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THE INVENTION OF MICROMETER AND ITS USE IN ASTRONOMICAL OBSERVATIONS

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Abstract. The circumstances following the micrometer invention concern the telescope application to the measuring astronomical instruments (quadrant, sextant). The inventions of this measuring device in England and France gave rise to the question of priority which finally was attributed to William Gascoigne, an English astronomer.

In a letter dated December 28, 1666 and published in No 21 of *Philosophical Transactions* for 1667, pp. 373-375, Adrien Auzout, a French astronomer, communicated that in the summer of 1666 he had determined the diameters of the Sun, of the Moon and of the planets by using a method devised by him, and also by Jean Picard, to be the best one used for these purposes by that time since it enabled the diameter measuring of these objects as accurate as one second of arc, bearing in mind that a foot was divided into 24 000, i.e. 30 000 parts.

As for the diameter of the Sun, its apogee value was found to be $31' 37'' - 40''$, i. e. it could no be less than $31' 35''$. The corresponding perigee value did not exceed the amount of $32' 45''$ and it could not be smaller by one or two arc seconds. As for the Moon, its diameter was never less than $29' 44'' - 45''$, also never exceeding the amount of $33'$. In the same letter Auzout mentioned that he had discovered a method for the Moon-parallax determination provided the diameter was known.

Although it was not explicitely said by Auzout in what way he and Picard had performed the mentioned measurements, already the results communicated in the letter initiated Richard Towenley to rise the question concerning the priority in the invention of this instrument used in the measuring of the angular separations and which, consequently, was named micrometer ($\mu\iota\kappa\rho\alpha\varsigma$, small; $\mu\varepsilon\tau\rho\varepsilon\iota\nu$, to measure).

The invention of this measuring instrument took place after the telescopes begun to be attached to the instruments used by that time for the measuring purposes (quadrants, sextants) and the observations begun to be performed by use of the telescopic sight instead of the simple diopters. Such an application of the telescopes enabled some objects to turn out as having measurable diameters and in view of the improvement in the quality of observations it initiated the research aimed at the determining of these diameters by direct measuring.

In a letter of which an excerpt was published in No 25 of *Philosophical Transactions* for 1667, pp. 457-458 Richard Towenley pointed out that he would offend the English nation unless he published that the first who had introduced a measuring device of a

micrometer type in the observational praxis, about 1640, was William Gascoigne. This statement of his Towenley supports by invoking the original correspondence between Gascoigne and his friends concerning this discovery and the measuring-device application to the measuring of small angular separations. All these friends and Gascoigne himself vanished from life while very young. This circumstance, certainly, led to an independent rediscovery of the micrometer after more than twenty years, but this time on the continent and by persons gathered around the newly founded Academy of Sciences in Paris unlike its first discovery which was rather an individual act of a person working alone.

In distinction from England where the empiricism originated from a free commercial and industrial initiative and was codified in Bacon's work *Instauratio magna* published in 1620, on the continent the rationalism, established in Decsartes' works *Discours de la méthode* and *Principia philosophiae* published in 1637 and 1644, respectively, was promoted. Since the XVII century was a century of mechanics (Pannekoek, 1961) it may be said that both trends (empiricism and rationalism) were in the methodological sense connected through the mechanicism. Though in both cases about twenty years elapsed between the publishing of each of the works characterising the two different methodological principles the obtained results, when micrometer is concerned, coincided, bearing in mind the time difference mentioned above.

References

Pannekoek, A.: 1961, *A History of Astronomy*, 246.