We reached Zamboanga on the 23rd, and on the 26th we passed into the Sulu Sea and trawled at a depth of 102 fathoms. On the 27th we sounded to 2550 fathoms, and took a serial temperature-sounding. A minimum temperature of 10° C. was found at 400 fathoms; so that the Sulu Sea must be regarded as the fourth of this singular succession of basins, cut off by barriers of varying height from communication with the ocean. This observation in the main confirmed those of Captain Chimmo in the same locality. The minimum temperature reached was the same in both, but we appear to have found it at a somewhat higher level.

We arrived at Ilo Ilo on the 28th, and proceeded by the eastern passage to Manilla, which we reached on the 4th of November.

The collections have been packed and catalogued in the usual way, and will be sent home from Hong Kong. We have had an opportunity during this cruise of making a very large number of observations of great interest. I believe I may say that the departments under my charge are going on in a very satisfactory way.

February 11, 1875.

JOSEPH DALTON HOOKER, C.B., President, in the Chair.

The Presents received were laid on the table, and thanks ordered for them.

The following Papers were read:—

I. "On the Structure and Development of *Myriothela*."
By Prof. Allman, F.R.S. Received February 5, 1875.

(Abstract.)

The *endoderm* of the body is composed of numerous layers of large spherical cells composed of clear protoplasm, enclosing a nucleus with some brown granules and refringent corpuscles. Externally it is continued in an altered form into the tentacles, while internally it forms long thick villus-like processes which project into the cavity of the body. Towards the free ends of these processes there are abundantly developed among the large clearer cells, smaller, easily isolated spherical cells, filled with opaque brown granules. Where the endoderm passes into the tentacles it loses its large clear-celled condition, and consists of small round cells, so loaded with opaque granules that the axis of the tentacle appears nearly white under reflected light.

The free surface of the endoderm carries, at intervals, long, very slender, sluggishly vibrating cilia, and is overlaid by a thin layer of homogeneous protoplasm, which on the villus-like processes becomes especially distinct,

and which here develops minute mutable pseudopodia, which are being constantly projected and withdrawn. Indeed the vibratile cilia appear to be but a modification of these pseudopodial processes of protoplasm.

Interposed between the endoderm and the ectoderm is the *fibrillated layer*. It is extremely well developed, and consists of longitudinal muscular fibrillæ, closely adherent to the outer surface of a structureless hyaline membrane—the "Stützlamelle" of Reichert. The fibrillated layer, with its supporting membrane, is so strong as to remain entire in a section of the animal after the tissues on both sides of it have been broken down.

The *ectoderm* is composed of two zones, a superficial and a deep. The superficial zone consists mainly of two or three layers of small round cells containing yellowish granules. Among these cells the thread-cells may be seen, lying chiefly near the outer surface of the body. Two forms of thread-cells may be here distinguished—one ovate, with the invaginated tube occupying the axis; the other fusiform, with the invaginated tube oblique.

The deeper zone of the ectoderm consists of a very remarkable tissue, composed of peculiar membraneless cells, each of which is prolonged into a tail-like process, so that the cells assume a claviform shape. In most situations, where this tissue is developed, the processes from several such cells unite with one another, so as to form branching, somewhat botryliform groups, whose common stalk can be followed into the fibrillated layer. The author is thus enabled so far to confirm the observations of Kleinenberg on cells of apparently the same significance in *Hydra*. In *Myriothela*, however, these cells do not, as in *Hydra*, reach the surface. With the exception, apparently, of their condition in the transitory arms of the *Actinula* or locomotive embryo, they form everywhere a deep zone interposed between the muscular layer and the superficial layer of the ectoderm. This zone is designated by the author as the zone of *claviform tissue*. Though it is in intimate association with the fibrillated layer, the author did not succeed in tracing a direct continuity of the individual fibrillæ with the processes of the cells, as described by Kleinenberg in *Hydra*.

The author adopts, as a probable hypothesis, the views of Kleinenberg respecting the caudate cells of *Hydra*, which he regards as representing a nervous system. While the deep layer of ectodermal cells in *Myriothela* would thus constitute a nervous layer, the superficial layer would represent an epidermis; and since recent researches justify us in regarding the ectoderm and endoderm of the Cœlenterata as respectively representing in a permanent condition the upper and lower leaf of the blastoderm in the development of the higher animals, we should thus find *Myriothela* offering no exception to the general law, which derives both epidermic and nervous tissues from the upper leaf of the blastoderm.

The structure of the tentacles is in the highest degree interesting. In

their narrow stalk-like portion, the condition of the endoderm departs widely from that of this tissue in the tentacles of other marine hydroids; for it presents no trace of the septate disposition so well marked in these. It is, on the contrary, composed of a layer of small cells loaded with opaque granules and surrounding a continuous wide axile cavity.

It is, however, in the terminal capitulum of the tentacle that the structure of these organs departs most widely from any thing that has as yet been recognized in the tentacles of other hydroids. Here a very peculiar tissue is developed between the muscular layer and the proper ectoderm, where it takes the place of the zone of claviform tissue. It forms a thick hemispherical cap over the muscular lamella and endoderm of the tentacle, and is composed of closely applied exceedingly slender prisms, with their inner ends resting on the muscular lamella, to which the prisms are perpendicular, the whole structure forcibly suggesting the rod-like tissue associated with special sense-apparatus in higher animals. It appears to be but a modification of the tissue which elsewhere forms the zone of claviform tissue.

Extending in a radiating direction from the convex surface of this rod-like tissue, towards the external surface ef the tentacle, may be seen numerous firm filaments, each of which, making its way among the cells of the ectoderm, terminates distally in a very delicate transparent oviform sac, which carries, near its distal end, a minute styliform process. Within this sac, and completely filling it, is an oviform capsule with firm transparent walls, and having immersed in its clear refringent contents a cylindrical cord wound upon itself in two or three coils. Under pressure, the contained cord may be sometimes forced out through the smaller or distal end of the capsule. Notwithstanding the obvious resemblance of these bodies to thread-cells, their significance is, without doubt, something entirely different. Indeed their resemblance to the Pacinian bodies of Vertebrata is too strong to be overlooked. Their assemblage constitutes a zone parallel to the spherical surface of the capitulum, and lying at a slight distance within it. Though it is impossible to assign to them, with certainty, their exact function, we feel compelled to regard the whole system, including the bacillar tissue to which their stalks can be traced (and which is only a locally modified portion of the nervous zone, or zone of claviform tissue), as an apparatus of sense. It would almost seem to represent a form of sense-organ, in which sight and touch show themselves in one of their earliest phylogenetic stages, in which they have not yet become fully differentiated from one another. This is the only known instance of the existence in a hydriod trophosome of any thing which may with fair reason be regarded as a special apparatus of sense.

The male and female sporosacs are borne by the same trophosome.

The generative elements, whether male or female, originate in a special cavity (gonogenetic chamber), which is formed in the substance of the endoderm of the sporosac.

In the female, the primitive plasma becomes gradually differentiated into a multitude of cell-like bodies having all the characters of true ova with their germinal vesicle and spot. They are entirely destitute of enveloping membrane.

These bodies next begin to coalesce with one another into numerous roundish masses of protoplasm, which develop over their surface minute pseudopodial retractile processes.

The masses thus formed still further coalesce with one another; and there results a single spheroidal plasma mass, through which are dispersed numerous small spherical vesicles, mostly provided with a nucleus. These vesicles appear to be nothing more than the nucleolated nuclei of the coalesced ovum-like cells.

About the time of the completion of this last coalescence, the resulting plasma mass, enveloped in an external, very delicate, structureless membrane, is expelled, by the contraction of the sporosac, through an aperture formed by rupture in its summit.

Immediately after its expulsion, it is seized, in a manner which forcibly suggests the supposed action of the Fallopian tube on the mammalian ovum at the moment of its escape from the Graaffian follicle, by the sucker-like extremities of certain remarkable bodies, to which the author gave the name of *claspers*, which are developed among the blastostyles, and resemble long filiform and very contractile tentacles.

It is apparently now that fecundation is effected; for the plasma becomes again resolved into a multitude of roundish masses. This phenomenon may be regarded as representing the yelk-cleavage of an ordinary ovum. Reasons are assigned for believing that it is through the agency of the claspers that fecundation takes place; and the claspers are compared to the hectocotylus of Cephalopods, and to certain organs by which fecundation is effected among the Algæ.

The mulberry-like mass thus formed, surrounded by its structureless membrane, which has now acquired considerable thickness and forms a firm capsule, continues to be held in the grasp of the claspers during certain subsequent stages of its development. An endoderm and ectoderm with a true multicellular structure become differentiated, a central cavity is formed by excavation, and the germ becomes thus converted into a spheroidal non-ciliated *Planula*. This, after acquiring certain external appendages, ultimately escapes, by the rupture of the capsule, as a free actinuloid embryo.

The actinuloid, on its escape from its capsule, is provided not only with the long arms already noticed by Cocks and Alder, but with short scattered clavate tentacles. The short clavate tentacles become the permanent tentacles of the fully developed hydroid; the long arms, on the other hand, are purely embryonic and transitory.

The long embryonic arms originate in the spheroidal *Planula*. They are formed by a true invagination, and at first grow inwards into the

body-cavity of the *Planula*. It is only just before the escape of the actinuloid from its capsule that they evaginate themselves and become external.

After enjoying its free existence for one or two days, during which it moves about by the aid of its long arms, the embryo fixes itself by its proximal end, the long arms gradually disappear, the short permanent tentacles increase in number, and the essential form of the adult is soon acquired.

II. "Some Particulars of the Transit of Venus across the Sun, December 9, 1874, observed on the Himalaya Mountains, Mussoorie, at May-Villa Station, Lat. 30° 28′ N., Long. 78° 3′ E., Height above Sea 6765 feet."—Note No. I. By J. B. N. Hennessey, F.R.A.S. Communicated by Prof. Stokes, D.C.L., Sec. R.S. Received January 2, 1875.

May Villa, 9th December, 1874.

Naturally sharing in the great interest excited by the transit of Venus, which occurred this forenoon, I proposed that I should observe the event with the equatoreal of the Royal Society, which Capt. J. Herschel, R.E., in his absence from India, had temporarily placed at my disposal; and the project meeting with liberal support from Col. J. T. Walker, R.E., Superintendent, Great Trigonometrical Survey of India, I was enabled, through his kindness, to provide myself with four chronometers, a good altazimuth, a barometer, thermometers, and other articles of equipment necessary for the undertaking. My especial object in view was to observe the transit from *a considerable height*; and this condition was easily secured through the circumstance that I was located only 14 miles from Mussoorie, on the Himalaya Mountains. No doubt a station on these mountains would be very liable to an envelope of mist and cloud at the time of year in question; but, on the other hand, were really good weather to prevail, I should enjoy the advantages of an exquisitely clear atmosphere, such as I have never experienced save on the Himalayas. Add to this, the journey, as already stated, was merely an ordinary ride, the necessary equipment for my purpose was at hand, and though failure would involve a waste of no inconsiderable preliminary labour, this latter I was willing to incur if need be. Arguing thus, I selected a station some 6500 feet above the sea, and proceeded to find my latitude, longitude, and height, to observe for time, and to rate my chronometers. My numerical results will be communicated very shortly in a second note. The remarks here made are restricted chiefly to what I *saw* with the equatoreal.

The telescope of the equatoreal has a 5-inch object-glass, with about 60 inches focal length, and is driven by an excellent clock. The eye-end may be fitted at will with an eyepiece of 55, 85, 125, 200, or 300 power,