

to state general principles, there is a strong suggestion that at different phylogenetic levels a dimension which may be called "complexity" of experience, provided early, orients the young organism preferentially to greater environmental complexity later, and may also encourage the development of skills for more effective adaptation to complexity.

DALE B. HARRIS, *Program Chairman*

Activation. The participants in the symposium on activation presented new experimental data contributing to the development of this interpretation of behavior. It was shown that the two projection systems deriving from the reticular formation at the level of the pontomesencephalic junction have two independent functions—behavioral arousal and electrocortical desynchronization. While these two phenomena are normally correlated, it is possible to dissociate the systems responsible for wakefulness or arousal from those responsible for electrocortical "tone." Therefore, electrocortical tone, as such, is in no way a "mirror" of wakefulness.

Additional information on the central mechanism of activation comes from the study of the variations of the electrocortical baseline potential on which modifications of the brainwave frequencies are superimposed. This variation or shift of the d.c. potential is quantitatively correlated with the conventional oscillating brain wave measure of activation and with behavioral arousal. But these baseline shifts also occur in varying patterns in the different parts of the cerebral cortex. It seems that these differences are dependent on the quality of activation, whether it may relate to alerting to danger, or to anticipation of food, or to another stimulus.

The peripheral activation systems also provide new information on the relations between behavior and activation. BRL and GSR measures in the rat are apparently correlated with arousal under certain conditions. However, there are reasons to question the classical theory of the thermoregulatory function of these systems. Several facts also indicate that appropriate activity on the part of the animal may contribute in lowering the level of activation as reflected, for instance, in the HR. It is furthermore evident that the effects of activation

and inattention can be clearly dissociated.

Finally, some experiments with human subjects point to the possibility of studying arousal as a factor of reinforcement. It can be concluded that, as our understanding of the specific mechanisms contributing to activation and arousal develop, these concepts will provide information on both the intensive and directive dimensions of behavior.

DAVID BELANGER, *Program Chairman*

Bilingualism was a topic particularly appropriate for a Montreal meeting. In the session chaired by F. R. Wake, it was noted that many prominent figures in history have been bilingual or multilingual. That this is more of an asset than a liability tends to be confirmed by Elizabeth Anisfeld's findings that bilingualism may result "in either a fuller development of the individual's intellectual potential or the development of a different pattern of mental abilities." Wilder Penfield hypothesized a "switch mechanism" that, when perfected in the first decade of life, permits the individual to shift languages appropriately in response to a single stimulus word, and to "think" in the second language without the intermediate step of translation. W. F. Mackey outlined a quantitative technique for analyzing the distribution of the two languages throughout the entire behavior of the bilingual.

The vice-presidential address by Lorrin A. Riggs included a description of electrical records taken from the human eye, with the contact-lens technique, in response to various patterns and colors of stimulus. The symposium on vertebrate color vision was chaired by Clarence H. Graham. The participants (P. A. Liebman, Edward MacNichol, David Hubel, and George Wald) discussed normal and abnormal functioning of the human visual system with particular reference to the spectrophotometry of individual cones, the electrical responses of single retinal and geniculate cells, and recent data on selective color adaptation. The preponderance of evidence still points to a three-receptor mechanism of human color vision.

In the symposium on Activation (Robert Malmö, presiding officer) new data were presented which may lead to a more precise interpretation of the relationship between cortical and peripheral

activation and behavioral arousal. Experimental evidence on the existence of two independent neural pathways, for behavioral arousal and electrocortical desynchronization respectively, points to the necessity of reassessing the role of the reticular formation in activation (S. M. Feldman). The use of the d-c potential shift as a measure of activation opens new possibilities and may even provide sought-for information for the comparison of general versus localized activation (Vernon Rowland). The first results deriving from a new technique for the recording of BRL and GSR in the rat show that, while this measure is apparently correlated with arousal, there are reasons to question the classical interpretation of these phenomena as being related to sweat gland activity (E. L. Walker). Heat rate, on the other hand, has proven to be a very reliable indicator of activation. There is considerable evidence pointing out that muscular activity as such does not result in cardiac acceleration but may, on the contrary, under proper circumstances form part of a deactivating mechanism (David Bélanger). These various data, as well as other experiments at the human level, permit the conclusion that the concepts of activation and arousal may help us understand the directive as well as the intensive aspects of behavior (D. E. Berlyne).

The section chairman and Association vice president for 1965 is Benton J. Underwood (Northwestern University) and the new member-at-large of the Committee is Robert M. Gagné (American Institute for Research). The 1965 meeting in Berkeley will be merged with an extraordinary session of the Western Psychological Association.

FRANK W. FINGER, *Secretary*

American Political Science Association (K2)

The symposium sponsored by the American Political Science Association at the 1964 AAAS convention in Montreal was on science and international relations (27 December 1964). Contrary to usual treatments of this subject that concentrate on the international activities of science, this meeting had as its focus the scientific and technical aspects of central issues of foreign policy. In particular, the needs and op-

opportunities posed by science and technology for the policy-making process were stressed.

Detlev Bronk (Rockefeller Institute; chairman of the meeting) set the stage by summarizing lucidly and succinctly some of the effects of recent scientific advances on the relations among nations.

E. B. Skolnikoff (M.I.T.) presented the first paper which was, in essence, a general summary that offered a structure for the subject. The central thesis was that the technical aspects of foreign-policy issues are crucial variables for more of the major issues in international relations than is generally realized. Furthermore, when they are important, these technical variables tend to be so intimately linked with the political considerations and objectives that they must be integrated at all stages of the policy process if their full relevance is to be perceived and the political opportunities they offer are to be realized.

These points were illustrated first by a discussion of the nature of the technical aspects of specific areas of foreign policy, such as national security, international organizations, and bilateral relations. This was followed by development of the proposition that science and technology could be used in conscious ways to create new choices for the policymaker as he reaches for political objectives. Examples of the latter were cited in policy areas such as bilateral relations, international institution-building, and foreign aid. The paper also included some more abstract typologies intended to provide analytical tools for further study.

Two of the following papers were designed to illuminate the basic thesis by presenting detailed studies of examples of the interaction of science and foreign policy. The first was presented by Lawrence Mitchell (National Academy of Sciences). His subject was the U.S.-U.S.S.R. scientific exchange program, an example of the political problems and opportunities posed by scientific relations between two countries divided by ideology and conflicting aspirations.

Mitchell recounted the history of the exchange program, and gave the meeting a good sense of the many difficulties of a practical nature. More important, he showed quite clearly the different bases from which the United States and the U.S.S.R. approach the

program—the former largely from a desire to establish contacts that will serve the desires of American scientists to meet and keep abreast of relevant work in the Soviet Union, with the hope for long-term political gain; the latter with a much sharper sense of “mission” to gain needed information. Mitchell emphasized the danger to the United States of falling into the habit of establishing scientific relations by governmental agreement rather than by letting contacts occur naturally. He saw no alternative to the present arrangement, but expressed the view that it may be time now to begin to work toward encouraging greater freedom in U.S.-U.S.S.R. scientific contacts.

F. Joachim Weyl (ONR; formerly with the Agency for International Development) presented a paper on science and foreign aid, as the second “case” study. Weyl made several major points, the first being that, for a country that depends so heavily on science and technology and that prides itself on its prowess in those fields, the United States has approached its foreign aid program in a remarkably unscientific way. This is being slowly corrected, in part through the mechanism of a research program within AID. In addition, Weyl advocated the application of some of the recently developed techniques of systems and cost-effectiveness analyses as a means of making clearer the choices open to country planners and to U.S. policy officers in the economic assistance field.

Weyl also discussed at some length the importance of building indigenous scientific capability in the developing countries. In this connection he emphasized, in particular, two pivotal needs. The first one concerns the identification of the indispensable factors in the environment which are required towards such an end and how to provide them. The second one is that American scientists must learn to realize and make clear to their colleagues in the developing countries that the scientific problems encountered in their world can be just as challenging intellectually as the research problems currently popular in the United States and other advanced countries. Otherwise they will be led to try to emulate the sophisticated specialists in American scientific centers, with little value to their own land and perhaps even to science.

Weyl touched finally on a number

of underlying conditions which must be met in the intercourse between societies which offer the teachings of science in the interest of development assistance, and the societies expected to profit from such offers—the establishment of forums and procedures of arbitration restoring some comparability in weight of voice to grossly unequal agents, the meticulous observance of objectivity and truth in the discourse between the haves and the have-nots, and finally the full public acceptance in the former of the long-range intellectual commitment to technical development in full recognition of the uncertainties in its long-term returns and the vicissitudes of short-term difficulties.

Christopher Wright (Columbia University's Council for Atomic Age Studies) summarized the implications of all the papers by discussing the need for new skills in policy-making. In particular, he expressed the view that these new skills involved more than simply scientific training. To date, those operating in this area of interaction between science and foreign affairs did so largely on the basis of experience. More than likely, on-the-job experience will be the primary form of training for this work for many years, but means must be devised for digesting and transmitting this experience to subsequent generations of students.

Wright pointed out that in the long run more deliberate means will have to be developed to prepare scientists or others in this field. He indicated in his paper what he believed were the formidable problems and barriers to developing such formal training programs at the present time.

Though the prepared papers took the full three hours, the audience paid the panel the great compliment of staying virtually without defection for an additional hour of lively discussion. E. B. SKOLNIKOFF, *Program Chairman*

Social and Economic Sciences (K)

National Institute of Social and Behavioral Science (K5)

A session for contributed papers on 28 December constituted the program of the National Institute of Social and Behavioral Science. Alvin Cohen (Lehigh University) evaluated the role of the elite in the economic development

Science

American Political Science Association (K2)

E. B. Skolnikoff

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