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Art. X.—*Fossil Plants of the Stony Creek Basin.*

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(With Plate VIII.)

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The geology of the Stony Creek Basin, Daylesford, has been the subject of many papers, the last of which being that by Orr (1). In this basin is a thick deposit of black ligneous clay, the origin of which is a matter of doubt. Although in places the deposit contains a large amount of plant material, yet owing to its lack of any definite lamination it is very difficult to secure unbroken specimens. This applies particularly to the leaves of the genus *Eucalyptus*, which occur abundantly. Small fragments of what is apparently fern material are present, but the identification is difficult. One fern appears to be *Pteridium aquilinum*, which is at present world wide. Another specimen has large broad frond segments with large orbicular sori, characters which are identical with the living species *Polypodium pustulatum*. The veining of the leaves of the Eucalypt leaves can be very distinctly made out in fresh material. No complete leaves were obtained. The veining is of two distinct types: one has the veins very oblique and the other has the veins set at an angle of about 45°. The oblique veining occurs among others in the living species *E. amygdalina*, and the other type is seen in the living species *E. viminalis*. Both these species occur living in the area under discussion. The veining of *E. amygdalina* is very variable, so that it is quite possible that the leaves all belong to the same species. The leaves are all comparatively narrow and falcate, and about 4 to 6 inches long. It is quite probable that the fossil leaves belong to the existing species. Besides the leaves, however, there are woody masses which are very soft and cheesy in consistency. The material is very soft and, therefore, difficult to section, but when dry it is very brittle and fractures like coal.

Microscopically it is seen that the cell walls have been enormously swollen, so much so that in most parts the cell cavity has been obliterated. This swelling of the walls has also caused the bordered pits to a very large extent to disappear, and other characters are also very much affected. This makes the identification very difficult. However, it is easily seen that the wood is of gymnospermous origin. The annual rings are very distinct, and are also very broad. Approximately the spring and the autumn wood are about equal in breadth. The summer wood is very dense, and owing to the swelling of the walls the lumen is completely obliterated. The spring wood is very open, and comparatively thin walled. This portion of the ring is very much distorted. At first sight it would appear that the wood had been subject to strong pressure in a radial direction, but the nature of

the deposit in which it occurs does not favour this suggestion. The distortion is entirely due to the swelling of the walls. In cross section no resin canals nor resin cells can be observed, but it is quite possible that even if the latter were present in the summer wood they would not be observed. In longitudinal radial section it is seen that the bordered pits, which are but rarely preserved, were arranged in single rows. The medullary rays are homogenous. The pits connecting the medullary rays with the tracheides are large, broad, elliptical and simple. These, too, have been largely obliterated by the swelling of the walls. This character had been observed in some fossil wood sent by Baron von Mueller to Schenk (2, pp. 872-4), and named by the latter *Phyllocladus Muelleri.* These large pits had already been noted in the living species *Phyllocladus trichomanoides,* which is endemic to New Zealand. These pits also occur in the Tasmanian species, *P. rhomboidalis.* This is also an endemic species. These pits are,

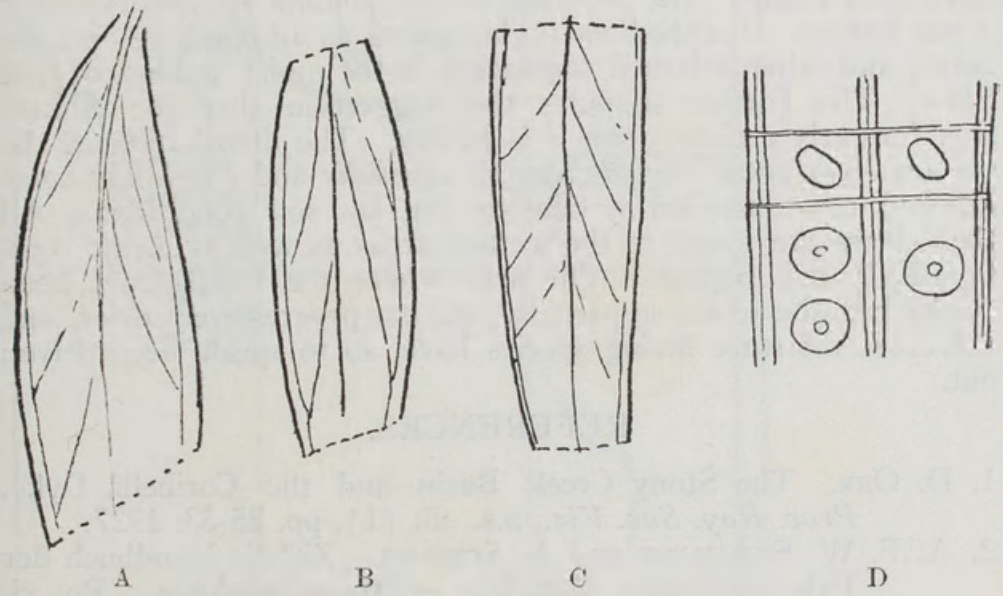

FIG. 1.—A, B and C leaves of *Eucalyptus* spp.
D Radial section of woody material shewing uniseriate bordered pits of the medullary rays.

however, not confined to the genus *Phyllocladus,* for they also occur in the two endemic Tasmanian species, *Dacrydium Franklini* and *Microcachrys tetragona.* The last genus is endemic to Tasmania, and is monotypic. The other two genera in which the large elliptical pits occur, are, however, very widely distributed. *Phyllocladus* occurs in Tasmania, New Zealand, New Guinea, Borneo and the Philippine Islands. *Dacrydium* occurs in Tasmania, New Zealand, Fiji Is., New Caledonia, New Guinea, Borneo, Philippine Is., Malay and Chile. From the distribution of the existing species it is seen that these two genera range over a very wide area, and it is therefore very surprising that, while these two genera are found on the south, east and north of Australia,

they are nowhere found at present on the mainland itself. The two genera, *Phyllocladus* and *Dacrydium*, as far as their Tasmanian species are concerned, are so very similar as regards their wood anatomy that it is impossible to separate them. It is therefore impossible to say in which genus this fossil wood should be placed. The longitudinal tangential section does not show any definite characters, and this is also a feature of the Tasmanian species mentioned above. Similar fossil wood has been obtained from the Malakoff Reef at Ballarat, and also from the Langi Logan Mine at Ararat. From the distribution of the fossil wood, therefore, it is apparent that somewhere about the Newer Basaltic period at least one of the above genera was present in Australia itself. The disappearance of the genus from the mainland has been probably due to secular changes of climate since basaltic times. The three genera mentioned are found in the wetter areas of Tasmania, and therefore it is most probable that similar conditions previously existed in those parts of Victoria where the fossils have been found. The presence of *Polypodium* sp. also indicates a wet habitat. *Polypodium* to-day exists as an epiphyte on tree-ferns, and other arboreal vegetation in the moist gullies of the State. This further supports the suggestion that the climate was formerly moister than it is to-day. The distribution of the species *Eucalyptus amygdalina, E. viminalis* and *Pteridium aquilinum* is not controlled by climatic but by soil conditions. All these three are found in the wettest areas as well as in the comparatively dry regions. The area where the fossils have been found has, therefore, apparently become progressively drier, and therefore moisture loving species have, so to speak, been driven out.

REFERENCES.

1. D. Orr. The Stony Creek Basin and the Corinella Dyke. *Proc. Roy. Soc. Vic.*, n.s., xl. (1), pp. 25-33, 1927.
2. A. F. W. Schimper and A. Schenk. Zittel's Handbuch der Palaeontologie. Part II. — Palaeophytologie. Pp. xi, 958. 433 text figs. 8vo, Munich and Leipzig, 1890.

EXPLANATION OF PLATE VIII.

Distribution of the genera *Phyllocladus* and *Dacrydium*.