

## Tribute

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ALFRED FESSARD

Alfred Fessard died in Paris on February 20, 1982 in his 82nd year. He was born in Paris; he graduated at the Sorbonne in 1925 and received his DSc from there in 1936. He began his scientific career as early as 1925 and during this prewar period, he became one of the French pioneers of modern investigations on the nervous system with electrophysiological methods.

In this early period, he was mainly occupied in studying isolated excitable preparations such as nerve or muscle fibres, stretch receptors, ganglion cells and even certain plant cells. His interest was to show that all such structures were able to develop 'autorhythmic' states of activity when treated with different physical or chemical agents; autorhythmicity thus seemed to be a general property of isolated excitable preparations. Because of his encyclopaedic interests, he soon became fascinated also by problems of a very different level of complexity, those belonging to the field of psychophysics and psychophysiology: hence his early studies on sensation (vision, hearing and proprioception) and on voluntary movements in man. Thus, from then on, Fessard was interested in two apparently very distinct, almost opposite fields: the one led him to explore basic nervous mechanisms, the other to investigate processes evolving in complex organized systems. During his whole scientific life, his thinking was shared between these two trends; one towards

biophysics, the other, more synthetic, toward psychophysiology. This eclectic attitude could seem strange nowadays, considering the narrow specialization that exists within the field of neurosciences at the present time. However, this was a sign of his broad intellectual curiosity investigating an immense, as yet little-explored domain with a new technology that he was one of the first to possess.

After several years as an Associate Director of Pieron's laboratory at the Collège de France (Henri Pieron was at that time Professor of Experimental Psychology), Fessard obtained support in the postwar years from the Centre National de la Recherche Scientifique to create in 1949 the 'Centre de Physiologie Nerveuse et d'Electrophysiologie.' This laboratory was located in the building of the Institut Marey. This is where in the early 1900's Marey had conducted the last of his well known observations on animal locomotion. Fessard continued to hold the post of Director of this Institute after being appointed Professor of General Neurophysiology at the Collège de France in 1949. He retired from both positions in 1971.

It is the 'integrated' aspect of Alfred Fessard's scientific work that made him very well known among EEGers, from the very first days when the new methodology had become available. Quite independently he made his first EEG recordings with a string galvanometer, and thus confirmed the (then) recent discovery of the alpha rhythm by Berger. He thus introduced this technique into French medical circles. It was Fessard who first taught the EEG methodology to Frédéric Bremer and we all know the important discoveries the latter made with this new approach in the domain of sleep-waking mechanisms. Working with Durup, Fessard soon came across a new phenomenon: the arrest reaction could be conditioned through a combination of light and sound. Habituation of the arousal reaction to sound would quickly occur after a short period of 'orienting.' If sound was followed regularly by light, the arrest to sound would then reappear after a few trials. This evolution (orienting-habituating-conditioning), described in terms of the EEG arrest reaction in the early 30's, has been repeatedly confirmed since, especially by Jasper and Shagass.

Fessard then turned back to more elementary phenomena; thinking that they would help in understanding the complex activity patterns in the mammalian cortex. It is with this idea in mind that he undertook work on the electrogenic organs that exist in some species of fish. He first studied the Torpedo fish, demonstrating the marked impedance drop in this electric organ at the time of discharge. By nerve degeneration experiments also in the Torpedo, he confirmed the puzzling observation that this organ has no electrical excitability of its own. These findings, as well as many others on these fish species, were of course far away from the conventional 'brain research.' In Fessard's mind they were only steps toward the understanding of synaptic processes and thence, toward the higher brain operations. Fessard encouraged studies on other more complex models, such as the optic tectum in lower vertebrates: though very sophisticated in its detailed histological structure, the tectum was also a kind of 'model' of a centre with radially organized neuronal systems, pretty much resembling the mammalian cortex.

Always interested in the complex brain, as he was thus searching for fundamental mechanisms, he also turned to another field, that of the mechanisms for voluntary movements. He used to recall that in reading Wacholder, he had found an interest in the characteristics of synergistic muscle contractions. With the French neurologist Auguste Tournay, a pupil of Babinski, he undertook some studies on various aspects of muscle contractions; with Tournay, Robert Livingston and Paillard the 'plasticity' of a synergy in hand contraction was carefully investigated. Fessard encouraged studies on the human H-reflex, whose importance in clinical neurophysiology rapidly became widely recognized. Close contacts with the early EEGists in France quite naturally led him to become one of the founders of the French EEG Society ('Société d'EEG et des Sciences Connexes', the latter terms covering the field that is now currently designated as 'Neurophysiologie Clinique'). He was later elected President of this Society. Some of us remember well his chairing the sessions of this Society, his pertinent remarks and his concern that 'fundamentalists' (i.e., those working in the basic sciences) and electro-clinicians find a common language.

French physiologists are particularly grateful for the important role Alfred Fessard played in upgrading the standards of neurophysiology in their country. Having spent some time in Cambridge working with

Bryan Matthews just before the war, and after visiting several laboratories in the United States immediately after the war, Fessard fully realized how much the new method of electrophysiological exploration could contribute to our knowledge of central nervous mechanisms. He met the urgent need for developing such studies in France by fostering investigations not only in biophysics and psychophysiology, the two fields that he had been initially interested in, but also in the broad domain of the physiology of the vertebrate brain.

At the Institut Marey, Alfred Fessard, together with Denise Albe-Fessard (his wife), and a group of senior collaborators sponsored the training of many young French and foreign workers. The Institut Marey thus became a centre attracting international exchanges. Some of us may remember a short but very exciting meeting, held one day in the 50's, when Norbert Wiener, W. McCulloch, Grey Walter and R. Lorente de Nó met there and discussed nervous circuitry and cybernetics. In 1955, Fessard organized an International Symposium under the auspices of the CNRS on 'Microphysiology of Excitable Tissues,' bringing together specialists in peripheral and central nervous mechanisms.

Important contributions were made in several fields by those working at the Institut, including some of the first intracellular explorations in the mammalian cerebral cortex and in cerebellar cortex. The importance of long duration hyperpolarisations in cortical neurones — presumably pyramidal cells — was emphasized; the first demonstration of depolarisations occurring as complex spikes in Purkinje cells was also obtained. Another important discovery was that the distribution of sensory information within the mammalian brain is much more extensive than had been thought from very early experiments based on the distribution of primary evoked potentials in deeply barbiturized preparations. It was known, after the pioneer works of Magoun and Moruzzi that the same areas or the same cells in the reticular 'core' could be activated through stimuli belonging to several distinct sensory modalities. The Marey group largely extended this concept of 'multimodality' or 'converging' cells, demonstrating their broad distribution with extension into various thalamic, striatal and cortical areas. Still other investigations were among the pioneer explorations performed on chronically prepared animals with implanted electrodes, to gain insight into some important electrophysiological correlates of behavioral processes. This was about the period when a large number of studies were carried out, for the first time, in various laboratories, on electrophysiological concomitants of pavlovian or instrumental conditioning. Fessard's interest in these studies was very great: he actively participated in a Symposium organized at Marseilles by Henri Gastaut on 'Conditioning and Reactivity in EEG' in 1955; Fessard and Gastaut also published a well documented survey of these early data in '58.

As Fessard's responsibilities in French and international organizations increased over the years, less time was available for personal participation in research. However, he actively continued to suggest, to stimulate and to discuss the investigations performed around him, maintaining his constant interest in the problems posed by trying to understand the working of the nervous machine. He published thoughtful theoretical essays such as 'Mechanisms of Nervous Integration and Conscious Experience' presented at a landmark symposium on 'Brain Mechanisms and Consciousness,' held in 1953 at Ste. Marguerite (Quebec) under the auspices of the Council for International Organizations of Medical Sciences and UNESCO. Suffice it to quote the chapter headings of this essay ('consciousness and integration; consciousness within the brain; integrative mechanisms in neural networks; integration and time') to realize that Fessard already considered in his review some of the important issues of the mind-body problem that have been so often discussed since among neurobiologists.

Fessard was also present in 1958 at another historical meeting, where the proposal was made for an international organization promoting research on the brain. He enthusiastically supported this proposal and thus participated in the foundation of what was to become IBRO. As a member of the Executive Committee of IBRO and of its Central Council, he was active for many years in fostering international scientific exchanges of young fellows in the various fields of brain science. Fessard remained interested in IBRO affairs, often giving advice to the officers in charge of this international organization, even more

recently when a new impetus was given to it under the active leadership of Mary Brazier.

One of Fessard's last public contributions to the neuroscientific community was to chair a symposium organized by the French EEG Society on theoretical problems posed by the methodology of exploration of the CNS (1974).

A member of the French Academy of Sciences, and of the Académie Nationale de Médecine, he was also elected a foreign member of the Brazilian Academy of Sciences, foreign honorary member of the American Academy of Arts and Sciences and honorary member of the Physiological Society of Great Britain. He was the General Secretary of the Association des Physiologistes from 1968 to 1972.

Alfred Fessard will be remembered by his students, collaborators and friends as a scrupulous and thoughtful man, with an exceptional intellectual curiosity, intellectual honesty and breadth of view. We pay tribute to one of the physiologists who led in the great development of the neurosciences over the past 5 decades; we admire a man whose life has been so intensely devoted to neurophysiology and to neurophysiologists.

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