new name by which to designate it. Strasburger's term 'spongy' tissue, although given when the nature of these cells was not understood, and being a misnomer so far as their structure and function are concerned, has obtained a wide usage in the literature of the gymnosperms and should be retained, just as the term cell is still retained in all biological literature.

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RECENT LITERATURE ON TRIASSIC ICHTHYOSAURIA.

WITHIN the past few months two important contributions have been made to our knowledge of the Triassic Ichthyosauria of the Eastern Hemisphere. The more extensive of these papers is one by Dr. E. Repossi,* giving the long-desired exact description and illustration of the material upon which Baur based the genus *Mixosaurus*. In this paper the statements of Baur concerning the primitive characters of this genus are strongly supported and many previously unknown and even unsuspected characters have been brought to light.

One of the most important contributions made by Repossi is the description of the pectoral and pelvic arches. These are quite unlike those of any Post-Triassic form of the order, but show a strong similarity to the corresponding structures in the Californian genus *Shastasaurus*. All of the elements excepting the ilium and clavicle are much broader and more robust than in *Ichthyosaurus*. The inter-clavicle is more nearly triangular than T-shaped and is hence more stegocephalian. The scapula, like that of *Shastasaurus*, has more of a mosasaurian than of an ichthyosaurian aspect.

Beautifully preserved specimens show the limbs to be pentadactyle with elongated epipodial bones and notched or sometimes shafted phalanges. A peculiar feature is found in the presence of four elements in the proximal row of the carpus and tarsus. Were it not for the character of the specialized mesopodial region, these limbs might well be considered as the primitive types from which the limbs of *Ichthyosaurus* were derived. The limb structure differs considerably from the types found in the Californian genera, both in the number of digits and in the character of the mesopodial region.

Another interesting discovery is the fact that the dorsal ribs of *Mixosaurus* are mainly single-headed. Those who have concerned themselves with this group seem generally to have taken for granted a double rib articulation.

A second paper of interest dealing with Triassic Ichthyosauria is one by N. Yakowlew on 'New Finds of Triassic Saurians in Spitzbergen.'* One of the specimens here described was found near the locality at which the type of Hulke's *Ichthyosaurus polaris* was discovered by Nordinskiöld, and as it resembles *I. polaris* in the size and general form of the vertebræ, it has been referred to this species. A posterior dorsal vertebra which has been figured is shown to differ from *Ichthyosaurus* in possessing a single broad apophysis for the articulation of the rib. This species is, therefore, placed by Yakowlew in the genus *Shastasaurus*. The vertebra is certainly very similar to some of the posterior dorsals of *Shastasaurus*. After a study of Hulke's descriptions and measurements of the type material, the writer has already expressed the opinion† that a careful examination would show it to belong in the Californian genus.

In this paper the valuable suggestion is made by Yakowlew that the ribs of the Ichthyosauria were primitively single-headed and that the double-headed form has been produced by more complicated and stronger movements of the ribs, causing disappearance of the middle portions of the rib heads and of the corresponding parts of the lateral apophyses

* 'Em. Repossi. Il Mixosauro degli strati triasici di Besano in Lombardia,' *Atti della soc. ital. di scien. natur.*, Vol. XLI., Fasc. 3, p. 361–372 tav. VIII., IX. Novemb., 1902.

* 'Neue Funde von Trias-Sauriern auf Spitzbergen,' *Verhand. der Kais. Russ. Mineralog. Ges.*, Bd. XL., S. 179–202.

† 'Triassic Ichthyopterygia of California and Nevada,' p. 88.

of the vertebræ. In a later article* written mainly in review of Repossi's paper on *Mixosaurus,* Yakowlew expresses the opinion that the double-headed character appeared first in the posterior portion of the dorsal region owing to the more vigorous movement of that portion of the body. It is difficult to reconcile this theory with the fact that in *Ichthyosaurus* the ribs tend to be single-headed toward the base of the tail and double-headed anterior to it, and that in *Shastasaurus,* which had also a great sculling tail, the ribs are all single-headed excepting a very few immediately behing the head.

Concerning Yakowlew's suggestion that the single-headed rib is the primitive type in this order, it is certainly a significant fact that it seems to occur frequently in the Triassic ichthyosaurs. We should not forget, however, that the oldest representative of the order which has been described, viz., Quenstedt's *atavus,* from the lower Muschelkalk, is said to have a double articulation and is possibly not to be referred to *Mixosaurus,* as has been generally supposed. Recent discoveries have shown the existence also in the Californian Triassic fauna of a form (*Toretocnemus*†), in which the middle dorsal ribs are as widely forked as in *Ichthyosaurus.* Again, it appears that in *Shastasaurus* the double articulation in the anterior part of the column is not formed by reduction of the middle portions of simple lateral apophyses. From the atlas to the anterior dorsal region the diapophyses are gradually increased in height and the parapophyses reduced till the latter are mere points some distance below the lower ends of the diapophyses. The lateral apophyses of the dorsal region, therefore, correspond to the diapophyses in the cervical region. If the double articulation in the neck region is secondary it would appear to have required the *addition* of a lower rib head and a parapophysis. There appears, therefore, to be still a chance that the double articulation is primitive in this group, and it may be well to withhold final judgment till we have a better acquaintance with the structure of the vertebral column as a whole in the later Triassic forms, and particularly till we know more about the Middle Triassic representatives of the group.

John C. Merriam.

* 'Einige Bemerkungen ueber die triassischen Ichthyosaurier.' *Verhand. der Kais. Russ. Mineralog. Ges.,* Bd. XL., Lief II.

† See *Bull. Geol. Dept. Univ. of Calif.,* Vol. 3, No. 12, p. 260.

NOTES ON PHYSICS.

INTERFERENCE OF LIGHT WITH GREAT PATH DIFFERENCE.

The most carefully designed and constructed mechanical vibrator, such as a pendulum, cannot be made to vibrate, when left to itself, more than a few thousands of times without greatly decreasing in amplitude. On the other hand, the number of free oscillations made by an atom of a luminous gas during the intervals between collisions between that atom and others, during which times the atom is presumably not receiving energy from any source to make good its losses by radiation, is, in the case of mercury vapor at least, as many as 2,600,000 and that without very great decrease of amplitude. This follows from some recent work of Lummer and *Gehrcke,* who have recently shown that a given portion of the beam of light from mercury vapor (the green rays) is in condition to interfere with a portion of the same beam 125 centimeters or 2,600,000 wavelengths farther along the beam, which shows that as many as 2,600,000 successive waves come without a break of continuity from the vibrating luminous particles in mercury vapor.

THE ELECTROMAGNETIC THEORY OF MATTER.

The most complete and readable presentation hitherto made of the mathematical theory of the motion of minute electric charges (electrons) is given by Max Abraham in *Drude's Annalen* for January, 1903. It is by comparison of the results of this mathematical theory with results of experiments on cathode and Becquerel rays, on the Zeeman effects, etc., that the electromagnetic theory of matter has arisen.

An electrically charged body in motion has more momentum and stores more energy, in