

Mathematical engineering: a five year program. 1967.

Panel on Mathematics for the Biological, Management and Social Sciences

Tentative recommendations for the undergraduate mathematics program for students in the biological, management and social sciences. 1964.

Advisory Group on Communications

CUPM basic library list. 1965.

Ad Hoc Subcommittee on a General Curriculum in Mathematics
A general curriculum in mathematics for colleges. 1965.
Ad Hoc Subcommittee on Applied Mathematics
A curriculum in applied mathematics. 1966.
Ad Hoc Subcommittee on the Qualifications of College Teachers of Mathematics
Qualifications for a college faculty in mathematics. 1967.

Consultants Bureau
Consultants bureau brochure (issued annually).

All publications listed are distributed free of charge by CUPM Central Office, P.O. Box 1024, Berkeley, California 94701.

COMMISSION ON COLLEGE PHYSICS

The Commission on College Physics (CCP) is charged with the coordination of a national effort to improve physics instruction at the undergraduate level. Its primary functions are (1) the analysis of the problems and an appraisal of the strengths and weaknesses of college physics teaching, (2) the stimulation of programs to strengthen physics instruction and (3) the communication of the results of the analysis, appraisal and program development to the teaching community.

THE COMMISSION

The Commission consists of seventeen physicists—six elected by the academic physics community, eight selected by the Commission itself, and three ex *officio* Commissioners from the American Association of Physics Teachers and American Institute of Physics. There are four full-time professional staff members with offices and supporting staff in the Department of Physics and Astronomy, University of Maryland.

The CCP has quarterly Commission meetings to provide review and suggestions for action. Panels with members from the CCP and the physics community at large bear responsibility for specific areas; conferences and pilot programs involve and inform the profession, provide examples and lead to "spin-off" projects.

The present CCP panels are (1) Panel on the Preparation of Physics Teachers, and (2) Panel on Physics in the Two-Year Colleges. *Ad hoc* panels are formed when areas requiring continuing attention are identified.

PROGRAMS

The CCP activities fall roughly into five program areas. Each of these titles should be prefaced by "The Stimulation of . . .," as the Commission itself carries out these programs through involvement of the profession at large. These areas are:

(1) Curricular analysis and recommendations;
(2) Experimentation with new course content and format;
(3) New instructional materials and techniques;
(4) Educational research and evaluation; and
(5) General cooperative programs.

Within these areas the more important CCP activities are summarized below.

I. Curricular Analysis and Recommendations
   A. Major curriculum: CCP-sponsored meetings of university and college physicists for analysis and recommendations. (See item 1-4 on publications list)
   B. High school teacher preparation: CCP Panel on the Preparation of Physics Teachers studying problems of curricular revision, student recruitment and encouraging the design of pilot programs. (Item 1-3 on publication list)

II. Course Development
   A. Staff charged with collection and dissemination of information on course development.
   B. CCP stimulating experimentation with subject matter and course structures.

III. New Instructional Materials and Techniques
   A. Exploration of potentials of new technology
      (1) The computer: the CCP has several programs of experimentation with the computer in the tutorial form, as an aid to realistic problem solving and simulation and as a film making device. (See item I-5 on publication list for an overall summary and item I-1 for a description of computer-assisted film making.)
      (2) Single concept films: see item I-1 and I-2 for report on national conference on use and production of films for physics teaching. CCP is supporting pilot model production of experimental films and is working to establish a distribution mechanism for non-commercial films.
      (3) Programmed instruction: the CCP has published one example of an advanced topic in programmed form (Wigner-Eckart Theorem by B. A. Green, Jr.) and is conducting a workshop in programmed instruction during summer 1968 to produce more examples.
   B. Exploration of new approaches to material creation
      (1) New films: we are encouraging physicist-film maker collaboration to experiment in the visual media.
      (2) New instructional techniques: in several areas the CCP is involving physicists with experts in educational research, with writers, designers, etc., in the hopes of synthesizing new instruction techniques, content and formats.
   C. Resource booklets
      (1) A workshop conference in the summer of 1968 will develop laboratory experiments and pedagogical guidelines for the introductory laboratory.
      (2) A workshop during the summer of 1968 will develop "Lecture Packets" for junior college physics courses.
   D. Other resource materials
      (1) Resource letters, initiated by CCP, spun off to AAPT
      (2) Momentum Books, published under CCP sponsorship by D. Van Nostrand & Co.

IV. Educational Research and Evaluation
   A. The CCP has established consultant arrangements with professionals in pertinent fields to provide advice and assistance for evaluation of projects in which the CCP has an interest.
   B. The CCP has as a long-range goal the encouraging of educational research projects within the context of physics instruction.

V. General Cooperative Programs
   A. Promotion for development of university and college regional associations for mutual strengthening of physics programs.
   B. Encouragement of regional centers for pedagogical research and development.
   C. General consulting service to aid colleges interested in revising physics offerings.

COMMUNICATION

CCP publishes five newsletters per year for a circulation of approximately 20,000. Reports of conferences with national participation are also published and sent to physicists, along with a biennial progress report.

"Grass roots" regional meetings are held to bring work to the attention of physicists and to keep them abreast of new developments. The Commission is represented at AAPT sectional meetings, regional APS meetings, etc.

FUTURE GOALS

The general philosophy of the Commission on College Physics will continue to underlie its goals and actions. As innovation and revision occur, however, and as the academic system continues to change, the CCP programs will change also. The present critical shortage of teachers of high school physics demands our immediate attention; the rapid rise of the junior college system signals an area of future concern.

The long-range goal is to bring into existence in the academic physics community an attitude receptive to continual innovation and renewal, and the institutions to facilitate it. The spectrum of Commission activities and CCP communication with the profession contribute to the former. The programs to establish regional associations and instructional research and development centers give us trial models of the latter.

COMMISSION MEMBERS

Commission members are Fay Ajzenberg-Selove, Haverford College; H. Richard Crane, University of Michigan (Vice Chairman); Kenneth W. Ford, University of California, Irvine; Anthony P. French, Massachusetts Institute of Technology; Morton Hamermesh, University of Minnesota; E. Leonard Jossem, The Ohio State University (Chairman); Edward D. Lambe, State University of New York, Stony Brook (Secretary); Richard T. Mara, Gettysburg College; James W. Mayo, Morehouse College; Alan M. Portis, University of California, Berkeley; Allan M. Sachs, Columbia University; Robert L. Sells, State University College of New York, Geneseo; and Elizabeth A. Wood, Bell Telephone Laboratories (retired).

Ex officio members are Stanley S. Ballard (President, AAPT), University of Florida; Ronald Geballe (President-elect, AAPT), University of Washington; and H. William Koch, Director, American Institute of Physics.

PUBLICATIONS

I. Reports

1. Production and use of single concept films in physics teaching. 1967. Report of the Conference on Single Concept Films in College Physics Teaching, Rensselaer Polytechnic Institute, 15-17 December 1966.

   An illustrated report on how films can be used to enhance the presentation of physical concepts or phenomena; it also serves as a manual of how-to-do-it and equipment information for prospective makers and users of film.

2. Short films for physics teaching. 1967. A comprehensive catalog of about 800 short films listing both 16mm and 8mm, with information on producers, distributors, etc.

3. Preparing high school physics teachers. 1968. Report of the Panel on the Preparation of Physics Teachers at the Workshop at the University of Minnesota, 5-9 June 1967.

   A review of the shortage of physics teachers with detailed recommendations on how a physics department might enter the field of teacher preparation with greatest effectiveness.

4. Curricula for undergraduate majors in physics. 1963. Reprinted 1967. Report of the Second Ann Arbor Conference on Curricula for Undergraduate Majors in Physics. 12-14 November 1962.

   A summary of three national conferences on physics curricula with the conference recommendations.

5. The computer in physics instruction. 1966. (To be revised 1968) Report of the Conference on the Uses of the Computer in Undergraduate Physics Instruction, University of California, Irvine, 4-6 November 1965.

   A detailed handbook of current computer technology for physics teaching—particularly what's available and useful in equipment, programs, and systems.

6. Instruction by design. 1966. Report of the Working Conference on New Instructional Materials in Physics, University of Washington, 20 June-21 August 1965.

   An illustrated report of a gathering of physicists, film makers and designers and the teaching materials — monographs, films, laboratory apparatus and computer programs—they developed there.

7. Physics for nonscience majors. 1965. Proc., Boulder Conference on Physics for Nonscience Majors, University of Colorado, 20-29 July 1964.

   A collection of expanded course outlines for and working papers on physical science courses, including laboratory experiments, homework problems and a bibliography.

II. Reprints (Journal Issues)

1. Progress report of the CCP (through June 1964).
2. Progress report of the CCP (through June 1966).

III. Reprints (Articles)

1. Fowler, John M. The interdisciplinary curriculum.
2. Fowler, John M. Commission on college physics.
3. Roll, Peter G. Introductory physics textbooks.
4. Report of a Conference on Physical Science Courses.
5. Strassenburg, A. A. Study programs for college physics teachers—an analysis of supply and demand.
6. Morrison, Philip. Less may be more.
7. Portis, A. M. The Berkeley physics laboratory.
8. Crane, H. R. Remedial programs.
9. King, J. C. Experiences with solder glass and students.
10. Homemade high vacuum techniques.
11. Jossem, E. L. Undergraduate curricula in physics: a report of the Princeton Conference on Curriculum S.
12. Michels, W. C. Freedom, responsibility and barriers.
13. Michels, W. C. Graduate record examination advanced physics test as a predicator of performance.
14. Jossem, E. L. Dialogues concerning some old sciences—The Seattle Interdisciplinary Conference.
15. Cralle, R. K. Language for making movies on a computer.
16. The "new physics" and the Minnesota Conference on New Materials for Introductory Physics Courses for Science and Engineering Majors.
17. Strassenburg, A. A. Physicists and teachers.
18. Michels, W. C. Momentum books.
19. Wood, Elizabeth. PNSI Project at RPI.
20. Dalton, Robert. Sealing with solder glass.
21. Orsula, Jan. Power supply for penning vacuum gauge.
22. Brown, Sanborn. Outline of a course in plasma physics.

IV. Newsletters No. 1-16 (available from the Commission office).

For further information, write the Commission on College Physics, Department of Physics and Astronomy, University of Maryland, 4321 Hartwick Road, College Park, Maryland 20740.

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July, 1968