

or less free of clouds, and yet all were enveloped by cloud before noon.

The following features were very apparent :—The wind, although brisk before and during the progress of the eclipse, considerably moderated at the time of greatest obscuration, becoming brisk again afterwards. The darkness, although *felt*, was by no means so great as had been expected ; yet this was in a great measure owing to the overcast sky. The pupil of the eye was not contracted by strong light, consequently it was able to take in the diminished light over a larger surface, diminishing the effect of darkness to our senses. Practically it was dark ; the impossibility of reading the instruments at Isham, Towcester, and Grantham, was a certain measure. I have seen greater apparent darkness produced by a storm, and yet the darkness was not such as to prevent instruments being read. The contracted landscape was well shown at Isham and Highfield House. The change in the colour of the landscape was almost universally remarked, as well as the great stillness at the time of greatest obscuration. A solar halo occurred in the Orkney Islands during the time of greatest obscuration. Rooks everywhere returned to their rookeries ; fowls prepared to go to roost ; peafowl actually went to roost ; turkies hastened home ; cocks crowed ; sparrows appeared frightened ; song-birds sang as in early morning, and kept up their song all afternoon. Bees returned to their hives. Cows seemed to have imagined that milking-time had arrived. The crocus and hepatica closed their flowers. An effect on sea animals was not observable ; the *Actinia crassicornis*, which always expands in the evening, did not open during the eclipse.

II. "On the Structure and Functions of the Hairs of the Crustacea." By CAMPBELL DE MORGAN, Esq. Communicated by GEORGE BUSK, Esq. Received March 13, 1858.

(Abstract.)

The object of this communication is to determine, by the observation of their anatomical relations, the uses of the hairs and similar appendages to the shell of the Crustacea. The author mentions the observations of those who have of late specially investigated this subject. M. Lavalle noticed the connexion at times of the canals of the

hairs with canals penetrating the whole thickness of the shell, and the *occasional* continuity of the matter which filled the hairs with that which exists in the corresponding canal of the shell. M. Hollard says that the canals of the shell which correspond to the hairs, are occupied by membranous investments, which embrace the base of the hairs, and seem to receive an extension of the nutrient system. He suggests that amongst other functions, the hairs may possibly be connected with that of general sensibility. Dr. Häckel in a recent publication has shown that the canals of the shell and hair are lined by a continuation of the outer layer of the soft internal integument, which he calls the chitinogenous layer. He describes minutely the structure of the inner integument, and his account on the whole agrees with that given by Milne-Edwards; but he does not recognize the presence in the canals, of any of the elements of the inner integument except the external cuticular or chitinogenous layer; nor the connexion of these canals with the corium which lies beneath it, and which receives abundantly nerves and vessels.

According to the investigations of the author, it is with this deeper, vascular and nervous layer that the contents of the hair-canals and of the corresponding canals in the shell are especially connected. This can be readily seen in parts where the shell is thin, as in the foot-jaws for example. In a section made in such a situation, the canals leading to the hairs will be found to be often nearly as large as the bases of the hairs to which they correspond. They are lined by a thick membrane, which invests the cup-shaped cavity in which the hairs are implanted, and becomes so closely connected with the bulb of the hair itself, that it is often dragged out with it when the hair is pulled out. The cells and other elements of the deeper layer of the internal integument fill up the canal and pass on into the hairs.

Where the shell is thick, as in the claw of a lobster, the sheaths which are connected with the hair-bulbs and line the shell-canals can be demonstrated in the manner adopted by Mr. Tomes to show the existence of the dentinal fibres. If a section of a part of the shell of the claw where the hairs are implanted, and which has been previously softened in dilute acid, be torn through, the sheaths will usually be dragged out, and will be seen projecting from the torn edges, their contents often remaining in them. The connexion of the inner in-

tegument with these sheaths may be seen in sections of the claw with the integument still adhering to it, when on carefully tearing away the latter, its prolongations into the sheaths will be dragged out. That the hairs have some especial and important connexion with the inner vascular and nervous layer of the integument of the lobster's claw and elsewhere, seems probable from the observations made by the author on the contents of the claw. The terminal moveable piece, the pollex, and the prolongation of the metatarsus which it opposes, the index, do not contain muscular fibre, but are filled entirely by a soft pulpy mass of corium. The nerves of the limb are large, but only some small branches will be found to go to the muscles; the principal nerves pass on and terminate in the pulp which fills the opposing pieces of the claw. The author believes that it is the office of the hairs to establish a communication between the outer surface and this inner, and no doubt highly sensitive pulp, and that this is rendered still further probable by the comparison of the claws on the two sides. In the smaller claw the edges are sharp, and have fine tubercles along their margin; and the hairs are placed in a regular series of short tufts on each side of the tubercles, beyond which they do not project. But on the larger crushing claw, the tubercles are massive, and no hairs are seen projecting above the surface. If, however, a section be made, it will be seen that a communication is established between the inner pulp and the surface by means of an abundant series of canals which terminate in bulbous extremities, sometimes projecting beyond the surface, sometimes lodged in depressions in the shell. This arrangement may be found in other parts; and in the crab's claw, where the tubercles are deficient, these hairless pulp-cavities almost entirely replace the hairs.

Here, then, lodged within the densest part of the shell, is a structure richly supplied with nerves, shut off from other parts of the body, and having communication with the surface only through the medium of canals, which are sometimes continued into short bristles, and sometimes terminate in mere bulbs. As a prehensile organ, the claw needs sensibility, but no force which the animal could exercise could make any impression on the parts within, through its dense tuberculated edges. On the other hand, it is difficult to assign any office to the bristles, and still more to the bulbs, mechanical or otherwise, unless it be that which has been suggested,—that, establish-

ing, as they do, a communication between the external surface and the nervous structure within, they communicate impressions, and are in fact tactile organs.

The author had satisfied himself, before the appearance of Dr. Häckel's paper, that the hairs were connected with the inner layers of the corium, and not with the chitinogenous membrane only; and he had seen indications in the lobster and larger Crustacea of an arrangement of the pulp corresponding to the arrangement of the hairs. In the smaller Crustacea, especially in the shrimps, he found a remarkable confirmation of his views. In the flabelliform processes, and even in the claws in these animals, he found that the structures within the shell were arranged in the form of tubes corresponding to the hairs, through which passed from the deeper parts, fibres which were prolonged into the hair-canals. In the claw the nerve was traced to the inner termination of these tubes. The tubes in some instances merged internally into the general mass of the corium; in others they were truncated. Externally, or towards the margins, they presented open orifices, through which the fibres passed. The fibres, when drawn out from the hair-canals, often presented the plumose or serrated character, according to the form of hair to which they belonged. They could be traced for some distance down the tubes, and at times completely through them, but their deep connexions could not be clearly made out. Several modifications of this arrangement are described and figured. The author believes that the facts brought forward are sufficient to establish that the hairs of the Crustacea are probably organs by which external impressions are communicated to the internal sensitive parts.

III. "Note on the Measurement of Gases in Analysis." By A. W. WILLIAMSON, Ph.D., F.R.S., Professor of Chemistry in University College, and W. J. RUSSELL, Ph.D. Communicated by Dr. WILLIAMSON. Received April 6, 1858.

In Bunsen's admirable method of gas analysis, considerable time and trouble are expended in observing the exact temperature and pressure to which the gas is subjected at the time of measurement; and also in calculating from these data the volume which the gas would occupy at the normal temperature and pressure. Frankland's