NOTES.

THE DELAYED DEHISCENCE OF *CALLISTEMON RIGIDA*, R. BR.—

This plant, commonly known as the stiff or rigid Bottle Brush, first described by R. Brown in the *Botanical Register*, 1819, Pl. 393, is frequently grown in Melbourne, although a native originally of West Australia. The tufts of red flowers at the ends of the branches are very striking in appearance, and leave behind sessile closely-set fruits which ultimately dehisce by three oval apertures in the centre of the flattened top of the semi-succulent fruit.

Since the plant flowers each year at the ends of the youngest branches only, the age of the fruit is that of the branch bearing them. Each fruit, sessile on the bark, is connected by a short stalk to the wood-cylinder of the year of its formation, the clusters of fruits leaving the wood perforated at such points by knot-holes. Hence the age of a fruit can be further verified by counting the number of annual rings inwards to the point of origin of its stalk.

When first formed the fruits are separated by spaces from one another, but since they grow at first relatively more rapidly in diameter than do the branches, they come into very close contact and remain so for the first two or three years. Ultimately they separate again, owing to the branch steadily increasing in diameter, while the fruits have practically ceased to grow. The same applies to the knots in the wood, which, after the fruits have fallen, are soon obliterated in the succeeding year's growths of wood. The fruits normally persist on the plant for many years, finally becoming rough and corky on the surface, though still containing living pericarp-cells, the pericarp-tissue being watery and pale green, with few scattered chloroplastids, more distinct in the younger fruits. These have no special cambial tissue except on the surface, where the layers of cork are formed, and on the stalk, where the latter passes through the cambium of the stem. The fruits nearly cease to grow in their second year (0.8 to 1 cm. diam.), the total increase in the next ten or even eighteen years being not more than 1 to 2 mm. The edges of the semi-succulent receptacle, however, which are at first nearly flat with the three carpellary valves, grow a millimetre or two upwards and inwards over the valves, sometimes nearly closing these in, but on drying always contracting so as to allow their dehiscence to set free the seeds.

Dehiscence and the escape of the seeds is normally delayed for three, four, or more years, and in one case portions of a cluster twenty years old were undehisced; the pericarp contained living and plasmolysable cells, and of the small linear seeds many also were found on microscopic examination to contain undoubted living cells. In the dry air of the laboratory, the fruits dehisced on cut branches, and the minute brown seeds fell in quantity. The same occurs in the open if an attached branch is

killed at its base by heat so that the water supply is cut off from the fruits, or even if the water supply is strongly diminished by partial interruption of the wood-cylinder, or by drought. Repeated attempts to germinate twenty-year-old and ten-year-old seeds failed, but it seems always to be a difficult matter to obtain satisfactory germination with the seeds of this plant.

The popular superstition is that the seeds will only germinate after subjection to intense heat, as after a bush fire. The origin of this idea probably lies in the fact that the fruits are retained undehisced for a long time, so long as they are supplied with sap, but that on dead or cut branches dehiscence soon follows as the result of the cessation of the supply of water. Scrub fires very commonly kill the basal ends of stems or branches, and leave the upper portions more or less uninjured, so that

FIG. 1. Clusters of fruits on stems of *Callistemon rigida*. (a) Cut and dried four-year-old stem, the fruits all dehiscent. (b) Cluster twenty months old, freshly cut and fruits all undehiscent. (c) Cluster nine months old, fruits half-grown and not yet in contact.

the still living fruits would then dehisce and shed their abundant seeds to germinate on the temporarily cleared ground beneath.

Dehiscent fruits on living branches dry up, and fall gradually from the clusters, leaving these broken and irregular. Even when all have fallen, the cluster is still represented by pits on the bark which persist for some years,

We have therefore in this case a special instance of a plant which saves its seeds until the ground beneath has been cleared by fire or excessive drought, or until the branch or tree has been killed by these or other causes.

A fair-sized plant of this small shrubby tree, 12 to 15 feet high, may possess 1,200 clusters of fruits, each averaging fifty-two undehiscent fruits, and the fruits containing approximately 250 seeds per valve, or 750 per fruit. The total number of seeds ready for dehiscence on such a tree might therefore amount to 40 or 50 millions. Hence it is hardly surprising that although the seeds are only about a millimetre long, by a fifth of a millimetre broad, the blackened ground beneath a tree whose base has been killed by a bush fire, while the upper branches are temporarily undamaged and living, should become completely covered by a brown layer of fallen seeds within a few days to a week or more.

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ON THE CONSTANCY OF CILIA-INSERTION IN BACTERIACEAE.—

For the last eight months I have kept two forms of the genus *Pseudomonas* (cylindrical cells with polar cilia) under observation, constantly re-inoculating and causing them to become perfectly adapted to their environment. My object was to ascertain whether a form which had polar cilia could, under more favourable conditions, develop cilia all round the cell, i. e. become peritrich.

In the order Spirillaceae, on account of the undulating nature of the membrane, it is not to be expected that ciliation can be other than polar, and peritrich ciliation is never found: increase of motility, as I have previously observed, in *Spirillum giganteum* (syn. *Spirillum volutans*), is correlated with an increase in the number of polar cilia.

In the case of the Bacteriaceae, however, we are dealing with organisms whose membranes are stiff, and in which it is conceivable that increase of motion would be correlated with a development of cilia on the sides as well as at the poles. This would break down the distinction between the genus *Bacillus* and the genus *Pseudomonas*.

After eight months' cultivation of two forms of the genus *Pseudomonas* I have found that in all cases the cilia remained polar, even when better adaptation to the test-tube-culture environment, and consequently greater motility, had taken place.

Hence, to attain greater motility the cilia either become stronger or else more numerous at the poles only. In this they agree with the genus *Spirillum*.

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Ewart, Alfred J. 1907. "The delayed dehiscence of *Callistemon rigida*, R. Br." *Annals of botany* 21, 135–137.

<https://doi.org/10.1093/oxfordjournals.aob.a089120>.

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