brain reward systems, and it tries to point the way to a vein of research that would lead to a greater understanding of mental disease and drug abuse.

The first section lists the questions that were asked about the psychology of self-stimulation. How rewarding is self-stimulation in terms of work expended or pain endured? Is self-stimulation related to normal feeding or reproductive behavior? Is the drive effect Hess discovered the same as the "priming effect" in which a little stimulation causes a rat to search for more? The brief answers to 35 questions form a historical review. This section adds clarity and style, which make the book particularly good for classroom use. The author is a good teacher; he asks some questions that have not been, but could be, answered. For example, he presents evidence that leads him to ask if rats would self-inject morphine into the brain. (A report of success has come from his laboratory since the book was written.)

The next section sketches attempts to localize anatomical substrates of drive and reward. It begins with lesion studies and leads into recent catecholamine studies. Olds is intrigued with the general theory that facilitation of catecholamine activity promotes both the rewarding aspects of self-stimulation and relief from depression. Amphetamine's action is the prime example. It facilitates the activity of all three catecholamines (norepinephrine, epinephrine, and dopamine) and does so in three ways (by transmitter release, reuptake block, and direct postsynaptic action). It increases self-stimulation in rats and is an antidepressant in humans. Unfortunately, at high doses amphetamine can cause reverse effects on self-stimulation and can induce psychotic symptoms. Perhaps an overdose causes postsynaptic depolarization block or any of the several types of feedback inhibition that have been proposed in various catecholamine systems. Perhaps it causes excessive "drive" in relation to "reward" or flooding that blurs the response-reinforcement contingency necessary for learning. Clearly the theory is simplified and vague with regard to specific transmitters, pathways, drug levels, response measurements, and behavioral definitions. Olds recognizes this and does not overemphasize any particular postulated mechanism, such as "dopamine reward," "dopamine drive," or "norepinephrine reward." Instead he tentatively supports a combined theory proposed by T. J. Crow. Olds says mesolimbic and nigrostriatal dopamine pathways might be involved in "those rewards that come at the beginning of the consummatory process" and that are "involved in a positive feedback way" with initiating events, whereas the dorsal noradrenergic bundle "might be more involved in those rewards that come toward the end of a consummatory process and which carry the seeds of satiety and the demise of the drive system."

This old-fashioned psychological terminology combined with colorful language is sure to distress some readers. However, there is a large and growing population of scientists who do not pale at the use of "reward" when it refers to self-stimulation, or of "drive" when it refers to the induction of eating. Physiological psychologists are no longer talking to themselves when they use these terms, they are talking with neuroanatomists, neurochemists, and neuroscientists of all kinds.

Electrophysiologists probably are the last major holdouts, and with good reason; it has been terribly difficult to show that the firing of any single cell is causally related to the performance of a learned behavior, much less to "drive" or "reward." Olds tried. He did find neurons that fired in anticipation of food reward as a function of food deprivation. The book discusses the problems of interpreting such findings and gives examples of other attempts to identify "reward neurons."

Last, and most speculative of all, Olds suggests that chemical codes in the form of peptides, such as adrenocorticotropic hormone, might bias neuronal processes and thereby determine various drive states, such as fear or hunger. He then asks how a peptide code for drive could spread within the brain. His answer: the peptides could be packaged in their own vesicles and transported in catecholamine neurons.

Olds the psychologist turned neuroanatomist, turned neuropharmacologist, turned electrophysiologist, has in this section of the book turned neuroendocrinologist. Every neuroscience student should be exposed to this book, not to learn any of these fields but to learn how to study the brain on its own terms, by the integration of many kinds of information.

The book ends with the most twinkly-eyed, far-out idea for the neural basis of learning Olds ever proposed. He suggests, as a working hypothesis, that catecholamine neurons pick up peptide hormones in the hypothalamus and carry them through the brain to produce drive states. The *same* neurons might release amines to produce reward. The pattern of neural activity would determine whether the drive peptide or the reward amine would be released. "In this case the problem of how a reward connects a drive to a set of behaviors or objects would be resolved in an easily conceptualized way. Connecting a reward fiber would consist in connecting a drive fiber." If the past is any guide, this idea is at least partially correct. James Olds was a prospector with a knack for getting there first.

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## Dissociationism Revived

**Divided Consciousness.** Multiple Controls in Human Thought and Action. ERNEST R. HILGARD. Wiley-Interscience, New York, 1977. xviii, 300 pp., illus. $16.95. Wiley Series in Behavior.

For the past two decades Ernest Hilgard has been pursuing research on a family of topics that experimental ("scientific") psychology has assiduously avoided. These are the great topics of 19th-century dynamic psychiatry—for example, hysteria, hypnosis, unconscious mentation—which because of their methodological intractability have by and large been relegated to the subfield of abnormal psychology. It has been Hilgard's goal to "domesticate" these unruly topics and to assimilate them into the body of experimental psychology, where many of them logically belong.

In the present work Hilgard seeks to integrate his research and thinking on these subjects. The book is a potpourri of the "fascinating" topics which tend to draw students to the field of academic psychology but which, as they soon discover to their consternation, are not usually dealt with within it. Among the topics included are possession states, multiple personality, hypnotic age regression, amnesia and repression, dreams, hallucinations, imagination, automatic writing, the hypnotic experience, and even spiritualism and the ouija board.

The theme unifying this sprawl of topics is the doctrine of dissociationism, the view that the "unity of consciousness is illusory" and that every individual is made up of and controlled by a multiplicity of subsystems which may be more or less dissociated, that is, separated by an amnesic barrier. This is by no means a

novel idea. It was expressed, for example, by Carl Gustav Jung in his Tavistock Lectures, delivered in 1935: "The so-called unity of consciousness is an illusion. . . . We like to think that we are one but we are not." Hilgard traces the idea back to the earlier work of Pierre Janet, who sought to explain by it a variety of hysterical manifestations, including those that are artificially produced through hypnosis. Hilgard revives the approach under the label neodissociationism, which in essentials is the old doctrine in new analogic garb, with information-processing metaphors ("systems," "subsystems," "controls," "monitors") tending to supplant the older mentalist concepts ("complexes," "egos," "ideas").

Dissociation theory, new or old, is remarkably elastic, capable of explaining, or at least dealing with, a vast range of psychological phenomena. In some cases, for example multiple personality, the application is obvious. A particular subsystem of personality, or a set of subsystems, takes control over behavior and thought from other subsystems of personality. The dominant subsystem, as in the case of "Eve White" in the famous *Three Faces of Eve*, may not even be aware of the existence and past activities of other subsystems, such as "Eve Black." Amnesia and repression may also be articulated in dissociationistic terms: information available in the system as a whole may be inaccessible, for whatever reason, to a particular subsystem, consciousness.

Hilgard expends considerable effort in examining hypnosis from a dissociationistic perspective. Hypnosis is viewed in part as a "readiness to fractionate the central executive and monitoring system" (p. 227), resulting in an internal dissociation from normal planning and reality-testing routines. "The modification of controls can be described as dissociative if the usual controls are inoperative" (p. 228). Some of the more dramatic hypnotic phenomena—hypnotic analgesia, deafness, amnesia, and so on—may be conceptualized as and even directly demonstrated to be (though how convincingly remains an open question) dissociative phenomena. Thus, the subject may verbally report no pain (or hearing, or memory) while at another level (for which Hilgard uses the metaphor "the hidden observer") the information may be shown, through such techniques as hypnotic interrogation or automatic writing, to have been registered and stored.

A bold synthesizing effort such as the present one, attempting, as it ultimately does, to repair the dissociation between the clinic and the laboratory, inevitably inspires doubts and objections.

From the clinical side, it may be asked whether the phenomena have been any better elucidated than before. The work of Jung, perhaps the greatest dissociationistic theorist of the century, is unaccountably ignored despite his rich theoretical analyses—and laboratory investigations—of the phenomena of interest. The treatment of psychoanalysis is not always adequate, and its dissociationistic underpinnings are not fully appreciated. The frequent suggestion that the unconscious in psychoanalytic theory necessarily implies a more primitive mode of cognition is based on a confusion of Freud's "dynamic unconscious" with his "systemic unconscious" (which he renamed the "id" in 1923).

From the vantage point of experimental psychology, the question may well be raised whether Hilgard has managed to domesticate the subject matter he undertook to explore experimentally. His methods and analyses are, as a rule, presented in a highly impressionistic fashion that makes them difficult to evaluate. Some problems, however, are clearly evident. Despite "the centrality of the hypnotically based data" (p. 155) it is not demonstrated experimentally that hypnosis is essential for the production of the effects. This is a particularly serious deficiency, for T. X. Barber and his group have been demonstrating experimentally that the whole gamut of hypnotic phenomena may be produced without hypnosis. Those well acquainted with the literature will be able to pick up a number of hints in the book about Hilgard's position on this matter, but it is not made explicit enough for the uninitiated. Questions can also be raised about the viability of the concept of hypnosis as a special state, which Barber has challenged. This is not to suggest that Barber's position is unassailable, but his work demands that the issues be confronted.

The central experimental weakness of the studies reported on in this book is their direct reliance on verbal reports about the presence or absence of awareness, whether of pain, hearing, or memory, which raises questions about whether one is dealing with cognitive or reporting effects. It is a pity that signal-detection techniques, which were designed precisely for the purpose of dealing with such questions, have not been employed.

Also, it is to be regretted that Hilgard did not choose to discuss, beyond some passing references, the research on split brains, which provides a physiological standard against which to compare the psychological data.

Despite these various objections Hilgard's book stands out as unique in contemporary experimental psychology. Any experimentalist wishing to explore the issues it deals with will want to start—but not stop—with this important work.

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# A Synthesis in Primatology

**Living New World Monkeys (Platyrrhini).** With an Introduction to Primates. Vol. 1. PHILIP HERSHKOVITZ. University of Chicago Press, Chicago, 1977. xiv, 1118 pp., illus. + plates. $80.

Like many branches of organismic biology, the study of living mammals has over the past 30 years become too sharply divided between those who specialize in systematics and those who deal with anatomy, physiology, behavior, or ecology. Individuals with either the versatility or the desire to treat all aspects of the biology of a group of mammals are rare. Philip Hershkovitz, however, is such an individual. Thus, a volume that was begun 12 years ago "with the stated objective of providing taxonomists and others with a means for making unequivocal identification of all known living callitrichids and callimiconids" has emerged as a lavishly illustrated opus of more than 1100 pages that provides not only an exhaustive synthesis of information on the biology of the clawed New World monkeys but also a provocative and insightful review of many other aspects of primate evolutionary biology.

This first volume consists of three sec-