

# **Ivan Pavlov: a pioneer researcher and fine human being**

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## **His life:**

Ivan Pavlov was born in Riazan (1849), a city today called Pavlov in his honor, to a family of Russian Orthodox priests, a profession passed down from fathers-in-law to sons-in-law. He belonged to a large family, being the eldest of eleven brothers five of whom survived since they were able to avoid the infectious diseases typical of that time.

He started school at the age of 11 delayed because he had suffered a head trauma due to a fall. Four years before he started school, his father gave him classes in horticulture and garden work at the family farm. From these times he remembered the pleasure that this sort of activities gave to him; he described this as “muscular joy”, because of the mixture of mental and physical work. He was always thankful to his parents because they taught him to follow a humble life and made it possible for him to study medicine.

In 1870, he started at the University of Saint Petersburg in Natural Science, studying physiology with professor Cyon with whom he performed his first physiological research. Later, when this professor was expelled for political reasons, Pavlov also left his place in the University.

He did his doctoral thesis that was based on the nerves of the heart in Russia. After that he worked for some time working in Germany, and when he came back to Russia he worked as director of physiology in Professor Botkin ´s Clinic in Saint Petersburg (1886). Then, he became the professor responsible of pharmacology in the Military Academy of Medicine in Saint

Petersburg (1890). Later on, he became interested in the physiology of the digestive system - a research field in which he earned the Nobel prize in Medicine in 1904.

He led an austere life of work and sacrifice, sometimes leaving aside his material concerns to dedicate time to his passion, investigation.

Usually economical, he supported his research activities himself. Public generosity and scientific societies helped him financially to begin the construction of the famous “tower of silence” (it was later finished by government’s support). The laboratory that was destined to study the conditioning of dogs was so called the laboratories were sound and vision proof. His economic difficulties began to disappear when he became professor of the Military Academy of Medicine and disappeared completely when he was chosen member of the Academy of Sciences.

He died at 86 years of age in Saint Petersburg after an intense scientific life which he continued practically until his death.

### **His work**

As was mentioned earlier, Pavlov was obsessed with his methods. Due to this obsession with clarity, his experiments were easy to understand.

At a time when there were few medical devices or little scientific technology, which is so important for modern biological science, Pavlov turned his fierce observation and remarkable surgical skills to this activity, developing original experimental animal models.

In “vivisection” the experimental method used in those times, the research worker destroyed the animal in order to isolate the organ in which he was interested in, thus losing any perception of the functions as a whole body. Even though, Pavlov acknowledged that this experimental method had brought much important information, he noted that it had made impossible this acquisition other significant data, especially that related to system integration.

### ***Physiology of the digestive glands***

Based on his extensive laboratory experience, he created a surgical technique for developing a “small stomach” that consisted of a part of the stomach separated from the rest of the organ by a muscular wall. Thus, although neither fluid nor food from the stomach could reach this small chamber, it had the same neurological stimulus and secreting response as the actual organ. This experimental model allowed him to study all the reflexes involved in the gastric phase of the digestive process. Moreover, this model enabled him to study the biochemical characteristic and behaviour of gastric juice in different situations. When, he made the same sort of fistulas farther along the intestine, he was able to describe for the first time composition and behaviour of the other digestive juices (duodenal, jejunal ones, etc) during different situations: fast, fatty food, carbohydrate food, etc.

The studies were remarkable that his merits as a great physiologist were soon recognized even in the closed Russian academic environment and, in 1901, he was appointed corresponding academic member of the Academy of Sciences. However, he had to wait until 1907 before he became an effective member even though he had won the Nobel prize three years before.

### ***Important studies of nervous activity***

To study the physiology of the digestive fluids, Pavlov created a model by which to examine salivary secretions. He created a fistula into the parotid gland, and demonstrated that the experimental dog secreted saliva (the gland was connected to the exterior by a fistula) when it saw the person who used to feed it, even though the dog had not yet tasted the food. Conversely, when the same animal saw another person, there was no salivary secretion. His observation of his phenomenon led Pavlov to the concept of the “conditioned reflex”.

From his experiences on feeding experimental dogs, he proposed a relationship between the digestive process and the nervous system: every time he presented a piece of bread to a dog, it started secreting saliva. He named this phenomenon: arc reflex, where the act of presenting the food was called stimulus, and the act of secreting saliva was called the response.

A by product of these finding was the method of *conditioned reflexes* for training animals to perform various tasks, such as in the aerospace research.

***Pavlov's personality:***

***-Loyalty:*** At the beginning of his career he worked with Professor Cyon, who was in charge of the Physiology Department. When this Professor was fired from the University for political reasons, Pavlov resigned from his position at the University as a token of his solidarity with him.

***Humility:*** Even though his original work on the physiological reflexes was his own ideal that he developed while working with Professor Sechenov, he always attributed the whole work to the professor.

***- Joy working with his hands:*** he was very skilful with his hands, a characteristic that helped him a lot making his physiological research models. Moreover, he usually worked in his own garden, an activity that he learned in his childhood. He used to say that this sort of work gave him “muscular joy”.

***-Openmindedness:*** In his early professional career, when he worked under the supervision of Professor Botkin, he got involved in many research project, just as a learning experiences.

***-Tenacity and modesty:*** He wrote the following beautiful letter as a guide to new researchers, and it summarizes many of his personal characteristics:

*“ ... First, study the ABC of sciences before trying to reach the summit. Never start a new chapter if you do not know the previous one perfectly well. Do not ever try to compensate your*

*ignorance with suppositions or hypothesis, not even the boldest ones. Learn to be observer, and patient. Get used to perform the ordinary scientific works. Study, compare, compile facts, without which you will never be able to reach the summit, since without them your hypothesis will turn into vain efforts. But, even studying, experimenting, observing, try hardly not to remain in the surface of the facts. Do not be a facts collector, conversely try to discover their origins. Persevere in looking for their ruling laws. Second, be modest. Never think that you know it all. Do not let pride get to you. It will make you obstinate when you should give in, since it will make you reject a good advise and friendly help, and it will make you lose objectivity. Third, be passionate. Remember that science needs a man's whole life; and even if you had two lives, they would not be enough. It is great passion and strong effort that science demands to men ... “*

### **Conclusion:**

Ivan Pavlov was a model of scientist. Not only do we owe him the knowledge of the digestive physiology, for which he was awarded the Nobel prize, but also many facts about the central nervous system gained during his study of the conditioned reflexes.

He led an austere life of work and sacrifice dedicated to his great passion: investigation.

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