

## GERARDUS MERCATOR

Prior to the time of Flemish geographer, mathematician, and cartographer **Gerardus Mercator** (March 5, 1512 – December 2, 1594), a degree on maps used for navigation, whether of latitude or longitude, was always represented by the same length. The course of a ship was marked on the map by a straight line joining the ports of arrival and departure. This led to many errors in determining the position and tracing the course of a ship. Mercator realized that for accuracy sake it would be necessary that the space assigned on the map to a degree of latitude should gradually increase as the latitude increased. This was the basic principle of what is now known as the Mercator projection.



To represent the features of the earth's surface on a flat surface, Mercator projected the world on a cylinder with the parallels and meridians intersecting each other at right angles. He stretched the distances of the parallels with the same factor as the distances of the meridians. As far as navigators were concerned, the greatest strength of the Mercator map was its conformality, that is, the projection preserved angular measure. Before Mercator indications on charts didn't agree with the indications of the compass. He solved one of the most urgent problems of navigation: to construct a map or chart on which the course of a ship at a constant compass direction cuts across all meridians at the same angle. It permitted mariners to steer a course over long distances by plotting straight lines without continually adjusting compass readings. Straight lines on the Mercator projection are called loxodromes, or rhumb lines, and represent lines of constant compass bearing, which is perfect for "true" direction.

Mercator was born Gerard de Cremere or Gerhard Kremer in Rupelmonde, Flanders (now Belgium)

near Antwerp. His father was a shoemaker who didn't have the wherewithal to give his son a good education. Fortunately, the youngster's uncle generously supplied the needed funds for his nephew's schooling. As was the custom among intellectuals of his day, Kremer Latinized his German name, which means "merchant," and changed it to Mercator, which means "world trader." Mercator commenced his education at a school operated by the Brothers of the Common Life in Hertogenbosch. From there he went to the University of Louvain in 1530, graduating with an M.A. in humanities and philosophy two years later. For a time, Mercator traveled extensively, developing a strong interest in geography. He returned to Louvain to study with Cornelius Gemma Frisius, the leading mathematician of the Low Countries. Mercator's interest in cartography and scientific geography was stimulated by Frisius.

From 1535-36, Mercator worked with instrument maker Gaspar a Myrica and Frisius constructing terrestrial globes for wealthy patrons. He published his first map in 1537. It was a map of Palestine, with illustrated Biblical texts. It was extremely popular as was his 1538 map of the world based on Ptolemy's map. Mercator's fame in cartography was assured with his famous 1540 Map of Flanders, dedicated to the emperor, Charles V. In 1551 he constructed a celestial globe.

Mercator went through a personal crisis in seeking answers of how to reconcile the origin of the Universe as preached by the Christian church and that given by Aristotle. Unsuccessful in his quest, his doubts led to his arrest and prosecution for heresy and imprisonment in the Rupelmonde citadel located on what is now known as Mercator Island. After seven months, he was released, as a consequence of the strong support from his colleagues at the University of Louvain. He was quite fortunate; of the forty-two arrested with him, two were burned at the stake, one was beheaded and two were buried alive.

In order to be free to continue his work in search of new data for his maps without interference from the authorities and to travel - in itself considered suspicious by the Inquisition - at age 42, Mercator moved to Duisberg on the Rhine, where he opened a cartography shop. He was appointed to the chair of cosmography in Duisburg in 1552. There, in 1554, he produced a masterful six-sheet map of Europe, followed in 1569, by a map of the world, inscribed with the phrase “Ad usum navigation” (for the use of navigation). It was the only map that he made which used the projection that is named for him.

Mercator’s projection produced a flat map that although it had the advantage of allowing navigators to plot their course as a straight line of constant heading corresponding to a great circle of the globe, it made regions around the North and South Poles vastly larger than they actually were. Mercator’s maps were not immediately used in navigation because he kept its mathematical basis a secret.

Mercator was the first to apply the name “America” to the entire New World. Previously it had been restricted to that portion (South America) actually visited by Amerigo Vespucci. Mercator’s dream was to publish a volume of maps, which would also give a history of the world since creation. He or his son, who was also a mapmaker, is credited with coining the word “Atlas.” Named for the Titan who held up the universe, the Atlas consisted of a collection of maps, bound inside boards. It contained a chronology from creation to 1568. The last section was published a year after Mercator’s death.

Not to be confused with Gerardus Mercator is Nicolaus Mercator (originally Niklaus Kaufmann).

Nicolaus was born in Denmark, lived in London for a long time, and was elected a Fellow of the Royal Society in 1666. The honor was bestowed on him for his design of a pendulum clock to be used at sea to determine longitude. He advertised himself as an expert on the theory of Gerardus Mercator’s map projection, and he published a paper on navigation in the *Philosophical Transactions*. In 1683, he designed the fountains at Versailles in France. In his *Logarithmotechnia*, (1688), Nicolaus Mercator discovered the series, now known as “Mercator’s series”  $\ln(1 + x) = x/1 - x^2/2 + x^3/3 - x^4/4 + \dots$

Quotation of the Day: “In making this representation of the world we have had to employ a new proportion and a new arrangement of the meridian with reference to the parallels ... We have progressively increased the degrees of latitude towards each pole in proportion to the lengthening of the parallels with reference to the equator.” – Gerardus Mercator