of both species of *Nezara* of a quadripartite chromosome, composed of two somewhat unequal components and having exactly the form of a butterfly with wide-spread wings. This element, always lying in the outer ring and in constant position with respect to the spindle-axis, divides equally into two double elements. Each spermatid-nucleus thus receives six single chromosomes (including one idiochromosome) and one double element; though the duality of the latter is often obscured in the later anaphases. This phenomenon may indicate that a change in the chromosome-number is in progress, the double element representing either the initial stages in the separation of one of the "autosomes" into two (as appears to have occurred in case of the X-chromosome of *Syromastes, Fitchia,* etc.) or the final stage of a fusion of two into one.

EDMUND B. WILSON

THE STRUCTURAL CHARACTERISTICS AND RELATIONS OF THE APODAL FISHES[1]

THE characteristics and relations of the Apodals (Apodes) have been involved in much uncertainty even to the present hour. Nevertheless, no order appears to be really more trenchantly differentiated when a sufficient number of skeletons is at hand. Their chief characteristics of ordinal value may be given as follows:

Order Apodes

The order of eels or apodals is composed of fishes with a skull specialized especially by its extension forwards and the coalescence of the ethmoid, vomer (and premaxillaries?) into one piece which projects and is clamped laterally and more or less backwards by the maxillaries, the fusion with the vomer (?) or loss of the premaxillaries, the slight development of the palatal and pterygoid systems, the junction of the parietal bones, the presence of a chain of suborbital bones, the single cotyloid condyle for the articulation of the vertebral column, the freedom and reduced development of the shoulder girdle (and in some the complete loss), the single coraco-scapular plate in which are ossified the hypercoracoid and hypocoracoid, the mesocoracoid being lost, the brain of the ordinary teleost type but with secondary olfactory lobes in front of the principal ones, the great development of the branchiostegal apparatus, and the development of a pneumatic duct between the air-bladder and alimentary canal, and the loss or abdominal position of the ventral fins. The species propagate in the sea and pass through a peculiar stage known as the *Leptocephalus* or *Atopichthys* form, a ribbon-like translucent condition from which develops a later eel-like stage.

All the known species have the familiar eel-like form in varying degrees, some being much stouter and others excessively elongated, but the form is not an ordinal character, although in this case to a large extent coordinated with such characters. The absence of ventrals which gave name to the order (Apodes) is falsified by extinct representatives of the family Anguillavidæ, although justified by all the living species.

Inasmuch as much difference of opinion has prevailed respecting the homologies of the supraoral dentigerous bones, and as silence respecting them might be interpreted as the result of ignorance or undue disregard of others, some explanation seems to be called for here. By many of the old anatomists, the upper lateral dentigerous bones were considered to be palatines, but that view, for the most part, has been long abandoned. Recent high authorities, however, have regarded the bones in question as not homologous for the Murænids compared with the rest of the Apodals. While the upper bones of the Anguillids and other platyschistous eels have been admitted to be maxillaries, the lateral dentigerous bones of the Murænids have been homologized with the palatines or pterygoids. In other words, according to one author, the Murænids have the "maxillaries absent, replaced by the palatopterygoid, the mouth bordered by the latter and the ethmo-vomer," according to another, by "the toothed ethmo-vomer and pterygoids." Such an interpretation implies that the dentigerous bones, so much

[1] Abstract of a communication to the National Academy of Sciences, April 21, 1910.

alike and so highly specialized, connected, too, in such an unusual way with the cranium, have developed from two extremely different sources; that (1) the usual dentigerous bones have retained in the platyschistous eels, the functions performed in other fishes but under a highly specialized form, while (2) they have been lost in the engyschistous eels and bones (palatopterygoid), which had been much reduced or atrophied in the others, have been highly developed in the same manner but at the expense of the dentigerous bones of the typical eels. No reason has been assigned for such interpretations but it is probable that the posterior connection with the cranium of the dentigerous bones of the Murænids was one cause. We are thus forced into one or other of the two forks of a dilemma: which is the more probable, (1) that bones of two very distinct and disconnected arches have been inversely developed at the expense of each other in a like highly specialized manner, or (2) that the vomer-ethmoid has projected in one type (Colocephals) more than in the others (Euchelycephals)? The latter alternative has been preferred by the present author.

As to the premaxillaries, they have been considered to have been lost by recent ichthyologists, but it is at least possible (or even probable) that they have been consolidated with the ethmo-vomer, as Peters and Jacoby contended.

The order, as now limited, is represented by two suborders, (1) the Enchelycephals, including most of the species, and (2) the Colocephales, including (so far as known) only the Murænids. The only near relations of the apodals are the Carencheli, known only by a single species, which is distinguished by the distinct premaxillaries, free nasals, etc.

The Lyomeri, which have been generally associated with the apodals, are extremely distant and *contrast* with them by the absence of most of the characters distinctive of the order.

Theo. Gill

THE PROPER RESTRICTION OF EUCYNOPOTAMUS

Some time ago I proposed the name *Evermannella* to replace *Odontostomus*, as the latter was found to be preoccupied in mollusca. Since then, Dr. C. H. Eigenmann, overlooking my use of this name, again proposed *Evermannella* as a new genus of Characinæ. with *Cynopotamus biserialis* Garman as its type. Subsequently I renamed Dr. Eigenmann's genus *Eucynopotamus*, a fact he seems to have entirely neglected, as his later proposal of *Evermannolus* shows. Thus *Evermannolus* must be considered an exact synonym of *Eucynopotamus*, embracing the single species *E. biserialis*. The wrongly identified genus *Eucynopotamus* of Eigenmann may now be known as Galeocharax gen. nom. nov. (type *Cynopotamus gulo* Cope), to embrace the species *G. magdalenæ*, *G. humeralis*, *G. gulo* and *G. knerii*.

Henry W. Fowler
Academy of Natural Sciences
of Philadelphia

THE AMERICAN PHYTOPATHOLOGICAL SOCIETY. II

The Mildew of Ginseng caused by Phytophthora Cactorum (Leb. & Cohn) Schroeter: Professor H. H. Whetzel, Cornell University. (Read by Mr. V. B. Stewart.)

The mildew has long been known to the ginseng growers of Japan. It is known as "Koshi-ore," meaning a "bending-at-the-loins," from the characteristic drooping of the leaflets at the end of the affected petiole.

The relation of *Phytophthora cactorum* to the disease was first discovered by Hori in 1904 as pointed out by Van Hook. He demonstrated the constant association of this well-known Phycomycete with the lesions on the ginseng. Van Hook discovered this disease in Ohio and New York in May, 1905. He reports the constant abundance of oospores of *P. cactorum* in the diseased stems. So far as can be determined from the literature on the subject, no inoculation experiments have even been made to definitely establish the causal relation of this parasite to this disease.

The writer has observed this disease on an occasional plant in ginseng gardens since 1906. An epidemic of it appeared in a large ginseng plantation in New York State in 1909, causing a loss of more than 20 per cent. in some beds. Microscopical examination of a large number of diseased plants showed the *Phytophthora* always present in great abundance.