just short of Kircher's clause in which he attributes this theory to Mercurialis.

Mercurialis, a celebrated Italian physician, who lived from 1530 to 1607, was one of the encyclopædic writers typical of the period. I have searched the available volumes of his works, including several editions of his extended treatise on the cause and nature of the plague.[2] So far I have failed to locate the reference in question, but it is evident that Kircher was indebted to Mercurialis for the suggestion.

The statement of Mercurialis can be regarded as no more than a lucky guess, but to Kircher we must give more credit. This astute Jesuit, born in 1601, was an indefatigable worker, and his writings are much more than mere compilations. There is no doubt that long before Leeuwenhoek's discovery Kircher had seen the larger species of bacteria, which he described in the following words:

> It is known to all that decaying bodies abound in worms, but not until after the wonderful invention of the microscope was it found that all putrid substances swarm with an innumerable brood of worms which are imperceptible to the naked eye, and I would never have believed it if I had not proved it by frequent experiments, during many years.[3]

Among the substances in which he found these "worms" he mentions spoiling meat, cheese, milk, vinegar and decaying serpents. He does not stop with the mere discovery, but he attributes the production of disease to the organisms, and formulates a theory of the animate nature of contagion. Interpreted in this light, the statement of Mercurialis assumes a new dignity. The germ theory of disease, which became dominant so soon after this period, fell into disrepute, to be revivified in the latter part of the nineteenth century. Only now are we putting to the test the theory of Kircher relative to the rôle which flies play in the dissemination of disease.

[2] "De pestelentia in universum, præsertim vero de Veneta et Patavina," Venice, 1577.

[3] "Scrutinium Physico-medicum," 1658 ed., p. 42. This is one of many references which might be cited. In his book "Ars magna lucis et umbræ," published twelve years earlier, there is to be found mention of these "worms," showing that Kircher's observations really had extended over "many years."

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Scientific Books

A Treatise on Zoology. Part IX. (Oxford Zoological Series). Vertebrata Craniata. First Fascicle—Cyclostomes and Fishes. By E. S. Goodrich. London, Adam & Charles Black. 1909. Pp. 518, 515 figs.

This is an advanced hand-book, scholarly in treatment and brimful of facts, bringing up to date the knowledge of a growing subject. It embodies also a number of original results which for the most part are based upon anatomical data: its facts are marshalled convincingly: many of its sections are admirably treated, especially those on the theme of bone, paired-fins and urogenital system. It considers fishes fossil as well as recent: its weakest side is its treatment of the results of embryology. The illustrations are numerous, usually well selected, scores of them original and important. From the book-making standpoint, the work is the equal of those which have preceded it in the Oxford series: among details one may be mentioned which may seem trivial to a strong-wristed reader—the paper, though apparently heavy, does not weigh pounds as in the case of several hand-books newly published in the United States.

Goodrich's book, in a word, is a very valuable contribution, and its preparation must have proved a formidable task. Weak spots it has, however, and reviewers will not fail to discover them. The fact is one should hardly expect that a single writer could follow the literature of so broad a subject without an occasional slip. As it is we may safely say that Goodrich has accomplished a conspicuously better task than any of his predecessors. We may pass over proof errors, which are not rare but of the usual type, and as we thumb over the pages point out such defects as these: "Myxinoids are normally hermaphrodite," the author not knowing, apparently, that the early findings in this matter are discredited. *Læmargus,* the great Greenland shark, does not "fertilize the eggs externally" as Turner

and Lütken believed. Jungersen has shown conclusively that these early findings were based upon immature specimens. I know of no trustworthy evidence that the whale-shark "realizes the length of some seventy feet": it probably does not exceed fifty feet or thereabouts. There is, as far as I am aware, *no* "embryological evidence that the hyomandibular element in *Holocephala* has fused with the skull." The early forms like *Pterichthys* are not, I am convinced, separated from Coccosteids on the grounds which are instanced, pp. 260–261, though this is a matter upon which opinions of specialists may differ. "*Palæospondylus* can not be a larva on account of the centra present," but it is none the less a fact that larval forms, fish or amphibian, are not uncommon in which well-grown centra are present. Goodrich again assumes a "pineal eye" in petromyzonts, though it is only fair to admit that this organ may not *sensu stricto* be an eye at all, perhaps it is a temperature-appreciating organ, for one can hardly call an organ an "eye" in which a dense screen of pigment separates the image—if there be an image—from the sensory cells. On page 125 we read that "the main lateral line of the trunk runs forward on to the head": a better reading perhaps would have been that the main lateral line runs backward from the head, in view of the development of this organ. It is stated that the "yolk-sac of the Selachian protrudes from the ventral surface of the embryo often after birth," a condition which, I believe, does not normally occur. At least I have observed that in six species (in three different families) the young show at birth nothing more conspicuous than a scar to mark the disappearance of the sac.

In several details of terminology I am not sure that Goodrich has lessened our troubles. In certain cases he has created a series of popular names for groups whose technical names are already widely accepted, in some cases classic. Thus why should we adopt "Petromyzontia" and "Myxinoidea" for the well-known Müllerian names Hyperoartia and Hyperotreta? Nor is he consistent in his effort toward popularization, when he devises complicated technical names where simpler ones seem adequate. Thus in the matter of the fin supports of fishes he usually discards the well-known "radials," "basals" and "actinotriches" (or plain "dermal rays," to distinguish them from obvious skeletal rays), for such new names as "dermoptrichia," "somactidia," "lepidotrichia." Indeed it is not quite clear that these terms are as specific as the author implies. We query whether the criterion of their homology is to be based upon the details of structure instanced, for we recall that the homology of the bones of teleosts can not be determined on such finely-spun histological distinctions. Indeed, Goodrich himself reverts to the homely "radials" and "basals" when he is not on his guard (p. 302). He occasionally uses names for various structures which are far more questionable in point of homology than the fin supports noted above. Thus he refers throughout to "clavicle," "coracoid" and "scapula" in fishes, although specialists by no means agree as to their homologies in the cheiropterygian girdle.

His treatment of the teleosts will not escape criticism. Certain it is that he has cut several of the Gordian knots in which the despairing phylogenist has been entangled. Thus, undaunted by convergence, he adopts numerous (about twenty) group-names ending in "formes"—Notacanthiformes, Perciformes, Beryciformes—and from this point of view gives us a very useful summary of the groups, perhaps the best of its kind. This mode of treatment has clearly the merit of convenience—too great convenience, perhaps, for we doubt whether it expresses adequately our present knowledge of teleostean interrelationships.

BASHFORD DEAN

A Hand-list of the Genera and Species of Birds. (Nomenclator Avium tum Fossilium tum Viventium.) By R. BOWDLER SHARPE, LL.D., Assistant Keeper, Department of Zoology, British Museum. Volume V. London, printed by order of the trustees. Sold by Longmans & Co., 39 Paternoster Row,