most courageous, the ducks were not to be denied, and daybreak found them still in possession. Yet, it was not until the sun was high in the sky that they felt it safe to leave their pool and rest on the edge of the ice.

These ducks serve as the center of attraction for the thousands that daily pass through the Fenway; and as one studies them there seems to be an air of triumph about them as if conscious of having successfully combated the first and most severe thrust of King Winter.

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WANTED—A WORD TO REPLACE "BELIEVE"

FOR some years the writer has avoided the use of the expression "I believe" feeling that it did not adequately express the scientific attitude of mind. Belief is a religious attitude of mind and implies something which the person considers precious and immutable, which he is ready to defend, and for which he is willing to sacrifice even his life. There is nothing in the scientific attitude of mind corresponding to this. Our hypotheses and assumptions and so-called facts are subject to change over night and no one sheds a tear.

Not only does the word "believe" fail to express the scientific attitude of mind, but it is particularly unfortunate to use it because of the effect produced on the non-scientific persons. One reason why the rabid fundamentalists fail to understand the scientist is that they have no adequate conception of our mental attitude in such matters. Their whole attitude of mind is one of belief and they naturally assume that our attitude is similar. They assume that we hold to the theory of evolution as they hold to the (theory of) atonement. Under these circumstances, for us to continue to use the word "believe" simply confirms them in their error.

However, when one attempts to eliminate the word from his vocabulary he finds that it is a very convenient word and one for which it is hard to find a substitute. It is widely used and well understood by the people in a rather loose sense. It is widely used because the corresponding attitude of mind is so universal; it is used in a loose sense because religion has so largely lost its meaning. We who have found the better way still continue to use the old words though we have been warned about putting new wine in old wine skins.

It certainly would be a great improvement if we could find an adequate substitute and even if we can not, it is desirable to eliminate the word from our vocabularies even at the cost of some circumlocutions. If any one can suggest a substitute please speak up.

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THE PRONUNCIATION OF RESEARCH

As pointed out by R. H. Smith, in the issue of January 20, 1928, the average scientist is likely to have certain foibles in pronunciation. Even more annoying to me than the mispronunciation of "data" is the mispronunciation of "research." There was a time when I used to pronounce this word correctly, with the accent on the last syllable, but overwhelming usage seems to place the accent on the first syllable.

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SCIENTIFIC BOOKS

Handbuch der Paläobotanik by MAX HIRMER, with Chapters by Julius Pia and Wilhelm Troll. vol. 1: *Thallophyta, Bryophyta, Pteridophyta.* 624 pp., 817 figs., R. Oldenbourg, Munich and Berlin, 1927.

THIS pretentious work has the usual merits and defects of such an undertaking. It starts off with a rather good 30 page discussion by Pia on methods of preservation. The Thallophyta are also treated by Pia, who probably knows more about the fossil forms than any other living student. This is gotten into 106 pages and is on the whole very well done, although some sections such as that on the Diatoms are too brief to be of much service.

The part on Bryophyta is by Troll and occupies but 9 pages. It is not at all notable and the author does not seem to be familiar with the literature, as many fossil forms are missing. For example no fossil mosses are recorded from North America.

The bulk of the volume, nearly 550 pages, is devoted to the Pteridophyta. As conceived by the author, the term Pteridophyta is quite as broad and comprehensive, and consequently as meaningless as the term Thallophyta. One might forgive the author for not having heard of several more or less valid proposals for segregating the diverse assemblage included under the term Pteridophyta if only his ears were not so keenly attuned to such, to the reviewer, ill advised proposals as the group Protoarticulatineae, suggested recently by a fellow countryman.

The Pteridophyta are segregated in 6 main stocks which unfortunately are given with the *ales* endings universally applied to groups of ordinal rank by botanists. These 6 stocks are Psilophytales, Lycopodiales, Psilotales, Articulatales, Cladoxylales and Filicales, the first four microphyllous and the last

two megaphyllous (wrongly termed macrophyllous). The Psilophytales are thoroughly described and to it the following 5 families are referred: Rhyniaceae, Horneaceae, Pseudosporochnaceae, Psilophytaceae and Asteroxylaceae. One might well question the propriety of making the imperfectly known Pseudosporochus the type of an independent family.

The Lycopodiales are considered to include the following 6 families: Lycopodiaceae, Selaginellaceae, Isoetaceae, Lepidodendraceae, Sigillariaceae and Bothrodendraceae, and aside from certain questions of relative values, are fairly well done.

The Articulatales stock is divided into 5 groups which I suppose have the rank of orders. These with their contained families are: Protoarticulatineae with the families Calamophytaceae and Hyeniaceae, which is considered the most primitive group, although actually based upon 3 highly interesting but imperfectly known and possibly misinterpreted species: Pseudoborniineae with the single family Pseudoborniaceae, also imperfectly known: Sphenophyllineae with the family Sphenophyllaceae: Cheirostrobineae with the family Cheirostrobaceae: and Equisetineae divided into the three families Asterocalamitaceae, Calamitaceae and Equisetaceae.

The fifth main stock, the Cladoxylales, with the single family Cladoxylaceae, seems particularly unfortunate. The group is remarkable enough in its combination of characters and is evidently an isolated one, but no one certainly knows that it is a Pteridophyte. Paul Bertrand, who knows considerably more than the present author about these forms, thinks that they were seed plants. We know something of the habit of the middle Devonian *Cladoxylon scoparium* but its foliage is less deserving of the term megaphyllous than is that of Pseudobornia or Asterocalamites and the supposed association of *Sphenopteris refracta* Goeppert with Voelkelia is by no means established.

The Filicales are treated as Eusporangiatae, Protoleptosporangiatae, Leptosporangiatae, and those of uncertain systematic position. The first includes the Coenopteridineae with six families, and is well done to the extent to which the facts are available; the Ophioglossineae and the Marattiineae. The Protoleptosporangiatae comprise the single family Osmundaceae, and the Leptosporangiatae are divided into 12 families. The volume closes with brief and unimportant chapters on the general morphology of the Filicales and the comparative morphology of the Pteridophytes.

The book is well printed and profusely illustrated, a considerable number being original. It seems to me that the discussion of impressions of Lepidodendron and Sigillaria is well done. The somewhat difficult anatomy of the Coenopteridineae is made rather clear, and there is a full discussion of the diverse forms of Psaronius. The author evidently believes that Thomas has demonstrated that Sagenopteris is the foliage of a seed plant, since it receives no mention in the present volume.

Opinions will naturally differ regarding the success with which Hirmer has performed his self-assigned task. Many omissions could be pointed out, but such are inevitably present in a work of such scope. On the whole I believe that the book will serve a very useful purpose. Its chief defect, in addition to the lack of judgment in the classification adopted which has already been alluded to, is the failure to exhibit any acquaintance with the American literature. For example I find no Mesozoic Lycopodiums recorded from North America, nor any mention of Harder's work on fossil bacteria, or of the important Lepidophyte fructification Cantheliophorus, and I might easily mention a great many other instances. However, no one but a German author seems to have the industry to produce a work of this sort, and no one but a German publisher would undertake to print such a work, so that botanist, paleobotanist and geologist should alike be thankful and give it their blessing.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A CONSTANT RATE ASPIRATOR

IN a study of the factors affecting the rate of respiration in plants,[1] it became apparent that a constant rate of aspiration was one of the most desirable features. Several well-known types of aspirators were tried but in every instance it was found that the desired constancy could not be maintained. A new type of aspirator was developed which combines simplicity, unvarying rate, a wide range of force and portability. The features of this instrument are such that we believe it will prove of value to investigators in all branches of scientific research where a constant rate of aspiration is desired.

The device consists in an arrangement employing the well-known principle of Mariotte's bottle. Two bottles, the size of which depends upon the use to which the operator puts his instrument, are arranged so that one is supported in an inverted position directly over the other as in Figure 1. The inverted bottle is fitted with an intake tube A bent upon itself in the manner illustrated with the open end at x–x'. The reason for bending this tube will be shown later.

[1] Article to appear in a forthcoming issue of *The Botanical Gazette.*