whether the point proved is not that a glacial period has intervened since the times of Palæolithic man and the present, rather than that man existed in this country before the glacial epoch, I think Mr. Tiddeman thinks as I do; but I take the liberty of stating this view more distinctly. O. FISHER

Wave Motion

IN NATURE, vol. viii. p. 506, Mr. Woodward has suggested a simple and ingenious illustration of wave motion. Could he, or any other correspondent, supply, or refer to, a popular explanation of the action of the particles upon each other, to which the propagation of the wave is due?

In the case of sound waves, the propagation is comparatively simple, and is fully and clearly explained in Dr. Tyndall's "Lectures on Sound," and elsewhere. Helmholtz, in his "Popular Lectures," has figured the motion of the individual particles of which a water wave is composed. And in Sir John Herschel's "Familiar Lectures," there is an elaborate and beautiful demonstration of the motion of the particles of ether in plane and circularly polarised light; but neither of these expositions appears to deal with the mode of propagation of the motion by which the wave is formed.

On the other hand, Sir Charles Wheatstone's ingenious model beautifully exemplifies the interaction of *waves* and their results. But here the waves are produced by the wooden wave forms introduced into the machine, the beads representing the particles remaining fixed in relation to each other. Neither, therefore, can this explain the manner and direction of the actual impact of each particle upon the adjacent one (beginning with those in contact with the source of motion itself), to which, combined with the tendency to yield in the direction of least resistance, the water wave must owe its form, and upon which the still more complicated conception of the light wave must ultimately depend.

Could a reference be given to any practical explanation of this point, it would confer a benefit on many who are not competent to follow the subject into the higher mathematics. M. F. E.

Sussex, Nov.

Elementary Biology

I, ALONG with many others, who are desirous of obtaining an insight into Nature, would esteem it a great favour, and it would be of the greatest benefit to us, if any of your scientific readers would undertake to give through your columns a short account of the various low forms of life included under the elementary stage of biology of the Science and Art Department. They might give instruction as to where the various objects could be seen, how inspected, names of the best text-books for the students' guidance, &c.

By so doing, they would secure the praise of many who at present cannot find out the modes of studying such subjects.

Hull, Nov. 8 BIOLOGY

Black Rain and Dew Ponds

CAN any of your readers explain the cause of this phenomenon? On Thursday, the 4th Sept., about 5 P.M., in the village of Marlsford, in the valley of the Thames, near Wallingford, a heavy storm of rain occurred: and the water which fell in several parts of the village was found to be nearly black. It is described as being of such a colour as would be produced by mixing ink with water. Another of these black water showers fell during the night of the following Friday.

Would any reader of NATURE also kindly set forth the theory upon which the utility of the dew ponds, found in many of the highest points of the Berkshire Downs, rests. They are circular ponds made with considerable care, and are supposed to receive so much dew as to supply all the water needed for the sheep in their neighbourhood through the driest summer.

Tiverton E. HIGHTON

ALBANY HANCOCK

THE brief announcement by which some of our readers may have first learnt of the decease of one of our greatest biologists is, in its simplicity, in singular harmony with the life the close of which it commemorates.

The retrospect of so serene a career leaves little to the biographer, for its points seem marked rather by phases of study, as indicated by important scientific memoirs, than by incidents which the world regards as striking or noteworthy.

Albany Hancock was born at Newcastle-on-Tyne on Christmas Eve, 1806. His father, Mr. John Hancock, died some six years later, and of the six little children thus left dependent on their mother, Albany was the third. He received a good education as times then went, and on leaving school was articled to a solicitor of good standing in Newcastle. Uncongenial as was the employment, he served his full term, passed the customary examinations in London, and even took an office in Newcastle with the view of establishing himself in practice. But the occupation was irksome, and he gave it up ere long to join a manufacturing firm, and this in turn circumstances led him soon to abandon. The simple fact probably was that neither occupation permitted him to follow the bent of his inclination, and that the desk and counting-house were alike distasteful to a mind pre-engaged as was his by other currents of thought. His early taste for natural history pursuits was probably in part derived from the collections, chiefly conchological, formed by his father, who was in many ways a man of superior ability, and had been something of a naturalist; and association with the late Mr. Robertson and Mr. Wingate, the one a botanist, the other an ornithologist, of repute; with the well-known Mr. Bewick; and above all with his near neighbour Mr. Alder, confirmed his inclination in this direction. He was, as a boy, clever with his fingers, and that manual dexterity which in later years served him so well when engaged with dissecting needle and pencil, exhibited itself in many of the pursuits of his early life.

The first mention we find of Mr. Hancock's devotion to natural history is in Mr. Alder's "Catalogue of Land and Fresh-water shells," published in 1830, in which the author handsomely acknowledges the obligations he is under to him and to Mr. John Thornhill "for the communication of many habitats observed during their active investigation of this as well as other branches of the natural history of the neighbourhood" of Newcastle. His earliest appearance as an author seems to have been in connection with two short papers in the first volume of "Jardine's Magazine of Zoology and Botany," published in 1836, the one a "Note on the Occurrence of *Raniceps trifurcatus* on the Northumberland Coast," the other a "Note on *Falco rufipes*, *Regulus ignicapillus* and *Larus minutus*." These notices were, comparatively speaking, of trifling significance, but they were the beginning of a long series of contributions to knowledge which only ceased when his last illness deprived him of the power of continuous work. It is unnecessary here to enumerate the successive memoirs that embody the results of his life's labour. A catalogue of the original papers of which he was author, or joint author, would extend to something over seventy titles.

Early association with Mr. Alder in the study of the mollusca led to the production between the years 1845 and 1855 of their magnificent "Monograph of the British Nudibranchiate Mollusca," which may still be taken as a standard of excellence amongst such publications. Many of Mr. Hancock's earlier papers were devoted to the elucidation of the boring apparatus of the mollusca, and these were followed by similar researches respecting the excavating power of a group of sponges (*Cliona* and allied genera) which until that time had been but little known or understood.

As an anatomist—and after all it was his large knowledge of minute anatomy and infinite skill in dissection that gave its especial value to most of his work—he was, perhaps, best known by his elaborate memoir on the Organisation of the Brachiopoda, published in the Philo-

sophical Transactions for 1857; but many other papers of the same thorough and original character proceeded from his pen. Amongst them will be remembered the following:—"On the Olfactory Apparatus in the Bullidæ" (1852); "On the Nervous Systems of *Ommastrephes todarus*" (1852); "On the Anatomy and Physiology of the Dibranchiate Cephalopoda" (1861); "On the Structure and Homologies of the Renal Organ in the Nudibranchiate Mollusca" (1863); "On the Anatomy of Doridopsis" (1865); "On the Anatomy and Physiology of the Tunicata" (1867).

For some years previous to his death Mr. Hancock had devoted much attention to the fish of the Carboniferous period, and in conjunction firstly with Mr. T. Atthey, whose fine collection afforded ample material for the purpose, and subsequently with Mr. Howse, published a series of fifteen papers on these coal-measure fossils.

The promised Monograph of the British Tunicata, preparations for which had made some progress even before the death of Mr. Alder, had occupied much of his time; and though probably still unfinished, it may be hoped that the results of his investigations are so far complete in themselves, that the work, as far as it has gone, may be saved to science. A supplement to the Monograph of Nudibranchiate Mollusca had been a matter long on his mind, but one that he had never been able to devote himself to realising, beyond the collection of materials.

Allusion has been made to Mr. Alder, Mr. Atthey, and Mr. Howse, as having been associated with Mr. Hancock in certain of his papers; to these must be added the names of Dr. Embleton and the Rev. A. M. Norman as occasional colleagues.

On the establishment of the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne in 1829, Mr. Hancock became an active supporter, and was one of the original staff of honorary curators; and on the formation of the Tyneside Naturalists' Field Club in 1846, he was one of its principal and most influential promoters. When the new College of Physical Science in Newcastle was instituted, his name, almost as a matter of course, was placed on the provisional committee; and it was only when this body had completed its labours and gave place to a permanent board, that he was permitted, on the ground of ill-health, to retire from active service in connection with the institution. He was a Fellow of the Linnean Society, a corresponding-member of the Zoological Society of London, an honorary member of the Imperial Botanico-Zoological Society of Vienna, and perhaps of some other similar bodies; but honours of this sort, though valued in their way, were thrust upon him rather than sought. Though living a retired life, no man more highly prized social intercourse. His kindly helping hand was held out to every young naturalist: Such were always welcome at his house; and when appealed to by them, as was often the case, he made their difficulties his own till he could help to solve them.

It is yet too soon to attempt to shake oneself free from a sense of his presence, or to essay to weigh in judicial balance the value of his contributions to human knowledge: considerations of this sort are overwhelmed in the sense of irreparable loss to science.

H. B. B.

*FERTILISATION OF FLOWERS BY INSECTS**

IV.

On the two forms of flower of Viola tricolor, and on their different mode of fertilisation.

VIOLA tricolor presents a further example of the same kind of dimorphism as that described in the last article in the case of Lysimahcia, Euphrasia, and Rhinanthus. One of its two forms, illustrated by Fig. 15 in natural size, is more conspicuous than the other (Fig. 16), not only by its larger size, but also by the more striking colour of its petals. When the flower has just opened, its two upper petals are light violet, or, in rarer cases, nearly white; but they gradually become a deep violet, or even dark blue. Far more striking is, ordinarily, the change of colour in the two lateral petals and the lower one, which, immediately after the opening of the flower, are nearly white, while in a fully-developed state they are always violet. The petals of the small-flowered form of *Viola tricolor*, illustrated in natural size by Fig. 16, are, on the contrary, uniform in colour and nearly white during the whole time of flowering. The attractiveness for insects of the two kinds must therefore be very different, whereas those particular marks round the opening of the flower which serve as a guide to insects in search of the honey, the "Saftmal" of Sprengel, are nearly the same in the two varieties. That part of the lower petal immediately before the entrance of the flower (*y*, Fig. 21, 22) is in both dark yellow, and the lower petal is also marked by black streaks converging towards the same entrance. There is only this difference between the two forms as to their guide-mark (*Saftmal*), that in the large-flowered form seven black streaks on the lower petal, and three on each of the lateral ones point towards the entrance of the flower; whereas in the small-flowered form there are but five black streaks in the lower petal, and none at all on the lateral ones.*

Although these two forms have been generally known, at least since the time of Linnæus, all botanists who have published observations on the fertilisation of *Viola tricolor* have apparently turned their attention exclusively to the large-flowered form (Fig. 15), whose beautiful adaptations to cross-fertilisation by insects, have been, therefore, very accurately described; while the peculiarities in structure and fertilisation of the small-flowered form have not even been mentioned. If, in this case, we clearly see that even scientific inquirers have been far more attracted by the larger violet flowers than by the smaller whitish ones, we need not wonder that insects are influenced in like manner, and that from this cause smaller and less conspicuous flowers are so frequently quite overlooked by insects, that they would rapidly become extinct, unless slight modifications of structure and development enabled them to produce seeds by self-fertilisation.

Indeed, in *Viola tricolor*, as in those species hitherto considered, regular self-fertilisation in the small-flowered form is effected by such slight modifications of structure and development, that by far the larger number of the contrivances in the large and small-flowered forms are identical.

In both forms, honey is secreted by two long appendages (*n*) of the lower filaments (*fi*), from which it ascends by adhesion into the uppermost part of the hollow spur (*sp*); the style (*sty*, Fig. 22) is directed downwards on its base, slender and bent like a knee, while above it is straight and gradually thickened, but does not increase at all or only slightly in breadth, ending in a skull-like stigmatic knob (*k*), thick enough to completely stop the entrance of the flower. This knob is provided with a wide open moist stigmatic cavity (*st*,) and is protected from above by two sets of hairs (*pr*, Figs. 21, 22, Sprengel's "Saftdecke") on the two lateral petals, which at the same time defend the entrance of the flower against rain, and prevent insects from entering into the flower in any other way than by the lower side of the skull-like knob. In both forms the five anthers open inwards, are narrowed towards their

* Continued from vol. viii. p. 435.

* My description relates exclusively to those varieties of *Viola tricolor* which grow in the environs of Lippstadt. From Sprengel's, Bennett's, and other descriptions and illustrations, I am aware that in other localities somewhat different varieties are found. But I do not doubt that differences in the manner of fertilisation, identical or closely allied with those here to be described, will be found wherever a large-flowered and a small-flowered form of *Viola tricolor* co-exist.