'LIGHT-WINDOWS' IN CERTAIN FLOWERS.

(*Asclepiadaceae* and *Araceae*).

BY

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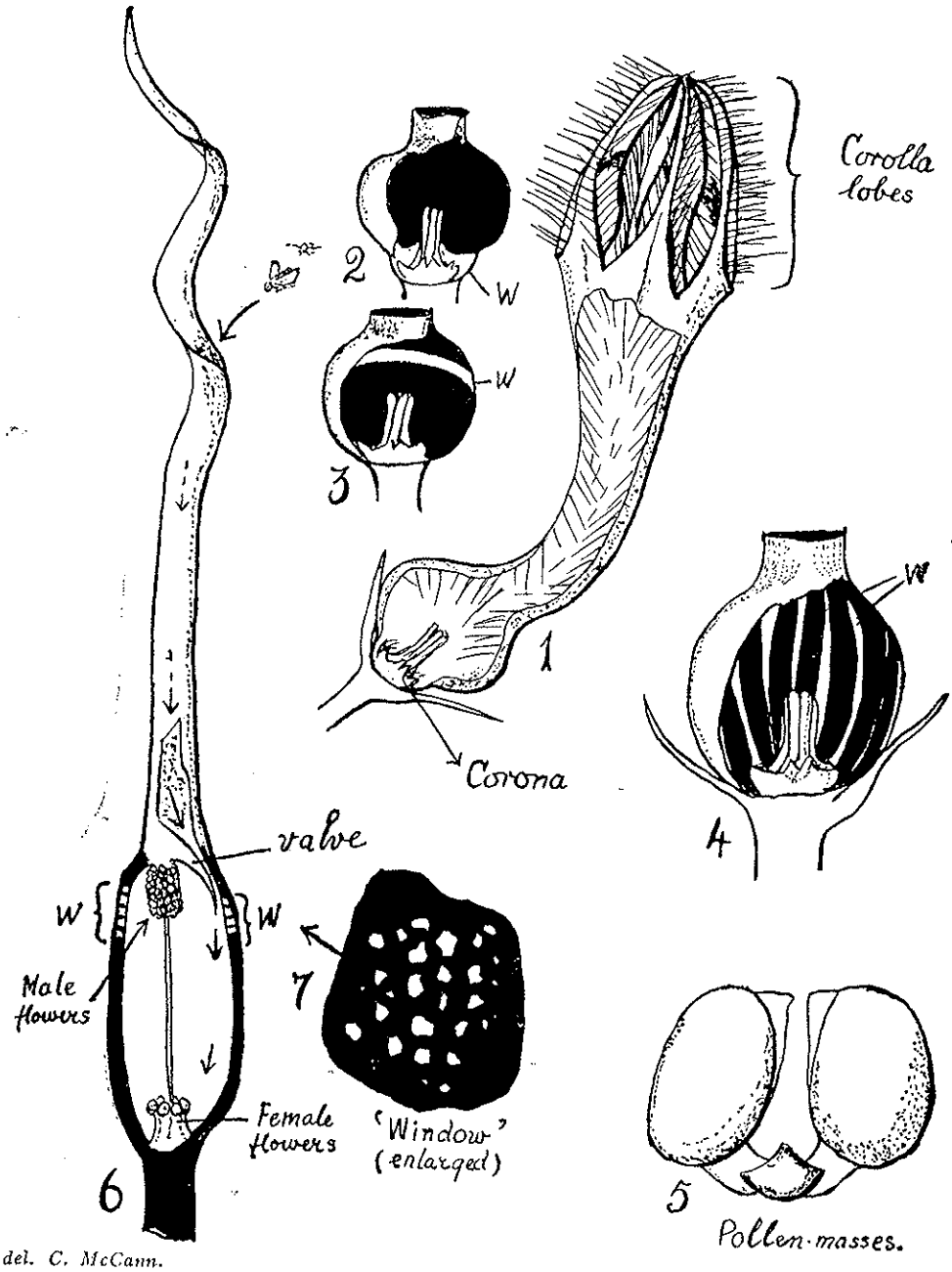
(*With a plate*).

The title of the paper may, at first sight, seem rather curious, but its true significance will soon become apparent from what follows. It is well known that in the great economy of Nature animal agents, directly or indirectly play an important rôle in the pollination of flowers and the dispersal of seed, so much so, that it is doubtful whether certain plants could survive without their animal 'helpmates'.

Most plants that employ carrion feeding insects must appeal to the 'aesthetic' senses of their guests, and accordingly the 'hosts' produce flowers which resemble decomposing material in *colour*, *form*, or *scent* or better still, a combination of all three. Carrion and fruit flies (*Diptera*) are perhaps the chief guests. The flower may offer some form of refreshment, by way of food or drink, or a temporary home for the visitors or their young, or it may lure its visitors by mere bluff, and what is more, imprison them for a while under 'Act 1 of year 0'! In return for whatever form of hospitality they receive, the guests must transport the pollen from one flower to another, and thereby effect cross-pollination. Some such flowers, keep 'open house' and the guests come and go freely, irrespective of 'caste or creed'; others are more select in their choice of visitors, only the 'chosen' may enter and depart at will; lastly there are the 'highbrows' that are not merely highly exclusive in the choice of their guests, but are so overbearing in hospitality that they imprison the visitors, and only permit them to take their leave at their (the hosts') pleasure.

Flowers that invite carrion feeders generally range in shades of colour varying from pink, through purple, to almost black, mottled with green and yellow tints and finished off with a bluish gloss or bloom. The region in which the reproductive organs are situated is usually the deepest in colour, thus often making it quite dark within, especially in flowers which select and imprison their visitors. Carrion flies and fruit flies are usually diurnal insects and accordingly must have a certain amount of light to see and feed (remain active). Into such a darkened flower the flies would probably not enter, or if they did, would soon fall asleep. Nature in some marvellous way 'anticipated' this, and has invariably inserted a 'window' in such flowers, or rather, a translucent 'window-pane'. The 'window-pane' is a light-coloured area which admits light. Viewed from within it merely appears as a light coloured area in the region, and its true significance is not immediately apparent. The 'window' is so arranged that the light is focussed on to the reproductive organs. What a marvel!



del. C. McCann.

'Light Windows'

[*For explanation see end of article.*

It is not my intention to pursue the subject of 'light windows' exhaustively in the plant world, but merely to draw attention to the formation of such 'windows' as observed by me in the course of studying certain plants in the field. My attention was drawn to this point particularly when engaged on the study of the genus *Ceropegia,* and subsequently I extended my observation to the genus *Cryptocoryne,* in which I knew of the existence of 'closed' flowers, darkened internally.

Flowers which have developed 'light windows' have usually developed devices to exclude top lighting and for darkening the chamber containing the reproductive organs. This is achieved by modifications in the corolla as in *Ceropegia* (Figs. 1-5), or by modifications in the spathe as in *Cryptocoryne* (Figs. 6 and 7). In both instances there is a more or less inflated chamber formed round the reproductive organs. In *Ceropegia* the corolla is remarkably inflated at its base to form a chamber round the reproductive organs (corona). Above the chamber the corolla is strongly constructed, and generally bent to form a funnel-shaped tube terminating in the five corolla lobes, which are united at their extremities. The chamber and part of the tube above are very deeply pigmented interiorly with purple. Thus it will be clear that, but for a 'window', the interior of the flower would be in darkness—the colouring of the inside, the bend in the corolla tube, and the union of the corolla lobes above the 'funnel' all contribute towards excluding direct light from the reproductive chamber. A glance at the accompanying figure will make matters clear. The inner surface of the corolla lobes, the throat of the funnel, and often the chamber itself are provided with stiff hairs, all pointing downwards. The amount of hairiness varies with the species. The hairs admit the visitors, but prevent their exit for they all face the visitors like so many spear heads—the intruders are trapped! Following the maturation of the pollinia (pollen masses) the flower stalk bends downwards, the hairs break down, and light is admitted down the tube and the flies make good their escape carrying with them the pollinia fixed to their head like pairs of horns.

In *Cryptocoryne* the construction is somewhat different. What appears to be the flower is in reality an inflorescence, and not a single flower as in *Ceropegia.* Nevertheless, the method of attracting visitors is much the same. The spathe, which may appear as a corolla, is converted into a reproductive chamber in its lower portion to contain the two groups of male and female flowers, the remaining upper part is twisted into a tube of varying length, according to the species. Externally the spathe is variously pigmented in dark hues, but internally it is a very deep purple, almost black at times. But for light windows the internal gloom would be further accentuated by the presence of a valve which separates the chamber from the tube above. This valve admits the visitors, but once in, there is no escape—it is a trap-door which will only open when the pollen is mature and the visitors are thoroughly covered with golden dust. The inner surface of the chamber is polished and may act as a reflector. The female flowers are situated at the bottom of the chamber and the males are fixed at the top near the valve. Both

groups are connected by a thread-like process which may serve as a ladder. When the female flowers mature the spathe opens and gives off the necessary odour to attract visitors. These alight on the free end of the tube and in their ardour to discover the 'goods' advertised, enter the tube and finally press pass the valve into the chamber. The male flowers ripen next, giving out the pollen grains. The flies finding themselves trapped, fly round the chamber and towards the source of light, which in *Cryptocoryne* enters from two trellis-like grids at the top of the chamber, one on either side of the group of male flowers (Fig. 6), the polished surfaces of the walls probably reflecting a certain amount of the light admitted. The whirling of the flies in their frantic efforts to escape fills the chamber with clouds of pollen dust and the flies themselves are covered with it. The valve soon after breaks down and out go the flies with the new pollen only to enter another flower and effect the task assigned to them by Nature.

The *Cryptocoryne* are more or less aquatic, or amphibious plants, and according to the species may be partially submerged when flowering or, as is the case with some less aquatic species, a greater portion of the reproductive chamber may be hidden from view. The flowers are produced deep in the axils of the leaves and consequently become slightly compressed. The windows are produced on the 'shoulders' of the chamber which are not covered by the petioles.

In both *Ceropegia* and *Cryptocoryne* the reproductive chamber would be positively dark, but for the fact that Nature has provided 'light-windows' in each case. In *Ceropegia* the position of the 'window' varies. In some species there exists a light-coloured ring around the top of the chamber, in others the ring of light is below, and in such a position as to light up the corona, while in yet others the 'windows' form longitudinal 'pannels' composed of dense and thin bands of tissue to admit light. Whatever may be the type of lighting arrangement, it is so constructed as to illuminate the *corona* in *Ceropegia* and the male flowers in *Cryptocoryne*. The accompanying drawing will explain the subject matter more explicitly than my pen.

Explanation of Plate.

Fig. 1.—Flower of a *Ceropegia*.
Figs. 2 to 4 show various types of lighting.
Fig. 5.—Pollen-masses.
Fig. 6.—'Flower' of *Cryptocoryne*.
Fig. 7.—'Window' of *Cryptocoryne* enlarged.
(*The figures are somewhat diagrammatic.*)