

## Research on Sex

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The history of science is marked by the development of social attitudes that are inimical to progress or that foster growth in an area of knowledge. The study of sex and behavior is complicated by its emotional connotations.

Two volumes relative to this area of study have appeared in the last year; they are encyclopedic in scope and open the way for a better integration of the biological and social sciences. Among the many old controversies that are brought into focus, with a resulting emphasis on their naiveté, is the nature-nurture debate of the older systems of psychology. The books are a major contribution to sexual knowledge, comparable in their own areas to the classic tome, *Sex and the Internal Secretions*.

One of the volumes, *Sex and Behavior* (Wiley, New York, 1965. 608 pp., \$8.95), edited by Frank A. Beach, contains a series of papers that range from laboratory studies to field studies and from the algae to man. The volume edited by John Money, *Sex Research: New Developments* (Holt, Rinehart, and Winston, New York, 1965. 272 pp., \$3.50), albeit shorter, covers a similar array of topics, with slightly more leaning toward clinical aspects. Some participants contributed to both volumes.

Although the book edited by Beach is based on two conferences held in 1961 and 1962 at the University of California (Berkeley), Money organized his on the basis of an all-day symposium held at the third annual meeting of the New England Psychological Association (Boston, November 1963). The former volume marked the dissolution of the National Academy of Sciences-National Research Council's Committee for Research in Problems of Sex.

As Beach points out in his preface, "Private philanthropy cannot compete with the public treasury and, as the grant programs of the NSF and the NIMH took shape, the \$25,000 annual

budget of the Committee for Research in Problems of Sex began to look very small indeed." Since the conferences were a final project for the committee, they take on additional historic meaning. Ironically—and, as Beach says, inevitably—support for this undertaking was sought from, and readily provided by, the National Science Foundation and the National Institute of Mental Health.

The history of the Committee for Research in Problems of Sex has been adequately treated in a study by Aberle and Corner [*Twenty-Five Years of Sex Research: History of the National Research Council Committee for Research in Problems of Sex, 1922-1947* (Saunders, 1953)]. For those acquainted with the gradual development of research acceptability with respect to the study of sex, a feeling of nostalgia pervades the realization that this pioneer committee no longer exists. Robert M. Yerkes (1876-1950), to whom the book is dedicated, gave 25 years of service and leadership as chairman of the committee, and he would be delighted to see the development of sex research as presented at the Berkeley conferences.

In perusing the two volumes, one notes that many complications are apparent with respect to the comparableness of the included studies. Some are the result of species limitation, and often they reside in the verbal meaning attributed to sex behavior. What is sex behavior? How does it affect other biological activities, and how is it related to them?

Ascending the phylogenetic scale, the definition of sexual behavior evolves with the species. At the higher levels, Caspari's definition of the sexual process—"the exchange of nuclear material between cells of mating types or sexes"—is inadequate. Eventually, sexual behavior includes a broad emphasis on sex-related rather than reproductive activities per se.

In his contribution to the Berkeley conference, Tinbergen emphasizes bird courtship, its origin, and ritualization. He deals also with the fascinating relationship between agonistic (hostile) be-

havior and courtship displays. Aggression and escape provide breeding success by means of territorialism and evasion of predators. Aronson prefers to regard the "mutual signalling effects" of courtship described by Tinbergen as a stimulus-response situation. This concept, which seems less teleological, permits the development of Aronson's idea that courtship is a general activator or inhibitor of behavior, a position that adds a significant dimension to the understanding of the motivational and selective effects of the interaction.

Money traces psychosexual differentiation ontogenetically and elaborates on the relationship of neurohumoral aspects of activity to sensation (particularly smell), perception, and distractibility. There are male-female differences. Genetic and functional endowment must be environmentally elicited, a point demonstrated again and again in recent years by clinical and experimental studies.

Caspari, concentrating on insects, emphasizes genetic endowment. A balance between the X chromosomes and the autosomes (nonsexual chromosomes) determines sex. Dramatically suggestive are the data that relate to the parasitic wasp (*Habrobracon*). Thus, gynandromorphs may have the sex organs of one sex and the brains of the other, as shown by marked genes. Such an insect with a male head and female organs courts females but does not respond to *Ephestia*, the moth larvae that female wasps sting and paralyze as hosts for their offspring. "Chromosomal sexual constitution may affect mating behavior either directly, by controlling the genetic constitution of the brain cells, or indirectly, by primarily determining the sex organs and hormones secreted by them. The reaction of the brain being dependent on the hormonal stimulus." For vertebrates, hormonal control is superimposed on genetic control, and early learning seems to be even more important.

Hampson concludes that, at the human level, ascribing the sex role on the basis of external genitalia is a social process. The variables of sex difference follow: (i) sex chromatin patterns, (ii) gonadal sex as indicated by morphology, (iii) hormonal sex associated with secondary sex characteristics, (iv) external genital morphology, (v) internal reproductive structures, (vi) sex of assignment and rearing, and (vii) psychologic sex, or gender role. Hampson believes that psychosexual neutrality rather than bisexuality is present at

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birth. This is a debatable point. Gender roles begin at about age 18 months, with the onset of language skills.

Gender role is an intricate human problem. Could one extend research in this area to the infrahuman primates and higher mammals? It seems that temperament, a very breedable characteristic (Ginsburg), plays a significant role in the sexual behavior of such animals as wolves. We may speculate about temperament as a component in human sex identity.

In both volumes Harlow provides pertinent information concerning the sex behavior of the rhesus monkey and the effects of rearing conditions. He concludes that three primary stages appear in the development of heterosexual affectional systems. Five or six months are devoted to infantile sexuality characterized by rubbing and thrusting responses. The second stage, differential heterosexuality, includes normal posturing and responding by both sexes. The third stage, so-called adult heterosexuality, is marked by capacity for procreation.

There are sex-related activities that bear on problems of temperament. Among these are the early increase in thrusting and posturing in males and a greater passivity in females after the first few weeks, as well as early differences in general play patterns. Harlow insists that these patterns are unlearned but that inadequate early experience interferes with them. He found that unmothered mothers could never develop an adequate affectional system toward their young. (Is this, too, a type of sexual behavior?) He concludes (in the Money symposium) that "... the longer and the more complete the social deprivation, the more devastating are the behavioral effects." As the role of the nervous system becomes more dominant, it acts on the endocrine mechanisms. Consequently, changes appear in postural and temperamental attitudes necessary for the completion of the sexual act and performance of sex related behaviors.

Young, Goy, and Phoenix (in Money's volume) suggest that, in the primate series, there is some emancipation from the effects of hormonal action. Furthermore, individual differences exist in hormonal response. Young (in the Beach volume) describes prenatal sensitivity to hormonal action in vertebrates. The use of prenatal androgens particularly disrupts the feminine capacity and causes an intensifi-

cation of the male response. Under such circumstances in embryogenesis, the Wolffian ducts are stimulated to differentiate while the Müllerian ducts are suppressed. On the basis of Young's research, Diamond concludes that the newly born organism is bisexual rather than neutral. However, an organism is predominantly male or female, and, by means of prenatal hormonal effects, is more easily transformed from female to male.

The discrepancy between Diamond's position concerning bisexuality and Hampson's emphasis on neonatal psychosexual neutrality suggest mechanisms, as yet undescribed, mediating male and female behavior. It would seem that they are separate from each other and may be suppressed or elicited by hormonal or environmental stimulation.

Both volumes deal with the role of the central nervous system; deGroot, as well as other participants in the Beach volume, implicates the central nervous system in sex behavior. He emphasizes the relationship between environmental stimuli and the pituitary gland. The role of the cortex in sexual behavior and the release of gonadotrophins are stressed. The hypothalamus and the pituitary constitute a type of homeostat that can control changes in internal environment stimulated by exteroceptive means. MacLean allegorically speaks of the three brains of man. He emphasizes the lower mammalian brain which is basic to feeling responses, shared by man with all mammals. A close organization exists between sexual and oral functions in the brain. Neuroanatomically, there is a juxtaposition between structures involved in these functions and those related to fearful and combative behavior. Some Freudian concepts seem to fit with these recent developments in neuropsychology.

Many participants in the symposia study the elicitation of sexual behavior by means of stimulus variables. Schein and Hale speak of "broadcast" stimuli which bring potential partners into geographic proximity, "identification" stimuli which help an organism recognize a potential partner, and "synchronizing" stimuli received from a selected partner of determined receptivity. Their evidence shows further that stimulus novelty may elicit sexual reactions. Sexual behavior to the same female becomes progressively less frequent, and eventually may cease for many infrahuman animals. Regardless of the

moral implications for the bees and the birds, human behavior apparently shows suggestive parallels.

Lehrman, in his usual creative manner, demonstrates for the ring dove that "the effects of hormones on behavior are paralleled by effects of external stimuli on the secretion of hormones, including those that arise from behavior of the bird and its mate." The presence and behavior of each bird affects the endocrine system of the other bird. Hinde, working with canary reproduction, arrives at very similar conclusions. Aronson, studying fish, demonstrates that the hypothalamico-anterior pituitary gonadal system is activated by external stimuli and the rhythmic processes of the organism. Light, temperature, chemical, auditory, tactile, and other stimuli are significant in sexual reaction all through phylogeny. As one ascends the scale, learning becomes more meaningful. Thus, Rosenblatt's castrated male cats are affected by hormone on the basis of their differences in previous sexual experience. Of importance with respect to the effects of environment and learning is Hediger's finding that zoo animals appear to show hypersexualization. He contradicts Darwin who held that, in the case of many mammals and birds, captivity had a special sterilizing effect.

Owing to differences in the categorization of sexual behavior, some studies are not easily comparable. For example, in their research, McGill, Rosenblatt, and Young are strictly concerned with copulation of animals. What is important for the copulatory response itself may differ from what is involved in the total sexual reaction pertaining to courtship, care of the eggs, and the young, and male-female differences.

Both volumes deal with aspects of human behavior. Of necessity, chapters overlap. However, their underlying premises differ in terms of the scope of behavior examined. In both books, Masters and Johnson present four phases of sexual response in the human female: the excitement phase, the plateau phase, the orgasm phase, and resolution phase. They elaborate in detail the anatomical changes that occur during the sex act. A dramatic finding is that the clitoris develops identical response patterns regardless of whether there is active coition or manual or mechanical stimulation. Study of the male and female response cycles and the refractory period following male

orgasm have significance for a better understanding of the marked changes that occur in the total organism as a result of arousal. Similarities of response between the sexes are emphasized. The data are cogent to psychosomatics and to the biology of reproduction. One would hope that these studies have been extended to include persons with attitudinal problems relating to sex expression, as well as the introduction of such experimental variables as the effects of stress.

At the human level, as Gebhard indicates, situational and learning factors are, as would be expected, increasingly pertinent in arousal and response. The clinical implications are immediately obvious. Man may establish all kinds of associations to the sexual situation. Factors that mold his responsiveness include age, health, fatigue, nutritional state, and recency of drive fulfillment. Cultural components play a major part. As Davenport has shown for a southwest Pacific community, the extensive sex-related behavior patterns involving modesty, morality, and gender role are often difficult to understand. For example, in the society, early masturbation and premarital homosexuality for males are encouraged and accepted. It would appear that, in this culture, a male with no homosexual experience is statistically abnormal. Two questions are raised: that of gender role and that of psychopathology. Exclusive homosexuality and transvestism are relatively unknown in his population. Apparently, the problems of gender identification and homosexual behavior may differ for Davenport's culture and for the exclusive homosexual in American society that Hooker describes. Sex typing (Sears) is based on training practices. Perhaps the social acceptability of the particular type of behavior experienced and expressed will also affect the ultimate gender identification. Many factors operate—for example, variations in family organization including the membership, lines of authority, sibling order, and the amount of time the father and mother can spend at home with the children (Romney).

Other meaningful topics are treated in these volumes. The Beach symposium includes a chapter, by DeVore, on free-ranging baboon troops and contributions, by McGill, on the effects of genotype of the recovery of sex drive in the male mouse. Whitney evaluates the early stress effects on menarcheal age of humans.

Beach has written a valuable integrating chapter for his own book and a provocative chapter for that edited by Money. In the latter, he traces the effects of evolutionary change on sex behavior and vice versa.

These books present an extensive analysis of sexual behavior studied by a variety of old and new methods. There are studies based on field examination, anthropologic and zoologic (DeVore), and on autoradiography, such as that of Pfaff which involves hormonal implantation in the brain utilizing radioactively labeled sex hormones. There are also controlled laboratory studies that involve manipulation of a variety of variables.

These symposia constitute a major contribution to the integrative knowledge of sexuality as it shifts from simple nuclear exchange through mating behavior to gender role. It is pertinent to note that, in an evolutionary

sense, social customs and traditions are mediated through the increased neural organization of the human nervous system and its vast relationship to the glandular and biochemical functions of the body. Both books, despite Money's useful glossary, are basically written for the professional behavioral scientist. They might be useful in graduate courses of psychophysiology or comparative psychology. It appears that the chapter arrangement in both volumes might have been more systematically organized. The volume edited by Beach has chapter-by-chapter discussion by other participants. The volume edited by Money contains critical comments by Knowliss and Maslow. It is gratifying to know that sexual phenomena are taking their basic place in the full understanding of behavior, both normal and pathological. There are numerous suggestions in these vast implicative data.

## Archeology of New York State

A good argument can be made for the view that the careful regional summary is the most generally valuable form of publication in prehistoric archeology. It is often true that the region described is a modern political unit, as is the case with the present volume, rather than a natural area defined by ecological criteria, but this theoretical defect is more than offset by the fact that modern political units are natural regions for the operations of archeologists. William A. Ritchie has devoted 40 years to the excavation and study of the archeological data of New York State and immediately adjacent areas, and his intimate knowledge of the prehistoric cultures and their environment is evident throughout his book, **The Archaeology of New York State** (Natural History Press, Garden City, N.Y., 1965. 379 pp., \$12.50).

The information presented includes a substantial amount of previously unpublished material as well as a synthesis and reconsideration of published data and opinions. In addition to describing the bare bones of chronology, assemblages of artifact types, and formal relationships, Ritchie has attempted to draw reasonable inferences on the human activities implied by the artifacts, food debris, settlement patterns, site distributions, and other evi-

dence. The result is a primary reference work for other archeologists and a valuable source of information for those whose interest is less than professional.

Human occupation of the state began perhaps as early as 10,500 B.C., when southern New York was free of glacial ice and the fauna still contained such Pleistocene forms as mastodons, mammoths, and giant beavers. The earliest inhabitants are known only from scattered finds of their characteristic fluted projectile points and, in a few campsites, other forms of chipped stone tools. The fluted point itself clearly links the early New Yorkers with other early inhabitants over much of North America. By about 7000 B.C., a climatic shift to something approaching modern conditions had begun, and by the time of the next well-known cultural phase, the Lamoka, climate and ecology were essentially modern. The Lamoka people were flourishing by 2500 B.C. They were a regionally specialized variant of the hunting, fishing, and gathering cultures characteristic of the eastern United States at that time; their specialization and that of equivalent cultures in other areas suggest a long period of adaptation to the eastern deciduous forests in the poorly known interval that followed the occupation of the fluted point hunters. The Lam-