nebulæ, but of greater extent — to *cosmical clouds*, in short — of whose existence we have, I think, some indication in the singular and apparently capricious phenomena of temporary stars, and perhaps in the recent extraordinary sudden increase and hardly less sudden diminution of η *Argus*."*

Supposed gradual diminution of the earth's primitive heat. — The gradual diminution of the supposed primitive heat of the globe has been resorted to by many geologists as the principal cause of alterations of climate. The matter of our planet is imagined, in accordance with the conjectures of Leibnitz, to have been originally in an intensely heated state, and to have been parting ever since with portions of its heat, and at the same time contracting its dimensions. There are, undoubtedly, good grounds for inferring from recent observation and experiment, that the temperature of the earth increases as we descend from the surface to that slight depth to which man can penetrate: but there are no positive proofs of a secular decrease of internal heat accompanied by contraction. On the contrary, La Place has shown, by reference to astronomical observations made in the time of Hipparchus, that in the last two thousand years at least there has been no sensible contraction of the globe by cooling; for had this been the case, even to an extremely small amount, the day would have been shortened, whereas its length has certainly not diminished during that period by $\frac{1}{300}$th of a second.

Baron Fourier, after making a curious series of experiments on the cooling of incandescent bodies, considers it to be proved mathematically, that the actual distribution of heat in the earth's envelope is precisely that which would have taken place if the globe had been formed in a medium of a very high temperature, and had afterwards been constantly cooled.† He contends, that although no contraction can be demonstrated to have taken place within the historical period (the operation being slow and the time of observation limited), yet it is no less certain that heat is annually passing out by radiation from the interior of the globe into the planetary spaces. He even undertook to demonstrate that the quantity of heat thus transmitted into space in the course of every century, through every square metre of the earth's surface, would suffice to melt a column of ice having a square metre for its base, and being three metres (or 9 feet 10 inches) high.

It is at the same time denied, that there is any assignable mode in which the heat thus lost by radiation can be again restored to the earth, and consequently the interior of our planet must, from the moment of its creation, have been subject to refrigeration, and is destined for ever to grow colder. But I shall point out in the sequel (chapter 19.) many objections to the theory of the intense heat of the earth's central nucleus, and shall then inquire how

* Proceedings Roy. Astronom. Soc. No. iii. Jan. 1840.

† See a Memoir on the Temperature of the Terrestrial Globe, and the Planetary Spaces, Ann. de Chimie et Phys. tom. xxvii. p. 136. Oct. 1824.