

- b. Success in predicting eclipses depended mostly on his account of latitudes, which included an approximately 6 deg movement of the line of nodes per sidereal revolution of Jupiter
 - 5. These tables attracted a good deal of attention in both England and France, where published reviews confirmed their accuracy, helping to stamp Cassini as at the forefront of observational astronomy
 - a. So far as I have been able to tell, Cassini does not address the question of Kepler's third "law," which Wendelin had said holds exactly for these satellites in a letter to Riccioli (in 1640's)
 - b. (Question left for Flamsteed to resolve in 1670's and 1680's, prompted in part by his knowledge of Streete and Horrocks)
- B. Streete's *Astronomia Carolina* (1661)
1. A step forward with the publication of Streete's *Astronomia Carolina* in 1661, written in English and named in honor of newly restored monarchy of King Charles of England
 - a. The best among the several British works on planetary astronomy in the twenty year period starting and ending with Wing's books
 - b. The most eclectic, picking and choosing in pursuit of the most accurate predictive system
 2. Elliptical orbits, using Boulliau's 1657 method of determining true from mean anomaly, not the area rule, but with superior orbital elements, in large part under the influence of Horrocks
 - a. (Boulliau's method attributed to Streete's friend, Robert Anderson, in the book)
 - b. As Table (from Wilson) shows, Streete comes closest to "correct" elliptical elements at the time
 - c. Flamsteed remarks in 1669, "I esteem Mr Streete's numbers the exactest of any extant."
 - d. (See graphs in Wilson (1989) showing discrepancies in ephemerides for the 1650-1690 period)
 3. Follows Horrocks's *Venus in sole visa* in reducing the solar parallax to about 15 sec and using Kepler's third law to determine mean distances from periods
 - a. Significant improvements for Mercury and Venus, as we already know from Horrocks
 - b. Adapts a procedure of Herigone's (1637) for circular orbits to simple elliptical orbits to obtain eccentricity and aphelia
 - c. Denies that aphelia and nodes move, provoking a major controversy with Wing that extended across the 1660's, focusing on solar parallax and correct precession of the equinoxes; whether orbits are stationary (unlike Moon's) later to become an important issue
 - d. Invokes magnetism as a physical basis rather than a geometrical basis for defending (see Appendix)
 4. Streete important because he shows the potential for refinement through revision of some of the assumptions underlying the *Rudolphine Tables*
 - a. Makes Horrocks's discoveries public, in process calling attention to Horrocks, whose *Venus in sole visa* is published in 1662 by Hevelius, to whom Huygens had sent a copy of the manuscript
 - b. Streete the first of the group in the 1650's and 1660's to pursue empirical improvement over Kepler, and not just comparability

- c. So, finally get to where Horrocks was when he died in 1642
 - d. Horrocks's papers *Opera Posthuma*, published in separate volumes in 1672-73, edited by Wallis (I) and Flamsteed (II)
5. Streete's book proved to be influential -- in some cases the primary source in astronomy for subsequent key figures
 - a. Huygens bought a copy while in England in 1661, and it clearly continued to influence him, if only through making him aware of Horrocks, when the Royal Academy's Kepler-refinement project was being fashioned
 - b. Newton appears to have learned his astronomy from it
 - c. Tables outlasted Boulliau's and Wing's, into the 18th century
 6. {Fifteen years later the last of the pre-Newtonian new orbital methods comparable in accuracy to Kepler's was published, Mercator's *Institutionum Astronomicarum* of 1676, employing a method he had proposed in his *Hypothesis astronomica nova* of 1664; Newton cites 1676 book in the *Principia*
 - a. Presents with care first the equant at the empty focus, showing it is inadequate, then both Kepler's area rule and Boulliau's geometric construction (used as well by Streete), before presenting his own geometric construction, claiming it is preferable to both of these
 - b. His method employs a small displacement of the circle circumscribing the ellipse (see Appendix)
 - c. Ends discussion with comparisons of different methods for Mars, reproducing Kepler's table of comparisons of oppositions from *Astronomia Nova*, following it with a table showing that his own values for Kepler's 28 featured comparisons are a little better than Kepler's
 - e. Mercator's book thus becomes the "review article" reference on the question of the area rule
 - d. (See Appendix for tables for the 28 comparisons from Kepler through Mercator)}
- C. The Founding of the Royal Society (1660-63)
1. Regularly meeting discussion groups involving those interested in the new "experimental philosophy" had been going on in both London and Oxford from 1645 on
 - a. Group at Gresham College, led by Wilkins and Wallis, and a group brought together by Hartlib, a Puritan educator
 - b. Boyle spoke of the "invisible ... philosophical college" as early as 1647
 2. The political turmoil in England during the Cromwell years -- 1649 to 1660 -- produced similar turmoil in the management of colleges and universities, turmoil that intensified with the Reformation of 1660, in which Church of England administrators regained control of the universities, after nearly two decades in which puritans had much more power than they had had before
 - a. Those engaged in the empirical movement felt legitimately threatened in this atmosphere
 - b. Turned to the newly installed King Charles with the idea of starting a new academic institution
 3. King Charles agreed in 1660, and in 1662 chartered the Royal Society of London for the Improvement of Natural Knowledge