follicles as a matter of course, and pass along the canal leading from it to a primary branch of the ovarian tube, and there two and sometimes three of these eggs *fuse into one mass*, around which a shell is secreted, and which thus forms the actual egg—really a threefold egg; and from such a wonderfully formed egg only one embryo develops. Unfortunately we are not told what becomes of the germinal vesicles; according to the drawings they seem to disappear at this stage. We know of the development in the tunicate *Pyrosoma* of five embryos from one egg, here we have the converse case of one embryo developing from three eggs. Siebold appears to have convinced himself that the fusion is a normal thing, and not due to any pressure or osmotic action taking place during the microscopical examination. The structure of the ovary of Apus is figured in a plate.

As to the other crustaceans named, which are *Artemia salina* and *Limnadia Hermanni*, the occurrence of parthenogenetic broods is inferred from the descriptions of other writers whose works are criticised at some length, and also from examination of specimens. It seems not impossible from an observation of Zenker that in *Artemia salina* parthenogenetic alternate with digenetic broods. In the beginning of the year 1851 this observer found three males among one hundred females, later in July the same pond furnished thousands of females, but not one male.

In conclusion, Prof. Siebold, whilst adopting Leuckart's term "Arrenotoky," to designate the phenomenon of the parthenogenetic production of male offspring, as seen in the Hymenoptera, proposes the parallel term, "Thelytoky," for the parthenogenetic production of female offspring as demonstrated now conclusively in some Lepidoptera and Crustacea. It seems to us that a third term should also be available for the case of mixed offspring (that is of two sexes) such as "Amphotoky;" and the terms need not be limited to parthenogenetic cases. In his concluding remarks, whilst repeating the expression of his conviction that parthenogenesis will be found more and more to be of frequent and fixed occurrence in various classes of animals, Siebold alludes with caution to the list of cases in which parthenogenesis is stated to occur, given by Gerstaecker in Bronn's "Classen und Ordnungen des Thierreichs." Gerstaecker rightly enough distinguishes cases in which parthenogenesis has been observed as an accidental and rare exception, and those in which it has a definitely recurring place. Siebold considers (and after the great pains he has himself expended on the cases recorded in this book, he is fully warranted in so doing) that many of the examples put forward by Gerstaecker require a more careful testing, and he offers some remarks on parthenogenesis in the gall-flies, and in the silkworm moth. Finally, he alludes to cases among Vertebrates in which indications of a power of development in the egg, independent of the male element, have been observed. The most remarkable of these is that quoted by Leuckart in his work already cited, which Siebold omits here, but has done justice to in the short supplementary paper read at the Munich Academy since the publication of this book. In 1844 Prof. Bischoff found ova in the uterus of an unimpregnated sow, which exhibited segmentation of the yelk, some into two and four, and others into sixteen and twenty divisions. Other cases here given are as follows:—In the oviduct of a three-year-old rabbit, thoroughly separated pathologically from the uterus, Prof. v. Hensen of Kiel found ova in various stages of yelk-division, and some of their cells had even advanced into a branched condition. Dr. Oellacher of Innsbruck has observed stages of yelk-division in unfertilised hen's eggs. In fishes, in 1859, Agassiz observed yelk-division occurring in the eggs of Gadidæ, whilst yet in the ovary, and considered it to be due to impregnation, even stating that he had seen certain fishes place themselves in such a position as to favour this supposed intra-ovarian fertilisation. Burnett has since investigated the case, and concludes that the yelk-division is independent of fertilisation, a supposition which is rendered in every way probable from other researches on the fish egg; but, curiously enough, Dr. Burnett thinks these eggs should be regarded as "germs," and not as "true eggs," an opinion to which Siebold, of course, is completely opposed, and which, in invertebrate cases, has been shown to be untenable.

Siebold does not allude to those cases of ovarian cysts found occasionally in the unfertilised human female, and containing hair and teeth—a phenomenon which we should be glad to see further discussed and investigated, since, as far as we can remember, the origin of the contents of such cysts from irregularly developing ova is probable. The eel is suggested as a possible parthenogenetic vertebrate. It is a very strange fact that we are still ignorant of the ripe eggs and embryos as well as of the males of the eel, even as in the time of Aristotle. With the following words of that greatest naturalist, addressing them to those who still refuse to accept the existence of Parthenogenesis, Siebold ends his book:—"More belief must be given to observation than to theory, and this last is only worthy of belief when leading to the same result as experience."

E. RAY LANKESTER

ON SOME NEW POINTS IN THE MOUNTING OF ASTRONOMICAL TELESCOPES *

THE very great inconvenience attendant upon the use of the ordinary position circle of a micrometer divided on a metallic limb, and the necessity of having small lamps hung on to the micrometer for producing that very useful character of illumination of the wires known as the "dark field," has induced me to introduce some modifications in this (to the observer at least) very important part of an equatorial instrument.

These modifications have already been applied with success, and for the first time (as far as I am aware) to a 7-inch refracting telescope now in course of erection at the Observatory of the Royal Artillery Institute, Woolwich; and I have (in consequence of this success) been ordered to adapt them to the Great Equatorials now in course of construction for the Royal Observatory, Edinburgh, and the Observatory of the Lord Lindsay, Aberdeen.†

The rack and pinion tube carrying the eye piece or micrometer revolves freely in the casting which forms the lower end of the telescope tube, and carries a brass plate (all cast in one piece), on which is cemented a flat ring of plate glass, muffed on back, and in front varnished with an opaque varnish. Through this varnish the divisions are cut, so that on being illuminated from behind, the divisions appear bright upon a black ground. The vernier is similarly treated, and the whole of this circle, being covered with a cap, with a glazed window only sufficiently large to expose the vernier and about 15° of the circle, is protected from possible injury and is read most conveniently through this window, being illuminated by a beam of light constantly directed upon it from a lamp hanging on end of the declination axis, as will be afterwards explained.

Between the fixed casting which forms the end of the telescope tube and that which revolves in it is another metallic circle cut into 360 teeth on edge, and with 90 holes drilled accurately on face: into the teeth on edge is geared a screw which is mounted on fixed casting, one revolution of which is of course equal to an angular movement of 1°.

In the other (outer) moveable brass circle is mounted a steel pin working up and down in a small cylinder; this pin, being pressed down by a small spiral spring, enters into one or other of the 90 holes in the intermediate circle, and thus clamps the whole eye-end to the intermediate circle, in which condition a slow motion is obtained by the endless screw. When it is desired to move the eye-end through a large angle, the rack and pinion tube is grasped by the hand, and in doing so the hand almost necessarily grasps also a small steel trigger which lifts the steel pin out of the hole, frees the moveable circle, and allows it to be placed in any angular position. When the desired position is approximated, and the trigger relieved, the pin drops into the nearest hole, and the endless screw is then used for final setting.

The diagram will I think explain the various matters of illumination.‡

From a lamp hanging upon the end of the declination axis is sent a beam of slightly divergent light through this axis, which is hollow; this slightly divergent beam is utilised for six different purposes, three portions of it being reflected out in different directions to illuminate portions of the declination circle, of which one is for a long reader for setting from eye-end, and the other two for micrometer microscopes subdividing the 10' division of circle into single 1" arc.

None of these are shown in diagram, but the other three purposes for which the light is utilised, viz., for position circle,

* Paper read before the British Association at Brighton in Section A, Aug. 20, by Howard Grubb, C.E., F.R.A.S.

† The breech-piece and position circle of the Woolwich Equatorial were here produced.

‡ The original diagram showed all three illuminations, and of different colours. Here it has been thought better to show the dark field by itself, and the bright field and position circle illuminations in a separate diagram.

bright field illumination, and dark field illumination of micrometer, are shown.

The position circle illumination is very simple (see Fig. 1), a single reflector R, attached to the inside of the tube directs a constant beam of light on the back of the glass circle at P.

The bright field illumination is effected by a very small central reflector, R′, which sends the light directly into the field of the micrometer.

This method is, I believe, now generally considered to give the best results, and has, as far as I am aware, but one disadvantage, viz., that the arm which supports the small mirror produces a little diffraction, and consequently deterioration of definition.

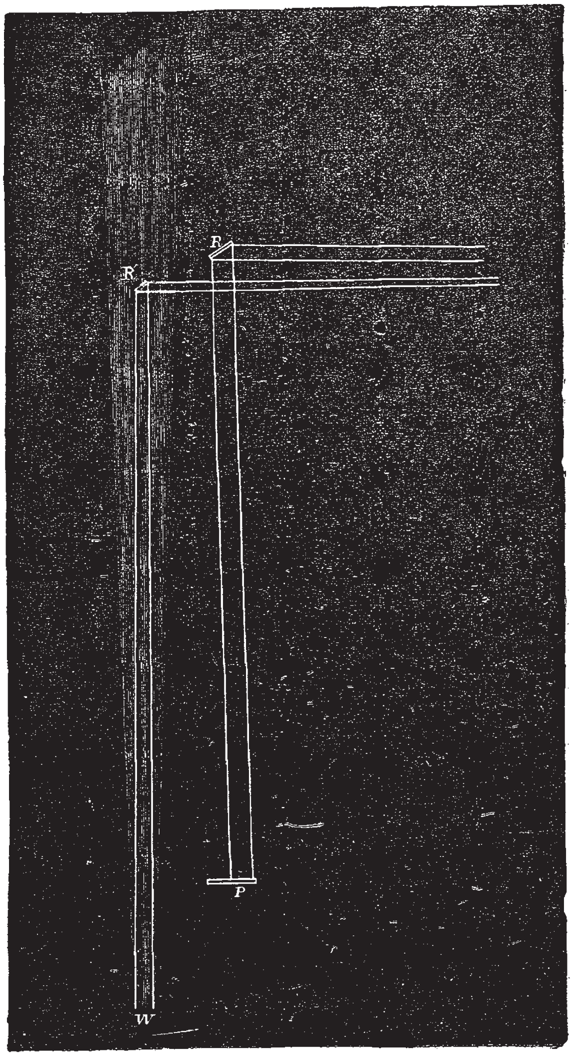

FIG. 1

This objection I have in some measure reduced by making the arm and mirror removeable at pleasure by pulling or releasing a string, so that while actually observing, it can be removed and replaced instantaneously.

In devising the dark field illumination, I started on the hypothesis that there were two essential points to keep in view, viz., that the lines should be illuminated on both sides (not one), and that the angle at which the light should be thrown upon the wires should be very great, so that the blackness of the field as seen through the eye-piece should not be injured.

I found that the best result is obtained by placing four prisms of total reflection round the field of the micrometer, just behind the wires, and of such an angle that the light thrown upon them should be reflected upon the wires at an angle such as is shown in the diagram Fig. 2, where W is the position of the wires in the focus of the objective.

In order that this scheme of illumination should be carried out effectually from the light of a single lamp hanging on the declination axis, it is necessary that a certain annular portion of the micrometer which embraces these prisms should be constantly illuminated from this lamp, and this is effected in the following way: a portion of the slightly divergent beam of light, shown in Fig. 2, proceeding from the lamp on the declination axis, is passed through a very low power convex lens, *l*, which renders the beam slightly convergent.

This is not necessary, but a mere matter of convenience, as it reduces the necessary size of the reflector and lens afterwards required.

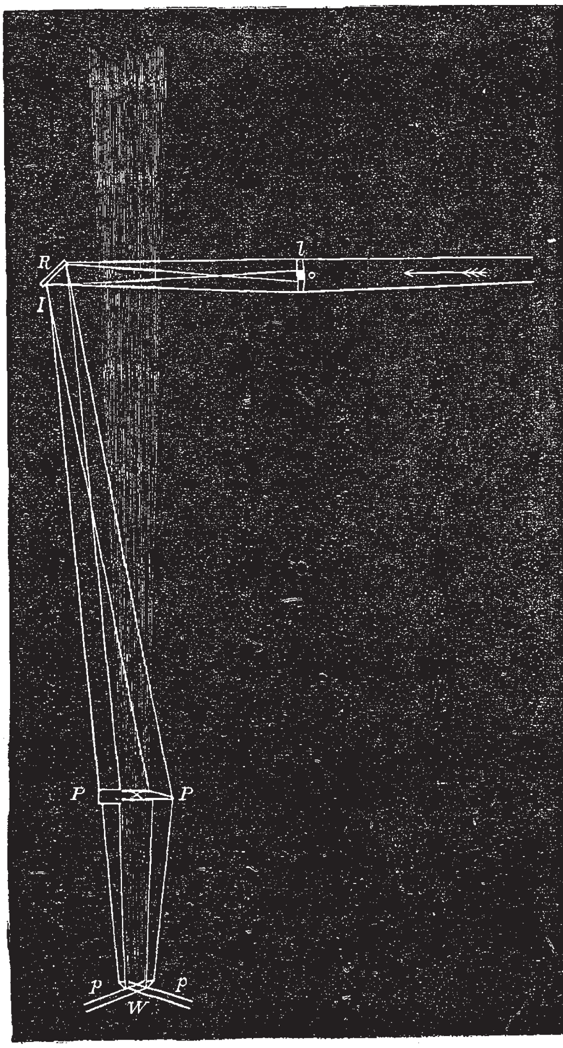

FIG. 2

The light is now taken up by a reflector, R, within the tube, and directed towards the eye-end at such an angle that it crosses the axis of the telescope just at the inner end of the eye-piece tubes, X; hence it is passed through a piece of glass of a peculiar shape, P P, which I call, for want of a better name, an annular prism lens. This piece of glass has a hole cut in it large enough to admit the whole pencil of light from the object glass.

The use of this annular prism lens is twofold:—

1st. It has to alter the direction of the beam of light before diagonally thrown across the tube, RX, to that parallel to the axis of the telescope; and

2nd. It is necessary that it should have a slightly converging effect to reduce the size of the illuminated circle it produces.

This arrangement so far performs perfectly in all but one particular. It throws a strong beam of light constantly upon the four prisms $p\,p$, and illuminates the lines well; but although no direct light can enter into the field from the mirror placed so far out of the cone of rays from the objective, still the light thrown against the side of the eye-piece tube is sufficient to completely destroy the effect of this illumination. The difficulty, however, has been completely removed in this way :—

I should first mention that the eye-piece or micrometer tube is made double, an outer parallel tube and an inner taper one, and it is between these two that it is required that the light should be brought to the four prisms or micrometers, any light shining into the inner tube doing mischief by injuring the blackness of the field.

On the lens used to give a slight convergence to the light is placed a circular opaque disc, O, of a certain size easily ascertained. A lens, I, of a suitable focus being then placed near the reflector, an image is formed of that opaque disc just over the eye-piece tube at X, and of such a size, when properly adjusted, that no light can possibly enter the inner tube.

Thus, while not a single ray of light can by any possibility enter the inner tube, a flood of light is sent down between the inner and outer tubes, and directed upon the four prisms in whatever angular position they may be.

It only remains to say that both the intensity and colour of the light for both characters of the illumination are under complete control of the observer while actually observing.

One other matter is perhaps worthy of note.

The want of a convenient method of mapping nebulæ or faint stars by a reticulated diaphragm of bright lines in the field of view has long been felt, and the various methods of using diamond scratches on glass or illuminated lines are subject to objection, and troublesome to manage. A simple method of using an image of such a diaphragm instead of the actual diaphragm itself here suggests itself.

Referring to the portion of the rays used for bright field illumination, and shown in Fig. 1, suppose the small diagonal mirror, R′, to be replaced by an equally small prism having such a convex power that it forms an image of any object at the end of the declination axis exactly in the same plane as the image formed by the objective—then any kind of reticulated diaphragm of bright lines on dark ground can be placed on the end of the declination axis which would have a suitably prepared carrier for them, and their image would be seen in the field of the telescope of any colour and any intensity desired.

SCIENTIFIC SERIALS

THE *Scottish Naturalist* for July is rich in articles of interest, mostly brief, and chiefly relating to Entomology and Ornithology. Many deserve notice, but we have been especially interested in one on the nest of *Formica rufa* and its inhabitants by the editor, Dr. Buchanan White.

IN the *Journal of Botany* for August, Dr. Trimen describes and draws the genuine *Ranunculus chærophyllos* Linn. which has been detected in Jersey, but was not heretofore known as a native of Britain. Dr. Hance describes a new species of Iris, *I. tomiolopha*. The Rev. J. M. Crombie contributes some notes on the Lichens in Sowerby's Herbarium.—In the September number, Dr. Hance describes another new species belonging to the Bignoniaceæ, *Spathodea cauda-felina*. Mr. T. R. A. Briggs contributes Notes respecting some Plymouth plants, and Dr. A. Ernst Notes on a small collection of Alpine plants from the summit of Naiguta in the mountains of Caracas.—The first article in the October number is Mr. Hayne's paper, read at the Brighton meeting of the British Association on the Flora of Moab. Mr. J. G. Baker, who has paid great attention to the Liliaceæ, has a monograph of the two genera *Dasylirion* and *Beaucarnea*. Another British Association paper, Mr. Hemsley's Summary Analysis of the Phanerogamic and Fern Flora of Sussex, is reprinted. The Rev. E. O'Meara contributes a continuation of his recent researches in the Diatomaceæ; and the Rev. J. M. Crombie, a description of a new erratic British *Parmelia*. Mr. Leo Grindon forwards a suggestive paper on the non-occurrence near Manchester of certain common British plants.

THE last part of the *Proceedings of the Swedish Academy of Sciences* for 1871 (Öfversigt af Kongl. Veterskaps-Akademiens Förhandlingar, Arg. 28, No. 7), opens with a notice by Prof. Lilljeborg of the occurrence of a South European species of Bleak (*Leucaspius delineatus*, Heckel) at Landskrona in Scania.—The same author has also a notice of the occurrence of *Limnadia gigas* (Hermann) in Sweden, which will prove of considerable interest to the student of Crustacea, as in it he gives a very detailed description, illustrated with good figures, of the structure of this curious species, and also gives a list of the other species of Phyllopoda, six in number, which inhabit Scandinavia. Prof. Lilljeborg is inclined to identify this species with the *Monoculus lenticularis* of Linnæus.—Prof. Nordenskiöld publishes a short paper, containing a table, on the fixed and variable atomic volumes of simple bodies.—The Swedish expedition to Greenland of the year 1870 originates two papers, namely, a valuable essay on the Phanerogamic flora of Disco Bay and Auleitsivik Fjord by Prof. S. Berggren; and a series of calculations of geographical positions worked out by M. E. Jäderin.—M. L. K. Daa discusses the origin and meaning of the name of Grumant applied by the Russians to Spitzbergen, and cited as an evidence of the independent discovery of that inhospitable land by the Russians; M. Daa states that Spitzbergen was named East Greenland by its earliest English and Dutch visitants, and he maintains that "Grumant" is merely a corruption of "Grönland."—Mr. H. D. J. Wallengren publishes a Contribution to the knowledge of the Lepidopterous fauna of the island of St. Bartholomew in the West Indies. He gives a list of 34 species belonging to various families from the Rhopalocera to the Crambidæ, with remarks on their characters and distribution. Three species are described as new, namely, *Graphiphora bartholemica*, *Micra Stålii*, and *Palthis Walkeri*.—M. L. J. Igelström notices the discovery of sandstone *in situ* in the Gefleborg district.

SOCIETIES AND ACADEMIES

PHILADELPHIA

Academy of Natural Sciences, April 9.—Prof. Leidy directed attention to some fossils upon which he made the following observations :—Several teeth and jaw fragments from the Loup Fork of the Niobrara River, Nebraska, obtained by Prof. Hayden, appear to indicate a large species of Felis, not previously described. The most characteristic specimen consists of an upper sectorial molar about as large as that of the Bengal tiger, and consequently much too large for either of the largest American cats, the panther and the jaguar. It is as much too small to have pertained to the American lion, *Felis atrox*, for its breadth is but slightly greater than that contained in the lower jaw, from which the latter was described. Breadth of the crown of the tooth is $15\frac{1}{2}$ lines; its thickness in front 8 lines. The measurements in the corresponding teeth of a Bengal tiger are, 16 lines in breadth, and $7\frac{1}{2}$ lines in thickness in front. The form of the fossil tooth is the same as in the other feline species. The extinct species may be named *Felis augustus*. A distal extremity of a humerus, from the Niobrara River, about the size and construction of the corresponding part in the Bengal tiger, may belong to this species. Another fossil, consisting of a detached body of a vertebra, apparently indicates an extinct reptile allied to *Plesiosaurus* and *Discosaurus*. The specimen, recently received from Prof. Hayden, was obtained in 1870, on Henry's Fork of Green River, Wyoming. It is free from attached matrix, and was the only specimen pertaining to the animal which was found. It probably belonged to a formation of earlier date than that of the same locality, which has yielded other fossils previously described. The vertebra is from the base of the tail, and is much shorter in relation to its other dimensions than in *Plesiosaurus* or *Discosaurus*. The extremities are concave, and encircled near the margin of the articular surfaces with a narrow groove. Posteriorly there are two larger articular facets, as widely separated as the bone would permit, for the junction of a chevron. Anteriorly there are no marks of chevron attachment. The roots of strong transverse processes or diapophyses project from the sides of the body just above the middle. The neural arch was completely co-ossified with the body, leaving no trace of its earlier separation. The breadth of the body is 23 lines, its depth 19 lines, and its length 1 inch. Viewing the specimen as probably representing a genus different from those mentioned, I propose to name it with the species as *Oligosimus grandævus*. Another fossil is a remarkable specimen, obtained by Prof. Hayden in the "Black Foot Country" at the head of the Missouri River. It looks as if it had formed part of the dermal armour of some huge saurian or perhaps of an armadillo-like animal. It is imperfect, and looks as if it were half broken away. In its present state it is hemiovoid, about two inches in diameter, concave below and convex above, where it is