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NOTE: See R. B. Freeman's bibliographical introduction here: http://darwin-online.org.uk/EditorialIntroductions/Freeman_InsectivorousPlants.html

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Mr. Charles Darwin's last book, entitled "Insectivorous Plants," is attracting much attention from men of science and others. The author has been experimenting on the Drosera rotundifolia, or common sundew, since 1860, and has developed new and interesting facts relating to the power of a few well known plants to capture many small insects, consume and digest them, as appropriate and natural food. That animals subsist on plants has long been known; but to reverse the rule, and have plants endowed with something like the gastric juice in the stomach of animals, to digest and assimilate flesh, is a newly discovered function in vegetable physiology. To show the render how animal and vegetable life and organisation run into each other, both ways, we copy a paragraph from Darwin's new book:

'The gastric juice of animals contains, as is well known, an acid and a ferment, both of which are indispensable for digestion, and so it is with the secretion of Drosera. When the stomach of an animal is mechanically irritated, it secretes an acid, and when particles of glass or other such objects were placed on the glands of Drosera, the secretion, and that of the surrounding and untouched glands, was increased in quantity and became acid. But, according to Schiff, the stomach of an animal does not secrete its proper ferment, pepsin, until certain substances, which he calls peptogenes, are absorbed; and it appears from my experiments that some matter must be absorbed by the glands of Drosera before they secrete their proper ferment. That the secretion does contain a ferment which acts only in the presence of an acid on solid animal matter, was clearly proved by adding minute doses of an alkali, which entirely arrested the process of digestion, this immediately recommencing as soon as the alkali was neutralised by a little weak hydrochloric acid. From trials made with a large number of substances, it was found that those which the secretion of Drosera dissolves completely, or partially, or not at all, are acted on in exactly the same manner by gastric juice. We may, therefore, conclude that the ferment of Drosera is closely analogous to, or identical with, the pepsin of animals.'

[1] 1875. Insectivorous Plants. (F1217): 268-9

The plants secrete hydrochloric acid for purposes of digesting animal substances, which acid is powerful enough to dissolve bone and the enamel of teeth, due, Mr. Darwin believes, to the desire of the plant for phosphorus. In the case of bone, the ferment does not come into play until all the phosphate of lime has been decomposed and acid is present, and then the fibrous base of the bone is quickly dissolved. The secretion attacks and dissolve nutritive matter out of living seeds. It also absorbs matter from pollen and fragments of leaves.

A long series pf experiments with salts of ammonia show that while they all caused the tentacles and often the blade of the leaf to be inflected, they act with very different power,

the citrate and the phosphate, owing, no doubt, to the presence of phosphorus and nitrogen, being the most powerful. It was further developed that the absorption of less than the one-twenty millionth of a grain of the phosphate on the gland of the Drosera is sufficient to cause the tentacle bearing this gland to bend to the center of the leaf.

These experiments have an important bearing on the use of phosphates as fertilizers in all farming and gardening operations. Productive industry and the latest researches of science meet on common ground. Mr. Darwin says:

In this experiment, owing to the presence of the water of crystallisation, less than the one-thirty-millionth of a grain of the efficient elements could have been absorbed. There is nothing remarkable in such minute quantities being absorbed by the glands, for all physiologists admit that the salts of ammonia, which must be brought in still smaller quantity by a single shower of rain to the roots, are absorbed by them. Nor is it surprising that Drosera should be enabled to profit by the absorption of these salts, for yeast and other low fungoid forms flourish in solutions of ammonia, if the other necessary elements are present. But it is an astonishing fact, on which I will not here again enlarge, that so inconceivably minute a quantity as the one-twenty-millionth of a grain of phosphate of ammonia should induce some change in a gland of Drosera, sufficient to cause a motor impulse to be sent down the whole length of the tentacle; this impulse exciting movement often through an angle of above 180°. I know not whether to be most astonished at this fact, or that the pressure of a minute bit of hair, supported by the dense secretion, should quickly cause conspicuous movement. Moreover, this extreme sensitiveness, exceeding that of the most delicate part of the human body, as well as the power of transmitting various impulses from one part of the leaf to another, have been acquired without the intervention of any nervous system.

[2] 1875. Insectivorous Plants. (F1217): 271-2

Here is a living being, a mere plant, more sensitive without a nerve than man with brain and nerves in the supposed greatest perfection. The organisms that feed on the sound and diseased bodies of mankind, may be not not less at the head of organic life, than at its base.

In describing the Venus fly trap, our author makes the following interesting statement.

"The Venus fly-traps does not close its lobes for the falling rain, nor for the wind, however severely it may blow; nor did the heat from the rays of the sun, concentrated by a lens on the basis of several filaments, so that they were scorched and discolored , cause any movement, though the leaves were active. as they closed, rather slowly, however, when a filament on the opposite side was touch. Non-nitrogenous matter, such as bits of wood, cork, moss, paper, stone, or glass, may be left of the Dionæa, and it remains quite dry. Nor does it make any difference if the lobes close over such objects. On the other hand, if a bit of damp meat or a crushed fly is placed on the surface of the expanded leaf, the glands after a time secrete quite freely, but only on the spot where the animal matter actually touches it. When the lobes are made to close over a bit of meat or insect, the glands over the whole surface of the leaf secrete copiously.

"As in this case the glands on both sides are pressed against the meat or insect, the secretion from the first is twice as great as when a bit of meat is laid on the surface of one lobe; and as the two lobes come into almost close contact, the secretion, containing dissolved animal matter, spreads by capillary attraction, causing fresh glands on both sides to begin secreting in a continually widening circle. The secretion is almost colourless, slightly mucilaginous, and, judging by the manner in which it coloured litmus paper, more strongly acid than that of Drosera. It is so copious that on one occasion, when a leaf was cut open, on which a small cube of albumen had been placed forty-five hours before, drops rolled off the leaf. On another occasion, in which a leaf with an enclosed bit of roast meat spontaneously opened after eight days, there was so much secretion in the furrow over the midrib that it trickled down."

[3] 1875. Insectivorous Plants. (F1217): 295-6

Feeding plants on roast meat with an eight days' supply is a very suggestive transaction. All life and all wealth come from growth. If so, the first and most pregnant inquiry is, how do plants and animals, including man, live, grow, possess health, vigor and multiply their kind? No question is more direct, or more practical than this. Darwin understands this fact, and labors accordingly.