Book Reviews

A Planetary Anomaly

Mercury's Perihelion from Le Verrier to Einstein. N. T. ROSEVEARE. Clarendon (Oxford University Press), New York, 1982. viii, 208 pp., illus. $49.

The advance of the perihelion of Mercury's orbit, long an anomaly in Newtonian celestial mechanics, is one of several astronomical tests of the general theory of relativity. This advance of the point in its orbit when Mercury is closest to the sun was first discussed by the French astronomer Urbain Le Verrier in 1859 as the reason why theories of Mercury's motion and observations of its position did not agree.

The detection of the anomaly came at a time when recent events had vindicated Newtonian celestial mechanics: the discovery of Neptune through an analysis of its perturbations upon the orbit of Uranus by Le Verrier and J. C. Adams, and the introduction of an improved theory of the motion of the moon by P. A. Hansen. Though the lunar theory remained problematic, the anomaly in Mercury's motion posed a more serious threat to Newtonian theory.

Searching for the cause of this anomaly occupied the talents of many of the best celestial mechanicians of the late 19th and early 20th centuries, including Le Verrier, Simon Newcomb, and Hugo von Seeliger. Among the many solutions proposed were: the existence of an intra-Mercurial planet or planets (lumped under the common name "Vulcan"); the existence of matter in rings or in a disk both internal and external to Mercury's orbit; an oblateness of the solar disk; and alterations to the Newtonian theory of attraction, specifically through electrodynamical analogies. Einstein's general theory of relativity finally explained, in full, the perihelion advance.

N. T. Roseveare begins his technically sophisticated scientific review of the general problem by outlining the various ways a perihelion advance might be caused: either through the presence of disturbing matter or through the action of a non-Newtonian force law. He then carefully shows that, throughout the late 19th century, all Newtonian solutions seemed to fail with the exception of von Seeliger's theory that matter comprised by the zodiacal light perturbed Mercury's orbit, causing the advance. A discussion of the parallel development of non-Newtonian theories based upon electrodynamical analogies (velocity-dependent force laws) then sets the stage for his ultimate review of how Einstein employed his general theory of relativity to explain the anomaly.

Roseveare treats both obscure and mainstream theories and lays before the reader a detailed narrative of the false starts and misleading paths that were taken to resolve the anomaly. All mathematical theories are treated in enough detail to convey their character; but observational studies and descriptive reviews are somewhat neglected. For instance, only a few of the many fascinating episodes in which astronomers claimed to have sighted Vulcan are recounted, and those only in the briefest fashion. Similarly, though Roseveare correctly notes that observations of the motion of Mercury, or observations that would lead to determination of the mass of the zodiacal light or of Venus, were very difficult to make, little discussion is provided of the details of the attempts.

Another restriction of this work is that archival sources are almost completely neglected. Though some other historical studies containing archival matter are cited, the present work is restricted to published sources, and in at least one place Roseveare admits that this restriction kept him from making a complete analysis.

Roseveare provides a detailed and cogent review of the progress of theoretical studies and succeeds in showing how the new physics was able to account for what remained an anomaly in classical astronomy and physics, although he has not provided a completely satisfying history. This is especially important to note because 19th-century celestial mechanics has long been neglected by historians. Perhaps Roseveare's work will stimulate further interest and activity.

DAVID H. DEVORKIN
National Air and Space Museum, Smithsonian Institution, Washington, D.C. 20560

Victorian Paleontologists

Archetypes and Ancestors. Palaeontology in Victorian London, 1850–1875. ADRIAN DESMOND. Blond and Briggs (Frederick Muller), London, 1982. 288 pp., illus. £15.95.

The subtitle of this book might more appropriately be "Palaeontologists in Victorian London, 1850–1875." Although Desmond states his goals in terms of relating major social and cultural changes to the "deep structure" of science, his real concern is with the motives and ideologies of scientists rather than with the content of their science. The central characters in his study are Richard Owen and Thomas Henry Huxley, along with their respective followers, students, and supporters. The central theme is the conflict between the scientific representatives of a conservative, hierarchical, preindustrial society and the impatient, ambitious new professionals of the industrial age. Paleontology in the decades surrounding the publication of *On the Origin of Species* was one of the arenas in which this clash of ideologies took place.

Desmond's account of the decades-long conflict between Owen and Huxley is more thorough and is likely to be more controversial than any that has yet appeared. Going beyond the familiar anecdotes of their public clashes over Darwinian evolution—which, as Desmond rightly points out, have generally been based on accounts by Huxley and his partisans—Desmond tries to unravel the many professional, social, cultural, ideological, and personal motives that drove the two men and to show how this complex matrix of influences affected their interpretations of paleontological evidence. Inevitably, Desmond's attempt to provide a less biased assessment of Owen has resulted in a more critical look at Huxley. Indeed, he holds Huxley up to a particularly harsh revisionist scrutiny, questioning the motives behind his scientific judgments and emphasizing the un-Darwinian character of much of his paleontology.

Desmond regards Owen and Huxley as representatives of two opposed but interdependent social and cultural communities. He also sees them as members of a single scientific community in which personal goals, ideas, and ideologies coincided and conflicted in patterns that were anything but simple. Desmond is at his best in tracing individual strands in this tangled web of ideas and personalities. His brief sketches of the individuals who made up his various communi-