Bright light comes around again

Edmond Halley: Charting the Heavens and the Seas
by Alan Cook
Oxford University Press: 1998. Pp. 540. £29.50, $37.50

Owen Gingerich

"Wherefore if according to what we have already said [the comet] should return again about the year 1758, candid posterity will not refuse to acknowledge that this was first discovered by an Englishman." Candid posterity did not forget, and today Edmond Halley's comet carries more fame and mystique than any other.

Halley's brilliant prediction was in part a matter of luck: there is but one periodic comet visible with the naked eye, and Halley identified it after noticing the similarity of the orbital geometry of the comets of 1532, 1618 and 1682. But his success also came in part through following an avenue opened by the most important scientific book of the seventeenth century, Sir Isaac Newton's *Principia*. For historians of science, Halley's critical role as midwife in bringing out Newton's classic work looms even larger than his memorable but lesser work on the orbits of comets.

In the seventeenth century, however, Halley achieved international fame as a mathematician, although the importance of his geometrical publications has scarcely stood the test of time. More enduring was his brief observational campaign on St Helena in 1677–78, which resulted in the first published star catalogue made using telescopic sights, and his effort in editing *Philosophical Transactions*, which helped to hold together the Royal Society during otherwise precarious years. For his English contemporaries, he was particularly well known as a scientific seaman who charted currents, tides and magnetic bearings in two expeditions where he served as commander of the pink *Paramore*. And, as Sir Alan Cook now brings to light in this well-researched biography, Halley was appreciated in the circles of government as a diplomatic and maritime spy on the Dalmatian coast in the years 1702–03.

In the years that followed his maritime exploits, Halley was appointed professor of astronomy at the University of Oxford, and as henchman for Newton he became involved in an unseemly quarrel about publications with John Flamsteed, the first Astronomer Royal. On Flamsteed's death, Halley became the second Astronomer Royal and, at an age when most men would have long since retired, he followed the Moon through an entire 18-year nodal cycle.

Previous works about Halley, notably Eugene Fairfield MacPike's *Correspondence and Papers of Edmond Halley* (1932), assembled some basic materials for a Halley memoir, but Cook has been far more diligent in his search through archives and record offices for Halley connections of all sorts. One of his most interesting findings suggests that the mysterious death of Halley's father in 1684 was not suicide, as claimed, but murder because he knew too much about the events in the Tower of London on the day the Earl of Essex died.

Cook's research also encompass virtually everything said about the astronomer's religious views, and he considers, but dismisses as biased, Flamsteed's view of Halley's smoking, "swearing like a sailor" and harbouring atheistical ideas. However, material to confirm Halley's orthodoxy is thin and circumstantial. Even more elusive is any insight into Halley's domestic life: virtually nothing is known of Mary Tooke, his wife of 53 years and the mother of his son and two daughters.

Cook's investigations of Parisian collections have helped to fill out the picture of Halley's trip in 1679 to Danzig to test and challenge the observational procedures of Johannes Hevelius, who used the naked eye in contrast to the telescopic sights used by Halley. Hevelius, a highly experienced 68-year-old observer, greatly impressed young Halley by the consistency of his measured positions. Archival research in Venice turned up fresh evidence for Halley's skill as a cartographer of Mediterranean ports.

Occasional pieces of 'Halleyiana' have nevertheless escaped Cook's tight net. In 1684, from his private observatory in Islington (London), Halley made the first daytime telescopic observations of the planet Mercury, thereby enormously increasing the database for this elusive planet, an accomplishment that goes unrecorded here. Also, the helpful appendix "Correspondence of Halley not listed by MacPike" omits a brief but interesting 1695 letter about printing the *Synopsis of Comets* that has been published in the *Journal for the History of Astronomy* (**16,** 223–224; 1985).

There are also a few minor glitches, such as the names Andrew Sharp (instead of Abraham Sharp) and Christfried Kirck (instead of Kirch), and the incorrect statement that Hevelius had observed a transit of Venus. Newton's charming little drawing of the comet of 1680 exists in manuscript, but not in the *Principia*. Some of the transcripts would have been more readable if, for example, instead of the inscrutable "Lopps" the text had read "Lo[rdshi]pps", and US readers could have done with compact explanations of footpads and nonjurors.

Nonetheless, the overall impression created by the book is one of careful craftsmanship and brilliant stage setting to bring to life seventeenth-century England and the

A man for all seasons

Although Newton is today chiefly remembered for his theoretical work *Principia*, he also spent much of his time doing experiments, sometimes using equipment like that shown in this artist's impression of an alchemist's laboratory — or so argues Michael White in *Isaac Newton: The Last Sorcerer* (Fourth Estate, Addison-Wesley, £18.99, $27).

London scene in particular. This serious and informative account promises to be the standard biography for many years to come. □

Owen Gingerich is at the Harvard–Smithsonian Center for Astrophysics, Cambridge, Massachusetts 02138, USA.

Brains trust

The Central Nervous System of Vertebrates

by R. Nieuwenhuys, H. J. ten Donkelaar and C. Nicholson

Springer: 1997. Three volumes. Pp. 2,219. £942, $1,595

Glenn Northcutt

At a time when many scientists debate what constitutes an LPU — least publishable unit — this work, consisting of more than 2,000 pages in three volumes, must at least meet the minimal requirements. Such monumental surveys of the variation in the central nervous systems of vertebrates have been attempted several times.

In 1920, Cornelius Ubbo Ariëns Kappers, the first director of the famous Dutch Central Institute for Brain Research in Amsterdam, produced a two-volume work entitled *Vergleichende Anatomie des Nervensystems* which would form the core of a later expansion in 1936 by G. Carl Huber and Elizabeth C. Crosby. This three-volume work, *The Comparative Anatomy of the Nervous System of Vertebrates*, became a tombstone for the field — surely one could not write three volumes on the nervous systems of vertebrates without everything being said. Nothing could have been further from the truth. These surveys were based on descriptive histology which is particularly refractory to the analysis of microstructure and the interconnections of various parts of the nervous system.

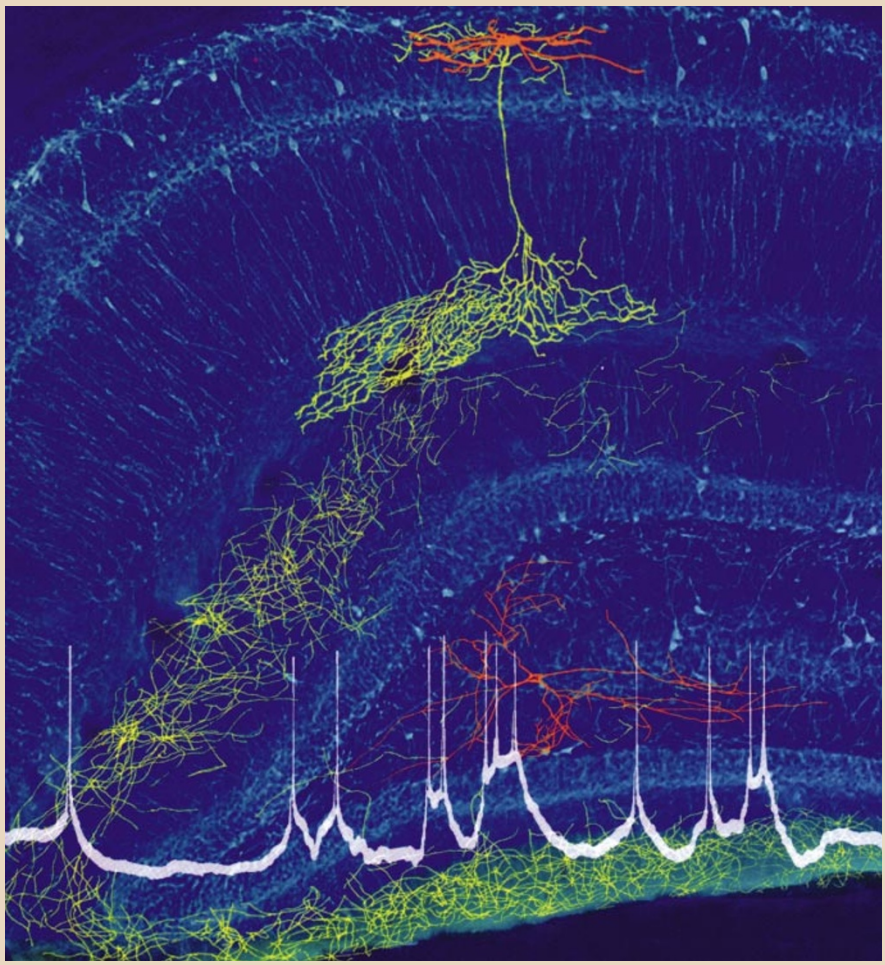
Although the Kappers, Huber and Crosby volumes continued to be used during the 1960s, much of the original work and illustrations were badly out of date, and the material was not set within a broader biological context. These inadequacies were exacerbated by a renaissance of new techniques that allowed pathways to be experimentally established, neurotransmitters and their enzymes to be visualized, the ultrastructure of neurons and their processes to be examined in far greater detail than previously possible, and the refinement of electrophysiological techniques. Renewed interest in the development of nervous systems and their genetic underpinnings has further intensified the need for a new survey.

The new synthesis by R. Nieuwenhuys and colleagues is stunning and represents a level of scholarship that is rarely achieved in any field. The authors clearly outline the purpose and plan of this work by dividing it into three main sections: general features of the cellular elements that form the nervous systems of vertebrates and the general principles that guide their interpretation; detailed descriptions of the brains of selected species of all groups of vertebrates; and possible directions for future research. The quality and uniformity of the illustrations are remarkable.

Seven chapters form the general introductory part of this work. The topics range from the structure and function of the cell types that compose nervous systems and their morphogenesis to the general biological framework within which comparative neurobiologists analyse these systems. These chapters will be invaluable to the novice, who may know little about the organization and functions of neural cells, as well as to more advanced students who understand the basic structure of neural cells but have little idea of how they are generated.

The final chapter in this section outlines the goals of comparative neurobiologists and discusses how a new method of comparison, cladistics, initially generated in another biological field, is being used by neurobiologists to gain a deeper understanding of neural evolution. This chapter will be of immense value to contemporary neurobiologists and, ironically, will also constitute a comprehensive statement for historians of the biological sciences who could otherwise only guess the goals and programmes of comparative neurobiology at the end of the twentieth century.

The second section has 15 chapters summarizing the central nervous systems of amphioxus and representatives of all groups of vertebrates. These chapters follow a general pattern in which the life history of one or more species of a group is briefly summarized, and standard views of their brains are presented, followed by a sequence of drawings of transversely sectioned tissue from the spinal cords and brains of these same species. The authors have adopted a standard way of illustrating the various brain levels by primarily using line drawings rather than photomicrographs. Some readers will



Looking closely at neuroscience

This section through the immunostained hippocampus of a rat adorns the cover of *Foundations of Neurobiology* (W. H. Freeman, $55.95, £32.95). This broad-based neurobiology textbook, written by Fred Delcomyn for students early in their training, will prepare them for further study in neuroscience. It is clearly laid out, with key terms in bold and generous use of tables and illustrations, and contains a useful glossary.