REVIEWS.

A RESEARCH ON THE PINES OF AUSTRALIA.

[By R. T. Baker, Curator and Economic Botanist, and H. G. Smith, Assistant Curator and Economic Chemist, of the Technological Museum, Sydney, published by authority of the Government of New South Wales, Sydney, 1910, as No. 16 Technical Education Series of the Department of Public Instruction. Price not stated.]

1. This is a handsome royal quarto volume of 458 pp. printed on heavy glazed paper and profusely illustrated with well over 300 figures, many of which however are not numbered. The work, the results of which are included in this volume, was undertaken with the object of ascertaining the extent of the commercial possibilities of the conifers of Australia. The plants dealt with comprise—*Callitris* (18 sp.), *Actinostrobus* (2 sp.), *Diselma* (1 sp.), *Microcachrys* (1 sp.), *Athrotaxis* (3 sp.), *Araucaria* (2 sp.), *Agathis* (2 sp.), *Dacrydium* (1 sp.), *Pherosphæra* (2 sp.), *Phyllocladus* (1 sp.), *Podocarpus* (5 sp.) and the word *Pines* in the title of the work consequently strikes one who is not familiar with the local vernacular names of the species as somewhat inappropriate.

2. So far as the information and materials available rendered possible, each species has been dealt with under the heads of habitat; systematic description; economics, anatomy, chemistry of products of leaves, fruits, timber and bark; and forestry. The

authors were assisted in their work by the officers of the Department of Public Instruction and much of the information included regarding the distribution of the various species and other points was obtained from the Public School Teachers of the State. An appendix gives the names of no less than 250 correspondents (chiefly Public School Teachers) who assisted in collecting data for the work. In addition to the material obtained from New South Wales specimens were also obtained, to some extent, from other parts of Australia and the principal European herbaria were also consulted.

3. Among the more important species dealt with may be mentioned :—

Callitris glauca (White Pine) attaining a height of over 100′ with a diameter of 2′—3′. Yields a good building timber which, in company with that of other species of the genus, is but little attacked by white-ants, probably on account of a phenol contained in the wood to which it owes its characteristic odour.

Callitris calcarata (Black Pine) attains 60′—80′. Yields an ornamental and good building timber and also a valuable bark for tanning.

Araucaria Cunninghamii (Hoop Pine) attains 200′ and a girth of 22′—23′. Largely used for all kinds of indoor work.

Araucaria Bidwilli (Bunya Bunya) attains 150′ and yields a timber valuable for indoor work.

Agathis robusta (Queensland Kauri) attains 150′, and yields an excellent timber for joinery and commercial oil of turpentine.

Podocarpus elata (Brown Pine) attains a height of over 100′ and yields a valuable wood for joinery which is said to resist attacks of teredo and white-ants.

4. The authors have done excellent work in bringing prominently to notice the urgent necessity for an energetic and scientific forest policy in Australia which, while arranging for the prompt utilisation of the valuable species, would also insure a permanent and sufficient supply of the same. In the case of practically all the important species there is apparently the same sad story of destruction and want of provision for the future. Thus of the valuable Hoop Pine we read that "forty years ago the ridges

on the Lower Richmond were covered with what appeared to be an inexhaustible supply. A saw-mill to cut up the pine was started at Lismore about 1856 followed by several others at different parts of the river. * * As a natural consequence, at the present time, this pine is rapidly becoming a tree of the past on the Lower Richmond."

Of the White Pine that "they are getting scarce near the towns owing to the great demand for this timber, and the thoughtless destruction of young trees" and that "the supply of this most useful timber is gradually becoming less and less, and no steps are being taken for its propagation." Of the Brown Pine in New Italy we read that "this species is, unfortunately, almost extinct, the only specimens being saplings of very little value. It grew in profusion about the Williams River long ago."

Of the Kauri that "it has always been regarded as the most valuable of Queensland pines, but it is unfortunately becoming scarce," while the authors rightly note that "the present policy of indiscriminate destruction of Australian vegetation, now going on all round us, is to be deplored, and we raise our voices in protest; while, on the other hand, we would indeed welcome a vigorous policy in the opposite direction."

We are glad to see that in the authors' opinion successful afforestation depends on an ecological study of the species concerned "because it must certainly be more judicious and scientifically correct to plant those trees which are most suited by habit and constitution to the situation and soil required to be utilised, than to deal with the matter in a haphazard way."

5. The authors have brought together a large quantity of valuable economic information regarding the distribution of the various species, more particularly with reference to New South Wales, and the economic products yielded by them which include timber, perfumery oils, turpentine, tanning-material and sandarac. While we are in full sympathy with the contention that pure science forms the foundation on which applied science must be based, we cannot but feel that the present book would have better served its purpose of assisting "the development of the natural resources

of Australia," which the authors state has been their incentive throughout, if more care had been taken to give prominence to facts of obvious practical interest and importance and to prevent these being obscured by detail of purely scientific interest. Thus the ordinary reader naturally wishes in the first place to be able to identify the species with certainty which have been dealt with. He will however find no concise key, based on easily recognisable morphological characters, to help him in quickly discriminating closely related species, and although there is a profusion of figures illustrating the anatomical structure of several species, of others there are no figures at all. The business man, also, who is on the look out for information regarding the products of known, or probable, commercial value, and for facts which will help him to decide whether or not a paying industry can be established, will find himself impeded by much detail of purely botanical or chemical interest.

6. The key to the lines of work followed and method of publication adopted is apparently to be found in the authors' faith regarding the capacity of anatomy and chemistry to aid in systematic work, to help in the definition of species, and in indicating their relationships and their course of evolution. In our opinion the primary object of the systematist must be to define, and to assist field-workers to identify, plant-groups which actually occur as distinct and readily distinguishable entities in the field and the definition of the systematic species must therefore depend on morphology alone. In this work of definition the pioneer must be the herbarium systematist, but no species can be regarded as finally established until the work in the herbarium has been exhaustively tested in the field by the field systematist and ecologist. A species founded on morphological characters alone which has passed the test of both the herbarium and field-botanist must be considered as having been finally determined, and classification thus arrived at should not be influenced or upset by a consideration of different sets of characters, anatomical, chemical, or otherwise. Granting this, it will be at once conceded that anatomy and chemistry may both subserve a valuable if only

subordinate roll in systematic work inasmuch as they may be the means of drawing attention to morphological characters which had hitherto been overlooked and may provide additional characters which are always correlated with morphological differences, by the aid of which the accurate identification of incomplete specimens and of the products of plants may be facilitated or rendered possible, while the help of these branches of knowledge is of course indispensable if we wish to elucidate problems of plant-nutrition or to realise the full economic benefits to be derived from vegetation. The lack of a clear understanding of what is to be regarded as a species and of a clear recognition of the part which field-study and ecology must play in the final determination of species and in the accurate definition of the boundaries of plant-groups which the herbarium systematist can only indicate approximately and tentatively, we regard as desiderata of the first importance in modern botany. Until a general understanding is arrived at regarding them, it seems impossible to hope for a time when nomenclature and classification shall crystallise from their present state of flux, shall present for the use of the practical man and economic worker adequately defined and finally named plant-groups, in the place of elusive forms with ever-changing names and varying characters, and shall provide a firm foundation on which the problems of the relationship and evolution of the various forms can be undertaken with some prospect of success, rather by an experimental study of the variation and heredity of living plants than by a search for correlated characters and theorising on herbarium material.

7. This being our view we are naturally disappointed to find that the authors, who were apparently able to study their plants in their natural habitats, have not found it possible to pay more attention to ecology. The details given in the book, for instance, do not indicate that the field-study has been sufficient for an accurate or permanent definition and classification of the various species. The authors themselves point out that a wide geographical area by no means necessarily connotes considerable differences in environmental factors, and consequently a species which appears

constant from isolated gatherings in widely separated localities may prove to be variable and to present numerous intermediates, if care is taken to study it in localities where there is a considerable difference in such important factors as soil, available moisture, light, proximity of nearly related species, and so on. To discover and explore such localities and to deal satisfactorily with the intermediates that may be met with is the special function of the field-botanist and ecologist and until this work has been done the classification cannot be regarded as final. From the quotation with which the authors aptly close their book it is clear that they do not consider their work as finished and we trust that they will supplement the valuable work that they have already done on the Australian Eucalypts and Conifers by a careful ecological study of the species dealt with. When this has been completed, we would suggest the issue in handy form of a concise summary of the chief results obtained which would aim at (1) facilitating as far as possible the ready identification of all the species finally established, and (2) giving prominence to all facts of undoubted practical importance, those of purely scientific interest being omitted.

8. While therefore the book seems to us to be to some extent open to criticism, we must record our unstinted admiration for the industry and skill with which a mass of valuable information has been collected, which cannot fail to be of interest to the botanist, chemist, forester and commercial man and which makes the book indispensable to anyone interested in the forest vegetation of Australia.

A feature of the book which deserves special attention is the successful employment of natural-colour photography for the reproduction of stained micro-sections.