

THEODOR SCHWANN

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The name of Theodor Schwann (1810-1882) is familiar to anybody involved in the neurological sciences. When prompted with the name of this German biologist, the first thing that comes to mind is the *Schwann cell*. To have his name associated with a particular type of cell seems most appropriate since Schwann was one of the founders of the cell doctrine. This theory revolutionized biology by establishing that the cell is the elementary unit of life, in animals as well as in plants. All the anatomy and physiology of the nervous system rests on this basic concept.

A GERMAN EDUCATION AND A BRILLIANT DEBUT

Theodor Schwann was born in 1810 in Neuss near Düsseldorf (Germany). After secondary school at the Jesuit College of Cologne, he entered the University of Bonn in 1829, where he studied natural sciences and medicine. There he first met Johannes Peter Müller, a pioneer of experimental methods in comparative anatomy and physiology. He started his clinical training in Würzburg and two years later, moved to the University of Berlin where Müller had been appointed professor of anatomy and physiology. Under his supervision, he prepared his thesis on the necessary role of oxygen in the development of the chicken embryo. In 1834, he obtained his MD and became assistant to Müller. He then began a large series of microscopic and physiological studies on nerves, muscles and blood vessels. His experiments on the muscle, establishing the first tension-length diagram, paved the way for a new experimental approach in neuromuscular physiology, that would make famous the Berlin laboratory with Du Bois-Reymond and Helmholtz. The first amongst Müller's disciples, Schwann proclaimed the necessity of a mechanistic explanation of life phenomena. In 1835, while investigating digestive processes, Schwann isolated a substance responsible for digestion in the

stomach and named it *pepsin*. He also identified the role played by microorganisms in alcohol fermentation and putrefaction processes. This work anticipates the researches of Pasteur who would later acknowledge its importance. Another now familiar term in physiological studies, *metabolic*, was coined by Schwann to characterize the chemical changes that take place in living tissue.

In 1838, his friend the German botanist Matthias Schleiden, who worked at the University of Jena, published an article discussing the structure and origin of plant cells. Despite many flaws, this paper contains the essential idea that a basic cellular structure was common to all plants. Schwann soon came to the conclusion that the model proposed by Schleiden could be extended to animals. This appeared quite straightforward in most tissues but Schwann had still some hesitation for muscle and nerve. While studying more closely peripheral nerves, he first described the membranous wrapping, produced by a specialized type of cell, which envelops the prolongation of nerve cell. Schwann's name has been associated with both the supporting cell and this membranous sheath. Today, the term *Schwann sheath* has become obsolete, whereas the name of *Schwann cell*, remains universally used. In a remarkable synthesis, Schwann united all previous histological observations and developed a general principle, known as the cell theory: all tissues, from plants or animals, are composed of a basic structural unit, the cell. This theory was expounded in his book *Microscopical Researches into the Accordance in the Structure and Growth of Animals and Plants* which appeared in German in 1839 and was translated into English by the Sydenham Society in 1847. This theory gained immediate acceptance and was the starting point for many histological, physiological and pathological works. As conceived by Schwann, the theory contained inaccuracies and errors, particularly concerning cells formation and reproduction. During the following decade, Rudolf Virchow would correct and extend Schwann's theory, both conceptually and in a great number of details.

A BELGIAN PROFESSORSHIP AND AN AUSTERE ACADEMIC CAREER

After these fruitful years of a precocious genius, Schwann's long academic career appears rather disappointing. In 1839, the Université Catholique de Louvain, in Belgium, offered Schwann the chair of anatomy. There he was appreciated as a conscientious professor. However, his scientific production of this period is limited to one single significant paper showing the essential role of bile, studied by establishing biliar fistulas in dogs. In 1848, he left Louvain for the University of Liège (Belgium), enticed by his compatriot Spring, whom he succeeded first to the chair of anatomy and ten years later to the chair of physiology. Although he no longer took an active part in the scientific movement, he remained an attentive observer of the advances in anatomy and physiology. In his small laboratory, he became more of an inventor, improving or designing ingenious physiological devices, among others a portable closed circuit respiratory apparatus allowing human life in an unbreathable environment. This period was characterized by intense philosophical questioning. His profoundly Catholic mind was tortured by existential doubts. He went through a mystical phase, with marked neurotic sides, and he led an isolated and melancholic life. He began the composition of a vast treatise. This *Theoria*, which should have been a general system of organisms, started from cell theory, going through brain function and psychology to theological considerations. In 1882, three years after his retirement, he died in Cologne.

AN INTERNATIONAL RENOWN

Schwann's contribution to science was widely acknowledged during his lifetime. In 1878, his 40 years of teaching were celebrated with pomp in Liège and most of the greatest biologists from all countries joined in the festivities. An original manifestation of gratitude was organized: scientists were asked to send their photographic portrait with an autograph. Two hundred and sixty three pictures were thus collected. The list of names is impressive and includes Billroth, Bowman, Charcot, Darwin, Ferrier, Kölliker, Krause, Marey, Meynert, Paget, Retzius, Sharpey, Virchow, von Recklinghausen, Waldeyer, to cite just a few.

This splendid photographic album with the dedication: *To the creator of the cell theory, the contemporary biologists*, was offered to the master.

GENERAL REFERENCES FOR FURTHER READING

Clarke, E. and Jacyna, L. S. (1987). Nineteenth-century origins of neuroscientific concepts. University of California Press, Berkeley and Los Angeles.

Harris, H. (1999). The birth of the cell. Yale University Press, New Haven & London.

Shepherd, G. M. (1991). Foundations of the neuron doctrine. Oxford University Press, New York.

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FIGURE

Lithographic portrait of Theodor Schwann by Louis Tuerlinckx (1846), courtesy of Prentenkabinet, Centrale Bibliotheek, Katholieke Universiteit Leuven, Belgium