work it was bound in volumes, making a very handsome as well as valuable set.

OLIVE JONES,
*Librarian*

AN EXPERIMENT ON A FASTING MAN

THERE was completed at this laboratory on May 15 a successful 31-day experiment during complete inanition, the subject drinking 900 c.c. of distilled water per day. Elaborate measurements of the gross metabolism as indicated by the carbon dioxide production, oxygen consumption, water vaporized and heat elimination were made on each day. Continuous records of rectal temperature, pulse rate, respiration rate, ventilation of the lungs, blood pressure, microscopic blood examination, careful clinical examinations, anthropometric measurements and psychological tests were a part of each day's routine. Photographs of the subject at stated times and X-ray plates at the conclusion of the fast were secured. Complete urine analyses were also made throughout the 31 days. The mass of data will require several months for complete and verified computation.

Newspapers and magazines, actuated only by the sensational element, have used every means to secure advance statements, and in some instances have issued "faked" statements, regarding this experiment. The results will be presented only in the publications of the Carnegie Institution of Washington or in the regularly accredited scientific journals, and any prior statements purporting to be made by me or signed by the subject, A. Levanzin, are to be disregarded.

FRANCIS G. BENEDICT
NUTRITION LABORATORY OF THE
CARNEGIE INSTITUTION OF WASHINGTON,
BOSTON, MASS.,
May 15, 1912

## SCIENTIFIC BOOKS

*The Pines of Australia.* By RICHARD BAKER and HENRY G. SMITH. Technical Education Series, No. 16. Sydney, 1910.

The present publication of the department of public instruction of the state of New South Wales is a memoir of over four hundred and fifty pages, copiously illustrated by means of photographs and photomicrographs and accompanied by two maps showing the distribution of the "Pines." Many of the illustrations represent more or less accurately the appearance of stained microscopic sections reproduced by the three-color process. It seems questionable even in a semi-popular work like the present to use the term "Pines" to represent the Conifers as a whole. Such an appellation is almost sure to lead to misconceptions on the part of the reader, particularly in the southern hemisphere, where true pines are conspicuous by their absence. The authors are at some disadvantage on account of the multifariousness of the task they have set themselves, for they aim to include in their account of these trees, their systematic relations, the history of the names given them, their morphology and anatomy, their useful products, including the chemistry of some of these and finally their geographical distribution. This appears to be too large a field to be covered successfully or fully, even by the collaboration of a chemist and a botanist.

Under the head of morphology and anatomy are recorded observations as to the significance of the "spur" of the cone scale of the genus *Callitris* and the probable function of the central columella in the cone of the same genus. It is noted that the chemical products, particularly the resinous ones of species which resemble one another morphologically are very strikingly similar. Attention is called to the presence of manganese compounds in the parenchymatous cells of the wood of *Callitris* and other genera. The manganese content in some cases is very considerable. The value and nature of the tannins and sandarac resins of *Callitris* are discussed and similar accounts are given of the gums, resins and oils of the other coniferous genera of the Australian flora.

The volume concludes with appendices on the systematic value of the chemical products of plants, on the distribution of Australian conifers, and on the collaborators, who have assisted in various ways in the preparation of the work. There are likewise several good

maps which further illustrate the subject of distribution. The present work will be of considerable value to those interested in the economic products of Australia and to botanical travelers in that region.

*The Eusporangiatæ, the Comparative Morphology of the Ophioglossaceæ and Marattiaceæ.* By Douglas Houghton Campbell, Carnegie Institution of Washington, August, 1911.

This superb memoir deals with the representatives of two important orders of ferns, the Ophioglossales and the Marattiales, which on account of their remote and often tropical distribution are imperfectly known. The illustrations are admirable scientifically and are often extremely artistic. Thirteen full quarto page heliotypes representing the habit of the rarer species are of great beauty. While the author deals adequately with those features of the morphology of the Eusporangiates, which have been accessible to other writers, he naturally devotes special attention to the question of the structure and development of the gametophytes and the young sporophyte, since it is precisely in regard to these matters that our present knowledge is least perfect. With entirely admirable zeal, Professor Campbell has made it his business to visit those remote parts of our earth which are at the same time most interesting botanically and least salubrious and accessible.

An account as complete as is permitted by the abundant material rendered available by the author's extensive travels is given of the gametophytes of the three Ophioglossaceous genera, *Ophioglossum, Botrychium* and *Helminthostachys.* This is supplemented by descriptions of the development of the embryo and the later stages of the young sporophyte. It is clear that Professor Campbell inclines to the opinion that the leaf is the primitive fern organ and for him the genus *Ophioglossum* is likewise the primitive genus of the Ophioglossaceous family. There appears to be here much room for difference of opinion, since the whole tendency of investigation in recent years, covering both the living and fossil representatives of the lower vascular plants, whether cryptogamic or seed-bearing, has been to show that the course of evolution has been from the more complex to the simple and not as has been generally assumed in the past *vice versa.* Unfortunately in the case of the Ophioglossaceæ no fossil evidence is available to check up the results obtained from the study of the morphology of the living forms. In accordance with his point of view, the author apparently regards the stem of the Ophioglossaceæ as a complex of fused leaf bases, a conception supported in his opinion by the method of development of the vascular strands. He apparently regards the fertile segment of the leaf too, the so-called sporangiophore, as an organ *sui generis,* although Professor Bower, the most vigorous defender of this point of view, has recently practically abandoned it. The possibility of the sporangiophore representing specialized pinnæ of the leaf, which has recently been convincingly urged by Professor Chrysler, is not entertained.

The account of the Marattiales given by the author is particularly full and original and does full justice to the admirable opportunities of travel and collection which he has enjoyed. Of particular interest is the account of the gametophyte, sexual organs and embryonic development of the monotypic genus *Kaulfussia,* by reason of its marked resemblance to the fossil forms referred to the Marattiales. A feature of this second division of the memoir is the attention given to the development of the fibrovascular system. The author takes the position that the origin of the first tracheids as separate groups, which only later become merged in the general fibrovascular system of the stem, indicates the origin of the axis from originally separate parts. This doctrine carried to its logical conclusion would apparently lead to somewhat striking absurdities.

The third division of the memoir is devoted to the discussion of the origin and relationship of the two fern families described in the earlier pages. The author assumes the correctness of the antithetic hypothesis of the origin of the alternation of generations, char-

acteristic of all vascular plants. In this connection he definitely homologizes the moss sporogonium with the sporophyte of ferns. Obviously he entertains the view that *Ophioglossum* among the Ophioglossaceæ is probably the most primitive representative of the fern stock. There appears to be little support for the correctness of this view and it entirely lacks the confirmation of fossil evidence, which in this case is unfortunately lacking. Logically in accordance with the general attitude just indicated, the author derives the Marattiaceæ from ancestors allied to the Ophioglossaceæ. He acknowledges in this connection the serious difficulty of bridging over the morphological gap, between the dorsisporangiate foliar organs of the Marattiales and the so-called sporangiophore of the Ophioglossales. This difficulty appears to the reviewer to be very great indeed, especially in view of the known antiquity of the Marattiales and the apparently recent origin of the Ophioglossales. It further appears from a consideration of the reproductive parts and anatomy of the sporophytes as well as of the gametophytes, that it is much easier to derive the Ophioglossaceæ from typical ferns such as the Marattiaceæ, than it is to entertain the possibility of a reverse course of evolution.

*The Morphology of Gymnosperms.* By COULTER and CHAMBERLAIN. University of Chicago Press. 1911. Postpaid, $4.22.

The present volume is undoubtedly the most important general work on the gymnosperms which has ever appeared and is highly creditable to American science. It consists of four hundred and fifty pages and of an equal number of, for the most part, original and remarkably good illustrations. The book is characterized throughout by a sane, broad and withal interesting treatment. The views expressed as to affinities and evolutionary sequence are for the most part clearly, logically and convincingly stated.

The volume is modeled on evolutionary lines, grounded on the solid foundation of the testimony afforded by the rocks, and in this respect presents an agreeable contrast to most botanical works on plant evolution, which are too often written by persons who have no knowledge or appreciation of the past history of plants. In accordance with this feature, it begins with the oldest known seed-plants, the Cycadofilicales as the authors more logically term the Cycadofilices of Potonie and the Pteridospermeæ of Oliver and Scott. The enormous progress made in our knowledge of the evolution of the gymnosperms is nowhere better illustrated than in this chapter, which may be instructively compared with the meager amount of information supplied on the same subject in the first edition published ten years ago. Here we find an extremely good account of this fascinating primitive group of gymnosperms, long mistaken for ferns, whose true affinities were guessed at by the German paleobotanist Potonie and proved by Oliver, Scott, Grand'Eury and David White.

Logically following the Cycadofilicales, with the interposition of the Cordaitales, which need not be specially referred to in this connection, come the true Cycads and their allies the Bennettitales. The Chicago laboratories have added much to our knowledge of the Cycadales, and the chapter on this group of gymnosperms, now confined to the warmer regions near the equator, is one of the strongest in the book. The Bennettitales, the Cycads of the earlier Mesozoic, owe their elucidation to a large extent to the striking investigations of Dr. Wieland, of Yale University. We find them treated with the fulness which their importance demands.

Next to the Cycad-like gymnosperms come the relatives of the maidenhair tree, Ginkgo, sole survivor, through the pious care of the Japanese priests, of a stock which in the Mesozoic flourished abundantly throughout the northern hemisphere.

The Conifers, the most abundant and important gymnosperms of our existing flora and of great evolutionary importance on account of their extension into the remote past, appropriately occupy about one third of the volume. The gametophytes of this group, which have been particularly the subject of

investigation at Chicago, naturally come in for full consideration, but the past history and the important anatomical features of the Coniferales have not been overlooked. The great influence of modern anatomical and paleobotanical work is nowhere more clearly shown than in the systematic grouping of the Conifers along evolutionary lines. One illustration will serve to make this clear. In the first edition of the present work, which appeared ten years ago, the pine was considered to represent the highest member of the Conifers on account of the complexity of its vegetative and reproductive structures. In the present edition, it is put near the bottom, if not at the very bottom, of the coniferous series, since recent investigations, paleobotanical and anatomical, have demonstrated its great antiquity and at the same time the truth of the general proposition that the Conifers are a reduction series in which the simplest members are most modern and not an ascending one, in which the most complex representatives are the highest.

The Gnetales, which on account of their supposed affinities with the angiosperms are of great botanical interest, are adequately treated. The riddle of their existence is discussed in an entirely unpartisan manner. Following this chapter is one on evolutionary tendencies among the Gymnosperms. This part of the volume is naturally the one about which there is the greatest room for difference of opinion, and it is precisely here that the authors deserve the highest praise. At the present moment the older morphology is in process of resolution under the influence of experimental and paleobotanical activities. For that reason a clear expression of evolutionary sequence, even of groups concerning the past history of which we are well informed, as is relatively true of the Gymnosperms, is extremely difficult. Notwithstanding, in the present volume, we find a remarkably clear position taken, although not entirely unaffected by the back eddies resulting from the partial persistence of the older standpoints.

E. C. Jeffrey

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*Pharmaceutical Bacteria, with Special Reference to Disinfection and Sterilization.* By Albert Schneider, M.D., Ph.D. Published by P. Blakiston's Son & Co., Philadelphia, Pa. Price $2.00.

The rapid development of bacteriology in various directions has led to the publication of books in considerable number, showing the application of bacteriology to different phases of modern life. Medical bacteriology, agricultural bacteriology, industrial bacteriology and various other aspects of this new science have been fairly well exploited. The present book is in a new line, and is designed simply to cover the relations of bacteriology to pharmacy—being intended primarily for students in college of pharmacy and incidentally to pharmacists in general. The subjects that are treated in the work are only those which have some practical relation to this business. After a general introduction there is a brief but comprehensive historical survey of the development of bacteriology, divided into periods and bringing the subject up to date. This is followed by a general description and classification of bacteria, with the method of bacteriological technique, and then brief considerations of the relation of the bacteria to a few industries, like agriculture in general, dairying, the extermination of pests, canning, cider-making, etc. A somewhat extended discussion of the problems of immunity and the activities of bacterial products, together with a discussion of the manufacture of sera and vaccines, is naturally given in a book of this nature, the subject being treated from both a theoretical and a practical standpoint. Disinfection and the use of various disinfectants are discussed quite extensively, the subject being considered from the standpoint of the disinfection of water, of food, of dwelling houses, of surgeons' supplies, of various chemicals that are liable to be handled in the pharmacy; in short, all relations of disinfection which have a bearing upon the problems of the pharmacy, are carefully considered. A chapter upon communicable diseases and their prevention treats very briefly of the