

es by fusion and solidification, or by precipitation from the waters. The typical character and mineralogical differences of rocks, or, in other words, the associations of certain mostly crystallized substances recurring in the most remote regions, are as little made a subject of consideration in the *Protogæa* as in Hooke's geognostic views. Even in the last-named writer, physical speculations on the action of subterranean forces in earthquakes, in the sudden upheaval of the sea's bottom and of littoral districts, and in the origin of islands and mountains, hold a prominent place. The nature of the organic remains of a former world even led him to conjecture that the temperate zone must originally have enjoyed the heat of a tropical climate.

It still remains for us to speak of the greatest of all geognostic phenomena—the mathematical figure of the Earth—in which we distinctly trace a reflection of the primitive world in the condition of fluidity of the rotating mass, and its solidification into our terrestrial spheroid. The main outlines of the figure of the Earth were sketched as early as the close of the seventeenth century, although the relation between the polar and equatorial axes was not ascertained with numerical exactness. Picard's measurement of a degree, made in 1670 with instruments which he had himself improved, is so much the more important, since it was the means of inducing Newton to resume with renewed zeal his theory of gravitation (which he discovered as early as 1666, but had subsequently neglected), by offering to that profound and successful investigator the means of proving how the attraction of the Earth maintained the Moon in its orbit, while urged on its course by the centrifugal force. The fact of the compression of the poles of Jupiter, which was much earlier recognized,* had, as it is supposed, induced Newton to reflect on the causes of a form which deviated so considerably from sphericity. The experiments on the actual length of the seconds pendulum by Richer at Cayenne in 1673, and by Varin on the western coast of Africa, had been preceded by others of less decisive character, prosecuted in London, Lyons, and Bologna at a difference of 7° of latitude.†

The decrease of gravity from the poles to the equator, which even Picard had long denied, was now generally admitted. Newton recognized the polar compression, and the spheroidal form of the earth as a consequence of its rotation; and he

* *Cosmos*, vol. i., p. 164.

† Delambre, *Hist. de l'Astronomie Mod.*, t. ii., p. 601