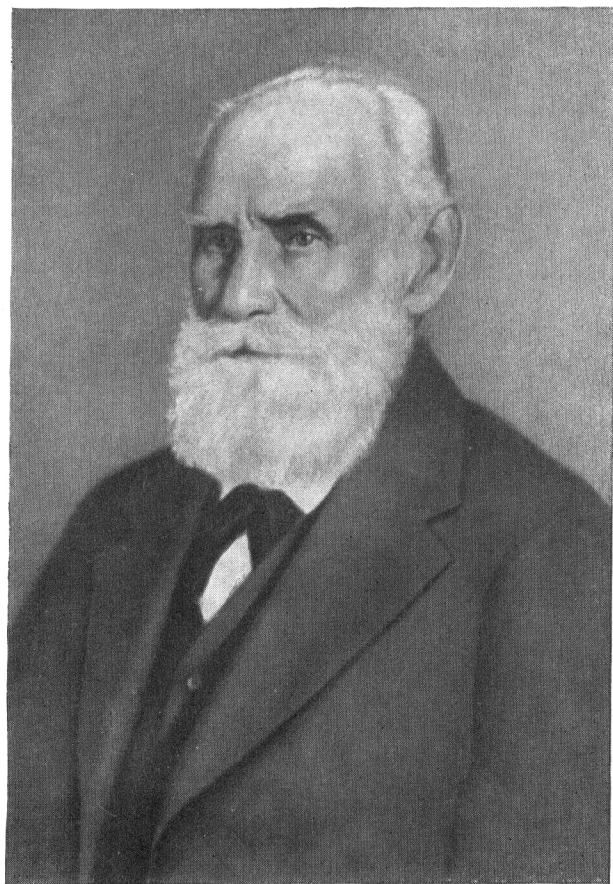


I. P. PAVLOV

SELECTED
WORKS

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Н.б. Пабров

I. P. PAVLOV



SELECTED WORKS

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of Kh. S. Koshtoyants, Corre-
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IVAN PETROVICH PAVLOV AND THE SIGNIFICANCE OF HIS WORKS

"Yes, I am glad that, together with Ivan Mikhailovich [Sechenov], I and my group of dear colleagues have won for the mighty realm of physiological research, the animal organism, complete and undivided, instead of a vague half. And this, indisputably, is our Russian contribution to world science and generally to human thought."

IVAN PAVLOV

A new era in one of the major branches of human knowledge—physiology—is linked with the name of the great physiologist Ivan Petrovich Pavlov.

The wise saying of the ancients "know thyself" has assumed in present-day physiology the form of strictly scientific generalizations of the physiological laws governing the activity of separate organs, systems, and of the organism as a whole in its unity with the environment. The part played by the Russian school of physiologists in advancing physiology, in assuring the tremendous benefit that it brings to vital branches of human practical activity, is truly exceptional.

The names of the great Russian physiologists I. M. Sechenov and I. P. Pavlov stand out like beacons of tremendous power and faithful orientation, lighting up the pathways of scientific progress. J. V. Stalin placed them alongside the names of our greatest men of history and culture, names that are near and dear to the Soviet people.

I. P. Pavlov reconstructed on new foundations such essential branches of physiology as digestion and blood circulation, the theory of the trophic influence of the nervous system; science is indebted to his genius for the founding of the theory of higher nervous activity.

Pavlov followed to the very end—completing a definite phase in the development of Russian science—the toilsome but glorious pathway of searching, blazed with such persistence by the splendid Russian phys-

ologists that preceded him, the path taken by his ideological inspirer and teacher, I. M. Sechenov.

At the same time, stepping out along this pathway, Pavlov, by his investigations and by his passionately irreconcilable attitude towards idealism, carried forward the splendid traditions of the advanced Russian materialistic philosophy—the philosophy which inspired Russian naturalists and above all physiologists in disclosing the secrets of nature and in the bitter conflict with those who admitted the existence of some kind of non-material forces in nature beyond the scope of investigation.

The Soviet country is rightly proud of the Russian physiologists who have made such a big contribution to the development of physiology, as a whole, and to its related branches. No other country has produced so many ardent and uncompromising fighters against idealism in physiology, so many profound and penetrating theorists of this complex science, so many physiologists devoted to the interests of medicine, this noble branch of human practical activity.

The year in which Pavlov was born was the year in which the eminent founder of experimental physiology in Russia, A. M. Filomafitsky (1807-49), died. The work and writings of Filomafitsky, Professor at Moscow University, strikingly illustrate the high level reached by Russian physiology already in the forties of the 19th century. It was in Filomafitsky's laboratory that another remarkable surgeon, V. A. Basov, first performed a stomach fistula operation. This operation was of immense significance for the further study of the physiology of digestion and formed the bedrock for the classical works of Pavlov in this field. At the end of the forties, and the beginning of the fifties, A. N. Orlovsky, a neglected Moscow physiologist and comparative anatomist—a contemporary of A. M. Filomafitsky—carried out experiments jointly with the famous surgeon F. Inozemtsev for the purpose of studying the influence exerted by the nervous system on the nutrition of organisms, i.e., to disclose the so-called trophic influence of the nervous system, to which Pavlov subsequently devoted a number of brilliant works. In his student days at Moscow University I. M. Sechenov was also drawn to the study of the influence exerted by the nervous system on the nutrition of tissues that was carried out by Inozemtsev and Orlovsky; among his early works there is an article on the influence of the nervous system on the nutrition of organs. S. P. Botkin was also a student in the Moscow University at that time; later on, Botkin introduced into clinical medicine the profound physiological theory of the trophic influence of the nervous system.

In his conclusions relating to the trophic influence of the nervous activity Pavlov originally proceeded from his classical works on the nervous regulation of the heart and the cardiac vessels, on the functions of the centrifugal cardiac nerves.

It should be pointed out that the work carried out by Russian physiologists along these lines had already made a big contribution to physiology. On the basis of a special article published by I. T. Glebov, an authoritative Russian physiologist of the fifties of the 19th century, it can be affirmed that the first proof of the existence of a nerve accelerating the work of the heart was adduced by A. N. Orlovsky way back in the early fifties of the last century. Shortly after this discovery by Orlovsky (who was unable to get his works published) two other Russian physiologists, the Cyon brothers, confirmed the existence of this nerve, and this time it won general recognition. One of the brothers, I. F. Cyon, was Pavlov's teacher in the field of experimental technique.

To F. V. Ovsyannikov, another of Pavlov's teachers, belongs the honour of discovering (1871) the so-called vaso-motor centre in the central nervous system. Ovsyannikov's laboratory investigated the trophic influence of the nervous system at the outset of Pavlov's experimental work. Finally, it should be mentioned that influence was also exerted on Pavlov by S. P. Botkin, one of the outstanding representatives of medicine of the 19th century, in whose clinic Pavlov worked. It was in this clinic that his basic idea of the leading role of the nervous system in all physiological processes (the idea of nervism) came into being and matured; and it was here that his views on the connection between physiology and medicine took shape.

Even these fragmentary data relating to the history of Russian physiology testify that the source of the main lines of Pavlov's experimental research can be traced to the works of the Russian physiologists of the period between the forties and seventies of the 19th century, that they are historically connected with them.

Pavlov's theory of conditioned reflexes was a landmark in the development of advanced philosophical thought and natural science in our country, where, as in no other country, the question had been resolutely raised of overcoming the dualism of matter and consciousness, of substantiating the material foundation of the psychical processes on the basis of the unity of matter and spirit, while the idealists affirmed the non-material nature and immortality of the spirit in contradistinction to the material nature and mortality of the body.

In the sixties of the last century D. I. Pisarev, an ardent popularizer of natural science and materialism, carrying forward the materialism and revolutionary democratism of A. I. Herzen, V. G. Belinsky, N. A. Dobrolyubov, and especially of N. G. Chernyshevsky, did much to publicize the highest achievements of the biological science of the time—Darwinism, physiology, etc. Pisarev summoned the young people to a crusade for science, especially natural science; he advanced the profoundly popular revolutionary-democratic task—to use science for the purpose of contributing in every way to the spiritual and social emancipation of the people.

Pisarev's ideas greatly influenced the development of Russian science. K. A. Timiryazev, A. N. Bakh, N. A. Morozov and other outstanding naturalists emphasized its beneficial influence. Pavlov, too, was influenced by it.

In an autobiographical note Pavlov stated: "Influenced by the literature of the sixties, and particularly by Pisarev, our intellectual interests turned to natural science, and many, myself included, decided to take this subject at the University."*

The militant materialistic spirit in Pavlov's works, manifested in raising and solving the problems of higher nervous activity, can be properly appreciated only in its historical association with the traditions of the uncompromising struggle for materialism waged on this crucial sector of the ideological front by the Russian philosophers-materialists, and by their pupil I. M. Sechenov, Pavlov's predecessor and ideological inspirer.

The philosophical writings of Herzen, Pisarev and Chernyshevsky were of enormous significance in moulding the advanced, materialistic traditions of the Russian school of physiology in the fifties and sixties of the 19th century. The ideas of the great Russian physiologists I. M. Sechenov and I. P. Pavlov were also influenced by these works.

The fundamental similarity and the historical and logical link connecting the works of Sechenov and Pavlov consist in that the two men attributed a leading role in the shaping of the highly complex processes of psychical activity to environment, or, as Sechenov expressed it, to the conditions of existence. Pavlov's theory of conditioned reflexes showed that all the diverse manifestations of higher nervous activity are caused by constant interrelations between the organism and its environment, that they arise under certain conditions of the organism's existence. Sechenov's basic postulate that the organism cannot exist without its supporting external environment, is experimentally proved and, in a way, rounded off by Pavlov's theory of conditioned reflexes.

Also typical both of Sechenov and Pavlov is the application of objective physiological methods in studying complex psychical phenomena. Prior to Sechenov and Pavlov all the outstanding explorers of nature proved helpless when it came to the investigation of the so-called spiritual activity; unable to find the way to objective study of it they remained prisoners of philosophical dualism. Sechenov and Pavlov were the first to escape from this captivity, adducing convincing proof of the unity and interdependence of psychical and physical phenomena.

Pavlov's theory of the higher nervous activity rounded off the long searching by Russian philosophers and naturalists who had persevered

* See present edition, p. 43.

in their efforts to overcome the constant counterpoising of spiritual and physical processes. Their immense labours brought the Russian philosophers and naturalists to the *only true teaching of materialistic philosophy*—the dialectical unity of the physical and the spiritual; and the works of Sechenov and Pavlov furnished irrefutable proof of this teaching. This, so to speak, completed a definite stage in the development of science, the path of diligent searching which led from the philosophical concepts of Radishchev, Belinsky, Herzen and Chernyshevsky to the ideas of the Russian physiologists-materialists of the 19th and 20th centuries.

The historical and logical sequence linking Sechenov's and Pavlov's works is marked by a significant date: two years before his death, in 1903—a memorable year for Russian physiology, Sechenov issued a revised edition of his famous book *Elements of Thought*. This was the last word of the great reformer of the teaching on the nature of consciousness. That same year Pavlov read his first paper on conditioned reflexes at the International Medical Congress in Madrid.

Pavlov stated that Sechenov's *Reflexes of the Brain* exerted enormous influence on him in his youth (in his last years at the Ryazan Seminary), and gave an impulse to his work in the field of the physiology of higher nervous activity, which later developed into the theory of conditioned reflexes. This extremely interesting fact illustrates the complexity of the problems encountered in scientific work, the history of the appearance of varied and important generalizations in science and their links with the generalizations of earlier scientists. The following remarkable excerpt taken from Pavlov's statement describes most convincingly the influence that a genuine teacher exerts on his pupils, testifying to the tremendous effect of a truly scientific book.

"When Tolochinov and I began our investigations the only thing I knew was that the extension of physiological research (in the form of comparative physiology) to the entire animal world would involve, in addition to abandoning our favourite laboratory objects (dogs, cats, rabbits and frogs), abandoning the subjective standpoint and essaying the application of objective methods of investigation and objective terminology (J. Loeb's doctrine of tropism in the animal world and the objective terminology suggested by Beer, Bethe and Uexküll). Indeed it would be difficult and unnatural to think and speak of any thoughts and desires of an amoeba or infusorian. But I believe that in our case, in the study of the dog, man's best friend since prehistoric times, the chief impetus to my decision (although I was not conscious of it at the time) came from the brilliant pamphlet by Ivan Mikhailovich Sechenov, the founder of Russian physiology. It was entitled *Reflexes of the Brain* (1863) and influenced me as a youth. And the influence of ideas which are strong by virtue of their originality and

faithful reflection of reality—especially in one's youth—is profound, lasting, and, it should be added, often concealed. This pamphlet was an attempt, brilliant and truly extraordinary for the time (of course only theoretically, in the form of a physiological outline) to picture our subjective world in a purely physiological aspect.

"At that time Ivan Mikhailovich made an important discovery (concerning central inhibition) which deeply impressed European physiologists and was the first Russian contribution to this essential branch of natural science which had just been greatly advanced by German and French scientists. The strain and the joy of this discovery, together, perhaps, with some other personal emotion, brought about this flowering of Sechenov's thought, which, without any exaggeration, can be described as the thought of genius."*

Thus, we see that Pavlov, the greatest physiologist-materialist of our times, developed and matured on the soil of Russian philosophical thought, and that pre-Pavlovian physiology in Russia paved the way for the tremendous contribution which the great physiologist made.

Pavlov is the outstanding representative of that brilliant galaxy of thinkers, who, in their endeavour to wrest from nature her innermost secrets, always proceeded from strictly scientific experience, from the verification of all scientific discoveries in practice. Physiological experimentation, close contact with clinical medicine, "observation and still more observation," real facts—these were the principles which guided Pavlov, the explorer of one of the most intricate domains of nature. All speculation about natural phenomena without trustworthy experimentation was alien to him.

He wrote: "The more complex the phenomenon (and what can be more complex than life?), the greater the need for experiment. Experiment alone crowns the efforts of medicine, experiment limited only by the natural range of the powers of the human mind. Observation discloses in the animal organism numerous phenomena existing side by side and interconnected now profoundly, now indirectly, or accidentally. Confronted with a multitude of different assumptions the mind must *guess* the real nature of this connection. Experiment, as it were, takes the phenomena in hand, sets in motion now one of them, now another, and thus, by means of artificial, simplified combinations, discovers the actual connection between the phenomena. To put it in another way, observation collects that which nature has to offer, whereas experiment takes from her that which it desires. And the power of biological experimentation is truly colossal. This experimentation has created in the course of some seventy or eighty years practically the entire modern, highly developed physiology of the

* I. P. Pavlov, *Complete Works*, Vol. III, Academy of Sciences of the U.S.S.R., Moscow-Leningrad, 1949, p. 18.