The Director of the Bogomolets Institute of Physiology of the National Academy of Sciences of Ukraine, Hero of Ukraine, Academician Platon G. Kostyuk died after a prolonged and serious illness on May 10, 2010.

This standard phrase of official information not only announces that a prominent researcher, a public figure, and, all in all, an outstanding personality went the way of all flesh, but that we have regrettably lost a researcher among the cohort of world-class scientists. Thus, the entire epoch in the development of neurosciences, first in the Soviet Union and then in independent Ukraine – the epoch of Kostyuk – has ended.

The scientific activity of Platon Kostyuk left its mark forever on two important fields of investigations of the central nervous system. Two main directions were within the sphere of Kostyuk’s scientific interest. The first was concentrated on the elucidation of the fundamental biophysical, neurochemical, and molecular mechanisms underlying the basic functions of nerve cells, in particular, the mechanisms providing ion currents and intracellular/cell-to-cell signaling. The second direction was focused on the elucidation of the systemic structural/functional organization of the nerve centers controlling the somatic and visceral functions of the organism. The data obtained from a considerable part of the studies carried out in the above-mentioned directions by Platon Kostyuk personally and also by his colleagues (research workers of Kostyuk’s first-rate scientific school) were recognized as classical.

Kostyuk’s research activity began in the late 1940s under the guidance of his prominent teacher, Academician Daniil Vorontsov, who is recognized as the “father of Ukrainian electrophysiology.” After the first studies directed to examination of adaptation processes in nerve conductors, Kostyuk began to study the synaptic mechanisms of excitation and inhibition in nerve centers and concentrated his attention on the simplest monosynaptic reflex arcs. The analytic principle of research was successively introduced
in these experimental works, which significantly differentiated Kostyuk’s studies from a considerable part of “soviet-type” physiological studies carried out in the 1950s where the scholastic hyper-ideological concepts of the post-Pavlov scientific school remained dominant. Kostyuk’s studies initiated a fundamentally novel experimental approach. Kostyuk was the first in the Soviet Union to introduce the microelectrode technique and modern (at that time) experimental equipment techniques in electrophysiological studies. This success was consolidated in the fruitful teamwork of Kostyuk with the leader of world neurophysiology, Prof. J. Eccles, in Canberra (Australia, 1960-1961), and, later on, with world-renowned American, German, and Japanese researchers. The Department of General Physiology of the Nervous System (Kostyuk continuously occupied the position of its head from 1958) in the Bogomolets Institute of Physiology became a singular Mecca, which attracted scientists not only from many research centers of the Soviet Union but also from abroad. Here, neurophysiologists became familiar with novel modern methodological approaches and techniques. The monographs entitled Two-Neuronal Reflex Arc (1959) and Microelectrode Technique (1960) in fact became manuals for many soviet neurophysiologists.

In the 1960s to 1970s, Platon Kostyuk and his research group carried out detailed studies of neuronal systems, which control the motor activity of the organism and certain visceral functions and are also involved in the transmission of somatosensory information. These studies allowed researchers to propose detailed neuronal schemes of spinal segmental mechanisms, cortico-, rubro-, and reticulo-spinal descending systems, propriospinal interneuronal connections, and a few brainstem mechanisms. These data and their theoretical interpretation and generalization were described in a few monographs and numerous articles, which gained extensive international recognition.

Another mainstream neuroscience direction, namely, investigation of the membrane and molecular mechanisms of fundamental nerve processes, for which Kostyuk and his pupils achieved the greatest success, was also developed from the beginning of the 1960s. The techniques of isolation of single nerve cells obtained from different animals were successfully mastered, and ion currents through the plasma membrane of these neurons were studied. Based on these achievements, a crucial methodological breakthrough, the development of a technique of intracellular dialysis of the neuronal somata of isolated cells, was made in the middle of the 1970s. This technique was impartially qualified in the world scientific literature as a “Kostyuk’s technique.” This allowed researchers for the first time to change the composition of both the extracellular and intracellular milieus of the neuron and also to study the roles of different components of these media in the excitation and inhibition of nerve cells. The development of this technique became the headstone of the entire further progress in electrophysiology of the nerve cells. At present, this technique allows researchers to record ion currents through a single transmembrane channel formed by a macromolecule of the channel protein and also to adequately examine processes of molecular reception of biologically active agents and intracellular signaling. Kostyuk, together with his pupils and colleagues, succeeded in recording the currents through separate calcium channels, differentiated various representatives of the family of these channels, and elucidated different aspects of the exclusive role of calcium as one of the most important universal intracellular messengers. The results of these pioneering fundamental studies were deservedly recognized in 1983 as a significant scientific discovery and were described during the past 30 years in a few monographs published by the most authoritative leading domestic and foreign publishing companies. These scientific achievements of Kostyuk and his colleagues were recognized through state and academic prizes of the USSR and Ukraine and also through international prizes.

At present, the department headed by Kostyuk and a number of other departments at the Bogomolets Institute of Physiology, which develop similar research area, actively continue to elucidate the molecular and metabolic bases of nerve cell activity, first of all those of the plasma membrane and membranes of subcellular structures (endoplasmic reticulum, mitochondria, and nuclei). The data obtained in these studies have both significant fundamental and applied importance, since the corresponding processes are investigated not only in the norm but also in experimental models of pathological states, such as ischemia, hypoxia, diabetes, and epilepsy. The action of a few agents capable of effectively influencing the activity of ion channels and fundamental intracellular regulatory processes are tested; some such agents can be effectively used in the clinic. It is obvious that the data obtained and their interpretation have great importance for the development of medicine.

Kostyuk’s first-rate scientific school per se can be regarded as commemorative of its founder.

From 1966, Kostyuk continuously occupied the position of the Director of the Bogomolets Institute of