

metaphysics grows out of the empirical problems faced by systematics, evolutionary biology, and their cognate disciplines. Thus Ghiselin's metaphysics is mixed up with the scientific conception of the world, not with ontological doubt. Following the way of Aristotle, simultaneously a great philosopher and the father of academic biology, Ghiselin combines philosophy with biological detail. For some scientists, his combination will be a heady brew. For those who insist on post-Kantian subjectivist metaphysics, Ghiselin's book will be a curio, if not a travesty.

Readers who find Ghiselin's approach attractive will also find numerous specific achievements in this book. Ghiselin presents again his thesis that species are historically unique individuals, and he supplies an extensive Aristotelian metaphysics for the concept of individuality itself. He also provides exceptional exegeses of such concepts as homology, ontogenetic recapitulation, macroevolution, and laws of nature. In every case his analysis is of equal or greater clarity than that of other commentators on these subjects. Indeed, he points out the mistakes and ambiguities of his predecessors with relish. Even Ernst Mayr, to whom Ghiselin owes a considerable intellectual debt, receives correction. He also includes many acidulous put-downs of his critics, "vulgarizers," and others whom he dislikes. Stephen Jay Gould seems to be a favorite target, though the swipes directed his way are disguised, as in, for example, Ghiselin's disparagement of "less than satisfactory neologisms that might as well be passed over in silence" (p. 290), alluding to Gould's neologisms for the various types of preadaptation. Although these remarks do little to advance Ghiselin's arguments, they may provide some guilty pleasure for the evolutionist. It is extremely rare for biologists to write this way, though our spoken gossip is as vicious as that of any discipline.

Regardless of rhetorical flourishes, Ghiselin's book has an exceptional intellectual sharpness for a treatise on biology. Almost every page offers an original insight or penetrating argument. Not all of the biological specifics will be agreeable to specialists, but that is inevitable; biology is too vast and misshapen a discipline to allow mastery of all of its specifics. And the orientation of the book is strictly evolution *sensu* Ghiselin. His self-citation is virtually imperial. But there is no "metaphysical book" more bracing for the philosophy of biology. It is the only one that evolutionary biologists and systematists simply must read.

MICHAEL R. ROSE

**Michael Hagner.** *Homo Cerebralis: Der Wandel vom Seelenorgan zum Gehirn.* 382 pp., bibl., index. Berlin: Berlin Verlag, 1997. DM 48.

Before picking up Michael Hagner's fascinating account detailing the connections between conceptions of the brain and more general ideas about human nature between the seventeenth and late nineteenth centuries, the reader is well advised to contemplate the following two recent news items. A group of Canadian researchers announced that in Einstein's brain the *Lobulus parietalis* was significantly enlarged. (*The Lobulus parietalis* is of course the region in the brain where the abilities for mathematical reasoning and spatial representation are believed to be located.) And a dramatic increase in discussions about the relations between science and religion has been highlighted by a few widely publicized events and debates.

These two observations can serve as a reminder that the issues marked out in the subtitle of Michael Hagner's book—that is, the nature of the "organ of the soul" and the brain—are still very much alive today. The localization of higher brain functions has been among the most publicized aspects of research during the "decade of the brain," and, despite all our advances in understanding and modeling the functions of the brain, a belief in the existence of a "soul" is still rather widespread.

*Homo Cerebralis* traces the emergence of the modern conception of the brain up to the end of the nineteenth century, when efforts at localization began to bear fruit. Tempting as it may be to interpret the emergence of the modern brain as the result of a progressive naturalization of the mind, Hagner cautions us against such simplifications. By embedding the major conceptualizations of the brain, such as the *Sensorium commune*, the *Homo duplex*, Soemmering's organ of the soul, Gall's multiple localized organs of the brain, and others within their respective cultural and scientific contexts, Hagner illuminates the differences even between deceptively similar representations.

The main theme of Hagner's account is the notion of the brain as an epistemic object. The analytic category of an "epistemic object" was introduced into the historiography of science by Hagner and, among others, Hans-Jörg Rheinberger. It stands for the not yet fully determined objects of scientific inquiry in a specific conceptual and experimental context. In Hagner's narrative the "same" physical object—the brain—thus goes through different representations as an epistemic object in a variety of cultural and experimental contexts. And cultural and experi-

mental settings there are aplenty. As Stephen Jay Gould and others have already pointed out, the study of the brain was closely linked with questions of anthropology. Gould emphasizes the comparative dimension of anthropology and its connections to racism; Hagner investigates as well the role of brain research in philosophical speculations about the nature of man throughout the three centuries he covers. Phrenology and romantic *Naturphilosophie* are just two of the offshoots of such speculations that he examines in some detail. Hagner also explains the effects of the different scientific methodologies of anatomy, physiology, and pathology on representations of the brain as an epistemic object. In this context his discussions of how an emphasis on ideal experiments at various times prevented progress in nineteenth-century neurophysiology and how the differences between the qualitative, case-history-based approach of clinicians and the quantitative method of anatomists and physiologists led to rather different conceptions of "localization" are particularly revealing.

Hagner's book is extremely informative and highly original in its emphasis on the brain as an epistemic object suspended in a web of cultural and technical considerations. Further, its lucid albeit Germanic prose is a pleasure to read. *Homo Cerebralis* will therefore be of interest not only to the specialist but also to a wider audience, who will surely benefit from this challenging account of a subject that has such an enormous appeal. Given the unfortunate decline in the knowledge of foreign languages in the United States, Hagner's book should be translated into English promptly. A new edition of *Homo Cerebralis* would also be a welcome opportunity to include illustrations and figures. The absence of illustrations is about the only thing that one can criticize in this otherwise excellent book.

MANFRED D. LAUBICHLER

**Marco Beretta.** *Il tesoro della salute: Dall'onnipotenza dei semplici all'atomizzazione del farmaco.* 93 pp., illus., bibl. Florence: Giunti Gruppo Editoriale, 1997. (Paper.)

This volume is a product of "The Treasure of Health: From the Omnipotence of Simples to the Atomization of Medicine," an exhibition held in Milan in February and March 1997. Marco Beretta, through a careful reconstruction of events and the use of a rich iconography, traces the history of chemical and pharmaceutical research

from the beginnings of pharmacy up to the nineteenth century.

Pharmaceutical work dates back to the creation of botanical gardens, where doctors—in consultation with herbalists—could choose medicinal plants and observe their effects. Later, pharmaceutical laboratories used the tools and technologies of the day to prepare new mixtures and substances. The creation and spread of pharmacopoeias and prescription books facilitated the expansion of pharmaceutical research. Thereafter, the introduction of iatrochemistry and advances in chemistry, comparative anatomy, and physiology led to the discovery of more and more effective remedies. From the eighteenth century on, pharmacology became primarily a chemical doctrine.

Beretta focuses on the discovery of new chemical treatments by D. MacBride and I. Beddoes, M. Wells, J. von Liebig, C. Bernard, L. Pasteur, R. Buchheim, and P. Ehrlich. He stresses the importance of statements about frauds and quacks, such as those made by the Austrian physician F. A. Messner. Beretta attributes recognition of the importance of systematic experimentation, teamwork, and laboratory diversification to Ehrlich, highlighting the economic potential of the industrial exploitation of pharmaceutical research.

At the beginning of the twentieth century the first industrial laboratories for research and production were created, among them the Institut für Serumforschung und Serumprüfung, the Georg-Speyer-Haus für Chemotherapie (which produced Salvarsan), Bayer (aspirin), Schering (urotropine), CIBA, Kern and Sandoz Chemical Works, Geigy, Hoffman la Roche, and, in Italy, the Carlo Erba, Biochimica Zanardi, and Zambon facilities. Despite the development of industrial pharmacology, however, patients still trusted traditional preparations, as the many pharmacopoeias used into this century attest.

The historical narrative ends with a description of the work of Paul Ehrlich. An interesting appendix offers a chronology of pharmaceutical research from 1480 (the first printed edition of the *Regimen sanitatis*) to 1928 (the discovery of penicillin).

The 109 illustrations, some in color, reproduce old prescription books and pharmacopoeias, manuscripts, and old prints; they make this volume interesting and valuable. The originals come from various institutions: the Uppsala University Library, the Istituto e Museo de Storia delle Scienze (Florence), the Museo dell'Accademia di Storia dell'Arte Sanitaria (Rome), the Archives de l'Académie des Sci-