AN EARLY SEVENTEENTH CENTURY PERSIAN MANUSCRIPT ON THE TYCHONIC SYSTEM

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The Vatican Library manuscript (Vat. Pers. 9)[1] summarized below is a letter containing the Persian translation of a Latin booklet on Tycho Brahe's system. It was written by Petrus della Valla, in 1624 from the city of Goa in India, to Mawlânâ Zayn al Dîn-i Lârî (from Lâr in Iran) entitled Al Munajjim, i.e., the Astronomer. The author of the Latin original is given as Christophorus Borrus, a Jesuit priest and astronomer from Milano, and it was Petrus della Valla who translated it into Persian.

The present manuscript is accompanied by an Italian translation, the translation of each page being given on the page facing it. This copy of the original letter was probably transcribed and translated by Petrus della Valla himself, who was also from Milano. The Italian translation bears the date 1631, and the place of translation is indicated as the city of Rome.

Petrus della Valla makes some apologies for his Persian. In fact, there are some mistakes and vague expressions in the text, and although the meaning as a whole is sufficiently clear, this makes the publication of the text a little difficult or unadvisable.[2] Moreover, the fact that the manuscript is of European origin leaves unanswered the question of whether the letter actually reached its destination or not. Such considerations have led me not to publish this important and interesting text but only to give a résumé of it.

Page 1a is the title-page, and the following five pages (1b, 2b, 3b, 4b, 5b) form the introductory chapter, the translation of Borrus' treatise starting on p. 6b. The writer says that great advances have

[1] Ettore Rossi, *Elenco dei Manoscritti Persani della Biblioteca Vaticana*, 1948, p. 35-36.

[2] Petrus della Valla is seen not to have any claims as an astronomer; he was conversant with astronomy, but he seems not to have been a professional astronomer.

recently been made in astronomy in Europe, adding that many important new books in trigonometry, on the newly invented instrument, the telescope (he calls it *âlat-i chashmak-i dirâz)*, and on other astronomical subjects have been published, and he promises to send all these to Zayn al Dîn-i Lârî as soon as he returns to Italy. He then mentions Tycho Brahe and describes him as the most famous of the later astronomers (p. 2b-3b).

A diagram of Tycho Brahe's system is given on page 6b. Here Venus is shown as the planet closest to the sun, Mercury coming next in the row; and the same is true for the diagram accompanying the Italian translation. There are also three circular orbits, shown with dotted lines, concentric with the planetary orbits and occupying different positions among them. These apparently represent paths of various comets. The corresponding stellar bodies themselves are marked as "signs", each bearing a date. The dates given are, in the order of increasing distances from the sun, 1577, 1618, and 1580. Each "sign" has a tail-like appendage projecting radially outward, i.e., away from the sun. A brief description of the Tychonic system follows (7b, 8b), after which it is shown that this system can account for all the appearances which can be explained by the other systems (9b-16b).

Chapter 3 (16b-20b) is devoted to the exposition of arguments showing the superiority of the Tychonic system. This consists of an enumeration of phenomena in the explanation of which Tycho Brahe's system is more successful than the other systems. The characteristic feature of this chapter is that it emphasizes the rejection of solid crystalline spheres and that it deals with this topic as if this rejection constituted an essential feature of the new system.

Two stellar bodies appearing in 1572 and 1579 are mentioned in connection with the first argument (p. 16b). It is asserted that, starting from the vicinity of the lunar sphere, these bodies traversed the region comprising the spheres of Mercury and Venus, and continuing their motion they moved up to the sphere of the fixed stars. It is then pointed out that, had solid spheres existed as set forth by the older systems, such movements would have been impossible, but that such motions are perfectly conceivable when the new view which rejects the solid spheres is adopted.

The second argument (16b-17b) deals with Mars. It is stated here that the distances of this planet from the earth are generally greater than that of the sun but that, when at opposition with the sun, Mars is nearer to us than the sun. It is added that this should be considered an established fact in so far as it is accepted both by Tycho Brahe and the most famous astronomers of the time. Then it is pointed out that such a situation cannot be reconciled with the idea of solid spheres.

In the third argument (17b) the phases of Venus as seen through the telescope are mentioned, and it is asserted that the "older systems" cannot account for such a phenomenon, as, e.g., the quadrature of Venus could not occur on the basis of such systems.

The fourth argument (18b) contains the news of Galileo's discovery of "four or five" stars revolving around Jupiter. It is then argued that the older systems would require a new epicycle for each of these and that there would be no end to thus increasing the number of spheres.

In the fifth argument (18b-19b) sun-spots are mentioned. They are described as bodies revolving around the sun, and it is said that their explanation by the older systems would involve the same disadvantage as mentioned in argument No. 4. There is a statement here to the effect that the sun-spots have been observed by some with the naked-eye.

The sixth argument (19b) deals with the mountains and depressions observed on the lunar surface, and it is claimed that these observations are found to be in greater harmony with the new system when the impossibility of vacuum and the idea of solid spheres are taken into consideration.

The seventh argument (20b) states that according to Kepler, if solid spheres did really exist light would suffer refraction when passing through them; it is then added that no such phenomenon has been observed.

Chapter 4 (21b-26b) argues that Tycho Brahe's system is in conformity with sacred writings and with the sayings of old prophets. It is also attempted here to establish the superiority of the new system on the basis of certain philosophical considerations. It is then asserted that it has already gained wide acceptance and that all calendars and astronomical tables are now being based upon it.

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As is known, the final victory of the Copernican system in Europe was mainly won by Newtonian physics, and as a result, the heliocentric view gained wide acceptance only about the middle of the eighteenth century. The first discoveries made with the telescope had decreased the importance of the Ptolemaic system as a rival, but the Tychonic system continued to find many adherants. According to Adnan Adıvar, the Copernican system is referred to briefly and apparently for the first time in the Ottoman Empire by Abû Bakr Bahrâm al Dimishqî in his translation of *Atlas Major* which he completed in 1685.[3] Tycho Brahe's system and Galileo's researches with the telescope had close relations with the Copernican system and, like it, were relatively easy to summarize and popularize. It is of interest therefore to investigate their repercussions in Islam and to see whether the spread of the Copernican system was in any way related to them.

The manuscript summarized above is obviously of interest from such view-points also. Its importance is enhanced by its date of 1624, a quite early one since it contains news of Galileo's work with the telescope. It indicates clearly that the rivalry between the Copernican and the Tychonic systems effected also their spread outside Europe. It is of great interest that although it contains information concerning major European discoveries in astronomy up to about 1620, with the exception of those of Kepler, there is no mention in it at all of the Copernican system. It gives the impression that probably the zeal of the antagonists of the Copernican system to secure acceptance for the Tychonic system was increased by their anti-Copernican feelings.

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[3] *Osmanlı Türklerinde İlim*, Istanbul 1943, p. 134-35.