SCIENCE

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Prof. J. McKeen Cattell, Garrison-on-Hudson, N. Y.

FISHES, LIVING AND FOSSIL.

A TEXT-BOOK of Ichthyology embodying the results of recent investigation and taking cognizance of both living and extinct forms has long been a desideratum. Dr. Günther's 'Introduction to the Study of Fishes' (1880) did not at all represent the condition of ichthyology even at the time of its original publication, and the German translation (1886) was scarcely more than a reproduction, in another language, of the original work and retained almost all its numerous defects and errors. Those defects and errors were especially manifest in the treatment of the extinct forms. The increase in our knowledge of past types, too, has been very great within the last decade, owing to the labors of Mr. Smith Woodward, Prof. Cope and others. The desideratum indicated, to a certain limited extent, has been supplied so far as the 'fossil' fishes are concerned, in a recent work, by Dr. Dean, of New York, entitled 'Fishes, Living and Fossil.'* But it is not, as the author confesses, an elaborate introduction to ichthyology; its 'object is to enable the reader to obtain a convenient review of the most important forms of fishes and of their structural and developmental characters'

* Fishes, Living and Fossil. An outline of their forms and probable relationships. By Bashford Dean, Ph. D., Instructor in Biology, Columbia College, New York City.—New York: Macmillan & Co. 1895. (Columbia University Biological Series III.—8vo, xiv, 300 pp.)

(p. ix). A brief summary of the chapters will enable the student to judge of the extent and scope of the work.

In the first chapter, after the 'introductory, the form and movement of fishes, their classification, geological distribution, mode of evolution, [and] the survival of generalized forms' are considered (pp. 1–13).

In the second chapter, 'the evolution of structures characteristic of fishes, *e. g.* (1) gills, (2) skin defences, (3) fins, and (4) sense organs' are discussed (pp. 14–56).

In the third chapter, 'the Lampreys and their allies,' including 'the Ostracoderms and Palæospondylus,' are described (pp. 57-71).

In the fourth chapter (pp. 72-98), 'the Sharks,' in the fifth (pp. 99-115) 'the Chimæroids,' in the sixth (pp. 116-138) 'the Lung-fishes' or Dipnoans, and in the seventh (pp. 139-178) 'the Teleostomes (*i. e.*, Ganoids and Teleosts)' are briefly noticed.

In the eighth chapter (pp. 179-226) we are presented with sketches of 'the groups of fishes contrasted from the standpoint of embryology, their eggs and breeding habits, outlines of the development of Lamprey, Shark, Lung-fish, Ganoid and Teleost, [and] their larval development.'

Next are furnished unnumbered sections, giving 'derivation of names' (p. 227–230), 'bibliography' (p. 231–251), and 'explanatory tables' (V.–XIX.) continued (p. 252–283) from others given elsewhere (p. 8, 9, 98, 166) in the volume, which is capped with a full index (p. 285–300).

Fish is a word of diversiform meanings; it is the expression of a concrete notion and it is the symbol of an abstract concept; in the former sense it brings before the mind a vertebrate inhabitant of the water with a subfusiform body, and in the latter sense any inhabitant of the water as contrasted with one of the air or of the land; when it is used in such compounds as fish-form, fish-like, fish-shaped, fish-backed and fish-bellied, it is the typical fusiform fish that is meant; when shell-fish, star-fish and jelly-fish are named it is the abstract concept of inhabitants of the water that is imagined. In the latter sense it is a reminiscence of the time when men believed in the 'elements' of earth, water and air, and apportioned to each their inhabitants. Those inhabitants were designated by Plato as *ξηροτροφικὰ*, *ὑγροτροφικὰ*, and *ξηρονομικὰ*. In the cosmological dreams of elders of our 'Aryan' stock as well as the Semitic they were created specially for the elements in question; so imagined the Hebrew historians, and to like purpose did Ovid sing.

Dr. Dean well remarks that "it would be unreasonable to doubt that the fish form is adapted to the mechanical needs of its environment" (p. 6). Such adaptation is evident. Nature has evolved and developed the form; man has copied. The 'fish form,' in its perfection, is realized in the tunnies and other wanderers of the high seas. The forms whose movements are delineated (p. 2) after Marey are not of this class, but a stage or more removed from it. The typical fish can only describe simple curves; the shark with its sigmoid curve and the eel with its multiplex curve introduce other conditions. On the other hand, it is the typical and sub-typical fish forms that have been the subjects of Mr. Parson's memoir on 'the displacement and the area curves of fish'* and have furnished the four outlines copied by Dr. Dean (p. 5).

The typical fish form, as exemplified in the tunnies, is especially adapted for rapidity of locomotion, and all the fishes in which it is developed are preëminently coursers of the sea. But it is not alone by coursing that fishes obtain their daily food. To obtain that food, to secure safety and concealment, Nature has provided many devices

*Trans. Am. Soc. Mech. Engineers Vol. IX., pp. 679–695, with 7 pl. incl. 21 contours.

and innumerable deviations from the typical fish form are developed.

But, as Dr. Dean well observes, the fish form 'is a factor in the evolution of fishes which appears in [almost] every [large] group and subgroup. And it has ever stood in the way of classifying them satisfactorily according to their kinships' (p. 7). Still more aggressive as obstacles have been certain deviations from that form and especially the eel-like form. The anguilliform modification, resulting from elongation of the body and concomitant adjustments, such as union of the vertical fins, loss of the ventrals, and restriction of the branchial apertures, is apt to recur in various groups, and does occur in the plectospondylous 'eels' ('electrical eel,' etc.) and the symbranchoid to such a degree that it has been difficult even for ichthyologists to convince themselves that the likeness was deceptive as indication of affinity.

The progress of ichthyology has been in a ratio inverse to the influence on the mind of this ancient concept of the importance of adaptation of the organization for aquatic life. Many are still influenced by it. As a consequence all the branchiferous vertebrates are confounded in one class—the Fishes or Pisces. By most morphologists, however, that physiological group is subdivided into three or more classes. Three are admitted by Dr. Dean—the Leptocardians, the Marsipobranchs, and the true Fishes or Pisces. The last two are arranged in the following table (p. 8):

A CLASSIFICATION OF FISHES.

Type: CHORDATA (VERTEBRATES).
- Class: MARSIPOBRANCHII, Lampreys, *Palæospondylus*, Hag, Lamprey, *Ostracoderms*.
- Class: PISCES (TRUE FISHES).
  - I. Sub-class: ELASMOBRANCHII, Sharks and Rays.
    - Order: *Pleuropterpgii* (Dean), *Cladoselachids* (Dean).
    - " *Ichthyotomi* (Cope), *Pleuracanthids*.
    - " Selachii, Sharks and Rays.
  - II. Sub-class: HOLOCEPHALI, Chimæroids, Spook-fishes.
    - Order: Chimæroidei, *Squaloraiids*, *Myriacanthids*, Chimærids.
  - III. Sub-class: DIPNOI, Lung-fishes.
    - Order: Sirenoidei, *Dipterids*, *Phaneropleurids*, *Ctenodonts*, Lepidosirenids.
    - " ? Arthrodira, *Coccosteids*, *Mylostomids*.
  - IV. Sub-class: TELEOSTOMI, Ganoids and Bony Fishes (Teleosts).
    - Order: Crossopterygii, *Holoptychiids*, *Osteolepids*, *Onychodonts*, *Cœlacanthids*.
    - " Actinopterygii.
      - Sub-order: Chondrostei (Ganoids), *Palæoniscoids*, Sturgeons, Garpikes, Amioids.
      - " Teleocephali, recent Bony Fishes (Teleosts).

In this table Dr. Dean claims to have 'retained in the main the classification of Smith Woodward,' but he has adopted the most prominent features from Prof. Cope. It expresses, too, the ideas of most morphologists, but it is questionable whether Dr. Dean has gone far enough in the valuation of some groups. The reviewer would be inclined to admit four classes exclusive of the Leptocardians.

The 'Marsipobranchii' might be split into two classes—the Marsipobranchii (properly classed) and the Ostracophori or 'Ostracoderms' as Dr. Dean calls them. The latter are very imperfectly unknown, and only by Prof. Cope had they been previously associated in the same class as the Marsipobranchs. By Woodward they were ranked as a special subclass of true fishes. The evidence for any allocation is defective but for the present the group may be given class rank and retain the name Ostracophori. It was originally named Ostracodermi, but that name having been preoccupied (in 1872) by Gill for the Ostraciids, the new name was later given by Cope. But although first distinguished as a *subclass* under the name Ostracodermi, the differences between the representatives of that subclass and the Arthrodira had been to a

considerable degree appreciated twenty years ago. The reviewer, in the article 'Ichthyology' in Johnson's Universal Cyclopædia (II., 1876) then gave the following arrangement of the extinct types:

'Super-order Dipnoi.'

'Order Sirenoidei.

'(?) Order Placoganoidei* (extinct).

'Super-order (?) Aspidoganoidei (extinct).

'Order Cephalaspidoidea (extinct).'

The 'Elasmobranchs' of Dean and Chimæroids have been segregated in another class named Selachians or Elasmobranchs, and the two main groups have been regarded as sub-classes—Plagiostomes and Holocephals.

The Dipnoans and the Teleostomes are scarcely separable as classes, although often kept apart as such. The Dipnoans and Crossopterygians lose some of their salient characters, as we follow them back in time, and have evidently diverged from a common stock. For the united group the class name Pisces, or Teleostomi, can be used.

Such are the opinions of the reviewer, but perhaps Dr. Dean acted wisely in accepting the classification adopted. The succeeding pages teem with statements challenging attention and often perhaps dissent. In almost all cases, however, weighty evidence could be urged in favor of the views adopted. There are few cases where we feel disposed to bring forward objections, but a comparison of ideas on some mooted questions may be of interest and use.

The 'explanatory tables' towards the end of the volume give facts respecting the 'skeletons of fishes' (pp. 252, 253), 'relations of the jaws and branchial arches of fishes' (pp. 256, 257), 'the heart of fishes' (260), 'a comparison of gills, spiracle, gill-rakers and opercula' (260, 261), 'digestive tract' (263), 'swim-bladder' (264), 'genital system' (266), 'circulation of fishes' (269), 'excretory system and urinogenital ducts' (270, 271), 'abdominal pores' (271), 'the central nervous system of fishes' (274, 275), 'the sense organs' (276, 277), etc.

These tables give a large amount of useful and tolerably well digested information illustrated by apt figures and arranged under the main groups of fish-like vertebrates, as Cyclostomes, Sharks, Chimæroids, Lung-fishes, Ganoids and Teleosts. But useful as the tables are, the ordinary reader will be liable to fall often into error if he allows himself to trust them too implicitly. The exceptions to the general propositions are very numerous. Examples of such are 'tail heterocercal' (p. 252) in Selachians, or 'Sharks' and Rays, 'operculum, pre-, sub- and inter-opercula,' in Teleosts, etc. (261), 'many pyloric cæca' in Teleosts (263), and air bladder in Teleosts as in Sturgeon (264) but 'may be absent (Pleuronectids).' Hosts of the fishes respecting which the characters in question are predicated differ from the majority in wanting them. The remarkably aberrant Lyomeres, indeed, want all.

The anatomical portion is generally satisfactory, so far as it goes, and, although we may sometimes differ from the author as to homologies, he seldom falls into absolute error, as he does, for example, in calling the ventral fins of Ophidium 'barbels' (p. 47). He may be congratulated on having divested himself of 'his former view that the pineal foramen of *Dinichthys* contained a specialized optic capsule' (55) and of a corresponding view respecting the 'pineal foramen' of Siluroids. Apropos of the Siluroids, we feel disposed to dissent from Dr. Dean's statement respecting 'the most complete encasement of a fish's body dermal plates' as manifest in callichthyids. He thinks that the two lateral rows of plates are the result of 'extended fusions, a single

* Placoganoidei was an ordinal name for the Placodermi with dipnoan dentition.

dermal plate enclosing the upper or lower division of the muscle plate of either side' (p. 26). It is not evident what reason he has for such a belief, and why the extension of single plates is not more probable; equally improbable is the explanation of the size of the 'dermal plates of the Seahorse' resulting from 'fusions' (p. 26). As a rule, enlarged scales result from individual extension, and not general aggregation. The mode is suggested by the varieties of carp alluded to by Dr. Dean (p. 26).

A short chapter on 'the development of fishes' is given, and, on the whole, the subject is well brought up to date. Dr. Dean thinks that the data of embryology are 'very inconclusive' with reference to the successively increasing complication of structure, if at present in any way suggestive (p. 180). This is certainly the case if reference is had only to external features. 'Adaptive characters have entered so largely into the plan of the development of fishes that they obscure many of the features which might otherwise be made of value for comparison' (p. 180). Such being the case, we have no right to expect very much from superficial characters. It is the study of the anatomy, and especially of the developing bones, that will ultimately give useful hints. Indeed, only from a survey of the detailed comparative anatomy of the successive stages of the developing fishes have we a right to look for light on some questions of relationship and phylogeny. For instance, we should not expect much more guidance from mere externals of the various stages of '*Ceratodus*' than the illustrations actually give. Here it may be added that we are indebted to Dr. Dean for giving the results of such very recent work as that of Semon.

The nomenclature of Dr. Dean's work is mostly in accord with current American usage, so far as the American species at least are concerned, but sometimes that current in Europe is adapted, as *Bdellostoma* (61) instead of *Heptatrema*, *Cestracion* (85), for *Heterodontus*, *Læmargus* (91) for *Somniosus*, *Rhina* (91) for *Squatina*, '*Butrinus*' (258, 260, *Butirinus*) for *Albula*, etc. Sometimes there is a discrepancy resulting, perhaps, from the fact that the author may not have been fully aware that his names referred to the same form as *Squalus* (89) and *Acanthias* (216).

The numerous (344) figures are generally well selected and illustrate morphological and other data. Some, however, as most derived from Agassiz's and Pander's works and that of *Pleuracanthus* (90), might have been supplanted by later and better ones. A few, also, have been misplaced or misnamed, as 29, which really represents *Aetobatus* and not *Trygon*; 172 depicting *Bathyonus compressus*; 173 representing *Notacanthus sexspinis*; 174 representing *Paraliparis bathybius*, and 182 illustrating *Microgadus tomcodus* and not *Gadus morrhua*.

The most serious omission in the 'Fishes, living and fossil,' is of most of the living forms. Somewhere near 10,000 of those are Teleosts, and only about 350 living species belong to the other divisions. Nevertheless the systematic consideration of the Teleosts is condensed within 13 pages (165–178), and no idea is given of the range of variation and the diversity of that large group. The Cyprinoideans, the Characinoideans, the Cichloideans and the Percoideans, which constitute so large an element of fresh-water fishes, are not even mentioned as such. In the tables of 'classification' and 'distribution * * * in geological time' (pp. 8, 9) only six groups (Teleocephali, Clupeoids, Salmonids, Perches and Berycids, Siluroids, and 'Gadoids and other Teleosts') are named. Surely the student would reasonably expect to find more in a work entitled as it is.

Mention having been made of the 'Teleocephali,' it may be added that the group

so called is by no means identical with the Teleosts, as stated (pp. 8, 165). The Teleocephali are an order of the sub-class of Teleosts restricted to such as have typically complete intermaxillary and maxillary bones and cranial in number exemplified or closely approximated by the Perch; it thus contrasts with the Nematognathi, the Apodes, and others.

The Nematognaths are considered by Dr. Dean, as by most old authors, to be 'closely akin to the Sturgeon' (p. 147), and, indeed, it is claimed that the Catfish 'is, perhaps, a direct descendant of some early type of Mesozoic Palæoniscoid' (p. 171). The same idea is also expressed in the exhibit of 'the phylogeny of the Teleostomes' (p. 166), where the 'Siluroid' branch is interposed between the 'Sturgeon' and 'Amia' and well separated from the 'Physostome.' It is likewise declared that 'their armouring is metameral and archaic, their sensory canals primitive in structure and arrangement' (p. 172). All this may be quite in accord with what has been believed by the most learned ichthyologists of old, but can be now known to be baseless. The Siluroids have no direct relations with the Sturgeons, the Coccosteids, or any of the extinct ganoid fishes, and are undoubtedly derivatives from the same stock as the Characinids and the Cyprinids. The armature, instead of being archaic, is of secondary development. The fishes themselves are more specialized and therefore more distant from the Ganoids than the Characinids and various other forms. The entire structure, including brain, vascular system, skeleton, weberian ossicles, air bladder, and morphological development generally, proves this and in turn is illustrated by this conception of their relationship. The similarity in appearance of Loricariids and Acipenserids, great as it is, is entirely superficial and illusive and should no longer be allowed to mislead. While referring to the Siluroids, it may be added that there is more than a 'single European species, *Silurus glanis*' (p. 171). There is another concerning which many data were published over 2200 years ago—the true Glanis of the Greeks and of Aristotle especially, the *Silurus*, or *Parasilurus Aristotelis*. Although this Greek fish has generally been supposed to be identical with 'the gigantic Wels of of the Danube,' it was, as declared by Agassiz 40 years ago, and demonstrated lately by Mr. Garman, a very different species.

Dr. Dean's misconceptions respecting the Siluroids are those of others. He declines to go to the extremes of some others, and very properly notes (p. 64) disbelief in the 'cirrhostomial origin [ascribed] to the mouth parts of a Teleostome (catfish).'

Some of the statements as to distribution and extent of groups may mislead. Of the Mormyrids, or genus *Mormyrus* as Dr. Dean calls the group, it is said, 'its species are restricted to the Nile' (p. 172), whereas species occur in all the rivers of tropical Africa. Of the *Anacanthini*, it is claimed 'that as many, perhaps, as one-quarter of the existing genera of fishes may be assigned to this type' (p. 174): in fact, the *Anacanthini* are comparatively few in number, especially if properly restricted. It is also said that 'of existing fishes about one-half are essentially percoid' (p. 174) and this also is a very much exaggerated statement.

The care which Dr. Dean has taken to bring his work up to date has already been adverted to in connection with Semon's researches on the embryology of *Neoceratodus*. Another example is found in the incorporation of the latest news about the earliest 'cyclostome.' References to recent memoirs (1890–92) on that interesting form are given (p. 238), and an illustration is reproduced (p. 65). We can scarcely agree with Dr. Dean, however, that it 'seems undoubtedly a lamprey;' apparently it represents not

only a peculiar family (*Palæospondylidæ*), but a distinct order which may be called CYCLIÆ.

Only one other feature of Dr. Dean's work can be noticed. The volume is gracefully introduced and its scope indicated in the words of Aristotle—"*Τῶν δ'ἐνύδρων ζώων τὸ τῶν ἰχθύων γένος ἕν ἀπὸ τῶν ἄλλων ἀφώρισται*"* —and it is supplemented with a 'list of derivations of proper names.' There is, however, evidence of misconception of many etymologies, and corrected forms are here given of some of the names, leaving aside those that are substantially correct. Nevertheless it may be well to remark that the author need not have added adjective terminations for such words as 'fin(ned),' 'tail(ed),' 'tooth(ed),' 'bone(d),' 'spine(d),' and the like; they were correct without those endings and perfectly in harmony with such English words as Redfin, Hardtail, Fantail, Dogtooth (*Dentalium*), Greenbone, Porcupine and Spineback and such ancient Greek names as *δασύπους*, *περκνόπτερος*, *ἵππουρος*, *μελάνουρος*, and *σινόδων*. It is in this way that men naturally frame new names for such subjects.

The means for ascertaining or confirming the etymologies of many scientific names are, perhaps, not available for all who might desire to ascertain them, and they are often wrongly analyzed. To aid such inquirers is the aim of the following lines. If a scholarly man like Dr. Dean has found so many obstacles to correct information, less accomplished men must find the way still more difficult.

Acipenser is not from '*ἀκπήσιος*, classic name of Sturgeon,' but is the old Latin name itself; both names were in use. According to Athenæus (VII., 44), "the accipesius, the same as the acipenser, or sturio, is but a small fish in comparison, and has a longer nose, and is more triangular than the galeos in his shape."

Alopias is not, of course, a transliteration of '*ἀλωπεκίας*, classic name of the fox shark,' and the name has been replaced with *Alopecias* by many zoölogists (Müller and Henle, 1838,* Richardson, Günther, and various text-books). There is, however, no reason why the veriest purists should not accept *Alopias*. Rafinesque might have preferred to make the name directly from *ἀλωπός* (=*ἀλώπηξ*) and the terminal element *ίας* (in analogy with *ἀλωπόχρους*, fox-colored) and had a perfect right to do so.

Amia, it is too true, was misnamed after '*ἀμία*, classic name of tunny (?),' but, although *a* tunny, the *ἀμία* was not *the* tunny. There can be no doubt as to what the ancients meant by *ἀμία*, and the old name was correctly referred nearly three centuries and a-half ago by Rondelet, while the correctness of the identification was confirmed by the most scholarly of later ichthyologists (Cuvier). Nevertheless, the fact appears to have been frequently forgotten of late and, therefore, reiteration with additional evidence will not be superfluous. The *ἀμία* was unquestionably the bonito of the books at least—the *Sarda sarda* of scientific nomenclature. Only this could have been the tunny-like form which had strong teeth which it could use successfully against sharks and in cutting the ropes of nets,† and which had a gall bladder stretched out upon the intestines and equal to them in length.‡

It was the bonito which, according to Archestratus.

"Towards the end of autumn, when the Pleiad
"Has hidden its light ———"
Was in season;
"——— then dress the amiæ

*The quotation from Aristotle occurs in the first paragraph of the ninth chapter of the second book of most editions of the *Περὶ ζώων ἱστορία*.

* Müller and Henle subsequently adopted *Alopias*.
† Aristotle, IX., xxv., 5.
‡ Aristotle, II., xi., 7.

"Whatever way you please———"

"For then you cannot spoil it if you wish."

It was the bonito which Epicharmus sang when he provided for the festive board

"——— large plump amiæ

"A noble pair i' the middle of the table:"

The etymology of *ἀμία* itself was given by Aristotle, according to Athenæus; the species was called *Amia* from its going in shoals with companions of the same kind.*

Amiurus is from *ἀ*, privative, and *μείουρος*, curtailed, and not from "*ἀμία*, Amia, *οὐρά* tail(ed)."

Ammocœtes is not derived from '*ἄμμος*, sand, *κοίτη* (a bed),' which would mean sand bed, but from *ἄμμος*, sand, and *κοττος* [*κοίτη* does not have the double meaning '(a bed) abider.'] What might have been intended, was sand abider—*ἄμμος* and *οἰκητής*—which should have been rendered *ammœcetes*, and *ammocœtes* would then have been a simple case of metathesis. (The same lapsus, but in an aggravated form, is seen in the case of two well-known genera of birds—*Pediocœtes* and *Poocœtes*.) But unfortunately for the hypothesis Duméril sanctioned and adopted the name *Ammocœtus* and the etymology from *ἄμμος* and *κοῖτος*, 'séjour, *cubile*.'

Arthrodira is composed of *ἄρθρον*, joint and *δειρή*, neck (not '*δίς*, double'), and is so called on account of the joint-like connections between the head and body armature.

Belonorhynchus is framed directly from *βελόνη*, a point or needle (*not* 'classic name of garfish'), and *ῥύγχος* snout. The ancient greek *βελόνη* was undoubtedly the pipefish, but the name in recent time has been perverted to the garfish.

Calamoichthys is from *χάλαμος* (rather than lat. 'calamus'), reed, and *ἰχθύς*, fish; *Calamichthys* would have been preferable because shorter, and accord with classic words, such as *χαλαμ–αύλης*, etc.

Carassius is a latinized form of Karass, or Karausche, the German name of the *C. carassius;* not from '*χάραξ*, classic name of (sea)fish.'

Cestracion is not from '*χέστρα*,* classic name of (pavement-toothed) sea fish,' but from *χέστρα*, a broad-headed poleax (or 'malleus, malleator,' according to Klein). Klein applied the name to the hammer-headed sharks, and it was first misapplied by Cuvier to the genus previously named *Heterodontus* by de Blainville. The fish named *χέστρα* by the Greeks was better known as the *Sphyræna*.

Chlamydoselachus was the original and proper form of the genus called *Chlamydoselache*. *Σελάχη* is the plural form and therefore improper; *σέλαχος* is the singular. Probably Dr. Dean was misled by Dr. Günther, who changed it to *Chlamydoselache*, and he was probably misled by Cuvier, who gave the name *Selache* to the basking shark.

Cladoselache should have been called *Cladoselachus*.

Coccosteus is from *κόκκος*, berry (not '*κόκκος*, rough like a berry') and *ὀστέον*, bone.

Cyclostomata is a compound of '*κύκλος*,' circle, (not 'circular'), and the plural of '*στόμα*, mouth.'

Dipnoi is not from '*δίπνοος*, double breathing,' but *δίπνοους*, with two breathing apertures. The word occurs in Galen.

Erythrinus is not directly from '*ἐρυθρός*, red-colored,' but from *ἐρυθρῖνος*, the old Greek name of the *Pagellus erythrinus*, and was misapplied to the American genus in sequence of a vicious habit which Linnæus

* *παρὰ τὸ ἅμα ἰέναι ταῖς παραπλησίαις.* Athenæus, VII., 6.

* *κέστρα*, in the old editions of Liddell and Scott's 'Greek-English Lexicon' (*e. g.*, 1864, p. 755), is defined '*a fish* held in esteem among the Greeks, doubtful whether *a pike* or a *conger*, Epich. p. 36, Ar. Nub. 339;' it is properly defined in later editions (*e. g.*, 1883).

and some others cultivated of using classical names for forms entirely unlike those for which the names were originally used.

Fierasfer, according to Cuvier, was the name current at Marseilles of the type species; therefore the 'derivation of Cuvier [was not] uncertain, perhaps, from proper name.'

Gadus is not 'the classic name of the cod,' which was practically unknown to the Greeks and Romans. The name does not occur in Aristotle, but in Athenæus (VII., 99), the words 'the ὄνος, which some call γάδος,' are quoted from Dorion. The name *Onos* seems to have been used in ancient Greece for the *Micromesistius poutassou* (*Gadus poutassou* of Risso), which now is called, in Greece, *Gaidouropsaron* (donkey-fish), or *Tsiplaki*. *Gadus* was first used as a generic name for the Gadids by Artedi, and subsequently limited, by exclusion of others and by definition, to the common cod and its congeners.

Ganoid is from γάνος, brightness, lustre, and εἶδος, appearance; not 'γάνος, enamelled.'

Hyperotreta (not Hyperotretia) is the better name of the order in question.

Ichthyotomi refers not 'to the distinctness of this group,' but to the alleged segmentation of the skull.

Lœmargus was not the 'classic name of a shark,' but derived from λαίμαργος, gluttonous. The name was applied by Müller and Henle to the genus previously called *Somniosus* on account of the character given by Scorseby to the type species.

Lepidosiren is from λεπίς, scale, and Siren, the name given by Linnæus to an eel-shaped amphibian, not a 'salamander.'

Ophidium is the Linnæan improvement of Ophidion of Pliny (XXXII., 35, 53); not ὀφίδιον, a snake.

Ostracoderm is simply the English form of ὀστρακόδερμος, hard skinned, from ὄστρακον (not ὀστράκιον), shell, and δέρμα, skin.

Protopterus is from πρῶτος, first or primitive (not 'ancient'), and πτερόν, fin.

Scomberomorus is from σκόμβρος, mackerel, and ὅμορος, neighbor, and not 'μόριον, part.'

Selachii is a new Latin equivalent of σελάχη (plural of σέλαχος), cartilaginous fishes generally,* and not 'σελάχη, shark.'

Teleocephali is from τέλεος, complete, and κεφαλή, head; not 'τέλεος, entirely, ὀστέον, bone, κεφαλή, head.' The cephalic bones are not reduced in number or proportions as in the Nematognaths and Apodals.

Teleostomi from τέλεος, complete, and στόμα, mouth; not 'τέλεος, entirely, ὀστέον, bone, στόμα, mouth.' Intermaxillaries and supramaxillaries are normally developed.

Other names whose etymologies require more or less emendation or explanation are *Ammocœtes*, *Anacanthini*, *Anguilla*, *Callichthys*, *Callorhynchus*, *Chimœra*, *Climatius*, *Crossopterygii*, *Dipterus*, *Elonichthys*, *Gyroptychius*, *Harriotta*, *Hemitripterus*, *Heptanchus*, *Hippocampus*, *Holoptychius*, *Ischyodus*, *Lamna*, *Mormyrus*, *Myliobatis*, *Mylostoma*, *Myriacanthus*, *Myxine*, *Palœoniscus*, *Parexus*, *Perca*, *Petromyzon*, *Phaneropleuron*, *Plectognathi*, *Pleuracanthus*, *Pogonias*, *Pristiophorus*, *Pristis*, *Protopterus*, *Pseudopleuronectes*, *Pterichthys*, *Raja*, *Rhabdolepis*, *Rhina*, *Rhinobatus*, *Scaphirhynchus*, *Scyllium*, *Silurus*, *Sirenoidei*, *Squalus*, *Squatina*, *Torpedo*, *Trachosteus* and *Trygon*. Interesting questions are involved in some of these names, but our already overcrowded space forbids lingering over any one of them.

The length to which this review has extended must be evidence of the importance of Dr. Dean's work. The suggestions here offered may be of use for another edition. That another may be called for, we may hope. For the work as it is and for the care and thought bestowed on it our thanks are due.

THEO. GILL.

*The Σελάχη are those which have been mentioned [βάτος, τρυγάν, ῥίνη]; and the βοῦς, λάμια, αἰετός, νάρκη, βάτραχος, and all the γαλεώδη' (Aristotle, V., iv, 2.) In other words, the Selache include all the Sharks, all the Rays, and the acanthopterygian *Lophius*.