



Fig. 1. Robert Bárány (1876–1936) as a young physician. He received his education in Vienna under the supervision of Adam Politzer. He was awarded the Nobel Prize in medicine and physiology in 1914. Bárány was a prisoner-of-war in Russia in 1914–1915. He was head of the Department of Otolaryngology in Uppsala from 1917, and was full professor at Uppsala University from 1926.

beginning Bárány had no explanation for why the direction of the nystagmus was dependent both on the temperature of the water and on the position of the head. In his Nobel lecture in Stockholm in 1916 (4), which was delayed because of his captivity in Russia, Bárány told how one day he suddenly understood the underlying mechanism. "I remembered the stove for heating the bath water and my surprise as a child at finding that the water immediately above the hearth felt cold, while higher up it was so hot that one burnt one's fingers. The labyrinth was like the stove, i.e. a fluid-filled vessel." In 1907 Bárány presented his subsequently so controversial theory that caloric stimulation leads to movements in the endolymph, which in turn induces nystagmus (5). In this report he also explained why the nystagmic direction was dependent on the position of the head. Bárány considered that the reversal of the nystagmus indicated endolymphatic movements in the opposite direction in the semicircular canals. He himself illustrated this concept with a simple diagram (Fig. 2). This shows two vessels filled with water at 37°C. If one wall of the vessel is cooled, this results in a downwardly directed movement of the water. When the same vessel is then turned upside down and the wall is again cooled, a downward movement of the water again occurs, which is equivalent to a reverse movement in the vessel.

Bárány's theory has gained the support of several research workers. The occurrence of thermally induced movements of fluid in capillary tubes mimicking a semicircular canal was observed by Maier and Lion (6). In his classical experiments on pike, Steinhausen (7) noted that after local heating, the Indian-ink-stained endolymph in a vertically positioned semicircular canal flowed upwards. This resulted in a cupular deviation.

Objections to Bárány's theory

Over the years four principal objections have been raised against Bárány's theory that caloric stimulation causes convective currents in the endolymph. These consist in claims that the following observations cannot be explained by this theory: