D. Samuel (Israel) described recent syntheses of organic compounds labeled with the stable isotopes of oxygen (O^{17} and O^{18}). The main methods of synthesis of oxygen-labeled compounds with isotopic water or oxygen are oxidation, hydrolysis, and exchange. Labeled organic compounds are obtained by hydrolyzing nitriles, halides, or esters in acid or alkaline solutions that contain isotopic oxygen. Alcohols labeled with O^{17} and O^{18} are prepared from esters which hydrolyze with C-O bond fissions such as dialkyl sulfates and trialkylphosphates. Labeled phenols are best made by hydrolysis of diazonium salts.

By use of O^{18}-labeled alumina a new method has been devised for labeling alcohols and steroids. Compounds such as cholesterol, α- and β-cholestanol, and ethyl alcohol have been prepared by heating them with alumina-O^{18} in benzene or petroleum ether. Although the isotopic enrichments are not large (1 to 2 percent of O^{18}) there is complete retention of stereochemical configuration by the sterols.

H. A. Smith and M. Lindauer (United States) discussed tritium labeling by catalytic exchange. A rapid exchange takes place between isotopic hydrogen in the gas phase and the carboxyl hydrogen of an organic acid in the presence of a platinum or rhodium catalyst. The labile hydrogen can be stabilized by decarboxylation of the organic acid or the marked acid can be heated with certain organic compounds in the presence of a catalyst. An exchange takes place which allows labeling of the new molecule. Acetylene, ethylene, and *cis*- and *trans*-dichloroethylene have been labeled by this procedure. The method may be used with pure deuterium or tritium or with relatively low mole fractions of these in the hydrogen gas. There are virtually no side reactions.

B. M. Tolbert (United States) described the decomposition of solid amino acids by radiation. Under the influence of ionizing radiation, organic compounds undergo chemical changes that result in fragmentation, polymerization, and isomerization during the course of synthetic and degradative processes.

Decomposition and decarboxylation were combined with efr data to give a postulated decomposition mechanism. Specific decomposition pathways for DL-leucine were given together with yields for various products. The G ($-M$) values (number molecules of studied material destroyed per 100 ev) for a number of amino acids in solution and in solid state were also presented.

In his closing speech, E. Medi (vice president of the Euratom Commission) stated that the Brussels conference was a starting point for international exchange on matters concerning the preparation and storage of marked molecules.

In conclusion, it should be pointed out that the applications of labeled molecules are of great consequence for research. For example, in 1962, there were almost 2000 published papers dealing with the use of carbon-14 in chemistry, biology, and medicine. Many of these studies required a carbon-14–labeled compound other than radioactive carbon dioxide. During the next 10 years dramatic new syntheses based on a combination of chemical and biological methods should be developed. Also, unique and simple procedures are continually being devised for the preparation of labeled compounds in a radiochemically pure form and at high specific activities.

Therefore similar conferences with an international scope will be welcomed as an efficient method for the continued interchange of pertinent information between scientists with related interests and discoveries.

This conference was sponsored by the European Atomic Energy Community Commission.

ROBERT F. NYSTROM
Radiocarbon Laboratory, University of Illinois, Urbana

Ethology

Behavioral physiology, motivation, development, and descriptive and comparative ethology were the four main topics of discussion at the 8th International Ethological Conference held at The Hague, Netherlands, 12–22 September 1963.

The number of studies on behavioral physiology are increasing in ethology, because of the diversion of neurophysiologists toward behavioral problems and because of dissatisfaction among behaviorists with purely descriptive analysis. Hormonal studies begin to reveal in detail the intricate chain of interlocking events that underlie, for example, the sequences of actions in the reproductive behavior of birds and mammals. Knowledge of sensory physiology, particularly of invertebrates, is illuminating behavioral problems ranging from food selection and the responses of moths to the ultrasonic pulses of bats, to the accurate auditory localization of mice by owls in darkness and the role of auditory feedback in the control of vocal behavior in birds. General functions of the central nervous system were also considered, both in vertebrates and invertebrates. Peripheral and central contributions were tied together in an analysis of the control of the pattern of flight actions in the locust. This paper resolved the conflict between proponents of endogenous and exogenous (that is, proprioceptive chain reflex) mechanisms by demonstrating that the natural behavior is a result of both kinds of process interacting with each other.

Stimulus analysis and other problems of motivation were also approached from a behavioral rather than a physiological point of view. The nature of chemical stimuli controlling behavioral responses was explored in several cases, including the famous swimming sea anemone, *Stomphia*. Among situations involving visual stimuli one of the most dramatic examples was the use of polymorphic egg markings made by cliff-nesting guillemots for locating their own eggs on the nest ledge. Another was a study of the communicating function of various postures in gulls by the use of movable models. Some new data on orientation problems were also presented. Aside from stimulus analysis, quantitative studies of motivation, including the fine analysis of the temporal organization of behavioral sequences, were also noted. Unitary drives were the subject of conflicting comment; one study emphasized the "unitary" nature of feeding behavior in fishes, and another demonstrated the multiple motivation of aggressive behavior in fishes.

Descriptive studies of natural development, both with and without experimental evidence, and analyses of the role of learning in parent-young relationships in fish, birds, and mammals were presented. Visual and chemical stimuli are important factors in the development of bonds between young and parent in cichlid fishes. New evidence was presented on the control of the critical period for the following responses in domestic chicks. Another long-needed and carefully controlled

demonstration showed the transference of imprinting effects in ducks from youth into adult sexual responsiveness. Perhaps the most remarkable example of the results that can accrue from careful selection of a subject for developmental study was a paper showing close correspondence between the vocal patterns of some parasitic finches and the songs of their bird hosts, with suggestive evidence that the resemblance results from learning.

The papers on various aspects of descriptive and comparative ethology were often inductive in approach and contained many ideas about social behavior and its evolution. Some were ecological in nature; others dealt with behavioral reproductive isolation and behavioral genetics. An apparent case of behavioral polymorphism was related to the color polymorphism of ruffs which, apart from its great intrinsic interest, also raised several fascinating genetic, endocrinological, and developmental problems. Work of this type has been especially important in the history of ethology, although we can see a change, as in experimental studies, toward more precise, quantified methods. It is hoped that the increasing concern with behavioral physiology will not divert attention from the value of descriptive investigations, both as excursions into an important and still largely neglected area of evolutionary biology, and also as a key episode in the training of students of animal behavior.

The hosts for this conference included Jan van Iersel and members of his staff from the department of zoology at the University of Leiden.

PETER MARLER
Department of Zoology,
University of California, Berkeley

Science Policy

The needs for intensifying the study of interactions between science and public policy were discussed at an informal meeting at the University of Sussex, England, on 9 November 1963. This conference, under the direction of Stephen Toulmin (director, Nuffield Foundation Unit for the History of Ideas) was attended by representatives of universities, industry, and government.

The main question posed was: "Is the making of science policy—interpreted broadly to encompass concern for pure and applied science and the education of scientists and engineers—a process amenable to scholarly study and, if so, how can we best foster the arrangements and environment conducive to academic investigation of this process?" There was general agreement that the role of science in society is an expanding and crucial one and that, in consequence, the quality of decisions affecting the development and application of science is a matter of prime importance to society now and throughout the foreseeable future. Encouragement, therefore, should be given to efforts aimed at gaining new insights into ways in which such decisions are made and new concepts and information that may assist in making future decisions.

Four general classes of problems were suggested as being relevant to the making of science policy. They concern (i) the internal development of the sciences, including the logical structure of scientific theories and the evolution and interrelation of scientific concepts; (ii) the external relations of the sciences, such as those with the public, with technological innovation, and with social value; (iii) quantitative aspects of the growth of scientific endeavor, such as amounts of expenditure and numbers of scientists, students, and publications; and (iv) comparative studies in science policy, examining administrative arrangements and policy-forming procedures in different countries at different points in time. Work already started on some of these problems in several countries was briefly summarized.

Four organizational structures, which could be effective for research in science policy, were outlined—units within a government establishment; extra-governmental individuals or groups who advise the government; academic centers conducting studies specifically to shed light upon the policy process; and university departments that carry on research in related areas, such as history of science, motivated only by scholarly interest and not by intent to produce results of direct value to makers of science policy. Although each structure has a place and can yield valuable results, the emphasis was placed on research centers in academic environments. Such centers could conduct programs of study designed to examine and build intellectual foundations for making science policy and could also train persons for work on policy aspects of science and government.

The effective formation of science policy demands many kinds of information and calls upon such varied academic disciplines as history, philosophy, economics, operations research, public administration, and political science. Consequently, the study of science policy probably will evolve in a more healthy way if it is carried on as a meeting place of several fields rather than if any attempt is made at the outset to isolate it as a separate field under a new name. At the same time, some organizational focusing of efforts would help research workers to develop a sense of common purpose, and also might aid in establishing needed facilities and financial support.

The group felt that it was worthwhile to establish a few, but not too many, centers of interest in academic institutions. They could be established in several different ways—as a unit within a department of economics, as a grouping of faculty in history and philosophy, and so forth. While recognizing the value of diversity and flexibility in developing this embryonic field, some participants believed that, in Great Britain, it might be better to start by establishing a single center, sufficiently well equipped with staff, documents, and computational aids to attain at once a strong and viable research unit.

R. H. BOLT
Bolt, Beranek, and Newman, Inc.,
50 Moulton Street,
Cambridge 38, Massachusetts

Forthcoming Events

June

1–3. Instrument Soc. of America, **Analysis Instrumentation** Div., symp., San Francisco, Calif. (Northern California Sec., ISA, 1341 Seventh St., Berkeley, Calif. 94710)

1–3. **Chemical Inst. of Canada**, 47th annual, Kingston, Ont. (D. G. Diaper, Royal Military College, Kingston)

1–3. **Subunit Structure of Proteins**, 17th biology symp., Brookhaven Natl. Laboratory, Upton, N.Y. (S. Lacks, Dept. of Biology, Brookhaven Natl. Laboratory, Upton 11973)

1–4. Basic Science and Clinical Aspects of **Muscle**, Edmonton, Alberta, Canada. (G. Monckton, Univ. of Alberta Hospital, Edmonton)

1–5. **Medical Library** Assoc., 63rd annual, San Francisco, Calif. (MLA, 919 N. Michigan Ave., Chicago 11, Ill.)

1–5. Society of the **Plastics Industry**, natl. conf., New York, N.Y. (W. C. Bird, 250 Park Ave., New York 10017)