

With reference to the *Maps of Cotidal Lines*, mentioned in the text, I may add, that we are as yet destitute of observations which should supply the means of drawing such lines on a large scale in the Pacific Ocean. Admiral Lütke has however supplied us with some valuable materials and remarks on this subject in his *Notice sur les Marées Périodiques dans le grand Océan Boréal et dans la Mer Glaciale*; and has drawn them, apparently on sufficient data, in the White Sea.]

CHAPTER V.

DISCOVERIES ADDED TO THE NEWTONIAN THEORY.

Sect. 1.—Tables of Astronomical Refraction.

WE have travelled over an immense field of astronomical and mathematical labor in the last few pages, and have yet, at the end of every step, still found ourselves under the jurisdiction of the Newtonian laws. We are reminded of the universal monarchies, where a man could not escape from the empire without quitting the world. We have now to notice some other discoveries, in which this reference to the law of universal gravitation is less immediate and obvious; I mean the astronomical discoveries respecting Light.

The general truths to which the establishment of the true laws of Atmospheric Refraction led astronomers, were the law of Deflection of the rays of light, which applies to all refractions, and the real structure and size of the Atmosphere, so far as it became known. The great discoveries of Römer and Bradley, namely, the Velocity of Light, the Aberration of Light, and the Nutation of the earth's axis, gave a new distinctness to the conceptions of the propagation of light in the minds of philosophers, and confirmed the doctrines of Copernicus, Kepler, and Newton, respecting the motions which belong to the earth.

The true laws of Atmospheric Refraction were slowly discovered. Tycho attributed the apparent displacement of the heavenly bodies to the low and gross part of the atmosphere only, and hence made it cease at a point half-way to the zenith; but Kepler rightly extended it to the zenith itself. Dominic Cassini endeavored to discover the law of this correction by observation, and gave his result in the form