

pass out of existence, their place being taken by those which are better fitted for the collection of their food. By this process many curious and interesting peculiarities have been evolved in insect and plant life.

In most cases the relation between insects and plants is one of mutual advantage; the plant depending on the insect for its pollination and the insect on the plant for its food in the form of nectar and pollen. But in some cases such as the *Drosera*, we find that the plant catches and feeds upon the insects and in a greater number of cases the insects feed upon the foliage or other parts of the plant.

The many contrivances by which the flowers secure the services of the insect in pollination are very interesting to study. A very ingenious form is seen in many of the plants belonging to the Labiatae. In *Salvia officinalis*, which belongs to that order, the tube is long and guarded by a fringe of hairs to protect the nectar from insects which are not large enough to brush against the anthers or pistils. The stigma hangs from the hood anteriorly, so that it is the first organ to touch the insect when it alights on the lower lip. The anthers of this flower are developed into lever like structures which are so placed that when the insect pushes its head down the tube, the pollen bearing lobe of the anther is swung down on its abdomen. Another mode of securing pollination is to be observed in *Eriogonum*, in which the corolla represents a bell with the protruding pistil as clapper. The eight anthers are connected laterally so as to form a ring and this connection closes up the only holes through which the pollen can escape. The bee, after having passed the pistil, which is almost sure to have taken some of the pollen from its back, disturbs the circle of anthers and causes the pollen to be showered on its body.

Many plants show a preference for certain insects and these are always the insects which are best adapted to their pollination. As an example, the flowers of *Antirrhinum*, which are specially suited to fertilization by the bees, are entirely closed and only bees have strength and knowledge enough to open them. A very interesting case is presented in the flowers of *Aristolochia* in which the pistils ripen first. Flies are the special favorites of this plant and the flower is modified to suit their requirements. The little flies, after having rubbed against the mature stigma, pass down the tube for the nectar, but by reason of a row of stiff hairs which point downward they are unable to return. They are held prisoners in that manner till the anthers ripen and discharge their pollen on them. Then the hairs shrivel up, letting the flies free to go to another flower. Flowers also show their choice between different insects in being open only when such insects are on the wing. Examples of this are presented in night flower, and such dismal flowers as "John-go-to-bed at noon," "Scarlet pimpernel," and others too numerous to mention. Some plants secrete nectar only during certain hours, that they may adapt themselves to the habits of insect.

Cases in which flowers have been modified to suit the customs of the insects are well seen in Dichogamous plants. Those pollinated by bees are usually protogynous and those pollinated by wasps protogynous. The reason for this difference is that in gathering nectar from a bunch of flowers the bee starts at the bottom flowers and works up, while the wasp starts at the top and goes down. Thus those fertilized by the bee, the bottom flowers ripening first, would have the mature pistils at the bottom of the bunch where the bee begins, then as she got to the top, she would get loaded with pollen for

the ripe pistils at the bottom of the next cluster. In protogynous plants however, the pistils at the top would be ripe while the lower stamens are shedding their pollen. Thus it will be noticed is particularly adapted to the habit of the wasp in visiting the topmost flowers first.

Besides plants catering to insects, insects adjust their ways to suit conditions. They arrange their visits to flowers at a time when they are open and secreting nectar. The great activity of insects may be shown by the fact that in fine weather a bee often visits over twenty flowers a minute, and some flowers are visited at least thirty times a day. Nearly every flower is examined once a day by insects. A very interesting and important fact has been discovered in relation to the habit of insects in visiting flowers of one species as long as possible. This makes a great saving of pollen; for if the insects went about promiscuously from one kind of plant to another a great deal of pollen would be wasted on pistils towards which it is sterile. The closing of flowers during rain, dark days, and night also helps to prevent the waste of pollen, which cannot be made use of in fertilizing other flowers.

A very interesting phenomenon is to be observed in regard to the partiality of certain insects for particular colors. We find that flowers fertilized by miscellaneous small flies are invariably white or pale; those depending upon beetles are nearly always yellow. Bees and butterflies are usually attracted by red, purple, lilac, or blue flowers. A certain plant in South America, called *Santana*, changes the color of its flowers from time to time, and the different kinds of insects which frequent it, wait till their favorite color comes before they visit it. This proves beyond a doubt that insects have the power of distinguishing colors. Their sense of smell is also very highly developed as is shown in some of the illustrations given above.

To sum up the whole subject, self fertilization produces certain weakening results, and to avoid these deformities, nature has modified insects and plants, by the process of evolution, so that the pollen from any one flower stands very little chance of fertilizing the pistils of that flower or any closely related flowers. At the same time fertilization is carried on as economically of pollen and with as little expenditure as the plants energy as possible. Of course I do not mean to say that no flowers fertilize themselves for they often do, but as a rule self fertilization takes place under difficulties and cross fertilization is given all possible chance to take place.

### Progress.



WHILE no extensive improvements have been made about the College since the building of the chemical laboratory, and the engineer's residence, yet much work has been done in the different departments which would be of interest to our readers, particularly the ex-students. As previously stated, the construction of a new reservoir is one of the projects which the authorities have in hand this summer. The industrious first and second year students are laboring daily at the excavation under the genial superintendence of the President or, in his absence, under the doughty Martin O'Donnell.

On looking over the farm proper one notices with pleasure the improved appearance of the fields. This is mostly due to the removal of many of the fences which hitherto divided the fields. Under Mr.