

THE CANARY ISLAND AND THE QUESTION OF
THE PRIME MERIDIAN: THE SEARCH FOR PRECISION
IN THE MEASUREMENT OF THE EARTH

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The prime or first meridian (*primus meridianus*) is an arbitrary line, one from which chart makers and map makers can begin to measure and to count longitudinal distance on the face of the globe. The system of determining terrestrial location by latitude and longitude measurements goes back to the Greek mathematicians and geographers, Eratosthenes and Hipparchus, and was first incorporated in a form that has come down to us in Ptolemy's *Geography*. Although Ptolemy's astronomical work was conducted in Alexandria, he chose the Fortunate Islands (the Canaries) as the physical location of the prime meridian from which point he measured and laid down the roughly 180° of the world known to the ancients. Ptolemy's purpose was to create an accurate grid system upon which the location of individual cities from the furthest known land west to the furthest known land east could be accurately placed. Unfortunately (or rather fortunately, as far as Columbus was concerned), Ptolemy exaggerated the eastward extension of Asia so that, even though he placed the Canaries about seven degrees too far east, he reduced the distance a mariner would have to sail between western Europe and eastern Asia to what Columbus regarded as a manageable distance¹. The distance between those points—the extent of the unknown world—was a matter of critical importance to Columbus. It is not surprising, therefore, that Columbus should have taken off from the Canaries in his voyages across the unknown. (This is not to ignore the importance of the prevailing wind patterns, nor is it to ignore Columbus's possible romantic interest in Doña Beatriz de Peraza y Bobadilla as additional reasons for beginning his four voyages in the Canaries.)

1. Wilcomb E. WASHBURN, «Japan and Early European Maps». *Pacific Historical Review*, Vol. XXI, No. 3 (August, 1952), pp. 221-236; Emerson D. FITE and Archibald FREEMAN, comp. and ed., *A Book of Old Maps Delineating American History from the Earliest Days down to the Close of the Revolutionary War* (Cambridge: Harvard University Press, 1926, reprinted New York: Arno Press, 1969), pp. 1-2.

The need for precision in determining the longitude of the lands in the Ocean Sea to the west of Europe was emphasized by Pope Alexander VI's 1493 bull laying down a line of demarcation between authorized Spanish and Portuguese discoveries 100 leagues west of the Azores and the Cape Verde Islands. After protests by Portugal, this line was shifted in accordance with the provisions of the Treaty of Tordesillas between Spain and Portugal to a meridian 370 degrees west of the Cape Verde Islands². The controversy over where the line fell —on both sides of the world— bedeviled relations between the two powers for over a century.

When Columbus passed the point of no magnetic declination in the ship's compass, he started cartographers on a vain quest for a stable isogonic zero meridian —or line showing no magnetic variation. Many cartographers in the sixteenth century began to run the prime meridian through the Azores rather than through the Canary Islands. By mid-century, Mercator had abandoned the Ptolemaic prime meridian in favor of a meridian based on the point at which the compass showed no variation. This line was not certainly established. In Mercator's 1554 map of Europe the prime meridian is still located near Ferro, the westernmost of the Canary Islands, but many map makers ran the new prime meridian through the Azores, as did Hondius in his 1601 terrestrial globe, «because there the compass needle points due north», as he noted in an inscription on the globe.

But it was increasingly apparent that the line of no magnetic variation was not consistent with a true meridian. The search for precision led once more to the Canaries. Johan Blaeu, on his 1622 globe, noted in an inscription that the search for a meridian through the compass needle was «a delusion» proved by the fact that «it varies along the same meridian according as it is near one land mass or another». Therefore,

we, following in the steps of Ptolemy, have chosen the same islands and in them Juno, commonly called Tenerife, whose lofty and steep summit covered with perpetual cloud, called by the natives El Pico, shall mark the prime meridian. In that way we have differed barely a quarter of a degree from the longitude of the Arabs who chose the extreme western shore of Africa....

2. Derek HOWSE, *Greenwich Time and the Discovery of the Longitude* (Oxford: Oxford University Press, 1980), p. 127; Lucie LAGARDE, «Historique du problème du Méridien origine en France», *Revue d'histoire des sciences et de leurs applications*, Vol. 32 (Paris, 1979), 289-304, at 291.

According to the English scholar W.G. Perrin, «Here we have what appears to be the first attempt to fix the meridian as passing through a precise geographical spot instead of vaguely through an island or group of islands»³. In Blaeu's *Le Grand Atlas* (Amsterdam 1663, facsimile edition in 12 volumes, *Theatrum Orbis Terrarum*, Amsterdam, 1967), in Chapter VIII Blaeu discusses the uncertainty and lack of agreement over the placement of the prime meridian, some following Ptolemy, some the marine compass's line of no magnetic declination. Blaeu here buttresses his argument with the authority of the mathematician of Bruges, Simon Stevin. It is necessary, Blaeu asserted, to select a place «fixé et arrêté». And since one such place exists in one of the Canaries, it should be chosen. The choice, (quoting Simon Stevin) he concluded, should be Pico de Teide. He describes the mountain as rising rapidly from a large base to a very sharp point like a sugar loaf. Thus we have, in Tenerife, he wrote, «la plus grande, la plus riche, et la plus excellente des sept Isles de Canarie. S'il y a quelqu'un qui trouve un autre lieu plus propre en tout l'Univers, ce sera judicieusement fait de la choisir. Mais en quel lieu que ce soit, que le choix se face, il faut éviter l'ambiguïté dont nous avons parlé»⁴.

The wonders of El Pico were often sung in the literature of the period. R. Stafforde, in *A Geographical and Anthological Description of all the Empires and Kingdomes, both of Continent and Islands in this terrestriall Globe* (London, 1634) wrote of «Tanariffa, wherein is a Mountaine so high, that the inhabitants have all their fresh water from a Cloud that droppeth there very fast, hanging about a tree»⁵. The story of the miraculous tree of Tenerife was a staple item in descriptions of the Canaries for centuries.

The authors of the *Thesaurus Geographicus: A New Body of Geography; or, A Compleat Description of the Earth* (London, 1695), describes El Pico as «thought to be the highest mountain in the World, the top of it may be seen distinctly enough at Sca, at the distance of 292 *English* miles; one

3. W.G. PERRIN, «The Prime Meridian», *The Mariner's Mirror*, Vol. 13 (London, 1927), 109-124, at 116-118.

4. Johan BLAEU, *Le Grand Atlas ou Cosmographie Blaviene* (Amsterdam, 1663, facsimile edition in 12 vols., Amsterdam: *Theatrum Orbis Terrarum*, 1969), Chap. viii; Simon STEVIN, *Les Oeuvres Mathématiques de Simon Stevin de Bruges...* par Albert Girard (Leyden, 1634), p. 105.

5. R. STAFFORDE, *A Geographical and Anthological Description of all the Empires and Kingdomes, both of Continent and Islands in this terrestriall Globe* (London, 1634), pp. 36-37.

cannot go up to it, except in the months of *July* and *August*; for all the rest of the Year it is cover'd with Snow, though Snow never falls, neither in *Teneriff*, nor in any other of the Canary-Islands»⁶.

The most prestigious confirmation of the legitimacy of the Canaries as the site of the prime meridian was the decree of Louis XIII, published on July 1, 1634, declaring, after having convened a panel of scientists to recommend the appropriate location of a prime meridian, that it should run through the Canaries, and in particular through the «l'ile de Fer» (Hiero or Fero). The decree cited not only the authority of Ptolemy, but also that of Andrés García de Céspedes, whose *Regimiento de Navegación* (Madrid, 1601), Chapter 52 spoke of «el Meridiano fixo que passa por las Canarias, de donde comunmente se cuentan las longitudes». Louis XIII directed that French ships not attack Spanish or Portuguese ships in waters lying east of the prime meridian and north of the Tropic of Cancer, and, in order that all should be aware of the geographical areas involved, he forbade «all pilots, hydrographers, designers or engravers of maps or terrestrial globes to innovate or vary from the ancient meridian passing through the most westerly of the Canary Islands, without regard to the novel ideas of those who have recently fixed it in the Azores on the supposition that there the compass does not vary, for it is certain that this happens also in other places that have never been taken for the meridian»⁷.

It was appropriate that the prime meridian ran through the Canaries through much of the modern world's history, as Jean-Joseph La Montre wrote in 1702, because the Canaries form the natural division between the old world and the new. Look at a world map, La Montre noted, and see that it is the most natural and most favorable disposition for a prime meridian that it is possible to choose. La Montre noted that Cardinal Richelieu did not feel it necessary to the interests of the King or of the State to require that a prime meridian based on astronomical observations run through Paris. Just as Ptolemy had made his astronomical observations in Alexandria while choosing the Canaries as the geographical site of the prime meridian,

6. *Thesaurus Geographicus: A New Body of Geography; Or, A Compleat Description of the Earth... Collected with great care from the most approved Geographers and Modern Travellers and Discoveries, by several hands* (London, 1695), Chap. iii, p. 9.

7. LAGARDE, «Historique du problème du Méridien», p. 293; Perrin, «The Prime Meridian», p. 119; Andres GARCIA DE CESPEDES, *Regimiento de Navegación* (Madrid, 1601), Chap. 52.

so Richelieu felt it logical to make the distinction between astronomical and geographical uses of a prime meridian⁸.

This distinction between a «meridien d'observation» (on which observatories were established) and a «meridien de compte (universal)» or meridian of calculation or reckoning, marking the zero of longitude, was later emphasized at nineteenth-century conferences on the meridian question, for example, by Colonel Wauwermans at Antwerp in 1882 and by M. Thury at Geneva in 1883.

On the other hand, Perrin is more cynical about Richelieu's motives, rejecting the claim of scientific «disinterestedness» made for him and attributing the choice of the Canaries to the practical need to fix a clear line of demarcation for the hostilities going on at sea with Spain against whom open war had been declared the preceding May. «The abstract devotion to science of which so much was made in 1884 (at the Washington Conference)», in Perrin's words, «was an acquired merit». It was merely another case of «no peace beyond the line»⁹.

With the creation of the royal Académie des Sciences in 1666, France began a program of research in astronomy, geodesy and cartography. Scholars from other countries, like the Italian Cassini, were brought to France. A program of mapping the king's realms was undertaken in 1680 by the order of Louis XIV by two members of the Academy of Sciences, Jean Picard and de la Hire. Their work was based on observations made at the Paris Observatory founded in 1667. Their report of 1682 stated «we thought we had better not mark the longitudes as they are ordinarily shown on maps, commencing from the Isle of Ferro as has been decreed, because we did not know the position of this island in respect to the Observatory»¹⁰.

Although the Royal Society of London for Improving Natural Knowledge—the British equivalent of the French Académie des Sciences—had been founded (in 1662) by Charles II four years earlier than the French Aca-

8. LAGARDE, «Historique du problème du Méridien», p. 297.

9. PERRIN, «The Prime Meridian», p. 119; The conferences at which the issue was previously discussed are recorded in *Septième Conférence Géodésique Internationale tenue à Rome en Octobre 1883: Rapport sur l'unification des longitudes par l'adoption d'un premier méridien unique et sur l'introduction d'une heure universelle* (Rome: Imprimerie Royale, 1883), pp. 1-29; Bouthillier de BEAUMONT, *Dissertation sur l'adoption d'un méridien initial unique présentée au Congrès Géographique de Nancy* (Nancy: Imprimerie Berger-Levrault et Cie, 1880), pp. 1-19.

10. PERRIN, «The Prime Meridian», p. 120.

démie it was not until the French interest in «finding the longitude» had communicated itself to King Charles through his French mistress, Louise de Keroualle (1649-1734), that the British took the decisive steps that led to the creation of the Greenwich Observatory, leading to its ultimate designation as the site of the world's prime meridian. Derek Howse tells the story in his *Greenwich Time and the Discovery of the Longitude* (New York: Oxford University Press, 1980). Louise, created Duchess of Portsmouth after her naturalization in 1673, did not personally champion the search but acted as the patron of Le Sieur de St. Pierre, a Frenchman at the English court, who claimed to have a method for the discovery of the longitude. Through constant importuning of the Duchess, he obtained an opportunity to present his plan to a distinguished group of English scientists in 1675. In the process the King was fully informed of French efforts to survey France and determine longitude and signed a royal warrant March 4, 1675, appointing John Flamsteed his «astronomical observator», charging him with finding the longitude, and authorizing the creation of the Greenwich Observatory. Flamsteed demolished St. Pierre's theory in the process and began England's march to scientific preeminence in navigation¹¹.

Meanwhile the French were making efforts to measure the difference in longitude between the Paris Observatory and Ferro. The uncertainty seemed to be resolved by the geographer Guillaume Delisle (1675-1726) in 1700 in an article in the *Journal des sçavans* and, again, in 1722, in a memoir entitled *Détermination géographique de la situation et de l'étendue des différentes parties de la Terre*. In this latter work, Delisle justified «ce chiffre rond de 20°» as the longitude of Ferro even though others had found it a few minutes off¹².

Delisle's figure was generally adopted despite the fact that a 1724 geodesic mission sent to the Island of Ferro under the leadership of Father Louis Fauillée, of Marseilles, obtained the result of 19°55'3'' west of Paris¹³. Although corrected by a later expedition, in 1789, which placed the Island of Ferro definitively at 20°31' from Paris, causing Delisle's prime meridian to fall between the islands of Gomera and Palma, Delisle's convenient calculation tended to remain in use.

11. HOWSE, *Greenwich Time*, pp. 19-30.

12. LAGARDE, «Historique du problème du Méridien», pp. 296-298.

13. *Ibid.*, p. 298; Alfredo HERRERA PIQUE, «Estancia en las Islas Canarias de Louis Feuillée», in Francisco Morales Padrón, ed., *IV Coloquio de Historia Canario-Americana* (1980), 2. Vols., (Gran Canaria, 1982), II, 741-761.

But, as more and more national observatories opened, new prime meridians, based on different world capitals, come into use. Delisle's prime meridian in Ferro came under question. As M. Janssen, the French delegate to the Washington Conference for Fixing a Prime Meridian and a Universal Day, held in October 1884, noted, the 20° line of Delile «ceased to be neutral and became merely the meridian of Paris disguised, as has been truly said, and the English, notably, never adopted it».¹⁴ On English charts of the early eighteenth century the zero meridian is usually the Lizard, or London, or sometimes Ferro. By the middle of the eighteenth century, Greenwich begins to be substituted on English charts. With the publication of the tables in the British Nautical Almanac in 1767 based on the Greenwich Observatory more and more nations, including the United States, began to utilize Greenwich as the prime meridian¹⁵.

The confusion and uncertainty caused by numerous and conflicting prime meridians on the charts of the world led, in the nineteenth century, to an attempt to obtain international agreement upon a «neutral» prime meridian, one not identified with any particular country. The proposal of H. Bouthillier de Beaumont, Président of La Société de Géographie de Genève, in his *Choix d'un Méridien Initial Unique* (Geneva, 1880), for a prime meridian splitting the North American and Asian continents in the Bering Straits and running through the largely open Pacific Basin, found increasing favor with those, particularly French, who perceived and overwhelming predilection on the part of others to select Greenwich from among the national meridians, should such a choice eventually be made among existing national meridians.

Professor Piazzi Smyth, Astronomer Royal for Scotland, on the other hand, advocated a prime meridian based on the Great Pyramid at Gizeh. Professor Smyth, in his contribution to the Report of Committee on Standard Time and Prime Meridian, International Institute for Preserving and Perfecting Weights and Measures, published under the title, *What Shall be the Prime Meridian for the World?* (Cleveland, Ohio, June 1884), noted that «The meridian of the Great Pyramid passes over solid, habitable, and

14. Forty-eighth Congress, 2d Session, House of Representatives. Ex. Doc. No. 14, *International Conference held at Washington for the Purpose of Fixing a Prime Meridian and a Universal Day, October 1884. Protocols of the Proceedings* (Washington, 1884), pp. 1-117, at p. 34.

15. HOWSE, *Greenwich Time*, pp. 129-131.

for ages inhabited, land through nearly the whole of its course from north to south. Its line is capable therefore of being laid out along almost all that distance by trigonometrical measurement, and marked by masonried station signals; and that is the only unquestionably accurate, permanent and sufficiently visible method of setting forth the one base for longitude measuring in the future before all varieties of men». Smyth noted that the Great Pyriamid «is acknowledged to be still, above its other high fulfillings, the grandest as well as best built surveying station-mark and monument that has ever been erected the whole world over». Smyth also noted its closeness to Jerusalem, close to which a prime meridian for the whole world ought to lie. Evoking the Second Coming of Christ, Professor Smyth asked «Who is there of Adamic descent, that has once learned to call on the name of the Lord', who would try to group mankind in these latter days round a totally different center, and make them look to the opposite side of the earth?»¹⁶.

In 1856 Smyth conducted an expedition to the Canaries, specifically to Tenerife, «to ascertain how much astronomical observations may be benefitted, by eliminating the lower third or fourth part of the atmosphere». Smyth was supported by a five hundred pound grant from the Admiralty. During 65 days at Tenerife Smyth established two high altitude observing stations, one on the summit of Guajara, and the other at Alta Vista. In addition to his formal report on the expedition, Smyth wrote a popular book on the expedition called *Teneriffe: An Astronomer's Experiment: or Specialities of a Residence above the Clouds* (London, L. Reeve, 1858), in which he concluded «We wonder how long the learned world will delay to occupy a station, that promises so well, for greatly advancing the most sublime of the sciences»¹⁷.

A hundred years later, in 1959, a permanent observatory was established at Tenerife. The Spanish Ministry of Education founded the Observatorio del Teide at Izana, from where the ruins of Smyth's observatory are visible. In 1973 the Observatorio del Teide became associated with the University of La Laguna as the Instituto Universitario de Astrofísica. In 1975

16. *What Shall be the Prime Meridian for the World? Report of Committee on Standard Time and Prime Meridian, International Institute for Preserving and Perfecting Weights and Measures (Cleveland, Ohio, June, 1884)*, pp. 1-56, at pp. 11-13.

17. QUOTED in Antony W. Jones, «The Canary Islands: An Astronomer's Experiment», *Sky and Telescope*, Vol. 62, No. 3 (Cambridge, Mass., September 1981) pp. 199-201.

this became the Instituto de Astrofísica de Canarias. The Canaries have become the site of increasing interest on the part of astronomers¹⁸.

There were many of Adamic descent who did not agree that a prime meridian should be near Jerusalem or through Tenerife. Professor Janssen, Director of the Physical Observatory of Paris, speaking at the 1884 Washington Conference «con calorosa eloquencia», as one of the Spanish delegates, Juan Pastorin y Vacher, put it, urged that all attempts to settle the issue upon an exclusively geographical basis (to say nothing of a national basis) be set aside, and that the matter be decided on astronomical, scientific, and neutral grounds. Janssen decried the necessity for «any material mark on the globe» although he conceded that «if one be desired, though it is in no manner necessary», it could be established in conformity to a neutral meridian fixed in its relationship to other points by the measurements of the various national observatories¹⁹.

Janssen failed to divert the growing consensus to select Greenwich as the world's prime meridian. The Washington Conference, with France and Brazil abstaining, voted to declare Greenwich the site of the prime meridian. At the same time, it also determined that longitude should be counted in two directions up to 180 degrees, east longitude being plus and west longitude minus, a decision which reversed the recommendation of the Rome conference to count longitude in one direction from west to east. The Conference also proposed the adoption of a universal day «for all purposes for which it may be found convenient, and which shall not interfere with the use of local or other standard time where desirable». The universal day was defined as «a mean solar day» and «to begin for all the world at the moment of mean midnight of the initial meridian, coinciding with the beginning of the civil day and date of that meridian, and is to be counted from zero up to twenty-four hours»²⁰.

18. *Ibid.*

19. Juan PASTORIN Y VACHER, *Memoria sobre el Congreso Internacional de Washington* (Madrid, Imprenta de Fortanet, 1885), p. 28 *International Conference held at Washington*, p. 30.

20. HOWSE, *Greenwich Time*, pp. 38-151.







