PLANTS AS INSECT DESTROYERS.

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[*Read* 10*th July*, 1877.]

Being much attached to Botany, and, in a less degree perhaps to Entomology, I have put together a few notes, bearing upon both these sciences, and bringing before you one out of the many points, at which the two great families of plants and insects cross each other's paths—one, it must be added, in which the latter get decidedly the worst of it.

We all know, to what an enormous extent insects are dependent on plants for support. In the supply both of food and protection Flora proves herself a veritable mother to her humble friends. But there is a dark side in the character of even this gentle deity, whom we are apt to associate with all that is cheerful and smiling; and it is astonishing to see in how many ways and under what different aspects she puts forth her "insecticidal" functions. Directly or indirectly the members of the Vegetable Kingdom help largely to thin the ranks of the little creatures which visit them.

To "begin at the beginning," we must go back to the old prehistoric times, when insects had nothing to fear from man's organ of inquisitiveness; for the simple reason, that man did not then exist; or, if he did walk the earth, his intellect was of the lowest, and collections and museums were undreamt of. I allude to the days when amber was forming, and vagrant insects were every day being entangled in its viscid toils, and there preserved for the wonder and admiration of modern scientists. Amber is a semi-transparent substance of a light yellow or brown colour, capable of taking a high polish, and therefore is much employed in the manufacture of heads of canes, mouthpieces of pipes, necklace beads and such small matters. Probably the most important use that has hitherto been made of amber is to be seen at Zarskoja-selo, a favourite residence of the Czars of Russia, not far from St. Petersburgh. Here there is a room, about thirty feet square, the walls of which from floor to ceiling are entirely lined with this substance.* It was presented by Frederick the Great to the Empress Catherine, whose initial E (Ekatarina) is interwoven with the Prussian arms in the devices on the walls. If we may give credit to old Homer, this is not the first time that amber has been used for the decoration of a palace; for he writes,

> "The spoils of elephants the roofs inlay,
> And studded amber darts a golden ray."†

The principal source of supply is the coast of the Baltic Sea in Eastern Prussia, between Memel and Dantzic, where it is disseminated in the sand or clay. It is searched for in the sea or on the shore, or is picked from the cliffs with iron hooks at the end of long poles, or lastly it is regularly mined, the shafts sometimes being sunk to a depth of a hundred and fifty feet. Saxony supplies a small quantity, in bituminous clay mingled with lignite. It also occurs in Sicily in beds of clay and marl; in Poland it is found in sandy districts at long distances from the sea; it also occurs in

*A. B. Reichenbach (Vollständige Naturgeschichte).
†Homer (Odyssey, iv. Pope's Translation).

Siberia, and Greenland, in Sweden, Italy and other parts of Europe. Amber occurs in varying quantities in nodules or nuggets of different sizes, sometimes as fine as grains of coarse sand, at others of much larger dimensions. One of the largest pieces on record is deposited in the museum of minerals at Berlin. This great mass, which measures upwards of thirteen inches in length, eight inches broad, and four to six inches thick, with a weight of over thirteen pounds, was found near Gumbinnen in Eastern Prussia in the year 1803. The fortunate possessor received one thousand thalers (or one hundred and fifty pounds) for his prize. Its real value, however, far exceeds that sum. There is no doubt of the vegetable origin of amber ; it is in fact a resinous exudation from an old-world pine-tree named by Göppert, *Pinites succinifer*, which was nearly allied to our modern spruce. Consequently amber is in its nature exactly analogous to the lumps of resin which occur in every forest of firs in the present day. Indeed if anything were wanting to prove its originally fluid condition, it would be the fact, that particles of leaves and wood, fragments of mosses, and, above all, insects, are constantly found embedded in it. Of the latter no less than eight hundred species have been detected.*

It is evident that the little creatures settled upon the treacherous resin, when it was in a semi-fluid state, and were of course retained there by the viscid nature of the substance. The gummy matter, as it flowed from the tree, gradually surrounded its victims, and at last entirely enclosed them in their premature and transparent tomb ; so that the question of the poet Pope can be answered with more certainty now, than in his day—

> " Pretty, in amber to observe the forms
> Of hairs, or straws, or dirt, or grub, or worms.
> The things, we know, are neither rich nor rare ;
> But all the wonder is—how got they there !"

The insects themselves are in different degrees of preservation. Some, which were evidently engulphed in the sticky matter, immediately that they got entangled in its folds, are as perfect as on the day that they were suffocated. Others have been consigned to a more lingering death ; the resin has exuded very slowly, and the victims have not only died before they were surrounded by it, but, having been trapped in bright dry weather, their bodies have become dessicated and withered ; nay, in some instances a white mould has begun to form round them, plainly discernible in the pellucid amber. At least two minute fungi have been detected ; *Penicillium curtipes*, and *Brachycladium thomasinum ;* traces of other genera also occur.† As a rule the enclosed insects are not widely different from—indeed many species are actually identical with—those now in existence.

At least one half of the insect orders have had their representatives embalmed in the golden fluid ; most of them, as may be easily imagined, being such as frequent woods and forests. Among Beetles are numerous Bostrychids and weevils : the Orthopterous Order supplies locusts and grasshoppers ; the Dictyopters a small cockroach. In the Hymenopterous Order we have ants, ichneumon flies, and a bee allied to the South American Trigona ; among Lepidopters,

* Hartwig. The Subterranean World.
† Berkely (Cryptogamic Botany).

which are comparatively rare, appear a large hawk-moth and several caterpillars. Of Neuropters there have been captured among others an ant-lion, a lace fly, dragon flies, and white ants. In a piece of amber lately in my possession there were no less than 27 white ants, besides several detached wings, together with a moth and a small beetle. Various kinds of Hemipters, or bugs, have been found; also divers Homopters (such as a Cicada and a Flata); while of Dipters or flies the list is well nigh interminable.

Other transparent resins, which embrace insects in their deadly folds, are known in commerce as copal and gum-anime or elemi.* Though largely employed in the arts, and exported in great quantities from certain localities—Angola alone supplies about two million pounds annually—little is known of their real origin, nor indeed whether there may not be several kinds of resin erroneously combined together, partly fossil, and partly recent, under the name of copal and anime. That they are of vegetable origin (as in the case of amber) there seems to be no question, though the exact species of tree which produces them is scarcely yet known. Whatever it may be, it does not belong to the Pine tribe. In all probability the matter is a product of two Leguminous plants, *Hymenea* and *Trachylobium*, species of which are indigenous to Southern India, South America, and Africa, both west and east. With regard to the latter region, Dr. Kirk, British Consul at Zanzibar, informs us, through the Linnean Society, that "Specimens removed from the living tree show that large masses equalling the fossil in size are still produced, and are as full of insects as were those of the ancient forests." Indeed so large a number of organic remains does "anime" contain, that its name of "animated" is fully justified. But while the *Trachylobium* of East Africa still gives forth an amber like resin from its stem, and the same resin exudes from the roots of the American and Indian Hymenea, the learned traveller Dr. Welwitch states as his decided opinion—(also in a paper read before the Linnean Society)—that the copal of Western Africa is, like amber, of a fossil nature "produced by trees which in periods long since past adorned the forests of that continent, but which at present are either totally extinct, or exist only in a dwarfish posterity. The copal is either dug out of the loose strata of sand, marl, or clay, or else it is found in isolated pieces, washed out and brought to the surface of the soil by heavy rain-falls, earth-falls, or gales." Burton also, in a recent work on Zanzibar, speaks of gum copal as though it were mainly, if not essentially, of a fossil nature.

From these statements it would appear that the copals of commerce are of both fossil and recent origin.

Having thus come down to our own days, we will notice first the lowest forms of vegetable life, but perhaps the most mischievous, the universally distributed "fungi;" as the onslaughts committed by one of its members is often patent to the eye. I allude to the fungus, called *Empusina* by one author, and *Sporendonema* by another, to which the common housefly so frequently falls a victim. One of these may often be seen during the autumn quite dead, but with all the semblance of life on the window pane; apparently glued down to the glass by its proboscis and outstretched legs; if

* Burton (Zanzibar).

you touch it, the chances are it falls to pieces, being a mere dry shell, the interior of which has been completely eaten out. If you have seen this phenomenon, you will probably have also noticed —(though perhaps without attaching much importance to the fact) —that the fly was surrounded by a filmy cloud which covered the glass, and extended over it for an inch or two on every side. But in point of fact this delicate white mass is the real "causa doloris," "the head and front of the offending"—it is a plant, a fungus, or mould. Now when a spore or seed of this mould comes in contact with a living fly, it forthwith sends out a delicate process which bores its way through the skin into the interior cavities of the body, just as does the mistletoe into the heart of the hawthorn or apple. Here it gives rise to minute corpuscles which, floating in the juices of the insect, multiply and lengthen into new filaments at the expense of the fly's substance, and ultimately are the cause of its decease. * No sooner does death ensue, than the filaments issue into the world through the openings between the segments of the animal's abdomen, spreading on every side, each tiny thread being the fertile bearer of innumerable spores or seeds, destined to work like ruin among new generations of flies.

A second species of the same plant has been detected on the common gnat. Another of these moulds, *Botrytis bassiana*—(so named after its first investigator, Dr. A. Bassi)—attacks the silk-worms of Italy and Southern France, producing a disease called Muscardine, which has for some years caused great apprehension among silk-growers. Its true character, in spite of the incessant and careful observations that have been brought to bear upon it, has even yet scarcely been made out with any certainty. It is not even ascertained whether it is identical generically with the fungus which attacks the flies.

It is probable, however, that both of them are merely incipient states of some more highly organised plant. † Be this as it may, of its destructive powers there is no doubt, more especially during the caterpillar stage of the insect's existence ; though the chrysalis is sometimes affected in the cocoon. The germs of the fungus once introduced spread through the fatty matter stored up beneath the skin, propagating themselves with extraordinary celerity, and sooner or later causing the death of the victim. It is only when life is extinct, that the plant shows itself externally, throwing up spore-bearing stems. These quickly ripen, and are the means of scattering the disease far and wide, for it has been ascertained that the mere contact of a spore with the insect's skin, without actual inoculation, is quite sufficient to ensure its growth. Where the disease has once established itself, all remedial measures appear to be hopeless, and the proprietor usually turns his attention to procuring a new stock from an uninfected source.

Cordiceps is the name of a fungus consisting, in its perfect form, of a stem varying in length from a few lines to four or six inches, and terminating in a pointed or club-shaped head of spores.

It is the same fungus to which I drew your attention a short time ago, when making some remarks on ergot in rye-grass. Ergot is, in

*Huxley. (Opening address, British Association, 1870.)
†Berkely. (Introduction to Crytogamic Botany.)

fact, an imperfect state of this plant, which appears to be very indiscriminate in its tastes.

This curious fungus counts its victims by myriads in the insect world, either in the larval, the pupal, or the complete form ; neither does it confine itself to one order of insects, having been detected on beetles, wasps, moths, and a variety of others. How the spores first find their way into the bodies of the little creatures is perfectly inexplicable. Certain it is that the parasite fixes itself within the insect near the back of the head, and from thence grows up into the perfect plant, the animal's body forming both support and nourishment. The example which has been longest before the world is that of *Cordiceps robertsii*, a native of New Zealand, where it is well-known under the name of *Hotete;* it is parasitical on the larvæ of a moth called *Hepialus virescens.* The caterpillar when about to assume its chrysalid dress, buries itself below the surface of the ground, generally at the root of a tree named *Rata* by the natives, *(Metrosideros robusta).* It is during its subterranean existence, and while yet in the larval state, that the fungus begins to form, gradually growing up through the soil to a height of seven or eight inches, consuming meanwhile the internal substance of the caterpillar, which of course never arrives at its next stage of being. Of this wonderful production Dr. Hooker writes :—"I am still much at a loss to account for its development. It is found in spring ; the caterpillar is buried in the ground, as is the lower part of the fungus. Both Mr. Taylor and Mr. Colenso hold the same opinion, that in the act of working the soil the spores of the fungus are lodged in the first joint of the neck, and the caterpillar settles head upwards to undergo its change, when the vegetable developes itself. The whole insect seems entirely metamorphosed into vegetable, with the exception of the skin and intestines."*

Many other species of this remarkable fungus, about twenty-five altogether, have been traced in different countries, all parasitical on various insects. The larva of the British Ghost Moth *(Hepialus lupulinus),* which buries itself in the ground previous to becoming a chrysalis, is attacked by *Cordiceps entomorrhiza.* It consists of a white branched mycelium spreading externally over the insect, and internally absorbing the natural structure. From near the head of the larva, generally from the second joint of the body, arises a stem, nearly two inches in length, bearing at its summit a small egg-shaped head in which the fructifying organs are placed, the length and direction of the stem being influenced by the position of the insect. The stem is externally of a dirty yellowish colour, and the head of a brick-red or livid brown. The whole substance is fleshy and fragile when fresh, so as to snap readily when roughly handled.†

The chrysalis of another British Moth has been found with the stem of *Cordiceps militaris* growing from its head.

Nor is the vegetable less pernicious to the perfect insect. A species of ichneumon-fly falls a victim to *Cordiceps myrmecophila,* and there is a West Indian wasp, which is condemned to carry about "the clubs of this fungus with their curled stems, until the

*Hooker. (Journal of Botany, 1841.)
†M. C. Cooke. (Science Gossip, 1866.)

unhappy insect sinks under the exhaustion produced by the waste of its fatty tissue."*

In South America there is a family of ants *(Cryptocerus)* which are so frequently attacked by a *Cordiceps* that they are called by the natives of Peru "*Tamshi-mama*, that is mother of *Tamshi*, because the ant is supposed at its death to take root in the ground, and to grow upwards into the liana, *Tamshi*, which is in reality the tough air root of an *epiphytal Carludovica.*" The fungus, protruding from the earth, "looks not unlike a slender truncheon of liana, and might be mistaken for such, on a superficial inspection." †

Ascending to the higher forms of vegetable growth we come to some, which are genuine traps, in which the prisoners are retained until death puts an end to their struggles.

There can be little doubt that the plants themselves derive direct benefit from the consumption of the captured insect, feasting on the decaying animal matter, and imbibing the gases which arise from its corruption, and that they deserve the name of predatory or carnivorous, as truly as do the eagles and lions of the animal kingdom. In point of destructive power and of ingenuity in the method employed, a plant produced in the sandy bogs of Carolina in the United States, stands at the head of the list ; this is the Venus's Fly trap *(Dionœa muscipula)*, and most admirably does it answer to its name. It is a lowly plant with a single naked flower stalk, which springs from a rosette of leaves spreading round the central stem. The upper half of each leaf is divided into two equal parts by a strong mid-rib. The margins are fringed with a row of stout spiny bristles, so that it may be likened to two upper eyelids joined at their bases. The leaf is slightly hollow on either side of the mid-rib, the upper surface is dotted with minute reddish glands, and each hollow portion is furnished with three slender bristles. The sensitiveness of the leaf chiefly resides in these bristles. If an insect alights on the leaf, and touches one or more of them, the sides suddenly close with a force so great as to imprison the little creature. In vain does the captive struggle to escape ; the greater are its efforts to disengage itself, the more firmly is it hugged by the enclosing leaves ; directly, however, it ceases to make a movement, the leaves relax their hold, only however to recover their former position should the struggle recommence. A bystander might imagine the leaf to have some kind of reasoning power, so exactly coincident are its movements with those of the insect it wishes to retain.

In the same natural order with the wonderful *Dionœa* is also found, the *Drosera* or Sundew, of which we have several species in this island, readily distinguished among our wild plants by the conspicuous red hairs, each surmounted by a viscid gland, with which the leaves are covered. It is from the presence of these glands glittering in the sun's rays, that the plant derives its common name. They, too, form the deadly trap, fatal to the unwary fly or ant, that touches them. No sooner is the presence of one of these felt, than the neighbouring hairs begin to bend towards the victim, and attach themselves to it ; the more distant ones succeed, until the leaf itself

* Berkely. (Introduction to Cryptogamic Botany.)
† R. Spruce. (Venomous Reptiles, etc. Ocean Highways, July, 1873.)

is folded over it, and a regular process of digestion commences. That the movement of the hairs is not due to their being pulled together by the struggling prisoner, is proved by the noteworthy fact that they do not begin to bend over towards it until its struggles have ceased. Moreover the same motion follows on placing a piece of meat on the leaf ; whereas not the slightest change is perceptible when an atom of wood or worsted is substituted.*

Similar tales are told of other species of the same family. At the Cape of Good Hope a practical use is made of *Roridula*, a genus closely allied to *Drosera*, "the branches being hung up for the purpose of catching flies."†

Of course all plants furnished, like the Sundew, with viscid glandular hairs—even though they may not have the sensitive property with which that vegetable is gifted—are indirectly the cause of death to thousands of insects which come in contact with them, when in search of food or rest. They are veritable traps, though not of so ingenious a character as those just mentioned.

Sempervivum glutinosum, a house leek of the Canary Isles, has the stem, (as implied in the second name) daubed from top to bottom with a sticky varnish. Many species of the mouse-ear-chickweed *(Cerastium)* have flower stalk and calyx clothed with glandular hairs. Another genus of the same Natural Order—Silene, with eight or nine British species—has obtained the common name of "Catchfly" from the fact of some part of the stem being covered with a viscid matter, to which unwary insects may be seen clinging in death. Of a similar nature are the leaf buds of the horse-chestnut and the *Tacamahac* poplar *(Populus balsamifera)*, which are painted over with a peculiar varnish of a very adhesive nature.

But the "viscid" principle is not the only one employed to beguile simple insects. Nature has other methods equally efficacious for working out her ends. Sometimes the throat of the Corolla is furnished with a ring of stiff hairs, which all point inwards, thus allowing of the entrance of a vagrant insect, but rendering its exit very difficult, and often impossible. Many a poor fly has been in a position to quote—with a depth of feeling which only bitter experience can give—the well-known lines of Virgil :

> Facilis descensus Averni est ;
> Noctes atque dies patet atri janua Ditis ;
> Sed revocare gradum, superasque evadere ad auras,
> Hoc opus, hic labor est. Pauci, (quos æquus amavit
> Jupiter, aut ardens evexit ad æthera virtus)
> Dis geniti, potuere.‡

Not the least remarkable of these predatory vegetables is the Californian Pitcher plant, *(Darlingtonia californica)*, which flourishes in spongy bogs at an elevation of five thousand feet above the sea. It is a vigorous plant, the stout flowering stems reaching three feet in height, and having seeds as large as walnuts. At a short distance the pitchers present the appearance of jargonelle pears, supported with the largest ends uppermost between ten and twenty-four inches above the ground. This results from the pitchers being quite turned

* A. W. Bennett. (Paper read before the British Association, September, 1873.)
† Barber. (Transactions Linn. Soc. 1870).
‡ Virgil. (Æneid. VI).

over at the top, so as to form a dome somewhat longer than broad, and the uppermost half of the pitcher being of a decided ripe pear yellow. They are all twisted spirally, especially in the upper portion; and they contain at the lower part a layer of from two to five inches of the closely packed remains of insects of all sizes from minute beetles to large powdery moths. When a sharp knife is passed through a lot of brown pitchers withering round an old plant, the stumps resemble a number of tubes densely packed with the remains of insects; but what it is that attracts the insects is by no means clear. Within the pitcher the surface is smooth for a little way down; then isolated hairs appear; and soon the chamber becomes densely lined with sharp needle-like hairs all pointing downwards, so decidedly indeed, that they almost lie against the surface from which they spring. These hairs are slender, transparent, and colourless, about a quarter of an inch long and very rigid. The poor insects evidently travel down these conveniently arranged stubbles, but none seem to turn back. The pitcher, which may be a couple of inches wide at the top, narrows very gradually at the base where it is a little more than a line in diameter. For some little distance above this point, the hairs all converge, and the unhappy fly goes on till he finds his head pressed against the thick firm bottom of the cell and his rear against myriads of bayonets. Very small creatures fill up the narrow base, and above them larger ones densely pack themselves to death in the hope of fighting their way out. When held with the top upwards, a reddish juice with an exceedingly offensive odour will sometimes drop from them."*

Another method of destruction, of a more peculiar nature, is found in the dogsbane, *(Apocynum androsæmifolium)*, a North American plant. Here we see certain toothlets on the inner surface of the flower, endowed with an extraordinary degree of irritability. No sooner does an insect, eager to secure the honey-like nectar, apply its proboscis to the flower, than these segments close over it, and the victim is held in a hopeless captivity, until death puts an end to its struggles. The vice-like toothlets then relax their hold, and the body falls off. In consequence of this curious faculty the plant has acquired the name of *Gobe-mouche* in France, while to the Germans is it known as *Fliegen fanger* or flycatcher.

We have seen how pertinaciously plants attack and destroy insects, by enveloping them in deadly folds, by gradually eating their very vitals, or by catching them in traps and gins of ingenious make; but perhaps the last mode of destruction we should credit them with is that of drowning their victims; and yet it is one to which they have constant resource. The Teazles of Europe—both the common wild kind *(Dipsacus silvestris)*, and that so largely employed in the manufacture of cloth *(Dipsacus fullonum)*—do a considerable amount of murder in this way. In these plants the leaves are placed in opposite pairs, and are in technical language "connate;" that is to say, the bases of each pair of leaves are as closely combined, as though they were one leaf, thus forming a hollow cup, which retains the rain and dew so successfully, that it is rarely empty even in very warm weather. Hither then, insects eagerly

*W. Robinson. (Transactions Linn. Soc. 1870.)

resort to slake their thirst, and are drowned by thousands. Teazles abound in every hedge row in England; and it is a rare thing to look into one of these natural reservoirs without seeing it dark with the bodies of gnats, flies, and small moths.

We have analogous examples in many of the pine apple plants *(Bromeliaceæ)*, which flourish in tropical lands, and whose fleshy leaves are capable of holding a considerable amount of water at their base. What destruction they cause among the insect tribes may be seen by the following passage :—

"The ground was clothed with the dwarf *Sumara* and other *Bromelias.* These may be compared with the "*arbres des voyageurs*" in various regions. A full-grown plant gives a pint of water collected between the stalk and the bases of the leaves ; when fresh it is pure, wholesome, and free from vegetable taste, but not nectar. After a time of drought the fluid becomes turbid, a fine black mould collects in it, and dead insects and live tad-poles (especially those of a small pale yellow frog, *(Hyla luteola)* require it to be filtered."*

A different, but equally effective class of drowners, is known under the name of Pitcher plant, for specimens of which we must look to the genera *Sarracenia*, *Heliamphora, Cephalotus,* and *Nepenthes.*

All of these plants are constructed on nearly identical principles, viz., the conversion of the leaf, either entirely, or at the point only, into a cylindrical cup, with or without a cover, and always containing a supply of fluid. This fluid is not true water ; that is to say, it does not descend from the clouds, but is distilled by the plant itself. Consequently the statement that the lid of the Pitcher is raised at night to catch the dew, and closed during the day to prevent evaporation—has no foundation in fact.

The liquid has been analysed by Dr. Völcker, who finds that it consists mainly of citric and malic acids, the same acids, as give their pleasant flavour to most fruit ; thus confirming Lindley's statement, that the fluid of the Pitcher plant "emits while boiling an odour like that of baked apple."†

The same property of secreting a transparent liquid exists also in certain arums, one species of which *Richardia æthiopica,* commonly called the lily, adorns our gardens with its large flowers, in the shape of the classical *cornucopia.* I have never observed the phenomenon in this colony, but in England where *Richardia* is a green house plant, the dripping of water from the points of the leaves may often be seen.

Curiously enough the same property is shared by some tiny insects of the Homopterous Order, known as plant lice. In these species, which appear to be confined to Africa and Madagascar, a limpid fluid exudes from the apex of the abdomen in such quantities as to form a continuous shower.‡ Bach states in his "Wunder der Insekten Welt," that "on placing a quart bottle under a mass of half-grown larvæ, 60 or 70 in number, from which large drops were falling in quick succession, it was filled in an hour and a half."

As nature, however, has provided neither the *Richardia* nor the

*Burton. (Highlands of the Brazil).
†Lindley. Vegetable Kingdom.
‡Livingstone. Missionary Travels.

Homopters with a special receptacle, the fluid simply falls to the ground and is lost.

This is far from being the case with the Pitcher plants, which utilise their fluid for their own ends; innumerable flies and beetles crowding in to the tempting reservoirs, and there meeting with watery graves. Occasionally it would appear that the *Sarracenia* is employed artificially as a flycatcher in the United States. In South Carolina, for instance, the leaves are detached, taken into a sitting-room, and placed in a vertical position. Very soon the flies are attracted to the orifice of the Pitcher, where they appear to suck up a sweet clammy substance, exuding from the interior of the tube with great avidity. In a few seconds they have marched down the fatal passage, from whence they drop into the treacherous pool at the base, never to see the light again, their return being effectually guarded against by a ring of hairs, which is fitted to the interior of the tube, and which all point downwards. If the room is much frequented by flies, it takes but few hours to fill the Pitcher with victims.*

But however agreeable the fluid may be to the flies, or however useful the leaves may be as a trap, its treacherous properties are sometimes, in an indirect manner, anything but agreeable to the weary traveller, who hoping to enjoy an agreeable draught, finds only a mass of corruption. "We had been told (writes Wallace), that we should find water at Padang Batu, (Malacca); but we looked about for it in vain, as we were exceedingly thirsty. At last we turned to the Pitcher plants, but the water contained in the Pitchers—about half a pint in each—was full of insects."†

A kind of Pitcher is produced on an asclepiadaceous plant growing in India, the *Dischidia rafflesiana*. "It is a creeping plant having a long twining stem which is destitute of leaves until near its summit, and this may be a hundred feet from the roots, on which, therefore, it can scarcely depend for nourishment by absorption of fluid from the ground. Its supplies of moisture from a tropical atmosphere would be very uncertain if there were no provision for storing up what it occasionally collects; but with such an one it is furnished. The pitcher seems formed of a leaf, with its edges rolled towards each other and adherent; and the upper end, or mouth, from which it is suspended is quite open, and adapted to receive whatever moisture may descend from the air, whether in the form of rain or dew. It is accordingly always found to contain a considerable quantity of fluid, in which a number of small black ants are generally seen. These are probably attracted by it, and their decomposition may, as in the case of the *Sarracenia*, render it yet more nutritious to the plant."‡

It is worthy of observation, from a geographical point of view, that each main division of the globe is provided, among its vegetable stores, with a special executioner of insects. *Dionœa*, *Sarracenia* and *Darlingtonia* are told off to North America; *Heliamphora* to South America. In Asia we find *Dischidia* and *Nepenthes*. Australia

* Macbride. (Transactions of the Linn. Soc. xiii).
† Wallace. (Malayan Archipelago).
‡ Carpenter. (Vegetable Physiology.)

has its *Cephalotus;* and also shares with Europe and Africa the services of the less conspicuous genera, *Drosera*, *Roridula*, and *Byblis*.