from observation or from theory, must possess great interest and importance. The doctrines of this kind which we have to notice refer principally to the effect of the sun's heat on the earth, the laws of climate,—the thermotical condition of the interior of the earth,—and that of the planetary spaces.

1. *Effect of Solar Heat on the Earth.*—That the sun's heat passes into the interior of the earth in a variable manner, depending upon the succession of days and nights, summers and winters, is an obvious consequence of our first notions on this subject. The mode in which it proceeds into the interior, after descending below the surface, remained to be gathered, either from the phenomena, or from reasoning. Both methods were employed.[9] Saussure endeavored to trace its course by digging, in 1785, and thus found that at the depth of about thirty-one feet, the annual variation of temperature is about 1-12th what it is at the surface. Leslie adopted a better method, sinking the bulbs of thermometers deep in the earth, while their stems appeared above the surface. In 1813, '16, and '17, he observed thus the temperatures at the depths of one, two, four, and eight feet, at Abbotshall, in Fifeshire. The results showed that the extreme annual oscillations of the temperature diminish as we descend. At the depth of one foot, the yearly range of oscillation was twenty-five degrees (Fahrenheit); at two feet it was twenty degrees; at four feet it was fifteen degrees; at eight feet it was only nine degrees and a half. And the time at which the heat was greatest was later and later in proceeding to the lower points. At one foot, the maximum and minimum were three weeks after the solstice of summer and of winter; at two feet, they were four or five weeks; at four feet, they were two months; and at eight feet, three months. The mean temperature of all the thermometers was nearly the same. Similar results were obtained by Ott at Zurich in 1762, and by Herrenschneider at Strasburg in 1821, '2, '3.[10]

These results had already been explained by Fourier's theory of conduction. He had shown[11] that when the surface of a sphere is affected by a periodical heat, certain alternations of heat travel uniformly into the interior, but that the extent of the alternation diminishes in geometrical progression in this descent. This conclusion applies to the effect of days and years on the temperature of the earth, and shows that such facts as those observed by Leslie are both exemplifications of

---

[9] Leslie, art. *Climate*, Supp. *Enc. Brit.* 179. [10] Pouillet, *Météorol.* t. ii. p. 643.
[11] *Mém. Inst.* for 1821 (published 1826), p. 162.