and it is only in order to become acquainted with these more readily, that the naturalist arranges or classifies them, placing those together which have most in common, and separating these from others, which are widely different. Classification, therefore, is not the object of Natural History, but a means of gaining that object: and it is very easy to enter upon many interesting enquiries without the slight-est knowledge of it. The structure and actions of man, for example, may be examined in the greatest detail, without knowing anything of his place in the general scale of being (although such knowledge will often shorten the student's labour); and other kinds of animals and plants may be observed in the same manner. In fact, several of the most valuable and interesting observations we possess, upon the habits and actions of particular animals, were made by those who devoted themselves almost exclusively to that special object. Thus it is scarcely out of the power of any one to contribute something to the general stock of knowledge; still less, then, can any be prevented from adopting some department of this pursuit, for the health and invigoration of their own minds.

THE TEMPERATURE OF THE SOIL.

" O ye Fire and Heat, bless ye the Lord : praise him and mag-nify him together."-The Benedicite.

It is not only by the properties in respect to heat of the ocean, or by those in respect to heat and vapour of the atmosphere, by marine currents, by the winds, by rains, and by the dew, that the processes of vegetation are influenced, and the geo-graphical distribution of plants modified; another vivifying element not less important in its agency is the nutive temperature of the soil.

There is a heat proper to the mass of the earth, increasing from a short distance beneath its surface downwards at the rate of about one degree of Fahrenheit's thermometer for every fifteen yards. This central heat becomes sensible in excavations reaching anywhere beyond a certain depth, and in some mines it is oppressive.

It is a constant heat. It does not by the slightest appreciable quantity vary from year to year, or season to season. Observations were made in 1671, by Cassini, on temperature of the air in certain closed cellars beneath the Observatory of Paris; they were repeated in 1730 by La Hire, and during the last forty-five years thermometrical apparatus of great sensibility have been fixed in these cellars and constantly observed; the temperature thus observed through a period of 175 years has never varied by more than one quarter of a degree from 11°82 of the centigrade thermometer, or 53° 37 of the thermometer of Fahrenheit.

There is, however, a temperature proper to the surface soil which is influenced at once by this constant subterranean heat and by the superficial absorption, and the radiation of the solar heat. This is a variable temperature. It extends to different depths, varying from 40 to 60 or 80 feet on the continent of Europe, but being found in tropical regions at the depth of a single foot. If a surface be imagined to pass through all those points beneath the earth's surface, to which the surface heat is propagated, and to which, therefore, a variable 112" F., and, in the summer of 1824, it attained 149" F.

temperature extends, it will be that called "the surface of invariable temperature."

Theory and experiment agree in indicating the temperature of any point in this surface of invariable temperature to be the mean temperature of that point in the carth's surface which is immediately above it.*

It is not a regular or even surface, but one having elevations and depressions dependent partly upon corresponding elevations and depressions of the earth's surface, and partly upon irregularities in the strata which constitute the earth's crust. Whilst beneath this surface there reigns an invariable temperature, a constant change is taking place above it, and that of a very remarkable kind.

From experiments made in Edinburgh, Zurich, and Strasburg, it appears that, during the winter months, January, February, and March, the tempe-rature increases uniformly as we descend from the earth's surface to the surface of invariable temperature ;---that in the months of April and May there comes, with the spring, a sudden and remarkable elevation of the temperature,† extending to a depth of about two feet into the soil, but continually increasing as we further descend, so that there is a depth (and a surface) of minimum temperature, situated between the surface of the earth and the surface of invariable temperature.

As the year advances, this surface of minimum temperature sinks continually deeper and deeper, until, in the month of August, it reaches the surface of invariable temperature and identifies itself with In this month, however, the mean temperature it. at the surface has begun to diminish, and beneath the surface it is reduced at different depths, more nearly to a state of uniformity, which state it actually attains in September, to the depth of 10 or It is in the months of October and No-20 feet. vember that this uniformity changes into an increas-And the temperature, which in ing temperature. the preceding months had increased from the depth of 15 or 20 feet to the surface of invariable temperature, now becomes throughout that space uniform.

Although the temperatures of the atmosphere and the soil are dependent for their variations on the same causes, yet in their amounts they are essentially different. During the day the temperature of the soil is much higher than that of the air ‡ At night it is sometimes from 14° to 18° below it. The relations by which these changes in the temperature of the soil are connected with atmospheric causes and the solar radiation, it is not easy to trace; -who can, however, doubt that when, in the months of March and April, the temperature of the soil so suddenly and so rapidly ascends, it is to meet the first efforts of vegetation-the bursting of the germ and the putting forth of the bud and blossom?

The black colour of the earth, favourable as it is to the absorption of heat, is one of the causes which

[•] Thus the mean temperature of Paris is 10°.6 of the centi-grade thermometer, which differs but one degree from the inva-riable temperature of the cellars under the Observatory.

⁴ In the experiments of Mr. Fergusson at Edinburgh, in 1817, that temperature at a depth of one foot, whose mean in February, was 37"04, became in March 30"-4, and April 62"+96. No variation of the temperature of the surface soil comparable to this, as to its amount, and the shortness of the time in which it is brought about, occurs at any other second of the var. occurs at any other season of the year.