



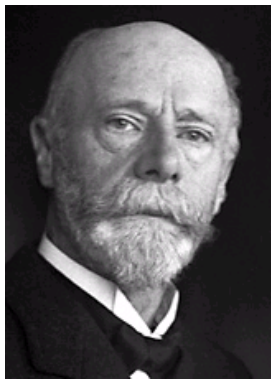
Medicine



## Willem Einthoven

### The Nobel Prize in Physiology or Medicine 1924

## Biography



Willem Einthoven was born on May 21, 1860, in Semarang on the island of Java, in the former Dutch East Indies (now Indonesia). His father was Jacob Einthoven, born and educated in Groningen, The Netherlands, an army medical officer in the Indies, who later became parish doctor in Semarang. His mother was Louise M.M.C. de Vogel, daughter of the then Director of Finance in the Indies. Willem was the eldest son, and the third child in a family of three daughters and three sons.

At the age of six, Einthoven lost his father. Four years later his mother decided to return with her six children to Holland, where the family settled in Utrecht.



After having passed the "Hogere Burgerschool" (secondary school), he in 1878 entered the University of Utrecht as a medical student, intending to follow in his father's footsteps. His exceptional abilities, however, began to develop in quite a different direction. After being assistant to the ophthalmologist H. Snellen Sr. in the renowned eye-hospital "Gasthuis voor Oogglidders", he made two investigations, both of which attracted widespread interest. The first was carried out after Einthoven had gained his "candidaat" diploma (approximately equivalent to the B.Sc. degree), under the direction of the anatomist W. Koster, and was entitled "Quelques remarques sur le mécanisme de l'articulation du coude" (Some remarks on the elbow joint). Later he worked in close association with the great physiologist F.C. Donders, under whose guidance he undertook his second study, which was published in 1885 as his doctor's thesis: "Stereoscopie door kleurverschil." (Stereoscopy by means of colour variation) - one of Einthoven's teachers was the physicist C.H.D. Buys Ballot, who discovered the well-known law in meteorology.

That same year, 1885, he was appointed successor to A. Heynsius, Professor of Physiology at the University of Leiden, which he took up after having qualified as general practitioner in January, 1886. His inaugural address was entitled "De leer der specifieke energien" (The theory of specific energies). His first important research in Leiden was published in 1892: "Über die Wirkung der Bronchialmuskeln nach einer neuen Methode untersucht, und über Asthma nervosum" (On the function of the bronchial muscles investigated by a new method, and on nervous asthma), a study of great merit, mentioned as "a great work" in Nagel's "Handbuch der Physiologie". At that time he also began research into optics, the study of which occupied him ever since. Some publications in this field were: "Eine einfache physiologische Erklärung für verschiedene geometrisch-optische Täuschungen" (A simple physiological explanation for various geometric-optical illusions) in 1898; "Die Accomodation des menschlichen Auges" (The accommodation of the human eye) in 1902; "The form and magnitude of the electric response of the eye to stimulation by light at various intensities", with W.A. Jolly in 1908.

Up till now, his talents had not yet been developed to the full. This opportunity came when he began the task of registering accurately the heart sounds, using a capillary electrometer. With this in view, he investigated the theoretical principles of this instrument, and devised methods of obtaining the necessary stability, and of correcting mathematically the errors in the photographically registered results due to the inertia of the instrument. Having found these methods he decided to carry out a thorough analysis of A.D. Waller's electrocardiogram - a study which has remained classic in its field.



This investigation led Einthoven to intensify his research. To avoid complex mathematical corrections, he finally devised the string galvanometer which did not involve these calculations. Although the principle in itself was obvious, and practical applications of it were made in other fields of study, the instrument had to be precisioned and refined to make it usable for physiologists, and this took three years of laborious work. As a result of this, a galvanometer was produced which could be used in medical science as well as in technology; an instrument which was incomparable in its adaptability and speed of adjustment.

He then, with P. Battaerd, took up the study of the heart sounds, followed by research into the retina currents with W.A. Jolly (begun earlier with H. K. de Haas). The electrocardiogram itself he studied in all its aspects with numerous pupils and with visiting scientists. It was this last research which earned him the Nobel Prize in Physiology or Medicine for 1924. In addition to this the string galvanometer has proved of the highest value for the study of the periphery and sympathetic nerves.

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In the remaining years of his life, problems of acoustics and capacity studies came within the sphere of his interests. The construction of the string phonograph (1923) could be considered as a consequence of this.

Einthoven possessed the gift of being able to devote himself entirely to a particular field of study. (His genius was actually more orientated towards physics than physiology.) As a result he was able to make penetrating inquiries into almost any subject which came within the scope of his interests, and to carry out his work to its logical conclusion.

Einthoven was a great believer in physical education. In his student days he was a keen sportsman, repeatedly urging his comrades "not to let the body perish". (He was President of the Gymnastics and Fencing Union, and was one of the founders of the Utrecht Student Rowing Club.) His first study on the elbow joint resulted from a broken wrist suffered while pursuing one of his favourite sports, and during the somewhat involuntary confinement his interest was awakened in the pro- and supination movements of the hand and the functions of the shoulder and elbow joints.

The string galvanometer has led countless investigators to study the functions and diseases of the heart muscle. The laboratory at Leiden became a place of pilgrimage, visited by scientists from all over the world. For this, suffering mankind has much to owe to Einthoven. In electrocardiography the string galvanometer is the most reliable tool. Although it has been superseded by portable types and by models utilizing amplification techniques used in radio communication (Einthoven has always mistrusted the use of condensers, fearing the distortion of curves), cardiograms from the string galvanometer have remained the standard of reference in numerous cases to this day.

Einthoven was a member of the Dutch Royal Academy of Sciences, the meetings of which he hardly ever missed. He frequently took part in the debates himself, and his sharp criticism frequently found weaknesses in many a lecture.

Einthoven married in 1886 Frédérique Jeanne Louise de Vogel, a cousin, and sister of Dr. W.Th. de Vogel, former Director of the Dienst der Volksgezondheid (Public Health Service) in the Dutch East Indies. There were four children: Augusta (b. 1887), who was married to R. Clevering, an engineer; Louise (b. 1889), married to J.A.R. Terlet, pastor emeritus; Willem (1893-1945) - a brilliant electro-technical engineer who was responsible for the development of the vacuum model of the string galvanometer and for its use in wireless communication, and who was Director of the Radio Laboratory in Bandung, Java; and Johanna (b. 1897), a physician.

He died on the 29th of September, 1927, after long suffering.

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