matically against Delboeuf and the rival investigators, Bernheim, Liègois, and Liébault at Nancy; but was ultimately forced to the humiliating realization that the whole business was a matter of either suggestibility or outright fakery on the part of the subject. Binet's later almost obsessive concern with experimental control, his excessive caution in drawing inferences from his research, his vociferous reference to "suggestion, that cholera of psychology," reveal how deeply he was scarred by the wasted years with Charcot. As one critic wrote of his later work, "after a marvelous exposition . . . one waits avidly for some conclusions—but he swerves from them . . . . Binet, so to speak, never comes to a conclusion."

The greatest service Wolf performs for the reader is to provide a balanced view of Binet's many achievements, which have for too long been overshadowed by his famous *échelle métrique de l'intelligence*. Despite the quantitative emphasis of the latter, Binet was fascinated by qualitative differences in problem solving and in what we should now call cognitive style. It is generally recognized that his comparative study of his daughters anticipates Piaget, but the similarities of detail in number conservation experiments come as a surprise. Not only a developmental psychologist, Binet was unquestionably the father of experimental psychology in France. Indeed, modern work owes far more to him than to Wundt. Led to a functionalist position by his own research, he claimed a decade's priority over the Wurzburg school. His attacks on Wundt's elementarism forecast the revolt of Gestalt psychology, and his insights concerning unconscious process are worthy of Freud. His prodigious efforts in pedagogy laid the foundation for an experimental science which is not yet achieved. His "mental orthopedics" for training the defective equal Montessori. Although psychiatrists ignored him. his classification of psychopathological syndromes was better differentiated than Kraepelin's.

Nor do these achievements exhaust the list. Pioneering projective tests before the term was coined, Binet used inkblots before Rorschach and word association before Jung. Interested in creativity, he developed psychological assessment techniques and produced a detailed study of Hervieu, the dramatist, long before the work of Murray, MacKinnon, or even Simoneit, who is sometimes credited with inventing the field. His test of "emotivity," using photographs of Bokhara criminals being decapitated, anticipates Lazarus's stress investigations with the film of Australian subincision. Even the work of Sherif and Asch on the dynamics of conformity in small groups is clearly forecast by Binet's experiments on "suggestion in a group situation," though his explanation seems circular and his vocabulary quaint.

The oblivion in which these germinal researches have rested for more than half a century is attributable in large measure to the notoriously noncumulative nature of psychological research, but also to Binet's being outside the academic establishment, unable to attract students or reward them with degrees. Even worse than neglect are the outright distortions that have attached themselves to the one thing that keeps his memory green, the famous Binet-Simon intelligence scale. Those who would suppress such tests in the service of egalitarianism may be surprised to learn that Binet declined to define intelligence lest he foreclose its exploration, that he specifically believed in the power of training to increase it, that he invariably used the phrase "mental level" (*niveau*) to avoid the connotations of "mental age," and would certainly have objected violently to calculating the IQ (Simon called the IQ a betrayal!).

Equally relevant for the contemporary reader are Binet's cautions on experimental method, long before Rosenthal and others sensitized investigators to the role of expectations in findings. Binet wrote in another connection, "Tell me what you are looking for and I will tell you what you will find." And the zealots of "informed consent" as applied to psychological research might well ponder Binet on the distortions in subjects' performance, even in matters as innocuous as the *Vexirfehler*, caused by knowing the experimenter's purpose.

Wolf writes that a young French psychologist characterized Binet's life work as a magnificent *carrefour* from which avenues stretched out in all directions, not one of which was resolved into a true boulevard. The metaphor is apt. The merit of Wolf's book is that readers in many branches of psychology, psychiatry, and education will emerge not only with a clear idea of whence they have come but also of who surveyed the route.

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Mental States and Processes

The Psychophysiology of Thinking. Studies of Covert Processes. F. J. McGUIGAN and R. A. SCHOONOVER, Eds. Academic Press, New York, 1973. xvi, 512 pp., illus. $26.50.

This book contains the 13 papers and subsequent discussions from a conference recently held at Hollins College, Virginia. The title would seem to suggest investigations into the neural processes underlying problem solving and concept formation with inferences drawn from—say—the effects of localized lesions, studies on evoked potentials, or microelectrode findings in animals. In fact, a much more accurate impression is given by the subtitle, "Studies of Covert Processes," which suggests a psychological equivalent of squaring the circle, namely, a behaviorist approach to the problem of relating neurophysiology and conscious experience.

The behaviorist rejection of the language of conscious experience is now outmoded in psychology, the behaviorist approach having been found barren and the structuralist approach relatively rich for theoretical explanations of subjects' actions in tasks more cognitively complex than bar pressing. Intellectual critics of behaviorism have tended to reject both the theory and the methods of the older paradigm, preferring, for example, those of cognitive psychology.

At roughly the same time, however, counterculture preoccupation with altered states of consciousness has renewed interest in phenomena such as hallucinations, which virtually necessitate some form of phenomenological description. Ironically, in an empiricist fashion the investigation of abnormal mental states can be pursued pretty much along behaviorist lines. Most of this book reflects such an orientation, a dominant strand being a combining of behaviorist techniques with concurrent physiological measures in studying counterculture phenomena. Thus conditioning techniques appear in seven papers, and seven are concerned with hallucinations, sleep, and biofeedback—hardly the central core of the thought processes. As literature surveys all the papers are competent. However, except for one they do not utilize any very powerful theoretical tools. Thus, Black, in one of the more interesting papers, shows that operant conditioning of brain electrical activity is possible for quite a wide variety of structures, but he provides relatively little insight into the functions

of the structures, even for the most discussed operant, hippocampal theta rhythm.

Theoretically the behaviorist view is again the most strongly represented; nowhere is any more complex a view of conscious awareness presented than that it is an internal response. The most extreme of these papers is that by McGuigan, who argues for a modified version of the motor theory of thought, maintaining that one cannot think well without the involvement of the musculature, particularly that concerned with speech. It is unfortunate that no clinical neuropsychologist pointed out in the discussion of this paper that peripheral dysarthria, which prevents speech, leaves thought totally unaffected.

A few of the papers do move well away from a behaviorist orientation. Chapman relates evoked potential and information-processing tasks in the style of Posner and Sutton. Paivio discusses the psychophysiological correlates of imagery. Unfortunately these studies of his seem much less successful than his better known studies using orthodox experimental-psychological methods. Sperry discusses what has been learned from split-brain patients about the neuropsychology of cognition. This is an excellent survey of the field, but split-brain work has by now been surveyed a number of times and it is not clear that this particular disconnection syndrome provides so much more information than other neurological syndromes as to merit its greater popularity among researchers. One major lacuna of the book is the absence of any discussion of frontal lobe and aphasic syndromes, obviously directly relevant to its theme.

One paper that stands out is that by the McNeilages on the central processes controlling speech production. Almost alone, it begins from a theoretical perspective, outlining alternative models of the speech production process. The models, which are of considerable complexity, are then compared with reference to a number of different types of evidence, from the peripheral physiology of the speech musculature to the nature of speech errors. This theoretical orientation enables different types of evidence to be related through a structural model of a subsystem which may reasonably be conceptually isolated within a total model of brain function. This procedure contrasts with the methodology common among the other papers, a relatively atheoretical correlating of different types of measure. The McNeilage approach is much more similar to that used successfully in relating different levels of explanation in other areas of science and thus seems more appropriate for relating conscious experience with neurophysiology and information processing.

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Cell Movement

Locomotion of Tissue Cells. Proceedings of a symposium, London, Aug. 1972. Associated Scientific Publishers (Elsevier, Excerpta Medica, North-Holland), New York, 1973. viii, 382 pp., illus. $20. Ciba Foundation Symposium 14.

This symposium was prompted, as Michael Abercrombie, the chairman, points out in his introductory remarks, by the knowledge of how widespread actin and myosin are in metazoan cells, the recent advances in understanding muscle contraction at the molecular level, and the recent refinements of experiments on living cells that are converting into functional terms the steadily improving picture of the microarchitecture of the cell. The content of the symposium extends beyond an attempt to understand the locomotory machinery per se and provides an evaluation of many factors that regulate cell movement in culture and during development.

The overall role of microfilaments and microtubules in cell locomotion is soundly evaluated. In addition, a diverse range of motile phenomena expressed by the cell surface are dealt with. An attempt is made to integrate into a coherent picture of cell movement such properties and phenomena as membrane fluidity, surface particle movement, formation and behavior of lamellipodia and microspikes, and exo- and endocytosis. Opposing mechanistic viewpoints emerge to account for these phenomena, but the approach is highly successful in that it draws attention to potential mechanisms whereby the cell surface transmits the translational forces of cell movement to the substrate and receives environmental cues that modulate cell movement.

The contact behavior of cultured cells is reevaluated in the light of a large input of new information. The factors underlying monolayering and the phenomenon of contact inhibition and its role in establishing and maintaining supracellular organization are clarified as a result of a series of incisive and spirited discussions.

Of considerable significance are two papers that take a pharmacological approach to such diverse phenomena as cell movement in the developing sea urchin and exo- and endocytosis. The papers emphasize the need to extend this approach to the regulation of cell movement in the intact organism. A single paper deals with the relationship between cell adhesiveness and movement and puts forward the theory that cells can adjust their motile processes to compensate for changes in cell adhesion. Although it is criticized in the ensuing discussion, the theory is highly attractive if only because this possibility has been largely overlooked in studies of cell movement.

As a whole the symposium will serve as a sound introduction to the subject and as a powerful reminder for the expert of the many phenomena that are directly involved in, or that profoundly modulate, the locomotion of tissue cells.

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Relations among Invertebrates

Embryology and Phylogeny in Annelids and Arthropods. D. T. ANDERSON. Pergamon, New York, 1973. xiv, 496 pp., illus. $24. International Series of Monographs in Pure and Applied Biology: Zoology, vol. 50.

During the past century a large number of descriptive studies of the development of representatives of the annelids and arthropods have accumulated. The embryologists involved have for the most part limited their attention to a restricted group, or at best to no more than one major one, and, not surprisingly, a variety of terminologies, points of emphasis, and interpretations have emerged. Communication among these embryologists and synthesis of their findings by others has proven difficult if not impossible.

D. T. Anderson is exceptional in this field in that he has carried out extensive studies on representatives of many of the major groups of segmented invertebrates. This publication is an attempt on his part to bring order to the complicated and confusing situation in an effort to utilize the facts of