with the solution of the pure crystallised salt. Recrystallisation of the whole is attended with a considerable loss. The crystals are quite permanent, however, when stored in dry bottles with well-fitting stoppers.

NOTES from the Marine Biological Station, Plymouth.—Last week's captures include the Anthozoan *Gephyra Dohrnii*, the Æolid *Amphorina cærulea*, the Cirrhipede *Scalpellum vulgare*, and the Brachyura *Ebalia tumefacta* and *Achæus Cranchii*. The floating fauna continues to be rich in trochophore larvæ of various types, as recently recorded; the larva of *Polygordius* was last week taken in addition. Among Protozoa, *Noctiluca* has become more plentiful; but the week has been especially marked by the presence of Radiolaria of several species in numbers altogether unprecedented in our experience. Other signs of an Atlantic element in the floating fauna of late are furnished by the continued abundance of the Siphonophore *Muggiæa atlantica*, both colonies, eudoxomes and larvæ, and by the capture of two specimens, sexually mature, of *Doliolum Tritonis*. The Hydroids *Aglaophenia pluma* and *myriophyllum* and the Nudibranch *Æolidiella Alderi* are now breeding.

THE additions to the Zoological Society's Gardens during the past week include a Mona Monkey (*Cercopithecus mona*) from West Africa, presented by the Misses Price; a Yellow-cheeked Lemur (*Lemur xanthromystax*) from Madagascar, presented by Miss Annie Gervers; a Bonnet Monkey (*Macacus sinicus*) from India, presented by Mr. J. W. Harris; a Short-toed Eagle (*Circaëtus gallicus*) from Morocco, and six Little Bitterns (*Ardetta minuta*) from Europe, presented by Lord Lilford; a Black-headed Gull (*Larus ridibundus*) from Brit. Isles, presented by Mrs. H. S. Wardrop; an Indian Kite (*Milvus govinda*) from Eastern Asia, presented by Mr. A. Savory; four Tortoises (——) from Formosa, presented by Mr. P. Aug. Holst; a Golden Cat (*Felis moormensis*) from Sumatra, a Slender-billed Cockatoo (*Licmetis tenuirostris*) from South Australia, and six Avocets (*Recurvirostra avocetta*) from Holland, deposited; six Avocets (*Recurvirostra avocetta*) from Holland, a Common Tern (*Sterna hirundo*) from Holland, a Japanese Ape (*Macacus speciosus*) from Japan, and a —— Hawk Eagle (*Spizaëtus* ——) from India, purchased.

OUR ASTRONOMICAL COLUMN.

THE CORDOBA DURCHMUSTERUNG.—Mr. John Thome, the Director of the National Argentine Observatory, is to be congratulated upon the publication of the Cordoba Durchmusterung Catalogue, containing the brightness and position of every fixed star down to the tenth magnitude comprised in the belt of the heavens between 22° and 32° of south declination. The results are a continuation of the Durchmusterungs of Argelander and Schönfeldt from their southern limit. In the present volume 179,800 stars are catalogued, but altogether the places of 340,380 stars have been determined down to − 42°. The observations for this great catalogue were begun in 1885 and ended early in 1891. They reach the enormous number of 1,108,600, and were made entirely by Mr. Thome and Mr. R. H. Tucker. The area over which the observations have extended is 6075 degrees of a great circle, hence the mean density of stars is 56·2 stars per square degree. The corresponding mean density for Argelander is 15·2, and for Schönfeldt 18·5. The density varies considerably, however, in different parts of the sky, and ranges from 70 to 160 stars per square degree in the Milky Way. Mr. Thome says that a series of twelve maps, each embracing two hours of right ascension and twenty degrees in declination, has been constructed upon the scale adopted by Argelander, and will be issued during next year with the second volume of the catalogue, containing stars within the belt from 32° to 42° south declination. The construction of these maps, and the preparation of a catalogue like that of which the first part has just reached us, involves an enormous amount of labour. Indeed, it is difficult to understand how, amidst the vicissitudes to which an observatory in the Argentine Republic must be subject, and with such a meagre staff as that under Mr. Thome's direction, it has been possible to do so much excellent work.

THE RORDAME-QUÉNISSET COMET.—On July 11 the Rordame-Quénisset comet (*b* 1893) was photographed at Goodsell Observatory, and a fine photogravure reproduction of one of the views forms the frontispiece to the August number of *Astronomy and Astro-Physics*. In a letter that appears in the same journal, Prof. J. E. Keeler describes the spectroscopic observations of the comet made at Alleghany Observatory. On July 10 the three usual carbon bands were seen, connected by a narrow continuous spectrum from the nucleus. Each band appeared to terminate sharply on its less refrangible side, where also the brightness was greatest. No direct comparison of spectra could then be made, so the positions of the bands were estimated. A photograph of the comet spectrum in juxtaposition with the solar spectrum obtained from the moon was procured on July 19. Upon the photograph could be seen a hazy band at λ 472 and another terminated by a line on the less refrangible side at λ 388, and fading away towards the more refrangible end of the spectrum. Between these two bands others were suspected, but could not be made out with sufficient accuracy for a determination of wave-length. A comparison of the spectrum of the comet with that of a spirit lamp on July 20 showed that the bands were coincident in the two spectra. The brightest comet band—that in the green—appeared to have a second maximum coincident with the second maximum of the corresponding carbon fluting

A SIMPLE EQUATORIAL MOUNTING.—M. J. Jarson describes in *L'Astronomie* for August a simple, if not new, means by which small telescopes can be moved equatorially, thus permitting an observer to keep objects in the field of view without constantly moving the telescope in altitude and azimuth. Applying this method, for instance, to a small telescope mounted on a small vertical tube, tripod fashion, such as those generally used at seaside resorts, the following account may show the simplicity of the arrangement. On the stand of the telescope a bar of wood or of iron is fixed horizontally, in which is a hole sufficiently large to pass a cord. The position of the hole is determined by the rule that the line joining the centre of motion of the telescope in declination to this hole makes an angle with the horizontal bar equal to the latitude of the place of observation. By connecting the object-glass end of the telescope to this hole, by means of a chain or cord, any celestial object can be followed in the heavens by simply keeping the cord tight and moving the telescope. A weight fastened to the eye end secures the tightness of the cord. The telescope will then describe an arc of a circle in the heavens, and not a straight line as formerly. For different objects it is obvious that one must vary the length of the cord; but for making prolonged studies of any particular one possessors of small instruments will find this a most useful arrangement.

A REMARKABLE SOURCE OF ERROR.—Dr. E. Von Rebeur-Paschwitz, in No. 3177 of the *Astronomische Nachrichten*, publishes some interesting curves traced by a horizontal pendulum during the prevalence of certain slight earth tremors occurring on different occasions and at different places. Traced photographically on sensitive plates moving with a velocity of twenty-four inches per minute, these tremors show a striking similarity to those observed by Prof. Milne in Japan. It appears that the surface of the earth is occasionally subjected to wave motions analogous to those disturbing a sheet of water, and often persisting with great regularity for several hours. Their connection with steep barometric gradients is probable, although that does not appear to be the only condition. In any case, the tremors appear in the presence of strong winds, at least in the neighbouring country, and they travel with at least the velocity of 2 km. per second. The influence of these tremors upon observations of polar distances, and upon spectro-photographic work, is sufficiently obvious to render it desirable that all observatories should be fitted with automatic instruments for registering these disturbances, and arrangements should be made for their study and comparison.

THE APEX OF THE SUN'S WAY.—In a letter to the editor of the *Bulletin Astronomique*, Prof. H. G. van de Sande Bakhuyzen says that he has determined the apex of the movement of our system from all Bradley's stars of which the distances from the pole of the Milky Way are less than 50°. In

the calculation, he made use of the method employed by L. Struve in his memoir on the determination of the movement of the solar system, in order that the two results might be strictly comparable. Prof. Bakhuyzen has also repeated the calculations, using stars in the same part of the heavens as the above, but with proper motions not exceeding 0″·075. The first method gave, as the position of the apex,

R.A. = 264°, Decl. = 30°.

The result obtained by the second calculation was—

R.A. = 290°, Decl. = 24°.

The position found by L. Struve was—

R.A. = 273°·3, Decl. = 27°·3.

Prof. Bakhuyzen is at present occupied in determining the apex from stars of small proper motion in the Milky Way.

THE ORIGIN OF NEW STARS.—In the current number of *Die Natur* Prof. G. Hoffmann surveys the various new stars discovered since Tycho Brahe's Nova Cassiopeiæ, and the different theories advanced to account for their appearance. He is inclined to endorse the views of Prof. Seeliger, according to which the sudden brightness is produced by a heavenly body entering a "cosmic cloud" consisting of sparsely distributed matter. Prof. Hoffmann thinks that all new stars may be regarded as essentially of the same type as the variables of long period.

THE MINUTE STRUCTURE OF PLANT HYBRIDS.[1]

DR. MACFARLANE'S paper will not fail to impress biologists by the suggestiveness of some of his speculations and with the importance of his observations. Nor are his conclusions limited to the plant hybrids, which he discusses, but they apply, though with certain limitations, to all organisms resulting from sexual reproduction.

Of course, in the case of hybrids, the parental characters are often very different, and can therefore be easily recognised in the offspring, whence the examination of their characters, including, of course, their minute anatomy, becomes important to all who are interested in the problems of reproduction. For in the case of fusion of reproductive cells of the same species, where the parental characters differ often very slightly, it is difficult, and at times impossible, to distinguish whether the characteristics of the male or female parent predominate, or whether a complete blending has taken place. Theoretically perhaps we should expect this blending of characters, but our everyday experience brings to our mind so many instances of almost unadulterated inheritance of paternal or maternal characteristics, that we are somewhat prejudiced against a conclusion to which Dr. Macfarlane's observations on hybrids lead him, and which ought equally to apply to normal offspring.

The study no doubt presents many difficulties, which are, it is true, recognised by the author, but do not seem to him insuperable. First and foremost we have the variability of what are usually termed true species; and the author is careful to point out that "for hybrid investigation one should be acquainted with the parent individuals and the conditions under which they were grown, or try to choose an average specimen for study." But in either case errors may creep in. For if one of the parents has varied abnormally, though some of the offspring will inherit such a variation, others may revert to the more normal condition of their grandparents or great-grandparents. If, on the other hand, we choose the average specimen, we are entirely in the dark as to any special variation of the parental form. Nothing short of selecting normal individuals as parents and examining all or a large number of the hybrid offspring would afford sufficient basis for such conclusions, as the author deduces from his less complete observations. But Dr. Macfarlane does not even state in each case whether his observations are taken from the parents themselves, or only from average specimens.

The conditions of growth, too, enormously affect some of the characters which the author has chosen for comparison. The character of leaves for instance, especially as regards their transpiratory functions, can be completely altered by the treatment of the young plant. If, therefore, the number of stomata per unit of surface are to be of any value for comparison of forms, both the parents and the offspring must be raised under similar conditions. If this is not the case we should expect the offspring to resemble in this particular that parent which was grown under conditions most similar to itself. Nor does the author fail to find such a case. *Hedychium Sadlerianum* approaches very nearly in the number of stomata on the lower surface the condition of one of its parents, *H. coronarium;* but we are told nothing as to the condition under which the parents or offspring were reared, and the tendency to "sway towards one parent" is explained by the assumption that it is "a morphological adaptation in the hybrid for physiological work, or in the truest sense a case of physiological selection."

Having thus briefly stated some of the difficulties besetting the problem, we may state that all his observations and measurements, down to the size of the plastids and starch grains, lead the author to the conclusion that plant hybrids, at least seed hybrids, are, both in their minute structure and in their general life-phenomena, intermediate between their parents.

This complete blending is, to say the least, very extraordinary, and we are tempted to question whether the author has investigated a sufficient number of individuals of each hybrid. Surely the variability of hybrids would be sufficient to supply any investigator with numerous examples which were not intermediate. The unanimity of the observations published make it imperative that some further investigations should be undertaken with regard to the variability of hybrids, a factor to which sufficient prominence is not given in the present paper.

Darwin insists both in his "Forms of Flowers" and also in his "Cross and Self-fertilisation of Plants," upon the correspondence between the crossing of distinct species and legitimate unions of dimorphic and trimorphic heterostyled plants. Yet from Dr. Macfarlane's paper we must conclude that in some respects at least there is no correspondence.

For Darwin states that though "the shape of the stigma and the length of pistil both vary, especially in the short styled form, I have never met with any transitional states between the two forms in plants growing in a state of nature." Now the difference in these forms extends also to anatomical details, such as the size of the pollen-grain and the size of the stigmatic hairs; and yet the offspring will all resemble either one or the other parent, and thus differ radically from all the hybrids which Dr. Macfarlane has examined, all of which represent forms intermediate between the two parents. Dr. Macfarlane has of course come across some exceptions, but we are not told whether they are merely individual variations approaching one or other of the parents, such as we should expect to find, or whether in the production of the hybrid there was always a tendency to approximate the male or female form. Whichever be the case, the author is of the opinion that the number previously asserted to diverge towards one of the parents has been considerably overestimated.

The author's contribution, however, to the investigation and discussion of graft hybrids is extremely valuable, and we cannot help wishing that he had found more similarity in the characters of graft and seed hybrids. We feel convinced, though we should not like to impugn the evidence brought forward, that the latter does not represent the average condition of the structure of plant hybrids, but that there must be more variation in their characters than the author has found in the specimens he was enabled to examine, especially more variation towards one or other of the parent forms, though we should not expect it to be so pronounced as in the case of graft hybrids. F. E. W.

COMPULSORY LAWS OF ERROR IN DRAWING.

Digest of the Phenomena, with Examples.

THE object of the following paper is to present the facts in the briefest and, it is hoped, the plainest possible manner, for the purpose of calling attention to phenomena connected with the art of drawing, or depicting form in outline. It is to prove that error made in such drawing comes under the dominion of natural law, or compulsion, and is not the result of individual misconception of truth. The phenomena are altogether distinct

[1] "A Comparison of the Minute Structure of Plant Hybrids, with that of their Parents, and its Bearing on Biological Problems." By Prof. J. Muirhead Macfarlane. (Transactions of the Royal Society of Edinburgh, vol. xxxvii. part i. no. 14.)