

OBITUARY

Lord Adrian

Edgar Douglas Adrian, Baron of Cambridge died on August 4, 1977, in his 88th year. With him a whole epoch of neurophysiology went to the grave.

When the young scholar Edgar Douglas Adrian left Westminster School in 1908 to start premedical studies at Trinity College, Cambridge, he was, in his early days, taken care of by Keith Lucas, a great physiologist and genial constructor of physiological apparatus. It was in Lucas' research on the all-or-none phenomenon in skeletal muscle and in motor nerves that Adrian took an early part. This laid the foundation for the revolution in neurophysiology which Adrian, after Lucas' untimely accidental death, accomplished after World War I.

I attended his lectures and demonstrations in 1919 and worked in his laboratory in the summer of 1920. In the autumn of 1925 I returned to Cambridge as a Rockefeller Travelling Fellow and I will quote a letter I wrote to Professor Johansson in Stockholm on October 7, 1925: "Adrian has got an amplifier consisting of 3 thermionic valves for his capillary electrometer, constructed by Keith Lucas. It works excellently and allows us to record nerve impulses from the sciatic nerve of the frog when we excite the sensory end-plates in the gastrocnemius muscle by loading the muscle. It is our task now to prove definitely that we are registering true sensory impulses; we have already taken a great number of plates with the muscle at different temperatures and with the nerve at constant temperature, and we are already rather certain that this is the case, although we have not yet fully analyzed the plates. I am now going to learn the use of Lucas' device. We will now try a smaller frog muscle with as few sensory nerve

fibres as possible in order to determine the maximum frequency in a single fibre, and further to be able to prove definitely that the all-or-none principle holds for sensory nerve fibres. There is a lot of experiments which can be made with this enormously sensitive apparatus".

In a later letter on November 9, 1925, to Dr. G. Liljestrand in Stockholm I wrote: "We are using the small sternocutaneous muscle of the frog. Only 30 nerve fibres run to that muscle and we obtain large excursions from the action current in a single sensory fibre. The other day (November 3) I managed to make a preparation containing only one sensory fibre and we obtained plates showing impulses of exactly the same size. Only the frequency varied with the tension".

It was a raw and chilly November day. We managed to keep the preparation alive for the whole day and when we went home in the late evening we knew that what we had seen that day would be told in every textbook of physiology within the next ten years. We were quite aware of the importance of our finding — the sensory code. Adrian had made the crucial experiment proving that his and Keith Lucas' idea of the all-or-none principle is valid even for sensory nerves. We knew then how our sensory organs send their information about our outer and inner world to the brain. We found that the transmission occurred according to what today could be called *impulse frequency modulation*. It was wonderful to witness such a decisive experiment.

From this experiment followed a rapid development, Adrian's simple amplifier, made by Pye and Co., and Keith Lucas' capillary electrometer and camera were gradually replaced by new inventions: Matthews' iron-tongue oscillograph, cathode ray tubes, etc, which enabled Adrian and thousands of his

followers all over the world to study the inflow and outflow of nerve impulses and to record the bioelectrical events within the whole nervous system. In nearly all of these activities Adrian was the leader who opened the field or who made the proper analysis and interpretation of bioelectrical phenomena, such as the cochlear microphonics first described by Wever and Bray or the EEG of man discovered by Berger in Germany.

Physiology is a manual science, said the great Ernest Starling once, and Adrian was unusually dexterous. With a box of mechano and a piece of plasticine ("the physiologist's little friend", he used to say) he made many of the small devices we needed as stimulators in our experiments. He was used to working alone and had not more than about a dozen coworkers although his active time in the famous basement room of the Cambridge Physiology Lab. covered nearly 60 years.

As teacher, speaker and scientific author he was supereminent owing to the sublime clarity in his way of expression. It was this clarity which fascinated me when in 1919 as a junior assistant in physiology I read his early papers on nervous conduction in the *Journal of Physiology*. It made me go to Cambridge immediately after the first route of the North Sea was swept free from mines in order to attend his lectures and demonstrations for a couple of months. It was not only neurophysiology I learned; it was the special atmosphere — the intimate company of students and teachers which was so very characteristic for Cambridge and which still is.

Adrian was the prototype of the refined intellectual group of gentlemen which one found in Cambridge and Oxford and he early stood out as one of the most prominent. He was Foulerton Research Professor of the Royal Society from 1929 to 1937 at which time he succeeded Joseph Barcroft as Professor of Physiology until 1951 when he was appointed Master of Trinity College by the King. From 1950 to 1955 he was President of the Royal Society. He shared the Nobel Prize in Physiology and Medicine with Sir Charles

Scott Sherrington in 1932; received the Order of Merit in 1942 and was elected unopposed in November 1967 as Chancellor of Cambridge University from which high office he resigned in 1976. He was succeeded by the Duke of Edinburgh. He was made a baron in 1955; his son Dr. Richard Hume Adrian, well-known biophysicist, will now take his seat in the House of Lords.

When he was going to be installed as Chancellor on the 6th of June 1968, the undergraduates of Trinity College honoured him by putting him as cox in their eight, rowing him on the river Cam to the place of the ceremony in the Senate House.

As Master of Trinity College, Adrian with his charming wife Lady Hester (Dame of the British Empire) developed great hospitality in the Master's Lodge, parts of which had been built in the 15th century. They lived as in a museum with great portraits of Elisabeth I and Isaac Newton and others, but it was a living home where royalties and students were received with the same welcome. Many scientists and young students were cordially received by Adrian who loved to guide them around the venerable Trinity College.

Adrian attended many International Congresses of Physiology ever since the Congress in Groningen in 1913, Paris 1920, Edinburgh 1923, Stockholm 1926, etc. as well as several International EEG Congresses including one in 1969 in San Diego. He was for many years a consulting editor of the *EEG Journal*. The papers which he presented were always in the center of interest. I have a vivid memory of his report at Zürich in 1938 when he started by showing a slide which gave the electric response from the sacculus nerve when he said "good morning" to the pike.

Adrian had many talents as a sportsman. He liked motoring in speedy cars, he was an excellent fencer and he loved climbing in the Alps. He conducted his experiments as a sport. What a quick and hard worker he was in the old basement room of the Physiology Laboratory and you had to be quick when working with him. He was very annoyed when

stray visitors entered his room which very seldom was dusted. If visitors had expected to find elegant and imposing apparatus they were disappointed. But to quote Wilhelm Busch: "Es kommt nicht auf den Käfig an wenn nur der Vogel singen kan". Adrian working capacity was enormous. I once received a letter from him in which he wrote: "it is now 1:30 a.m. and I must stop as I have to prepare a lecture on the cerebellum at 9 o'clock this morning and I know hardly any-

thing about how it works, Do you?"

I would like to quote Longellow:

"The heights that were by great men achieved and kept, were not attained by sudden flight, but they when their companions slept, were toiling upwards in the night" (From the Ladder of St. Augustin).

Physiology has lost one of its greatest followers, a beautiful and noble man.

YNGVE ZOTTERMAN