

Book Reviews

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Behavior and Evolution

Anne Roe and George Gaylord Simpson (Eds.)

New Haven, Yale University Press, 1958, 557 pp., \$10.00

For a student of psychosomatic medicine this book on the evolution of behavior is of fundamental importance. It reports two symposiums arranged jointly by the American Psychological Association and the Society for the Study of Evolution. There are sections on "The study of evolution and its record," "The physical basis of behavior," "Categories of behavior," "The place of behavior in the study of evolution," and "Evolution and human behavior." The final section is an epilogue by Simpson which is such a skillful and beautifully constructed summary that this reviewer is impelled to lift long quotations for the benefit of our readers, and to convince them that here is a fascinating book to read and ponder.

Simpson indicates the area of contribution in a sentence: "There is in this discussion a grasp of the distinction between comparative studies of contemporaneous forms and historical studies of phylogenetic series, that has hitherto been lacking in comparative psychology and that may serve as a model."

In discussing behavioral mechanisms and their history (pp. 508-515) he says in part:

"The nervous system, the central nervous system, and the brain, at the levels where these severally occur, are by far the most intricate parts of the behavioral mechanism. It has, especially for the vertebrate brain, been generally assumed that this is the limiting factor in the evolution of behavior, that evolutionary progression in behavior must be accompanied by and cannot proceed either slower or faster than correlated changes in the brain. There is good authority for that view (Sperry), but the point is disputable and this symposium includes conflicting opinions in different sections. Harlow maintains, in effect, that the neural apparatus is commonly capable of mediating more complex or advanced behavior than actually occurs. As evidence he cites experimental learning, from worms to apes, that does not occur in nature and that could not, in his opinion, be of the slightest utility to the animals if it did occur. . . . On the opposite side, Washburn and Avis suggest in a specific instance that change in behavior led genetic change in the brain: their hypothesis is that adoption of tools by creatures with ape-sized brains (compare the australopithecines) eventuated, through the implicit action of strong natural selection, in brains of human size. The evidence is admittedly inconclusive. Finally, Mayr discusses the related question as to whether structural change precedes correlated behavioral change (with its concomitants in the nervous system) or vice

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versa. He concludes that 'there is no general answer to the question. . . . Each case must be analyzed separately . . .

"The most striking single change in gross anatomy is the expansion of the upper and medial parts of the cerebrum, the so-called neopallium, beginning among reptiles but most accentuated between primitive and advanced mammals. Changes in over-all behavior certainly accompanied this change (and ~~others~~) in the brain. The usual conclusion is that the neopallium is particularly involved with newer and 'higher' intellectual functions, flexibility and elaboration of reactions, complex learning, reasoning, and so on, while the rest of the brain, phylogenetically older, is concerned with more instinctual, simpler, more rigid, or generally more primitive parts of behavior. In this symposium Freedman and Roe, among others, have understandably accepted the consensus on this point.

"Pribram has here entered an emphatic dissent. The brain has not evolved by simple accretion but by general remodeling, a conclusion that is, even *a priori*, practically inescapable. It is simply incredible that so complexly coordinated an organ could continue to function as smoothly as it does by, so to speak, simply plugging in new parts on the old chassis. Pribram denies that there is a relationship between neopallium and learning, paleo- and archipallium and instinct. He finds a more significant functional separation between the inner core of the brain, concerned with behavior sequences, and an outer part, related to discrimination. Both inner and outer divisions have both old and new structural elements. Behavioral progression in the vertebrate series, reflected in the remodeling of the brain, is believed to involve increase not in extent of repertory or in the ratio of learned to innate behavior but rather in multiple sensory and motivational determination of responses. Establishment of the relationship between brain architecture and behavior demands new taxonomies of behavior, with categories that would be testable anatomically in place of earlier categories (such as 'learned' and 'innate') which seem, in this connection, to have failed. The approach cannot be quite as simple as all that, and Pribram plainly knows that it is not, but here is an exciting program for new approaches to old problems!

"There is a fairly clear distinction between

the functional properties of elements in a system (physiology) and the number and arrangement or architecture of those elements (anatomy). Bullock shows that all neurophysiological properties known in the vertebrates (including man) also occur widely among invertebrates, including many with behavior radically different from and remarkably simpler than any vertebrate's behavior. The differences in behavior must, therefore, either be purely architectural or use now quite unknown neurophysiological mechanisms—or else involve something called 'mind' that is not amenable to any such naturalistic explanations. As a matter of sheer faith Bullock rejects the dualistic or mystical third alternative, but he is highly dubious about the first and apparently pessimistic about progress toward discovering the postulated new parameters of the second alternative. Perhaps this, too, is a profession of faith, but many of us will agree with McCulloch (cited by Bullock) and with Sperry (herein) that the known neurological parameters are more than adequate to account for any conceivable complication of behavior merely by architectural modification of finite numbers of neurons. A perhaps oversimple but probably valid analogy is that, given contractile units and jointed skeletal elements, no conceivable motion would require new physiological properties but only multiplication and arrangement of those given. A further pertinent (and fascinating) observation by Bullock would seem to go far in countering his own skepticism: 'the typical synapse in integrative systems (is no longer considered to be) a digital device exclusively . . . but rather a complex analog device which finally converts into digital output' . . . and even the output of many neurons may be a graded event. The potentialities of a device that is both digital and analog, that has millions of units, and that can be interconnected in more millions of ways stagger the imagination—mine, at least!"

S. C.

Zur Familien-Umwelt des Schizophrenen (The Intra-familial Environment of the Schizophrenic Patient)

This publication is a collection of nine papers of Theodore Lidz and his coworkers at the Yale Psychiatric Institute. They are published here in German translation, as a special issue