Meetings

Ethological Study of Behavior

One of the basic contributions of ethology is precise description of behavioral processes. Detailed observations of numerous species in natural habitats form an important part of this work. Such observations and other recent research in this field were discussed at the 9th International Ethological Conference, 21–30 September 1965, in Zurich, Switzerland. More than 60 papers were presented; attendance exceeded 250. J. Goodall (van Lawick) supplemented her previous extensive reports on wild chimpanzees with a vivid film which included among other details the animals shaping a variety of "tools," from modified twigs for extracting termites to leaves employed for toilet purposes. Also included in the film were sequences of complex social interactions between individual members of a group and even between young chimpanzees and baboons. Species covered by other "open field" workers largely concerned with intraspecific social behavior included the South American monkey (*Callicebus*), Gelada Baboon (*Theropithecus*), the Spider Monkey (*Ateles*), impala (*Aepyceros*), shrike (*Laniarius*), and the Sulidae family (booby and gannet). Field and laboratory investigations provided further impressive observations on animal groups, including insects, fish, birds, rodents, canids, and primates. One point of importance was the emphasis placed by most workers upon the differences as well as similarities between the various species. This balance is essential for valid comparative investigations.

A technique basic to the ethological method again became manifest during the conference—that is, the recording of simple motor patterns and postures in addition to more molar behavioral units such as "aggression," "fear," "approach," or "avoidance." In addition to providing more comprehensive and sensitive descriptive measures, these patterns are of interest in that they remain relatively fixed and thus characteristic for a given species. With care, therefore, they may be used to aid taxonomic analysis. Papers by Kleiman on Canidae and Nelson on Sulidae were among reports that illustrated this potential. The evolutionary framework is indeed important for understanding the ethologist's approach to behavior. Correlated with this is a willingness to ask questions of function; that is, the result of a behavior pattern and its importance to the organism. The problem of function has frightened away many workers because of its teleological ring, but this apprehension appears largely due to failure to realize the possibility of examining function as an extension of sequential events within the normal causal framework. This was illustrated nicely by Rosenblatt who showed that preventing self-licking in pregnant rats by the use of collars will result in maldevelopment of mammary secretion. Other studies of function ranged from the role of territorial behavior in reproductive success in the stickleback, to the influence of high-frequency sounds elicited by mouse pups upon maternal behavior, to the various functional roles of various appendages in shrimps.

Renewed emphasis upon developmental processes was one of the important features of the conference. The theory of fixed dichotomies, such as those existing between innate and acquired complex behaviors, has been largely abandoned. The current trend was demonstrated by Denenberg, who cross-fostered rat and mouse pups and found considerable modification of species-typical aggression. Other striking examples of the potential in probing developmental processes were provided by Gottlieb who reported the influence of prenatal vocalizations on the subsequent behavior of ducklings and chicks, and by Vince's study of the importance of auditory and tactile cues for synchronization of hatching in quail. The possible relation of juvenile copulatory tendencies in chicks to the following response was explored by Andrew, who stressed that apparently diverse activities may share basic components. Other developmental studies included sexual preferences in related species of vole, the optomotor response in certain fish, and the role of experience in snail-smashing in the song thrush.

Another facet of the ethological method is the continuous recording of sequences of behavior and concern for the interrelationship between different activities. Kennedy, for example, demonstrated the importance of recognizing interaction between sequential tendencies to account for the release, priming, and waning of behavior patterns in aphids. Similarly, Fentress showed the dependence of fleeing behavior in voles upon ongoing activities temporally proximal to presentation of a rapidly moving visual stimulus. He argued from data upon subsequent increase and decrease in grooming, which is superficially unrelated, that motivational models stressing specificity as opposed to generality or even facilitation as opposed to suppression may as often reflect conceptual and analytical differences as differences in the organization of mechanisms. Numerous investigations of complex motivational processes for a wide variety of species were presented. Problems of interpreting conflict behavior, for example, were discussed by Becker, and the difficulty of dividing an organism into "drive" systems was illustrated in a report by Fischer. One point from this work that should be emphasized is that it is not uncommon for ethologists to record behaviors other than those of primary immediate interest, and further, that this additional information may prove extremely useful in suggesting mechanisms for subsequent analysis.

That detailed observation and recording are not only important for workers interested in descriptive data or taxonomic comparisons, but are also crucial to more precise understanding of mechanisms was stressed by Hinde. He noted the confusion that could result from premature automatic-recording techniques, such as breaking a beam of light by a variety of activities. The contribution of careful behavioral observation to the understanding of nervous mechanisms is illustrated in a paper by Wilson on the control of insect walking. By noting the similarity obscured by apparent differences in the leg movements of partially amputated and intact animals, he was able to discount the necessity of nervous plastic-

ity postulated by earlier workers. He also illustrated an additional point of interest that repeated itself during the conference, namely, the relative roles of central and peripheral nervous mechanisms in controlling behavior. Aronson and Cooper's investigation of sexual behavior in male cats after sensory deprivation of the glans penis, Flynn's study of aggression in cats after neural stimulation and blocking of sensory inputs, and Labeyrie's examination of the influence of sensory stimulation upon the organization of behavior in insects, are three other outstanding examples. The problem of underlying mechanisms was approached in a variety of ways in the present conference. Several investigators combined techniques in a single study, often adding considerably to its value. Included were control theory models by Maynard, McFarland, and Schleidt; stimulation studies by Brown and Hunsperger; ablation work by Hutchinson, Phillips, Warren, and Wiepkema; hormonal enquiries by Levine, Michael, and Richards; and genetic analyses by Freedman, Heinrich, Kalmus, and Scott. The range of species and behaviors investigated added considerably to the value of the individual contributions.

The study of perceptual processes and their relation to behavior has long been a major concern of ethologists. Stimuli investigated included auditory, visual, tactile, and chemical; organisms included dragonflies, ephippigers, mice, and numerous fish and birds. The degree of sophistication to which such problems can be explored is illustrated by the paper of Dawkins who constructed a remarkably accurate threshold model for pecking at different colors in chicks, and by Payne who determined alterations in directional sensitivity of moths to the supersonic cries of bats as a function of wing position.

The use of sophisticated recording techniques to aid analysis was indicated by many participants. Perhaps the most dramatic demonstrations were films by Griffin and Groot. In Griffin's film on the role of echolocation in discrimination and catching of prey by bats, both speed of movement and corresponding sounds were drastically reduced by high-speed techniques, thus making detailed analysis possible. Conversely, Groot employed a combination of time-lapse photography and sonar to compress the main patterns of salmon migration into a few moments. A film by McKinney on pair-formation in captive green-winged teals showed the value of single-frame analysis not only of motor patterns and postures but of spatial relations between individuals. The potential of tape recordings was made clear in several papers including an analysis of antiphonal duets in African Shrikes by Thorpe and catalog of Squirrel Monkey vocalization by Winter. Indeed, the interest in animal vocalization was one of the striking features of the meeting, and offers a realm of information too long neglected.

As might be deduced from the above summary, the 9th International Ethological Conference was filled with an air of excitement which persisted through the final dinner. During this dinner the organizer of the conference, H. Hediger, introduced one of Switzerland's most deceptive magicians, to remind all present that what appears important to the casual observer may be more misleading than helpful in analysis.

JOHN C. FENTRESS
Center for Brain Research,
University of Rochester,
Rochester, New York

Thermal Analysis

The long-recognized need for an international association of individuals applying the diverse techniques of thermal analysis within the many fields of science and technology has been fulfilled. At the first International Conference on Thermal Analysis held in Aberdeen, Scotland, 6–9 September 1965, such an organization was formed.

Topics discussed at the conference included advances in instrumentation; organic materials, including polymers; inorganic materials and metallurgy; physical chemistry and quantitative aspects; minerals; and applied science.

G. N. Rupert (Los Alamos Scientific Laboratory) described a versatile piece of equipment capable of oscillographic presentation of thermal analysis, differential thermal analysis, derivative thermal analysis, and thermal derivative thermal analysis. The latter, a new approach to thermal analysis, consists of a plot of temperature against the derivative of temperature, eliminating the independent variable time, and shows the temperature range and amplitude of a phase transition directly on the temperature axis of the oscilloscope. Results of differential thermal analysis, thermogravimetric analysis, and differential enthalpic analysis of fiber-forming polymers were discussed by R. F. Schwenker, Jr. (Textile Research Institute, Princeton, New Jersey). The effectiveness of torsional braid analysis in the definition of weak peaks in differential thermal analysis was demonstrated. R. A. Mercer (National Physical Laboratory, Teddington, England) described equipment which operates on a hot-stage microscope and is capable of giving thermograms of differential thermal analysis as well as permitting visual observation of thermal processes.

In thermometry, two developments were reported. A. Benjaminson (Hewlett-Packard Company, Palo Alto, California) demonstrated the applicability of the quartz thermometer to differential measurements; R. P. Belcher (Shell Research Ltd., Chester, England) described the application of templugs as thermometers and as thermal gradient sensors. In measurement of the organic matter in sedimentary rock, F. Chantret (C.E.A., Fontenay-aux-Roses, France) showed that results of differential thermal analysis correlated well with more conventional chemical methods of analysis.

In my opinion, the most significant paper was that of J. M. Steim (Pennsylvania State University), who described the application of differential thermal analysis to aqueous solutions of proteins. This technique has permitted acquisition of data on the temperature and calorimetry of the denaturization of such materials. However, the greater implication of this work consists in a new approach to the study of complicated biological processes.

L. G. Berg (Gosuniversitet, Kazan, U.S.S.R.) was elected president of the organization. J. P. Redfern (Battersea College of Technology, London) and R. C. MacKenzie (Macaulay Institute for Soil Research, Aberdeen) were elected secretary and treasurer, respectively. Members of the Executive Committee are R. Barta (Czechoslovakia), S. K. Battacharyya (India), C. Duval (France), L. Erdey (Hungary), T. Sudo (Japan), and D. J. Swaine (Australia). C. B. Murphy (U.S.A.), ex officio member of the Committee, is chairman of the organizing committee for the next meeting, which will be held in Wor-