ART TO ZOO

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APRIL 1981

The Greatest Show on Earth— Starring Some of the World's Smallest Animals

Roger P. Watts

Children examining a grasshopper at the Insect Zoo in the Smithsonian's National Museum of Natural History.

This issue of ART TO ZOO was written by Ann Bay

In sand dune or meadow pond, under leaf or log or in hollow tree—in fact almost anywhere you might happen to look—you're more than likely to find one. Scientific name . . . Insecta: member of the phylum Arthropoda; six legs; two antennae; usually one or two pairs of wings; segmented body in three sections.

Insects live all over the world, inhabiting every biological niche you can think of except for the ocean. Far beyond the Arctic Circle, amid rock and snow high in the Himalayas, in the swiftest rivers, the deepest darkest bogs, and the hottest driest deserts: *insects are everywhere*!

Scientists now estimate that between 80 and 90 percent of all animal species on earth are insect species—and that *there are about 200 million insect individuals to every human individual alive today*!

How is it possible that these tiny creatures, seemingly so fragile, have managed to survive extreme conditions the world over? *Adaptability* is an important key to the insects' success in the struggle for survival. Insects have been on this earth for more than 300 million years, longer than practically any other animal. Gradually, down through the ages, hundreds of thousands of different kinds (*species*) of insects have evolved—and each one of these species has developed special traits that adapt it to the environment it lives in and its own particular way of life.

If we were to design a biology lesson introducing students to ways in which animals adapt to the environment, we would be sure to base that lesson on insects. All living things, whether plant or animal, must adapt to their environments in order to survive . . . and insects provide an ideal means for introducing this important concept to your students. Insects are so numerous that you can

- always depend on finding them,
- collect them without undue concern about depleting their population,
- insure that every child will have his or her own specimens to study.

In addition, many insect adaptations are dramatically visible and therefore easy for a child to understand. For example, even a very young student can readily see how the paddle-shaped legs of the diving beetle or the long skinny body of the walkingstick help to suit these insects to unique and special ways of life. Now here are some basic facts about insects:

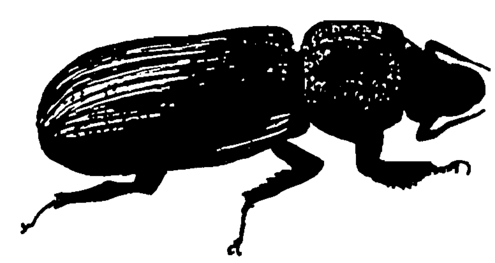
Insect Facts

Not every tiny creature that crawls or hops is an insect. If you're in doubt, count its legs. If there are six, it's an insect. If there are more or less than six, it's probably some other kind of arthropod.

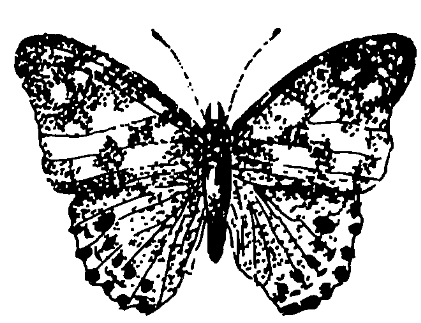
The group of animals to which insects and their relatives belong is called *Arthropoda*, a Latin name meaning "jointed legs." All arthropods have an external skeleton, or shell-like body wall, moved by internal muscles. Arthropods' bodies are segmented, with pairs of appendages. Other arthropods besides insects include these four classes: millipedes, centipedes, arachnids (especially spiders), and crustaceans.

Within the class *insecta*, there are hundreds of thousands of species, which scientists have classified in approximately twenty orders (groups). The four largest of these orders are as follows, beginning with the biggest:

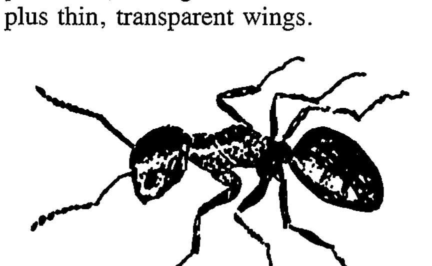
1. Beetles (Coleoptera). Includes such familiar kinds as ladybugs, fireflies, and Japanese beetles as well as many more varieties you have probably never ever heard of. Nearly all members of this group have in common two pairs of wings, the front pair of which are hard and thick, forming a protective shield for the animal's body. Beyond that, however, there is enormous variation as to size, habitat, and kind of food eaten.



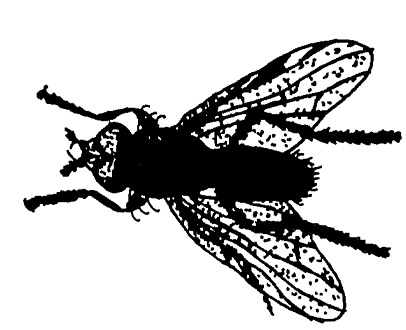
2. Butterflies and moths (Lepidoptera). Second largest group of insects. Wings and bodies of most adult forms are covered with tiny, shinglelike scales.



3. Wasps, bees, and ants (Hymenoptera). Most useful of all the insects to mankind: pollinate crops, turn over the soil, make honey—and most important—prey on other insects. Generally members of this order have *wasp waists* (one segment of the abdomen is pinched in) plus thin, transparent wings.



4. Flies, gnats, mosquitoes (Diptera). Includes some of mankind's deadliest enemies because they may carry a variety of diseases. Generally characterized by one pair of wings and tubular mouths.



How an Insect's Body Works

Besides the external skeleton, jointed legs, and segmented body common to all arthropods, insects have a number of other physical features you should know about.

Breathing and blood circulation. Unlike human beings, insects have no lungs for breathing. Instead, when an insect breathes, air goes into the body directly through tiny oval openings (called *spiracles*) that lie along the animal's sides. Each spiracle leads to an air tube (*trachea*), which divides and redivides into very fine tubes leading to all parts of the body.

Also unlike us, insects have no veins or arteries for transporting blood through their systems. When an insect's heart contracts, the blood is simply pumped out into the animal's body. After oozing through the body spaces, it eventually returns to the heart again.

Body temperature. Insects are what is known as "cold-blooded" animals. This means that unlike you and me, they have no internal thermostats to maintain a constant body temperature year round. An insect's body is the same temperature as the surrounding air or water. When the environment is hot or warm, chemical processes go on at a faster rate, and the insect can move around quickly. In the winter, the animal becomes more and more sluggish the colder the weather gets, so that in fact insects living in northern climates must hibernate in order to make it through till spring.

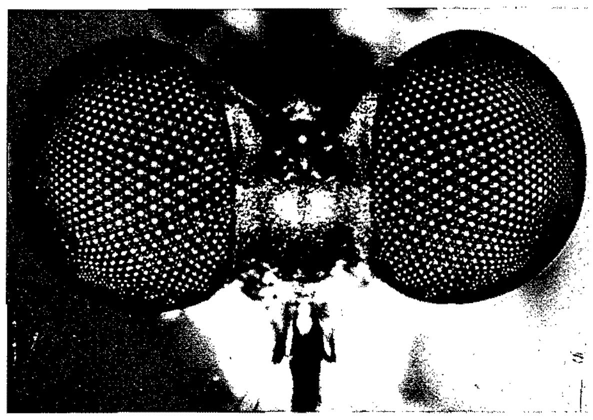
Nervous system. Insects do not have to stop and reason things out as we do. This is because nearly all of their responses to their environment are automatic—and this is why that housefly you keep trying to swat just *automatically* goes zooming off at the approach of your hand!

An insect's body can carry out reflex actions on its own without first having to go through the switchboard of the brain. These reflex actions are triggered by messages from the outside world that the insect receives through its antennae and also through hairs and spines strategically located on various parts of its body. The senses of sight and hearing, however, are severely limited or altogether missing in insects. Most insects have a pair of *compound eyes* made up of many six-sided lenses (facets), as well as a pair of small *simple eyes*, with one lens each, which are probably used to distinguish light from dark.

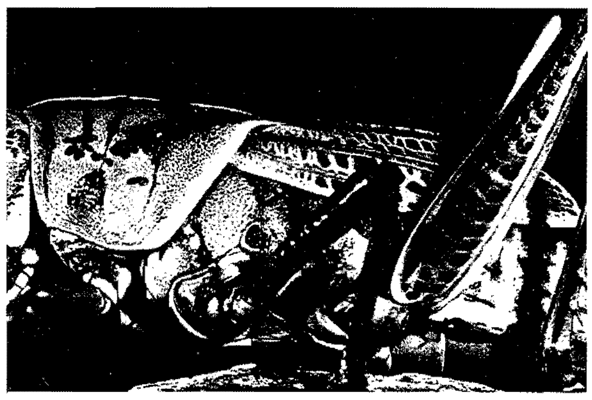
How Insects Grow Up

All insects start out as eggs. When and where the eggs are laid—in spring, summer, or fall, on land or in the water—depends on the insect. Some insects hatch out of the egg looking exactly like miniature adults without wings. As the insect grows, it sheds its rigid skin (*exoskeleton*), increasing one step in size and sprouting larger and larger wingpads with each shedding (*moulting*). With each moult, the insect crawls out of its old skin and rapidly expands before its new skin—already formed under the old—can harden in the air. After half a dozen moults, the wings reach full size and the insect is an adult. Insects that grow up in this way (cockroaches and grasshoppers are two examples) are said to undergo *incomplete metamorphosis*.

Other insects come out of the egg looking not at all like their parents but rather like tiny worms with legs. In this case, the hatchling (called a *larva*) moves slowly and has no external signs of wings. Its days and nights


Kjell Sandved, National Museum of Natural History

The complex eyes of the robberfly: a close-up view.


Chip Clark, National Museum of Natural History

A grasshopper's legs.

are devoted to eating voraciously, growing longer and fatter, and storing up energy. It moults several times during the larval stage to accommodate its increasing bulk. Then one day the larval skin splits open for the last time, revealing a new state of growth—the *pupa*. Inside the pupa the insect will grow into an adult. When this growth process is finally finished, the adult emerges from the pupa case and is now fully mature and able to reproduce. Insects that grow up in this way (butterflies and moths are two examples) are said to undergo *complete metamorphosis*.

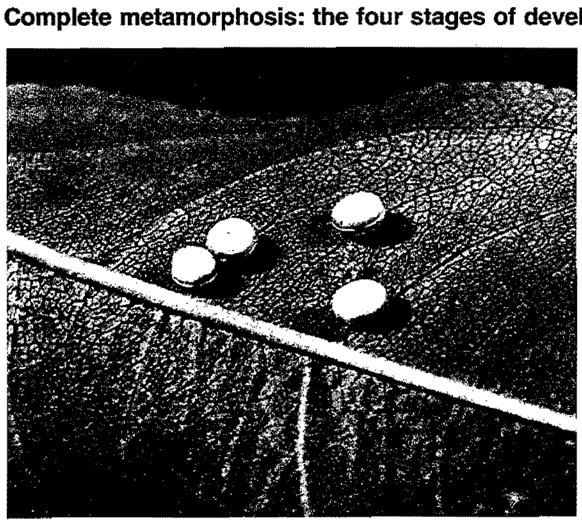
Insect Adaptations

Legs. All insects, you may recall, have three pairs of jointed legs. When an insect walks, each one of these pairs of legs serves a specific function. The forelegs reach ahead, the hind legs push, and the middle legs act as a support to maintain the animal's balance.

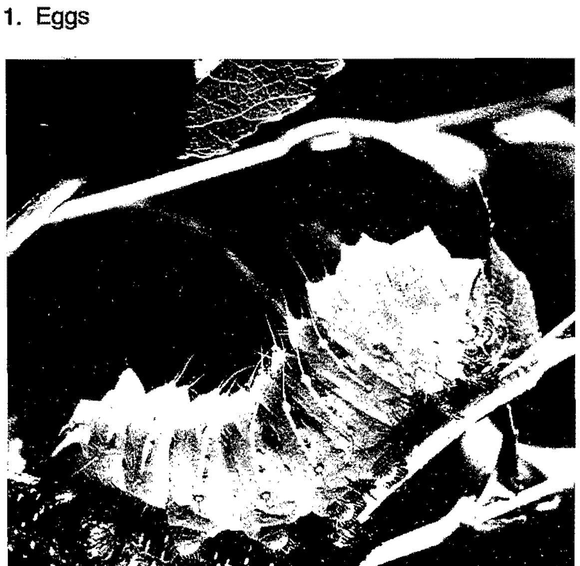
Climbing—even the steepest surfaces—presents no problem for most insects. This is because the typical insect leg ends in a pair of claws having a pad (covered with moist hairs) between them. In climbing a rough surface, the insect digs in with its claws; on smooth surfaces, the pads come into action and the hairs work to provide traction.

Besides walking and climbing, there are other notable functions for which the legs of some insects are adapted. For instance . . .

Complete metamorphosis: the four stages of development of a moth.


Chip Clark, National Museum of Natural History

1. Eggs


Chip Clark, National Museum of Natural History

2. Larva (or caterpillar)

3. Pupa (inside cut-away cocoon)


Chip Clark, National Museum of Natural History, Smithsonian Institution

4. Adult


Chip Clark, National Museum of Natural History, Smithsonian Institution

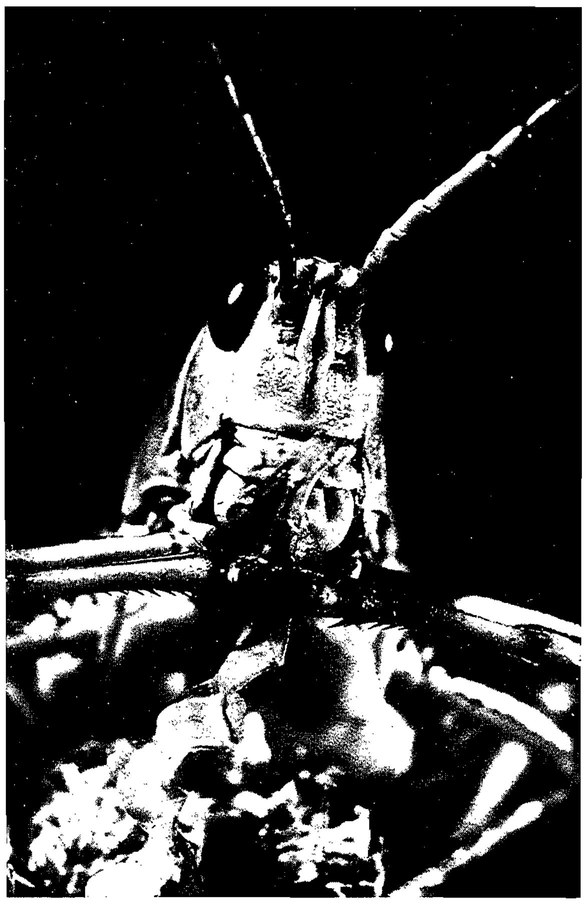
Can you find the insect in this photograph? The sphinx moth's mottled color pattern makes it almost invisible against a background of bark.

- *Leaping*. The hind legs of a grasshopper are unusually long and powerful, and ideally suited for jumping long distances. The angle formed between the thigh and shin portion of the grasshopper's leg is very small—and when this angle is suddenly increased (by use of delicately controlled muscles), the grasshopper is launched for a quick getaway.
- *Cleaning*. The small, hairy front legs of many butterflies—useless for locomotion—are used instead as brushes to clean the surfaces of the butterflies' compound eyes. Many insects also have notches on their forelegs for cleaning their antennae.
- *Making music*. The male grasshopper has strong spines on his hind legs, which he rubs against the thickened edges of his front wings to produce a rasping, "fiddling" sound quite irresistable to female grasshoppers.
- *Swimming*. Some water beetles have fringed legs, flattened and oarlike, for paddling through the water.
- *Catching prey*. Dragonflies have long, slender legs with rows of bristles on each side which form a sort of basket for scooping up small insects in midair. Certain other carnivorous insects, like the praying mantis, have pinchered legs for grasping prey.
- *Digging*. Mole crickets, which dig burrows in the earth, have unusually strong and flattened forelegs that not only serve as shovels but also bear a pair of shears for cutting through small roots.
- *"Skating" on ponds*. The pond skater, or water strider, has long, widely spaced legs, with feet ending in little fanlike tufts of hair, which enable it to skate across the surface film of the water without falling through and getting wet.

Wings. The capacity for winged flight has given insects a big advantage over landbound animals in the struggle for survival. Down through the ages, flight has allowed insects to forage widely for food, search actively for their mates, and successfully escape from their enemies. And although many insects *as larvae* spend most of their lives grounded, *as adults* they nearly all take flight.

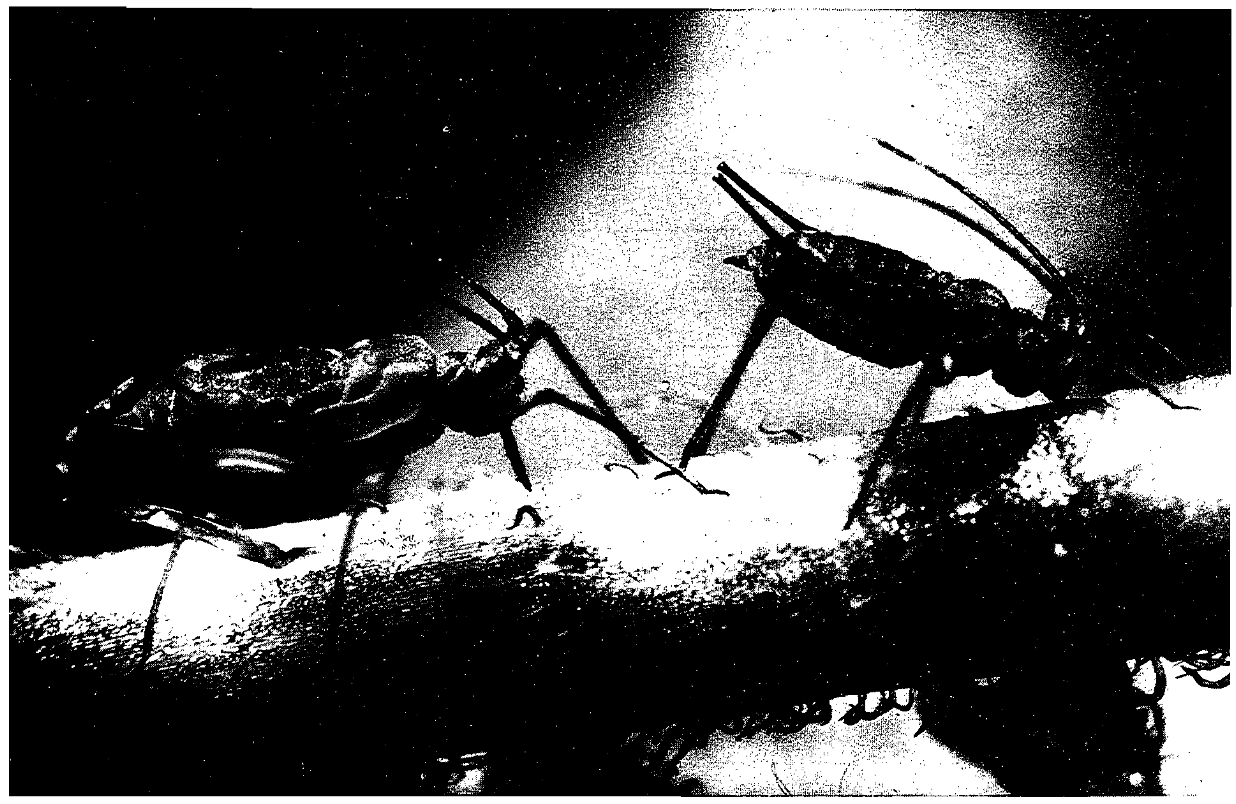
Some insects have one pair of wings; others have two. Here are some ways that insects use their wings for purposes other than flying:

- *Making music*. Crickets and katydids, which have two pairs of wings, use the front pair as "fiddle" and "bow" for making music to attract the opposite sex.
- *Gliding*. The wings of the grasshopper are especially adapted to gliding. The front pair is straight and leathery; the hind pair is pleated—like a Chinese fan—for sailing through the air.
- *Armour*. In beetles, the front pair of wings folds down over the back pair to form a hard protective shield for the animal's body. This arrangement is very well suited to the beetle's way of life, which involves relatively little flying and a lot of burrowing and other landbound activity.
- *Camouflage*. Making their owners inconspicuous is an important function of the wings of some insects. The wings of the katydid, for example, are veined and colored bright green to look like the leaves on which these insects live, and the wings of some nocturnal moths look exactly like the tree bark on which the moths sleep during the day.



Chip Clark, National Museum of Natural History, Smithsonian Institution

With chewing mouthparts, an eastern lubber grasshopper gobbles up a shred of lettuce.



Chip Clark, National Museum of Natural History, Smithsonian Institution

With sucking mouthparts, pink aphids feed on the juice of a potato plant.

- *Signaling*. The wings of other insects, on the other hand, are deliberately designed to *attract* attention. For example, the wings of many butterflies and moths are spectacularly big and beautiful so as to attract the opposite sex, and the gaudy orange and black wings of the milkweed beetle are distinctively marked and colored as a self-protective device to warn away predators.

Mouthparts. What do insects eat? Practically everything. Wine-bottle corks, fence posts, tobacco, glue—you name it, and some insect or another is likely to favor it as a steady diet. This is why insect mouthparts vary so enormously from group to group.

In all insects, the mouth itself is simply a round hole at the front of the body. This mouth has no jaws of its own but instead is surrounded by several appendages (*mouthparts*). In insects like caterpillars, beetles, and crickets that feed on solid foods, the mouthparts typically include an upper and lower lip: two pairs of jawlike structures (called mandibles and maxillae) and a tonguelike hypopharynx. The mandibles, placed at the side of the mouth, swing inward to crush and chew the food, which is held firmly in place by the maxillae. In insects like mosquitoes, aphids, and adult butterflies and moths, which feed on *liquid* foods, the mouthparts have the same basic plan except that they are fused and extended downward, forming a hollow tube like a soda straw for sucking. In the case of many butterflies and moths, this tube is so long that it is wound into a tight coil when not in use.

These two basic kinds of mouthparts—for sucking and for chewing—have many variations, depending on the insect. Often one mouthpart or another is modified to serve a specialized function. For example, the dragonfly larva, a voracious eater of other insects (and sometimes even of tadpoles and small fish), is equipped with a modified lower lip that looks for all the world like a stout hinged arm. When not in use, this appendage—which has a hook on the end for seizing prey—is folded up compactly beneath the face. But when something to eat comes along, the mouthpart shoots forward, stabs the prey, and brings it back within reach of the jaws, where it acts as a "saucer" to catch any stray bits of food that may slip through in the course of the meal!

Because insects have a variety of mouthparts, they can find food in a variety of places. This means different insects don't have to compete for the same food, another important over-all reason for the insects' success in the struggle for survival.

Breathing Apparatus. Roughly 3 percent of all insect species live under the water. This presents a special problem: how to breathe. To solve this problem, underwater species have evolved specialized breathing apparatus to supplement the basic air-intake system common to all insects (*described earlier in this article*).

In some instances, this specialized apparatus enables the insect to take its oxygen directly from the water, as in the case of the dragonfly larva, which has *gills* as a fish does and is fully aquatic. In other instances, air from the atmosphere is brought beneath the water's surface by means of a snorkel-like *breathing tube*. Insects like the water scorpion, which breathe in this way, simply rise to the surface of the water and stick their tubes up into the air to get the oxygen they need. In still other instances, the insect carries its oxygen supply around with it in the form of an *air bubble*. The diving beetle, for example, has an air storage area under its wings. Every day or so the beetle interrupts its usual business of stalking tadpoles and small fish by swimming to the surface and hanging upside down in order to replenish its own oxygen supply.

Slide Kit on Arthropods

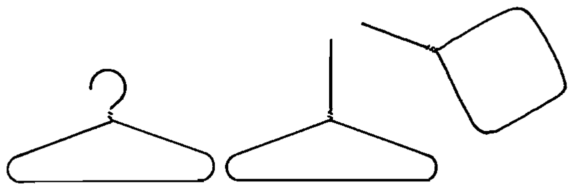
Arthropods! An Introduction to Insects and Their Relatives is a slide/tape kit designed especially for students of grades 4 through 8. In addition to slides and a 15-minute taped narration, the kit contains a teacher's guide (with suggested activities, bibliography, and printed script), a poster, an arthropod worksheet, and a booklet on the Insect Zoo at the Smithsonian's National Museum of Natural History. The cost is $42.00, plus $1.50 for postage and handling. Order from OPPS, Services Branch, National Museum of American History, Room CB054, Smithsonian Institution, Washington, D.C. 20560.

Methods of Capture

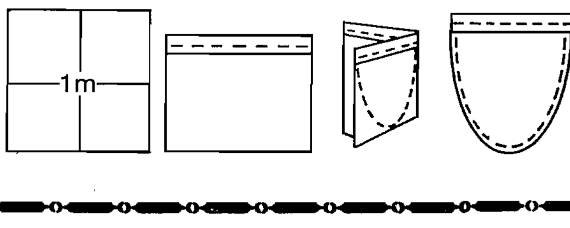
Now here are some methods that you and your students can use to collect beetles, butterflies, and many other live* insects to study:

Method #1: The Trusty Sweepnet. A sweepnet, the device used by school groups visiting the Smithsonian Environmental Research Center and also by professional scientists, may be bought from a biological supply house or just as easily made. The following directions for making a sweepnet are excerpted from the resource kit, *Outdoor Biology Instructional Strategies*, listed for the John H. Falk reference in the bibliography at the end of this article.

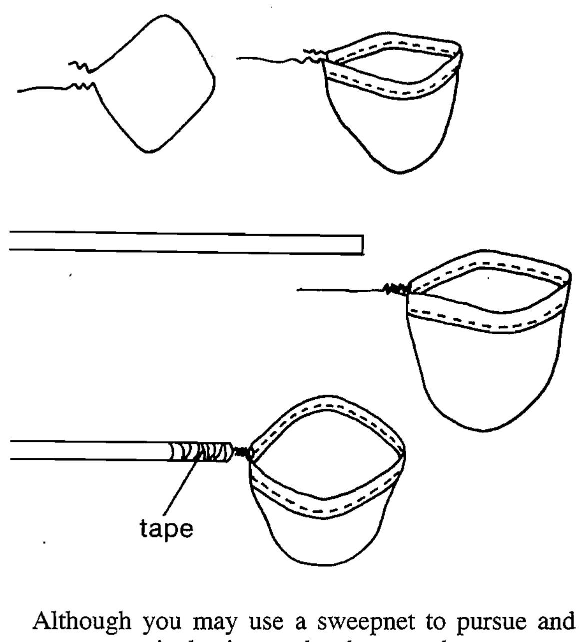
First, prepare the hoop: Take a wire coathanger, straighten the hook, and pull the hanger into a square.



Second, make the bag: The bag should be net or gauzy fabric, about one meter in circumference at the top, tapering down to a point. A sewing machine speeds up construction, but older children will enjoy doing their own sewing by hand. Sew like this: Fold one edge down and sew. Fold square in half and sew. Cut off excess.



Third, assemble the net. Open the wire square and thread it on the net. Wind the tail of the square around the end of a sturdy stick. Secure with tape.



Although you may use a sweepnet to pursue and capture a particular insect that has caught your eye, the net is really designed for gathering random samples. The idea is to walk at moderate speed across an area, swinging the net back and forth, pendulum-style, over the tops of the vegetation you are sampling. After you have made between fifteen and thirty sweeps with the net, execute a quick swing around your head to concentrate the insects at the bottom of the net. Now grab the end of the net in your hand to keep your catch from escaping, and then immediately transfer the animals to a quart-size plastic bag. Close the plastic bag by knotting or with a "twistum."

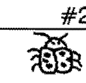
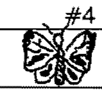
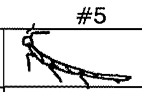
Method #2: Light Trap. Place a lighted light bulb (attached to an extension cord) in the bottom of a widemouth jar. Fit a funnel into the rim of the jar, and wait. Insects will be attracted to the light and will crawl or fly through the funnel into the jar. Or, instead of using a light, you might simply try placing some bait, like peanut butter or bacon grease, in the bottom of the jar.

Method #3: White Sheet. Using rope or string tied to the two top corners, hang a white sheet from a tree in a vegetated area on a dark and windless night. Stand behind the sheet with a flashlight and see how many insects you can catch in a jar, a sweepnet, or your hands. Many insects will fall into the folds of the sheet where they will be easy to capture. From the sheet, you can funnel them gently into a plastic bag.

Method #4: Pitfall Trap. Wrap a square piece of aluminum foil around your thumb, and pinch the foil into a thin cup two or three inches long. With a pencil point or pin, punch a small hole in the bottom of the foil to allow water to drain through. Now dig a pit the size of the foil cup and press the cup into the pit, making sure that the top edge of the trap is even with the ground level. Drop a piece of bait into the trap. Come back in several hours and see what you have caught. Transfer the insects to a plastic bag.

***One very important object of insect study is to teach a respect for life. Please make sure that your students recognize the insects they have captured as complicated, highly evolved, *living* organisms—and also please be certain that they release the animals unharmed at the site of entrapment when the lesson is over.**

Insect Worksheet

	#1	#2	#3	#4	#5
Sketch of insect					
Where found	cornfield				
Color	black				
Sketch of legs					
Sketch of wings (if present)					
Mouth parts—chewing or sucking?	chewing				

Insect Fact Sheet

	#1	#2	#3	#4	#5
Sketch					
Name					
Locomotion					
Food					
Defense					
Habitat					

Lesson (for Students) on Insect Adaptation: What to Do With Your Insects Once You've Caught Them

By now each child should have his own plastic bag containing a mix of insects. An elementary field guide (see the bibliography at the end of this article), hand lenses (if available), pencils and paper, and *patience* are the only other things needed for this lesson, in which students practice observation, classification, and inductive reasoning skills:

(*1*) Place your bag of insects on the ground and take a few minutes quietly to look at what's happening inside. Decide which five insects in the bag interest you most. (Do this by looking: DO NOT HANDLE THE INSECTS!)

(*2*) Now on a worksheet, like the one *shown here* with its first column filled in to show how, record the following information for each one of the five insects you have chosen:

The place (or habitat) where the animal was found: for example, wooded area, pond, open field, seashore, vacant city lot.

What the insect looks like: its size, color, and overall shape; the shape or shapes of its legs; the shape or shapes and number of its wings, if present; and whether its mouthparts are for chewing or sucking.

(*3*) Now from this information, you should be able to draw conclusions as to:

The kind of food each one of your five insects eats: liquid or solid.

How the animal gets around, its means of locomotion. Remember that many insects have other means of locomotion besides just flying: running, leaping, swimming, and burrowing underground are some examples.

On the back of your worksheet chart, write down these conclusions for each insect, along with clues (from the worksheet chart) that support your answers.

(*4*) Then from the evidence on your worksheet chart, as well as on your earlier observations of the insects' behavior, *what else* can you guess about the habits of your five insects? Consider the following questions for each insect: Is the animal active at night or during the day? Is it a plant-eater, a meat-eater, or an eater of both plants and animals? How does it defend itself from its enemies? Write down your answers, along with supporting evidence, on the back of your worksheet. Now try to identify each one of your five insects as to general type—ant, butterfly, beetle, or whatever.

(*5*) Next day, back in the classroom, check in a *field guide* to see if all the conclusions you have drawn about your five insects are correct. Change your conclusions if necessary. Also with the help of the field guide, try to go a step further in *identifying* your insects: exactly *what kind* of butterfly, ant or beetle are you looking at? Then organize all the conclusions you have finally reached about your five insects on an *Insect Fact Sheet* like the one shown here.

(*6*) Last of all choose, from among your five insects, *one* that is your favorite. Make a list of everything you know about this insect. Then use some of the books listed in the bibliography at the end of this article to find out more. For example, How does the animal grow up (stage by stage)? Where does it live? Is it harmful or helpful to human beings—and in what ways? Finally, using all of the information you have gathered, write a report on your favorite insect so that you can share the information with your classmates, emphasizing all the ways that the animal is adapted to a particular environment and way of life. To illustrate your talk, you may want to use drawings or photographs of the insect in its natural habitat, or even a model of the insect constructed from clay or papier-mâché.

(*7*) *Optional: classroom museum.* To round out your study of insects, you and your classmates may want to make a classroom museum that would share your new-found knowledge with other students in your school. Here are some things you might include in such an exhibit:

Your photographs, drawings, and models, with labels that tell about the insects.

A mural or poster-sized Insect Fact Sheet on twenty or so of the insects studied by different members of the class.

Dioramas showing different insect habitats.

A display of live insects inspired by the Smithsonian's own Insect Zoo. (See this month's Pull-Out Page for information and instructions).

Insecta: *member of the phylum,** Arthropoda; *six legs; two antennae; usually one or two pairs of wings; segmented body in three sections.* Almost anywhere you might happen to look, you're more than likely to find one.

Smithsonian Video on Insects

The new Smithsonian Video Collection is now in production. One of the new tapes that will soon be available is *Insects: The Little Things that Run the World.*

Watch for further information in the next issue of ART TO ZOO.

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Additional Resource

Young Entomologists' Society (Y.E.S.), Y.E.S. International Headquarters, Department of Entomology, Michigan State University, East Lansing, MI 48824-1115

Membership in this organization is open to amateur entomologists of all ages. Its modestly priced *Y.E.S. International Entomology Resource Guide,* by Gary A. Dunn, is a valuable source of information about resources for the observation and study of insects.

*TEACHER'S NOTE: In the 18th century, a Swedish botanist named Carolus Linnaeus established a system of biological nomenclature that grouped living things according to their observable similarities. The groups that he established are: Kingdom, Phylum, Class, Order, Family, Genus, Species. It's easy to remember them in their proper order by using the following sentence as a guide: *Katie please close our front gate slowly.*

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Write to this address if you want your school to be placed, free of charge, on the ART TO ZOO mailing list.

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THE NATIONAL MUSEUM OF NATURAL HISTORY
THE NATIONAL PORTRAIT GALLERY
THE NATIONAL ZOOLOGICAL PARK

Designer: Joan Wolbier

This issue updates the April 1981 ART TO ZOO

ART TO ZOO brings news from the Smithsonian Institution to teachers of grades three through eight. The purpose is to help you use museums, parks, libraries, zoos, and many other resources within your community to open up learning opportunities for your students.

Our reason for producing a publication dedicated to *promoting the use of community resources among students and teachers nationally* stems from a fundamental belief, shared by all of us here at the Smithsonian, in the *power of objects.* Working as we do with a vast collection of national treasures, that literally contain the spectrum from "art" to "zoo," we believe that objects (be they works of art, natural history specimens, historical artifacts, or live animals) have a tremendous power to educate. We maintain that it is equally important for students to learn to use objects as research tools as it is for them to learn to use words and numbers—and you can find objects close at hand, by drawing on the resources of your own community.

Our idea, then, in producing ART TO ZOO is to share with you—and you with us—methods of working with students and objects that Smithsonian staff members have found successful.

Many thanks to the following people at the Smithsonian for their help in preparing this issue of ART TO ZOO: Chip Clark, Joyce Coleman, Sally Love, Sheila Mutchler and Kjell Sandved, National Museum of Natural History

Barbara Robinson, Maria del Rosario Basterra, and Michelle K. Smith, Office of Elementary and Secondary Education

ART TO ZOO March 1989
News for Schools from the Smithsonian Institution

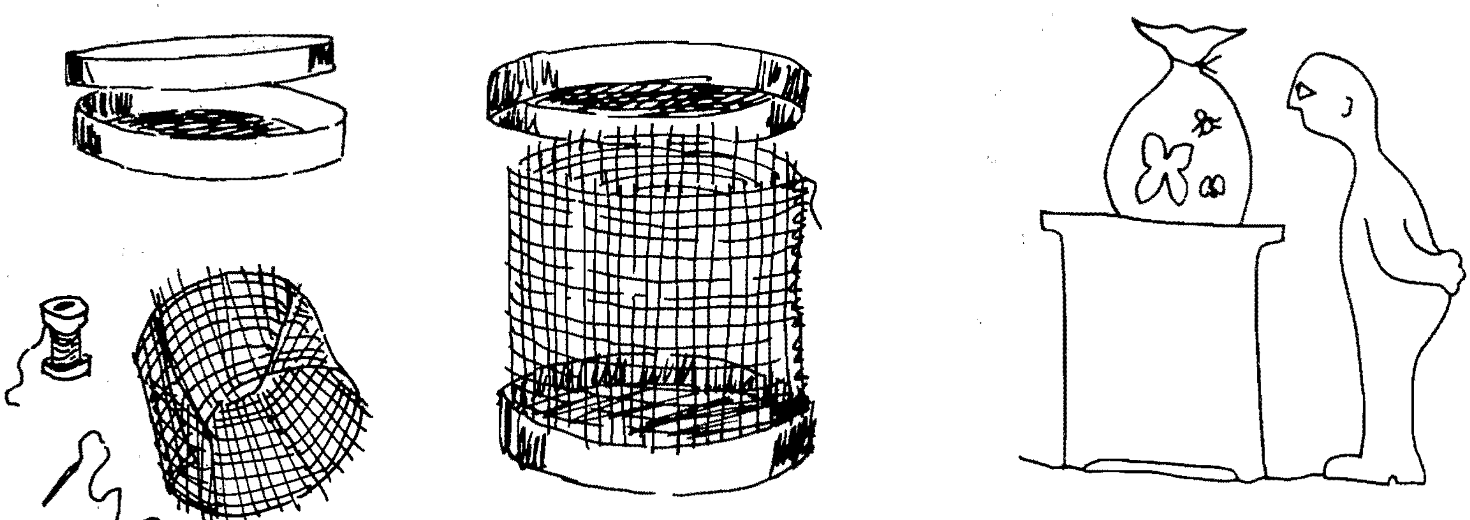
Make Your Own Insect Zoo

Would you like to take a longer, closer look at some of the insects you have collected? If so, you and your classmates may want to put together an exhibit of live insects, inspired by the Smithsonian's own Insect Zoo (pictured inside this Pull-Out page).

Here is a simple way to make a cage, in which you can keep insects for a day or two: Take two jar lids or empty tuna fish cans of the same size, plus a swatch of window screening with holes that are smaller than the insects you want to keep. Roll the screen into a circular shape and cap the open ends of the screen tube with lids. Or, if you want a bigger cage, use cake pans for the floor and ceiling and sew the edges of the screen tube together with heavy thread.

When you have finished making your cage, place a layer of dampened soil in the bottom. Then add some grass and leaves and other things your insects like to eat. Dampen a tissue and put that inside too so as to keep the soil moist. Last of all, add your insects.

After you have enjoyed your zoo residents for a day or two, don't forget to let them go—and do it *gently*. Then they can continue their lives as before.



Illustrated by JUDITH WHITE

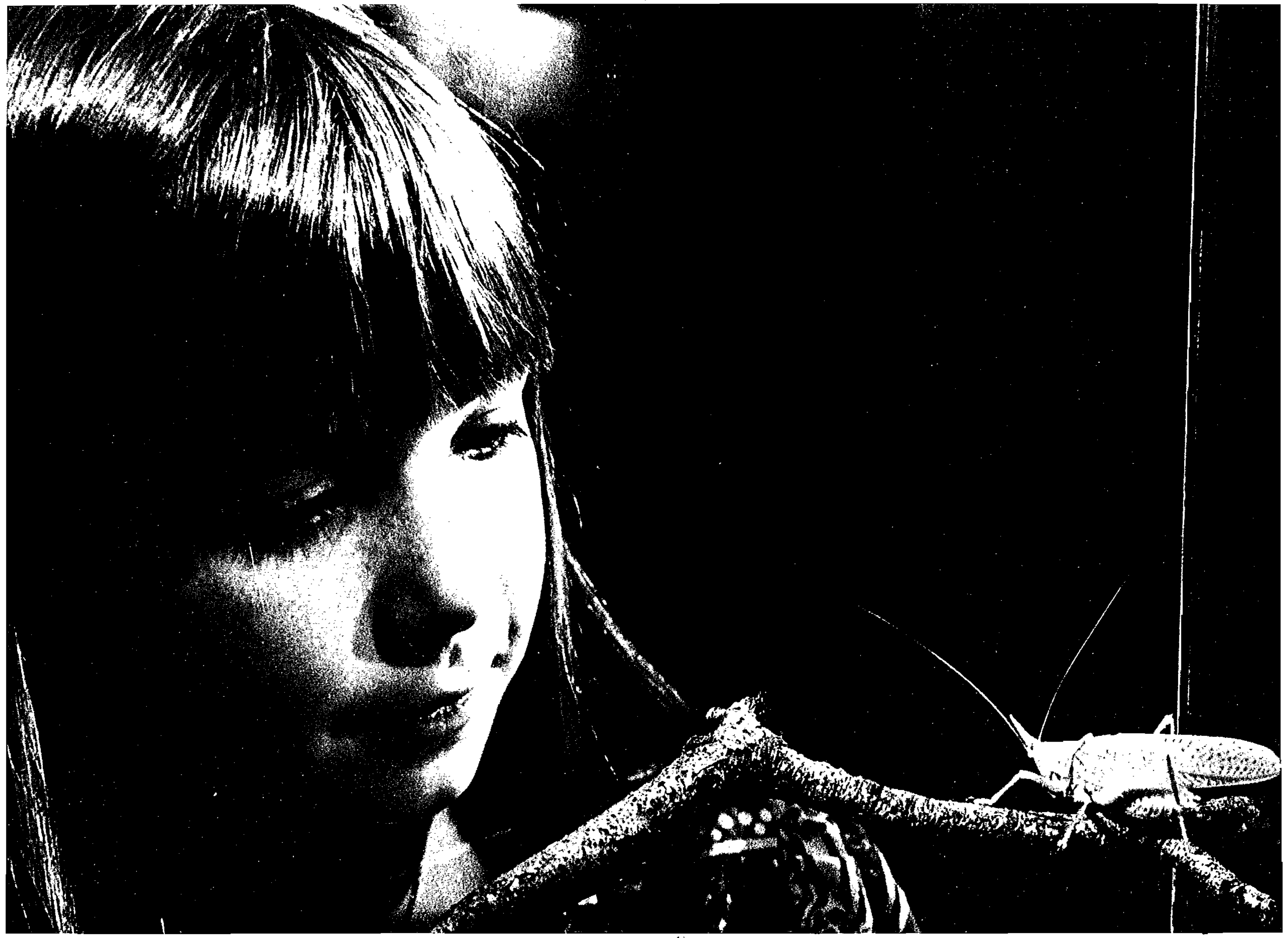
The Insect Zoo

"Success through diversity" is the theme of the National Museum of Natural History's Insect Zoo, where a large variety of living insects and other arthropods are exhibited. Some of these insects are quite rare; others are quite familiar. Here is just a small sampling of what visitors to the Smithsonian Insect Zoo can see.

Cockroach.

What do you think this Madagascar hissing cockroach feels like to the boy?

Cockroaches are one of the most successful types of arthropods partly because of their flattened shape. Because they are so flat, cockroaches can get into cracks and crevices where most predators cannot follow.



Cone-Headed Grasshopper.

This kind of grasshopper, which lives only in tropical regions of the world, is unlike most grasshoppers you're likely to see in that it eats not only plants but also other insects. Its head is filled with muscles, used to move its powerful jaws; and it's been known to bite right through a person's finger when given the chance!

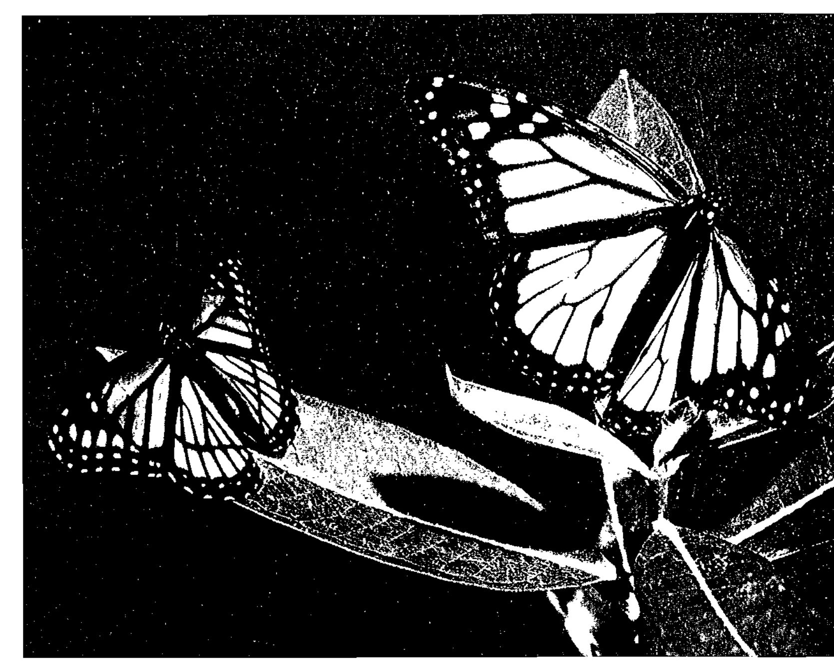
Bumblebee hive.

Cleaning out the Insect Zoo hive.

Bees play an important role in the plant kingdom, pollinating flowers when they land to feed.

Monarch butterfly.

Here is a good example of defense through coloration. Monarch butterflies, found throughout the United States, are distasteful to predators because as caterpillars they feed on milkweed, a plant containing bad-tasting chemicals. The adult monarch retains these chemicals in its body; and its vivid orange and black coloring warns predators that it tastes bad.



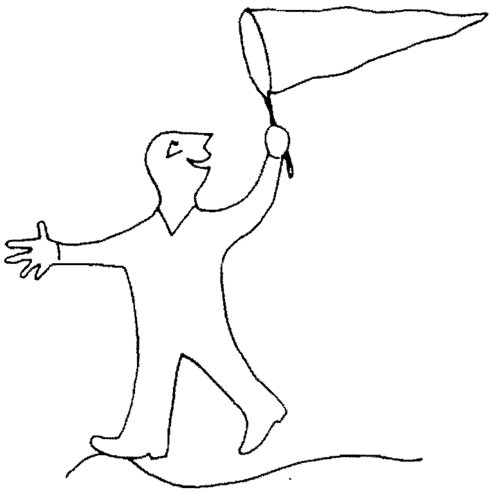
Rhinoceros beetle.

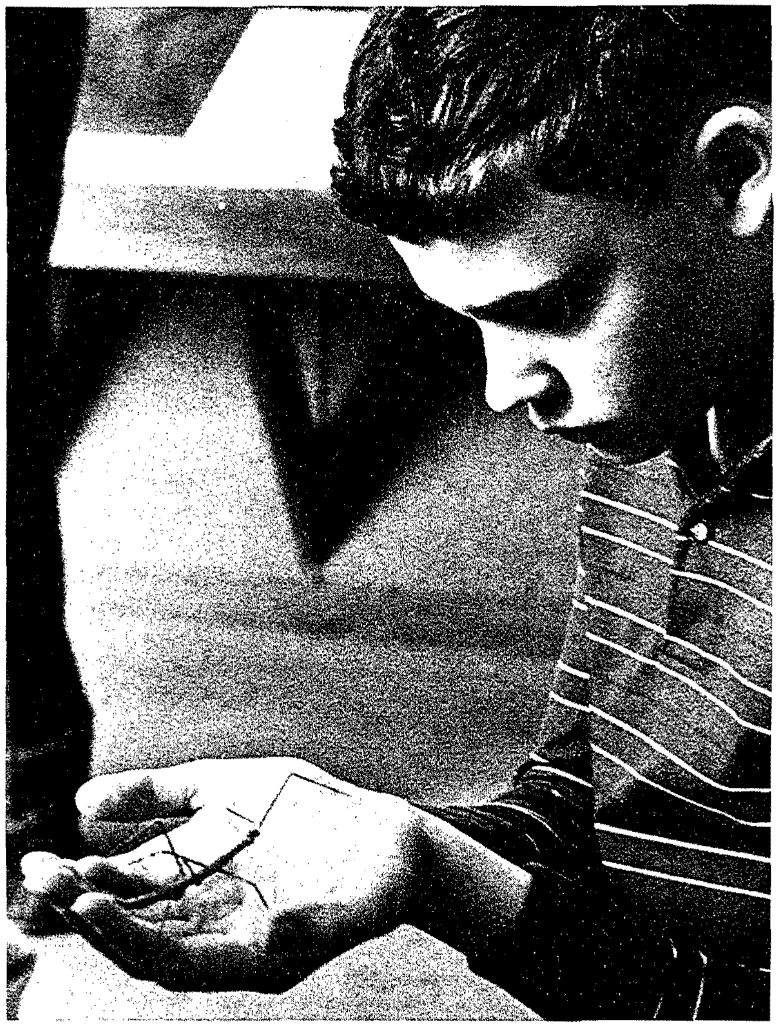
Only the males have this "horn," which is an extension of the thorax. They use the "horn" to knock over rival males.

Photos by Chip Clark, National Museum of Natural History, Smithsonian Institution

Walkingstick.

Walkingsticks are big, plant-eating insects with long skinny bodies and a handy ability to imitate the twigs and branches on which they live. The walkingstick is active mostly at night, when it busily munches away on the leaves of oak and wild cherry trees. During the day, it keeps very still in a long and drawn-out pose so as to make itself invisible to predators. Walkingsticks walk awkwardly, and most kinds are wingless. Their drab olive coloring blends in perfectly with their surroundings.





Roger P. Watts

Jump pattern of the Katydid. As it jumps, it moves its wings to help propel itself forward.

Traducido por Dr. Ricardo Inestroza

ARTE A ZOOLOGICO Marzo de 1989
Noticias para las escuelas de parte del Instituto Smithsoniano

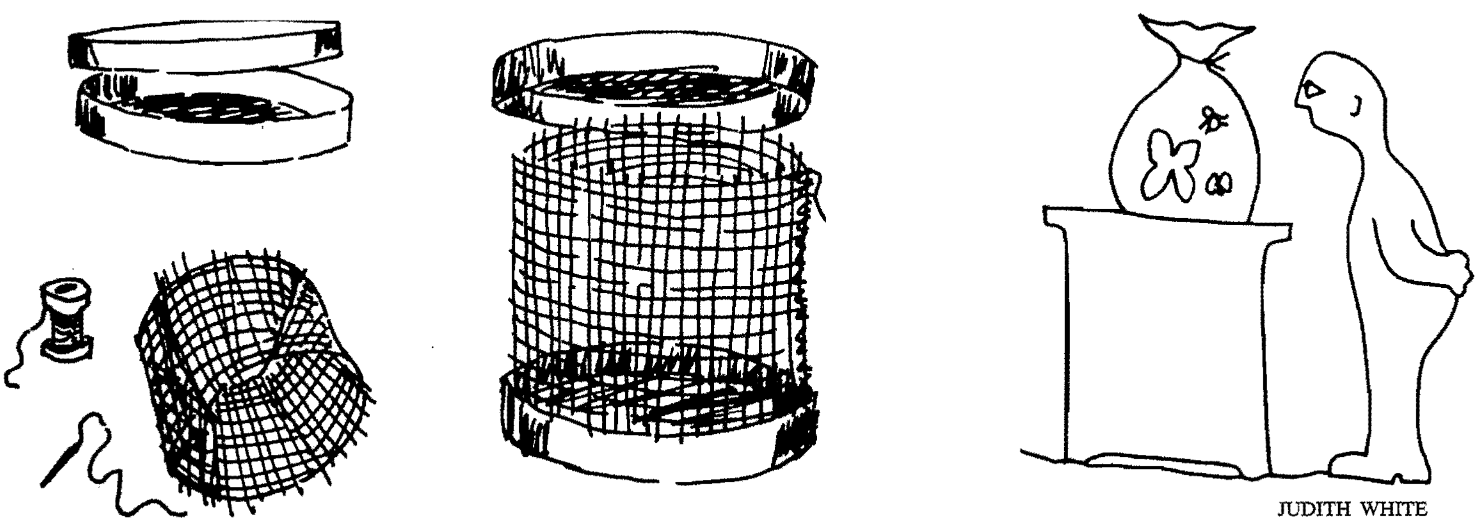
Construye Tu Propio Zoologico de Insectos

¿Te gustaría observar detenidamente los insectos que has coleccionado? Si este es el caso, tu y tus compañeros quizás quieran crear una exhibición de insectos vivos, inspirados en el Zoológico de Insectos del Instituto Smithsoniano (ve la página suelta).

A continuación te explicamos una manera sencilla de hacer una jaula, en la cual puedes tener insectos por uno o dos días: Toma dos tapas de un tarro o dos latas de atún vacías y del mismo tamaño, y un pedazo de tela metálica con hoyos que sean mas pequeños que los insectos que allí quieres poner. Enrolla la tela metálica en forma de tubo y tapa ambos extremos con las tapas. O, si quieres una jaula mas grande, usa torteras para que sirvan de piso y techo y cose con un hilo fuerte los bordes del tubo de tela metálica.

Cuando hayas terminado de hacer la jaula, pon una capa de tierra húmeda en el piso de ésta. Después agrega algunas hojas, zacate y otras cosas que les gusta comer a tus insectos. Humedece un papel tisú y ponlo adentro también, esto sirve para mantener húmeda la tierra. Por último, pon tus insectos en la jaula.

Cuando hayas disfrutado de tus habitantes del zoológico por uno o dos días, no te olvides de soltarlos muy cuidadosamente. Así, los insectos pueden continuar viviendo como antes.



JUDITH WHITE

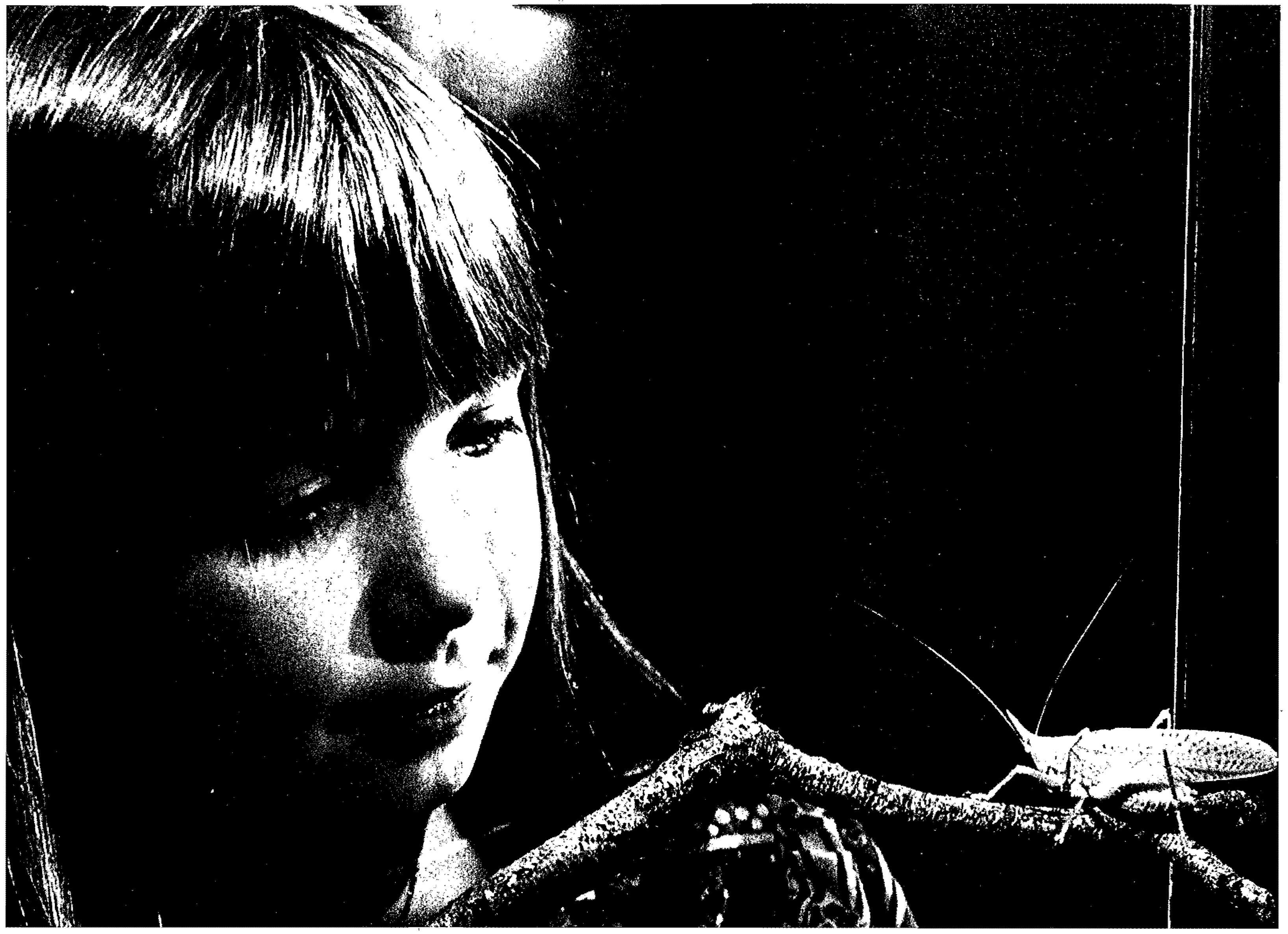
El Zoológico de Insectos

"El éxito a través de la diversificación" es el tema del Zoológico de Insectos del Museo de Historia Natural, lugar donde se exhibe una gran variedad de insectos vivos y otros antrópodos. Algunos de los insectos son bastante raros, otros nos son mas familiares. Aquí hay una pequeña muestra de lo que los visitantes al Zoológico de Insectos del Instituto Smithsoniano pueden ver.

▲ La Cucaracha

¿Cómo crees que este niño siente a la cucaracha silbadora de Madagascar?

Las cucarachas son unos de los antrópodos mejor adaptados, debido en parte, a su forma plana. Por ser unos insectos tan planos, las cucarachas se pueden meter en grietas y hendeduras donde no las pueden alcanzar la mayoría de los animales que las atacan para comérselas.



▲ El Saltamontes de Cabeza Cónica

Este tipo de saltamontes, que vive solamente en las regiones tropicales del mundo, es diferente a otros saltamontes ya que además de comer plantas, come otros insectos. Su cabeza tiene muchos músculos que usa para mover sus poderosas quijadas; y se ha sabido que es capaz de morder el dedo de una persona, ¡ sí se le presenta la oportunidad!

► El Escarabajo Rinoceronte

Sólo los machos tienen este "cuerno," que es una extensión del tórax. Estos escarabajos usan el "cuerno" para atacar a sus rivales machos.

▲ La Colmena de Abejas

Haciendo la limpieza de la colmena del Zoológico de Insectos.

Las abejas juegan un papel importante en el reino vegetal, polinizando las flores al posarse en ellas para comer.

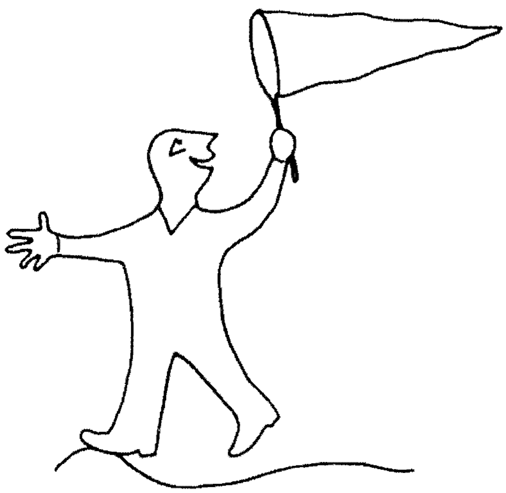
▼ La Mariposa Monarca

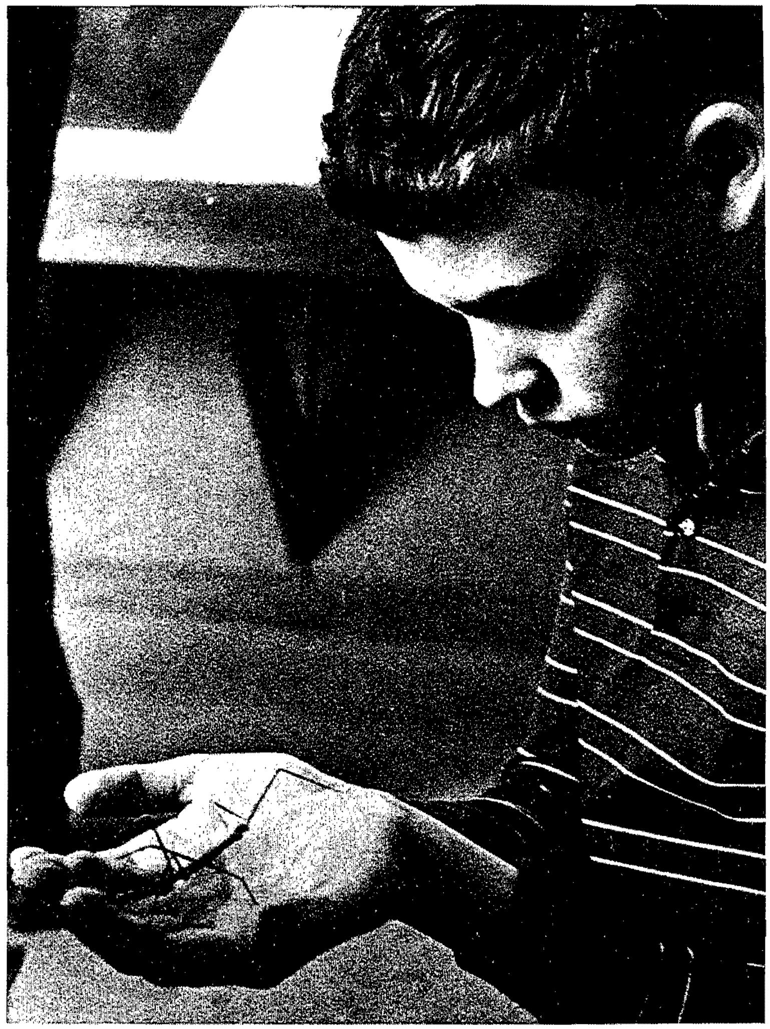
Este es un buen ejemplo de defensa por color. Las mariposas monarca, que se encuentran en todo Estados Unidos, no le saben bien a los animales que los atacan. La razón es que estas mariposas cuando son orugas se alimentan de asclepias, una planta que contiene substancias químicas de muy mal sabor. La mariposa monarca adulta retiene estas substancias en su cuerpo, y sus colores anaranjado y negro les recuerda a sus atacantes su mal sabor.

Chip Clark, National Museum of Natural History, Smithsonian Institution

La Madreculebra

Las madreculebras son insectos de largos cuerpos delgados y una gran habilidad de imitar a las ramas en las cuales viven. La madreculebra se alimenta de plantas y es activa especialmente de noche, cuando come hojas de roble y de cerezo silvestre. Durante el día permanece quieta en una pose alargada para volverse invisible a sus atacantes. Las madreculebras caminan torpemente y la mayoría no tiene alas. Su color verde olivo las hace indistinguibles en el ambiente en que viven.





Roger P. Watts

Patrono de salto de la esperanza. Cuando la esperanza salta, mueve sus alas para ayurdarse a moverse hacia enfrente.