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(*b;* Hertfordshire, England, 1981; *d*. London, England, 10 December 1626)

navigation, mathematics.

Little is known of Gunter's origins or the details of his life. Of Welsh descent, he was educated at Westminster School and Christ Church, Oxford, graduating B.A. in 1603 and M.A. in 1605. He subsequently entered holy orders, became rector of St. George's, Southwark, in 1615, and received the B.D. degree later that year. In March 1619 he became professor of astronomy at Gresham College, London, retaining this post and his rectorship until his sudden death at the age of forty-five.

Gunter's contributions to science were essentially of a practical nature. A competent but unoriginal mathematician, he had a gift for devising instruments which simplified calculations in astronomy, navigation, and surveying; and he played an important part in the English tradition—begun in 1561 by Richard Eden's translation of Martin Cortes' *Arte de navegar* and furthered by William Borough, John Dee, Thomas Harriot, Thomas Hood, Robert Hues, Robert Norman, Edward Wright, and others—which put the theory of navigation into a form suitable for easy use at sea. Gunter's works, written in English, reflected the practical nature of his teaching and linked the more scholarly work of his time with everyday needs; the tools he provided were of immense value long afterward.

Gunter's first published mathematical work was the *Canon triangulorum* of 1620, a short table, the first of its kind, of common logarithms of sines and tangents. His account of his sector, in the *De sectore et radio* of 1623, had circulated in manuscript for sixteen years before its publication. The sector, a development from Hood's, included sine, tangent, logarithm, and meridional part scales; its uses included the solution of plane, spherical, and nautical triangles (the last formed from rhumb, meridian, and latitude lines). With improvements, the British navy used it for two centuries, and it was also a precursor of the slide rule. Gunter solved such problems as finding the sun's amplitude from its declination and the latitude of the observer by additing similar scales to the seaman's cross-staff. Comparison of the amplitude with the sun's direction, measured by a magnetic compass, was known to give the compass variation; but although Gunter's own observations in 1622 at Limehouse were about five degrees less than Borough's 1580 results there, a statement of the secular change of variation awaited the further decrease observed by Gunter's Gresham successor, Henry Gellibrand.

Gunter's other inventions may have included the so-called Dutchman's log for measuring a ship's way. Henry Briggs acknowledged his suggested use of arithmetical complements in logarithmic work and the terms cosine, contangent, and such are probably Gunter's own; his use of the decimal point and his decimal notation for degrees are to be noted. Gunter's chain, used in surveying, is sixty-six feet long and divided into 100 equal links, thus allowing decimal measurement of acreage. Largely following Willebrord Snell, Gunter took a degree of the meridian to be 352,000 feet; this decision gave English seamen a much improved result.

BIBLIOGRAPHY

I. Original Works Gunter's chief works went through six eds, by 1680 and were successively augmented by their editors. They are *Canon triangulorum, sive tabulae sinuum et tangentium artificialium ad radium 10000.0000. & ad scrupula prima quadrantis* (London. l620)—the British Museum copy (C.54. e. 10) is bound with Henry Briggs's rare *Logarithmorum chilias prima* (London, n.d. [probably 1617]) and contains copious MS additions; *De sector et radio*. *The Description and Use of the Sector in Three Bookes*. *The Description and Use of the Crosse-Staffe in other Three Bookes...* (London, 1623), a work of great practical importance; and *The Description and Use of His Majesties Dials ill While-Hall Garden* (London, 1624)—the British Museum copy (C.60.f.7) gives evidence of Gunter's friendship with Ben Jonson—describes the large complex of dials, which stood until about 1697. A copy of the enl. 2nd ed. of his works. entitled *The Description and Use of the Sector, Crosse-staffe, and Other Instruments: With a Canon of Artificiall Lines and Tangents, to a Radius of l00.000,000 Parts, and the Use Thereof in Astronomie, Navigation, Dialling and Fortification, etc...* (London, 1636), was bought by Newton for five shillings in 1667 and may be seen, much thumbed, in the library of Trinity College, Cambridge (NQ.9.160); it includes the vexed method of "middle latitude," probably first put forth by Ralph Handson in his 1614 version of Bartolomäus *Pitiscus' Trigonometria* but not used by Gunter himself. The 1653 ed. of the works, amended by Samuel Foster and Henry Bond, contains an early printed statement of the logarithmic result for the integral of the secant function or meridional parts—Gunter's meridian scale, like Wright's earlier one, came from the simple addition of secants; and he was doubtless unaware of Harriot's unpublished calculation of them as (in effect) logarithmic tangents, completed in 1614: he was not, anyway, interested in such theoretical niceties.

II. Secondary Literature. There is little need to refer to the brief early biographicalsketches by [John Aubrey](), Charles Hutton, and John Ward. Accounts of aspects of Gunter's scientil1c contributions and their contexts are given in James Henderson, *Bibliotheca tabularum mathematical Being a Descriptive Catalogue of Mathematical Tables. Part 1. Logarithmic Tables (A. Logarithms of Numbers*)(Cambridge, 1926); and, extensively, in David W. Waters, *The Art of Navigation in England in Elizabethan and Early Stuart Times* (London, 1958), which gives detailed references to the relevant work of his contemporaries, of whom Briggs, Hatriot, and Wright are the most important in this context. Christopher Hill. *Intellectual Origins of the English Revolution* (Oxford, 1965). covers the wider background, with much detail on the Gresham College circles. E. G. R, Taylor. *The Mathematical Practitioners of Tudor and Swart England* (London, 1954), is useful but often infuriating on documentation. A more recent survey of the mathematical and navigational reference is in J. V. Pepper. "Harriot's Unpublished Papers:" in *History of Science*, **6** (1968), 17–40. The scientific correspondence of the later seventeenth century contains references to Gunter but does not add much of substance.

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