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Book Reviews

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BOOK REVIEWS

Helena Eccles and Hans J. Biersack, eds. *Sir John Eccles. In Memoriam – A Tireless Warrior for Dualism*. Landsberg, Germany: Ecomed Verlagsgesellschaft, 2000. 192 pp. Ill. €29.00 and SFr51.00 (cloth).

This book, devoted to the memory of Sir John Eccles, is subtitled "A Tireless Warrior for Dualism," but it is more than just an overview of his philosophical opinions. The first four chapters contain many interesting and lively details on some of the major episodes of Eccles' scientific life. Marianne Fillenz concentrates on Eccles' early professional years in Dunedin, New Zealand, where Eccles arrived in 1944 from Sydney, after staying in Oxford before World War II, working under Sir Charles Sherrington on what was to become his life-long project: synaptic transmission. At this time, he strongly believed that transmission in the central nervous system was electrical, unlike many other scientists who believed that transmission was chemical at junctions with smooth muscles. In 1944, he described for the first time a "synaptic potential" in the frog spinal cord. He then studied inhibitory processes in the spinal cord and concluded that interpolating a short axon, Golgi type interneuron was indispensable. He also made important contributions to the field of long-term changes of synaptic transmission, due to use or disuse, or in other words, the problem of synaptic plasticity. Eccles' final and most superb work in New Zealand, was the first intracellular recording from cat spinal motoneurons with glass microelectrodes. The findings were consistent with the prediction of the presence of an inhibitory interneuron, but the data contradicted the theory of electrical transmission. Thus, by fairly accepting the idea of a chemical transmitter, Eccles rejected his "cherished theory" (p. 22).

The second chapter is written by Masao Ito who joined Eccles' group in 1959. By this time, Eccles had left Dunedin and was Professor of Physiology at the Australian National University in Canberra. Ito remembers the time (this was in 1962), when Eccles became interested in higher levels of the central nervous system, such as the hippocampus, thalamus, and cerebellum. Soon after in 1963, John Eccles was awarded the Nobel Prize in Physiology or Medicine. Back in Japan, Ito was asked by Eccles to write with him and Janos Szentagothai, the well-known monograph entitled *The Cerebellum as a Neuronal Machine* (Eccles et al., 1967).

The third chapter was written by Piergiorgio Strata who worked with Eccles, first in Canberra (1965-1966), and then in Chicago where Eccles, who was due to retire from the chair in Canberra, had moved in 1966. Strata describes the epoch when Eccles and his very active groups explored all of the details of the cerebellar circuitry. The last historical chapter is by Roger Nicoll who worked with Eccles and his new wife, Helena Taborikova (Lady Helena) for two years after they moved to Buffalo. This was Eccles' last working place. After leaving Buffalo, he retired and settled down in Contra, Ticino, Switzerland. However, as Nicoll and so many others who met him at that time realized, his retirement was anything but a true retirement. He remained very active, attending scientific meetings, and maintaining his philosophical interests.

In her chapter, Gabriele Stotz-Ingenlath gives an interesting overview of Eccles' philosophical thinking and dualistic philosophy. An important event took place in 1945 when Eccles met Karl Popper in Dunedin. They established a friendship that had a profound influence on both of them. Popper's influential ideas on the importance of deduction versus induction in scientific discovery – described in detail in *Logic of Scientific Discovery* – greatly impressed Eccles (Popper, 1959). Eccles adopted Popper's three worlds theory to illustrate his own views on *The Self and Its Brain* (Popper and Eccles, 1977). World One contains physical objects and states; World Two discusses states of consciousness and mental states; and, World Three describes knowledge, man-made

culture, and theoretical systems. Worlds One and Three can only communicate and interact through World Two. World One contains the neural events of the brain, and the brain and mind interact at the interface between part of World One (''biological liaison brain'') and World Two with its three components, outer sense, will, and inner sense. The unity of our ego is not the result of a neurophysiological process, but that of the integrating power of our self-conscious mind. The brain and the self-conscious mind are distinct entities, as is well-explained in Popper and Eccles' book *The Self and Its Brain*. Of course they interact (thus, this attitude is called ''interactionism''). According to Eccles, this interacting machinery is localized in the ''liaison-brain'' in the prefrontal lobe of the dominant hemisphere. He attributed the uniqueness of the Self or the Soul to a supernatural spiritual creation. Animals are conscious, but they do not have Selves. Materialistic belief, reducing the spiritual world to patterns of neuronal activity, was to him, as a dualist, ''an incredible demeaning of the human mystery . . . and must be classed as superstition'' (p. 73).

Cordula Schmolke, Roman Kernchen, and Michael Gerharz then discuss their own data on fine cortical microarchitectonics. Even though they do not directly contribute to our knowledge of Eccles' ideas and doings, they indeed develop issues that were in the line of his thinking about mind-brain interactions at the microstructural level. Other such interactions, as suggested through cerebral blood flow imaging, are discusssed by Ludwig Feinendegen and by Hans-Jürgen Biersack, E. Klemm, and Frank Grünwald, in their chapters. These data, obtained in a variety of ''internal'' brain states (memory task, coma, hypnosis, sleep, etc.), all visualize how the brain may be activated ''by its Self'' and are well in line with Eccles' views on mind-brain relationships.

With Friedrich Beck, one of his last collaborators, Eccles applied Heisenberg's uncertainty principle to mind-brain interactions, introducing a decisive role for the quantum indeterminacy into brain dynamics (the quantum logic replacing the classical ''if-then'' theory). In his search for sites at which the mind and brain interact, he was very much struck by the peculiar architecture of the cerebral cortex, with its numerous, densely packed apical dendrites (he called this organization ''dendrons,'' as described by Schmolke et al., mentioned above). To him, these interactions took place in the dendrons. It is through them that the mind can act as spatio-temporal patterns, these units of consciousness being termed ''psychons.'' The dendron-psychon action involving the synapses requires that quantum physics operates at the synaptic level, controlling exocytosis. As reported by Beck in a paper with Eccles in 1992, exocytosis could be a candidate for quantum processes as it is the basic unitary activity of the cerebral cortex. The probability of exocytosis is much less than the probability of an incoming impulse reaching the synapse. Beck concludes that ''quantum logic makes the struggle between Descartes' dualism and monism to a certain extent obsolete because World One in Popper's terminology is no longer causally closed . . . making discussions beyond the limitations of science possible'' (p. 178).

To end this review, why not quote some of Eccles' last words: ''I have spent my life looking for the mystery, he said, now I am sure I'll get it'' (p. 185). Finally, a quote from his last book *How the Self Controls Its Brain* (1994, p. 180): ''there is recognition not only of the transcendent God, the creator of the cosmos, the God in which Einstein believed, but also of the immanent God to whom we owe our being.''

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Shigehisa Kuriyama. *The Expressiveness of the Body and the Divergence of Greek and Chinese Medicine*. New York: Zone Books, 1999. vi + 340 pp. Ill. $32.00 (cloth); $18.00 (paper).

It is well-known that perception and expressiveness of the body are different, subtly or grossly, among different cultures and societies. For the medical profession which studies the body most intensely, these differences would be assumed to be minimal. However, the image of the body and the doctrines of its diseases diverged so widely between Greek and Chinese medicine that you may be tipped off guard from your conventional beliefs.

Shigehisa Kuriyama commands extensive knowledge of ancient Greece and Greek medicine, as well as ancient China and Chinese medicine. He has the vantage point of objectively viewing the evolution of body expressiveness in two widely separated ancient civilizations whose subsequent development of medicine has continued to influence modern medical practice.

The book begins with a statement and a figure. The statement reads "Versions of the truth sometimes differ so startlingly that the very idea of truth becomes suspect. . . . The true structure and workings of the human body are, we casually assume, everywhere the same, a universal reality. But then we look into history, and our sense of reality wavers. . . . The accounts of the body in diverse medical traditions frequently appear to describe mutually alien, almost unrelated worlds" (pp. 7-8). The figure shows side by side a muscular man from Vesalius' *Fabrica* (1543), and a flabby Chinese man with acupuncture tracts and points from Hua Shou's *Shisijing fahui* (1341). It then states "Muscularity was a peculiarly Western preoccupation. On the other hand, the tracts and points of acupuncture entirely escaped the West's anatomical vision of reality" (p. 8).

Why did such big differences exist? Undoubtedly, it is a complex issue. Kuriyama observes that such divergence was not so marked in the early medical works, such as the Hippocratic Corpus (450–350 B.C.) and the *Mawangdui* manuscripts (168 B.C.). During these periods, Greek physicians mentioned mostly flesh and sinews rather than muscles, while their Chinese counterparts had not yet accomplished the art of acupuncture needling. In the subsequent developments, mainly the illustrious works of Galen (130–200 A.D.) and the canonical Chinese classics of *Huang di neijing* and *Nanjing* (probably around 150 A.D.) that the muscle and the acupuncture commanded the prominent position, respectively in Western and Chinese medicine.

Kuriyama advances the thesis that such historical changes in the conceptions of the body were due primarily to particular uses of the senses and particular ways of thinking. To elucidate these points, he presents his arguments in three parts that consider styles of touching, of seeing, and of being.

The main theme of touching is pulse taking. In the art of pulse diagnosis, Greek and Chinese physicians not only used different words, but also used words differently. Galen published seven treatises on the pulse, culminating in the birth of sphygmology. The Chinese developed the particular concept of the pulse (*mo*) and excelled in the ways of pulse taking (*qiemo*).

In seeing, Greek and Chinese also differed greatly. The Greek medical emphasis on muscle largely originated from a culture that saw the muscular body as a symbol of being healthy, strong, and brave. This tradition of the body's muscularity can be traced back as early as the fifth century B.C. in the works of Homer and the metopes of the Parthenon. Galen's anatomical work on muscles led to the concept of structure and function, and further nurtured the muscle consciousness and the relationship between muscle's purposive actions and self-awareness. In China, dissection and morphology did not inspire comparable enthusiasm of Western anatomical ideas. Instead, functional structures of the human body were divided into the body surface and the inner core. The concept of the body's interior centered around five *zang* (solid organs) and six *fu* (hollow organs). Seeing the body surface, particularly the color (*wangse*), has been an integral part of the diagnostic art. Furthermore, as an analogy to the macrocosm, the body was also ruled by five phases (wood, fire, earth, metal, and water) which were represented by the five colors of green, red,

yellow, white, and black. Chinese physicians saw the five colors as manifestations of these phase forces operated through cosmic changes. As a result, color acquired cosmic metaphor and significance. Physicians who could master both the pulse (*mo*) and the color (*se*) were regarded to have achieved professional perfection.

The last part of the book is devoted to the vital forces of blood and breath. Again, the contrast between Greek and Chinese medicine was striking. While bloodletting was popular in Greek and Western medicine, the Chinese developed acupuncture probably initially based on the topography of the blood vessels. Intriguingly, the breath was transformed into *qi*, which Chinese philosopher Zhuangzi equated with life. In Chinese medicine, blood and *qi* were considered essentially the same, representing the complementary vital forces as *yin* and *yang*. Moreover, the breath drew an intimate relation with the wind, which was considered the origin of hundreds of diseases.

Eventually, the history of the body also becomes the history of the ways of viewing ourselves in the world. Kuriyama points out that systematic dissection allowed Greek doctors to peer into the inner core of the body, and to find out, as declared by Galen, that ''the usefulness of all the organs is related to soul'' (p. 264), and ultimately related to a divine design. Thus, the study of the body altered Western perspective on the anatomical imagination. On the other hand, the classic Chinese *xushi* (full and empty) theory for understanding sickness assigned cosmic significance, and considered outside influences, particularly the wind, the causes of the disease, and even the disease itself.

We must admit that the issues of the evolution of body image and the concepts of disease is far more complex, and the respective roles played by medicine, culture, philosophy, geography, and politics remain to be further explored. Kuriyama seems to regard the evolution as largely a continuous process which resulted from complex interactions among those factors.

To the reviewer, systemic dissection was probably the major, if not the essential, step to distinguishing Greek medicine from Chinese medicine. It was like Thomas Kuhn's ''paradigm shift.'' Dissection was nearly non-existent in China because of ancestor worship and Confucian teaching forbidding harm to the body of parental endorsement. Consequently, human dissection became a social taboo which has persisted to even today. Without anatomical and physiological knowledge, ancient Chinese doctors had to find alternative ways to understand the body and its diseases.

The book is a scholarly work by an author who admirably knows not only the history of medicine, both Western and Chinese, but also the history, culture, philosophy, and society of these countries. The arguments are analytical and philosophical. In addition, the book is beautifully written from an original reading of early medical works. For those who are not familiar with Chinese history and medicine, the book, especially the parts on Chinese medicine, may not so easily be comprehended fully.

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Marc Renneville. *Le Langage des Crânes: Une Histoire de Phrénologie.* Paris: Le Seuil, 2000. 354 pp. Ill. No price listed.

Phrenology is part of those ''relicts'' of science history which attract and fascinate the historian. Its forlorn greatness lies in having pointed out a new scientific object, not so much a real object – a skull of osseous bumps – but a cultural one, better yet, a problem: the relationship between material territories and ideal faculties. How this came to be, what was the event advocated enthusiast craniologists who thought to be able to ostensively demonstrate human faculties, and above all, what relationship this scientific adventure had with politics, society, pedagogy, and the *savants* physicians of the first half of nineteenth century, is rigorously reported in this well-documented work by Marc Renneville, led by a preface by G. Lantéri Laura who also published in 1970 an important history important history of phrenology.

The value of Renneville's book lies in its constant attention toward what was the background,

the audience, the target public of the discipline ''invented'' by the Viennese physician Franz Gall. Thus, the relationship of Gall's discipline with the official science is taken into consideration: the mingling of tensions and political-pedagogical hopes with the presumed diagnostic and predictive abilities of cranioscopy, and the unkept promises of ethnic-anthropological nature in the formulation of research programs in voyages to far away lands in search of ''primitive'' skulls.

Phrenology entered the gates of science through the examination of Franz Gall's and Johann Caspar Spurzheim's theories by Georges Cuvier. It later will come out from the window of divinatory applications and in fairgrounds as a circus freak, together with animal magnetism, metallotherapy, dowsing. Rather than turn his attention to the theoretical contents of the discipline, meticulously recorded in the first chapter of the book, Renneville considers the practical relapse it had and it was thought it could have at the moment of its major peak of popularity in the 1820s and 1830s. The second chapter is particularly fortunate in pointing out the relationship between phrenology and politics, its bonds with Saint-Simon's disciples and with the *Carbonari* in the person of Gall's most important disciple, the Italian Giovanni Fossati.

Topical moment of this success was the foundation of a scientific society, *La Société Prenologique de Paris*, at a time in which not even Xavier Bichat and Hyacinthe Laennec's famous clinical anatomy method earns such a vast public support. The proof of this success was the adhesion to the movement given by Victor Broussais, the most important physician among those converted to phrenology. The success of the discipline was even more important among the Alienist physicians, who found in phrenology the promise of salvation from the impasse between a science incapable of pointing out the lesions responsible for insanity and the uncertainty of Philippe Pinel's moral treatment. Less convincing is the long paragraph dedicated to the trip of the phrenologist Alexandre Dumoutier with Jules Dumont d'Urville's expedition in Southern seas, a little prolix in telling the adventure and prejudices of the naturalist during his voyage on the *Astrolabe*.

Another emphasis of stimulating epistemological relevance is the use of Thomas Kuhn's interpretative principles to the decline of the phrenology research program. The example reported in the third chapter of Jean-Baptiste Sarlandière's craniometer is very clear: when the estimations obtained with the instrument didn't match the theory, it wasn't the latter to be questioned but the instrument's imperfection. The decline of phrenology, reported in the last chapter, coincides with the scientific attacks made by Louis-Francisque Lélut and Pierre Flourens and with the end of the July monarchy: phrenologists abandon physiology and tend towards psychological or literary suggestions.

For the reader of the work, there remains a remarkable stock of information on the cultural background in which the rise and fall of phrenology occurred, and the intriguing suspect that, fallen into the oblivion of science the fund of crania and compasses with which phrenologists strived in the attempt of measuring the faculties of the spirit, the cultural problem risen by Gall and his disciples has remained live and active: the possibility to locate the seat of the human disposition and materially modify them, if not in a bump, in a sequence of nucleic acids.

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Bernd Holdorff and Rolf Winau, eds. *Geschichte der Neurologie in Berlin*. Berlin and New York: Verlag Walter de Gruyter, 2001. 229 pp. Ill. €44.95, SFr 72.00, and US$ 45.00 (paper).

The eightieth birthday of Professor Hans Schliack and the seventieth birthday of Professor Manfred Wolter – who as neurologists were both outstanding driving forces in post-war clinical neurology in West Berlin – was the occasion for a symposium held in November 1999 with a historical symposium on the ''History of Neurology in Berlin.'' The book contains various contributions to this symposium and illuminates 130 years of productive development of clinical and scientific neurology in Berlin between 1800 and 1933.

The detailed studies of the neuroscientific microcosm in Berlin provide a good understanding of the general development of neurosciences during the nineteenth and early twentieth centuries in Germany and give a comprehensive impression of the positions, controversies, and developments during this period.

The contribution of Reinhard Horowski focuses on the important role of the two brothers Alexander and Wilhelm von Humboldt in the development of the natural sciences and arts in the nineteenth century and especially on their influence on neuroscience. Wilhelm is frequently portrayed as the introverted antagonist to his active and restless brother Alexander with his inquiring mind. Wilhelm started assisting his brother in various animal experiments for their publication ''Experiments on electrically stimulated muscle and nerve fibres'' in 1797. Horowski's article brings out Wilhelm's role, especially in respect of his scientific contributions to the phenomenon of ''language.'' Wilhelm elaborated concepts on the nature of human language and was one of the most profound theorists in general linguistics. As an inspirational figure, he can be counted as Noam Chomsky's libertarian forefather. In various letters (e.g., to the physician and poet Friedrich Schiller), Wilhelm explained how language creates human self-identity and is the basis for the reflection of individuality. Wilhelm von Humboldt, who knew more than one hundred languages, planned the edition of an encyclopaedia of all human languages for which his brother Alexander collected various American Indian languages from his expeditions. The reader can imagine Wilhelm's attitude by the fact that, when prior to his death he was thought to be delirious due to his incomprehensible murmuring, he answered to his brother: '' . . . no, I have tried to speak sentences from all the languages I know [supposedly more than 100] to find out how the process of dying influences language processing in the brain.'' Wilhelm died in 1835 at the age of sixty-seven of aspiration pneumonia after having suffered from Parkinson's disease for many years. The modern reader will be impressed by the accurate and complete descriptions of his symptoms in his letters. Only some years after James Parkinson's essay of 1817, Wilhelm von Humboldt provides descriptions of micrography, rest-tremor, and hypokinesia (in contrast to James Parkinson, Wilhelm von Humboldt uses the term ''movement inability'' instead of ''palsy'') that are more detailed in some aspects than Parkinson's essay. The article illustrates that neuroscience in the Romantic period was integrated into a wide spectrum of approaches to explore the phenomena of nature, ranging from empirical animal experiments on the one hand to poetry, philosophy, and sometimes even spiritual concepts on the other. Examples of this view can also be found in the works and biographies of Johann Goethe and Schiller (e.g., the perfect description of aphasia in ''Wilhelm Meisters Lehrjahre,'' and Friedrich Schiller's unsuccessful thesis in medicine on the ''Philosophy of Physiology'').

Heinz-Peter Schmiedebach's article, ''Network or Neurons?,'' gives an excellent insight into the debate in the early twentieth century on the question of whether the communication of nerve cells and fibres is based on the cumulative functions of single cells with their fibres – the neurons – or – is the result of a pre-existing fibrillary network structure in which the single cells are integrated. The protagonists in this debate were Robert Remak (1815–1865), Alfred Goldscheider (1858–1935), Wilhelm von Waldeyer (1836–1921) and Max Bielschowsky (1869–1940).

Jürgen Peiffer's contribution describes the development of neuropathology in Berlin, mostly influenced by Johannes Müller (1801–1858) and his disciples Matthias Schleiden (1804–1881), Jakob Henle (1809–1885) and Theodor Schwann (1810–1882). The conception of neuropathology in the nineteenth century was not restricted to the special anatomic pathology of the nervous system, but included broader ''neuropathological'' aspects such as hypnosis, mesmerism, magnetism, and electrotherapy. Important contributions to the development of neuropathology and neuroscience in general were made by the following scientists working in Berlin: Ernst W. Brücke (1819–1892), Ernst Haeckel (1834–1919), Joh. Lukas Schönlein (1793–1864), Robert Froriep (1804–1861), Rudolf Virchow (1821–1902), Wilhelm Griesinger (1817–1868), Carl Westphal

(1833–1890), Friedrich Jolly (1890–1904), Theodor Ziehen (1862–1950), Karl Bonhoeffer (1868–1948), Max de Crinis (1838–1945), Richard Henneberg (1868–1962), Berthold Ostertag (1895–1975), Hans-Gerhard Creutzfeldt (1885–1964), Oskar Vogt (1869–1959), and Cecile Vogt (1875–1962). The biographies of the Jewish scientists Emanuel Mendel (1839–1907), Hermann Oppenheim (1858–1919), Friedrich Heinrich Lewy (1885–1950), Clemens Ernst Benda (1898–1975), and Franz Kallmann (1897–1956) who were not considered in the appointments for university chairs clearly shows the general anti-Semitic climate already present in Berlin and Germany prior to the Nazi regime. The scientific decline of the neurosciences after 1930 in Berlin was mainly caused by the arrest, forced emigration and killing; of Jewish neuroscientists by the Nazi regime.

The time course of the historical analysis ends with the 1930s. However, the involvement of German scientists with the Nazi system is mentioned, as for example, the neuropathological research carried out on victims of the ''euthanasia'' programme by Hugo Spatz.

The contribution by Heinz A.F. Schulze describes the development of the concept of localisation of brain functions ranging from the theory of ''phrenology'' by Franz Joseph Gall to the scientific and sometimes controversial approaches by Griesinger, Gustav Fritsch, Julius Eduard Hitzig, Hermann Munk, Carl Wernicke, Richard Henneberg, Hugo Liepmann, Kurt Goldstein, Cecile and Oskar Vogt and Korbinian Brodmann. Vogt's work, for example, had a great influence on Hans Berger's research in Jena on the development of electroencephalography.

Additional chapters deal with the history of neurosurgery and its pioneers Ernst von Bergmann, Fedor Krause, Moritz Borchardt, and Wilhelm Tönnis; with the foundation and development of the ''Berlin Society of Psychiatry and Neurology'' since 1867; with the important role of Hermann Oppenheim and Moritz Heinrich Romberg (Romberg was the author of the first ''scientific'' textbook of neurology in 1894 and wrote in his preface: '' . . . the textbook takes only facts of proven scientific value into account . . . ''); with the development of neurology at the Charité hospital; and, with the role of Bonhoeffer and his followers. The latter two chapters illuminate the development of an independent neurology in Berlin – an area of conflict between internal medicine and psychiatry.

With their very detailed, biographical, and anecdotal reflections on the major aspects of the development of neurology, the contributors to this book provide excellent insight into the philosophical and neuroscientific trends, positions, and discussions of the nineteenth and early twentieth centuries. The roots of German neurology in the area of conflict between internal medicine and psychiatry can be well understood. Anecdotes and biographical essays, as well as more systematic historical analyses in the book, organise the complex historical trajectories of neuroscience for a better understanding. Tables and photographs of the most famous neuroscientists and neurological clinicians from Berlin round off the historical contributions by the various authors. The book again makes clear that history is made to a certain extent by outstanding people. However, historical forces and the spirits of the times find their actors.

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Michel Meulders. *Helmholtz: Des Lumières aux Neurosciences*. Paris: Editions Odile Jacob, 2001. 312 pp. €27.44 (paper).

Many historians of science regard Hermann Ludwig Ferdinand von Helmholtz (1821–1894) as the greatest German scientist of the nineteenth century. A brief catalog of his contributions in physics, physiology, and psychology includes co-discovering the conservation of energy, inventing the ophthalmoscope, measuring the velocity of propagation of the nerve signal, formulating modern theories of vision, color, hearing, and harmony, advancing electrodynamical field theory, and attempting to ground thermodynamics in mechanics. As a teacher, Helmholtz trained Wilhelm Wundt and Heinrich Hertz; as an

administrator, he presided over the *Physikalisch-technichsche Reichsanstalt*, the richest physical laboratory of its day. Along with Rudolf Virchow and Emil du Bois-Reymond, Helmholtz also served as his nation's greatest spokesman for science. For a man this accomplished, it is astonishing to contemplate the lack of any modern critical biography. Michel Meulders provides the first treatment in French.

Meulders, a retired professor of neurophysiology at Louvain University, concentrates on the development and exposition of Helmholtz's scientific philosophy, in particular as expressed through his studies on vitalism, perception, and aesthetics. Meulders places Helmholtz after Johann Wolfgang von Goethe, Alexander von Humboldt, Johannes Müller, and Theodor Schwann as the last in a series of great nineteenth-century German philosopher-biologists. Borrowing heavily from the American expert David Cahan, Meulders portrays Helmholtz as a polymath *lumière*, one who interpreted the world through the values of ''reason, empiricism, and utility'' (Cahan, 1996, 600). By this tactic, Meulders renders Helmholtz familiar to his French audience as a classical hero of the Enlightenment.

Evidence of his argument can be found in the very first chapter. Meulders paints an imaginary scene that describes Helmholtz's father as he took his habitual stroll through the park and gardens of *Sans Souci*, Frederick II's palace in Potsdam. Meulders compares the natural light reflected off the palace to the cultural light spread by Frederick, an image that very much resembles Daniel Chodowiecki's contemporary engraving *Enlightenment*. Thus begins a biography that focuses on Helmholtz's own studies of light and vision.

Meulders has done no original research on Helmholtz himself, but he makes up for this lack by drawing heavily from relevant French, German, and English scholarship. His narrative of Helmholtz's life is written with elegance and verve, and his discussion of his science is concise and clear. Especially good is his ability to situate Helmholtz's sensory physiology in the contest of German philosophical debates on *Naturphilosophie*, vitalism, and reductionism. Here Meulders demonstrates unity in the choice, method, and popularization of Helmholtz's research: all attest to a man driven to unveil the physical basis of perception.

Meulders identifies with his subject. His comparison between Helmholtz and Goethe at the ends of their lives could serve as one between Helmholtz and himself:

> The reader might ask himself if it were useful to linger so long on an essay which may have been only a polite ceremony where one old man showers praise on another . . . on the contrary, one can see in it a moment of grace in the history of men and ideas . . . where two very different men separated by time shared the same fury to comprehend . . . nature and life. (p. 296)

This proximity between subject and biographer weakens Meulders's analysis. The author takes at face value Helmholtz's own version of history, reading his essays as if they documented the inevitable development of science. In this, Meulders is not alone; ever since J.T. Merz (1892–1914) copied Emil du Bois-Reymond's rhetoric into his *History of European Thought in the Nineteenth Century*, historians of biology have tended to repeat the simple narratives of progress promulgated by ''scientific winners'' like Helmholtz and du Bois-Reymond. Equally dated is Meulders' methodology: in intellectual history one must not just demonstrate affinity, but affiliation, of thought. Meulders' opening chapter would have been stronger, for example, if he had reminded us that Chodowiecki was the grandfather of du Bois-Reymond, Helmholtz' best friend. All in all, though, Meulders has rendered a great service to French readers with this book.

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José María López Piñero. *Cajal*. Madrid, Spain: Editorial Debate, 2000. 287 pp. Ill. No price listed (cloth).

Few scientists have been the subject of more biographies than Santiago Ramón y Cajal (1852–1934), the great Spanish histologist and the 1906 Nobel Prize laureate in Physiology and Medicine. The heroic figure of a resolute son of a small-village physician, who emerged virtually alone from the dust of a thoroughly arid land – both geographically and scientifically – and went on to revolutionize the microanatomy of the human brain with his dazzling demonstration that nerve cells are individual units, and who was consequently awarded the world's highest academic honors, has proved too suggestive for many writers in various languages. The ''Don Quixote of the Microscope,'' Cajal was called in one of the best-known essays on his life written in English (Williams, 1954).

Such is precisely the romantic but misleading image that an ambitious new study attempts to correct by placing Cajal in a sober and more realistic perspective. Fortunately, the task was undertaken by an expert belonging to the robust Spanish school of medical history, who recently also co-authored an exhaustive catalog of documents written by or about Cajal (López Piñero et al., 2000). Drawing from this rich bibliographical trove, the book provides a strictly linear account of Cajal's life, quite palatable for the non-specialist reader but also rigorously supported with copious footnotes indicating primary and secondary sources for the professional historian. As an additional premium, two appendices are included. The first one surveys the history of microscopic anatomy in Spain before Cajal, whereas the second examines some of the young professor's initial writings, in which a carefully cultivated intellect is already evident. The nourishing soil and the early seedling of the future master can thus be assessed in detail, independently of the main narrative.

In fact, a similar organic scheme of development, from taking scientific root in the existing Spanish school of histology, through full blooming in the production of both breakthrough knowledge and a collection of talented pupils, each in turn a prolific origin of new growth, is emphasized in the straightforward program of exposition. The first two chapters present Cajal's family, childhood, and student years at the medical school of Zaragoza, in the midst of the rapidly changing political and economical landscape in nineteenth-century Spain, along with a cursory analysis of the resulting scientific decline and slow rebuilding of medical science in the country. The third chapter deals with his almost fatal experience as an army physician in Cuba, where he was a victim of malaria.

Much of Cajal's evolution as a scientist, starting in the fourth chapter, is followed in relation to key figures on both the national and international stages. An early decisive influence was Aureliano Maestre de San Juan, the most distinguished Spanish histologist of the previous generation, under whose guidance Cajal learned the bases of microscopy techniques and graduated as a doctor from the medical school of the Central University of Madrid. His dissertation, read on the 3 July 1877, studied the pathogenesis of inflammation. A few years later, already married in an open challenge to the wishes of his father, Cajal won a teaching position at the University of Valencia. Here he became briefly interested in microbiology, largely as a result of his involvement in the first attempt to vaccinate a human population against cholera in 1885. This experience led to a bittersweet friendship with Jaime Ferrán, the unorthodox bacteriologist who had prepared and tested the vaccine first on himself.

It was a stay in the laboratory of the noted neurologist Luis Simarro in Madrid, in 1887, which decided Cajal's future passion for the investigation of the nervous system. There he learned the silver-staining procedure just discovered by Camillo Golgi in Italy which so neatly revealed individual elements of the nervous tissue. Tirelessly improving upon this capricious method, first in Valencia and later in Barcelona,

Cajal obtained evidence that convinced him that nerve cells are interconnected but essentially independent units. Convincing the world was another matter, however, since nervous tissue was conceived almost universally as an uninterrupted reticulum of fibers where cells acted as centers of convergence at certain nodal points. Realizing the importance of his finding, Cajal ventured a bold career move in 1889. With scanty funds borrowed from his father, he took his microscope and histological slides to Berlin, where the German Society for Anatomy was to hold a meeting. There he managed to get the attention of some of the leading microscopists of the day, who went from skepticism to curiosity and then to certitude about the young Spaniard's claims. Gustaf Retzius, Wilhelm His, Arthur van Gehuchten, and especially Albrecht von Kölliker, who learned the Spanish language just to read Cajal's writings in the original versions, were among the most enthusiastic converts to the new concept. Also present at that meeting was Wilhelm Heinrich Waldeyer, who would later coin the word ''neuron'' to designate the individual nerve cell as proposed in the theory championed by Cajal.

As Cajal's work became gradually known in other European countries, mainly through translations of his papers into German and French, he met and befriended many other influential colleagues. These included editors of scientific journals like Jean-Baptiste Carnoy and Wilhelm Krause, and the pre-eminent British physiologist Michael Foster, then secretary of the Royal Society of London, who invited Cajal to deliver one of the prestigious Croonian Lectures in 1894. Foster's close collaborator Charles Sherrington, who years later would also be awarded a Nobel Prize, offered the guest speaker to stay at his home while in London. In 1899, Cajal accepted an invitation to visit the United States as a speaker at Clark University in Worcester, Massachusetts. The following year he received the City of Moscow award for the most important work on medicine or biology published in the last three years.

In the meantime, international acclaim had brought Cajal practical respect in the domestic academic environment. Cajal was offered a high-profile professorship in Madrid, together with a new laboratory superbly equipped for histological work with enough microscopes and microtomes for a small army of students. ''It was the coveted ideal, the supreme aspiration of a life!'' he recalled later. Moreover, the Moscow award prompted the Spanish government to establish especially for Cajal the Laboratory for Biological Investigations, where he could carry on his own personal research in the company of a select group of associates. Accordingly, his scientific output continued to increase with still more novel ideas, especially the notion of dynamic polarity of impulse conduction in nerve cells, and with several publications debating the alleged role of intracellular ''neurofibrils'' in nerve conduction. Eventually this exhausting activity culminated with the appearance of the monumental treatise on the texture of the nervous system in man and other vertebrates (Ramón y Cajal, 1899–1905).

Worldwide recognition of these major contributions finally took the form of top international honors. The Berlin Academy of Sciences decorated him in 1905 with the Helmholtz Gold Medal, and the following year he shared the Nobel Prize with Camillo Golgi, the discoverer of the silver-staining procedure that Cajal improved and exploited so brilliantly. Golgi's less than courteous attitude towards the work of his Spanish colleague during the award ceremony, to the consternation of Retzius and other good friends in Stockholm, is treated with polite objectivity in the book.

Having become a celebrity abroad and a national hero at home compounded a situation to which Cajal reluctantly adapted. Since the turn of the century he had been perturbed by ill health and a deep disappointment over Spain's colonial disaster of 1898, which meant losing Cuba to the United States. And now he had to cope with the offers to head institutions and the requests to lecture everywhere that showered on him. He refused to accept the Ministry of Public Education but agreed to direct the National Institute for Hygiene and Serotherapy, as well as to preside over the newly created Council for the Widening of Scientific Studies and Research, which played a decisive role for invigorating modern science in Spain. In parallel, he continued at the front of his beloved Laboratory for Biological Investigations.

Cajal kept the two latter positions for nearly a quarter of a century, until his health prevented him from going on with them any further.

The ninth and last chapter of the book examines the two final decades in Cajal's life, beginning with the terrible blow that meant for him World War I. For the most part, however, it describes the careers of his most outstanding intellectual heirs – namely Francisco Tello, Fernando de Castro, Rafael Lorente de Nó, and Nicolás Achúcarro. Last but not least comes Pío del Río Hortega, the second-brightest star of Spanish histology after Cajal, although not his direct disciple, who made pioneering fundamental advances in the study of glial cell morphology. Ironically, the pair never could enjoy an easy relationship, and the clash of the aging master with the reverent but independently minded young upstart is lively told in the book.

Not only Cajal's students are portrayed in summarized form. Every one of the personages mentioned above, and many others, is presented to the reader accompanied by an informative biographical sketch that may take anywhere from a single paragraph up to several pages. While these pieces of supplementary content obviously enhance the value of the book, sometimes the flow of significant events is rather abruptly interrupted to introduce and discuss a new character. One wonders, for example, whether the sixteen page long stretch of text describing Río Hortega's full career, just before the two pages that suddenly go back in time to tell how Cajal's prolonged illness ends in his death, would find a better place elsewhere in the book, perhaps in a third appendix with concise biographies of students and other young scientists around Cajal (i.e., his immediate followers, just like the first appendix presents his forerunners)?

Having on hand the amount of autobiographical material left by Cajal is of course a savory lode for any biographer, and it is well mined in here. The author's writing is often closely intertwined with many of Cajal's own views and feelings expressed as direct quotations, mostly from his well-known memoirs (Ramón y Cajal, 1923). As a result, Cajal the man breathes behind the celebrity on many pages, often to expose interesting aspects of his personality (e.g., the visionary who utterly disliked the appearance of automobiles and aircraft, a liberal in politics who held traditionally conservative attitudes toward women). His opinions on this latter topic, a number of which surface also as guidelines for selecting a suitable wife in his *Advice for a Young Investigator* (Ramón y Cajal, 1949), were collected by a female scholar into a book titled *Woman* for which he wrote a warning preface (Ramón y Cajal, 1932). Also engagingly shown are his occasional experiments as a science-fiction writer, and his life-long interest on that exciting new technique for capturing images of the world-photography.

Surprisingly in a project of these dimensions, however, the book lacks an index, so there is no way to readily locate specific data in its vast wealth of information. There are but a few minor flaws. For instance, Cajal and Retzius are said to have first met personally in Berlin in 1889 (p. 159, correct), then in Stockholm in 1906 on the occasion of the Nobel Prize ceremony (p. 163). The famous color portrait reproduced on the dust jacket is not acknowledged to the artist, Ricardo Madrazo, who amply deserves the credit. Otherwise this is a carefully designed, well-written, and handsomely printed volume with numerous line drawings distributed at the appropriate places throughout the chapters, plus a central section of half-tone illustrations that include photographs of Cajal at different ages, of his family and friends, as well as of colleagues from around Europe. The book fully succeeds in dispelling the entrenched notion of a spontaneously generated and poorly supported Spanish scientist. Both the fertile background of biomedical research in his country, and his own enormous contribution to the field, become clearly illuminated in harmonious relation to each other as a result of this valuable effort. The final product is undoubtedly the most complete and reliable reference for Cajal's life available today. An English translation would be most welcome, particularly if it includes a detailed analytical index.

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Hal Hellman. *Great Feuds in Medicine: Ten of the Liveliest Disputes Ever.* New York: John Wiley & Sons, Inc., 2001. xiii + 186 pp. Ill. $24.95 and CAN$ 37.50 (cloth).

With the 1998 publication of his *Great Feuds in Science*, Hal Hellman made a valuable contribution to the historical education of students of the sciences. He presented a double handful of the most stubborn controversies – from Galileo and Urban VIII in the seventeenth century to Derek Freeman and Margaret Mead in the twentieth – that have fostered or impeded progress in the physical and behavioral sciences.

Now, with its companion volume, *Great Feuds in Medicine*, he does much the same for the enlightenment of aspiring medical scientists and their teachers. Their studies frequently include little enough of the history of medicine, and of the protracted disagreements that have helped to shape present-day medical theory and practice. Hellman examines ten of the medical ''feuds'' that he regards as the most far-reaching, beginning with a chapter on William Harvey's seventeenth-century battle with contemporary anatomists over the reality of the circulation of the blood.

Neuroscientists will find at least five of the book's ten chapters of particular interest. The second deals with the acrimonious dispute between the gently intuitive anatomist Luigi Galvani and the brilliantly aggressive physicist Alessandro Volta, about the meaning of the ''animal electricity'' that Galvani had detected in frog muscles. The science of electrophysiology took its origin from their protracted eighteenth-century wrangle. It has long been clear that they were both on the right path, Galvani about the generation of an electric current in muscle contraction and Volta about the ability of electric currents to elicit contraction.

A later chapter deals with a matter of even greater import in the history of neuroscience: the famous quarrel between the 1906 Nobel Prize laureates, Camillo Golgi and Santiago Ramón y Cajal, about the basic structure of the nervous system. Golgi insisted that it forms a continuous network, whereas Cajal, having adapted Golgi's difficult but invaluable neurohistological method for his own use, was able to establish the modern view that the nervous system is made up of its multitude of discrete, individual neurons, interconnected by countless synapses.

Another chapter for physiologists and neuroscientists alike is devoted to the lonely nineteenth-century struggles of Claude Bernard, in defending his experimental medicine against the strident accusations of the anti-vivisectionists. Their swelling ranks included many of his prominent fellow-scientists as well as fashionable but unscientific physicians. Sigmund Freud's unforgiving quarrels with his colleagues and disciples also occupy a chapter of their own, but readers interested in learning more about the turbulent beginnings of psychoanalytic theory and practice would do better to go directly to the biographical writings of Ernest Jones. The varied scientific labors of Louis Pasteur, sometimes opposed by such chemical and bacteriological eminences as Justus von

Liebig and Robert Koch, are discussed in yet another chapter. Pasteur's anti-rabies vaccine was his great contribution to the prevention of that fatal neurological disease.

Unfortunately, Hellman does not review this past century's debate about the chemical or electrical nature of the mediation of excitation and inhibition at synapses. His remaining chapters deal with such disparate clinical topics as Ignaz Semmelweis' long campaign against puerperal fever and the obstetrical hierarchy of the Allgemeines Krankenhaus in Vienna; Albert Sabin's and Jonas Salk's polemics promoting their respective vaccines against poliomyelitis; and the roles and rivalry of Maurice Wilkins and Rosalind Franklin in the ultimate revelation of DNA's structure as a double helix. In his final chapter, Hellman analyzes strategies and tactics of the "AIDS War" between Luc Montagnier of the Institut Pasteur in Paris and Robert Gallo of the National Cancer Institute in Bethesda, while hailing its unusually peaceable conclusion, which may augur well for the settling of future medical controversies.

This is not merely a book to be recommended to students of medicine. Older readers, overlooking its few misprints and misstatements, will be impressed with the emotional heat generated in past skirmishes between assertive egos and in battles of priority and interpretation along the frontiers of scientific medicine.

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