the rate and amount of reproduction in water as they do upon land.

The question of the biological stratification of the haliplankton is treated at length. Investigation has shown that the marine phytoplankton is mainly limited to a relatively thin superficial region about 200 m. in thickness and that it ceases to grow below 400 m. The zooplankton on the other hand descends, in the opinion of many investigators, to greater depths, feeding upon the débris of the phytoplankton and upon cadavers, descending from the more densely populated zone above. The *Valdivia*, which made but few hauls at great distances from continental influence or away from great currents, found evidence in closing net catches of animal life extending to great depths.

Steuer's presentation of Agassiz's results and conclusions in this contested matter is far from adequate. He designates the Pacific as "sehr planktonarme" and "wenig günstig" for the examination of this question of the extent of life below 400 fathoms. The plankton of the Pacific is certainly as rich in large areas and probably no poorer in others than that of other oceans, while the oceanic conditions it presents for investigation could hardly be more typical or more favorable for the determination of this question. Nor is Steuer's statement that Agassiz's admission of the existence of a true bathybic plankton is to be accepted as placing him in accord with his opponents, to be regarded as either adequate or critical, for Agassiz limited this bathybic plankton to regions of continental influence and to territories below richly laden currents. Furthermore, to characterize Agassiz's discoveries of so-called deep sea animals, such as *Pelagothuria* and fishes as "gelegentliche Auftretungen" of the bathybic fauna in the upper levels of the sea is to dismiss a mass of evidence with a wave of the hand.

The horizontal divisions and the geographical and seasonal distribution of the plankton are discussed at length and its relation to the economy of nature and to man are analyzed. Under the latter caption attention is called to the relation of those occasional outbursts of species resulting in discolored seas and disturbances in the balance of nature, to plankton as a source of food for man and for fishes, to pond culture, to purification of polluted streams, to fish culture, to plankton as an index of productive capacity of water, and to the relations of plankton organisms to education, research and the fine arts.

A compiled work of this sort, the first in its field, is necessarily incomplete and imperfect. Noticeable omissions in both works are the Lucas sounding machine, Whipple's thermophone, Nathanson's discussion of the relation of vertical circulation to the problem of maintenance of fertility of the sea, Petterssen's, Ekman's and Nansen's contributions to facts and theories of oceanic circulation, Bauer's work on vertical migrations, and, in general, an occasional lack of perspective in dealing with the results of Scandinavian, English, French and American literature of the subject—defects easily remedied in a new edition. Dr. Steuer has done a great service in putting in so concise and compact a form the most striking and many noteworthy achievements in the field of planktology. The illustrations are numerous, usually good and well-executed. Exception may be taken to inverted figures of *Ceratium* (p. 476) and to an inverted figure from Okamura of a crushed Peridinian labelled *Gonyaulax polygramma*. Much better figures of this species have long been available.

The second work is an abridgment of the first, omitting some of the illustrations, the extensive bibliographies and some of the more technical treatment of the chemistry and physics of water and some of the details of the discussion of the seasonal distribution of the plankton.

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The Realm of Ends or Pluralism and Theism: The Gifford Lectures Delivered in the University of St. Andrews in the Years 1907–1910. By James Ward, Sc.D. (Camb.), etc., Fellow of the British Academy and of the New York Academy of Sciences, Professor

of Mental Philosophy, Cambridge. New York, G. P. Putnam's Sons. 1911. 8vo. Pp. xv + 490. Price, $3.00 net.

It was inevitable that the Gifford foundation for "natural theology" in the four Scots universities should produce some notable books, one or two bad books, and non-significant books not a few. Professor Ward's Aberdeen lectures of 1896–98, published under the title, "Naturalism and Agnosticism," have taken rank in the first class long since, as three editions attest. They embody a criticism of the Spencerian type of thinking, so astute and resourceful that, possibly, the assault need never be undertaken again. The present lectures are no less important, but, unlike their predecessors, they travel far from the beaten track of the "positive" sciences. It is the more necessary, then, to describe their contents fairly for readers of SCIENCE.

In the decade that has elapsed between the two courses, the fortunes of the "mechanical theory" have tended to sink lower and lower, so much so, that the spirit of revolt against it may be said to dominate contemporary philosophy, particularly in France, and this with scarce a protest, certainly with no effective protest, from the scientific camp; nay, if anything, with approval—witness McDougall's recent "Body and Mind." But, if the "mechanical theory" be thus relegated to the limbo of discards, we are confronted forthwith by a new situation. We must try "to ascertain what we can know, or reasonably believe, concerning the constitution of the world, interpreted throughout and strictly in terms of Mind" (p. v). Professor Ward's new work is a candid attempt to face this problem, and to think it through. Accordingly, its plan and main contents are as follows:

Part I. is a most adequate discussion of pluralism. After two introductory lectures (I., II.) and a discourse on the fundamental nature and contemporary ascendancy of this theory (III.), the author analyzes contingency in the world (IV.), evolution (V.) and the pluralistic goal (VI.). He then devotes two lectures (VII., VIII.) to Hegel—"it must be confessed, largely a digression" (p. vi). Part I. ends with critical treatment of the limits and difficulties of pluralism (IX., X.), whence Part II., Theism, originates. "For pluralism, though empirically warranted, we find defective and unsatisfactory; but the theism to which it points is only an ideal—an ideal, however, that, as both theoretically and practically rational, may claim our faith though it transcend our knowledge" (pp. v, vi). Here Professor Ward plunges *in medias res* at once, with discussion of the idea of creation (XI.), and of the cosmology of theism (XII.). Investigations of freedom and foreknowledge (XIII., XIV.) follow. Lectures XV.–XVII. deal with the problem of evil in its relations to pessimism, optimism and the moral order. Lecture XVIII. presents theories of a future life and, as a pendant, we have a chapter on faith and knowledge (XIX). The concluding lecture, the Realm of Ends, is in the nature of a summary, and may be read as an introduction to the book. Twenty-seven pages of supplementary notes (on contingency, creation, the relation of body and mind, the temporal and the eternal, and the divine experience), and an adequate index, complete the volume.

In view of the subjects discussed, it is well, perhaps, to add by way of elucidation, if not warning, that Professor Ward has always kept in view the condition laid down by the founder. Lord Gifford's will contains this direction:

> I wish the lecturers to treat their subject as a strictly natural science, . . . without reference to or reliance upon any supposed special or exceptional or so-called miraculous revelation. . . . They may freely discuss all questions about man's conceptions of God or the Infinite, their origin, nature, and truth, whether he can have any such conceptions, whether God is under any or what limitations, and so on.

This is precisely what Professor Ward has done; and, to quote the words of the first lecturer on the foundation, Max Müller, the book "must be reckoned among the signs of the times, pregnant with meaning." For it is the latest pronouncement, not simply of a veteran, but of one of the ripest and, from the scientific point of view, best equipped, among living thinkers.

Taking the work as a whole—for space forbids detail—the following remarks and excerpts may help to indicate its attitude and quality. Dr. Ward adopts the pluralistic position in pragmatic fashion. He insists that, as a matter of fact, we do start from a plurality of existing things. On the other hand, he nowhere affirms these things to be self-subsisting and, to this extent, leaves a convenient loophole. The most interesting result, from the scientific standpoint, is, possibly, the interpretation of evolution. "It is often applied to processes that are diametrically opposed, to the differentiation of a unity and to the integration of a plurality (97). . . . To the supposed unfolding of an organism regarded as completely pre-existing in miniature within the germ. . . . The successive unfolding of such a system, . . . though the *ne plus ultra* of evolution literally understood is then the direct negative of evolution as we understand it to-day. According to this later theory each new organism is not an 'educt,' but a 'product,' to use Kantian phrases: its *parts* are in no sense present in the embryo, but are gradually organized, one after another, in due order, as the term epigenesis implies and as Harvey, who first used the term, prophetically maintained (98). . . . It is the parts, the many, with which the pluralist starts: the question, whether or no there is an absolute whole prior to—at once the logical and the real ground of—all the parts, is for him not the first question but the last" (101). Plainly, the pluralist is tied to epigenesis: "The life-history of the race is original, is a long process of gradual acquisition by way of trial and error, in short, answers to what we have identified with *natura naturans;* whereas the genetic history of the individual is a derivative, rapid and, so to say, substantially invariable process, in a word, is routine or *natura naturata*" (207). Yet, even so, pluralism has its own difficulties. An "absolute plurality" "would be merely a sporadic manifold of realms of ends having a common physical basis but devoid of all teleological continuity (185). . . . A Supreme Spirit confronted and conditioned by free agents certainly does not correspond to the notion usually entertained of the Deity. Such a 'finite God' many would disown as a manifest contradiction in terms; yet beyond this it does not seem possible for the pluralist to go" (194). Nevertheless, pluralists would deny that evolution requires a transcendent Prime Mover distinct from the Many: for the Many they hold are all prime movers, and so far *causæ sui*. . . . The efficient causation in the world then is just this totality of prime movers, its final causation their organization into a higher unity" (199). That is to say, singularism, with its Absolute, is not the sole alternative; nor is scepticism the consequent recourse; therefore the contradictions as between the One and the Many remain to be overcome. The lectures on Theism offer the solution, or considerations towards it.

Theism "introduces one essential modification, at any rate, viz., the idea of creation. It does not, that is to say, assume merely that one transcendent Being exists above and beyond the whole series of the Many, however extended; but it assumes further that this one Being is related to them in a way in which none of them is related to the rest: they do not simply coexist along with it, they exist somehow in it, and through it" (231). This implies the difficulty, admitted to be insuperable (245), of the self-limitation of Deity. Hence, turning again to experience, "between the intemporal world of ideas and the temporal world of phenomena, free agents have their place" (306). Accordingly, the ideal realm of ends is "the achievement of virtuous struggle crowned eventually with victory" (374). Consequently, as to immortality and faith, "death becomes indeed but a longer sleep dividing life from life as sleep divides day from day; and as there is progress from day to day so too there may be from life to life (407). . . . Hence the moral ideal, as it leads to faith in God, leads also to the belief that the spirit world has other dimensions than those of the time and space that encompass the world of phenomena. . . . Has not God been mocked and life called the vanity of

vanities on the assumption that the present world is all?" (429).

Despite my radical dissent from Dr. Ward's pluralism, with its concessions to what I am bound to call irrationalism, his book has made a profound impression upon me. It is a work which any man may well peruse as a discipline in self-education, and this without reference to the field of his specialty. Assuredly, we have to thank Dr. Ward for a human, and therefore significant—often a wise—pronouncement. A main portion of the charm of the work is traceable to the skill shown by the author in conferring distinction upon the commonest things.

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BOTANICAL NOTES

THE PASSING OF THE SLIME MOULDS

DE BARY, whose keen botanical perception has perhaps never been equalled, long ago discarded the name Myxomycetes for the slime moulds, significantly applying to them the name Mycetozoa, and then placed them outside the limits of the vegetable kingdom, greatly to the consternation and indignation of many fungologists of the old school. The latter, relying upon external characters, associated them for a long time with the puffballs among the higher fungi, implying a relationship whose impossibility is now manifest to the merest tyro in botany. Latterly they have been pushed down into the neighborhood of the schizophytes (blue-green algæ, and the bacteria), as is done by Engler in his "Syllabus," but he takes particular pains to disclaim any relationship with the true fungi (*Eumycetes*), or higher plants.

More than thirty years ago the writer of this note said of them "they have no structural affinities with plants higher than they are, nor with any lower; they stand alone, and appear to belong to a different genetic line" ("Botany," p. 207), although in deference to the views as to their nature then prevalent they were still included among plants. By speaking of them as "a group of remarkable organisms which differ in many respects from all other vegetable structures," and by comparing them to certain Protozoa the attempt was made to educate the reader to regard them as aliens instead of true plants. In later publications they have been omitted as no longer necessary to be spoken of in a systematic arrangement of plants.

The final disappearance of these animals from the domain of botany seems now imminent, for in the new (eleventh) edition of the Encyclopaedia Britannica they are treated under De Bary's name of Mycetozoa, with the introductory defining phrase "in zoology, a group of organisms reproducing themselves by spores." The whole treatment, which is by J. J. Lister, is zoological, and no doubt is expressed as to their animal nature. We may now look for an approaching general revision of our botanical text-books so as to omit the Mycetozoa, greatly to the relief of the scientific botanists who have long been sorely puzzled to find a proper niche in which to fit them in the vegetable kingdom.

It will now be necessary for the zoologists to prepare to take charge of the considerable number of Mycetozoa to which they fall heir. It behooves the botanists to generously remove the specimens of these organisms from the pigeon-holes of their herbaria, and turn them over to the zoologists to be placed by them on the museum shelves devoted to the Sarcodinia among the Protozoa. And further it will become necessary for the librarians to revise their system of classifying botanical and zoological books so as to make the proper transfers upon their shelves and in their card catalogues. When all this is done the botanists may feel that they are well rid of these animals that have too long roamed quite too freely in the botanical garden. The "slime moulds" will have passed from the domain of botany, and there will remain in their stead only the "fungus animals."

THE SECRET OF THE BLUEBERRIES

IF to make "two blades of grass grow where but one grew before" has been regarded as a laudable undertaking, what shall we say of the successful effort to make blueberries grow