seven Halictidae, one *Sphex;* on *M. bradburiana,* none; on *Scutellaria canescens,* three Halictidae; on *Penstemon laevigatus, Leionotus anormis.*

At Orlando, Florida, I saw two Eumenidae and two Vespidae getting nectar of *Gaylussacia hirtella* from holes made by *Odynerus erinnys.*

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A NOTE ON A ROT OF THE SMYRNA FIG IN CALIFORNIA

AN article published in SCIENCE, August 14, 1925, page 161, by P. D. Caldis, of the University of California, entitled "A rot of the Smyrna fig in California," has been a source of confusion in regard to the name of the fungus causing the rot. The writer has already had several inquiries from pathologists and cataloguers in Washington and elsewhere how to index it.

In the spring of 1924 the fungus was isolated from the fig and the Blastophaga in this laboratory, and as the typical curved septate spores were obtained from both sources it was determined to be a Fusarium. Report of the work was sent to the Fig Growers Association in California in September, 1924. The species was identified by Dr. Sherbakoff in January, 1925, from our cultures and subsequently from one of Mr. Caldis' cultures which had been held under our laboratory conditions for eight months, as *Fusarium moniliforme* Sheldon. It is true that *Fusarium moniliforme* Sheldon has been confused with *Oospora verticilloides* Sacc. when it produces only the microconidial type of spores and on that account it has sometimes been listed as an Oospora. But it is not an Oospora, as might be inferred from Mr. Caldis' article.

The fungus has also been called a Cylindrotrichum, but the presence of curved septate Fusarium spores in infectious cultures determines its proper classification.

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SCIENTIFIC BOOKS

The Downtonian Fauna of Norway. I. *Anaspida, with a Geological Introduction.* By JOHAN KIÆR. Pp. 139, with 50 text figures and 14 plates. Kristiania, 1924, Videnskapsselskapets Skrifter. I. Mat.-Naturv. Klasse. 1924, No. 6.

THIS fine monograph is the first part of an extended memoir on the remarkable upper Silurian fauna discovered by the author and his wife in 1909 at Ringerike, in the southern part of the Oslo area. About 2,500 specimens of crustaceans, merostomes and fishes have been obtained, of which only the anaspidans, including *Pterolepis nitidus* Kiær, *Pharyngolepis oblongus* Kiær, and *Rhyncholepis parvulus* Kiær, are here discussed.

Traquair's views as to the orientation of the body are shown to be incorrect, the dorsal and ventral surfaces being reversed, as had been suspected by some students.

The scale system is shown in all three genera in the most detailed fashion. On the head the hitherto unknown dorsal and gular plate systems, formed by the fusion of smaller scales, is made known and an adequate terminology is proposed. The plates are intimately related with the openings in the head. Of these there are on the dorsal surface, besides the large eyes, a small median opening between the orbits believed to have lodged the pineal organ, and a somewhat larger unpaired opening in advance of this, supposed to be the single nostril.

The large terminal mouth is bounded superiorly by the anterior plates of the dorsal cranial system. Inferiorly it is bounded in one form by a small area of transverse scales, in another by a single moderate-sized median plate, and in the third by well-developed paired plates strengthened by the powerful gular system—apparently indirect stages in the formation of a large, powerful beak. There are no traces of teeth.

As has been known, there are a number (eight to fifteen) of circular branchial openings arranged in an oblique band back of the head. Just posterior to the lower end of this band there is a strong sharp spine in the Norwegian genera which the author considers as a possible homologue of the pectoral fins of the true fishes. There are unpaired anal and caudal fins. The latter is not, as was generally supposed, a normal heterocercal tail, but a reversed heterocercal one, strangely similar to that of an ichthyosaur but unknown among real fishes.

There is no trace of a sensory canal system or of a bony axial skeleton.

Clear, well-drawn reconstructions of the three genera are given.

The remaining fifty-five pages are devoted to the general bearing of these very welcome new facts. As regards the "jawless" nature of these forms, Kiær concludes that there was a definite cartilaginous stiffening around the mouth "which, it is highly probable, may be compared with the mandibular arch in real fishes." The presence of a functional pineal eye and of an unpaired narial opening, believed to be proven, is stressed. The branchial system is held necessarily to have consisted of cyclostome-like pouches, probably without any homologue of the branchial arches of true fishes.

Kiær looks upon the spines of the Anaspida and the lateral lobes of the Cephalaspidae as homologous with paired fins and as originating in lateral fin folds. The absence of any homologue of the pelvic appendages is believed to be primitive.

As regards the affinities of the group the following views are advanced:

(1) He concurs in the "general view" that the Acrania, Cyclostomata and Pisces form three ascending stages in the development of the Chordata (although, to be sure, the Acrania and Cyclostomata as we know them are specialized and to some degree degenerate).

(2) The dermal skeleton was characteristic of a normal stage in this development. The earliest forms were naked, then arose a scale system governed largely by the mechanics of the lateral muscle plates, and passing by later development into various specializations, such as fusion into plates, as in the ostracoderms, or on the other hand reduction or loss.

(3) The unpaired nasal opening and pineal organ, their grouping with the eyes and the structure of the branchial apparatus are believed to be the most important structures of the Anaspida. Now in all these characters they resemble the cyclostomes (Petromyzontia) and furthermore these are just the characters which separate the latter from the true fishes. The unpaired nasal opening is considered especially fundamental and Haeckel's grouping of all vertebrates into Monorhina and Diplorhina is revived. Hence the Anaspida are believed to belong to the same group of monorhine craniates as the cyclostomes. The absence of a dermal skeleton, jaw structures and paired pectoral appendages in the latter are considered secondary due to degeneration.

(4) As to the other groups usually united under the designation Ostracodermata, the Cephalaspidae are close relatives of the Anaspida. Pteraspidae and kindred forms (Heterostraci) are, however, very different, and it is considered probable that they are related to the Elasmobranchii, as Traquair believed. As for the Antiarchi, these forms are so isolated as to be altogether uncertain in position. They can scarcely be assigned any close connection with the Arthrodira and are in any event diplorhine and true fishes.

An outline of the classification which concludes the work may be given here:

Subphylum Vertebrata Craniata.
Branch I. Monorhina.
Class I. Anaspida:
Lasaniidae,
Birkeniidae,
Pharyngolepidae,
Pterolepidae,
Rhyncholepidae,
Euphaneropidae.
Class II. Cephalaspidomorphi.
Class III. Cyclostomata.

The fourteen plates are reproductions of photographs and bear abundant witness to the wonderful preservation of the material.

The theoretical conclusions of this monograph will undoubtedly give rise to much discussion and some differences of opinion. There is, however, no room for discussion as to the painstaking and accurate nature of the work nor as to its meriting the high praise and wide notice which it will undoubtedly receive. The gaining of a thorough knowledge of these members of the Anaspida, a group so ancient and so fundamental as to be of the highest interest for any student of vertebrates living or extinct, is an event of the very first magnitude.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

REACTION OF OPALINAS TO VARIOUS LABORATORY MEDIA

PHYSIOLOGICAL salt solution has for many years been the traditional and all but universal medium in use for maintaining organisms and tissues in biological laboratories.

In a series of experiments on *Opalina obtrigonoidea*, begun for another purpose, we have however found, rather contrary to our expectations, that physiological salt solution is not as efficient as several other common laboratory media for keeping Opalinas alive. By the use of Locke's solution, 50 per cent. sea-water, etc., Opalinas may be kept alive for a considerable length of time outside of their natural habitat in the cloaca of the leopard frog (Rana pipiens). It has been observed in a number of other instances that sea-water of various concentrations is an excellent medium; this has also proven true in our work on Opalinas. In our experiments it has been observed to be almost on a par with Locke's solution, which we found to be the best of all the solutions we used.

Eight different media were tried with varying results as shown in the table below.

These results we hope will be of interest to teachers of biology who wish to demonstrate or study such parasitic protozoa as are found in frogs. All the protozoa that one may desire may be obtained from frogs used for other class purposes. This may easily be done by removing the cloaca from a freshly killed