

on the above-mentioned propositions, the author concludes his paper with the following sentence :—

“ The several partial theories of philosophers, as far as concerns the leading facts on which they are based, are contained in the simple principles here developed : thus, the theory of universal gravity is here carried out to its ultimum ; Newton and Boscovich’s theories of alternate attractions and repulsions are derived from facts which depend on the alternate atmospheres, and neutral spaces of tenacious atoms ; Sir Humphry Davy’s theory of electrical energies, Dr. Dalton’s atomic theory, and the theory of the diffusion of gases, Dr. Black’s theory of latent heat, Gay-Lussac’s theory of volumes, Newton’s theory of light, or the theory of the emission of light, the undulatory theory, and very many others are here united in the most simple principles, which are, therefore, strongly recommended to the notice of philosophers.”

6. “ On the Organs of Reproduction, and on the Developement of the Myriapoda.” By George Newport, Esq. Communicated by P. M. Roget, M.D., Sec. R.S.

The author commences his paper by stating that great interest attaches to the study of the Myriapoda, from the already known fact that their mode of developement, by an increase in the number of segments, is directly the reverse of that of true insects in which the developement of the perfect individual is accompanied by an apparent diminution in the number of these parts. He remarks, that although the developement of the Myriapoda has already been examined by several eminent naturalists, such as Degeer, Savi, Gervais, and Waga, some of the most important facts relating to it have, nevertheless, escaped their notice, and he proposes, therefore, to lay before the Society the result of his own investigations on this subject, and also his examinations of the organs of reproduction.

The paper is divided into four sections. In the first, the author describes the organs of reproduction, and shows that the parts described by Treviranus, both in the male and female *Julus*, are only the efferential ducts in the male, and the oviduct in the female ; that in the former there are developed, from the sides of the efferential ducts, a large number of sacs, the structure of which he describes, and states his opinion that these are the proper secretory organs in the male, but remarks that he has not been able to follow out the organs to their fullest extent. In the female, he shows that the oviduct described by Treviranus is covered by an immense number of ovisacs, each secreting only a single ovum ; that many hundreds of these exist around the duct, a large proportion of which never reach maturity, being retarded in their growth by the developement of others immediately around them ; and that the ova, when matured, are passed from the ovisacs into the duct, and are then all deposited at one time. He adverts especially to the remarkable condition of the female oviduct being a single organ, throughout the greater part of its extent, but having a double outlet ; and shows its analogy in the internal portion of the organs to those of some in-

sects, and in its double outlet to the Crustacea and Arachnida. He also institutes a comparison between the structure of the male and female organs in this Myriapod, which, from their simplicity, admirably illustrate the uniformity of origin of these structures; more especially the analogy between the ovisacs in the female and the cæca in the male, and also their conformity in the absence, in the latter, of separate vesiculæ seminales, and, in the former, of spermatheca.

The second section is occupied by a short account of the structure of the ovum, in which the author observes the germinal vesicle and macula. He notices especially the presence of the yelk in the earliest stages of development, together with the vesicle and the membranes of the ovum at a later period, as showing in this low form of animal the conformity of structure and laws with those which prevail in the higher forms.

In the third section, the author speaks of the deposition of the ova, and of the habits of the species, as observed in specimens collected and preserved by him for that purpose. These habits he regards as particularly curious. The female excavates for herself a burrow, by digging with her mandibles in the soil, which she has previously moistened with a fluid, supplied, as the author believes, by her immense salivary glands. With this she forms a soft pellet, which she removes from the burrow with her mandibles and anterior legs; and thence, after being brought to the top of the hole, it is passed on to the next pair, and by these on to the next in succession, until it is entirely removed out of the way; after which, she deposits her eggs and closes the burrow with moistened clay. Great difficulty was experienced in preserving the eggs during the observations, from the circumstance that their shell is soft, and dries quickly when exposed to the air. To avoid this, the author had recourse to the plan of inclosing the eggs in a glass tube, filled with clay, and closed with a cork; the eggs being placed in a cell next to the glass.

The fourth section, which constitutes the most important part of the paper, gives the history of the evolution of the embryo. The process is divided by the author into different periods. After a few observations on the earlier changes of the egg, and the proof that they consist in an alteration in the size and appearance of the cells out of which the embryo is formed, he states his having observed that the egg bursts at the end of twenty-five days, by means of a fissure along the dorsal surface, as described by Savi and Waga; and that, in opposition to the remarks of Degeer, the young *Julus*, as first stated by Savi, is perfectly apodal. The author has also discovered a singular fact, entirely overlooked by all who have attended to the development of these animals, namely, that the young *Julus* at this time is still an embryo, and is completely inclosed in a shut sac, which terminates in a distinct *funis* at the extremity of the body, and in the proper *amnion*, or foetal envelope of the animal. He finds, also, that the funis enters at the posterior penultimate segment of the dorsal surface of the body, and not at the dorsal surface of the thoracic region, as seen by Rathke in the Crustacea. The embryo, he says, is retained in connexion with the shell, between the two halves of it, for seven-

teen days, by means of the funis, which is continuous with a second, or external membrane, *the chorion*, which lines the interior of the shell. He states that the liberation of the embryo from the shell is not effected by any effort of its own, but by the expansive force of the growth of its body. He describes, also, another important fact which had been overlooked by previous observers, relating to the mode and place of origin of the new segment of the body in the Julidæ. The new segments are always produced in a *germinal membrane* immediately before the penultimate segment, which segment, with the anal one, remains permanent throughout the life of the animal. The production of the first set of new segments is commenced even before the animal has burst from the amnion. After leaving the amnion, the young *Julus* possesses six pair of legs, as stated by Savi and Waga; but the author remarks, in addition, that, notwithstanding this, it is still inclosed in another tunic, the proper skin of the embryo, beneath which new segments are being formed, and which begins to be detached before the embryo has left the amnion. He suggests whether this may not be the representative of the proper tunic of the germinal vesicle. After minutely describing the embryo, and showing that its body is still formed of cells, he states that four pairs of new legs are forming beneath this tunic, and that, on the twenty-sixth day, the young animal throws off this covering, and the legs are developed, and also the six new segments, to a further extent. The animal then takes food, the segments become developed to the same extent as the original ones, until the forty-seventh day, when it again changes its skin, new segments are again produced, and new legs to those segments last formed. In this way it passes through several changes, developing first segments and then legs.

One remarkable circumstance stated is, that the production of segments is *sextuple* in the Julidæ; but this does not hold in other genera, in some of which it is *quadruple*, and in others *double*; but these peculiarities appear in all cases to be characteristic of each distinct genus. In conclusion, he confirms the observation already made by M. Gervais, that the number of eyes is increased as the animal advances in its transformations. The author concludes by stating that he proposes continuing these observations on the Myriapoda at some future period.

The paper is accompanied by drawings of the parts described, and of the successive changes which take place during the development of the animal:

The Society then adjourned over the long vacation, to meet again on the 18th of November next.