A Survey of the *Almagest*

By Olaf Pedersen, with annotation and new commentary by Alexander Jones (originally published by Odense University Press, 1974). New York (Springer). 2010.
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Ptolemy's *Almagest* is a difficult book. The first time I encountered it was in my first year at St. John's College. We worked through selections of the text in a presentation and discussion based seminar. The only book I used for reference was Euclid's *Elements*. I like to believe that I understood most of the individual arguments, but in many ways I couldn't see the forest for the trees. The second time was as a graduate student at University of Toronto. We read the whole book in a small seminar led by A. Jones. I had Pedersen's survey by my side every step of the way. In terms of working through the *Almagest*, Pedersen's companion is like a new technology, which I now have a difficult time remembering how I ever made do without.

Olaf Pedersen developed the material in his *Survey* through the process of teaching the *Almagest* at Aarhus University, where he was professor of physics and founder of the department in the history of science. This background probably explains why his approach is so useful. The book is a guide to reading through the details of Ptolemy's argument, while keeping a clear focus on the astronomical and mathematical concepts. Along with Neugebauer's *A History of Ancient Mathematical Astronomy* (New York: Springer, 1975), the *Survey* is an essential tool for making a technical study of Ptolemy's opus. As Jones says in his introduction to this new edition, "It is the first book one puts in the hands of a student approaching the *Almagest*" (6).

Pedersen's strategy is to equip the reader with the necessary concepts, both mathematical and astronomical, to approach the text itself. From an astronomical perspective, the modern reader must become familiar with the naked-eye phenomena, with which ancient astronomers were familiar. From a mathematical perspective, the modern reader must learn how to handle sexagesimal fractions, solve trigonometric problems using the chord table and do spherical trigonometry using the chord table and the so-called Menelaus theorem.

After developing these basic concepts, Pedersen presents Ptolemy's work using modern trigonometry and condensing the verbose algorithms in the original into equations involving functions. This allows Pedersen, and his readers, to focus on Ptolemy's overall approach, which is divided up into various theories, such as spherical astronomy, solar and lunar theory, eclipse theory, the fixed stars, and the various planetary theories.

With the exception of his treatment of Ptolemy's mathematical introduction, Pedersen is not much interested in the details of Ptolemy's mathematical methods and mostly translates these into modern forms, in order to focus on the structure of Ptolemy's astronomical models. An important exception to this, however, is his treatment of Ptolemy's use of tables, which is a significant contribution to our understanding of Greek mathematical methods. In a section called "The mathematics implicit in the *Almagest*," Pedersen argues that well before the development of the function concept, mathematicians thought of, and used tables, in at least two ways that are conceptually related to two of the ways that we work with functions (78–91). In particular, tables were understood to be one-to-one relations between two sets of numbers and, when used in an algorithm, they could be used to associate a member of the domain unambiguously with a member of the codomain. Moreover, Pedersen shows that Ptolemy had a sufficient grasp of the use of tables as functions to allow him to do things like simplify functions of two variables using a standard interpolation technique and applying a general method to approximate an instantaneous angular velocity. (This material is also presented in O. Pedersen, 1974, Logistics and the Theory of Functions, *Archives International d'Histoire des Science*, 24, 29–50.) Historians of Greek mathematics have still not sufficiently explored the implications of the way Ptolemy used tables to combine geometric and arithmetic approaches.

This new edition brings a useful work back into circulation, along with a number of additions. The original text is reproduced photographically, with a few in-line corrections. Where comments are necessary, or desirable, black lines have been drawn in the margin of the text, which alert the reader to the presence of a note at the back of the text. Jones has added over 20 pages of comments (455–476), bringing the scholarship up to date and correcting Pedersen's occasional mistake. These corrections, and comments, include the contents of three important reviews of the original publication by G. Saliba, V.E. Thoren, and G.J. Toomer. This is followed by a four-page bibliography of recent material referred to in the notes (477–480).

Since the original has been out of print for many years and is now difficult to find, any reprinting would be welcome, but the inclusion of supplementary material makes this edition essential for anyone studying Ptolemy or the ancient and medieval traditions of mathematical astronomy that were influenced by his work.

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Étienne Bézout (1730–1783) Mathématicien des Lumières
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The name of Bézout is now associated in mathematics with one object and two results. The object is the Bezoutian matrix, an important tool in constructive algebra and elimination