

"17-Year Locusts" Now Emerging—*Continued*

twig to lay her eggs she first excavates a deep, narrow pocket. For this work she carries a pair of specially adapted tools, parts of her ovipositor. These tools consist of two long, hard, chisel-like rods with ends notched into saw-teeth. These are ordinarily carried within her body but can be protruded at will. Working with these alternately she rapidly cuts the burrow she wants, down into the soft wood of the twig. Then she lays a "clutch" of eggs, about twenty in number—tiny, white, glistening, slightly elongated pellets.

Having finished such a nest, she takes a step up the twig, selects a new spot on the green bark, and proceeds to go through the whole process again. After a time she reverses, coming down the twig, and at each of the openings she has made she reinserts her ovipositor and makes a second nest alongside the first. During her month or less of life as an adult, the maternal cicada may lay as many as 600 eggs. Then she dies.

After six or seven weeks in their narrow nests, the eggs hatch. The creatures that come out are as little like cicadas as can well be imagined. They are exceedingly tiny things, only about a sixteenth of an inch long, white, wingless, and with the front pair of legs modified into claw-like arrangements. They are the larvae of the cicada. They run about as actively as ants for a moment, then deliberately let go the twig and fall to the ground. They are so small that they can fall for forty or fifty feet without any injury whatever.

Once on the ground the larva finds a natural crevice, or follows the stem of a small plant, and plunges beneath the surface. Then begins the long subterranean existence which is to end only after the lapse of more than half a human generation. With its claw-like front legs it burrows, mole-fashion, until it finds the root of a plant. Into this it sinks its sharp beak and proceeds to feed.

And that is its story for the next seventeen years. Clinging to the root of a tree, feeding on the sap, growing and growing. Occasionally the larva will migrate, whether through restlessness, or lack of sufficient sap in the old root, or drying out of the soil, or for any of a number of other causes, not as yet well determined. The larva hollows out at each of its stopping places a little cell somewhat larger than its body, but not at all a spacious mansion.

The larva changes houses occasionally, and it also changes clothes. Insects and all their kin are cased in shells of a stuff called chitin, which will not stretch, and when they grow the only thing they can do is burst the shell, emerge, and grow a new one. The soft-shelled crab is a familiar example of this kind of thing: it is just an ordinary crab caught in the embarrassing predicament of having shed one suit of armor and not yet having got the new one hardened. Similarly, the cicada larva changes its clothes of chitin four times, through a period of several years. At each moult it becomes larger and fatter, and begins to have some faint resemblance to the insect it will finally become.

Finally comes a day when it ceases to be a larva, and passes into a second stage in typical insect development, the pupa. This looks even more like the adult insect, though the resemblance is still faint enough. The pupa changes clothes but once, and thus the rest of the years pass, until the spring of the fateful seventeenth year arrives.

How the now fat and lusty cicada knows that its day is approaching we have no way of guessing. But its conduct changes radically. No longer is it content to lie inert, sucking sap from a tree-root, or casually burrowing in search of a new food supply or a place to sleep a year or so. It has joined the Sons and Daughters of I Will Arise. Up toward the ground surface it digs its way, toward the sun and air it knew for the last time almost seventeen years ago.

But its time is not quite yet. An inch short of the surface it stops, feeling somehow through the intervening soil that the weather outside is not quite propitious for the serious business of unfolding close-packed wings and hardening the soft shell of body-armor. Sometimes, during this period of waiting, the cicada pupa will build a conical chimney of mud, anywhere from two to six or more inches in height; a sort of over-ground continuation of its burrow, in which it passes the remainder of the time.

But at last the right day comes, a day in early June, warm, clear, dry. The myriads of pupa hastily remove the last plugs of earth that stand between them and freedom. They emerge swarming from their holes in the earth, or from the chimneys

they have built, and make a bee-line for the nearest tree or stout bush. Up the trunk they crowd, like immigrants coming down the gangplank. When they have reached a satisfactory height above the earth they pause, brace themselves on a bit of bark or a good firm leaf, and prepare for the most crucial event of their lives.

This is the cracking of the pupa shell and their emergence as adults. The case splits down the back, like a lady's dress of the styles before the present Era of Freedom, and the full-grown insect crawls out, slowly and very carefully, so as not to injure the precious and as yet tightly wadded-up wings. The process may be completed in as little as twenty minutes, or it may take a couple of hours, but it is usually well accomplished before the heat of the day is well begun.

At first the cicada is as white as a ghost, the only points of color being the large, dark eyes, two spots on the chest region, and a few markings in the legs, together with an orange tint at the wing bases. But gradually the soft wings unfold and stiffen, the body armor hardens and darkens, and the insects are ready for song, for mating, for a new crop of eggs sawed into the green twigs, for a re-beginning of the whole seventeen-year story.

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A Symbol of Our Time

Engineering

Modern engineering equipment is not ordinarily designed for its picturesqueness, but that such mechanism may achieve a beauty of its own is shown on the cover picture of this issue of the *SCIENCE NEWS-LETTER*. The picture is from the camera of Mr. E. O. Hoppé, one of the leading British photo-pictorialists, and shows the switchboard of a great electric power station in Berlin, all under the control of one man. With the suggestion of vast forces at work the artist has obtained a result both pictorial and impressive—one for which his title, "A Symbol of Our Time", is most appropriate.

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An industrial school planned for Monterey, Mexico, is to be complete in every respect according to equipment and methods used in similar schools in the United States.