Mouton, Gabriel | Encyclopedia.com

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(*b*. Lyons, France, 1618; *d*. Lyons, 28 September 1694)

mathematics, astronomy.

Mouton became *vicaire perpétuel* of St. Paul's Church in Lyons in 1646, after taking holy orders and obtaining a doctorate in theology. He spent his whole life in his native city, fulfilling his clerical responsibilities and untroubled by any extraordinary events. During his leisure time he studied mathematics and astronomy and rapidly acquired a certain renown in the city. Jean Picard, who also was an *abbé*, held Mouton in high esteem and always visited him when in Lyons to work on the determination of the city's geographic position.

The book that made Mouton famous, *Observationes diametrorum solis et lunae apparentium* (1670), was the fruit of his astronomical observations and certain computational procedures he had developed. Lalande later stated: "This volume contains interesting memoirs on interpolations and on the project of a universal standard of measurement based on the pendulum."

Mouton was a pioneer in research on natural and practicable units of measurement. He had been struck by the difficulties and disagreements resulting from the great number of units of length, for example, which varied from province to province and from country to country. First he studied how the length of a pendulum with a frequency of one beat per second varies with latitude. He then proposed to deduce from these variations the length of the terrestrial meridian, a fraction of which was to be taken as the universal unit of length. Mouton selected the minute of the degree, which he called the *mille*. The divisions and subdivisions of this principal unit, all in decimal fractions, were called *centuria, decuria, virga, virgula, decima, centesima*, and *millesima*—or alternatively, in the same order, *stadium, funiculus, virga, virgula, digitus, granum*, and *punctum*.

The *virgula geometrica* (geometric foot), for example, was 1/600,000 of the degree of meridian. In order to be able to determine the true length of this foot at any time, Mouton counted the number of oscillations of a simple pendulum of the same length over a span of thirty minutes and found it to be 3,959.2. These ideas were espoused by Picard shortly after the book appeared and a little later, in 1673, by Huygens. They were also favorably received by members of the Royal Society.

Although Mouton's proposals were seriously considered in theoretical terms in his own time, they led to no immediate practical results. Contemporary measuring procedures were too unsatisfactory to assure their valid and definitive application. It was not until 1790 that projects like Mouton's were taken up again. At a session of the Academy of Sciences on 14 April of that year, M. J. Brisson proposed that a new system be based on a natural standard. The Academy preferred to press for a geodesic survey, however, and decided to adopt one ten-millionth of the quadrant of the meridian of Paris as the standard for the meter.

In the *Observationes diametrorum* Mouton presented a very practical computational device for completing ordered tables of numbers when their law of formation is known. He used successive numerical differences, an idea previously employed by Briggs to establish his logarithmic tables.

When Leibniz went to London in January 1673, he took with him his *Dissertatio de arte combinatoria*. He summarized its contents to John Pell and, in particular, explained what he called "différences généeratrices." Pell remarked that he had read something very similar in Mouton's book, which had appeared three years earlier. Leibniz had learned, during his stay in Paris, that the book was in preparation but did not know that it had been published. While visiting Oldenburg, Leibniz found Mouton's book and observed that Pell had been right; but he was able to prove that his own, more theoretical and general ideas and results had been reached independently of Mouton's.

A skillful calculator, Mouton produced ten-place tables of logarithmic sines and tangents for the first four degrees, with intervals of one second. He also determined, with astonishing accuracy, the apparent diameter of the sun at its apogee. A skilled experimentalist, he constructed an astronomical pendulum remarkable for its precision and the variety of its movements. It was long preserved at Lyons but was ultimately lost.

BIBLIOGRAPHY

I. Original Works. Mouton’s major work is *Observationes diametrorum solis et lunae apparentium, meridianarumque aliquot altitudinum, cum tabula declinationum solis; Dissertatio de dierum naturalium inaequalitate*,…(Lyons, 1670).

His trigonometric tables, which remained in MS, are now in the library of the Academy of Sciences. Esprit Pézénas, director of the observatory at Avignon, consulted this MS and used Mouton’s method in preparing the new ed. of William Gardiner’s *Tables of Logarithms* (to seven decimals) (Avignon, 1770).

II. Secondary Literature. See the following (listed chronologically): J. B. Delambre, *Base du système métrique décimal ou mesure de l’arc de méridien compris entre les parallèles de Dunkerque et Barcelone, exécutée en 1792 et années suivantes par MM. Méchain et Delambre*, I (Paris, 1806), 11; *Biographie universelle ancienne et moderne*, XXIX (Paris, 1861), 485; Rudolf Wolf, *Geschichte der Astronomie* (Munich, 1877), 623; and Moritz Cantor, *Vorlesungen über Geschichte der Mathematik*, III (Leipzig, 1901), 76–77, 310, 389, and IV (Leipzig, 1908), 362, 440.

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