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## Fusion of neuroscience and art

**Cajal's Butterflies of the Soul: Science and Art**  
Javier DeFelipe.  
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Javier DeFelipe should be congratulated on assembling such a beautiful book about the earliest microscopic investigations of the nervous system conducted at the end of the 19th century and early 20th century. DeFelipe is an accomplished neurobiologist at the Cajal Institute, Madrid, Spain, where his research has focused on the micro-organisation of the cerebral cortex and the alterations of cortical circuits in epilepsy and Alzheimer's disease. His professional background, research accomplishments, and affiliation with the Cajal Institute place him in a situation

of unique expertise to analyse the early history of research into the cellular organisation of the nervous system.

The book is organised into two parts. In the first part DeFelipe succinctly and thoroughly reviews the history of neurobiological investigations from 1859 to 1932. Of central importance was the widely accepted reticular theory of nerve continuity in which the cells of the nervous system were all thought to be cytoplasmically interconnected. Camillo Golgi published his results using a silver staining method in 1873, which Santiago Ramon y Cajal started using in 1887. Cajal's

results gave credence to the alternative neuron doctrine in which nerve cells are entirely separate entities. For their accomplishments, Golgi and Cajal received the Nobel Prize for Physiology or Medicine in 1906.

However, at this time adequate microphotographic technology had not yet been developed. Therefore, scientists had to hand draw illustrations from the microscopic slides to demonstrate their findings. Most often, camera lucida drawing techniques were used. As a result, extremely beautiful and artistic images of the nervous system were created. A fusion of neuroscience and art occurred. "There can be no doubt, only artists are attracted to science", said Cajal.

The second part of the book contains 288 hand-drawn figures by 95 authors. Drawings by Cajal and Golgi are included, along with the artistic accomplishments of Alzheimer, de Castro, Meynert, Nissl, Ranvier, Retzius, del Rio-Hortega, and many others. The first section of illustrations covers "The Benedictine Period: The Early Days." The drawings are of globules, granules, and corpuscles, all indistinct forms of what we call neurons. Most of these illustrations were thought to substantiate the reticular theory. Of note are the neuronal cell body drawings by Butzke and Deiters for their

elegance and simplicity. The second section of drawings covers "The Black Period: Neurons, Glia and the Organization of the Nervous System." With the use of the Golgi staining technique, individual neuronal cell bodies could be defined, showing their incredible complexity. Of interest are the drawings of microglia by del Rio-Hortega and de Castro's images of ganglion cells for their intricate complexity, visual movement, and aesthetic appeal. The final section covers "The Colorful Period: Internal Structure and Chemistry of the Cells." Using various stains, coloured drawings were generated. Righetti's and Holmgren's drawings of individual neuronal cell bodies are extremely elegant works of art.

As Cajal wrote, "...my attention was drawn to the flower garden of the grey matter, which contained cells with delicate and elegant forms, the mysterious butterflies of the soul, the beating of whose wings may someday...clarify the secret of mental life." This book is a wonderful addition to the library of any neuroscientist or neurologist. It is worthy of attention of artists who enjoy the beauty of the natural world.

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