

changed, the air became temperate, and the freshness increased the further we advanced."

This passage, which is elucidated by many others in the writings of Columbus, contains views of physical geography, observations on the influence of geographical longitude on the declination of the magnetic needle, on the inflection of the isothermal lines between the western shores of the Old and the eastern shores of the New Continent, on the position of the Great Saragossa bank in the basin of the Atlantic Ocean, and on the relations existing between this part of the ocean and the superimposed atmosphere. Erroneous observations made in the vicinity of the Azores, on the movement of the polar star,* had misled Columbus during his first voyage, from the inaccuracy of his mathematical knowledge, to entertain a belief in the irregularity of the spheroidal form of the earth. In the western hemisphere, the earth, according to his views, "is more *swollen*, so that ships gradually arrive nearer the heavens on reaching the line (*raya*), where the magnetic needle points due north, and this elevation (*cuesta*) is the cause of the cooler temperature." The solemn reception of the admiral in Barcelona took place in April, 1493, and as early as the 4th of May of the same year, the celebrated bull was signed by Pope Alexander VI., which "establishes to all eternity" the line of demarkation† between the Spanish and Portuguese

* *Observations de Christophe Colomb sur le Passage de la Polaire par le Méridien*, in my *Relation Hist.*, t. i., p. 506, and in the *Examen Crit.*, t. iii., p. 17-20, 44-51, and 56-61. (Compare, also, Navarrete, in *Columbus's Journal* of 16th to 30th of September, 1492, p. 9, 15, and 254.)

† On the singular differences of the "Bula de concesion á los Reyes Catolicos de las Indias descubiertas y que se descubieren" of May 3, 1493, and the "Bula de Alexandro VI., sobre la particion del oceano" of May 4, 1493 (elucidated in the Bula de estension of the 25th of September, 1493), see *Examen Crit.*, t. iii., p. 52-54. Very different from this line of demarkation is that settled in the "Capitulacion de la particion del Mar Oceano entre los Reyes Catolicos y Don Juan, Rey de Portugal," of the 7th of June, 1494, 370 leagues ($17\frac{1}{2}$ to an equatorial degree) west of the Cape Verd Islands. (Compare Navarrete, *Coleccion de los Viages y Descub. de los Esp.*, t. ii., p. 28-35, 116-143, and 404; t. iv., p. 55 and 252.) This last-named line, which led to the sale of the Moluccas (de el Moluca) to Portugal, 1529, for the sum of 350,000 gold ducats, did not stand in any connection with magnetical or meteorological fancies. The papal lines of demarkation deserve, however, more careful consideration in the present work, because, as I have mentioned in the text, they exercised great influence on the endeavors to improve nautical astronomy, and especially on the methods attempted for the determination of the longitude. It is also very deserving of notice, that the *capitulacion* of June 7, 1494, affords the first example of a proposal for the establishment of a meridian in a permanent manner by