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Book Review

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Outside Charles Darwin, Isaac Newton, and Albert Einstein, few other scientists have contributed to the foundations of modern science as much as Santiago Ramón y Cajal. Benjamin Ehrlich has succeeded in presenting an exacting biography that, to name an obvious audience -- philosophers, sociologists, and psychologists of science -- will find invaluable. Almost a quarter of his book is well-supplied with biographical notes. Ehrlich's prose is bound to please and inform a much wider audience.

While tracking and presenting much of Santiago Ramón y Cajal's life that might have been unknown to most readers, including those who already bestow the highest praise on the Nobel laureate and first neuroscientist, Ehrlich takes pains to describe Cajal's upbringing and makes relevant causal connections between a curious, rebellious, artistic, unruly, and stubborn child, adolescent, and young man and the laser-focused scientist that he was to become.

As Ehrlich points out, Cajal's powers of observation, imagination, love of natural spaces, need for adventure, and artistic talents are in keeping with the lives and experiences of many other scientists -- a timely and necessary clarification to many individuals who, in an absolutist and dualistic fashion, present science or scientists in the coldest and most monolithic ways.

Oversimplifications of "science" or "scientists" have more to do with or say more about the shortcomings of people who make these all-too-easy declarations. Full humanity, emerging from the complex interactions between inner life (personality proclivities and talents) and the social and natural worlds, is the norm in order to produce great science.

Ehrlich provides high quality reproductions of Cajal's drawings of neurons, on handsome glossy pages, which leave no doubt that his microscopic universe possessed as much beauty to him as any other natural phenomena he relished. We are also told that Cajal's father, taken by his son's expertise in drawing anatomical parts from actual corpses, took steps to publish an atlas of his son's works. This is also an important counterpoint to easy descriptions of the human body in abstract or fantastic terms. As described by Ehrlich, the picture of Cajal's father testing his son's knowledge of osteology in a cramped cave, while handling the very bones father and son had robbed from a cemetery, cannot be any more sobering, comical or telluric. Less comical is the tenacity with which Cajal almost single-handedly rescues Spain from the scientific wasteland it found itself in during the mid-1800s. Microscopic slide after microscopic slide, in stubborn trial-and-error fashion, Cajal succeeds in brokering a new era of scientific discoveries for Spain, to be sure, but also for the world.

In a chapter titled "A Myth Concealed in Ignorance" (pgs., 54-65), Ehrlich tracks Cajal's thinking, eventually leading to a rejection of the *vitalist* conception of physiology prevalent during Cajal's university days. That Ehrlich makes frequent and relevant connections between

Spanish politics and the acceptance or rejection of certain medical doctrines makes it a must-go-to, invaluable sociology of science reference text akin to Frank Sulloway's Born to Rebel.

The almost superhuman efforts of Cajal, in terms of determination, discipline, and the ability to ignore an ailing or tired body, is also reminiscent of the work and life of Charles Darwin, another example of fully-fledged humanity.

Santiago Ramón y Cajal and the Italian Camillo Golgi shared the Nobel prize in physiology (or medicine) in 1906. As enumerated on Wikipedia, Cajal is credited with the following discoveries and ideas: Cajal-Retzius Cell; Interstitial Cell of Cajal; the neuron doctrine; growth cones; dendritic spines; long-term potentiation; Mossy fibers; the Neurotrophic Theory; axon-axonic synapses; pyramidal cells; radial glial cells; retinal ganglion cells; trisynaptic circuits; and the Visual Map Theory (etc.).

Undoubtedly, Cajal's work marks the beginning of neuroscience. But to Cajal this might have meant much more than the term suggests today. Ehrlich shares Cajal's last written words:

“I leave you something greater than any wonder of the senses: a privileged brain, sovereign organ of behavior and action, which used wisely will immeasurably improve the analytical power of your senses. Thanks to it you can dive into the unknown and operate on the invisible, elucidating, as much as possible, the obscure questions of matter and energy (hidden from the common man)” ... (2022: 330)



Santiago Ramón y Cajal (Wikipedia page):

https://en.wikipedia.org/wiki/Santiago_Ram%C3%B3n_y_Cajal