

# "17-Year Locusts" Are Now Emerging

Entomology

By FRANK THONE

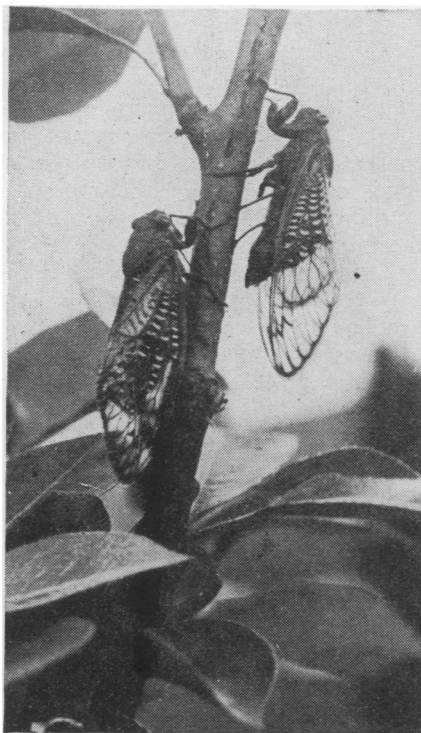
"Tshee-ee-ee-ee-EE-EE-EE-ee-ou!"

All day long, day after day, for a month or more, that sound, in a million-fold chorus, is shrilling into the ears of thousands of unwilling listeners over wide stretches of American countryside. Some of them declare they'll go mad if it doesn't stop. They won't, but it's without question very annoying to anyone the least bit inclined to "nerves." Others, seeing the leaves on the trees turn brown and myriads of tender twigs dry and die and drop off, fear for dreadful consequences to forests and orchards. These consequences will not materialize to any great extent, either, though there may be losses that will hit owners of recently planted orchards and nursery stock.

It all means that the insect we have known ever since Colonial times as the "seventeen-year locust" is abroad in the land again. It appears about the first of June, and ail but the stragglers of the host are gone shortly after the first of July. But while it is with us it swarms in literally uncountable millions, and its unwearying chorus, sounding all through the daylight hours, makes for the regions of its visitation a solid, monotonous curtain-like background of sound against which all other sounds are heard. It is like living near a waterfall, or on a surf-pounded shore. And when, a month or six weeks hence, the sound ceases utterly, to be heard no more for another seventeen years, even those who were most irritated by it will miss it, will feel a sort of persistent auditory vacancy with their ears, as a small boy feels with his tongue-tip the place where a tooth once was.

Not that 1929 is to go down in history as the "Big Locust Year." Every year is a "big locust year" somewhere or other in this country. For the peculiarity of this odd species of insect, whose inaccurate name has stuck to it for three centuries, is that it does not crop up everywhere at once. Every year its teeming myriads appear in the wooded lands of some part of the country, and that year is rated locally as the big locust year. And a stranger, whose wood-lot or orchard knew the depredations of the insect one or two or three years earlier, is apt to be counted a liar for his pains if he contradicts the local traditions.

As a matter of fact, both the con-



TWO CICADAS laying their eggs in twigs of an apple tree

troverted stranger and the observing native are right. This continent's population of these remarkable insects, longest-lived of all known things that creep on six legs and fly with wings, is divided into seventeen groups, called "broods," each of which has its own time of emergence. So that this year we have the group known as Brood III, centering in Iowa and scattering out into Nebraska and Missouri on the west and south, and cropping up in Illinois, Ohio and West Virginia. Last year Brood II had its day, ranging along the Atlantic tier of states, from New York and Massachusetts southward into North Carolina, with scattering outcrops in West Virginia, Indiana and Michigan. Next year's crop, Brood IV, will appear in the Middle West again, from southwestern Iowa southward into northern Texas.

Down in Dixie there is a special breed of long-lived "locust," which completes its life cycle in thirteen years, instead of the seventeen needed in the colder North. Otherwise the two species are practically indistinguishable. And as the North has seventeen broods, the South has thirteen, so that every year some section has an outbreak of these insects. This year's brood of the thirteen-year species is relatively small and

scattering, strung along the lower Mississippi from the neighborhood of Cairo down into Louisiana and Mississippi. Last year's brood was a big one, covering all this region, stretching over most of Missouri and Arkansas to the west and well into southern Indiana and western Kentucky and Tennessee on the east. Next year's brood of the thirteen-year "locust" is a doubtful quantity, for the reports of its earlier appearances are contradictory and meager.

All the broods of both the seventeen-year and the thirteen-year species have been studied, listed and mapped out by Dr. C. L. Marlatt, chief of the bureau of entomology, U. S. Department of Agriculture. He has supplemented his own researches with the observations of other men recorded through more than two centuries. There is a certain satisfaction for a biologist in carrying through a study of this kind. Usually the appearances of hordes of insects are wholly unpredictable; but there is a species that can be talked about with almost the assurance of an astronomer predicting a comet, for comets do pretty well if they turn up within a month or two of the time set for their return, and the seventeen-year "locust" always turns up on the seventeenth year, and always in the month of June.

The insect, by the way, should not be called a locust. It is not at all nearly related to those hungry plagues that devoured the crops of Egypt when the hard-hearted Pharaoh "would not let the people go," and which in later centuries in their turn were food for the hermit saint, John the Baptist, when he dwelt in the desert. The real locust is a grasshopper; any farmer of the older generation in Kansas or the Dakotas knows well how Pharaoh's helpless subjects felt after the living cloud rolled away and left their fields blasted, bare and accursed. Only the chewing jaws of true locusts do that kind of work; and the seventeen-year "locust" has no jaws to chew with, only a long, sharp beak folded back against its chest. The seventeen-year locust is, properly speaking, a seventeen-year cicada, and close kinsman to the shrilling insect whose endless song will disturb our Sunday afternoon raps in the hot weeks of late summer. (Turn to next page)

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This creature is also called out of its proper name, being dubbed "dog-day locust" by many, and "harvest-fly" by others. Its real title should be "harvest cicada" or "dog-day cicada." It is the same sort of insect that Fabre calls "cigale"—why Fabre's translator left that word in French is hard to imagine—and it has also figured in the classic literature of the world ever since Homer. Like the seventeen-year cicada, this cousin of the dog-days is a long-lived insect. Only the time it spends under the earth before it comes forth for its brief life of song and sunshine is limited to a single year, or possibly two or three. Its life history is not known so well as that of its longer-lived relative.

The cicadas, both short-lived and long, are members of that particular group of insects which you call "bugs" without making a sensitive entomologist uncomfortable. The true bugs are most easily recognized by the average citizen by that folded-back beak. They include, besides the cleanly and really attractive cicadas, such unwholesome citizens as squash-bugs, stinkbugs, "kissing-bugs" (which really should be called assassin-bugs because of their predaciousness), and various small insects of intimate and unwelcome habits, best left unnamed.

The thing that attracts our attention to the cicadas, aside from their prodigious numbers, is their song. It is like bagpipe music in one respect; some find it agreeable, and some think it the most infuriating noise in the universe. As early as 1633 this feature of its performance was noted by Colonial settlers. Concerning the cicada outbreak of that year, one Nathaniel Moreton made the following note:

"There was a numerous company of *Flies*, which, were like for bigness unto *Wasps* or *Bubble-Bees*, they came out of little holes in the ground, and did eat up the green things, and made such a constant yelling noise as made all the woods ring of them, and ready to deaf the hearers; they were not any of them heard or seen by the *English* in the Country before this time: But the Indians told them that sickness would follow, and so it did."

And in 1715 a Swedish pastor of Philadelphia, the Rev. Andreas Sandel, reported that "when they began to fly they made a peculiar noise, and being found in great multitudes all over the country, their noise made

the cow bells inaudible in the woods."

This gift of song is bestowed upon the males only, and when one cicada begins they all join in. Their noise is not really "ready to deaf the hearer," nor able to drown out cow-bells; it is high-pitched, strident and apparently endless, but ordinary sounds can be heard against it without difficulty. The impression of its deafening qualities probably comes from the over-wrought nerves and distracted attention of persons who have had to listen to it too long.

The cicada's organ of song resembles more or less the organ of hearing of most of the animals we are most familiar with. It is a drum, with a rigidly stretched membrane across the top. Under the microscope this membrane is seen to be surfaced with minute corrugations. Within the insect's body is a set of powerful muscles, which pull and relax thousands of times a second, vibrating the head of this tiny tambourine and setting up the shrill, dry sound that is the song of the cicada. You can do something of the same kind yourself by taking a tin lid, or a pie-pan with a slightly bulged bottom, and bending it back and forth between your hands. Imagine the size reduced by a thousand, and the speed as much increased, and you have a mechanical imitation of the cicada's way of singing. Each male cicada has two of these musical tympani, one on either side of the thorax or chest region.

A curious notion that cicadas sting and are poisonous has grown up; it apparently began at a very early date. Yet according to Dr. Marlatt they are probably incapable of stinging as a bee stings. They have a sharp and efficient egg-laying apparatus or ovipositor, with which they penetrate the rind of young twigs, but never use it in self-defense. And in any case, it has no poison-sac, such as the stings of bees, wasps and other similar insects are provided with. It is just possible, however, that a cicada might occasionally prod its captor with its sharp beak, which is quite capable of going through the skin, and of giving one a jab such as might be inflicted with a cambric needle. But here again there is no poison, nothing but the bare bodkin of the beak. In fact, so innocent is the cicada of poison that in a cicada year all kinds of animals feed on the insects in count-

less numbers: birds, poultry, squirrels, pigs, even dogs; and any sickness that results is usually traceable easily enough to sheer gluttony.

Yet it is possible, Dr. Marlatt continues, for a cicada to cause a person to be stung. Only the cicada does not do the stinging. For the vast numbers of the insects attract small feeders as well as large in the days of their swarming, and among these smaller predators is a certain specimen of digger wasp. Like all of her kind, this wasp lays her eggs in an earthen burrow, and provisions this nursery-stronghold with insects, stunned by her sting, for the hungry young to feed upon. Among her victims are many cicadas. It is not improbable that such a wasp, flying along through the air with a paralyzed cicada as cargo, might blunder up against a human being. The latter would probably brush off the annoyance, and in retaliation the wasp would sting him and then fly away, dropping her prey. The victim, feeling the sting and seeing only the hapless cicada, would place the blame on the poor, paralyzed bug.

The harm that cicadas do to trees, however, is quite another story. Wherever they appear they lay their eggs by the scores of millions in little nests which they plow into the soft green bark of the current year's twigs. Usually there are so many of the insects, and egg-laying space is so much at a premium, that vast numbers of these twigs are killed. The leaves die and turn brown, and sometimes windstorms break off many of the twigs, so that the trees in a cicada region suffer a severe though superficial pruning. This does no harm to the older, well-matured trees, that have plenty of dormant buds in reserve and plenty of strength and substance to meet such attacks. But to young trees, especially to newly planted nurseries and to tree and shrub nurseries, the consequences may be serious, even fatal. For this reason Dr. Marlatt suggests the postponement of orchard plantings in regions where a cicada outbreak is known to be pending.

The whole life story of the seventeen-year cicada is one of the most curious in the annals of the insect world, and since it is the longest of any known insect life stories it has received a good deal of study.

When the mature female cicada settles on a green (*Turn to next page*)

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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.

*Science News-Letter, June 8, 1929*

## 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.

*Science News-Letter, June 8, 1929*

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.