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Profiles in Cardiology

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Ilya Fadeyevich Tsion, alias Elias Cyon, alias Élie de Cyon

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Elias Cyon (Fig. 1) was born Ilya Fadeyevich Tsion in 1842 into a small Jewish community in Lithuania near the German border. He studied medicine at the Medical-Surgical Academy in Warsaw and the medical faculty of the University of Kiev, and completed his medical studies with a doctorate in medicine and surgery at the University of Berlin, Germany. He subsequently moved to the Medical-Surgical Academy in St. Petersburg and obtained his doctorate in medicine in 1865. He was sent by the Russian ministry of education to Paris to pursue his studies in physiology, probably under the auspices of Claude Bernard, and moved to Leipzig to work with Carl Ludwig. During this time, he established the isolated perfused working frog heart[1] and discovered the baroreflex together with Carl Ludwig.[2]

In 1867, Cyon returned to St. Petersburg and became director of the Physiological Laboratory at the University in 1868. Two years later he became professor of anatomy. He was a brilliant lecturer and did vivisection demonstrations. One of his students was Ivan Petrovitch Pawlow (1849–1936) who became the first physiologist to win the Nobel Prize in Physiology or Medicine in 1904. Against the decision of the faculty on the orders of the Minister of War, Milyutin, Cyon was appointed Professor of Physiology and Chairman at the Medical-Surgical Academy of St. Petersburg and gave his inaugural lecture January 21, 1873;[3] however, as early as 1874, students demanded his removal. Disorder broke out, troops were called out, and the Academy was closed. The termination of Cyon's lectures was announced, and Cyon submitted to the Minister of Education a request to be sent abroad on an official scholarly mission to Leipzig to prepare and publish a work on the methodology of physiologic research. His book and atlas on the methodology of physiologic research[4] was dedicated to his mentor and friend Carl Ludwig. Methods and equipment available at that time were carefully described and illustrated.

Cyon was dismissed from Russian governmental service in 1875 and emigrated to Paris, France. He continued his physiologic research under the patronage of Claude Bernard and received his third doctorate. However, he could not secure a position in Physiology after the death of Claude Bernard in 1878 because of his quarrels with Paul Bert, another scholar of Bernard who was appointed Minister of Education. He then called himself Élie de Cyon and never again resumed residence in Russia. He became an unofficial political agent, newspaper correspondent and editor, self-made diplomat, and cosmopolitan gentleman. He was involved at a very high social level in several activities to establish a Franco-Russian alliance against Germany,[5] both in military and financial terms. In his final years he returned to physiologic and scientific-philosophical topics and published books on cardiac nerves[6] and on the labyrinth;[7] he also wrote an obituary on Eduard Pflüger.[8] He died in Paris in 1910.

His work during the brief period of time he had spent at the Leipzig Physiological Institute resulted in four papers. All of these were communicated and submitted by Carl Ludwig at the Royal-Saxonian Society of Sciences at Leipzig and published in the Proceedings of this Society, most of them with Cyon as the only author, as was the custom with Carl Ludwig. The first of these contributions dealt with the isolated heart (Fig. 2). The heart was excised from a frog, and the aorta and vena cava were cannulated and filled with serum obtained from rabbit blood. This was circulated from the aorta through a glass tube to the vena cava (Fig. 2). When the pressure was ready to be measured, a stopcock was switched at the point where a glass tube was inserted (f), which was connected to a mercury manometer (right hand side). The temperature of the serum in the system was measured with a thermometer inserted into an oblique glass tube srq. This circulatory system was surrounded by glass cylinders in which the fluid could be adjusted to any desired temperature.

With this experimental design it was found that the heart must be filled with a certain amount of serum to induce diastolic filling pressure so that the ventricle can eject fluid. This is one of the earliest experimental hints as to the effect of filling pressure on the contraction of the heart. Although not docu-

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FIG. 1 Elias Cyon (1842–1910). Reproduced from Ref. No. 7.

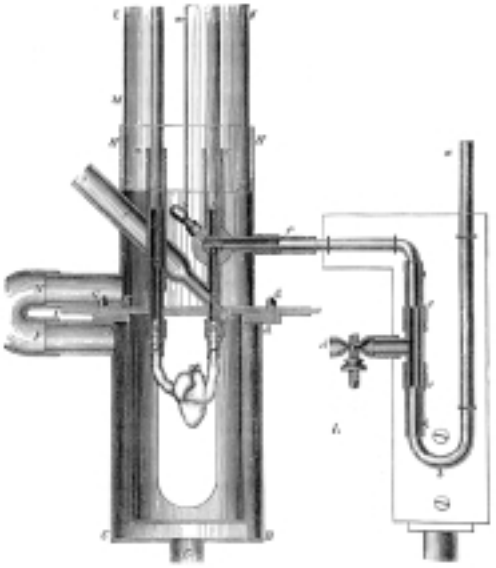

FIG. 2 The first isolated perfused working frog heart. Reproduced from Ref. No. 1.

mented, the response of the heart to increased filling pressure was described, a reaction that was recorded a few years later and named "Frank-Starling mechanism."[9]

Moreover, heart rate increased with increasing temperature reaching a maximum that was different in individual hearts. When the temperature exceeded the maximum, heart rate declined precipitously.[10] It was observed that heart rate increased within the temperature range that occurs in fever. On the other hand, pressure increased already at temperatures slightly above 0˚C to reach a maximum between 15 and 19˚C; beyond 20˚C, there was a decline.[10] It was concluded that there is a dissociation between heart rate and contraction amplitude over a wide temperature range. Given this discrepancy, it was further concluded that each individual heart has its own optimal temperature to pump most efficiently. In the frog heart, the optimal temperature range was between 18 and 26˚C. Finally, it was speculated that there are two components of the "excitation apparatus" of the heart: the first produces the stimuli and in the second, a regulating or inhibiting system modulates the rhythmic transition of the stimuli to the motor nerves of the heart.[1] This is a very early version of cardiac "excitation-contraction-coupling" long before the role of sodium and calcium ions in these processes was known.

This first isolated perfused working frog heart preparation was the prototype of a physiologic heart preparation developed 100 years before the isolated perfused working mammalian (rat) heart was created.[11] This served as an experimental model for many studies on heart function and metabolism in the twentieth century.

Cyon was a talented and productive physiologist who started his career in Leipzig. He was an unfortunate and tragic character. Kennan wrote: "His life remains shrouded in obscurity and can be reconstructed only uncertainly, from circumstantial rather than direct evidence. He never received recognition commensurate with his talents. He wrote in three modern languages. His views, especially with relation to philosophy and science, were ahead of his time."[3]

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