

which weathers rapidly into rounded grains. About 1 per cent. of these grains were found to be conodonts. This is the highest known stratigraphic occurrence of the conodont group.

The Phosphoria types are peculiar and are apparently senile specializations of a rapidly declining group. They seem to bear the same relationship to other conodonts that the late Cretaceous ammonites do to other ammonoids and that Silurian and Devonian trilobites do to other trilobites. There are at least two types of ribbed spoon-like teeth and one type of plate-like tooth with longitudinal lines of denticles. Simple conical forms are abundant. The species will be described and figured in a later paper.

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ACADEMIC FREEDOM IN ITALY

NEXT summer the International Physiological Congress is scheduled to meet in Rome. In this connec-

tion I wish to call the attention of the members of the Federation of American Biological Societies, who are members of this congress, to the official edict issued by the Italian government on October 8, 1931, compelling all professors in Italian universities to swear allegiance to the Fascist régime. As announced in *School and Society* for January 9, eleven university professors out of 1,225 have refused to take this oath of allegiance.

I wish to propose to the members of the Federation of American Biological Societies for the coming meeting in Philadelphia in April the consideration of refusing to attend the International Congress of Physiology in Rome August next unless this brutal and defiant attack on academic freedom on the part of the Italian government is rescinded.

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SCIENTIFIC BOOKS

The Universe of Modern Physics. By MAX PLANCK.
W. W. Norton and Company, Inc., 1931.

THE revolution of thought which had its inception in two physical theories, relativity and quantum mechanics, has swept over larger and larger fields of human concern. It has drawn into scientific controversy, and caused a revision of, some of the concepts that were considered to lie at the very basis of philosophical and physical thought. In the midst of the multifarious and conflicting attempts of reformulation we hear the voice of Planck, the man whose work was largely responsible for the abandonment of classical reasoning in physics. He addresses not the comparatively few who work in the special fields of theoretical physics, but all those who have an interest in the basic problems of physical reality. And his message is certain to be received with greatest attention.

Physicists are entirely too prone to forget the relations between their science and the fundamental issues of epistemology; indeed they frequently neglect to apply the test of logical consistency to the concepts which compose their theories. Planck's aim is to clarify these matters. He starts by stating the goal of physics, which he defines as the apprehension of true reality, a goal which is admittedly unattainable but acts as a guiding ideal in scientific investigations. Reality, in Planck's analysis, is more than the mere phrase it appears to be in many similar treatises: the world of reality is definitely set aside as one of three, the other two being the world of sense and

that of physics. The latter is a deliberate hypothesis and is subject to change, while the world of reality is immutable.

The discussion of these metaphysical matters is followed by a lucid exposition of relativity and the quantum theory, particular emphasis being placed upon those points at which they break away from the more common habits of thought. Planck's comments on Heisenberg's principle of uncertainty are very noteworthy indeed, for he makes a point which is too often overlooked in the numerous illustrations of this principle: It "has nothing whatever to do with any measurement," but derives its validity only from the wave nature of matter. Determinism is redefined, and its premises are then shown to apply to wave mechanics, so that uncertainty can not be said to be contradictory to determinism. Nevertheless, there is an important distinction between determinism in classical physics and in quantum physics. Classically, the configuration of objects was governed by definite laws; in quantum mechanics complete determination fixes the state of material waves. This situation is not opposed to strict determinism; it merely renders considerably looser the relation between the physical world and the world of sense.

Causality, complete physical lawfulness are in Planck's opinion the bases of physical science. He regards causality as a category which is given *a priori*, much in the Kantian sense. The definiteness of his statements on this controversial point is truly pleasing, and it is to be hoped that the soundness of the author's view will penetrate the mist which still be-