pass; it also presupposes close dependence between these stages and the population types. Although valid on a macroscale, not all the empirical evidence supports the theory. Despite the strong emphasis on the cultural variables and evident historical overtones, the study accepts the ideas of geographical neodeterminism of the physical conditioning of human endeavor.

The volume is the first of a new series of geographical studies published by Prentice-Hall under the editorship of Norton Ginsburg; it is hoped that other studies of similar nature will contribute additional humanistic flavor to the examination of economic postulates of the modern science of geography and serve as a link with many fields of social science.

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Eskimo Life

In this volume, **The Nunamiut Eskimos: Hunters of Caribou** (Yale University Press, New Haven, Conn., 1965. 400 pp., $8.50), Nicholas J. Gubser presents a straightforward description of the Nunamiut Eskimos of inland Arctic Alaska. One cannot but be impressed with Gubser's wide aquaintance with the details of their lives and his appreciation of the problems posed by their environment. The monograph ranges through the standard categories of ethnographic reports—history, language, economic activities, social organization, values, and world outlook. In spite of his balanced and knowledgeable handling of his material, I feel that the author just misses the full potential of the rich data to contribute either to social science or to glimpse the "soul" of the Eskimo. Although the study clearly adds to our knowledge of an ethnic group about which relatively little is known, the presentation is essentially descriptive, with little attempt to derive generalizations about behavior or to probe the value of various theoretical approaches. For example, Gubser tells us that the introduction of the gun resulted in a decline in cooperative hunting patterns, but does not push beyond to explore the ramifications of this event with respect to other aspects of social organization and values. Also, the fine details of the belief system of these Eskimos are presented without examining their functional relationship to other aspects of their mode of life. There is an excellent chapter on "The world of nature" of the Nunamiut that cries for an ecological treatment, but again the author stops short of integrative efforts.

There is another aspect of this study that I would like to note. Gubser describes the past and present of these people; about their future he is noticeably silent. Where are the Nunamiut heading? What are their aspirations? How do their young people feel? How do they see their future? What are the major social changes they are experiencing, and how do they react to these? At times I felt that the picture of the Nunamiut was frozen, with little sense of change or tension. The book ends with an anticlimactic chapter entitled "The caribou."

In concluding this review, however, I do want to reiterate my initial statement that the reader comes away from this volume with the feeling that he has learned a great deal of the raw material of Eskimo life, material that was meticulously gathered and presented in a readable manner.

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BIOLOGICAL AND MEDICAL SCIENCES

Russian Contributions on Brain and Behavior

Josef Brožek

The three volumes under consideration in this review constitute a valuable contribution to the history of Russian scientific thought and accomplishment. Ivan M. Sechenov's **Reflexes of the Brain** (M.I.T. Press, Cambridge, Mass., 1965. 149 pp., $5) is an impressive though largely programmatic formulation of a neurophysiological psychology. His **Autobiographical Notes** (American Institute of Biological Sciences, Washington, D.C., 1965. 174 pp., $4), translated by Kristan Hanes, provides a unique, personalized account of the Russian scientific scene in the second part of the 19th century. Kh. S. Koshtoyants' **Essays On The History of Physiology in Russia** (American Institute of Biological Sciences, Washington, D.C., 1964. 321 pp., $4), translated by David P. Boder, Kristan Hanes, and Natalie O'Brien, is a systematic presentation.

It has been said that the continuing lack of adequate working knowledge of Russian on the part of the American scientific community is replacing the politically imposed curtain of yesteryear with a one-way viewing screen today: open to the West, all but impenetrable in the Eastward direction. In these days when the Soviet scientific output is steadily increasing both in volume and significance, the lack of a ready access to this body of literature constitutes a handicap and a potential threat. The difficulties in the East-West flow of scientific information are not new. They are more serious today.

Sechenov's work provides a dramatic documentation of the lag in the transmission of scientific information. His far-seeing essay "Reflexes of the Brain" was published, as a journal article, in 1863. It was the hundredth anniversary of that event which, eventually, resulted in the publication of this work in America, 102 years after its publication

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in Russia. The M.I.T. paperback contains 109 pages of text plus notes by S. Gellerstein, a biography of Sechenov, and a postscript in which Walter A. Rosenblith stresses Sechenov's significance as an intellectual forebear of Norbert Wiener. The subtitle of Wiener's *Cybernetics*, "Control and Communication in the Animal and the Machine," could have come from Sechenov's own writings.

Reflexes of the Brain is the work of a young man who had just returned from postgraduate studies abroad. How modern, how daring must have appeared, in 1863, "an attempt to establish the physiological basis of psychological processes"!

Yet, there is no reference to Sechenov in the first edition of E. G. Boring's *A History of Experimental Psychology* (1929). The second edition (1950) gives a modicum of biographical data, some of them erroneous (for example, Sechenov graduated from Moscow University in 1856, not in 1851; after graduation he did not continue in St. Petersburg but left shortly to study abroad). Boring praises Sechenov as a pioneer in reflexology. Perhaps "a prophet of reflexology" (and, more broadly, a prophet of physiological analysis of psychological processes) would be a more fitting epithet. Sechenov's *Reflexes* anticipated these trends but did not directly and importantly influence the development of the scientific study of behavior in the West. Lack of familiarity with his work was a factor.

Some of Sechenov's writings, including materials particularly relevant to the topic of this review, were published in English translation in 1935 under the title *Selected Works*, on the occasion of the 15th International Physiological Congress, held in Moscow. The content was registered by Boring (1950, p. 660) with a note that the volume was "not generally available." The same limitation applies, perhaps even in a more stringent way, to the volume entitled *I. Sechenov, Selected Physiological and Psychological Works*. It was published in Moscow (1961) by the Foreign Languages Publishing House and contains the version of Sechenov's *Reflexes of the Brain* reprinted in the M.I.T. paperback.

The centenary of the publication of the *Reflexes of the Brain* was commemorated by three symposia, held in Moscow in November 1963 and sponsored jointly by the Academy of Sciences of the U.S.S.R. and the International Brain Research Organization, an affiliate of UNESCO. The first of the three symposia was devoted to "Brain Reflexes" and Central Inhibition, concepts intimately tied to the work of Ivan Sechenov.

Inhibition, a complement of "active" response, has been slow in finding its rightful place in the theory of behavior. Yet, a fuller understanding of this neglected aspect of behavior must lead to a changed view of behavior generally: the behaving organism emerges as a balance of forces, "as an arrangement of action systems which exert mutually restraining influences" [p. vii in *Inhibition and Choice: A Neurobehavioral Approach to Problems of Plasticity in Behavior* (1963) by S. Diamond, R. S. Balin, and F. R. Diamond].

In their search for historical antecedents of this model of behavior and for contemporary neurophysiological support, these authors encountered a number of Russian scientists who had relevant things to say, from E. C. Cyon (1871, interference theory of inhibition), through I. P. Pavlov, to Pavlov's critics (V. M. Bekhterev, A. A. Ukhtomskii, and I. Beritov), and followers (L. A. Orbeli and K. Bykov). P. K. Anokhin published, in Russian, a monograph entitled *Internal Inhibition as a Problem of Physiology* in 1958.

But the crucial historical event was the discovery, in 1862, of central inhibition by Ivan Sechenov who was working as a "postgraduate fellow" in Paris in the laboratory of the physiologist Claude Bernard. Sechenov's papers "Physiological studies on the cerebral mechanism of the inhibition of spinal reflex movements (reflex activity) in the frog" were published the following year, in French (in *Annales des sciences naturelles*), and in the form of a monograph, in German. As we have noted, 1863 was also the year in which Sechenov's *Reflexes of the Brain* saw the light of day.

Sechenov was fascinated by what later came to be called "objective psychology": the study of mental activity (the functioning of the brain) in terms of its external manifestations which, in Sechenov's view, can be reduced ultimately to a single phenomenon—the muscular movement. Movements account for "actions" (visible motor behavior) and for "words" (viewed as combinations of sounds produced by means of complex, coordinated muscular activity of the organs of speech). Muscular movements are the third link in a series of events that constitute a reflex: sensory stimulation, a central (central nervous system) process, and a movement. Spinal reflexes—reflexes in the narrow sense—are characterized by the mechanical nature of the response: "When [a specific sensory] stimulation takes place, the movements are as inevitable as the fall of a body without support, or the explosion of powder when it comes into contact with fire, or the work of a machine which has been set in motion" (p. 7).

The brain reflexes are also predictable: "given the same internal and external conditions, the activity of man will be similar" (p. 105). In other words, mental processes are "reflex" in character. Emotions are brain reflexes with an "intensified ending"—that is, "expressed outwardly in movements that are more intense than the usual ones" (p. 99). By contrast, there are many cerebral reflexes whose last member (that is, the movement) is inhibited: thoughts, intentions, and wishes are mental phenomena without external manifestation. Specifically, a thought is defined as the first two-thirds of a cerebral reflex (p. 86). The child learns to dissociate "the aural sensations of words which constitute a thought from the muscular speech movements expressing this thought" (p. 87). The child becomes capable of thinking quietly, of inhibiting speech.

But more significant than the analysis of any specific mental process was Sechenov's general idea that "all acts of conscious and unconscious life are reflexes by origin" (p. 107) and that mental phenomena can be approached by determining the ways in which the relevant muscular movements originate in the brain (p. 4).

The story of the troubles and tribulations encountered by Sechenov in publishing his essay is recounted in his *Autobiographical Notes*. In contrast to the *Reflexes of the Brain*, published at the very start of Sechenov's career as a productive scientist—he was 34 years of age at that time—his autobiography was written some 40 years later, about a year before his death (2 November 1905). The *Autobiographical Notes*, published in 1965, are the second volume in a series of translations entitled "Russian Monographs on Brain and Behavior." The translation program was initiated by H. W. Magoun and D. B. Lindsley and is being continued by Lindsley, with the help of a grant from

the U.S. Public Health Service. The series is published by the American Institute of Biological Sciences and cosponsored by the American Psychological Association. The editor informs us in the foreword that the series will be concerned with the historical background of investigations in neurophysiology and conditioned behavior as well as with contemporary advances in these fields.

The autobiography was not included in the Soviet editions of Sechenov's *Selected Works* that were translated into English. Thus, it represents a genuine addition to the meager store of authentic documents concerning the development of Russian science. It provides a delightful and informative portrait of Sechenov's life, viewed against the broader background of scientific developments in the Russia of the second half of the 19th century.

It begins with the author's childhood, continues with the account of Sechenov's life as a student at the St. Petersburg Military Engineering College and his brief stint as a field engineer in Kiev (1848 to 1850), and goes on to Sechenov's study of medicine in Moscow (1850 to 1856), the studies abroad (1856 to 1860), and the professorships at the Petersburg Medical Academy (1860 to 1870), in Odessa (1870 to 1876), and at Petersburg University (1876 to 1888).

There is a brief account of the exchange of the Petersburg professorship for the modest position as a *Privatdocent* (1889 to 1890) and of the 10-year professorship (1891 to 1901) in the medical school of Moscow University. This was a remarkably productive period in Sechenov's life, with a generalization of the observations, made over many years, on gas absorption in salt solutions and initiation of studies on muscular fatigue and recovery, culminating in the *Essay on the Working Movements of Man*. In the treatise on *The Physiology of Nerve Centers*, the nervous system is viewed as a control mechanism. Sechenov saw a close analogy between the nervous system in the animal body and the automatic regulators in machines—for example, Watt's safety valve in a boiler: "Corresponding to this, an organic part of the regulator is the apparatus perceiving the impulse and giving, so to speak, a signal to activity of the motor part, producing the regulation" (*Autobiographical Notes*, p. 169). This is, indeed, an interesting anticipation of the cybernetic point of view.

In regard to the overall history of Russian physiology, it would be patently false to maintain that work in the field has been focused, narrowly, on nervous function. After all, I. P. Pavlov was awarded the Nobel prize (1904) not for research on conditioned reflexes but for his work on the physiology of digestion. Sechenov, who is regarded by the Soviet historians of science as a forerunner of Pavlov's work on the physiology of behavior, spent more than three decades in research on the absorption of gases and made important contributions to the development of physiological chemistry. But the emphasis on neurophysiology, be it neurophysiology *à la russe*, is there.

This emphasis is reflected in the first volume of the Russian Monographs on Brain and Behavior, *Essays on the History of Physiology in Russia* by Koshtoyants. The emphasis on the research dealing with the nervous system is accounted for, in part, by the fact that the author's area of specialization has been in neurophysiology, supplemented by interest in developmental and comparative physiology. The volume was translated from a Russian original published in 1946. It is centered around the work and life of Sechenov, to whom the author devotes 7 of the 21 chapters in the book. The contribution of I. P. Pavlov, his students, and his coworkers, to the study of conditioned reflexes is described in a long chapter, but V. M. Bekhterev's important work on "associative reflexes" is not mentioned. Three other chapters deal with neurophysiology. The physiology of digestion, circulation, and the developmental ("evolutionary") physiology each rate a chapter. The early, pre-Sechenov period of the development of physiology in Russia is outlined in the first seven, brief chapters. Much of the material presented by Koshtoyants is not available elsewhere.

Clearly, the scientific community owes a debt of gratitude to all the individuals and institutions involved in initiating the series Russian Monographs on Brain and Behavior. It is unfortunate that, in the two volumes at hand, the performance of the translators falls far short of the desired goal. The translation suffers from a frequent use of expressions that are not idiomatic. This distracts the reader and at times severely taxes his patience. Thus it is said that pretty, lively Olga Alexandrova "was in general of the breed of *exultants*" (p. 35); the translator renders Sechenov's comment concerning his reason for disenchantment with medicine's excessive empiricism as "the *fault* of my faithlessness to medicine" (p. 49). What is the meaning of this statement: "The then groundless mistrust of students in political suspicion" (p. 144)?

The reader will be sorely puzzled by the Leningrad Society of Physiologists *imeni* I. M. Sechenov (Koshtoyants, p. v), a term that refers to the fact that the society was named in honor of Sechenov.

There are whole sentences that are simply unintelligible. Let me illustrate by using a passage taken from the *Autobiographical Notes* in which reference is made to Du Bois-Reymond's lectures on electrophysiology and Sechenov's laboratory exercises in nerve and muscle physiology: ". . . becoming acquainted with the sphere of phenomena of which we in Russia did not have a thought, that gave us the means of advancing easily in the extensive class of phenomena which comprised the later, so-called, general physiology of nerves and muscles" (p. 68). And for a good measure, let me quote a sentence from Koshtoyants' *Essays*: "The historical scope of the patterns of nature and of the study of nature in order to conquer it in the interest of the socialist structure constituted the two powerful stimuli for the reconstruction of natural science . . . in the USSR" (p. 318).

The Russian habit of a phonetic rendering of names written in Latin characters is troublesome enough. But when the names are retransliterated, we find the name of the Polish poet Mickiewicz written as Mitskevich (*Autobiographical Notes*, p. 34); in the same translation we meet the German chemist, Sonnenstein, as Zonnenshteyn (p. 67). One does not have to be a Polish or German chauvinist in order to experience a visceral response to such a maltreatment. Although one might argue about the justification for omitting the bibliographic material appended to the original Russian edition of Koshtoyants' *Essays*, the failure to prepare an index of names for the English edition is disheartening. It markedly reduces the usefulness of the publication as a reference work and forces the specialist to prepare an index of his own.