ing Plants.—Dr. Krause, in a recent number of *Kosmos*, has discussed the relationship existing between the algæ and phænogamous plants, taking as the special subject of his inquiry the *Podostemaceæ*, which, as well known, are aquatic plants growing on stones, some with the aspect of seaweeds and others of mosses or liverworts. The species of this order, he believes, combine characters of the algæ and flowering plants, and show a direct transition between them. Indeed, the resemblance is so striking, and the forms of both so variable, that one would be excusable for inferring that the podostemes are algæ with flowers. The flowers of the podostemes, moreover, are either apetalous or imperfect, and very simple. The plants are inhabitants of running water in Asia, Africa, and America—being represented in the latter country by a single genus and species, the river-weed (*Podostemon ceratophyllus*). The lower forms are composed of little else than parenchyma, while only the larger ones have vascular organs. The stem is either wanting or assumes a great diversity of shapes, and has scarcely any true roots. The leaves are mostly wanting in the thallus-like species, but are highly diversified in the stemmed species. The veins, when present, are dichotomous, seldom parallel The buds, both of the stem and flowers, are folded convolutely. The cushion-like organs of attachment, which take the place of true roots, are found elsewhere only among the algæ. The absence of vascular organs is common to algæ and mosses among cryptogams, and also to a few phænogams, as the *Naiadaceæ*, *Ceratophyllaceæ*, and *Lemnaceæ*. Since the lower plants of these orders show no differentiation of stem and leaf, at least no more than the algæ, it is suggested by Dr. Krause that they might be placed, with the *Podostemaceæ*, in a group representing a direct transition between the algæ and phænogams, and for which he proposes the name *Anthophyceæ*. If the *Cytineæ*, which have no cotyledon, and the *Balanophoraceæ*, which have only a simple undivided embryo, be regarded as higher forms rising out of fungi, we may join them as *Anthomyceteæ* with the *Anthophyceæ* representing the lowest phænogams, as *Anthothalloideæ*.

A Gluttonous Fish.—The Smithsonian Institution has received a curious specimen of fish, which was taken on the fishing banks of Gloucester, Mass. Scientifically it is known as *Chiasmodus niger*, and its peculiar and distinguishing feature is the fact that its rapacity leads it to swallow fishes which are twice as large and which weigh twice as much as itself. It is enabled to do this from the fact that its mouth is very deeply cleft, its teeth bent, and that its stomach has an elasticity resembling that of India-rubber. When it begins to swallow its food its jaws move alternately and seem to climb over the fish, which is gulped down and doubled up in this curious creature's inside. As the process of digestion and decomposition takes place and gases are originated, the distended stomach becomes lighter than the upper part of the body, so that the latter frequently turns under. In this condition the fish is utterly unable to help itself, and may easily be caught. This specimen, secured by the Smithsonian, is only the third known. The first was found a number of years ago floating in the sea off the Island of Madeira, and the second was discovered in the Dominican Sea. Careful drawings have been made of this particular specimen, which is ten inches in length. It has in its stomach a kind of codfish, eighteen inches long. It is only by contrasting the long and slender body of the fish in its normal state with its distended form after gorging, that a proper idea of the feat it so successfully attempts can be gained.

A New Harvesting Ant.—According to the Rev. G. K. Morris (in *American Naturalist*), we have a true harvesting ant at our very doors. In Vineland, at Island Heights, Ocean Grove, and Asbury Park, they are very numerous. It is a small ant, the worker being about a line long. It is of a reddish-brown color, and has a rather large head. The head of the soldier ant is a marvel for size, being many times larger than the abdomen. The soldiers appear to rule the community, and certainly furnish the brains of the family, in bulk, at least. They are ferocious, murderous warriors, and a battle between them is a terrible thing in a small way. They cut each other in two and yet continue to fight. Mr. Morris had the true character of these ants revealed to him by observing rejected husks of seed piled up by their doorways. They appear to do their house cleaning in the latter part of June, to be ready for harvesting the new crop of grass and other seed now ripening. Here and there, however, a careful eye may detect signs of some later work in husks just brought from below. Grass, clover, sorrel, or other seed put near them will be seized and carried below with eagerness. They have a violent antipathy to the little yellow ant—the pest of the pantry—and this fact may be used in recognizing them."

Experimental Transformation of a Living Organism.

The bulletins of the Academy of Science at Munich contain a report of a discovery which has the highest interest for the theory of evolution and will perhaps be also of practical value. Hans Büchner, well known as a skillful experimenter, has succeeded in transforming a microscopical kind of fungi, which is a dangerous agent of disease, into another kind of fungi which is perfectly harmless. He reached this result by a continuous treatment of the fungi for the space of six months, and by producing 1,500 generations. In this manner he was able to transform those bacteria that cause "milzbrand" (the dreaded inflammation of the spleen), into the so-called "heupilze" (fungi of hay), which are harmless, and *vice versa*. And even more, he produced an organism that forms a connecting link between the above named fungi, and which was hitherto unknown. To give a detailed description of the experiment would take too long. We only mention two facts which will show with what organisms the experiment was made. The hay fungi, such as can be produced in an infusion of hay, have such an enormous vitality that their life cannot be destroyed even by boiling the liquid which contains them for hours, and each of these little beings is able to propagate itself and to produce ten generations per day.

MALIGNANT DISEASES OF PLANTS.

The study of vegetable nosology, or the diseases and injuries to which plants are liable, is a department of botanical science which hitherto has not received the attention which it deserves. Writings on the subject are comparatively few, many of them empirical, and but few throwing much light on the subject. Intimately connected with the prosperity of horticulture and agriculture, it is a matter of great importance, and this being recognized it is now beginning to receive the attention which its importance demands. Our intention in this article is not so much to advance theories on the subject as to direct intelligent observers, especially fruit growers, in the line of observation and experiment, and to throw out some hints which, if properly followed out, may help to clear up this hitherto obscure subject. We do not propose to treat of the injuries produced by accidents or the attacks of insects, but only of diseases producing disorganization of the tissues of the plant and ultimately resulting in great injury to it, and frequently its death and consequent pecuniary loss to the cultivator.

Plants in a high state of cultivation are more or less predisposed to disease. This is due to the unnatural and excessive development of particular structures or substances caused by high cultivation, and so producing a general morbid condition of the plant, predisposing it to disease whenever the conditions of cultivation are too strongly or too suddenly opposed to those of nature; making exciting causes act with great intensity whenever the predisposition exists.

Modern investigations in vegetable anatomy and physiology all point to a close analogy between vegetable and animal life, and to a similar analogy between many of the diseases which affect both of them, at least in so far as such diseases produce disorganization or destruction of the tissues. Mr. Meehan, of Philadelphia, in a recently published article, gives the results of some microscopical investigations which he has made upon pear blight, and suggests that it is analogous to melanotic or black cancer. The black knot in plum and cherry trees is certainly analogous to a gangrenous ulcer. The disease known as the "yellows" in peach trees is so similar in many of its symptoms to syphilis that it may be called vegetable syphilis. In the cacti family we have a form of anthrax or malignant pustule, in which the whole interior substance of the plant becomes black and rots away into an offensive black mass. The action of frost upon the succulent shoots of plants is almost identical with its action on animal structures in producing destruction of the parts exposed and their subsequent sloughing off. The deleterious effects of the gases escaping into the atmosphere from chemical works in manufacturing certain chemicals is as injurious to vegetable life as it is to animal life, and sometimes even more so; the liquid waste from other manufactures escaping into rivers or ponds is as destructive to the aquatic plants therein as it is to the fish.

While plants have not stomachs as animals have, they nevertheless have organs of nutrition, through which they take up their food in a soluble form. The process is similar in both animal and vegetable life; in the first, the food in the solid state is taken into the stomach, to be there rendered soluble before being absorbed into the system; in the latter, it is rendered soluble in the soil, whence it is taken into the plant. But in some so-called carnivorous or insectivorous plants we have, as in dionœa, an apparatus which catches insects, secretes a fluid similar to gastric juice to digest them, and then absorbs all the parts dissolved; just as is done by some of the lower forms of polypi or medusæ, which catch aquatic insects and folding their skin over them absorb all that is soluble of them. Similar action takes place in pinguicula, drosera, and other genera of plants. In others, such as utricularia, we find bladders attached to the plant; these are furnished at their mouth with peculiar hair-like processes or cilia, which have a vibratory motion, and in this and in their general appearance resemble many forms of polypi and medusæ. These bladders entrap minute aquatic insects, which being digested in them the soluble parts are absorbed by the plant. They are in reality outside stomachs. Again, we have in sarracenia, in nepenthes, and some other genera, large tubular leaves or outside stomachs, furnished with various appliances for catching insects and digesting the soluble parts. All this goes to prove the analogy of which we have spoken; we might extend it still farther into the processes of respiration and reproduction, and show similar striking points of resemblance. This being the case it is reasonable to infer that in so far as their difference of structure will admit, plants may be liable to diseases similar to those of animals. If these latter can be cured by medical skill, why should not the diseases of plants be likewise cured?

Many pathologists ascribe the cause of some of the cancerous affections in the human body to cachexia, or a condition in which the system of nutrition is depraved. This being the case, should we not in such diseases as pear blight endeavor to ascertain the causes of such depravation, whether they are in the air or in the soil, and when in the latter endeavor to remedy the evil? Amputation is the general remedy, but where the disease attacks large numbers of trees in any section of country, it is reasonable to suppose that its cause must be in the soil. Perhaps introducing some antiseptic drug under and below the diseased parts so that it might be dissolved and carried up in the sap might destroy the destructive action, or even the introduction of some drug into the tree by means of small gimlet holes into the trunk or branches might be of service. What these drugs should be, or in what quantity they should be, we know not, our object being to draw attention to a certain line of experiment which we believe has not before been suggested.

The common idea is, that the class of diseases in fruit trees to which we refer is due either to injurious atmospheric or meteorological causes, to insects, or to fungoid growths. The first may no doubt have, in certain cases, much to do with it; as, for instance, an excess or a deficiency of ozone in the air, which by its remarkable oxidizing power may materially affect the various chemical changes going on in the organization of the plant. Lest some of our readers may not fully understand what this mysterious agent is, we will state, on the authority of Prof. Dunglison, that ozone is a powerfully odorous matter, produced when a current of ordinary electricity passes from pointed bodies into the air. It is generally presumed to be a peculiar modification of oxygen; and in varying quantity in the atmosphere is supposed to affect the health of man. By others, ozone is considered to be oxygen condensed to two-thirds its bulk, when it possesses remarkable oxidizing properties. It can be artificially produced by placing phosphorus in a flask filled with atmospheric air and partly covered with water, occasionally agitating the flask. So, too, an occasional change in the normal condition of the atmosphere by an excess or deficiency of its gaseous constituents, or the presence of other gases, may induce cachexia. In the full grown human being the lungs expose fourteen hundred square feet of surface to the action of the air inhaled. Large as this surface is, that of a good sized tree, through its leaves, is vastly greater; and just in such proportion must be the injurious effects of a vitiated atmosphere upon it.

The presence of insects in a degenerated tissue is not *prima facie* evidence of their being the cause of the degeneration. A neglected gangrene will become full of maggots, but they were not the inciting cause. The same may be said of fungi, particularly of such as the yeast plant, which develop whenever chemical changes incident to eremacausis or decay present themselves in any organic matter or living organization. The mildew on grape vines is well known to be caused by atmospheric influences; the mildew or fungi is not a cause, but only a secondary effect. Sulphur, or rather the sulphurous acid gas which it contains, is a specific cure for it, generally supposed to directly destroy the fungus; but it more probably destroys it by the gas being taken up by the leaves of the plant, thus absorbed into its sap, and so restoring the leaves to a healthy state, which in such a state do not afford the food necessary to the life of the fungus, and it therefore perishes. All these gangrenous diseases of plants are contagious if any portion of the diseased plant is introduced into a healthy one. If a knife used in pruning such a diseased plant be afterward used in pruning a healthy one without proper cleaning, it will communicate the disease from the first to the latter. As much care must be used in cleansing it as a surgeon would use in cleansing his instruments after an operation for cancer or gangrene, before again using them upon a healthy person in some other operation. In the "yellows" in peach trees the disease is no doubt mainly communicated through the organs of fertilization, the pollen of the diseased tree coming in contact with the stigma of a healthy one, and communicating the disease in the same way as syphilis is communicated to a healthy mother through the fœtus derived from a father having a syphilitic taint. This disease is so virulent that the roots or branches of a diseased tree coming in contact with the roots or branches of a healthy one will communicate the virus.

In conducting such experiments as we have suggested, absorption of air and water by the roots and leaves, and also the processes of exhalation and respiration by the latter, should be studied as a means of detecting the causes of disease and indicating the methods by which remedies may be applied to restore them to health when diseased. There is a certainty, at least, of insentient life in plants, if not a close approach in some to sentient life. Some forms of it may be chemico-vital action, but others are different and of a higher character. Vegetable physiology and anatomy have received great attention from learned botanists; their researches have been of much practical service to cultivators, and have done much to advance the arts of agriculture and horticulture. To these two branches of botanical study we shall soon have to add that of nosology and therapeutics. Veterinary science has advanced from mere empiricism to a strictly medical science. Agriculture and horticulture are but arts as yet, in which there is much groping in the dark. We now have agricultural colleges in which are many learned professors, who can do much to elevate these arts to science. The elevation of veterinary art to science has been of great pecuniary value to many nations; a similar elevation of agricultural art to a similar scientific standpoint would be of equal value. When we look at the immense values of our crops and their vital importance to the people, we cannot but recognize the necessity of preserving them from disease and the consequent pecuniary loss it involves.