former transcending the apparent gulf in organization of the brain between mammals and non-mammalian vertebrates. This largely imaginary gulf has grown wider in recent years, not so much as the result of the explosion of information as of the reduction in the number of neuroanatomists working on birds, reptiles, amphibians, and fish and of the propensity of mammalian neurobiologists, if they think of other vertebrates at all, to recoil from the seemingly vastly different and multifarious organizational plans exhibited by the non-mammalian brain.

The authors of *Comparative Vertebrate Neuroanatomy* have been major contributors to the study of the connectional anatomy of the non-mammalian central nervous system, and for them connections form the principal basis for drawing homologies that help bridge the gulf.

A large part of the book is devoted to a non-mammalocentric description of the nervous system in which long tract connections figure prominently. Microscopic and finer structural analysis remains relatively superficial, and the persistent use of "interneurons" in the old-fashioned sense referring to everything that is not a dorsal-root-ganglion, autonomic-nervous-system, or ventral-horn cell will be a surprise to the expert and a source of confusion to the student.

Basic evolutionary theory figures prominently, and much confidence is expressed in the value of cladistics in defining relationships between species and lines of descent. However, cladistic analysis is only as good as the ability of the classifier to discern homologous features. The authors' willingness to incorporate parts of the hypothalamus into the thalamus because they receive connections from ascending somatosensory pathways seems to reflect confidence in connections over other organizational features. Perhaps more unfortunate is the resurrection of the long-discredited view of the thalamic reticular nucleus as the rostral extension of the reticular formation on the grounds that its cells superficially resemble those of the brainstem.

There is repeated discussion, with appropriate debunking, of a hierarchical phylogenetic scale leading to the supposedly superior brain of the human, likened, as is customary, to Aristotle's scale of nature, although whether Aristotle ever saw this ladder as an evolutionary progression is doubtful. It is also doubtful that many scientists take this idea seriously today, and the anthropocentric idea of a ladder of evolution based on progressive increase in complexity of brain organization and behavior is probably only loose talk, other than among those who stand, as Joyce put it, "with one hand on the Bible and the other on *The Origin of Species*." To emphasize, as the authors do, that brain evolution has not been an orthogenetic progression from the generalized, undifferentiated, and unspecialized to the specialized, highly differentiated human brain is appropriate, however. The independent and multiple lines of evolution of the forebrain, not all of them directed toward a mammalian cerebral cortex, underscore this.

Two new perspectives are predominant themes. One is a classification of the cranial nerves based primarily on their embryological origins and incorporating modern ideas on the segmentation of the head and brain, extending the number of nerves beyond the traditional 12 of human neuroanatomy. The authors separate off the sensory (placodal) and motor/autonomic components of the glossopharyngeal and vagus nerves and extend the list of nerves to include the terminal and vomeronasal, which are rudimentary or absent in the adult human, and the profundus, which is incorporated into the trigeminal, as well as raise the lateral line nerves to rightful prominence. There are few new insights in this, and the principal objective seems to have been to provide an *aide mémoire* for students. The segmental organization of the head, brain, and cranial nerves postulated by the authors is interesting although highly conjectural, and they seem so bent on identifying a "typical" head segment that one cannot help recalling the unhappy fate of some earlier views of head segmentation.

The second perspective is emphasis on the division of the sensory pathways that lead through the thalamus to the telencephalon in most vertebrates into those arising in the retina and dorsal column nuclei on the one hand and those arising in the tectal region on the other. These are called the lemnothalamic and collothalamic pathways, respectively—names that jar as much by repeated usage as by their tortured Latin and Greek or lack of euphony. The authors probably go too far in attempting to force all elements of the thalamus and other structures into dependencies of the lemniscus or retina or of the midbrain colliculi.

The authors have combined a remarkably broad view of the fundamental organization of the nervous system with insights into its specializations and adaptations. The examples are drawn from a wide variety of vertebrate forms, presented without swamping the reader in detail. The result is a readable and enjoyable account. The authors say that their book is not directed at the specialist, but many a (mammalian) specialist will find this a useful work to dip into as a guide to brain organization in other vertebrates and as a reminder of the fundamental biology of the brain and its appendages.

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Vignette: Autumn Thought

Most scientists are not going to spend much time worrying in late October/early November whether that magic telegram from Stockholm is going to arrive. It is pretty easy in science to assign people, including oneself, to broadly correct bands of achievement. . . . Real generators of widespread anxiety, therefore, are going to be those awards that are at a high enough level to signify a satisfying achievement, but not so high that they are realistically beyond one's grasp. An example in the Commonwealth community would be election as a Fellow of the Royal Society. . . . Because the pyramid of achievement widens as it goes down, many more scientists will worry about getting into "the Royal" . . . than about getting a Nobel Prize.

—*John Polkinghorne*, in *Beyond Science* (Cambridge University Press)

Papers in Physics

Particle Physics. One Hundred Years of Discoveries. An Annotated Chronological Bibliography. V. V. EXHELA *et al.* AIP Press, Woodbury, NY, 1996. viii, 328 pp. Paper, $49. ISBN 1-56396-642-5.

This compilation of précis of some 600 papers—roughly one-quarter from 1895–1946, three-quarters from the past half-century, and of the latter well over half from 1947–1967—is a collaboration between the U.S. (that is, Berkeley) and the Russian (Protvino) particle data groups. For each paper there is a phrase proclaiming its significance; its full title (in the original language for earlier papers but only in English translation for later papers); a list of all authors if fewer than five; the orig-

inal abstract, in English, or a brief excerpt from the text; the particles/reactions studied; if experimental, the accelerator and detector used; a partial list of the references given in the paper; and references to reprintings of the paper. Unfortunately, no indication is given of the length of the paper, and authors whose identities disappear into an *et al.*—the rule for experimental papers of recent decades—reappear only in the name index, which is consequently dominated by the participants in those mammoth collaborations that chose to list individuals rather than sign as groups. A helpful, though all too incomplete, subject index is provided. Useful as they are in providing concrete historical orientation, chronologies are—for all their seeming lack of interpretation—among the most tendentious historical documents. In this case the tendencies are the laudable one of recognizing the many contributions of Soviet physicists in the postwar decades and the expectable one of placing stepping-stones to the establishment of the "standard model" and its six quarks. Explicitly excluded are the Grand Unified Theories, string theories, supersymmetries—all that lacks experimental confirmation, even where, as with proton decay, much experimental effort was invested and definite limits established. Other "particle data" discoveries are more unaccountably absent—for example, the continually reduced limits on the size of an eventual electric dipole moment of the neutron and the discovery of the electric quadrupole moment of the deuteron (1940) and attendant recognition of the non-central character of the nuclear force. Indeed by now so much has been written on the history of particle physics (see the excellent critical bibliography by H. C. Hovis and H. Kragh, "Resource letter HEPP-1: History of elementary-particle physics," *American Journal of Physics* **59**, 779–807 [1991]) that not even 600 papers can cover the subject. But it is a mitzvah nonetheless to provide in convenient form so much information about so many.

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Browsings

American Cardiology. The History of a Specialty and Its College. W. Bruce Fye. Johns Hopkins University Press, Baltimore, 1996. xviii, 489 pp. $24.95. ISBN 0-8018-5292-7.

The story of the discipline of cardiology and the technologies, research climate, and socioeconomic factors that have influenced it, by an academic cardiologist who is also a practiced historian.

Biology and Conservation of Sea Turtles. Karen A. Bjorndal, Ed. Second edition. Smithsonian Institution Press, Washington, DC, 1996. iv, 615 pp., illus. Paper, $29.95. ISBN 1-56098-619-0.

A reprinting of the proceedings of a 1979 symposium with the addition of 14 papers covering "recent advances" as of 1995, on topics ranging from early stages of life history through physiology to management issues.

The Cambridge Dictionary of Scientists. David Millar, Ian Millar, John Millar, and Margaret Millar. Cambridge University Press, New York, 1996. xii, 387 pp., illus. $39.95 or £24.95, ISBN 0-521-56185-X; paper, $16.95 or £10.95, ISBN 0-521-56718-1.

Brief lives of some 1300 scientists living and dead, with 33 interspersed "panels" giving accounts of various fields and research topics and of such matters as science in wartime, the exploration of Australia and Antarctica, and the contributions of women.

Discovering Molecular Genetics. A Case Study Course with Problems and Scenarios. Jeffrey H. Miller. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY, 1996. xxiv, 696 pp., illus. $59. ISBN 0-87969-475-0.

A pedagogic approach utilizing groups of "classic papers" accompanied by discussion of the context of the work, references to other sources, and questions to test the student's understanding.

Einstein's Wife. Work and Marriage in the Lives of Five Great Twentieth-Century Women. Andrea Gabor. Penguin, New York, 1996. xxvi, 341 pp., illus. Paper, $12.95 or C$16.99. Reprint, 1995 ed. ISBN 0-14-15993-2.

Recounts the life of the physicist Maria Goeppert Mayer as well as that of Mileva Maric Einstein, without espousing the claim that the latter deserves equal credit for the work attributed to her husband; other subjects are Lee Krasner, Denise Scott Brown, and Sandra Day O'Connor.

Lyme Disease. The Cause, The Cure, the Controversy. Alan G. Barbour. Johns Hopkins University Press, Baltimore, MD, 1996. xx, 258 pp. + plates. $35.95, ISBN 0-8018-5224-2; paper, $15.95, ISBN 0-8018-5245-5. A Johns Hopkins Press Health Book.

An effort by a medical expert to "set the record straight" for patients and other general readers amid the confusions and controversies surrounding the disease.

Magnetic Resonance in Perspective. Highlights of a Quarter Century. Wallace S. Brey, Ed. Academic Press, San Diego, 1996. xx, 681 pp., illus. $59.95 or £44. ISBN 0-12-133145-8.

A reprinting of 55 papers from the *Journal of Magnetic Resonance*, 1969–1989, selected "to give readers who have not lived through this period a feeling for how the complex array of art, science, and technology now available has developed."

Misunderstanding Science? The Public Reconstruction of Science and Technology. Alan Irwin and Brian Wynne, Eds. Cambridge University Press, New York, 1996. viii, 232 pp., illus. $59.95 or £35. ISBN 0-521-43268-5.

A dozen essays by British social scientists examining citizens' responses to encounters with expertise; episodes considered include exposure of British sheep to Chernobyl radiation, obstetric interventions and testing, diagnosis of a genetic disorder, and a supermarket-sponsored museum exhibit.

Reasoning About Luck. Probability and Its Uses in Physics. Vinay Ambegaokar. Cambridge University Press, New York, 1996. xvi, 231 pp., illus. $55 or £35, ISBN 0-521-44217-6; paper, $19.95 or £12.95, ISBN 0-521-44737-2.

An exposition of statistical reasoning and its applications in classical mechanics, thermodynamics, and quantum mechanics, based on a Cornell University course for non-science majors.

Selected Papers of Freeman Dyson, with Commentary. Freeman Dyson. American Mathematical Society, Providence, RI, and International Press, Cambridge, MA, 1996. xii, 601 pp. $59. Collected Works series, vol. 5. ISBN 0-8218-0561-4.

Reprinted technical papers by a theoretical physicist well known as an essayist on more general topics, grouped according to categories of mathematics (13 papers), physics (31), and biology and engineering (5).

The Simple Science of Flight. From Insects to Jumbo Jets. Henk Tennekes. MIT Press, Cambridge, MA, 1995. xii, 137 pp., illus. $20. Translated from the Dutch edition (Bloemendaal, 1992). ISBN 0-262-20105-4.

A work for general readers, characterized by its author as "an act of revenge on the part of an assistant professor of aerospace engineering" who was reprimanded by his department head for "dar[ing] to use flight calculations of ducks, geese, sparrows, and butterflies to entertain his class on aircraft performance."

Transmuted Past. The Age of the Earth and the Evolution of the Elements from Lyell to Patterson. Stephen G. Brush. Cambridge University Press, New York, 1996. x, 134 pp., illus. $44.95 or £30. A History of Modern Planetary Physics, vol. 2. ISBN 0-521-55213-3.

The perspective of a historian of science on "history and geology as ways of studying the past," Kelvin's ideas about geological time, the status of planetary science, and geochronology and stellar evolution as seen in the present century.

Typhoid Mary. Captive to the Public's Health. Judith Waltzer Leavitt. Beacon, Boston, 1996. xx, 332 pp., illus. $25. ISBN 0-8070-2102-4.

An account by a historian of medicine of the case of Mary Mallon, an Irish immigrant cook and "healthy carrier" of typhoid, to whom was attributed the spread of the disease in New York in the early years of this century.