

fleet under Ptolemy Philadelphus. As that work is totally lost, it is impossible to judge of the real extent of the obligations of Eratosthenes to his predecessor; but it is evident that such a practical guide to the mariner must have contributed materially to the more definite geographical knowledge of seas and coasts. This work of Timosthenes may be regarded as the precursor of the modern Sailing Directions issued by the British and other Hydrographic Offices. Timosthenes also introduced for the first time the arrangement of countries according to the winds that blew from different quarters with reference to Alexandria, that is to say, according to different points of the compass.<sup>1</sup>

PRECURSOR OF THE  
MODERN SAILING  
DIRECTIONS.

Some of the conceptions of Strato of Lampsacus,<sup>2</sup> which Eratosthenes adopted, may here be summarised in a few words. He held that the Euxinus and Mediterranean were formerly completely closed seas that stood at a much higher level and that they burst their barriers and gave rise to the Straits of the Bosphorus, the Hellespont, and Gibraltar. As proof of this theory, he cited the presence of marine shells far in the interior of Libya, as well as the deposits of salt in the same region. It is very improbable, to say the least, that the sudden disruption adduced by Strato and Eratosthenes suffices to account for these straits, although the speculation has been revived in modern times.<sup>3</sup> The observations with reference to marine shells have a great significance from a geological standpoint; they constitute one important fact in the science of the earth, but the presence of these shells in the far interior of lands cannot be explained in this manner. It is not without interest to recall that Strato, to support his hypotheses, records the existence in the Strait of Gibraltar of a submarine bank uniting Europe and Africa; it was this tongue of land which formerly joined the two continents. The presence of such a bank has been proved, but at too great a depth to make it at all probable that it was known by soundings to the ancients. The philosopher of Lampsacus and Eratosthenes knew, however, that certain parts of the Mediterranean—for instance, the sea about Sicily and Sardinia—were deeper than the rest of the basin.

STRATO OF LAMP-  
SACUS.

Hipparchus,<sup>4</sup> the greatest astronomer of antiquity, was posterior to Eratosthenes by about half a century, and, although he wrote more as an astronomer than as a geographer, his name is associated with the important reform of introducing projections in the tracing of charts and maps. He clearly conceived the idea, afterwards adopted by Ptolemy, of a map of the habitable world, on which every important point should be laid down according to latitude and longitude, determined by astronomical observations, although the construction of such a chart was, at the time, wholly impossible in practice. He drew circles of the sphere on the maps, representing the meridians by convergent curves. This new method had a great influence upon the study of the distribution of land

SECOND CENTURY  
B.C.  
HIPPARCHUS.

MAP PROJECTIONS  
INTRODUCED.

<sup>1</sup> Strabo, ix. 3; Bunbury, *op. cit.*, vol. i. p. 589.

<sup>2</sup> Flourished in the third century B.C.

<sup>3</sup> See Admiral Smyth, *op. cit.*, pp. 114-122; M. Dureau de la Malle, *Géographie Physique de la Mer Noire, de l'Intérieur de l'Afrique, et de la Méditerranée*, Paris, 1807; N. Andrussow, *Sur l'État du Bassin de la Mer Noire pendant l'Époque pliocène*, St. Petersburg, 1892.

<sup>4</sup> Flourished from about 162 to 125 B.C.; said to have been born 190 B.C.