Just as the discovery of the exogenous structure in many Carboniferous Pteridophytes (*Calamites, Stigmaria, Sigillaria,* even *Lepidodendron*) overthrew the old Lindleyan classification into endogens and exogens, which was supposed to be fundamental, so the discovery of the Pteridospermaphyta causes the later classification into spore-bearing and seed-bearing plants, which was confidently believed to constitute a durable substitute, to break down, and we are in the presence of the important truth that in both their internal structure and their floral structure the early types of vegetation advanced during Paleozoic time to a position not essentially different from that of the more developed types of the present day.

LESTER F. WARD.

INFLUENCE OF BORIC ACID AND BORAX ON DIGESTION AND HEALTH.

BULLETIN No. 84 of the Bureau of Chemistry, now in press, is the first of a series of monographs from that bureau embodying investigations made in accordance with the following authority contained in the act of Congress making appropriations for the Department of Agriculture, to wit: "To enable the Secretary of Agriculture to investigate the character of food preservatives, coloring matters, and other substances added to foods, to determine their relation to digestion and health, and to establish the principles which should guide their use."

These investigations were commenced in the autumn of 1902 under the direction of Dr. H. W. Wiley. Previous to their beginning a careful study of similar work done in this and other countries was undertaken and some of the laboratories where this work had been carried on, notably the laboratory of the Imperial Board of Health of Germany, at Charlottenburg, were visited and the method of experiments investigated. The plan finally decided upon was to secure the voluntary services of a number of young men who would undertake to try the effect of the added substances upon their digestion and health, to make the necessary observations, and to submit themselves to the rigid analytical control which such a series of investigations required.

The number finally selected for experiment was 12, as this was found to be about the maximum number which could be cared for with the analytical and culinary facilities afforded by the Bureau of Chemistry. A kitchen and a dining room were fitted up in the basement of the bureau and in December, 1902, the actual experimental work began and it continued, in the case of boric acid and borax, until July 1, 1903. The work was so divided that no one of the young men under observation was required to submit himself to the rigid control necessary to the conduct of the work more than one half of the time. The men selected were taken partly from the force of the Bureau of Chemistry and the rest from other Divisions and Bureaus of the Department of Agriculture. Each one was required to subscribe to a pledge to obey all the rules and regulations prescribed, and to abstain from all food and drink during the period of observation save that which was given him in the course of the experiment. Careful medical inspection of each of the members of the experimental class was secured, both directly and by collaboration with the Public Health and Marine Hospital Service. The details of the work, both analytical and medical, are found in full in the bulletin above mentioned which is now in press. Some of the conclusions are as follows:

When boric acid or borax equivalent thereto, in small quantities not exceeding a half gram per day, is given in the food no notable effects are immediately produced. If, however, these small doses be continued for a long while, as for instance in one case 50 days, there are occasional periods of loss of appetite, bad feeling, fulness in the head, and distress in the stomach. These symptoms, however, are not developed in every person within the time covered by the experiment, for some are far more sensitive to the action of these bodies in small quantities than others.

When boric acid, or borax in equivalent quantities, is given in larger and increasing doses there is a tendency to the somewhat rapid development in a more accentuated form of the symptoms above described. The most common symptom developed is a persistent

headache, a sense of fulness in the head, with a clouding to a slight extent of the mental processes. When the doses are increased to 3 grams a day these symptoms are established in a majority of the cases but not in every case. They are also sometimes attended by a very distinct feeling of nausea and occasionally by vomiting, though the latter act is rarely established. There is a general feeling of discomfort, however, in almost every case, but the quantities required to establish these symptoms vary greatly with different individuals. In some cases very large quantities may be taken without the establishment of marked symptoms, while in other cases from 1 to 2 grams per day serve to produce in a short time feelings of discomfort and distress.

No conclusions were reached in regard to smaller quantities than half a gram per day of the preservative, and, therefore, any statements in regard to the administration of smaller quantities must be based largely upon the results obtained with the quantities actually employed. It is reasonable to infer that bodies of this kind not natural to nor necessary in foods which exert a marked injurious effect, when used in large quantities for short periods of time, would have a tendency to produce an injurious effect when used in small quantities for a long time. The general course of reasoning, therefore, would seem to indicate that it is not advisable to use borax in those articles of food intended for common and continuous use. When placed in food products which are used occasionally and in small quantities it seems only right, in view of the above summary of facts, to require that the quantity and character of the preservative, that is, whether borax or boric acid, be plainly marked so that the consumer may understand the nature of the food he is eating.

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*LABORATORIES FOR BOTANICAL RESEARCH.**

THE publicity given to the opening ceremonials of the new science laboratories at Cambridge by the king and queen on March 1 will, it may be hoped, do something to rouse those who are responsible for the welfare of the nation to a wider sense of their duties. The time has surely passed when the remarks of a well-known prelate and of a prime minister, to the effect that they were born in a pre-scientific era, could be received, if not with overt applause, at least with sneaking sympathy.

Sluggish as we are, some progress has been made. Up to the middle of the last century, and for some time after, there was scarcely a botanical laboratory properly so called in the whole country. Now we have the Jodrell Laboratory at Kew, a very modest institution when compared with the necessities of the case or to the excellent equipment of other departments of this great national establishment. The Jodrell Laboratory is not intended for instructional purposes, but chiefly for study and research, and much good work has been done there.

At Cambridge, Edinburgh, Glasgow, Dublin, at University College, London, the Royal College of Science, and in many other universities, agricultural colleges and technical institutes, there are now more or less well-equipped laboratories under competent direction. But these are mainly for the instruction of students. Research laboratories are still rare, and those willing and competent to utilize them are also few in number. This condition of affairs is largely due to the indifference and lack of encouragement on the part of those who ought to know better. The *cui bono* question is ever in their minds, and much too frequently on their lips. Abstract science does not appeal to their sympathies, or to their intelligence, unless some immediate practical result at once comes into view. When that happens the commercial instinct may perchance be aroused, and they begin to ask, will it pay? Of course, no reader of this journal is likely to undervalue abstract science, and most of them are well aware of the enormous value of the practical results that may and do result from it. But even such persons must have been startled to find how the observations of Bower and others on the minute anatomy of the prothallus and spore-producing tissues of ferns, observations which might have been thought to be too abstruse and recondite to be of any practical value whatever, have directly led up to the

* From *Nature*.