first established instance of the occurrence of Niphargi in England, was Mr. Westwood's discovery at Maidenhead, Berkshire, of a well containing numbers of *N. aquilex*. They have more recently been obtained from Corsham and Warminster, Wiltshire, and also from Ringwood, on the borders of the New Forest, Hampshire. *Crangonyx subterraneus* has occurred at the two latter places, but not at the first named. *Niphargus fontanus* is found at both Corsham and Ringwood, but with a difference in the shape of the gnathopoda and posterior pleopoda, amounting to a probably distinct variety, if not species. The form of the gnathopoda, or hands, is worthy of attention, being each armed with a moveable claw of large size, forming a prehensile organ of great power. *N. fontanus* is also possessed of small, yellow eyes, which distinguish it in a very marked way from the allied species (of the genus *Gammarus*) found on the Continent. Every member of the subterranean Fauna hitherto found has been destitute of eyesight. The movements of Niphargi, when kept in captivity, are interesting to observe; but Mr. Hogan states that he has found great difficulty in preserving them alive. The longest period during which even the strongest specimens survived its capture was three weeks. The average temperature of the water in which *Niphargus* and *Crangonyx* are found is about 50° Fahr., and they seem to propagate in recently-formed wells as freely as in old ones. In no case have any species of this family been found, either in this country or abroad, in open wells or other than artificial ones,—pumps, in fact. They are found at all seasons of the year, but most abundantly towards the end of the autumn. The largest size known among the English species (that of *N. fontanus*) hardly exceeds half an inch. Mr. Hogan hoped that more extended observations would be made in Great Britain on this interesting family of Crustacea, as their economy and structure are as yet very imperfectly known, and an accurate examination would be sure to reward the investigator with results at least as interesting as those already obtained regarding their allies by Continental naturalists.

Mr. J. G. Jeffreys exhibited several specimens of the common whelk (*Buccinum undatum*) having double opercula; in one instance, a second or supplementary operculum being piled on the usual one; and in the others, there being two separate opercula, instead of one, in each whelk. He adverted briefly to the different kinds of monstrosity which occur in animals and plants, and said he believed this to be the first case of a similar monstrosity in the Mollusca. He observed that the monstrosity under consideration appeared to be congenital, and not to have arisen from an accidental loss of the original organ, because in some of the specimens both opercula were cases of hypertrophy, and in the others of atrophy; and he mentioned that all the specimens came from the same place (Sandgate in Kent), showing a repetition, and perhaps an hereditary transmission, of the same abnormal phenomenon; and he suggested that thus permanent varieties might in course of time be formed, and constitute what some naturalists would call "distinct species." He adduced in support of this view, the case of a reversed monstrosity of the common garden snail (*Helix aspersa*), having been bred for many years in succession by the late M. d'Orbigny in his garden at Rochelle, as well as many instances of a reversed form of almond whelk (*Fusus antiquus*) having occurred in the same localities on the coasts of England and Portugal, such being the normal form in the crag.

On the British Teredines, or Ship-Worms.
By J. G. Jeffreys, *F.R.S.*

After observing that his researches had not been confined to the British Teredines, but that he had recently had an opportunity of meeting all the French naturalists who had published on the subject, as well as of studying all the accessible collections and books, he treated the matter first in a zoological point of view, and gave a short history of the genus *Teredo*, from the time of Aristotle and his pupil Theophrastus to the present time; especially noticing the elaborate monograph of Sellius, in 1733, on the Dutch ship-worm; the valuable paper of Sir Everard Home and his pupil Sir Benjamin Brodie, in 1806; and the physiological essays of Quatrefages, in 1840.

He showed that the *Teredo* undergoes a series of metamorphoses; the eggs being developed into a sub-larval form after their exclusion from the ovary, and remaining in the mantle of the parent for some time. In its second phase (or that of proper larvæ) the fry are furnished with a pair of close-fitting oval valves, resembling those of a *Cythere*, as well as with cilia, a large foot, and distinct eyes, by means of which it swims freely and with great rapidity, or creeps, and afterwards selects its fixed habitation. The larval state continues for upwards of 100 hours, and during that period the fry are capable of traversing long distances, and thus becoming spread over comparatively wide areas. The metamorphosis is not, however (as Quatrefages asserts), complete; because the young shell, when fully developed, retains the larval valves. He then discussed the different theories, as to the method by which the *Teredo* perforates wood, giving a preference to that of Sellius and Quatrefages, which may be termed the theory of "suction," aided by a constant maceration of the wood by water, which is introduced into the tube by the siphons. This process, according to Quatrefages, is effected by an organ which he calls the "*capuchon céphalique*," and which is provided with two pairs of muscles of extraordinary strength. Mr. Jeffreys was of opinion that the foot of the *Teredo* was the sole instrument of perforation. He instanced, in illustration of this theory, the cases of the common limpet, as well as of many bivalve mollusks, *Echinus lividus*, and numerous annelids, which excavate rocks to a greater or less depth; and he cited the adage of "Gutta cavat lapidem non vi sed sæpe cadendo," in opposition to the mechanical theory. The *Teredo* bores either in the direction of the grain or across it, according to the kind of wood and the nature of the species; the *Teredo Norvegica* usually taking the former course: every kind of wood is indiscriminately attacked by it. The *Teredines* constitute a peaceful, though not a social community; and they have never been known to work into the tunnel of any neighbour. If they approach too near to each other, and cannot find space enough in any direction to continue their operations, they enclose the valves or anterior part of the body in a case, consisting of one or more hemispherical layers of shelly matter. Sellius supposed that the *Teredo* ate up the wood which it excavated, and had no other food; and, labouring under the idea that it could no longer subsist after being thus voluntarily shut up, he considered it to be the pink of chivalry and honour, in preferring to commit suicide rather than infringe on its neighbour. In this enclosed state the valves often become so much altered in form, as well as in the relative proportion of their different parts, as not to be easily recognizable as belonging to the same species; and one species (*T. divaricata*) was constituted from specimens of *T. Norvegica* which had been so deformed. The food of the *Teredo* consists of minute animalcula, which are brought within the vortex of the inhalant siphon, and drawn into the stomach. The wood which has been excavated also undergoes a kind of digestion during its passage outwards through the long intestine. The animal has been proved by Laurent and other observers to be capable of renewing its shelly tube, and of repairing it in any part. It is stated by Quatrefages (and apparently with truth) that the sexes are separate, impregnation being effected in a similar mode to that which takes place among palm-trees and other dicœcious plants. There appear to be only five or six males in one hundred individuals. The *Teredo* perforates and inhabits sound wood only, but an allied genus (*Xylophaga*) has been recently found to attack the submarine telegraph cable between this country and Gibraltar at a depth of from sixty to seventy fathoms, and to have made its way through a thick wrapper of cordage into the gutta percha which covered the wire. The penetration was fortunately discovered in time, and was not deep enough to reach the wire. He gave several instances to show the rapidity of its perforating powers,—one of them having been supplied by Sir Leopold M'Clintock while he was serving with the author's brother in the North Pacific.

Mr. Jeffreys traced the geographical distribution of the *Teredines*, and showed that at least two species, which are now found living on our own shores, occurred in the post-pleistocene period; and he inferred from the circumstance of one of these species having been found in fossil *drift* wood, that conditions similar to the present existed during that epoch. Some species inhabit fixed wood, and may be termed littoral," while others are only found in floating wood, and appear to be "pelagic." Each geographical district has its own "littoral" species, and the old notion of he ship-worm (which Linnæus justly called "*Calamitas Navium*") having been

introduced into Europe from the Indies was contrary to fact as well as theory, because no "littoral" species belonging to tropical seas has ever been found living in the northern hemisphere, or *vice versâ*. It is true that some species have been occasionally imported into this and other countries in ships' bottoms, and that others occur in wood which has been wafted thither by the Gulf and other oceanic currents; but the former cases belong to littoral species, and never survive their removal, while the latter may be said to be almost cosmopolite. Every species of *Teredo* has its own peculiar tube, valves, and pair of "pallets," the latter serving the office of opercula, and by their means the animal is able at will to close completely the entrance or mouth of the tube, and thus prevent the intrusion of crustacean and annelidan foes. The length of the tube is, of course, equal to that of the animal, which is attached to it by strong muscles in the palletal ring, and varies in the different species from three inches, or even less, to as many feet. The internal entrance or throat of the tube is also distinguishable in each species by its peculiar transverse laminæ, and it has frequently a longitudinal siphonal ridge. Monstrosities occasionally occur in the valves and pallets; and in one instance the pallet-stalk is double, showing a partial redundancy of organs, as exemplified by the author with respect to the operculum of the common whelk. More than one species often inhabit the same piece of wood; and want of sufficient care by naturalists in extracting the valves with their proper tubes and pallets may account in a great measure for the confusion which exists in public and private collections, and which has thence found its way into systematic works. The *Teredines* have many natural enemies. In the South of Italy, and on the North African coast, they are esteemed as human food. In Great Britain and Ireland, four species occur in fixed wood, and eleven others in drift wood, the latter being occasional visitants. Of these, no less than six have never yet been described, and two others are now, for the first time, noticed as British. The number of recorded exotic species only amounts to six more, making a total of twenty-one; but it is probable that, when the subject has been more investigated, a considerable addition will be made to this number.

Mr. Jeffreys then explained the distribution of the littoral species on the shores of Great Britain and Ireland, and produced a synoptical list with descriptions of the new species. He believed all the *Teredines* were marine, except, possibly, Adanson's Senegal species, and one which had lately been found in the River Ganges, the water of which is fresh for about eighteen hours out of the twenty-four, and brackish during the rest of the day; but as a well-known exception of the same kind occurs in a genus of marine shells (*Arca*), and the transition from fresh to brackish, and thence to salt water, is very gradual, such exceptions should not be regarded with suspicion or surprise. He concluded this part of the subject by exhibiting some drawings and specimens, and acknowledging his obligations to Dr. Lukis and other scientific friends.

He afterwards treated the subject in an economical point of view, and remarked that, although the French Government had issued two commissions at different times, and the Dutch Government had lately published the report of another commission, which was appointed to inquire into the mode of preventing the ravages of the *Teredo* in the ships and harbours of those countries, our own Government had done nothing. He alluded to the numerous and various remedies which had been proposed, during the last two or three centuries from time to time, some of which were very absurd; but he was of opinion, from a study of the creature's habits, that the most effectual preventive would be a siliceous or mineral composition, like that which has been proposed by Prof. Ansted for coating the decomposing stones of our new Houses of Parliament, or simply a thick coat of tar or paint, continually applied, which would not only destroy any adult ship-worms then living in the wood, but prevent the ingress of the fry. The *Teredo* never commences perforation except in the larval state *.

A Committee of the Association was formed, at the suggestion of Mr. Jeffreys, to inquire and report as to the best mode of preventing the ravages of *Teredo* and other animals in our ships and harbours.

* See also Papers by Mr. Jeffreys on this subject in the 'Annals of Natural History' for August and October 1860.

Dr. LANKESTER called attention to the completion of the first part of Mr. Blackwall's work on British Spiders,—a copy of which he placed on the table. The work contains twelve coloured plates, and is one of the most complete monographs hitherto published of the class of animals to which it is devoted. It forms the Ray Society's volume for 1859.

On the Statistics of the Herring Fishery. By CHARLES W. PEACH.

On Cydippe. By JOHN PRICE, *Chester.*

I will only remind my fellow-naturalists that the *Cydippe* (which has been, like everything else, retarded by this cold season) was pretty abundant in the Mersey on the 16th of June, and may therefore be looked for confidently on the coast henceforward.

In order to enjoy the sight of this most enchanting Oceanid, I advise them—

1. To provide tall glass jars, or, *faute de mieux*, the largest size of "sample bottles," *quite* transparent, and with large mouths. The last can be taken to the shore in a frame like a cruet stand to hold several bottles, *corked during carriage.*

2. To catch the animals in some cup or ladle large enough to take up a *gill* of water with them, to prevent damage. Best of all, in a ¾ spherical ladle, with *tubular* handle.

In either case, plunge it in a *full inch* in *advance* of the *swimming* Cydippe, *to save the trains*, which *easily break.*

3. To keep them, when transferred to their permanent lodging-jar, glass or "*Aquarium*," as *cold* as possible; and *never* (except when examining them) in a *full* light.

4. To watch minutely for the *ova* (grey specks smaller than "Noctilucæ") floating near the surface; and ladle them out (say with a salt-spoon) as *most interesting* microscopic objects before and after hatching.

5. To microscope, with a *low power*, Cydippes containing *food*; easily known, as they are transparent. And if you get the *right kind* of prawn, they will capture and swallow *them*, but not *shrimps.*

6. If Beroes are to be had, and Cydippes are "as plenty as blackberries," remember that the *latter* are the natural food of the former, who will bolt as many as five, one after the other.

7. By *uniting* the two last hints, my curious friends may see, by virtue of the transparency of *both* animals, two digestions going on (*for a short time*) at once. The Cydippe digests the prawn, whilst the Beroe digests the Cydippe. Qu. *In*gestion?, *Di*gestion?, *In*digestion?.

8. To remember that a number of these creatures were kept in the "good old times" for 13 weeks, without plants, and only changing the water occasionally; that these perished after all by *mere accident*, and that it is the pleasing duty of the rising generation to keep them *all the year round* under the *improved régime.*

On the Aspergillum *or Watering-pot Mollusk.* *By* LOVELL REEVE, *F.L.S., F.G.S.*

The *Aspergillum* is a siphoned bivalve mollusk which ceases in an early stage of its existence to live free, and while yet no more than the eighth of an inch in length, sinks into the sand, or adheres to shell or stone, and directs its calcifying functions to the formation of a comparatively large tubular sheath. Upwards the sheath enlarges with the growth of the siphons for their special protection; downwards the animal closes in the sheath by a disc like the rose of a watering-pot, fissured and perforated and bordered by a frill of small tubes. The mantle of the animal, which has been observed once, and only once, on the shores of the Red Sea, enlarges on commencing its sheath growth, and a number of tentacles are emitted, each corresponding with a perforation or tube of the disc. Frequent distortion is imparted to the shell, more especially to the disc end of it, the seat of the mollusk, according to the circumstances of its place of habitation; and when adhering to shell or stone the disc may be scarcely recognizable. Shells with the strength of growth even of *Spondylus*, become distorted by their inability to contend against the outward press-

ure of foreign bodies. Shells, therefore, of the delicate and comparatively fragile growth of *Aspergillum* would be liable to extreme contortion. *Aspergillum vaginiferum*, inhabiting the shores of the Red Sea, sinks into the sand, as may be seen by the particles of sand and shell *débris* that become agglutinated to the sheath, to the depth of eight to twelve inches and more; the sheath is comparatively straight and symmetrical, and the protruding end becomes furbelowed. A season of rest ensues, another effort is made to extend the sheath, but the calcifying functions either have done their part, or are enfeebled. A little is added to the sheath, and the end is again furbelowed; and in some specimens the process has been as many as eight times repeated.

In adherent species, only one of which, *A. Strangei*, inhabiting the shores of N.E. Australia, has been discovered, the disc is very much pressed in. Two specimens only have been collected, one affixed to the inner cleft of a mussel hinge, and one attached to stone. The peculiarity of this form of *Aspergillum* is that the sheath is formed in a square, and being formed, not in sand, but free, is tortuous and enveloped by a slight periostracum.

Dr. Gray has stated his opinion in a recent memoir in the 'Proceedings of the Zoological Society,' that the sheath of *A. Strangei* is an enlargement of the primitive pair of valves, and that it differs in this respect from the rest of the *Aspergilla*. I incline to dissent from this opinion. Whether by a stretch of induction it be regarded as an enlargement of the primitive valves, or not, the relation between them I hold to be the same in the sand-inhabiting species, as in the adherent species. Dr. Gray also draws a distinction between species which have a wavy depression in the sheath around the circumference of the valves, regarding the wavy depression as a part of the valves, of which only the umbones are seen. My own view is that at the time of the metamorphosis of the mollusk, the valves are not larger in any species than are defined by the smaller outline. When it is considered that the valves are discarded at this time, but not entirely, inasmuch as they are appropriated as material for a nucleus from which to develope a sheath, it is only reasonable to suppose that the new sheath matter would, in some species, obtain a wavy deposit corresponding with the outline of the nucleus.

Remarks on the Geographical Distribution of recent Terrestrial Vertebrata. *By* P. L. Sclater, *M.A., Ph.D., Sec.Z.S.*

After enunciating the principles of the distribution of organic beings according to certain laws, independent of the influences of climate and other external conditions, and that of the "continuity" of generic areas, which might, as a general rule, be extended to all natural groups, small and large, the author proceeded to point out what appeared to be the most natural primary divisions of the earth's surface, as deducible from a careful study of the distribution of the terrestrial vertebrates. These were:—

1. The *Palæarctic Region*, embracing Europe, Asia north of the Himalayas, and a strip of Africa north of the Atlas.
2. The *Æthiopian Region*, embracing Africa inclusive of Madagascar, and Arabia.
3. The *Indian Region*, including Southern continental Asia, Sumatra, Borneo, Java, and other islands down to the Straits of Macassar.
4. The *Australian Region*, including New Guinea and adjoining islands, Australia, New Zealand, and Pacific Islands.
5. The *Nearctic Region*, including America down to the Southern limits of the Mexican Table-land.
6. The *Neotropical Region*, including the rest of the New World and the West India Islands.

These Regions were well characterized by their striking zoological peculiarities, as shown by the preponderance of certain types and the absence of others in each; and by the fact that many of the families, more of the genera, and nearly all the species found in each were as a general rule distinct, of which numerous examples were given. These greater divisions of the earth's surface or regions were subdivisible into lesser areas or provinces, characterized by being the abode of distinct species, which in many cases represented one another in their different localities.

An inquiry into the meaning of these laws of geographical distribution was then