This small number contains two new species, and the *Rotalia* of the chalk, the lower shell of which is here abundant, indicates the marine or brackish origin of these animalculæ. Moreover the occurrence here of *Tetragramma Libycum*, is remarkable, as being a form which a short time since was met with in saliferous earth brought from Siwa, in the Oasis of Jupiter Ammon, and at one time was found nowhere else.

As a general result of these researches, the following may be proposed:—

1. There are in Iceland as in North America, useful beds of good peat, consisting, in great part, even to as much as the $\frac{1}{3}$ of their bulk, besides vegetable remains, of dead microscopic animalcules—whilst the most common European good kinds of peat, although Infusoria when sought for are rarely found wanting in them, have not hitherto been found to contain them in the same proportion.

2. There is a minute organic invisible life diffused entirely through those parts of the soil rich in humus; but sandy situations of the earth's surface from near the South to the neighbourhood of the North Poles, and the bottom of the sea near the North Pole, are also filled with similar organic forms.

3. It is possible according to the method of research pursued by the author, to render evident the forms in which this life occurs, from the smallest particles of earth adhering to the plants in Herbaria, or to bodies of any kind; and to determine much further than has yet been done, with ease and scientific certainty, a more or less numerous fauna of microscopic organisms, from all parts of the earth.

XXIV. — CONTRIBUTIONS TO VEGETABLE EMBRYOLOGY, FROM OBSERVATIONS ON THE ORIGIN AND DEVELOPMENT OF THE EMBRYO IN *TROPÆOLUM MAJUS*.*

By *Herbert Giraud, M.D.*

AFTER referring to the researches of MM. Schleiden, Wydler, Mirbel and Spach, and A. St. Hilaire, on this important point, Dr. Giraud states that he was induced to select *Tropæolum* as the subject of his own observations on account of its solitary ovula, and their compara-

* Abstract of a Paper read before the Linnæan Society, February 1st, 1842, and published in the Proceedings of that body.

tively large size, which render the individuals of this family, as well as the allied *Geraniaceæ*, peculiarly fitted for the purpose. He arranges his observations under seven general heads corresponding with as many progressive periods in the growth of the female organs, and extending from the completion of the anatropous development of the ovule to the perfect formation of the embryo; or from the commencement of the expansion of the bud to the complete formation of the fruit. The results are collected from a great number of dissections.

In the *first* period, or just before the expansion of the bud, a longitudinal section of the carpellum from its dorsum towards the axis of the pistillum, dividing the ovule, shows the latter to have completed its anatropous development. A portion of rather firm and dense cellular tissue enclosing a bundle of vessels descends from the placenta and in apposition with it to form the raphe, and terminates in the base of the ovule. The nucleus has only one integument, at the apex of which is the exostome or micropyle, opening close by and to the outside of the point of attachment; and the conducting tissue of the style may be traced into the carpellary cavity as far as the exostome.

In the *second* period, during which the expansion of the bud and the dehiscence of the anthers commence, and therefore before impregnation, a small elliptical cavity makes its appearance near the apex of the nucleus, having a delicate lining membrane formed by the walls of the surrounding cells: this cavity is the embryo-sac, and a minute canal may be traced leading from it to the exostome. The apex of the embryo-sac encloses at this period a quantity of organizable mucilage containing many minute bodies having the appearance and character of cytotlasts.

In the *third* period, the apex of the nucleus and of its integument becomes slightly inclined towards the placenta. The embryo-sac is much enlarged and lengthened; its mucilage has disappeared and given place to an elongated diaphanous utricle (*utricule primordiale*, Mirbel; *vésicule embryonnaire*, Meyen; *extrémité antérieure du boyau pollinique*, Schleiden;) containing a quantity of globular matter or cytotlasts. This primary utricle is developed wholly within the embryo-sac, from which it is obviously distinct.

The *fourth* period occurs after impregnation. The pollen tubes do not extend into the carpellary cavity; but the fovilla with its granules is found abundantly in the passage leading from the style to the exostome. With the increased development of the embryo-sac, the primary utricle elongates and becomes distinctly cellular by the development of minute cells in its interior, while at the extremity next the base of the

nucleus it is terminated by a spherical mass consisting of globular cells. The primary utricle at this period assumes the character of the suspensor (Mirbel), and its spherical extremity constitutes the first trace of the embryo.

In the *fifth* period the apex of the nucleus and of its integument becomes more inclined towards the placenta; the spherical extremity of the suspensor enlarges, and it becomes more evident that it constitutes the rudimental embryo. In the mean time the suspensor has become lengthened by an increase in the number of its cells; and its upper extremity is found to be protruded through the apex of the embryo-sac, the apex of the nucleus and the micropyle. From this extremity there is a considerable development of cells, many of which hang loosely in the passage leading to the conducting tissue of the style, while the rest unite in forming a process which passes down the outer side of the ovulum within the carpellary cavity. This process is composed of from nine to twelve rows of cells, and its extremity resembles in appearance and in the anatomical condition of its cells the spongiole of a root. By a slight traction of this cellular process the suspensor with the embryo may be withdrawn from the embryo-sac through the exostome, thus proving the continuity of the process with the suspensor, and through it with the embryo itself.

During the *sixth* period the suspensor becomes more attenuated; and the cellular process has reached the base of the ovulum, the cells of its extremity abounding with cytoblasts, which prove that it is still progressing in development. The embryo also increases in size, and two lateral processes are observed, which evidently form the first traces of the cotyledons.

In the *seventh* period all distinction between the nucleus and its integument ceases, and they form a single envelope enclosing the embryo-sac; the cellular process has become so much developed, that its extremity has passed round the base of the ovulum and is directed towards the placenta; and the lateral processes of the embryo have become distinct fleshy cotyledons, enclosing both the radicle and plumule in corresponding depressions of their opposed surfaces. The subsequent changes consist chiefly in the great development of the cotyledons, which ultimately occupy the entire cavity of the nucleus, filling the space usually taken up by albumen.

From these observations Dr. Giraud deduces the following inferences:—The formation of the embryo-sac and the development of cytoblasts within it having been shown to take place at a period prior to impregnation, and even the primary utricle itself making its appearance before

the emission of the pollen from the anther, and before the expansion of the stigma, the origin of the primary utricle cannot be referred to the influence of impregnation, nor can it have been derived from the pollen tube pressing before it a fold of the embryo-sac.

The primary utricle at its first formation being quite distinct from the embryo-sac, even at its apex (although brought into contact with it at a subsequent period, and ultimately penetrating it), cannot result from a depression or involution of the embryo-sac, as is maintained by M. Brongniart.

The pollen tubes (which after impregnation may be traced in the conducting tissue of the style) never reaching the micropyle, but pollen granules being found in abundance in the channel leading to it, and being doubtless brought into contact with the outer surface of the embryo-sac through the exostome; and the first trace of the embryo appearing at this time in the formation of the spherical body at the inferior extremity of the primary utricle—Dr. Giraud is led to conclude that the origin of this simple spherical body results from a peculiar process of nutrition, determined by the material or dynamic influence of the fovilla, conveyed through the medium of the primary utricle or suspensor.

The paper was accompanied by a series of drawings representing the ovulum of *Tropæolum* in the several stages of development described.

XXV.—CONTRIBUTIONS TO THE MINUTE ANATOMY OF ANIMALS.*

By George Gulliver, F.R.S., &c.

As minute anatomy is now become more generally interesting than formerly, and begins to assume the character of an extensive and comparatively accurate science, so as to give a new complexion to some of the most important questions in physiology and pathology, and to enable us to submit many old doctrines to a more exact scrutiny than most of our classical anatomists had the means of employing, it appears to me that considerable advantage might arise if different independent observers would more frequently publish a brief yet clear account of the results of their inquiries. Hence I propose to communicate occasionally to the Philosophical Magazine, a series of short notes on the ultimate structure of various animal tissues and on the elementary forms which occur in the fluids, taking the descriptions in all cases from my own observations, and frequently illustrating them with wood-cuts. It will thus be at-

* From the Philosophical Magazine, June, 1842.