

## Book Reviews

techniques. Instead he emphasizes theoretical aspects of diverse views of the cell, and provides an exposition of the views of major contributors to the debate on structural units following Dutrochet. There are accounts of the ideas of Raspail, Müller, Schwann, Remak, and Kölliker as well as Virchow. Duchesneau traces a shift from an anti-vitalistic programme to Müller's emphasis on the living organism. A welcome feature of the book is the attempt to relate French and German cell biology, so correcting the distortions of earlier German accounts of the history of cell biology as a German national achievement. Yet in relying on a textual exposition, no attempt is made to assess the transmission and influence of the various theories, to locate cellular research in the various institutional settings, or to consider the interaction between observational techniques and theories. Archival sources and editions of letters have not been used. Scientific innovations seem to have taken place in a cultural and social vacuum with no reference being made to how, for example, Raspail and Virchow related their political radicalism to their scientific endeavours. The neglect of these broader dimensions means that, despite the author's erudition, a definitive history of the origins and early years of cell theory has yet to be written.

Paul Weindling, Wellcome Unit, Oxford

JÜRGEN SANDMANN, *Der Bruch mit der humanitären Tradition: die Biologisierung der Ethik bei Ernst Haeckel und anderen Darwinisten seiner Zeit*, *Forschungen zur neueren Medizin- und Biologiegeschichte* 2, Akademie der Wissenschaften und der Literatur Mainz, Stuttgart, Gustav Fischer, 1990, 8vo, p. 218, DM 88.00.

The Nazis (and certain historians of Nazism) claimed that the German Darwinist Ernst Haeckel (1834–1919) was a precursor of their belief in racial struggle, the unity of man and nature, and a eugenically-based morality. Others have pointed out that Haeckel was a popular inspiration for liberals, socialists, feminists, and pacifists. In this conflict, Haeckel's substantial scientific achievements in embryology have been overlooked. A balanced scholarly reconstruction of the development of Haeckel's opinions on social and ethical issues is also long overdue. In an attractively-produced monograph, Sandmann has attempted to analyse Haeckel's voluminous publications. The results are not wholly convincing.

Sandmann claims that from his youth Haeckel was a mechanistic materialist, who by 1870 had formulated an inhumane creed of Social Darwinism; for example, he advocated euthanasia of babies with birth defects and socio-biological rationales for executing murderers. Haeckel is seen as elaborating an anti-Christian and naturalistic code of scientific ethics in his writings. Unfortunately, Sandmann's grasp of historical methodology is poor. His account is a highly selective "scissors and paste" compilation of quotations suiting his thesis. No attempt is made to consider other strands of Haeckel's thinking, or his great changes in emphasis over the years. Thus differences of opinion between Haeckel and the scientific materialists Büchner and Moleschott are overlooked, as are features of Haeckel's thinking that were consistent with Johannes Müller's anti-mechanistic organicism. Indeed, Haeckel continued to criticize mechanists like His. Haeckel's use of embryological explanations of development should have been scrutinized as these emphasize processes of the division of labour and organic integration rather than Darwinian natural selection. Given that he derived the concept of the "cell state" from Virchow (a noted liberal), perhaps Haeckel was less of an original thinker than Sandmann claims. There is no analysis of the use of social analogies in Haeckel's scientific work, although his researches into embryology provide a key for many of his views on psychology and society. Sandmann fails to detect changing opinions on Christianity and the emergence of pantheistic sympathies by the 1890s. An artificially simplified image is maintained. Sandmann has not used any of the extensive archival sources in Haeckel's house, the Villa Medusa in Jena, which would have enabled him to present a more nuanced and historically convincing account. The selection of "other Darwinists" mentioned in the title is limited to a few monists. No consideration is given to such major figures among Haeckel's students as Semon (a Jew—although Sandmann claims that Haeckel was an anti-Semite) and Oscar Hertwig, about whom a monograph is long

## Book Reviews

overdue. Relying on highly selective published extracts from Haeckel's archive is unsatisfactory because of the biases of various editors. Use of Haeckel's extensive correspondence and other materials, such as newspaper clippings, would have given Sandmann the opportunity of locating Haeckel in the changing socio-political context of Imperial Germany, as bourgeois opinion shifted from liberalism to support for a strong imperial state.

Paul Weindling, Wellcome Unit, Oxford

JAVIER DeFELIPE and EDWARD G. JONES, *Cajal on the cerebral cortex: an annotated translation of the complete writings*, Oxford University Press, 1988, 8vo, pp. xvii, 654, illus., £50.00.

Cajal's monumental *Textura del sistema nervioso del hombre y de los vertebrados* (1904; French ed. 1911, repr. 1952) might be my first choice for desert island reading. Santiago Ramón y Cajal's (1852–1934) position in the history of the study of the nervous system is unique. When he began his work, the neuron doctrine, the idea that the brain is made up of individual cellular elements that do not fuse, was controversial. Cajal's studies provided the anatomical support for the fundamental idea of the independence of individual nerve cells. Camillo Golgi had previously discovered a technique that stains completely a small percentage of the cells in the nervous system. For the first time, the nerve cell could be revealed clearly with all of its axonal and dendritic processes. Cajal adopted the Golgi method to analyse the structure of all of the major subdivisions of the vertebrate brain.

This volume, which gives a fascinating insight into the structure of Cajal's thinking and ideas, presents in English translation all of Cajal's work on the structure of cerebral cortex. It includes material from the Spanish and French editions of his textbook as well as his original reports, many of which are now virtually unobtainable. Several of these were in Cajal's own journals, the *Revista trimestral Micrografica* and the *Trabajos del Laboratorio de Investigaciones Biologicas de la Universidad de Madrid*. These original reports help us to appreciate the building blocks of Cajal's great synthesis in the *Textura* and *Histologie*.

Although Cajal contributed a great deal to the anatomical study of the cerebral cortex, his work in this area was not as definitive as it was for some other structures of the brain. Very little has been added, for example, to his description at the light-microscopic level of the cerebellum or the retina. Nevertheless, the cerebral cortex is a good place to continue the work, and I hope we shall have more. The combination of Drs De Felipe and Jones is especially apt. The former is an anatomist whose native language is Spanish, and who is obviously competent to render Cajal's Spanish papers into readable English. Jones is one of the foremost current authorities on the anatomy of the brain. Translation of a 100-year-old anatomical report can prove difficult since the style often differs from the terse prose that is typical of today's journals. The authors have tried to preserve some of the flavour of Cajal's Spanish in the translation. One is reminded sometimes of Hemingway's *Old Man and the Sea*, where two men discuss the American baseball season: "I fear the tigers of Detroit".

This volume dispels some time-worn Cajal myths in the oral tradition of neuroscience. One held that Cajal looked down the microscope during the day and drew his figures in the evening, or even from memory. De Felipe and Jones show a photograph of a *camera lucida* from Cajal's lab and argue convincingly that he used it. They also photographed some of Cajal's original preparations, which are still in the museum in Madrid. Their photomicrographs make it clear that Cajal's figures rendered accurately the Golgi material that he prepared.

Some of the limitations in Cajal's anatomical descriptions, and indeed, some of his errors of interpretation, stem from the lack of precise methods for tracing connections in the brain. Cajal made little use of the then-available Marchi technique, which stains degenerating myelin products. At its best, Marchi is capricious and heavily biased in favour of large fibre systems. For establishing connections, Cajal preferred to trace axons from their cell of origin to their termination, using the Golgi method. Because of the difficulty in following an axon over a long distance, he used material from young animals with small brains. In a favourable preparation cut