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colour; the former shows in other respects also remarkable approximations to the condition of an entomophilous flower. Indeed, if the pollen-grains of *L. lutea*, instead of being smooth and powdery, became adhesive, the plant might be supposed to have attained the rank of an entomophilous species (609, fig. 1).

ORD. *PALMÆ*.

Sabal Adamsoni has a white perianth which contains honey; it is proterogynous and is fertilised by insects (*Halictus*, *Polistes gallica*). *Chamædorea* is also entomophilous; *Cocos* and *Syagrus*, on the other hand, are anemophilous (177, p. 61).

ORD. *AROIDEÆ*.

397. ARUM MACULATUM, L.—The arrangement of the flowers in this species agrees so completely with Delpino's excellent account of *Arum italicum* (178, 360) that I have little new to add. The upper part of the spathe (*d*, 1, Fig. 185) serves as a wide, conspicuous entrance, guiding small Diptera (*Psychoda*) into the lower chamber (*c*) which forms a temporary prison. The insects creep down the dark-red spadix (*e*) or sometimes the sides of the spathe until they reach the upper part of the chamber (at the level of *a*, *b*, 1, Fig. 185). At this point several rows of hairs (metamorphosed stamens) radiate outwards, pointing slightly downwards, from the spadix, and form a palisade which does not prevent the small visitors from creeping down into the chamber (*c*), but afterwards prevents them from escaping when they try to fly towards the light. Even when they try to escape by crawling up the spadix, the sharp downturned points bar their way.

In the first stage of flowering the stigmas only, which are borne by the base of the spadix, are mature; a foul ammoniacal smell attracts the Psychodæ into the prison, where they cross-fertilise the stigmas if they have come from other plants. In the second stage the stigmatic papillæ wither, and a drop of honey appears in the middle of each stigma, to reward the little visitors for their pains. In the third stage the anthers dehisce, and the greater part of their pollen falls upon the floor of the chamber; the insects dust themselves over and over with it, and finally, when the palisade of hairs withers in the fourth period, they pass out, and enter another flower in its first stage.

Delpino has observed *Arum italicum* to be fertilised by six different flies, of the genera *Ceratopogon*, *Chironomus*, *Sciara*, *Psychoda*, *Limosina*, and *Drosophila* (178, p. 243). In *Arum maculatum* I have only found *Psychoda*, but it occurs almost constantly, and sometimes by hundreds in a single spathe. I could often see, on looking down through the grating, that many of the prisoners were trying to fly upwards to the light, and falling backwards, or trying to crawl out and being repulsed by the sharp points. Whenever I broke open a spathe in the third

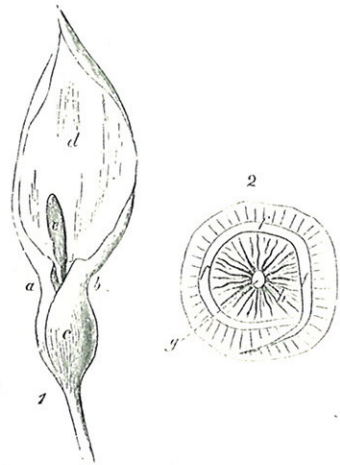

FIG. 185.—*Arum maculatum*, L.

1.—The whole inflorescence. × ½.
2.—Transverse section at the level of *ab* (1), seen from above, on a somewhat larger scale.
ab, point at which the cage *c* is closed by stiff hairs, radiating from the spadix; *c*, cage inclosing the spadix with its reproductive organs; *d*, attractive portion of spathe; *e*, barren portion of spadix, serving as a guide-post; *f*, cross-section of spathe; *g*, ditto of spadix; *h*, stamens transformed into stiff filaments.

stage of flowering, I always found a multitude of inmates groping about in the thick layer of pollen on the floor of the chamber. The Psychodæ which I collected were so various in size and colour that I supposed I had obtained at least three species; but Herr Winnertz of Crefeld tells me that they all belong to the very variable species *Psychoda phalænoides*, L., which is probably the same species found by Delpino in *Arum italicum*, and identified by Rondani as *Psychoda nervosa*, Schr.[1]

[1] According to Schiner, *Psychoda phalænoides*, L., is identical with *P. nervosa*, Mgn., and perhaps also with *Tipula nervosa*, Schrank.

Arum dracunculus (*Dracunculus vulgaris*) is visited according to Delpino by flesh-eating flies, as is also *Amorphophallus campanulatus* (178, p. 238). According to Arcangeli it is fertilised almost exclusively by carrion-loving beetles (*Saprinus, Dermestes, Oxyteles* (7).

Arisarum is distinguished from *Arum* by the following features. The edges of the spathe do not meet, the aborted stamens are absent, and so the spathe surrounds a cavity which insect-visitors can enter or leave at will. The stigmas are still capable of impregnation when the anthers, which stand above them, dehisce, so that self-fertilisation may occur (178, p. 21; 360, p. 591).

Alocasia odora is supposed by Delpino to be fertilised by snails. The spadix is covered in its whole length with normal and abortive stamens and pistils; only female flowers occur in the lower, wider part of the spathe, and they only are mature in the first period. From this chamber an attractive odour issues, and the snails are admitted by a narrow entrance. In the second stage this entrance closes, and the anthers dehisce. Snails which creep on to flowers in this stage seek vainly for the entrance, and dust themselves with pollen, which they afterwards carry to the stigmas of younger plants. Delpino supposes that the snails, after effecting cross-fertilisation, are poisoned by an irritant secretion within the chamber of the spathe, and are so prevented from devouring the flowers (178, 360).

In Delpino's opinion, *Typhonium cuspidatum*, *Arisæma filiforme*, *Amorphophallus variabilis*, *Atherurus tripartitus*, and species of *Anthurium* are also fertilised by snails (178, p. 238).

Arum ternatum, Thnbg., is proterogynous. There is an upper male chamber, and immediately below it a female chamber into which the pollen falls upon the imprisoned insects (probably small flies), which are afterwards allowed to escape by a small door (107, 596).

Arum crinitum, Ait., resembles *A. maculatum*, but attracts carrion-flies by means of its strong odour of putrid flesh. The smaller visitors are held fast by sticky hairs in the floral chamber and digested (688, 689).

The gigantic *Amorphophallus* (*Conophallus*) *Titanum*, whose spathe is 33 inches in diameter, and the bare part of whose floral axis attains a length of 6 feet, is adapted, by its dirty-yellow and dark-purple colours, for dung- and carrion-flies (48).

Stylochiton hypogæus, Lepr., and *St. lancifolius*, Kotschy and

Peyritsch, from Central Africa, remain with their inflorescence, which consists of male and female flowers, and is inclosed within a spathe (like our *Arum*), beneath the ground; the tip only protrudes, and by it the fertilising agents creep into the floral chamber. A similar condition exists in *Biarum* and *Cryptocoryne* (222).

Calla palustris, L.—This plant exhibits a first step towards the condition of things which is perfected in *Arum maculatum*. Its disgusting smell protects it from injurious animals, and attracts carrion-loving flies. The white spathe is very conspicuous, and the proterogynous condition is very distinctly marked (590, I.). Eug. Warming (762) attributes a share in the work of fertilisation to pond-snails.

Symplocarpus fœtidus.—This shows an intermediate stage between the open spathe of *Calla palustris* and the closed prison of *Arum maculatum* (728).

In *Ambrosinia Bassii* the anthers are within the spathe, the stigmas outside, at the end of the spadix. The fertilising agents (flies) creep down the spadix, and so in each plant come in contact with the stigmas before the anthers (178, p. 230).

Anthurium Pothos is proterogynous with short-lived stigmas, like most other Aroideæ (177, p. 62).

ORD. *LEMNACEÆ*.

Lemna minor, L., according to Ludwig, is adapted for fertilisation by insects which live upon the surface of the water; so also, apparently, are *L. trisulca*, *L. gibba*, and *L. polyrrhiza* (435).

ORD. *ALISMACEÆ*.

398. ALISMA PLANTAGO, L.—The three white or reddish petals are yellow at the base, and expand to form a disk about 10 mm. in diameter.

The chief visitors are Syrphidæ. They alight sometimes in the middle of a flower, in which case the insect's belly comes in contact with the stigmas and immediately afterwards with the anthers; or they alight on one of the petals and creep towards the pollen or honey, in which case various parts of the insect's body come in contact with the anthers, and sometimes also with the stigmas.