

## CONFERENCES IN SUPPORT OF SCIENCE

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One of the significant programs undertaken by the Foundation has been the sponsorship of conferences and symposia to review current scientific advances in special areas of science. The conferences have drawn together leading scientists from this country and abroad to exchange information on latest research findings, to develop improvements in theory and procedures, and to lay plans for future research. As a rule the subjects discussed are at the frontiers of knowledge where ideas are in a state of flux and the participants attempt to resolve theoretical differences and explain the known facts.

During the year ending June 30, 1953, a total of eight conferences were sponsored by the National Science Foundation, jointly with universities, scientific societies and other Government agencies. (See table II.)

Brief notes on these conferences are given below. In general, the request for support of conferences originates with the scientists doing active research in the field under review. Proceedings and papers are usually published at the conclusion of the conference so that the value extends well beyond that to the actual participants.

In addition to the listed conferences devoted to discussion of special areas of science, numerous other conferences, symposia and meetings were sponsored by the Foundation for other purposes. These included four summer institutes attended by college science teachers (p. 53); a Conference on Physics Research in Colleges (p. 37); a Symposium on Education in Physiological Science, sponsored by the Foundation-financed Survey of Physiological Science and held in conjunction with the St. Louis meeting of the American Association for the Advancement of Science; a Workshop on the Production and Use of Technical Reports, jointly sponsored by the Foundation, the Catholic University of America, the American Chemical Society, American Documentation Institute and Special Libraries Association; and a number of *ad hoc* advisory conferences held in Washington to which were invited specialists in various fields of scientific research and education.

TABLE II.—*Conferences Supported by the National Science Foundation in Year Ending June 30, 1953*

<i>Subject</i>	<i>Sponsoring institution</i>	<i>Chairman</i>	<i>Date</i>
Astrophysics	University of Michigan	W. Baade	June 29–July 24, 1952.
Photosynthesis	Committee on Photobiology of National Research Council; Office of Naval Research; National Institutes of Health; Atomic Energy Commission.	S. Hendricks	Oct. 29–Nov. 1, 1952.
Abundance of Elements	University of Chicago	H. C. Urey	Nov. 6–8, 1952.
High Energy Physics	University of Rochester, certain industrial firms of Rochester.	R. E. Marshak	Dec. 18–20, 1952.
Fiber Bundles and Differential Geometry.	Cornell University	R. J. Walker	May 3–7, 1953.
Methods of Determination of Steroids in Blood and Urine.	Worcester Foundation for Experimental Biology.	G. Pincus	May 31–June 4, 1953.
Specificity in Development	Society for the Study of Development and Growth; National Cancer Institute; American Cancer Society; University of New Hampshire.	E. J. Boell	June 19–22, 1953.
Lie Groups and Lie Algebras	American Mathematical Society, Colby College.	E. G. Begle	June 20–July 31, 1953.

## ASTROPHYSICS

The 4-week Symposium on Astrophysics conducted at the University of Michigan consisted of lectures and discussions on subjects of current interest in the field, including the composition and structure of galaxies; the origin, evolution, and age of the stars and galaxies; and the problem of turbulence as it applies to stars and nebulae. Discussion leaders included W. Baade, G. K. Batchelor, G. Gamov, G. Keller, G. P. Kuiper, D. Osterbrock, E. E. Salpeter, and A. Sandage.

## PHOTOSYNTHESIS

Sunlight as a continuing source of energy far surpasses coal and oil and even atomic fuel. On an average day the sunlight falling on the United States equals in energy some 40 tons of coal for each man, woman, and child in the country. Plants and plant life have been our principal means for tapping this abundant energy source, although wind and waterpower are converted forms of solar energy independent of the plant cycle.

The Conference on Photosynthesis at Gatlinburg was of primary interest to biologists working on the problem of how plants convert the energy of sunlight into food and fuel. The Conference was administered by the Committee on Photobiology of the National Research Council with support of the Foundation, the Office of Naval Research, the National Institutes of Health, and the Atomic Energy Commission.

Sunlight consists of a countless number of small energy-carrying packets, called photons. Altogether the energy thus transported is enormous. The quantum of energy represented by the individual photon, however, is almost incredibly small. This gives rise to one of the major theoretical problems in the study of photosynthesis. What is the nature of the chemical reaction that can be activated by the energy in a single photon? Apparently the process takes place in steps, the energy for each step being supplied quantum by quantum from the absorbed photons of light. Although some of the intermediate products have been identified, scientists have not determined conclusively the number of steps and the number of quanta required in the total reaction. Solution of this problem will be an important key to the commercial utilization of photosynthesis. It was the major topic of interest at the Gatlinburg meeting.

## ABUNDANCE OF ELEMENTS

The University of Chicago-National Science Foundation Conference on the Abundance of Elements at the Yerkes Observatory was particularly notable for bringing together scientists of several disciplines to discuss a common problem. More than 50 physicists, chemists, geologists, and astronomers met to discuss the present status of knowledge of the abundance and distribution of chemical elements, both on earth and in the universe as a whole.

Information on the relative abundance of the elements provides the key to many puzzling and important scientific problems. For example, the sun and the stars are great natural laboratories operating at temperatures and pressures unattainable to the scientist on earth, even with the most powerful instruments now available. Accurate estimates of the ratio of the various elements in a star aid in understanding the origin and nature of the reactions that are taking place. These estimates are also used by scientists to calculate the age of the earth and the universe and trace the decline of dying stars. They also give the theoretical limits of our material resources.

## HIGH-ENERGY PHYSICS

Over 100 representatives from 45 physics laboratories in the United States and eight foreign countries attended the Third Annual Rochester Conference on High-Energy Physics sponsored jointly by the Foundation, the University of Rochester, and a group of Rochester industrial concerns. Nuclear physicists at the present time are faced with the problem of formulating a suitable theoretical explanation of the massive forces within the nuclei of atoms. Well over 99 percent of all the energy in the universe is locked within atomic nuclei. Indeed, atomic fission, the basic physical process in atomic bombs, releases only about one-tenth of 1 percent of the total energy available in the uranium nucleus.

Several years ago physicists appeared to be on the threshold of reaching a complete and reliable theory of nuclear forces. The theory involved the assumption of an unknown entity called the *meson*, which in the nucleus appeared to bind the nuclear particles together but at the instant of destruction of a nucleus would be observed as a new type of particle. Shortly thereafter such particles were actually found—first in cosmic ray collisions, then in the laboratory. It now appears, however, that there are many meson-like particles having various masses

and electrical charges. As a result, previous theories of nuclear forces have had to be revised, and nuclear physicists are in need of a unifying principle that will account for the vast array of new experimental data now available. The Rochester Conference was devoted to the discussion of such problems. The proceedings of the conference have been published.

#### FIBER BUNDLES AND DIFFERENTIAL GEOMETRY

Some 17 years ago Hassler Whitney of Harvard University developed the concept of fiber bundle in mathematics and noted the possible application of algebraic topology to other branches of geometry. The Conference on Fiber Bundles and Differential Geometry at Cornell University constituted a survey of the very extensive developments of this concept during the post-war years. The first half of the program was devoted to the problems within topology itself resulting from the use of fiber space techniques. The second half reviewed the applications to Lie groups, differential geometry, complex analytic manifolds, and algebraic geometry. The most striking feature of the conference was the frequent use of the same mathematical treatment of problems in two or more widely separated disciplines. This strongly suggested that some unification of geometry at a higher level than now exists will probably be developed in the future. The discussions were marked by the presentation of numerous unsolved problems. These were recorded. A report on the conference is now being prepared for publication.

#### METHODS OF DETERMINATION OF STEROIDS

Steroid hormones, of which cortisone is a well-known example, are highly important factors in the regulation of many body functions. They are closely involved in growth, deposition of proteins, utilization of carbohydrates as energy sources, response to physical and mental stress, and regulation of reproductive processes in both male and female. The steroid hormones are often used by physicians to treat arthritic diseases, allergic conditions, a few types of malignant growth, and disorders of the reproductive systems. Despite their widespread clinical uses, however, exact knowledge of their function and sites of action is incomplete.

One of the remarkable properties of steroid hormones is their great potency. Small amounts will produce extraordinarily large effects. Thus, it is highly important in research and therapy to have reliable means for measuring minute quantities of steroid hormones and related products in blood, excreta and other body fluids and tissues.

The Conference on Methods for Determination of Steroids in Blood and Urine was organized to review recent progress in this field and to discuss the validity of present methods. It was a further goal of this conference to stimulate research for the development of better methods. The proceedings of the conference will appear in published form available to all investigators in the field.

#### SPECIFICITY IN DEVELOPMENT

The Twelfth Growth Symposium on Specificity in Development was supported jointly by the Foundation, the National Cancer Institute, and the American Cancer Society, under the direction of the Society for the Study of Development and Growth. About 150 persons attended the Symposium at Durham, N. H. Speakers were drawn from all parts of the United States and Europe.

The Conference was mainly interested in the biochemical differences in species, individuals, and the various parts of a single organism. These chemical differences are the basis for the more readily recognizable physical and physiological differences. Biological specificity of form and action is one of the basic problems before biologists at present. It has to do with such matters as the biochemical differences between the sexes, the immunity reactions, blood groups, and the origin of the different parts of an embryo.

Typical questions discussed at the conference were the following: What is the relation in the adult of the nucleus and cytoplasm in the cell? What are the biochemical factors that cause tissue antagonism preventing transplanting of tissue between different individuals? Why can a parasite exist in one organism and not in another?

#### LIE GROUPS AND LIE ALGEBRAS

The Summer Institute of Mathematics, sponsored by the American Mathematical Society and the Foundation at Colby College, brought together about 30 mathematicians for 8 weeks to discuss one of the foremost problem areas in present-day mathematics. The group contained specialists from Europe, the Far East and the Middle East as well as from the United States.

The work of the Institute was devoted to exploring the present status and lines of future development of Lie Groups and Lie Algebras. These topics are closely associated with differential geometry. Last year when Deane Montgomery of the Institute for Advanced Study,

Princeton, and Leo Zippin of Queens College, New York, solved Hilbert's Fifth Problem—one of a famous list of problems which has been of active interest to the mathematical world for forty years—it became apparent that Lie Groups also were of interest in topology, and would serve as a bridge between topology and differential geometry.

The scientific results of the Summer Institute will appear in the mathematical journals and in a volume to be published by the American Mathematical Society.