



## Edmund Gunter and his Measuring Devices

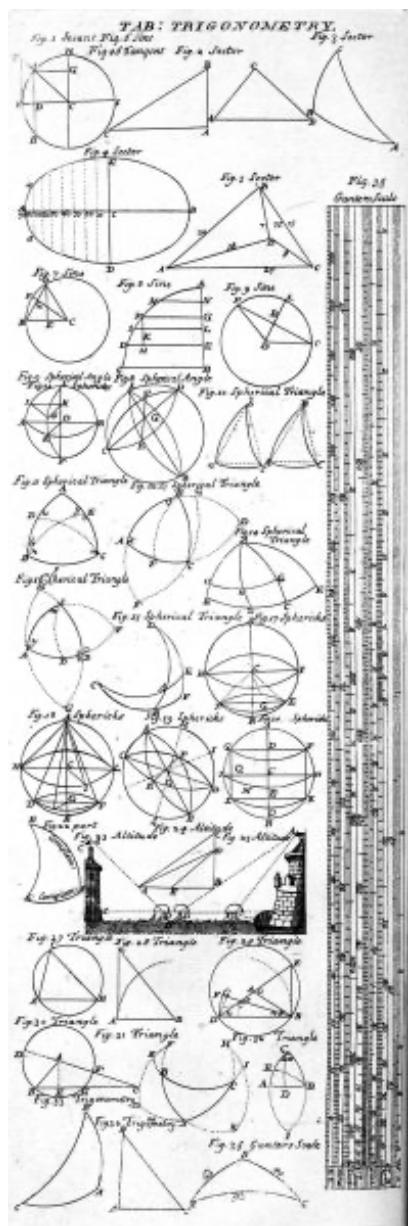


Table of Trigonometry, from the 1728 Cyclopaedia, Volume 2 featuring a Gunter's scale

On December 10, 1626, English clergyman, mathematician, geometer and astronomer **Edmund Gunter** passed away. Gunther is best remembered for his mathematical contributions which include the invention of the Gunter's chain, the Gunter's quadrant, and the Gunter's scale. In 1620, he invented the first successful analog device which he developed to calculate logarithmic tangents.

### **Edmund Gunter – Early Life**

Edmund Gunter was born in Hertfordshire in 1581. Edmund attended Westminster School as a Queen's Scholar, then entered Christ Church, Oxford on 25 January 1600. He graduated with a B.A. on 12 December 1603. Already as an undergraduate, Gunter had developed a strong interest in mathematics and in mathematical instruments. He wrote a manuscript *New Projection of the Sphere* in his final year as an undergraduate and this manuscript, which brought him to the attention of a number of leading mathematicians of the time including Henry Briggs. Continuing his studies at Oxford, Gunter was awarded an M.A. in 1606 but he remained at Oxford until 1615 when he received the divinity degree of B.D. on 23 November. Gunter was ordained and in 1615 became Rector of St George's Church in Southwark and of St Mary Magdalen, Oxford. He held these positions in the Church until his death.[1]

### **From Mathematics to Astronomy**

Mathematics, particularly the relationship between mathematics and the real world, was the one overriding interest throughout his life. Gunter became a friend of Henry Briggs, the first Professor of Mathematics at Gresham College, and would spend much time with him at Gresham College discussing mathematical topics.[7] In 1619, Sir Henry Savile put up money to fund Oxford University's first two science faculties, the chairs of astronomy and geometry. Gunter applied to become professor of geometry but Savile was famous for distrusting clever people, and Gunter's behavior annoyed him intensely. As was his habit, Gunter arrived with his sector and quadrant, and began demonstrating how they could be used to calculate the position of stars or the distance of churches, until Savile could stand it no longer. "*Doe you call this reading of Geometric?*" he burst out. "*This is mere showing of tricks, man!*" and, according to a contemporary account, "*dismissed him with scorne.*" He was shortly thereafter championed by the far wealthier Earl of Bridgewater, who saw to it that on 6 March 1619 Gunter was appointed professor of astronomy in Gresham College, London. This post he held till his death.

### **Triangulorum**

A competent but unoriginal mathematician, he had a gift for devising instruments which simplified calculations in astronomy, navigation, and surveying. With Gunter's name are associated several useful inventions, descriptions of which are given in his treatises on the sector, cross-staff, bow, quadrant and other instruments. He contrived his sector about the year 1606, and wrote a description of it in Latin, but it was more than sixteen years afterwards before he allowed the book to appear in English. In 1620 he published his *Canon Triangulorum, or Table of Artificial Sines and Tangents*, the first published table of common logarithms of the sine and tangent functions, he introduced the terms cosine and cotangent. 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. In 1624 Gunter published a collection of his mathematical works. It was entitled *The description and use of sector, the cross-staffe, and other instruments for such as are studious of mathematical practise.*

One of the most remarkable things about this book is that it was written, and published, in English not Latin. It was a manual not for cloistered university fellows but for sailors and surveyors in real world.

There is reason to believe that Gunter was the first to discover (in 1622 or 1625) that the magnetic needle does not retain the same declination in the same place at all times. By desire of James I he published in 1624 *The Description and Use of His Majesties Dials in Whitehall Garden*, the only one of his works which has not been reprinted.

### **Further Triangulations**

Gunter's interest in geometry led him to develop a method of sea surveying using triangulation. Linear measurements could be taken between topographical features such as corners of a field, and using triangulation the field or other area could be plotted on a plane, and its area calculated. A chain 20 metres long, with intermediate measurements indicated, was chosen for the purpose, and is called Gunter's chain. The length of the chain chosen, 20 m, being called a chain gives a unit easily converted to area. Therefore, a parcel of 10 square chains gives 1 acre. The area of any parcel measured in chains will thereby be easily calculated.

### **Gunter's Quadrant**

Gunter's quadrant is an instrument made of wood, brass or other substance, containing a kind of stereographic projection of the sphere on the plane of the equinoctial, the eye being supposed to be placed in one of the poles, so that the tropic, ecliptic, and horizon form the arcs of circles, but the hour circles are other curves, drawn by means of several altitudes of the sun for some particular latitude every year. This instrument is used to find the hour of the day, the sun's azimuth, etc., and other common problems of the sphere or globe, and also to take the altitude of an object in degrees.

### **Gunter's Scale**

Gunter's scale or Gunter's rule, generally called the "Gunter" by seamen, is a large plane scale, usually 2 feet (0.61 m) long by about 1½ inches broad (600 mm by 40 mm), and engraved with various scales, or lines. On one side are placed the natural lines (as the line of chords, the line of sines, tangents, rhumbs, etc.), and on the other side the corresponding artificial or logarithmic ones. By means of this instrument questions in navigation, trigonometry, etc., are solved with the aid of a pair of compasses. It is a predecessor of the slide rule, a calculating aid used from the 17th century until the 1970s. Gunter's line, or line of numbers refers to the logarithmically divided scale, like the most common scales used on slide rules for multiplication and division.

Gunter died at Gresham College on Dec 10, 1626, and was buried one day later in the churchyard of St Peter-le-Poer, Old Broad Street.

### **References and Further Reading:**

- [1] O'Connor, John J.; Robertson, Edmund F., "[Edmund Gunter](#)", MacTutor History of Mathematics archive, University of St Andrews.
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- [3] “[Gunter, Edmund](#).” Complete Dictionary of Scientific Biography. . Encyclopedia.com.
- [4] [Earliest Uses of Symbols for Trigonometric and Hyperbolic Functions](#)
- [5] Florian Cajori: *A history of the logarithmic slide rule and allied instruments and on the history of Gunter's Scale and the slide rule during the seventeenth century*, 1909
- [6] [Edmund Gunter](#) at Wikidata
- [7] [Henry Briggs and the Popularization on Logarithms](#), SciHi Blog
- [8] [Catch up with Kate: Gunter's Chain](#), 2020, [Tasmanian Museum and Art Gallery](#) @ youtube
- [9] Chisholm, Hugh, ed. (1911). “[Gunter, Edmund](#)“. *Encyclopædia Britannica*. Vol. 12 (11th ed.). Cambridge University Press. pp. 729–730.
- [10] [Timeline for Edmund Gunter](#), via Wikidata