BOTANY

# Weed Gives Botany Lessons

**Flower of Datura, or jimsonweed, is classic material in study of genetics, and especially in understanding of mechanics of pollination.**

By DR. FRANK THONE

➤ WEEDS CAN be useful. Even so unpromising a plant as jimsonweed, coarse, rank-smelling and poisonous though it is, proves as good as a lily and better than a rose when it comes to teaching the basic facts about plant life.

It is better for this purpose than most of the more seemly and conventional flowers in one quite important respect; its blossoming season is much longer. It opens up its first big white flowers (which are really attractive-looking until you get within smelling range) early in the summer and keeps right on opening more of them until decisive autumn frosts make it stop. It is therefore available practically throughout the summer-camp season, and remains so for a month or more after the opening of the regular school term. Jimsonweed therefore is one of our real nature-study resources, if we can only bring ourselves to overlook its rather bad company manners.

## Aids Genetics Study

Jimsonweed has not gone wholly unappreciated. One of this country's leading geneticists, Prof. A. F. Blakeslee, used many species of the genus Datura (which is botanists' Latin for jimsonweed) in demonstrating how heredity works in plants. He had, at the Carnegie Institution's Station for Experimental Evolution at Cold Spring Harbor, Long Island, a great array of greenhouses in which he grew practically nothing but hundreds of thousands of hybrid jimsonweeds of all sizes and shapes; and outdoors in a good-sized field there were hundreds of thousands more. Now, at Smith College, he is still carrying on some phases of this work.

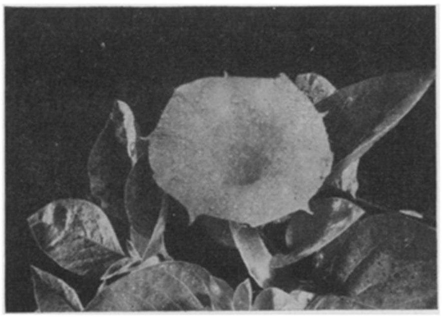
Along with him worked other botanists. One of them, Prof. John T. Buchholz of the University of Illinois who worked at Cold Spring Harbor during the summer months, made some very striking demonstrations of how pollen grains act in producing fertile seed, and what may go wrong sometimes when the pollen of one species is unable to fertilize the flower of a different species to form a hybrid.

The jimsonweed's flower is especially suitable for experimental work of this kind because it is big and relatively simple in structure, so that its parts can be taken out and handled relatively easily. That is an important matter when hundreds, even thousands, of dissections and microscopic examinations must be made as rapidly as possible.

By the same token, the jimsonweed's big, simply-built flower is well adapted for the less exacting, non-microscopic research of those who are not professional botanists.

The first thing we notice about it is its wide-flaring, trumpet-shaped corolla. There are no separate petals as in many common flowers; yet we can see where the lines of division might once have been, along the creases halfway between the projecting little points around the rim. This conspicuous structure, white, sometimes purple-marked, is the plant's advertisement to bee and long-tongued moth: "Nectar on tap here." For some reason, these insects are not repelled by the plant's ill scent.

The lure of promised nectar, of course, is the plant's promise of a fee for the transfer of pollen from one flower to another, so that crossbreeding may result, rather than debilitating inbreeding. Bees aren't always satisfied with nectar in payment, and take a load of pollen along to the hive instead, if there is need for more protein there instead of carbohydate. (Pollen grains are bees' soybeans.) It doesn't bother the flower to be robbed of part of its pollen—there's always a surplus of that.



*NECTAR ON TAP—Wide-open white flower of the jimsonweed (Datura) is an invitation to bees and other insects to take its pollen and nectar. It provides an excellent natural means of studying the basic facts about plant life.*

In making its collection, whether of nectar or pollen, the visiting insect is very likely to brush its pollen-dusted body against the sticky tip of the pistil, in the base of which the seeds will be formed. This sticky tip, called the stigma by botanists, is in some flowers borne on a long, slender, rod-like structure known as the style. The style is especially well-developed in the jimsonweed flower.

## Not the Whole Story

It is at this point, with the pollen grains on the stigma, that first lessons in nature study usually stop. But it is really only the beginning. There is no magic influence, telegraphed down the style to the unfertilized egg-cells below, commanding them to go ahead now and form seeds.

The egg-cell is in a way only half a cell. The nucleus it contains has only half the heredity-bearing chromosomes necessary for the development of a normal plant; the other half are in a nucleus up there in the pollen grain, and the two must be brought together and fused into one cell before the seed can begin to develop.

The process, though too microscopically fine to watch with the unaided eye, is a fascinating one. Each pollen grain left on the stigma germinates almost as if it were itself a seed. What emerges might almost be mistaken for an extremely slender root—a thin-walled filament of living material that grows down through the soft tissue inside the style as a root grows down through the soil. Dozens of these filaments (they're called pollen tubes) find their way down the length of the style toward the egg-cells at its base. A powerful chemical attraction spurs them on.

While the pollen tube is growing, the fertilizing nucleus lags somewhat behind its tip. But when growth is finished, near the unfertilized egg cell, the nucleus moves forward, finds its way to

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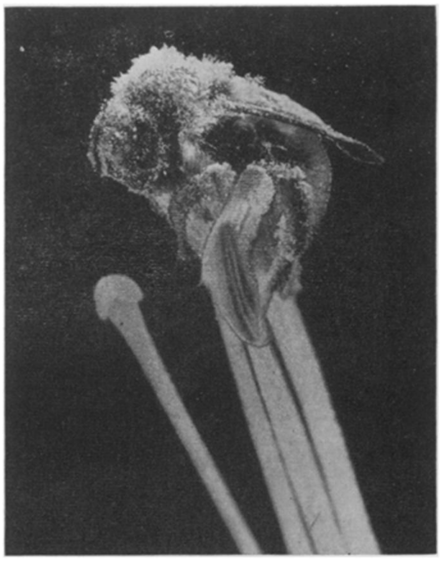


*POLLINATION—Bumblebee is taking pollen from the stamens of a Datura, in this closeup photograph by Lynwood M. Chace. Nature's purpose is accomplished by the bee carrying pollen from one flower to another.*

its mate, and the two fuse into one.

Immediately this cell divides again, and the two resultant cells do likewise, and so on for thousands upon thousands of divisions, with changes in arrangement and structure that finally produce the seed.

The process just described may be called the normal one. It is what has to happen for every fertile seed produced by ordinary pollination. There are, however, departures from the normal, which may frustrate the whole procedure, especially when efforts are being made by plant breeders to use strange pollen for the production of hybrids. Some of these troubles were traced to their causes by the researches of Prof. Buchholz.

One common cause of failure is the failure of the pollen tube to grow long enough. Either through weakness on its own part or because of chemical hostility encountered in the tissues of the style, a tube may stop growing. If it does, of course its usefulness is at any end. One way of evading this difficulty is by cutting off part of the style and letting the pollen-tube get started that much closer to its goal. This is a hint that practical plant breeders have found useful with plants more valued than jimsonweeds.

Another source of trouble, and one much more difficult to get around, is a more marked chemical incompatibility between pollen-tube and style tissue which results in the bursting of the pollen-tube and the loss of the fertilizing nucleus. This seems to call for a chemical reconditioning of the stylar tissue—something much more easily talked about than done.

At last, once the pollen-tubes have accomplished thier mission and the new crop of seeds is assured, there is no further need for the outer flower structures. The style withers and drops off, the flaunting corolla fades and is discarded. Down in their nursery at the base of the pistil the young seeds will grow and slowly ripen, until autumn opens the pod and the winds shake them out—to repeat the cycle another year.

*Science News Letter, September 7, 1946*

AERONAUTICS

# Jet Future for Aircraft

➤ JET POWER for all future American high-performance aircraft was predicted with the announcement that the Army Air Forces has given the green light to General Electric's Aircraft Gas Turbine Division to manufacture all present designs of jets and speed development of new and more powerful designs.

R. G. Standerwick, chief engineer for General Electric, forecasts that high-speed gas turbines may largely replace conventional airplane engines "in the next 10 years."

He predicted that jet engines propelling commercial planes at 500 to 600 miles per hour will be forthcoming, and for the future jet-propelled aircraft may speed at 1,500 miles per hour to altitudes as high as 15 miles with engines of as great as 10,000 horsepower.

Pointing out that the speed danger zone lies between 600 and 740 miles per hour, the jet engineer declared that an intensive program is underway by government and industry to send speeds above that of sound.

Although gas turbines require oxygen to operate, Mr. Standerwick said altitudes of 60,000 to 80,000 feet, where there is still some oxygen, might be reached.

Once jet speeds have broken through the wall of sound's speed, he pointed out, ram jet, the "flying stovepipe," might replace gas turbines.

"Then," he concluded, "if we are to fly higher and faster, we will depend upon rocket planes, which will break through the earth's atmosphere—100 miles up—at speeds between 3,000 and 4,000 miles an hour, which are not physiologically unreasonable."

*Science News Letter, September 7, 1946*

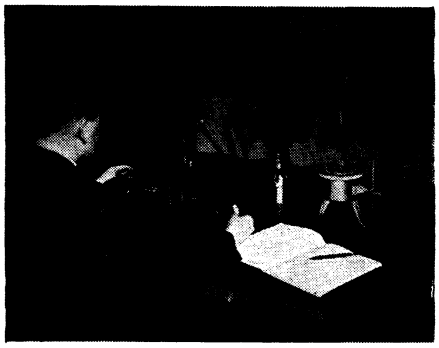
WILDLIFE

## Lovely Trumpeter Swan Saved from Extinction

➤ THE TRUMPETER swan, largest migratory waterfowl of North America, has probably been saved from extinction.

Only 73 of these magnificent birds remained in the United States in 1935. Today at least 301 of these swans are to be found in this country, it was discovered through a survey conducted by the U. S. Fish and Wildlife Service, active in their restoration.

*Science News Letter, September 7, 1946*



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