Karl Friedrich Wilhelm Ludwig Biography

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Biography

Karl Friedrich Wilhelm Ludwig was one of the greatest researchers and teachers in the history of physiology. Born in Witzenhausen, Germany, he was the son of a former cavalry officer in the Napoleonic wars who became a civilian official at Hanau. After finishing his schooling at the Hanau gymnasium in 1834, Ludwig studied medicine at the University of Marburg, where he was expelled for dueling and political activities. He later returned to the university and earned his medical degree in 1840 after writing a dissertation on renal secretion. He then progressed through a series of anatomy and physiology professorships combined with research in Marburg in 1846; Zurich in 1849; Vienna, at the Josephinum (1855); and finally Leipzig (1865), where he remained until his death thirty years later.

Ludwig had based his investigation and teaching of physiology on chemical and physical laws, explaining all physiological processes on the basis of measurable and experimentally demonstrable phenomena--not on some speculative "vital force." He invented a number of devices and methods to carry out his scientific approach to physiology, many of them related to his interest in circulation and respiration. In 1847 he devised the kymograph to prove that blood is moved by mechanical forces, not the invisible "vital force." Ludwig's kymograph used a mercury manometer tube and a revolving drum to graphically record blood pressure variations and other vital signs. With later modifications, the kymograph became a standard tool for recording results of experiments.

In 1859 Ludwig and a student designed a mercury pump that separated and measured quantities of gases--oxygen and carbon dioxide--in the blood. Ludwig's *stromuhr*, or stream gauge, of 1867 measured the flow of blood. Ludwig also discovered that he could keep organs alive outside an animal by pumping blood or a saline solution through the excised part, a process called perfusion.

In addition to his important inventions, Ludwig produced a long list of major physiological observations and findings, including discoveries about salivary secretions, the mechanism of cardiac activity, respiration, blood, and blood circulation. Ludwig used his appointment in 1864 to the newly created chair of physiology at Leipzig to create a model teaching center for physiology, which became a world center for physiological study. Ludwig's textbooks of 1852 and 1856 (the first modern one on physiology), his hundreds of students, and his numerous scientific contributions have made him perhaps the most influential physiologist of the second half of the nineteenth century.