*ter*, species of *Dentalium Noë*, and specimens of *Serpula*, also a large shark's tooth belonging to the genus *Carcharodon*.

During the autumn of 1885 I visited Zante in the Austrian Lloyd's steamer from Trieste to Athens. As the steamer only anchored for a few hours, I had time only for a walk to the top of the hill overlooking the town. A chain of hills trending nearly north and south forms the backbone of the Island of Zante. At the latitude of the town of Zante this chain is broken by a strip of alluvial plain about 2 miles wide, stretching from the eastern to the western coast of the island. The Castle hill is a mass of Pliocene marl, rising about 300 feet above this plain at its eastern edge. The steep side of the hill is channeled with innumerable ravines and gullies, and of the same colour as the Pliocene beds of Lattakia. In coming down the hill, I observed in one locality, within a radius of 30 feet, the following species:—

*Cerithium vulgatum*, Brug.
*Murex conglobatus*.
*Cardium edule*, L.
*Venus* (*Cytheræa*) *casina*, L.
*Ostrea*, sp.

All of these were more or less embedded, or had been worked out by the rain, and lay at the bottom or sides of the gullies.

London, June 23. GEORGE E. POST.

### The Perception of Colour.

I HAVE not yet heard it stated that our perception of colour is slower for the blue and violet rays than for the green, yellow, and red ones; and as I think that this subject has interest for many of your readers, they will perhaps carry out the following simple experiments on themselves and their friends.

A luminous object, such as a distant gas-lamp, an electric light, or the moon, is looked at through a direct-vision prism after it has been removed out of its case. The spectrum is of course a bad one, but brilliant. Now, if the prism is rolled backwards and forwards between the fingers, so that the spectrum oscillates through a small angle, it appears to bend like a riding-whip which is being flicked from side to side. The blue and violet parts of the spectrum always lag behind. In fact, as far as I could see, the spectrum, instead of being straight, seemed to be gently curved, but very sharply bent between the indigo and the violet part, which would show that the more refractive rays are seen by us very much later (even proportionately) than the others.

As everybody is not able to detect this bending of the spectrum, the following experiment should also be carried out. Instead of rolling the prism, it is passed between the eye and the object as quickly as possible, so that the spectrum is only seen for an instant; and it will be distinctly noticed that it seems to flash from the red end towards the violet—a sure sign that the red is seen first and the violet last. C. E. STROMEYER.

Strawberry Hill, July 5.

### Breeding for Intelligence in Animals.

SEEING the results that have been attained by breeding for special qualities in dogs, why should not systematic efforts be made to breed for general intelligence? The correspondents who have from time to time furnished you with illustrations of canine sagacity must be sufficiently numerous to form an Association to promote the interbreeding of intelligent dogs, and the distribution of their offspring to those who would foster and cultivate their intellect. H. RAYNER.

June 27.

### The Nephridia of *Lanice conchilega*.

SINCE my paper on the nephridia of *Lanice conchilega*, Malmgren, appeared in NATURE (June 16, p. 162), I have learned that the chief peculiarity to which I called attention in my description of the nephridial system had been observed and mentioned before. In the monograph on the Polycladen by Dr. Arnold Lang, published in 1884, and forming one of the series "Fauna und Flora des Golfes von Neapel," p. 677, occurs the sentence: "Bei *Lanice conchilega*, Pallas, hat neuerdings Ed. Meyer bei erwachsenen Thieren jederseits einen Längscanal aufgefunden, welcher alle Segmentalorgane mit einander verbindet, und nur an einer Stelle durch ein Dissepiment unterbrochen ist." Dr. Ed. Meyer has called my attention to this passage, and informed me that Dr. Lang received permission from him to make use of this and other observations which he (Dr. Meyer) had made in the course of his studies on Chætopoda. The sentence quoted has been also cited by Dr. R. S. Bergh in an article on "Die Excretionsorgane der Würmer," in *Kosmos*, 1885, Bd. ii. p. 115. That sentence is the only account yet published concerning Dr. Meyer's observations on the nephridia of the species in question. When my paper was printed I was unaware of the existence of the sentence in Dr. Lang's monograph, or of the reference to it made by Dr. Bergh. Unfortunately I had not had time to read the monograph through, and had not suspected that there was in it a mention of a novel fact concerning the anatomy of Chætopoda. My examination of *Lanice conchilega* was made in entire ignorance that Dr. Meyer had already investigated its anatomy; otherwise I should of course have mentioned his name in the summary I gave of previous work on the subject. J. T. CUNNINGHAM.

Edinburgh, June 30.

## *THE PARIETAL EYE IN FISHES.*

THE discovery of the parietal eye in lizards by de Graaf and Spencer is so recent that it is hardly necessary to preface an account of the structure of that organ in another group with the history of their researches.

Its high development in some lizards, and, so far as we know, its rudimentary nature in all other existing groups of vertebrates, including fishes and Amphibia, and lastly its entire absence in Amphioxus, are, for those who see in the latter the "Urvater" of the Chordata, points which made it difficult to form any satisfactory morphological conception of its origin.

True, something that admitted of comparison with it could be found in larval Ascidians; and Spencer, at the end of his able paper, endeavoured to trace its "rise and fall" from its supposed homologue, the larval Tunicate eye.

With Wiedersheim and Carrière, I consider that Spencer has placed the eye of the larval Tunicate at the wrong end of the series—if it should come in at *all*; for, as experience has abundantly shown, it is very easy to compare organs of the higher vertebrates with what are supposed to be homologous organs in Amphioxus and the Tunicata, and at the same time to be entirely in error. I need hardly refer the reader to the instances in which such comparisons have been shown by Dohrn in his famous "Studien" to have been entirely wrong; and holding with him that Amphioxus and the Tunicata are very degenerate vertebrates, and that from them but little can be got for the elucidation of the problems of vertebrate morphology, I felt the necessity of looking elsewhere for the solution of that of the parietal eye in its relations to the paired eyes.

With these problems in view I began to study the development of the pineal eye, and also its structure in such fishes as might be expected to retain it in a more developed condition than most of those we know.

At Prof. Wiedersheim's suggestion I examined the structure of the "pineal gland" in Ammocœtes of *Petromyzon planeri*, in the hope that something more might come out beyond that which the able work of Ahlborn has already made known to us. The result was, in a sense, disappointing, but not unexpected, for, remembering Dohrn's researches, and bearing in mind that the paired eyes of Petromyzon are rudimentary in Ammocœtes, first becoming capable of vision in the adult, I had firm hope of good results from the examination of sexually mature animals.

In the adult the discoveries made exceeded my expectations; and after examining this animal I proceeded to make sections through the brain of Myxine. Here, again, the finds were important, and the research was extended to specimens of *Bdellostoma* and *Petromyzon marinus*, which I owe to the generosity of my former teacher, Prof. Howes.

Before giving the detailed account of my investigations, I may say that neither the anatomical nor developmental studies so far made, give any direct clue to the origin of the organ.

That which seems to me the most likely hypothesis I shall give at the end of this paper, and in its favour I can at least say that it is a morphological explanation of the evolution of the parietal eye, which, so far as I know, is not inconsistent with any known facts.

The epiphysis in Ammocœtes has been described by Ahlborn (*Zeitsch. f. wiss. Zool.*, Bd. xxxix.). His description is mainly correct, and but little can be added to it. The epiphysis itself is divided into a dorsal and a ventral vesicle, and as we are not concerned here with the ventral one, I shall ignore its existence.

In large Ammocœtes the dorsal vesicle lies deep under the skin, and far removed from the light; its position being marked externally by a clear white spot just behind the opening of the nose.

It is a simple closed sac, and retains its attachment to the brain. The dorsal wall is thinner than the ventral, and is made up of a layer of flattened cells, which are not modified to form a lens.

The ventral wall is a much more complicated structure. Towards the inside of the vesicle it presents a layer of rod-like cells, which are more like the rods of a retina than like anything else. Externally (with regard to the vesicle) to this layer are two or three irregular rows of nuclei. There is no lens and no pigment, except a few very minute dots.

In this stage the retina of the parietal eye of Ammocœtes somewhat resembles that of *Cyclodus*, figured by Spencer, but is somewhat better developed, and tends towards the condition found in *Varanus giganteus*.

Except in the presence of the minute dots of pigment, and in the fact that the dorsal wall of the vesicle is not connected by fine strands with the ventral wall, as Ahlborn supposed, there is nothing new in this description, and even now we cannot say that the parietal eye of fully-grown Ammocœtes is very highly developed.

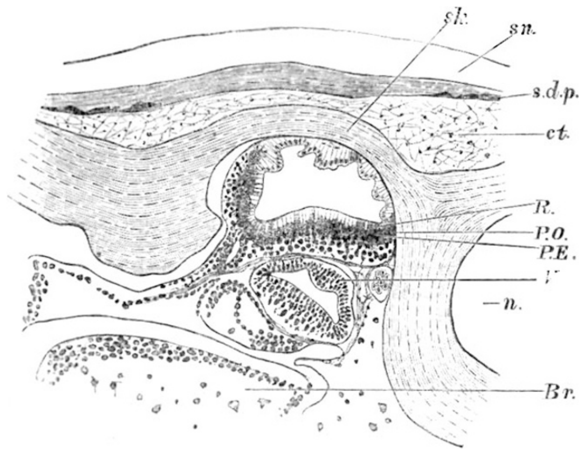
In the adult Petromyzon, just as the paired eyes are highly developed so also do we meet with an increased development of the parietal eye. As is well known since Wiedersheim's researches, the brain of the adult is much compressed in an antero-posterior direction. The dorsal vesicle of the pineal gland lies much further forwards, and more dorsally than in the larva, so that it comes to be nearer the external surface of the body, while it lies buried in the roof of the skull. Its posterior wall is densely pigmented, so much so that it is impossible by ordinary means to make anything out of the structure of the cells composing it. These points can be seen very plainly in longitudinal vertical sections through the brain and skull (see figure).

I ought to mention that the clear white patch of skin lying above the organ is much larger and more marked than in the Ammocœtes. It is, however, difficult to suppose that the white patch is here of much physiological importance, and it can only be referred back to a time when the eye in Petromyzon was of more use than at present. The anterior wall is composed of cells which are thrown into folds (possibly in part due to contraction) projecting into the cavity of the vesicle.

I mentioned above that in the full-grown Ammocœtes there are only a few minute dots of pigment present. So few and so small are these, that unless specially sought for they would be overlooked, as indeed they have been by previous observers. The state of things is much different in the young Ammocœtes of about 2 inches in length. There, as in the adult, the retina of the parietal eye contains a large deposit of pigment. This was first shown me by Dr. Schwarz (a pupil of Prof. Weismann's), who has made, for the study of the paired eyes, some very fine sections of very young Ammocœtes, at stages which I had failed to obtain. I shall figure these sections in the complete account I have in preparation. In the young Ammocœtes the parietal eye is large, and exceeds in size either of the paired eyes. Its posterior wall is really a well-developed retina, with long rod-like elements embedded in pigment, and a series of outer layers of spherical nucleated bodies. Its anterior wall consists of several layers of rounded cells, but it does not form a lens.

In the specimen of *Petromyzon marinus* mentioned before, owing to the soft state of the brain I could only make out a very deep fossa in the skull in the position in which the "eye" is situated in *P. planeri*. The white patch of skin is here very large indeed, and on the whole I am inclined to think that the parietal eye in *Petromyzon marinus* would well repay further investigation.

In Myxine the state of things is even more surprising. Here the parietal eye is a large flattened vesicle lying on the brain and connected with it by a very short solid stalk. There is externally no white patch of skin, but lying in the skin above the vesicle there is a flattened body, which, in structure and position, more nearly




Longitudinal vertical (sagittal) section through the parietal eye of an adult *Petromyzon planeri* [Zeiss C. oc. 2 cam.]. *br*, brain; *c.t.*, connective tissue; *n*, position of nose; P.E., pigment of the retina; P.O., parietal eye, i.e. dorsal vesicle of the epiphysis; R, retina; *s.d.p.*, subdermal pigment; *sk*, skull; *sn*, skin; V.V., ventral vesicle of pineal gland.

resembles the "Stirn-drüse" of Amphibians than anything else. This "Stirn-drüse," as is well known, is a rudimentary portion of the epiphysis, and hence of the parietal eye.

There is no lens and no pigment in Myxine. The anterior wall of the vesicle consists of a single layer of somewhat flattened cells.

The retina has essentially the structure of that of the parietal eye of Varanus, but it lacks the pigment which is there present (*vide* Spencer, "Pineal Eye in Lacertilia," *Q.J.M.S.*, vol. xxvii. Part 2, Plate XIV. Figs. 1 and 6).

Bdellostoma seems, in this, and, as was first shown by Johannes Müller, in other points in the structure of its brain, to resemble Myxine. Without discussing the matter at length, I may say that in the parietal eyes of Petromyzon and Myxine we have to deal with structures which are still well developed, and which were probably once much more developed than now. In this connexion the history of the changes in Ammocœtes is very interesting, and all the more so as confirming and extending Dohrn's opinion that the Cyclostomata have degenerated from highly developed fishes. The parietal eye in Ammocœtes, like many other of its organs, makes a good start, and only degenerates as the Ammocœte degenerates. When the Petromyzon state is reverted to, the parietal eye, like the animal in which it occurs, reverts towards an ancestral condition, and its doing so is an additional point in favour of Dohrn's opinion that the change to the adult Petromyzon is a sort of atavism.

Myxine, though in other respects more degenerate than the adult Petromyzon, retains the structure of the retina in a somewhat more specialized condition, one which most nearly recalls the highest parietal eye presented to us by the Lacertilia.

With regard to the development of the eye in lizards, the only point I will now mention is one which was to be expected to hold, viz. that the lens develops as a thickening of the anterior wall of the vesicle. I may add, however, that it shows signs of a tendency to involution.

And now, without discussing Spencer's speculations, I will briefly state my idea of the manner in which the parietal eye was evolved in connexion with the paired eyes.

From the start of my investigations I was fully convinced that the evolution of all three eyes must be viewed from one common starting-point. The fact that, as Wiedersheim states, even in man nerve-fibres have been traced from the optic thalami to the pineal gland, is sufficient evidence for this, even if we did not know that all three eyes arise in connexion with the same portion of the brain. The hypothesis is an extension of that given by Wiedersheim, Carrière, Dohrn, and others, to account for the evolution of the paired eyes.

The starting-point is a dorsal optic plate before the neural folds begin to form. This gives us a dorsal eye on the so-called invertebrate type. When the neural folds began to form so as to involute the brain and spinal cord, the optic plate was of course, being part of the brain, involved in the involution. With the progression of the latter it probably increased in size, and extended somewhat over the lateral margins of the neural folds.

When the neural folds closed and shut in that which forms the optic vesicles, part of the optic plate was left, forming the rudiment of the parietal eye. This, just as all known sense-organs tend to get involuted, got also secondarily involuted, and that but slowly, so that the outside wall of the involution had time to become a lens, an eye being thus formed on the invertebrate type. The parietal eye, being closely bound up with the paired eyes, got secondarily involuted with them; and, losing its primary mode of origin by delay in its development, it now appears as a secondary outgrowth of the brain, in which the lens is still formed from the outer wall. The lens, moreover, possibly retains traces of an involution.

Spencer has not attempted to grapple with the difficulty involved in the fact that the rods of the retina of the paired eyes are turned from the source of light, while in the parietal eye they are turned towards it.

The explanation given above is not in contradiction with this state of things; it, in fact, receives support from it.

In the complete paper I shall discuss the matter at length, and give ample illustrative figures.

J. BEARD.

Anatomisches Institut, Freiburg i/Br., June 21.

## THE JUBILEE ANTICYCLONE.

"QUEEN'S WEATHER" has long been a familiar expression descriptive of the most desired weather for all open-air celebrations and enjoyments; and perhaps no June of the last fifty years has presented us with so many days of such choice weather as the June of 1887. In the language of modern meteorology this is due to the fact that the prevailing type of weather has been anticyclonic. From the middle of June to the beginning of July, thus including the time of Her Majesty's Jubilee, a very pronounced and remarkable anticyclone overspread the British Islands, with its usual attendants of bright weather, strong sunshine and heat during the day, clear and cool nights, and capriciously-distributed rainfall.

Taking June as a whole, temperature was most in excess of the average in the west and north-west of Ireland and over Central Scotland from Inverness to the Solway; the excess at Glencarron, in Ross-shire, being 5°·0, at Laing and Braemar 4°·5, and in many places in Scotland and the west of Ireland about 4°·0. The exceptional character of these temperatures will appear from the fact that during the present century they have only been exceeded in the north-east of Scotland in the Junes of 1818, 1826, and 1846. On the other hand, over England, to the east of a line drawn from Berwick to the Isle of Wight, and to the north of a line from Stornoway to Wick, temperature does not appear to have exceeded the mean of June more than a degree: whilst at Somerleyton in Suffolk, and North Unst in Shetland, the temperature fell fully a degree below the average. These differences were due to the general position of the centre of the anticyclone being well to westward of the British Islands, so that the northern islands and the south-east of England were within the eastern margin of the anticyclone, and hence exposed to the northerly winds and lower temperatures peculiar to that section of an anticyclone, as was pointed out in NATURE ten years ago in reviewing the American Weather Maps. During this anticyclonic weather there were two distinct sources of high temperature, viz. that due to the strong sunshine which found its most decided expression in the high temperatures of Central Scotland; and that due to the warm descending air-currents of the anticyclone, which being most marked at great heights was most strongly expressed at the Ben Nevis Observatory. At this Observatory the means, for the ten days ended June 26, of the daily maxima were 61°·8, and of the minima 50°·3, thus giving a mean temperature of 56°·0, and 11°·5 for the daily range. Quite different was the temperature during these ten days at low levels inland. At Pinmore, for example, in the deep valley of the Stinchar, Ayrshire, the mean temperature was 63°·4, and the daily range 33°·3, or three times greater than on the top of Ben Nevis. On June 21 the contrast was very striking, the minimum on Ben Nevis being 43°·0, whereas at Pinmore it fell to 34°·3, on which morning, as reported by Mr. Donald, the observer, it was freezing at the river side. During the night the high temperature was kept up on Ben Nevis by the descending air-currents of the anticyclone, but the cold currents generated by the night radiation concentrated on and filled the steep narrow valley of the Stinchar.

The frequent occurrence of 40° 0 and upwards between the daily maximum and minimum, so frequently observed over the country, was primarily dependent on the clear dry atmosphere and the strong solar and terrestrial radiation consequent thereon. These great and sudden changes of temperature were on occasions largely increased by the shiftings of the position of the anticyclone, by which a particular locality was at one time on its west side, and therefore in enjoyment of the high temperature peculiar to that position, but a few hours thereafter was within its eastern side and its low temperature.

So far as records have reached us, the rainfall was nowhere above its average, being, however, at or close to the average at Glenquoich and Glencarron, where it was respectively 5·53 and 4·19 inches. On Ben Nevis 7·51 inches fell, being only 0·66 inch less than the average. At Oxford, the deficiency from the monthly mean was only 15 per cent., and at Somerleyton 23 per cent. Generally, however, the deficiency was exceptionally great and widespread, being in nearly all parts of the British Islands from 50 to 95 per cent. less than the June average of the