not necessarily a sign of Ctenophore affinities. As in other divisions of the Cœlenterata, the determination of true or natural specific distinctions in Medusæ from false or accidental differences is extremely difficult. A great many species have been described from the more or less distorted and contracted specimens that are sent to systematic zoologists by the collectors, and it is very probable that many of the folds and wrinkles, and even the warts and tubercles, that are relied upon for separating species are due to post-mortem changes. Mr. Mayer deals with this problem with sound judgment. The work of previous authors is carefully considered and tabulated, so that the reader may form his own judgment in each case if he wishes to do so; but his own opinion, based on a wide experience of living and preserved material, is clearly expressed. Thus, of the genus Pelagia, no fewer than fourteen species have been described, of which six are from the Atlantic Ocean. "All of the Atlantic species," he says, "are closely related one to another, and future researches may demonstrate that they are only geographical races."

It would be difficult to express adequately our admiration of the seventy-six coloured plates with which this monograph is illustrated. As regards delicacy of treatment and accuracy in detail, they may be regarded as the best series of zoological plates that have been published for many years. In addition to the plates, there are more than four hundred text illustrations in black and white. The majority of these are copied from the works of other authors, but there are several, such as the two specimens we reproduce, that have not been previously published.

Important changes in well-known generic names are not so common as in some other recent memoirs, but there are some which many students of the group will notice with regret. Thus the familiar genus Lizzia becomes merged in Rathkea; Corynitis becomes Linvillea. The generic name Turris, having been used by Humphrey in 1797 for a mollusc, is regarded as preoccupied, and this genus of Medusæ becomes Clavula. As examples of changes in spelling, we may refer to the genus Irene, which becomes Eirene, and Aurelia, which becomes Aurellia. But the most deplorable proposal in this respect is that the name Craspedacusta should be used in place of Limnocodium. It is clear from the text that the author has made this change with regret, since he realises the great inconvenience that must be caused by the substitution of a name that has been used only once, and in a preliminary note, for a name that has been used consistently by all authors, including the writer of the preliminary note, ever since. That the change has been made is due to the mandate of the International Commission on Zoological Nomenclature, who stated that the usage of the name Limnocodium would be "in contravention of the provisions of the Code." No better example could be found to show the pressing need of some revision of the Code. We cannot close this notice without again expressing our thanks to Mr. Mayer for his most magnificent and serviceable memoir. It is really a great work, and will mark a great step of progress in the literature of the subject.

MEASURES OF SOLAR PARALLAX.[1]

THE particular value of solar parallax derived from the discussion of any one set of measures is of smaller consequence than the manner in which the result has been achieved. The interest in the problem has shifted. In its present position, the knowledge of the distance of the sun from the earth is less important than the examination and elimination of the causes that affect the accuracy of the measured coordinates obtained from a series of plates. Viewed in this light, Prof. Perrine's paper is of great value, for it puts us in possession of an independent discussion of material that has already been submitted to the most careful scrutiny.

We have presented to our examination a numerical estimate of the different constructions that expert knowledge can place upon the same measures. Mr. Hinks, in his elaborate discussion of the solar parallax from photographic observations of Eros, pointed out some discrepancies in the Lick results, which he thought required further examination. Among others, he suggested that some of the comparison stars were too distant from the axis of collimation. Apparently this criticism was justified, and Prof. Perrine has employed in his reductions only those star images which were accurately circular. A second suggestion, that an error was introduced by the eccentric position of Eros with reference to the stars of comparison, is not accepted. This want of symmetry arose from the plan of choosing the same stars for the morning and evening observations, a scheme which possesses obvious advantages; but in a plate taken with Eros always in the centre, the motion of the planet will carry it nearer to, or away from, the more outlying members of the group of stars selected for measurement. The motion of Eros in the interval was about 8′–10′, and in a field the available diameter of which is small the distortion of the image might outweigh the evident theoretical advantages.

To test this point Prof. Perrine has made two solutions, according to the stars selected, and can find no evidence of systematic error. Another attempt to explain the observed discrepancy, more of the nature of a suggestion than a criticism, was made to depend upon the generally small magnitude of the comparison stars. With a large aperture and the necessity of restricting the field, there will be a tendency to use fainter stars than in other observatories employing the ordinary photo-refracting telescope. As a rule, the stars selected at Lick have been fainter than the planet. Prof. Perrine does not specifically discuss the effect of magnitude, and there is the less necessity, since the value of the solar parallax he obtains does not show any anomalous deviation from the final value adopted by Mr. Hinks.

The difference of computational results is a point of great interest. The final value of solar parallax derived from the total mass of measures at the command of Mr. Hinks is 8·807″, while the same authority obtained from the Lick measures alone 8·815″. From the same data Prof. Perrine derives from his own measures 8·8067″, or identically Mr. Hinks's result. The problem for solution has therefore moved from finding an explanation of the difference of Lick results from the general average to tracing the cause of the disagreement between the Cambridge and the Californian computations. The computed probable errors also differ. That attached by Prof. Perrine in his final equation for π is $\pm 0{\cdot}0025''$, and by Mr. Hinks $\pm 0{\cdot}0046''$. It is a matter for congratulation that such small differences should attract attention and call for explanation. The minuteness of the discrepancy seems to indicate that in modern processes such a degree of refinement has been reached that the disagreement must be attributed to purely arithmetical operations, and has no physical significance.

AMERICAN VERTEBRATE PALÆONTOLOGY.

THE phylogeny of the Felidæ forms the subject of an article, by Dr. W. D. Matthew, published in vol. xxviii. (pp. 289–316) of the Bulletin of the American Museum of Natural History. According to the author, the great majority of the extinct members of the family, including all the oldest species, are characterised by a more or less pronounced development of the upper canines into long, flat-sided tusks. These are the so-called sabre-tooths, or machærodonts, which date from the Lower Oligocene, typical cats with relatively short upper canines being unknown before the Pliocene. The early sabre-tooths are, however, divisible into two series, one characterised by the extreme length and slenderness of the tusks and the large size of the protecting flange on the lower jaw, and the other by the shorter tusks and smaller flange. Hoplophoneus and Dinictis respectively represent the two series in America. While the derivation of the large Pliocene and Pleistocene sabre-tooths from Hoplophoneus has been accepted, the relations of the modern cats to Dinictis have been overlooked. "The evidence appears, however, to indicate that the Dinictis phylum led

[1] "Determination of the Solar Parallax," from Photographs of Eros, made with the Crossley Reflector of the Lick Observatory, University of California. By Charles D. Perrine, and others. Pp. v+98. (Carnegie Institution of Washington, 1910.)

directly into the modern Felidæ, the canines having reverted from the almost unique machærodont specialisation to the normal type of carnivorous mammals. The series Dinictis—Nimravus—Pseudælurus—Felis are in direct succession, structurally and geologically."

In the opinion of Dr. Matthew the origin of the cat family cannot be carried back further than the Oligocene sabre-tooth, their supposed derivation through the so-called Ælurotherium—which is based on the milk-dentition of a species of the same group—from the Eocene creodont Palæonictis being inadmissible.

Mr. R. O. Peterson has, however, just described, under the name of Daphænodon, in the Memoirs of the Carnegie Museum at Pittsburg (vol. iv., No. 5), the skeleton of a dog-like carnivore of the size of a large leopard from the Miocene of Nebraska, which, together with the allied but older Daphænus, he regards as in a considerable degree intermediate between dogs and cats, although the skull and teeth are essentially dog-like. In many respects Daphænus, of which the whole skeleton is known, is very cat-like, especially in the long leopard-like tail, which may, however, have been bushy. A cat-like feature is the partially retractile structure of the claws. In concluding his description, Mr. Peterson observes that the model "is instructive, as it furnishes at least a conception of a primitive form ancestral to cats and dogs." Whether later discoveries in earlier strata will reveal a community of origin for the two groups remains to be seen.

Reverting to the first article, Dr. Matthew replies near the end to critics who have doubted his theory that the sabre-tooths attacked by dropping the lower jaw into a nearly vertical position and stabbing with the upper tusks. After supporting the theory by additional anatomical evidence, he remarks that most of the early large ungulates were of the "pachyderm" type, which were specially suitable to this method of attack, while they would succumb to the mode practised by lions and tigers.

"With the rise and dominance of the large light-limbed ruminants and horses some of the early sabre-tooths were correlatively adapted into the modern type of felines, while other sabre-tooths, as the surviving pachyderm phyla became larger, thicker skinned, and more powerful, became progressively larger, more powerful, and developed heavier weapons to cope with and destroy them. The final extinction of the machærodont phylum was probably largely conditioned by the growing scarcity and limited geographic range of the great pachyderms."

Finally, he protests against the idea that these later sabre-tooths died out as the result of over-specialisation.

Recent conflicting opinions as to the pose of the sauropod dinosaurs are discussed by Dr. Matthew in the September number of the *American Naturalist* (vol. xliv., p. 547). That these reptiles walked, instead of crawling, the author considers fully proved, their limb-structure, as was previously pointed out by Dr. Abel, displaying a remarkable parallelism to that of proboscideans. This "rectigrade" type, in which the whole limb is pillar-like, with the foot short, rounded, and heavily padded, and the toes reduced or rudimentary, is correlated with gigantic bodily size, the movements being mainly restricted to the upper joints, and the foot serving chiefly as a cushion to minimise the shock. A structure of this kind will obviously occur only among animals which habitually rest their weight on the limbs alone.

A limit is, however, soon reached in regard to the weight which even the most powerful limbs are capable of supporting in the case of a purely terrestrial animal, and this limit appears to have been attained among the elephants. But if this be so, we are confronted by the question why the sauropod dinosaurs, with their less perfectly formed limbs, vastly exceed the largest elephants in bulk and stature. The answer, in Dr. Matthew's opinion, is that these reptiles were aquatic, and adapted to wading. "A wading animal has the greater part of its weight buoyed up by the water, and might attain a much larger size without transcending its mechanical limitations, just as the whales and some true fishes attain a much larger size than any land animal."

In 1908 Mr. Lambe described a new genus of crocodile (Leidyosuchus) on the evidence of imperfect remains from the Judith River beds of Alberta, Canada. An unusually well-preserved crocodilian skull from the Ceratops beds of Wyoming, recently acquired by the U.S. National Museum, is referred by Mr. C. W. Gilmore (Proc. U.S. Nat. Mus., vol. xxxviii.), in spite of its later geological horizon, to a second species of the same genus, under the name of *L. sternbergii*. A second skull of the same species, from the Hell Creek beds of Montana, which came under the author's notice after the original paper was written, is also described and figured.

Leidyosuchus may now be characterised as a short and relatively broad-skulled crocodile, with the nasals apparently not reaching the nares, the posterior nostrils wholly enclosed by the pterygoids (instead of being behind them, as in Crocodilus), the mandibular symphyses short and formed in part by the splenial, the upper teeth more numerous than the lower, the first lower tooth received into a pit, and the third and fourth—which are about equal in size—into notches in the skull. The vertebræ have the cup in front; and there was armour on the lower as well as on the upper surface of the body. Many of these characters connect the genus with Crocodilus on one hand and Alligator (including Caiman) on the other, although their preponderance is with the first-named genus. There are also indications of affinity with the Tertiary Diplocynodon. The position of the posterior nostrils—intermediate between those of modern and Jurassic crocodiles—is just what might have been expected from the geological horizon of the genus.

Since its original description by Sir R. Owen in 1873 the imperfect skull of the saw-billed bird (*Odontopteryx toliapica*) from the London Clay of Sheppey, preserved in the British Museum, has remained the sole evidence of its genus and species. When complete the specimen probably measured something like 6 inches in length. The discovery is now announced by Mr. B. Spalski, in the second number of the new journal published at Leipzig under the title of *Der Geolog*, of the skull of a much larger species of the same genus in Tertiary strata in Brazil, the total skull-length being no fewer than 53 centimetres. The name *O. longirostris* is proposed for the Brazilian species.

THE INFLUENCE OF RIVER SYSTEMS IN THE EAST.

GLOBUS for September 1, Bd. xcviii., contains an article of some interest on the subject of the influence of river systems in the East, by Herr Ewald Banse. The author deals with the area between 17° and 36° N. lat. and 17° W. and 74° E. long. (which he terms the Orient), where the average annual rainfall is less than 200 mm. (8 inches); this is bordered in the southern Sahara and in the northern part of south-western Asia by a broad zone with an annual precipitation of 600 mm. (23½ inches). In summer this area is the hottest part of the earth's surface. It tends to prevent the intermingling of various flora, fauna, and human races; the Arabian peoples, the one-humped camel, and the date-palm are mainly confined to it. The map accompanying the article shows three main areas, which are drained by no rivers—the Saharan, the Arabo-Syrian, and the Irano-Armenian, the undrained regions amounting to 77 per cent. of the Orient.

The central regions, with their entire lack of hydrographic connection with the ocean, differ essentially from peripheral countries with sea-connection. The formation of level plains is one marked tendency of countries devoid of rivers; wind, which forms the sole connection with the ocean, plays a very important *rôle* there. These flats are to be regarded as phenomena of disease in the earth's surface, and the fact that three-quarters of the Orient is devoid of river systems will account for its low population and helps to explain its cultural backwardness. It is the watered areas—23 per cent. of the whole—which have produced the cultures of the Orient, *e.g.* the Sumerian within the Anatolian-Kurdic belt. Higher cultures concentrate where there is flowing water all the year.

Four regions are passed in review, the Atlas countries, the Sahara region, south-west Asia, and western Asia. For each a table is drawn up giving the total area, proportions of permanently river-drained, periodically river-drained, and entirely undrained land, and the density of the population—the last, it may be noted, is in inverse