Book Reviews

A Study of Thinking. Jerome S. Bruner, Jacqueline J. Goodnow and George A. Austin. Wiley, New York; Chapman & Hall, London, 1956. 330 pp. Illus. $5.50.

One of man's most impressive and important characteristics is his ability to group discriminably different events into meaningful and useful categories. For example, although there are an estimated 7 million or more discriminable colors, we get along with only a few color names. Or, with little information, people will classify others as intelligent or not, friendly or not, and so on. Now, although it is clear that such groupings are made and are efficient, we have known relatively little of the way in which intelligent adults arrive at classifications of new events when these events might be categorized in a number of different ways.

In their attempt to provide an answer to this question, the authors of *A Study of Thinking* have written an exciting and thought-provoking book. It can be recommended to persons outside, as well as within, the field of psychology because of its lively and clear prose, and because the authors have constantly related their findings to parallels in everyday life. Finally, the book is of interest because of the proposed solution to the aforementioned problem, one that will surely arouse controversy in the field of psychology.

The book is divided into three parts. The first presents a discussion of the nature of categories and the problems men encounter when using them. The second part presents and analyzes experimental results from an extensive research program. The third, an appendix, is a worthwhile discussion of language and categories by Roger W. Brown.

It is in the second part of the book that the authors' thesis is presented. They argue that, in attempting to place a new event in some category, men approximate ideal, abstractly describable, rational "strategies," and that the strategy approximated will vary as the experimental conditions change. Furthermore, these strategies are conceived of as major determiners of individual choices within a sequence of choices. An example of initial responses in two different strategies may be given by a man suddenly dependent for his existence on eating mushrooms but with knowledge of the appearance of only one nontoxic type. If he could find none of his safe type, he might with little risk test one slightly different and increase his supply by only a few mushrooms. Or he might test one differing in several ways from the safe one and at greater risk increase his potential supply much more. Do experimental subjects who make such initially different responses make further choices consistent with two different strategies? The range of facts that is incorporated by this assumption is impressive. However, the relationship between the responses and the inferred strategy is sometimes rather indirect.

Very likely, psychologists who resonate to this type of interpretation will attempt to specify more closely the nature of these strategies. Others who prefer to think in terms of simpler processes may attempt to formulate these problems in different ways. Regardless of the ultimate fate of these organizing concepts, this work will stand as a major contribution to the psychology of thinking.

DONALD A. RILEY
University of California, Berkeley

S. P. Botkin and the Neurogenic Theory of Medicine. L. R. Borodulin. State Publishing House of Medical Literature, Moscow, U.S.S.R., ed. 2, 1953. 184 pp. (In Russian)

Sergei Petrovich Botkin, a teacher of the physiologist I. P. Pavlov, played a catalyzing role in Russian medicine similar to the one played by William Osler in American and English medical practice and education. These two great clinicians were almost contemporaries. Botkin was 17 years old when Osler was born in 1849. He died at the age of 57, the year Osler moved his activities from the University of Pennsylvania to Johns Hopkins University. Both were in many ways alike in their keen intellects, their scientific attitudes to medical theory and practice, their abilities to arouse and sustain the enthusiasm of their many students in the investigation and practice of scientific medicine, and their breadth of interests which far exceeded the boundaries of medicine. Both were well versed in the physical and chemical sciences of their time as well as in philosophy, literature, and sociology. Both looked upon medicine as one important way of serving mankind and both exhibited continued interest in any activities and developments that would emancipate mankind from the unhappy triumvirate of disease, ignorance, and poverty.

The one major difference between these two men was that, while Osler was primarily a great clinician, Botkin was a clinician as well as an experimental physiologist. He was equally at home in the clinic and in the experimental laboratory. The environments in which these two men worked were also markedly different. Osler worked in an industrialized society in an atmosphere of liberalism and progressive thought that characterized life in the United States of America. Botkin, on the other hand, had to carry on his activities in an essentially feudalistic society governed by an unenlightened absolute monarchy with its secret police and its omnipresent censor.

In spite of this environmental difference, the two men shared many views in common. Among other things, these included their appreciation of the importance of psychologic factors in health and disease and the conviction that sound medical practice should not be limited to pharmacotherapeutics.

It appears that Botkin and Osler represented the most rational expressions of the general revolt against polypharmacy and so-called "heroic" medicine in which, to paraphrase Osler, "large quantities of drugs, the actions of which we knew little, were poured into bodies, the actions of which we knew even less."

The emotional expression of this revolt was represented by Hahnemann's homeopathy and his advocacy of the use of highly diluted drugs, and A. T. Still's osteopathy and his proscription of the use of any drugs and his reliance on joint manipulation as the only correct and useful form of therapy.

Osler and Botkin, on the other hand, attempted to apply the principles of scientific analysis and of the available scientific facts to the development of more rational and effective forms of therapy based on careful diagnosis and facts derived from physiology and pharmacology.

The author of this book on Botkin attempts to describe the development of Botkin's therapeutic concepts on a background of the medical thinking and practice then current in Russian, German, and French medical circles. The chief theme of this book may be indicated as follows: (i) The accumulation of scientific knowledge by the second half of the 19th century exposed the inadequacy of

the theory of medicine based on Cullen's ideas of humors as the seat of disease. (ii) This was replaced by the "anatomic" or "localistic" theory of medicine developed by Virchow in Germany and by the "physiologic" or "neurogenic" theory developed chiefly by the Russian clinician Botkin and the Russian physiologist Sechenov. (iii) This neurogenic theory is a specific characteristic of Russian medical thought that originated among a number of Russian physicians even before Botkin, who gave it a more definite expression. I. P. Pavlov and his students developed these concepts into a system of medicine referred to as "nervism." Briefly, the principle of nervism emphasizes the importance of the cerebral cortex in the regulation of physiologic homeostasis, the concept of the organism as a whole, and the importance of environmental factors (including particularly psychologic ones) in health and disease.

According to Borodulin, this neurogenic theory of medicine differed from both the philosophy of vitalism and the mechanistic concepts in biology. Botkin and his followers postulated that, while all living processes, including the psychic manifestations, can be ultimately analyzed in terms of natural laws, they cannot be explained solely on the basis of the known laws of physics and chemistry. The properties of the biological unit (whether it be a single free-living cell or a higher metazoan) cannot be predicted from the properties of the component elements of the organism; no more than the properties of H_2O or of H_2O_2 can be explained on the basis of the characteristics of hydrogen and oxygen. This latter fact does not induce the chemist to resort to mysticism in explaining the properties of H_2O or of H_2O_2 or of a tobacco mosaic virus molecule. By the same token, the biologist does not have to invoke mystical vitalism in order to explain biological phenomena, including those associated with the activity of the cerebral cortex.

Those who attempted to apply mechanically the laws of physics and chemistry to biological systems often ended up by invoking vitalism in relation to the entire organism, because these physicochemical laws cannot explain biological integration. For example, Claude Bernard, an outstanding and careful experimenter who applied physicochemical principles in analyzing various isolated biologic processes, nevertheless resorted to the assumption of some vital "directive force" in the development of an organism from an egg. "The vital force and life," declared Bernard, "belong to the metaphysical world." Botkin and his school of thought escaped that pitfall by developing the idea of the existence of different levels of organization of matter in nature, each level of integration possessing qualities of its own. The quality of life appears at a certain level of organization of particular kinds of matter.

Within the living organism there are various levels of such integration, beginning with integration within each individual cell and leading up to integration of organs and organ systems. The multicellular organism as a whole is integrated by the central nervous system, the cerebral cortex assuming a more dominant role in the higher animals, particularly in man. This dominant role is maintained in relation to somatic, as well as visceral, functions and in the synthesis of these functions so as to adapt the organism to its environment. With the increasing role of the cerebral cortex in the regulation of physiological homeostasis in higher animals, especially in man, there developed greater possibilities for impingement of psychologic factors on various visceral and somatic functions. Thus, the Botkin-Sechenov-Pavlov neurogenic theory of medicine led to the emphasis of the importance of psychologic factors in health and disease.

This philosophy reflected itself in Botkin's therapeutic principles. Thus, he looked upon fever as a defense mechanism (in which the central nervous system played an important role) and did not encourage the excessive use of drugs in combating fevers, a practice that was fashionable among medical circles at that time. He advocated the use of drugs with care and only when they were definitely indicated. Botkin suggested the need for studying the mechanisms used by the organism in combating disease: "It is in this studying of the natural abortive forms [of disease], the learning of the methods used by the organism in combating infection, it appears to me, that we shall find that path that will lead us to the discovery of recuperating, disease-combating remedies." Botkin urged that treatment be directed toward the patient and not just toward a localized disease.

The early physiological orientation of Russian medicine is also indicated by the following curious facts. Although Russian medical science and education, like science and education in general, barely scratched the surface of Russian society during the 19th century (as compared with the Western world), nevertheless the first Russian chair in physiology, as distinct from anatomy, was created in 1860 and was occupied by Sechenov at the St. Petersburg Medico-Surgical Academy 14 years before the first professorship of physiology was established at the University College at London in 1874 and 16 years before it was created in the U.S.A. at Harvard University in 1876.

Twelve years before Russell H. Chittenden at Yale University Sheffield School of Science organized the first course in physiological chemistry in the United States, Alexander P. Borodin was appointed to the chair of physiologic and organic chemistry in 1862 at the same medical academy in which Botkin taught. It is interesting to note that, in addition to his teaching at the Medical Academy and at the St. Petersburg Medical School for women, Borodin published more than 20 papers in physiological and organic chemistry and was the author of about the same number of major musical compositions, including the famous opera *Prince Igor*. In fact, in the Western world Borodin is known almost entirely as a great Russian composer and one of the originators of the national trend in musical composition based on the utilization of Russian folklore.

The direction of Pavlov's research on the psychic aspects of gastrointestinal physiology and later on conditioned reflexes can be traced directly to the influence of the ideas of Botkin. A number of Botkin's other students continued to develop these therapeutic principles in their clinical teaching and practice. One of these students, V. A. Manassein, developed a keen insight into psychosomatic factors in disease. He insisted that psychologic factors not only can produce temporary disturbances in various visceral functions but may also lead to a host of chronic diseases.

Manassein's remarks regarding hospital environments [*The Importance of Psychologic Influences* (St. Petersburg, 1877), pp. 141–48] could be read with profit by many hospital administrators today. "In this respect most hospitals and clinics present a very unhappy picture with their unfriendly uniform wards and their dull monotonous daily routines. Such shameful conditions in our hospitals, in my opinion, are no less harmful to the patients than all the other errors in regard to hygienic and dietetic arrangements, thanks to which many patients perish, not because of their diseases, but because of their hospitals." In such hospital environments "the thoughts of patients have nothing to concentrate on . . . they are therefore invariably centered around their own pains. . . . The first concern of a physician who understands the significance of psychic influences should be with the need for a more cozy appearance of the wards. In this respect, flower arrangements, birds in cages, wall pictures, aquaria, and so forth, would help us, without interfering with hygienic requirements of cleanliness and simplicity, to a large extent to remove that uniform dishearteningly deadly character which reflects itself at present from almost every hospital, from its bare walls, the monotonous uniforms and rows of beds. . . ."

Manassein advocated the utilization of

music in hospitals as well as occupational therapy and various forms of exercise and sports events: "Every well-organized hospital should have various devices for the occupation and amusement of patients, for example, newspapers, books, chess, cards, lotto, billiards." He urged the institution of a program of clinical and basic research on psychosomatic factors in therapy.

Another student of Botkin, V. P. Obraztsov (1849–1920) called attention to the close relationship between the disturbances of visceral and somatic functions, problems of referred pain, the neurasthenic heart, and the role of autosuggestion in cardiovascular disease.

This book represents an important contribution to the history of Russian medical practice and philosophy. It contains a great deal of material entirely unfamiliar to medical scientists in the Western world.

The book also demonstrates the lack of communication and of cross-fertilization of ideas between Russian and Western (particularly English-American) medical and biological laboratories and clinics and the resultant mutual ignorance and lack of appreciation of each other's achievements. Osler knew not of Botkin, nor Botkin of Osler; both would undoubtedly have profited from acquaintance with each other's ideas.

This lack of mutual understanding still persists and is evident in the over-all approach of Borodulin. In discussing the development by Pavlov, Bykov, Speranskii, and others of the Botkin-Sechenov concepts of cortical integration and of the living organism as a homeostatic unit, he seems to be unaware of the important contributions in this field by British and American physiologists. For example, the appearance of Sherrington's *The Integrative Action of the Nervous System* in 1906 is not mentioned. Nor is there any indication of familiarity with Fulton and Keller's demonstration of the principle of encephalization in their elegant publication *The Sign of Babinski—a Study of the Evolution of Cortical Dominance in Primates,* or with Fulton's extensive lobotomy studies in relation to behavioral problems in primates.

Studies related to the organism as a unit have occupied the center of attention of a number of investigators for many years and in many lands. Jacques Loeb analyzed some of these problems brilliantly in *The Comparative Physiology of the Brain and Comparative Psychology* (1902) and in his book *The Organism as a Whole* (1916). J. B. S. Haldane wrote in 1922: "The only way of real advance in biology lies in taking as our starting point, not the separated parts of an organism and its environment, but the whole organism in its actual relation to environment, and defining the parts and activities in this whole in terms implying their existing relationships to the other parts and activities."

The effects of emotions on body processes have been the subject of investigation and discussion by many scientists, from William Beaumont's *Experiments and Observations on the Gastric Juice and the Physiology of Digestion* (1833) to A. J. Carlson's *The Control of Hunger in Health and Disease* (1916), W. B. Cannon's *Bodily Changes in Pain, Hunger, Fear and Rage* (1920), and the excellent current studies conducted by Stewart Wolf and Harold Wolff and Hans Selye's extensive investigations on stress. As a matter of fact, observations on psychosomatic effects go back to antiquity. Maimonides, the famous Hebrew physician-philosopher of the 12th century, emphasized the importance of emotions in health and disease (letter to the Sultan Saladin). The appreciation and further development of scientific principles can best be achieved by maintaining a broad historical and geographic perspective.

This lack of communication is not, however, one-sided. British and American physiologists failed to appreciate and benefit from the contributions of Russian physiologists. As is pointed out so succinctly by Fulton in his *Frontal Lobotomy and Affective Behavior*: "Although the Russian School had a clear awareness of the importance of cortical representation of many visceral functions, neurologists and neurophysiologists in general were extraordinarily slow to appreciate the broad significance of these earlier disclosures."

The elucidation of the role of psychologic factors in the development of disease and the development of an integrative approach to medical research and practice could best be achieved not by periodic mutual "sniping" but by consistent attempts at closer communication and a development of mutual appreciation between Russian and Western medical scientists and practitioners.

SAMUEL A. CORSON
University of Arkansas School of Medicine

Cours de Physique Générale. Electricité. A l'usage de l'enseignement superieur scientifique et technique. G. Goudet. Masson, Paris, ed. 6, 1956. 899 pp. Illus. Cloth, F. 5100; paper, F. 4500.

This large and well-appointed book is one of a series of advanced textbooks in general physics for university students. In addition to the material usually found in American textbooks for graduate students, it contains a considerable amount of descriptive material dealing with electric measurements, instruments, and machinery written in a more elementary style. Beginning with a brief introductory section on vector calculus and the mathematical treatment of periodic functions, it leads the reader through the classical theory of electrostatics, direct currents, magnetostatics, and quasi-stationary electromagnetic phenomena to the general formulation of Maxwell's equations and the theory of electromagnetic waves. In a final section, the author discusses the properties of charged particles, x-rays, atomic and molecular structure, elementary quantum mechanics, electric and magnetic properties of solids, and electron tubes and semiconducting devices.

The classical electromagnetic theory is developed in the conventional manner. The theorems are precisely enunciated, and the derivations are detailed enough to permit independent study. Many representative problems are carried to a complete solution, and Maxwell's equations are illustrated by many applications. On the other hand and in accordance with European practice, student exercises are not included. The mks system of units is used throughout.

Although the book does not seem to present new approaches to the study of its field, it is clear, comprehensive, and up to date. The typographic arrangement is excellent and makes it easy to follow the derivations.

I. ESTERMANN
Office of Naval Research

Parasites and Parasitism. Thomas W. M. Cameron. Methuen, London; Wiley, New York, 1956. 322 pp. $6.75.

This book departs from the point of view and emphasis found in most present-day textbooks of parasitology. It widens the concept of parasitism to include, in addition to parasitic animals, bacteria, fungi, spirochetes, viruses, and rickettsiae and includes among the animal parasites the parasitic annelids, crustaceans, mollusks, and vertebrates not usually included in parasitological textbooks. Moreover, *parasitism* is used in the wider sense of including the whole gamut of relationships from extreme pathogenicity to symbiosis. Parasitism is viewed as a biological phenomenon with examples chosen from fields widely separated systematically. Thus there is little emphasis upon the medical and veterinary aspects of parasitism, except by virtue of the fact that the parasites involved in producing disease in man and animals are often better known than the forms of little or no economic importance.

Although the discussion of parasitism