Amerigo Vespucci

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The name America is so important and the controversy concerning its application has been so long and bitter that this article will be welcomed although it contributes nothing new to the name itself. It was written as a supplement to Madison Beeler's article in the first issue of the first volume of *Names,* and offers additional evidence to justify the application of Amerigo's name to the southern part of our continent.

THE REAL CLAIM TO FAME of the man for whom the American continent is named has apparently passed unnoted by the majority of historians and navigators.[1] At the time of Columbus' first and second voyage there was no good value of the circumference of the earth and the accurate evaluation of longitude was virtually unknown. Latitude was regularly determined by observing the elevation of the pole star in the Northern Hemisphere and less accurately by constellations like the Southern Cross in the Southern Hemisphere using an astrolabe. The determination of the earth's circumference in leagues, or miles, and the establishment of longitude of points on the earth's surface poses a far more difficult problem. Today longitude is determined by measuring the angle of elevation of a given celestial object, usually a star or planet with a precision sextant, at a time as given by an accurate clock reading Greenwich Observatory time at zero longitude. Nautical almanacs give data which permit of the calculation of the exact position of a celestial object at the time of observation using an assumed latitude and longitude *near* the point of observation (usually estimated by a ship's run since the last observation). The difference in the observed and calculated assumed angles leads to the accurate determination of the longitude of the point of observation.[2] Thus all modern longitude determinations at sea depend on the use of an accurate chronometer keeping Greenwich time, an accurate instrument for observing angles of elevation and proper almanacs giving the predicted position of the celestial objects for use in computation.

The essential element, the chronometer, or fairly stable clocks and watches that remained constant with the motion of the ship and changing temperatures, were not developed until the middle of the eighteenth century. In fact, even until the advent of the radio time signal, in the early nineteen hundred and tens, ship's chronometers required checking by astronomical observation at points of established longitude, or in earlier times by the method of lunar intervals first applied to navigation and discovery in a systematic fashion during his first voyage by Amerigo Vespucci on August 23, 1499 off La Guaria, Venezuela. Even as late as 1780 Captain Cook checked his chronometers by this method and the method was in constant use by whaling ships and others in the long ocean crossings of the days of sail.

It is probable that the method, or variants of it, was known to the ancients as far back as the time of Hipparchus, 1500 years ago, and was on occasion used in estimating the circumference of the earth and fixing longitude on land. However, it appears not to have been put to practical use in navigation and exploration until Vespucci used it for identifying the lands revealed by the Columbian voyages as a new continent, establishing the geographical location of the 6700 miles of South American coast line which he surveyed in his two voyages and in marking the line separating the Spanish and Portuguese spheres of commercial and political influence in South America as established by Papal Authority in the Treaty of Tordisillas of June 7, 1494.

In principle, the method is as follows: The moon travels around the earth and thus over the celestial sphere faster than do the other planets or fixed stars. If it is possible to determine the time when the moon is in conjunction (passes by), some planet relative either to the local noon, or midnight, on a fixed day and if the time of the same conjunction relative to the local noon, or midnight, at a place of known longitude is observed then the difference in longitude is easily computed. For the difference in time of the events at the two locations in hours and fractions thereof divided by 24 and multiplied by 360° gives the difference in longitude in degrees and fractions thereof and fixes the longitude of the point of observation.

It is suspected that Amerigo studied under Paolo del Pozzo Toscanelli of Florence, an astronomer and geographer of note. Tosca-

nelli had corresponded with and encouraged Columbus before his first voyage, had tutored Leonardo da Vinci, two years Amerigo's senior and had estimated the circumference of the earth, albeit inaccurately. While in principle the method is simple to us accustomed to watches and clocks, the matter was entirely different in Amerigo's time when the only available instruments were the hour and minute sand-glasses. To anyone who has used the minute sand-glass (some years back popular for boiling eggs), some of the inaccuracies and inconveniences are apparent. These glasses were quite unreliable on a ship in a sea way. Thus Amerigo had to await a period when his ship spent twenty days at anchor owing to injuries sustained by his crew in battle with the natives. During this period he had to establish his local midnight before conjunction by measuring accurately on successive days the time from sunset to sunrise by means of his hour and minute glasses, and halving the time observed. Then on the night of the conjunction, beginning at sunset, he established the time of conjunction of the moon and Mars as well as that of sunrise. On the basis of the Almanac of Regiomontanus he was able to note the time of the same conjunction for one of the cities in Spain of known longitude, for in those days conjunctions were a matter of importance for casting of horoscopes and so were given in almanacs.

On Amerigo's return to Spain and in incorporating his observations on the charts he was making, he began to suspect that Regiomontanus' times of conjunction were in error by an hour. It is presumed that he then checked Regiomontanus' data by observations of his own in Spain. Calculations of F. W. Pohl on the basis of existing records of Amerigo's studies indicate that with the correction of the errors of Regiomontanus, the circumference of the earth came to 27,000 Roman miles or 24,852 English miles. This value is only 50 miles short of the earth's true circumference and remains the most accurate estimate to modern times. The corrections enabled Amerigo properly to locate his observed 2700 miles of coast line on his maps and revealed to his annoyance that as an explorer for the Spanish Crown he had unwittingly been navigating far into Portuguese territory.

The second voyage of Vespucci in 1501–1502 was therefore made under the Portuguese flag and in this he surveyed from Cape San

Rocque 250 miles east of his previous eastern-most point for 4,000 miles south along the coast of South America to latitude 50 south and within two hundred and fifty miles of the Straits of Magellan. His most important contribution here was in picking the harbor which he called Cannanor, the modern harbor of Cannanae in Brazil, as marking the point of division between Portuguese and Spanish territory on the new continent. In this choice, his assignment of longitude by modern standards was in error by two minutes of arc, i.e., about two miles, a truly remarkable feat with the methods at his disposal.

The results of his explorations were recorded by him on maps which he made on his return and some of which are today extant. In consequence of his contributions to the art of navigation, he was appointed Pilot Major of Spain in 1505, and as such, ordered to instruct Spanish pilots in his new methods of navigation. Despite general opposition on the part of the pilots who refused to learn, it is quite apparent that the new techniques were acquired by enough navigators so that the method of lunar intervals became for many years the standard method of longitude determination and thus laid the foundation for all the later proper geographic exploration, until the time of accurate longitude determinations by astronomical observatories over the earth.

NOTES

[1] Exception to this statement lies in the excellent treatise of F. W. Pohl, *Amerigo Vespucci, Pilot Major,* Columbia University Press, 1944, and a brief mention in the Encyclopedia Britannica (eleventh ed.) by John Louis Emil Dreyer, Director, Armagh Observatory, in an article on Time.

[2] In practice there are several variants of the procedure, all in principle based on the solution of the celestial triangle from a known latitude and the position of some celestial object at a known instant of Greenwich time.