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Review of: Revolutionaries Of The Cosmos: The  
Astro-physicists by I. S. Glass and conceptions Of  
Cosmos: From Myths To The Accelerating  
Universe: A History Of Cosmology by Helge S.  
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I. S. Glass. *Revolutionaries of the Cosmos: The Astro-Physicists* .

Revolutionaries of the Cosmos: The Astro-Physicists Conceptions of Cosmos: From Myths to the Accelerating Universe: A History of Cosmology by I. S. Glass; Helge S. Kragh

Review by: Reviewed by James Evans

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ophy, which Gaukroger considers a transformation of the traditional *historia naturalis*; and mechanics, practical mathematics in the tradition of Archimedes that was extended to encompass motion and forces. Gaukroger's view of experimental philosophy (Boyle, Hooke, etc.) as a transformation or new branch of *historia naturalis* is particularly intriguing but may stir up objections. It is regrettable that Gaukroger did not go into Bacon's project of an experimental history to make this important case. Perhaps more irritating is the fact that two of the three roots of the emerging natural philosophy—namely, the *historia naturalis* tradition and the tradition of practical mathematics (mechanics, mostly statics)—enter Gaukroger's picture "out of the blue." They were not dealt with in the earlier parts of the volume (the short digression on *historia naturalis* in Chapter 4 focuses on features of this tradition that have no bearing on Gaukroger's claim). In my view, the fact that Gaukroger did not allot the same historical attention to these two branches of knowledge as he did to the tradition of *philosophia naturalis* weakens the persuasiveness of the overall narrative.

Summing up: Gaukroger's book is a historical reconstruction that brackets historical context (social, practical, political, etc.) and offers a plethora of studies in intellectual history on a variety of subjects that deserve attention in any investigation of the emergence of the scientific culture of the West. It also presents highly interesting general conceptions of the interplay of learned or expert knowledge traditions that shaped the first stage of the Scientific Revolution. It might, however, seem imbalanced: many of the issues one would expect to be prominent in a book on this general topic receive only marginal treatment or are even totally neglected, whereas others are discussed at considerable length. But this assessment might turn out to be premature. What appears to be an uneven distribution of attention and effort, when regarding this first volume in isolation, may prove a deliberate and canny deployment of arguments for making Gaukroger's case about scientific culture in the volumes to come.

WOLFGANG LEFÈVRE

**I. S. Glass.** *Revolutionaries of the Cosmos: The Astro-Physicists.* xiii + 317 pp., figs., bibls., index. Oxford: Oxford University Press, 2006. £35 (cloth).

**Helge S. Kragh.** *Conceptions of Cosmos: From Myths to the Accelerating Universe: A History*

*of Cosmology.* 276 pp., bibl., index. Oxford: Oxford University Press, 2006. £35 (cloth).

Helge Kragh's *Conceptions of Cosmos* is an effort to tell the whole history of cosmology from the Presocratic philosophers to the hot big bang and beyond. While there are short sections in the early portions of the book on ancient Egypt and Babylonia, as well as on the Old Testament, the book is unabashedly a history of Western cosmology, from the ancient Greeks, through the Christian Middle Ages and the scientific revolution, down to our own day. While European cosmology from antiquity through the nineteenth century is a well-worked field, historians have done relatively little with recent cosmology. So it is noteworthy that more than half of Kragh's short volume is devoted to the twentieth century.

The book is traditional internalist history of science, with emphasis on the technical details of theories. In his chosen genre, Kragh is sure-handed, clear, and interesting and has done a fine job of telling a complex story in short compass. The later chapters especially repay close reading. For example, Kragh traces the history of "Hubble's law" (that the distances of the galaxies are proportional to their redshifts) in the two decades before Edwin Hubble's 1929 paper, thus nicely illustrating the roles of chance and influence in the apportionment of historical credit. The chapter on the hot big bang, based in part on Kragh's own *Cosmology and Controversy* (Princeton, 1996), deftly traces the construction of the standard cosmology of our day, including its brief period of confrontation with the rival steady-state theory. As Kragh shows, although the steady-state theory turned out to be wrong, it contributed a good deal by forcing cosmologists to devise better observational strategies for eliminating possibilities. The closing chapter, on cosmological developments after 1970, including the discovery of the acceleration in the expansion of the universe, will be welcomed by many readers, for Kragh has the knack for explaining difficult scientific concepts clearly and concisely.

The earlier portion of the book is less original and, being more dependent on secondary sources, is somewhat less reliable. Kragh says, for example, that "Aristotle reports" that Thales fell down a well while looking at the heavens and was made fun of by a "clever and delightful Thracian serving-girl" (p. 13). Actually, the story comes from Plato's *Theatetus* (174A), but Kragh does not cite an ancient source and refers only to a recently published history of Presocratic philosophy. And he confuses (p. 22) the Sosigenes who in the first century B.C.E. advised

Julius Caesar on the reform of the calendar with Sosigenes the Peripatetic philosopher of the second century C.E., who was Simplicius's indirect source for the history of "saving the phenomena." These are minor blemishes, however, and scarcely detract from the book's considerable merits. The first half of the book contains a generous number of period illustrations and the second a goodly number of graphs and diagrams. Once a paperback edition becomes available, *Conceptions of Cosmos* would make a good choice for the central text in a history of cosmology course, perhaps supplemented by Dennis Richard Danielson's compilation of short primary-text readings, *The Book of the Cosmos* (Perseus, 2002).

Ian S. Glass is a research astronomer, now working at the South African Astronomical Observatory in Cape Town. But he is also the author of a number of articles on astronomical history, as well as *Victorian Telescope Makers: The Lives and Letters of Thomas and Howard Grubb* (Institute of Physics, 1997). As he tells us in his preface, the teen-aged Glass found pleasure and inspiration in reading E. T. Bell's *Men of Mathematics*. Later he came to regret that nothing similar was available in astrophysics, and he set out to remedy the situation. While his book is at a far more sophisticated level than Bell's, it is very much an appreciation, written by a modern scientist for his peers as well as for general readers.

Glass devotes one chapter each to eight "revolutionaries of the cosmos": Galileo, Newton, William Herschel, William Huggins, George Ellery Hale, Arthur Eddington, Harlow Shapley, and Edwin Hubble. Although the earlier chapters are largely based on secondary sources, Glass has found and used the best ones and has made the subject matter his own. He writes with charm and with sympathy for his subjects but is perfectly willing to show them in unflattering light. We learn that Eddington once hired a publicity agent to help him advance his own fame. Newton's insecurities are displayed, no less than his brilliance (though the nature of his relationship with Fatio is only sketchily explored). Indeed, one might complain that the chapter on Newton is too heavily biographical and contains too little discussion of his science.

Sometimes, especially in the earlier chapters, we encounter a sweeping or simplistic assertion: "The teachers of the sixteenth and early seventeenth centuries believed that Aristotle and the other philosophers of classical times had known everything worth knowing" (p. 4). On the other hand, Glass's observations on the traits, talents, and motivations that make for a successful ca-

reer in science are often astute and interesting. In the chapters devoted to more recent subjects, Glass is much more at home. The chapters that treat Eddington, Shapley, and Hubble do a fine job of tracing the development of twentieth-century astrophysics. The story is told with drama and flair, the science is clearly and carefully explained, and the personalities of the principal characters are convincingly realized. The book is illustrated with well-chosen drawings and photographs, and each chapter ends with a carefully compiled list of references. *Revolutionaries of the Cosmos* can be warmly recommended for students and general readers alike.

JAMES EVANS

**Edward Grant.** *A History of Natural Philosophy from the Ancient World to the Nineteenth Century*. xiv + 361 pp., bibl., index. New York: Cambridge University Press, 2007. \$24.99 (paper).

Edward Grant is one of the most distinguished historians of science and philosophy of his generation. In *A History of Natural Philosophy from the Ancient World to the Nineteenth Century* he has produced a study that distills a lifetime of teaching and research and opens difficult areas of thought not only to those specializing in ancient and medieval philosophy but also to modern historians seeking knowledge of those previous epochs. It should be noted that the volume really does concentrate on Grant's area of specialization, with only one valedictory chapter looking at the subject of natural philosophy from the sixteenth through nineteenth centuries. This last chapter is based largely on familiar secondary sources and does not probe the subject deeply.

That being said, the rest of Grant's study is exemplary in its precision and careful focus, leading the reader through almost two millennia of thinking about natural philosophy. After a nod to Egypt, Grant commences with the Presocratics, who first sought to explain events such as earthquakes and storms as natural phenomena rather than as actions of the gods. Divine explanations of causation gave way to natural ones. Grant is especially good at explaining what is obvious to some people but still rarely articulated: the exact character of the differences between the approaches to nature of Plato and Aristotle. Indeed, Grant's chapter on Aristotle is remarkable in terms of the vast amount of historical and philosophical information he manages to convey in a brief space. In particular, he conveys the manner in which the texts of Aris-