ISSN:2249-5347

IJSID

International Journal of Science Innovations and Discoveries

An International peer Review Journal for Science

Nobel Prize in Medicine 1906

Camillo Golgi **Santiago Ramón y Cajal**

The Nobel Prize in Physiology or Medicine 1906 was awarded jointly to Camillo Golgi and Santiago Ramón y Cajal *"in recognition of their work on the structure of the nervous system"*

RESEARCH INFORMATION:

This year's Nobel Prize for Physiology or Medicine is presented for work accomplished in the field of anatomy. It has been awarded to Professors Camillo Golgi of Pavia and Ramón y Cajal of Madrid in recognition of their work on the anatomy of the nervous system.

It is not possible at the present occasion to give a detailed account of this work. The importance of the field that they have undertaken to explore is obvious since it concerns the nervous system, an organic structure of such paramount importance to the most delicately organized of all living creatures. It is this system which brings us into relation with the outside world, be it that we receive impressions from it which act on our sensory organs and from there transmit themselves to the nervous centres, or be it that by movements or other forms of activity we intervene in the environmental phenomena. This same organic structure provides the basis and instrument for the highest form of activity of all, intellectual work.

The different parts of the nervous system are all structurally complex, to a greater or lesser degree. The peripheral nerves, which act as transmitters - they may be compared to telegraph wires - are relatively simple as regards structure and pattern. On the other hand, the central nervous system, which includes the brain and spinal cord, has an extremely complicated structure.

The central nervous system is connected to the different parts of the body by means of a mass of fibres emanating from the central organ and following the pathways of the nerves which originate from this organ. These fibres may however be divided into several groups according to their specific functions. One group of fibres transmits the impulses which produce muscular contraction. Another group enables the nervous system to control the activity of other organs such as those used in digestion. Still another group transmits to the central organ of the nervous system exterior stimuli registered by the sensory organs or stimuli resulting from changes occurring in the organs of the body itself. Even when we are not considering the central nervous system itself it is often extremely difficult to discover the exact pathways of these different groups of fibres and to study each one separately. Within the central system the task is naturally even more difficult, since the nerve fibres are dispersed throughout the system and the fibres corresponding to the different parts of the body intermingle with those which link up the different parts of the central nervous system; moreover, some of these nerves have a long tract and others a shorter tract within the central organ.

I should like to give an example of the way in which the nervous system functions in order to demonstrate how complicated this is. Let us suppose that a part of the skin at one of the extremities has suffered a lesion produced by an exterior agent; corresponding nerve endings receive the stimulus. Through the nerve trunk to which the nerve endings belong the irritation spreads and is transmitted to the spinal cord by the dorsal roots of the nerves to the area which is known as the dorsal horns of the cord. Should transmission of the impulse be interrupted at this point, the sensation will not be consciously registered. It can nevertheless give rise to a movement which is described as a reflex action. This proves that communicating pathways must exist by which the impulse is transmitted to cells in the ventral horns of the spinal cord which specifically control muscular activity. The resulting movement appears to be to some extent appropriate to the environmental circumstances, which denotes the existence of some mechanism which coordinates the activity of these motor cells. Even a relatively simple example such as this demonstrates a fairly complex mechanism.

But a far greater complexity appears if the impulse continues to be transmitted and reaches the centres of consciousness. The impulse progresses along nerve tracts which follow complex pathways until it reaches the surface of the brain, i.e. the cerebral cortex. For consciousness - in man at least - is exclusively located in this area. Until it reaches this area the transmission of the impulse must remain isolated, otherwise, if other pathways corresponding to other parts of the skin become involved, the site of the injury may be incorrectly located. If a painful sensation is eventually perceived, limited to the irritated area of skin, this sensation may in its turn give rise to a number of different activities within the central nervous system. It can give rise to thought and action. In this case, painful sensation can be linked with memory traces from earlier experiences, obtained in various ways and stored in various areas of the brain. This process presupposes a system of connections between different parts of the cerebrum. Finally, stimulation may occur of certain cells in the cerebral cortex which control voluntary and conscious muscular activity. When this occurs these cells produce impulses which provoke muscular reactions appropriate to the circumstances. The mechanism of transmission, which we have briefly outlined correlated with functional phenomena, will, I trust, demonstrate the complexity of the mechanism required for the functioning of the nervous system. Our present knowledge of this mechanism has been acquired in a number of different ways: by research in the field of comparative anatomy, by studying the development of the nervous system, by physiological experimentation, etc. The way which would appear to be leading most directly to better knowledge, i.e. direct anatomical observation, remained impracticable for many years.

ISSN:2249-5347

IJSID

International Journal of Science Innovations and Discoveries

An International peer Review Journal for Science

It had been shown that the nervous system contained, apart from blood vessels, etc. a «supporting substance», composed of cells and fibrillar structures, and of nervous elements proper, also composed of filaments and cells which at different places showed a different appearance. The nerve cells which, for good reasons, were considered as stages and foci of the nervous pathways, were found to be concentrated in those areas of the central nervous system which are characterized by grey pigmentation. It was often difficult, however, to distinguish between real nerve cells and cells which made up the supporting substance. It was also known that many nerve cells gave off cellular processes, in varying numbers, among which *one* in particular, by reason of its special appearance, was believed to give rise to the true nerve fibre. Unfortunately, it was not possible to follow this process for a very long distance along its pathway. As for the other cellular processes, which ramified very quickly, they were the object of guesses rather than direct observation. Our knowledge of nerve fibres was also to a great extent incomplete. In the white areas of the central nervous system grouped nerve fibres were seen, similar in appearance to the peripheral nerve fibres. But to what extent did those of the first group prolong themselves into those of the second group, or link up different centres in the central nervous system? Did these fibres produce ramifications or not? Did they communicate or not with other nerve fibres? Such were the questions which required answers. It should be remembered in particular that almost nothing was known for certain of the relationship between nerve fibres and nerve cells. The central nervous system appeared as a confused mass of filaments, each as fine as the thread of a spider's web, and of microscopic cells armed with cellular processes. It was impossible to isolate the individual components of tissue specimens. Nor was it possible to resort to known staining methods by which, for example, a single nerve cell with its processes could be distinguished as an entity.

For these reasons Golgi's method of silver impregnation, which met these requirements, must be considered as a fundamental discovery in the field of nerve anatomy. Using his original method, Golgi was also able to demonstrate a number of essential points of the architecture of the central nervous system, as well as many important structural details.

It was only after many years, however, that attention was paid to his work and its importance recognized. When at last this happened, many scientists began to work in the field of action which Golgi had opened up. One could mention the names of a number of eminent scientists from far and near who, by their important contributions in the field of original studies of the anatomy of the nervous system, have done a great deal for science. First among these we must place someone whose extraordinarily active and successful work in this field has revealed both fundamental factors of great importance and many essential details and who therefore, more than anyone else, has contributed to the recent extensive development of this branch of science. I refer to Mr. Ramón y Cajal.

By their achievements, which have been briefly described here, Professors Camillo Golgi and Ramón y Cajal must be considered as the principal representatives and standard bearers of the modern science of neurology, which is proving so fertile in results. In recognition of their achievements in this field, the Staff of Professors of the Caroline Institute has decided to award to them this year's Nobel Prize for Medicine.

For more details please visit:

http://www.nobelprize.org/nobel_prizes/medicine/laureates/1906/press.html