François Magendie (1783–1855)

Frank W. Stahnisch

Received: 4 July 2009 / Revised: 14 July 2009 / Accepted: 4 August 2009 / Published online: 20 August 2009
© Springer-Verlag 2009

François Magendie is often referred to as the ‘father of experimental physiology’ [2]. He introduced animal experimentation to scientific medicine and conducted pioneering neurophysiological work in several fields. These included the cerebrospinal fluid system (‘foramen of Magendie’), enhanced understanding of facial nerve functions, and the differentiation of the sensory and motor properties of the spinal nerves (‘Bell-Magendie law’) [5]. Over and above, Magendie was an ‘all-rounder,’ who investigated many body systems, including the heart, blood vessels and liver, and who conducted research over breathtakingly long periods. For example, his work on absorption in the intestines, lymphatic and venous system stretched more than 40 years (1809–1850) [8]. Magendie was educated not only in medicine, graduating with a M.D. from Paris University (1808), but he also received training as a resident (*interne*) at the *Hôtel Dieu*, becoming an adjunct clinician (*docteur agrégé*) to the Parisian hospitals [7]. Unlike many nineteenth century physiologists—including his pupil Claude Bernard (1813–1878) or Johannes Mueller (1801–1858) in Germany—Magendie’s hospital work enabled him to develop many scientific hypotheses from clinical observations. In addition, he learned to test laboratory results in patients, use

physiological protocols to improve clinical practice, and facilitate the emergence of his discipline [10].

Magendie (Fig. 1) was born to a surgeon, Antoine Magendie, and his wife, Marie Nicole de Perey, in Bordeaux. His father was a supporter of the French Revolution, immersing young François in the philosophical ideas of Jean Jacques Rousseau (1712–1778). In 1792, Antoine Magendie moved his family to Paris to assume a role in the revolutionary administration [9]. From 1789 to 1796 the revolutionary government dissolved French medical schools, which were considered ‘royalist strongholds’; the Paris University had by the time of Magendie’s inscription not fully recovered from these changes. Consequently, after graduating from the *lycée*, Magendie began to study medicine in peripheral *collèges* and as an apprentice to senior physicians.

Following Maximilien de Robespierre’s (1758–1794) death, the *idéologues* Étienne Bonnet de Condillac (1715–1780), Destutt de Tracy (1754–1836), and the physician-philosopher Pierre Cabanis (1757–1808) became the most influential intellectuals in French academia, philosophy,

F. W. Stahnisch (✉)
Department of Community Health Sciences,
University of Calgary, Heritage Medical Research Building
Room G30, 3330 Hospital Drive N.W.,
Calgary, AB T2N 4N1, Canada
e-mail: fwstahni@ucalgary.ca

F. W. Stahnisch
Department of History, University of Calgary,
Social Sciences 656, 2500 University Drive N.W.,
Calgary, AB T2N 1N4, Canada

Fig. 1 Unsigned oil portrait painting of François Magendie (ca. 1803) by Paulin Jean Baptiste Guérin (courtesy of the Collège de France, Paris)

and epistemology. They greatly influenced Magendie's views about knowledge generation in medicine, the mind–body relationship and the general conduct of experimental research. The *idéologues* analyzed human ideas, organizing these into 'elementary' sensations [6]. This body of work shaped Magendie's personal epistemology on the avoidance of theory, his considerable emphasis on laboratory results, and his therapeutic approaches to new experimental findings [3]. Magendie actually saw himself as a (physiological) ragpicker (*chiffonnier*): "With my spiked stick in my hand and my basket on my back, I traverse the field of science and I gather what I find" [7]. This statement is no slip of tongue, but a calculated refusal of theoretical speculations—Bernard later even quipped that "Magendie had only eyes and ears, but no brain when it came to experimentation" [2]. Magendie's self-perception was all but coquettish; it was a recurring theme (*Leitmotiv*) throughout his career. From his first publication, the essay '*Quelques idées générales sur les phénomènes particuliers aux corps vivans*' (1809), which appeared in the *Bulletin des sciences médicales de la Société Médicale d'Émulation*, Magendie praised experimental observation as the *via regia* to medical knowledge. In his '*Quelques idées*' Magendie expressively pointed out that with regard to neurophysiology, physicians like Xavier Bichat (1771–1802) often mistakenly equated internal physiological actions with 'insensible organic contractility', an entity that was not real: "...they speak of these properties as if they really existed and as if they were established and verified by observation.... Whatever their explanation for these phenomena, we have to say that they are not proven by true observation" [1].

Beyond the philosophical influence of the *idéologues*, Magendie acquired a practical research style by working with the surgeons François Chaussier (1746–1828) and Alexis Boyer (1757–1833). Under the guidance of the anatomist and surgeon Barón Guillaume Dupuytren (1777–1835), Magendie began to experiment with an extension of morphological work—using 'ablations,' 'extirpations,' and 'ligations' of structures as preferred methods, which he also taught at the *Séminaire St. Nicolas de Chardonnet*. In 1803, Magendie mastered the *concours d'internat* and began his clinical residency at the *Hôpital Saint-Louis*. In 1811, he became *prosecteur* at the Faculty of Medicine. However, he still required the support of his friend Henri Marie Husson (1772–1853) to conduct research at the *Hôtel Dieu*, an important experience that helped him relate clinical observations to experimental findings. In one example, Magendie compared individuals with spinal cord lesions to experimental findings on sensory and motor functions, as described in '*Expériences sur les fonctions des racines des nerfs...*' (1822). Other examples include the

comparison of psychiatric patients to work on cerebrospinal fluid abnormalities in '*Mémoire sur un liquide qui se trouve dans le crâne et le canal vertébral ...*' (1825), and that of individual stroke cases to pathological specimens of the brain showing intracerebral bleeding in '*Leçons sur les Fonctions et les Maladies du Système Nerveux*' (1840/1841).

In 1826 Magendie obtained a senior clinical position at the *Salpêtrière* and, in 1831, he became the first professor of physiology (*médecine expérimentale*) at the *Collège de France*. He was at the high point of his career when elected to Vice-President of the *Académie des Sciences* in 1836, a distinction that enhanced his own reputation as well as that of the young but emerging discipline of physiology. During his tenure at the *Collège* and *Académie*, he headed committees on therapeutic drug efficacy, substitute nutrients, and cholera epidemics. Magendie also mentored pupils, most notably Bernard, who succeeded him in the chair in 1855, and Henri Milne-Edwards (1800–1885), who became the comparative physiologist at the Sorbonne. Magendie had a tremendous influence on the 'investigative enterprise' in nineteenth-century medicine [4]. Although Magendie was also interested in fields other than neurophysiology, he had a lifelong fascination with the nervous system. Magendie himself said in '*Leçons*': "*Messieurs...Not much remains to be done with regard to the topography of the nervous system. But, on the contrary, everything has to be found out in respect to the physiology of this system. Fact is, the hand (of the experimenter) that patiently follows a small nerve bundle is much less likely to get lost than the imagination, which seeks to fathom the mysterious functions*".

Acknowledgments The author is grateful to the Hotchkiss Brain Institute (HBI) and the Calgary Institute for Population and Public Health (CIPPH) for their support, and wishes to thank Jennifer Lewis for her meticulous adjustment of the English language.

References

1. Albury WR (1977) Experiment and explanation in the physiology of Bichat and Magendie. *Stud Hist Biol* 1:47–131
2. Bernard C (1856) Fr[ançois]. Magendie. *Leçon d'ouverture du Cours de Médecine du Collège de France*. Baillière, Paris
3. Canguilhem G (1996) *Le normal et le pathologique*, 6th edn. Presses Universitaires de France, Paris
4. Coleman W, Holmes FL (eds) (1988) *The investigative enterprise: experimental physiology in nineteenth-century medicine*. University of California Press, Berkeley
5. Cranefield PF (1974) *The way in and the way out*. François Magendie, Charles Bell and the roots of the spinal nerves: with a facsim. of Charles Bell's annotated copy of his *Ideas of a new anatomy of the brain*. Futura, Mount Kisco
6. Gross M (1979) The lessened locus of feelings: a transformation in French physiology in the early nineteenth century. *J Hist Biol* 12:231–271

7. Olmsted JMD (1944) François Magendie—pioneer in experimental physiology and scientific medicine in xix century France. Henry Schuman, New York
8. Stahnisch FW (2003) Ideas in Action—der Funktionsbegriff und seine methodologische Rolle im Forschungsprogramm des Experimentalphysiologen François Magendie (1783–1855). LIT Press, Hamburg
9. Temkin O (1946) The philosophical background of Magendie's physiology. *Bull Hist Med* 20:10–35
10. Weisz G (2006) Divide and conquer. A comparative history of medical specialization. Oxford University Press, Oxford