



## Giuseppe Moruzzi



Campagnola Emilia, Italy, 30 July 1910 - Pisa, Italy, 11 Mar. 1986

**Title** Professor of Biology, University of Pisa, Italy

**Nomination** 17 Apr. 1978

**Commemoration** – I first met Giuseppe Moruzzi at an international conference in Copenhagen on the fateful day of September 1st, 1939, when the German army invaded Danzica, an event which signed the beginning of the Second World War. In spite of his young age – Moruzzi was 29 years old – he had already gained an international reputation for his outstanding contributions in the field of neurophysiology.

At that time, he was working at the field of neurophysiology. At that time, he was working at the Neurophysiological Institute of Cambridge, headed by lord Edgar Adrian. Together they had recorded the discharge of single motor units of the pyramidal tract.

These classical studies were to exert a most profound influence on the budding field of brain electrophysiology. I was, instead, an utterly unknown neuroembryologist who had been forced by racial laws to leave Italy and continue her research in a neurological center in Brussels. From our first encounter, I was impressed by Giuseppe as a scientist and as a most gentle human being, deeply concerned with political and social problems. We spent many hours together considering the future, which looked very gloomy for us. The following day, he returned to Cambridge and I went back to Brussels.

It was in a very different state of mind and atmosphere that Giuseppe and I met again, ten years later, in Chicago. I was at that time working at Washington University in St. Louis, Missouri, in the Department of Zoology chaired by Viktor Hamburger, and our work was progressing well. On the occasion of a neurological meeting in Chicago in the Spring of 1949, I visited Giuseppe who was at that time Guest Professor at Northwestern University. I had the great privilege of being present when he and Horace Magoun performed one of their celebrated experiments leading to the discovery of the ascending reticular system. Both scientists immediately realized the far-reaching significance of their findings which were to revolutionize the fields of neuroanatomy, neurophysiology, neuropharmacology, neurochemistry, experimental psychology and behavioral sciences. If, on the occasion of our first encounter, I had been deeply impressed by Giuseppe's broad scientific knowledge, his reserve and kindness, at this time I was no less impressed by his modesty, which, however, did not result from a lack of awareness of the fundamental importance of his discovery.

Many times in subsequent years I had the pleasure of spending several hours with Giuseppe, either in Pisa or in Rome where I had established a neurobiological research unit in the early sixties. In the conversations which took place in the relaxed environment of the laboratory, I could appreciate in full his human qualities which are very seldom found in scientists of his, or even much less, stature.

Typical of him, was an unlimited generosity in the evaluation of colleagues, coworkers and pupils, total indifference to recognitions and honors and last but not least, a profound humanistic and philosophical culture which inspired his Spinozian way of facing – *sub specie aeternitatis* – injustices and all other human weaknesses.

Another trait which became apparent in the last years of his life and that I greatly admired, was his stoical acceptance of a neurological disorder which caused him tremendous suffering but did not prevent him from working until the very end of his life.

Giuseppe Moruzzi's scientific contributions are too numerous and well known to need to be reported in detail; here I shall only list the most important.

As a young student of two great and beloved masters, Professors Pensa and Camis, Moruzzi started his career in neurophysiology exploring the role of the cerebellum in the control of posture. This research resulted in the discovery of the influence of the anterior lobe of the cerebellum on postural tone and phasic movements. At the same time, he explored the cerebellar influence on vegetative functions and discovered that the cerebellar vermis inhibits the cardiovascular changes induced by stimulation of the baroreceptors. As the recipient of a Rockefeller Foundation Scholarship, he spent the year 1937-38 in the Neurophysiologic Institute of the University of Brussels, directed by the already famous scientist, Frederic Bremer. The following year he joined the Neurophysiology Institute of Cambridge, headed by Edgar Adrian, awarded six years earlier the Nobel Prize for his discoveries of the characteristics of the impulse discharges in sensory receptors and motor nerve fibers. The experience acquired in both Institutes was of tremendous benefit to the young Moruzzi and brought his fervid mind to its full blossoming. From Bremer he learned not only to master the electrophysiological techniques but also, and perhaps even more important, he became aware of the key role played by afferent sensory systems in maintaining the tonic activity of the cerebral cortex. This activity is lost upon mesencephalic transection, a surgical intervention which results in the isolation of higher brain centers from ascending afferent fiber tracts, but is maintained if the transection is performed at a lower brain stem level. As Moruzzi stated many years later, he learned "not only to carry out electrophysiological experiments ... but also how to develop visual imagination with an extremely clear way of thinking". From the time that he spent in Cambridge, he learned not only the technique of recording from individual nerve fibers and single cell units, but also and above all "to gain confidence" which, as stated by Adrian in his essay on Creativity in Science, "is one of the most important ingredients in the scientific attack".

If Moruzzi's contributions to the classical studies performed with Lord Adrian on the single cortical cell discharge in the pyramidal fiber tract in the period 1938-39 were of such importance as to win him an international reputation, his fundamental discovery of the ascending reticular system, many years later, opened an entirely new field in the Neurosciences and made of him one of the most influential, leading scientists of our time. In the last, equally productive period of his life which ended on March 11, 1986, Moruzzi made fundamental contributions to the study of the physiology of sleep, giving unequivocal evidence that brain stem mechanisms are actively involved in the process of falling asleep and on the maintenance of sleep.

Besides his scientific work, Giuseppe Moruzzi devoted a large part of his time to instruct and follow the work of an ever-increasing list of pupils and coworkers coming from all over the world to the prestigious Institute of Physiology in Pisa, headed by him. It would be impossible to remember the names of all scientists who had the privilege of working under his direction and who continued their careers in Italy as well as in other countries. It may suffice to say that all of the most distinguished neurophysiologists now working in Italy, and of the most distinguished neurophysiologists now working in Italy, and many of those who work abroad, can pride themselves of the honor of having been students of a great master: Giuseppe Moruzzi.

Rita Levi-Montalcini