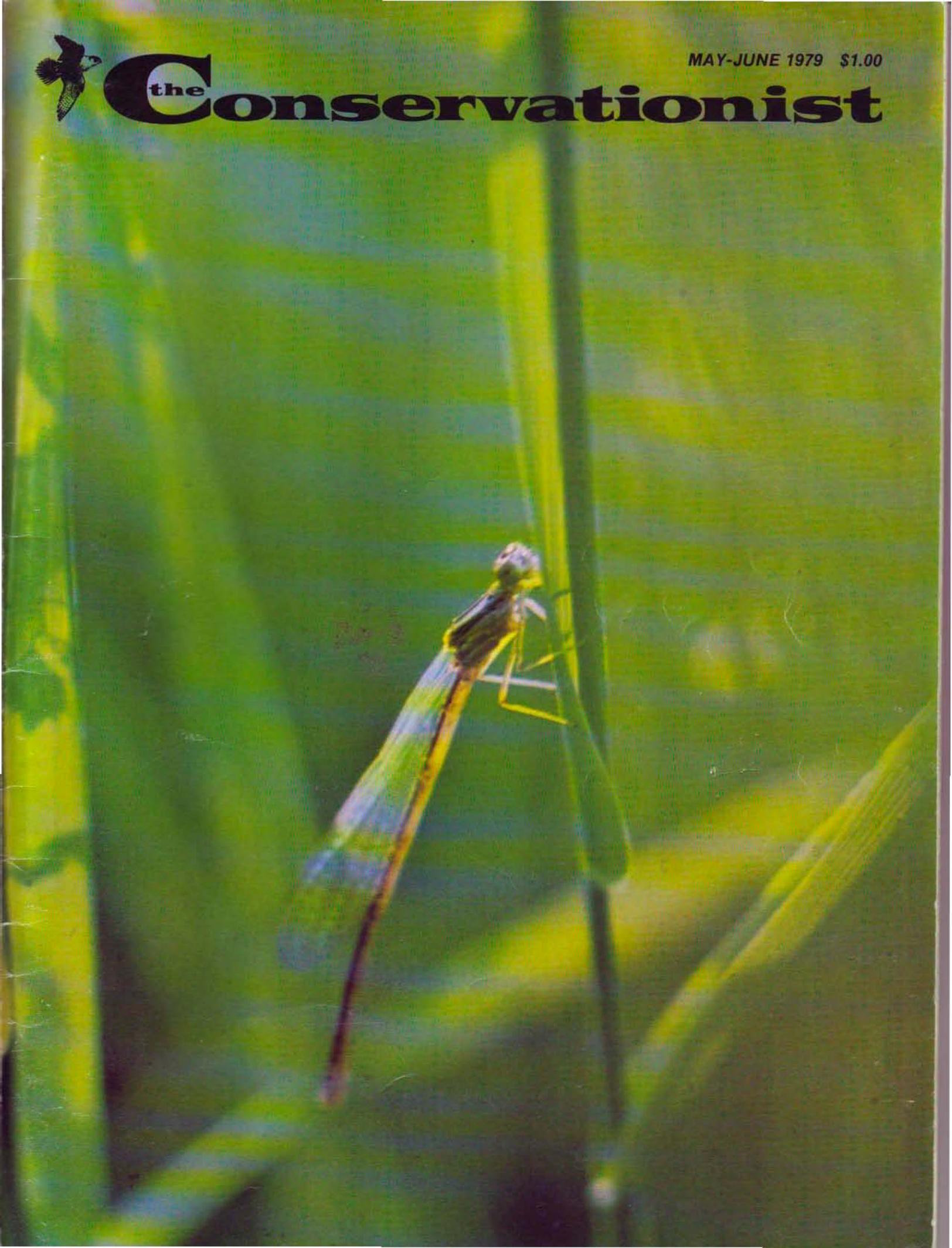




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Magicalicada :



The newly emerged cicadas will soon develop characteristic adult color and pattern.



A female cicada laying eggs in tree branch

An adult periodical cicada



(Above and below) Emerging cicadas look like beautiful white blossoms expanding.



Fifth instar nymph in burrow



Monte Lloyd

the Forgotten Visitor

by Christine Simon

Photos by author (unless otherwise credited)

MANY Hudson Valley residents have forgotten what happened here almost 17 years ago; much less are they aware of what is going on beneath their feet at this very moment. Soon, one morning in late May or early June, they will be reminded.

As always, the spring rains will come. The soil will warm gradually as the days lengthen. The white oak leaves will lose their soft white fuzz, expand, turn a darker green, and stretch tight. This particular morning, as the sun rises over the Taconics and warms the valley, the air will begin to hum. A soft mechanical noise, it resembles the whir of electrical wires, the roar of far away motorcycles, or the eerie sound of a fleet of flying saucers from a 1950's science fiction film. A familiar sound to many, yet somehow unrecognizable. This is not surprising, considering that the scrap of memory upon which this sound was recorded has been pushed progressively to the back of the filing drawer for 17 long years now.

On the front lawn the neighbor's cat is playing with something. A bluejay lands in the grass and flies to a treetop with a large insect buzzing loudly in its beak. Then, suddenly, the buzzing stops; but the strange whirring noise continues. It is coming from the treetops. Tiny dark objects flit between high branch tips. Every now and then the sun flashes on a gossamer wing. Slowly, the memory of June 1962 returns. A glance at the shrubbery and tree trunks confirms the suspicion: tiny golden shells are clinging everywhere. The ground is riddled with holes. The 17-year "locust" has emerged again to sing in the warm spring sun for three or four weeks.

Of course this large, red-eyed, orange and black insect is not a locust at all. It is a relative of the aphid, the treehopper, and other sucking insects of the order Homoptera, and is more properly called a cicada. The true locust, the migratory, biblical grapes-of-wrath kind, is a member of the order of chew-

ing insects known as Orthoptera. In other words, it is a grasshopper.

The "17-year locusts" received their infamous name from the Pilgrims in the spring of 1634. The newcomers of Plymouth suffered many hardships. When a massive "swarm" of strange insects emerged suddenly, they appeared to be none other than the biblical locust sent as yet another trial from heaven. Not long thereafter the following notice appeared in a journal of the Royal Society of London:

A great observer who hath lived long in New England, did upon occasion relate to a friend of his in London, where he lately was, that some few years since, there was such a swarm of a certain sort of insect in that English colony, that for the space of 200 miles they poisoned and destroyed all the trees of that country; there being found innumerable little holes in the ground, out of which those insects broke forth in the form of maggots, which turned into flies that had a kind of taile or sting, which they struck into the tree, and thereby envenomed and killed it.

The strange insect spoken of was indeed the 17-year cicada, but the effect of its "sting" (egg laying) was greatly exaggerated. The above article went on to liken the cicadas "to a plague which was said to happen frequently in the country of the Cossacks or Ukrani, where in dry summers they are infested with such swarms of locusts, driven there by an east or southeast wind, that they darken the air and devour all the corn of the country." And even though it would have been physically impossible for these sap-feeding insects to eat the leaves of any plant from that time onward, they and their non-periodical relatives have been known as locusts.

Of course, 17-year cicada is not restricted to the Hudson Valley and New England. Various groups (broods) emerge throughout the U.S. east of the Great Plains. They occur nowhere else in the world. In the South, these periodical cicadas have a life cycle of

only 13 years. Unlike all other members of the cicada family, the periodical cicadas are synchronized in adult emergence time, such that a given brood appears as adults only once every 13 or 17 years. Some broods are large and occupy much of the eastern U.S., while others are small and occupy only a small corner of a state. The broods are defined and numbered sequentially according to their year of emergence. Fourteen broods of 17-year cicada and four broods of 13-year cicada are thought to exist at the present time.

In almost every brood of periodical cicadas there are three morphologically distinct species. They differ in coloration, size, and song. The largest, most common species is called *Magicicada septendecim*. It has a black body, bright orange wing veins, an orange abdomen, and orange legs with black tips (tarsi). Its song is a sorrowful PHAROOOH, dropping in frequency at the end. The medium sized species is *M. cassini*. Its color is similar to *septendecim* except that the abdomen is black underneath. Its song is a series of ticks which increase in tempo and end in a loud buzz. The third and smallest species, *M. septendecula*, is probably present in New York State as well, although it has not been described here. Its abdomen is striped with orange and its legs are completely orange. Its song is a tambourine-like tshhhh-tch-tshhhh-tch-tshhhh-tshhhh . . .

Periodical cicadas should not be confused with annual cicadas, which do not appear until July and August and are known as "Harvest Flies," "Jaw Flies," or "Dog Day cicadas." They are generally larger and green or brown in color. None of these species has red eyes or quite as much character.

In New York State, periodical cicadas emerge from the ground in early to mid-June after spending 17 years in the juvenile (nymphal) stage feeding on the roots of trees. The adult males sing to attract the females, which have no voice of their own. After mating, the females lay eggs in nests which they

create by making grooves in pencil-sized tree branches with their sharp ovipositors. Approximately 24 eggs are laid in each nest, and it has been estimated that each female is capable of laying as many as 500 eggs.

After two months the eggs hatch and the ant-sized nymphs fall to the ground, burrow beneath the surface, and poke their tiny sucking beaks into tree rootlets where they feed on dilute xylem fluid. During the next 17 years they pass through five nymphal stages (instars). After each instar they shed their skin to become larger.

Although the nymphs grow at different rates, at the end of 17 years they are all in the fifth instar. They usually emerge within hours of each other on warm spring evenings shortly after sunset, leaving the ground honeycombed with round holes approximately one-half inch in diameter. They often emerge in such large numbers that the clatter and stumbling of their army marching toward any vertical objects (usually trees) are clearly audible. In dry leaves, they sound exactly like a bowl of Rice Krispies and milk. The subsequent escape of the adult insect from its final nymphal skin is a sight to behold:

There are few more beautiful sights than to see this fresh forming cicada in all the different positions, clinging and clustering in great numbers to the outside lower leaves and branches of a large tree. In the moonlight such a tree looks for all the world as though it were full of beautiful white blossoms in various stages of expansion.

C.L. Marlott, 1970 U.S.D.A. Bulletin

Ten broods of periodical cicadas are found in New York State. Brood I appeared in 1978. Brood II (see map) last emerged in 1962 and is expected this spring. The next brood to appear in New York, Brood V, will not be heard singing until 1982. Brood VI was last supposed to have emerged in 1966. Brood VII did emerge in 1967; Brood VIII in 1968; X in 1970; XIV in 1974; and XV in 1975. Brood VII is the only one exclusive to New York State. Some 17-year broods extend as far west as Kansas and as far south as northeastern Texas, but the two largest broods (XIV and X) are concentrated in the north and east central U.S.

In New York Brood XIV is known only in the eastern end of Long Island and on Staten Island. In 1974, few if any were recorded on Staten Island, but huge populations were found in localized areas from Hicksville and Massapequa in the west, to Manorville and Mastic in the east. There were no adults to be found still living by the beginning of July, but many tree branch tips had turned brown as a result of overcrowding of some of their egg nests. By the middle of August, the tiny white first-instar nymphs were hopping from their branch nests and falling to the ground. The following spring, the forests were as quiet and green as ever.

Brood X, largest of all the 17-year broods, is particularly remembered in Baltimore, where the insects were so numerous that they completely covered trees and houses as they emerged. In New York, Brood X is not a major brood. It occurs scattered over Long Island from Rockville Center to Mastic and has been recorded on Staten Island and in Columbia and Ontario Counties. Even as early as 1919, people began to



After hatching, the shed nymph cases fall to the ground.

worry that the cicadas of Brood X were dwindling in numbers. In a New York Times article on June 23, entitled "17-Year Locust Shuns Manhattan; Sings in Brooklyn, Queens and Richmond but Resists the Lure of Broadway," scientists speculated on how many years it would be before the activities of man entirely wipe out the amazing little insects. One newspaper article poignantly describes the "ultimate in hopelessness": a small nymph tunneling to the surface after 17 years underground only to find its escape route blocked by cold, hard cement.

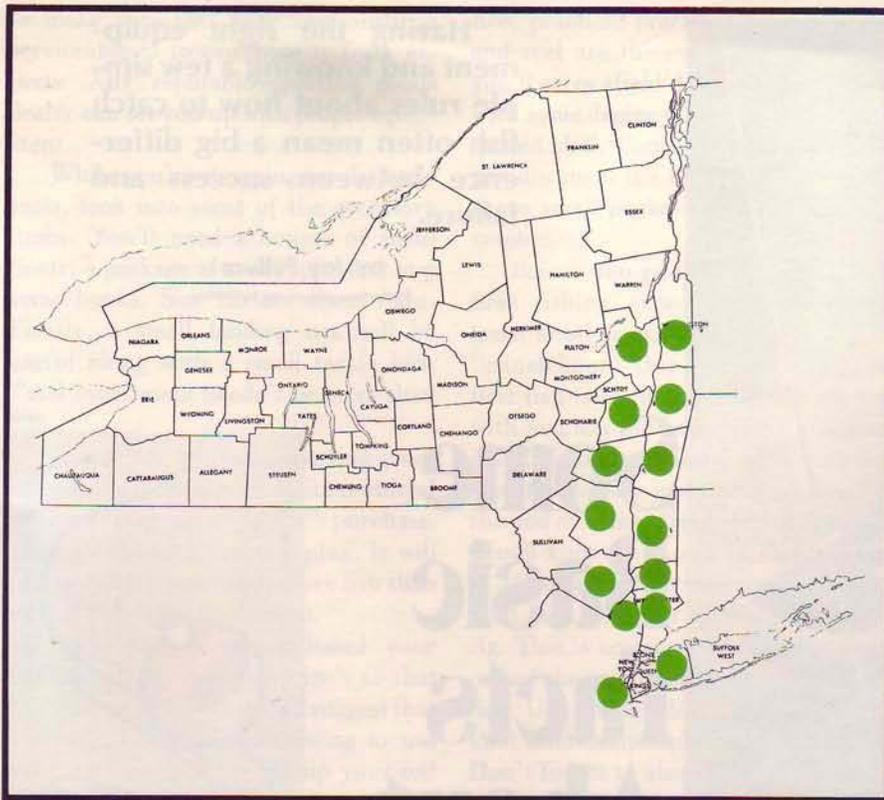
Brood VII, the only brood restricted to New York State, was rediscovered by L. L. Pechuman of Cornell University in 1967. He found sizable populations in

Onondaga, Cayuga, and Livingston Counties.

Brood II is well represented in New York State. It has been reported from Albany, Columbia, Dutchess, Greene, Nassau, Orange, Putnam, Rensselaer, Richmond, Rockland, Saratoga, Ulster, Washington and Westchester Counties. This is the brood which will appear this spring from northern New York south to the northern Piedmont section of North Carolina. It will be particularly heavy in New York and metropolitan New Jersey.

Brood I centers in the mountains of Virginia and West Virginia and has been recorded in New York only in the Half-Way-Hollow Hills area of Long Island (in 1910, 1927 and 1944) and in a patch of undeveloped park land and adjacent town firing range near Ridge, also on Long Island. For some reason, this small area of Long Island supports more broods of periodical cicadas than most states! The Ridge population of Brood I abuts Brood V and IX and overlaps Brood XIV which appeared four years before it. Egg scars from Brood I can be found on the same branches as those of its four year predecessor. This unusual localized juxtaposition of broods four years apart provides a unique opportunity for scientists studying the causes and results of the speciation process, for these broods represent the first stage of species formation.

Because these eastern Long Island populations are so localized; they went unnoticed for many years. They were rediscovered by the author with the help of publications written by W. T. Davis, an entomologist who specialized in cicadas and worked out of the Staten Island Museum. Davis' last periodical cicada hunting expedition was made in 1944 to the Holmes Farm on Burr Lane in the Half-Way-Hollow Hills in the company of Edwin Way Teale. Davis kept notebooks full of correspondence and newspaper clippings along with field notes, filed by year. His notebooks still sit in the grey metal filing cabinets in the dusty attic of the Staten Island Museum, just as he left them. It was here that records of Brood I were found. A friend had written to Davis saying that he heard the cicadas singing in 1927 near old Camp Upton (now Brookhaven Labs). Another correspondent had observed them in 1944 on his way from



The largest New York State brood will appear this spring (1979).

his home in Riverhead to Ridge. A search of newspapers and scientific publications produced no 1961 records, yet a (1978) journey to the spot mentioned in the 1944 letter found the cicadas singing as loudly as ever.

There is no doubt that, like many of our other natural resources, the numbers of periodical cicadas are dwindling. As early as 1907, U.S.D.A. entomologist C. L. Marlatt wrote:

The greatest check on the species has been in the advent of Europeans on this continent and the accompanying clearing of woodlands . . . The vast areas in the more densely populated east, which were once thickly inhabited by one or the other of the broods of periodical cicadas are rapidly losing this characteristic, and the cicada will doubtless appear in fewer and fewer numbers . . .

The peculiar habits of the 17-year cicada make them easy targets of predators. Rather than trying to escape, they practice safety in numbers. When they appear there are so many that predators soon become satiated and no longer desire to eat them. The chance of any one individual being eaten is therefore very low. This strategy works well provided nothing disturbs the

system; but often the activities of man lower the cicada population density below the threshold level and the entire local population is wiped out. This is what happened to Brood XV in New Jersey in 1975. It is unlikely that this brood will appear again in 1992.

The 17-year cicadas have been often abused by the public at large as a result of bad press. They have been accused of everything from starting wars to eating a man's arm off. They cause little economic damage. While it is true that the female cicada's egg laying activity can severely damage or kill very young trees, a simple cheese cloth or net bag will provide protection. Larger trees are essentially unaffected. Spraying large trees with insecticide is expensive, ineffective against cicadas, and harmful to the environment. What a small price to pay, a few branch tips, for the privilege of viewing one of nature's most fascinating creatures.

A Request from the Author

Because of the patchy nature of the distributions of local populations of 17-year cicadas, I need the public's cooperation in locating these insects. I have been studying the periodical cicadas for five years, along with scien-

tists from the Universities of Chicago, Michigan, North Carolina, Pennsylvania, and Illinois as well as Cornell and St. Louis Universities. My research concerns making testable hypotheses of evolutionary history based on biochemical and morphological data. Periodical cicadas are ideal subjects for this study because they exist as isolated populations and broods which are in the process of speciating. In order to decipher the puzzle of their evolutionary past, it is necessary to have accurate records of their exact distributions. It would help a great deal if local residents could send a postcard with the following information concerning the sightings of periodical cicadas:

Exact Location: _____
 Date (Day, Month, Year): _____
 Past Sightings: _____
 Name: _____
 Address: _____
 Phone Number: _____
 Song Description: _____

and a specimen, if possible. Note: (1) It will be satisfactory to send a flattened specimen in a standard envelope. (2) Cicadas do not bite or sting, etc. If it is not possible to obtain a specimen please enclose a brief description.

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Christine Simon, a post-doctoral associate of the University of Chicago, recently completed her doctorate at SUNY, Stony Brook. She received her bachelors and masters degrees at the University of Florida, Gainesville. She has studied the periodical cicadas since 1974 and plans to continue this work as well as investigate evolutionary relationships among other organisms.