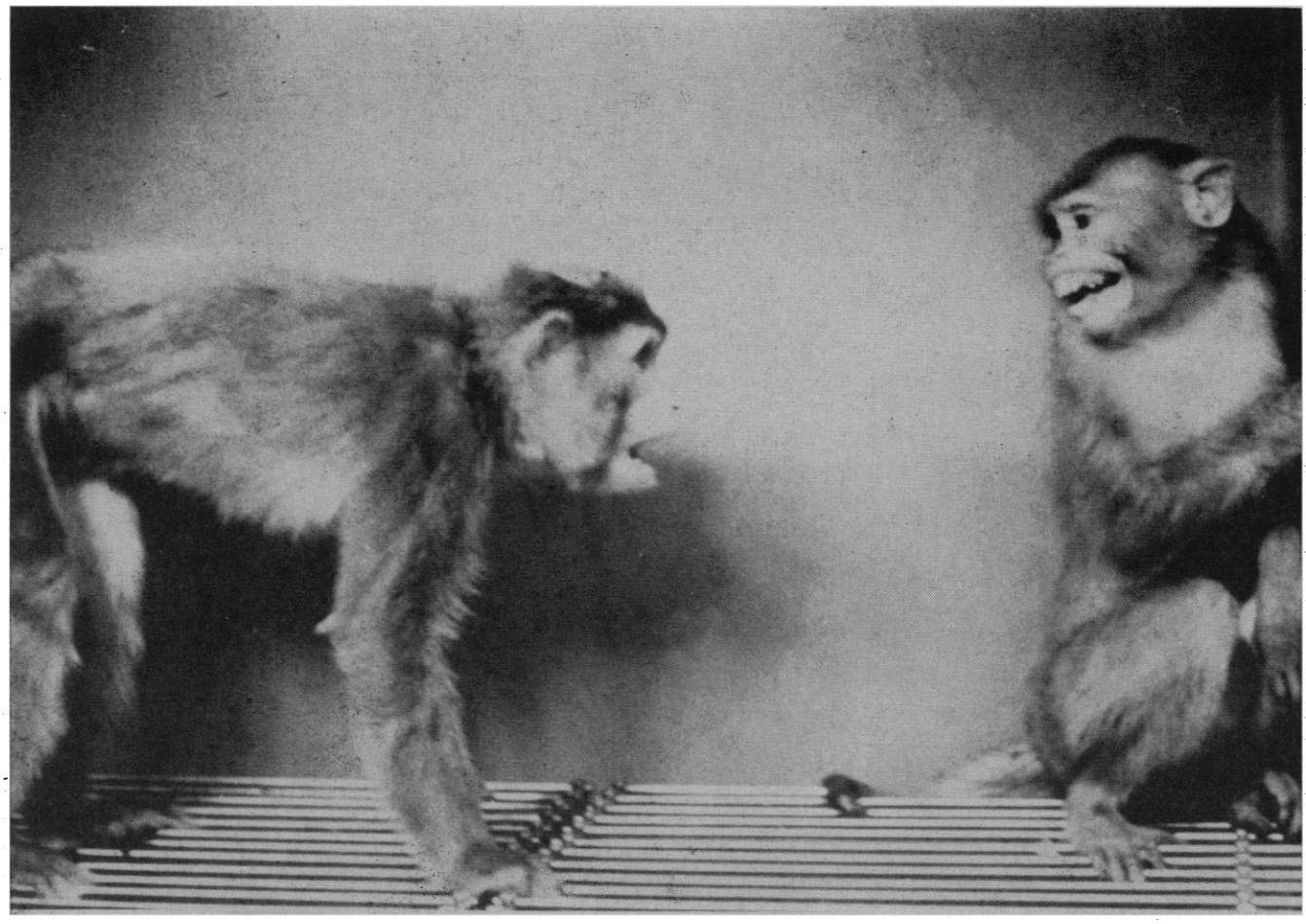

The Physiology of Fighting and Defeat

AAAS Symposium • 28 December 1968 • Dallas, Texas

Current work on the biochemical and neurophysiological correlates of agonistic behavior in mammals will be discussed at a symposium on The Physiology of Fighting and Defeat, 28 December 1968, during the AAAS Annual Meeting. Recent work indicates that both fighting and defeat produce striking changes in both the levels of blood hormones and brain biochemistry. Such experiences also have effects upon the testes and accessory sex glands, although it is not yet clear how much this affects sexual behavior and reproduction.

Using a realistic situation in which two monkeys living together have their brains stimulated by remote radio control, R. Plotnik and J. M. R. Delgado find no evidence for the existence of an "aggression center." Fighting between monkeys can be elicited only by noxious brain stimulation or external foot shock. When there is a dominance-subordination relation between the two animals, only the dominant animal can be stimulated to be aggressive. These results indicate the importance of the effect of training and experience upon aggressive behavior and raise the question of whether all aggressive behavior elicited by brain stimulation may simply be the result of pain or similar noxious stimulation.

J. P. Flynn finds that several areas in the brain of the cat will induce aggressive behavior, the midbrain and hypothalamus being the most important. In his theoretical discussion K. E. Moyer proposes the hypothesis that each kind of aggressive behavior (identified by the kind of stimulus which evokes it) has a separate neurological basis. Thus predation, which is essentially food-getting behavior, is physiologically distinct from agonistic behavior or social fighting.

New discoveries concerning the way in which hereditary factors produce sex differences in fighting will be reported by F. H. Bronson and C. Desjardins. Early in the postnatal life of the mouse, there is a critical period during which

(Above) Following foot shock to both monkeys, dominant monkey (opening mouth) threatens submissive monkey (grimacing). [R. Plotnik, Yale University]

Noxious radio-controlled brain stimulation produces poststimulation aggression. [R. Plotnik, Yale University]

treatment with the male sex hormone will increase the incidence of fighting in later life in either sex. In mice, the nervous systems of the two sexes become definitely different in this way.

New techniques for the chemical assay of hormones and other substances concerned in brain metabolism during fighting and defeat are making it possible to analyze the changes that take place under these conditions. Annemarie Welch reports that male mice in isolation become progressively more irritable and likely to start fights, and that these changes are accompanied by changes in brain chemistry. Such substances as norepinephrine, dopamine, and serotonin are metabolized more slowly. This and similar facts may lead to an understanding of the chemical basis of irritability and its control.

While physiological changes preceding fighting are difficult to find, major changes are produced as a result of fighting and defeat. C. Desjardins reviews work showing that defeat produces long-lasting changes in plasma hormones of mice, one of which (corticosterone) exhibits high levels over periods of many hours and days. B. E. Eleftheriou will report that these endocrine changes are accompanied by decreases in RNA in certain areas of the brain, the latter caused by increased ribonuclease activity. In successful fighters these changes are transitory, but in defeated animals the changes persist over long periods, resulting in disturbances of protein synthesis and general neural activity.

Corresponding data in man are difficult to obtain for obvious reasons. P. G. Bourne will report the fact that urinary corticosteroid levels, which would be expected to rise as a result of either fighting or defeat, were unexpectedly low in men involved in combat situations in Vietnam, but that the level was higher in officers than in enlisted men. The military situation thus appears to be different from that involved in individual combat.

J. P. Scott and B. W. Robinson will summarize the two sessions and attempt to outline a theoretical and conceptual synthesis based on current data. The results of the symposium will have considerable theoretical and practical interest, both with respect to the control of fighting and the effects of defeat, the latter having obvious relevance to psychosomatic medicine.

J. P. SCOTT
B. E. ELEFTHERIOU
Bowling Green State University and
Kansas State University

Speakers and Topics

Arranged by J. P. Scott (Bowling Green State University) and Basil E. Eleftheriou (Kansas State University).

28 December (morning)

Chairman: J. P. Scott.

Aggression and Pain in Unrestrained Rhesus Monkeys, R. Plotnik and J. M. R. Delgado (Yale University).

A Preliminary Model of Aggressive Behavior, K. E. Moyer (Carnegie-Mellon University).

Sites within the Brain from Which Aggressive Behavior Can Be Evoked, J. P. Flynn (Yale University).

Induction of Aggressive Behavior with Neonatal Injections of Sex Steroids, F. H. Bronson (University of Texas).

Theoretical Issues Concerning the Origin and Causes of Fighting, J. P. Scott.

28 December (afternoon)

Chairman: Basil E. Eleftheriou.

Altered Adrenal Function in Two Combat Situations in Vietnam, P. G. Bourne (Stanford University).

Effects of Aggression and Defeat on the Endocrine System, C. Desjardins (Oklahoma State University).

Isolation, Reactivity, and Aggression: Possible Involvement of Brain Catechol- and Indoleamines, A. S. Welch (Memorial Research Center and Hospital, University of Tennessee, Knoxville).

Effects of Aggression and Defeat on Brain Macromolecules, Basil E. Eleftheriou.

Summary and Overview, B. W. Robinson (Yerkes Regional Primate Center).