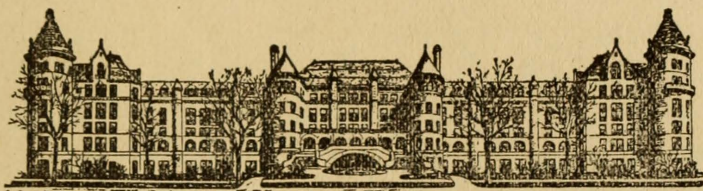


# HOW TO COLLECT AND PRESERVE INSECTS

By FRANK E. LUTZ



**American Museum of Natural History**

**Guide Leaflet No. 39**

**Fourth Edition**

**New York, October, 1920**

**Printed at the Museum**

This Leaflet has been prepared by Dr. F. E. Lutz in response to numerous requests for information as to how to collect and preserve insects. To some extent it complements the leaflet "Our Common Butterflies," as that tells what the butterflies are, and this how to catch and take care of them and other insects.

There is a widespread but erroneous idea that collecting insects yields a satisfactory financial return. Those that still have this notion should correspond with the dealers mentioned on page 4. The amateur will profit greatly in health, pleasure and instruction, but should not approach nature with money in his eye.

FREDERIC A. LUCAS

*Director.*

American Museum of Natural History  
June, 1914.



# HOW TO COLLECT AND PRESERVE INSECTS

## WHAT ARE INSECTS

"Insects are hexapodous tracheate arthropods," which doesn't help much unless it be translated, for the man who can translate it does not need to be told. On the part of laymen, however, and *this pamphlet is intended for laymen*, there is a good deal of haziness as to what are insects and what are not. Arthropods are creatures having jointed appendages but no internal skeleton. The group includes crabs, spiders and centipedes as well as insects. "Tracheate" refers to the structure of the breathing apparatus, but need not concern us here, for "hexapodous" settles the whole matter if one does not object to exceptions. An arthropod with no more than six legs is fairly certain to be an insect. The exceptions to this are minute immature forms not likely to be noticed by the reader. However, a young insect is an insect as truly as is a full-grown one, and while some young insects (flies, for example) have no legs, others (young butterflies, for example) have more than six legs. Perhaps if we call these exceptions maggots and caterpillars, enough will have been said. No mention has been made of wings, for two reasons: very many insects never have wings, and no insect has wings or even signs of wings when very young. It may be said here that when an insect does have fully developed wings it is full-grown. A small winged fly never grows up to be a larger fly, as many suppose. Most insects have an outwardly quiet stage, called the pupal, between the crawling larval and the flying adult ones, but many other insects remain active, merely gaining more and more fully developed wings at each molt. Compare in this respect the butterflies and the grasshoppers.

## WHEN AND WHERE TO FIND INSECTS

An entomologist is frequently amused at being asked by well-meaning friends if he found anything when he went out. Insect hunting is a sport in which there are no blanks if you know the game. Frequently the most unpromising times and places are the best, for others have been discouraged by the outlook and you get what they have missed. We can never truly say that we know an insect's haunts until we can tell where to look for it every hour of every day in the year. If you wish to confuse an entomological friend, find out where an insect sleeps, then ask him if he knows, or request him as a favor to get you some common insects in the winter. Many insects are



great hidens and should be looked for under bark; in rotten wood; under stones, dead leaves, etc.; among the roots of plants; in their stems and flowers—in short, everywhere at all times.

### COLLECTING APPARATUS AND HOW TO USE IT

The great essentials for insect collecting were given each of us at birth and need only be improved by us—an inquiring mind, eyes and fingers. Only a very few insects sting to such an extent that collecting with unaided fingers is uncomfortable, and even the swiftest fliers can be caught by hand when they are young or asleep. However, certain tools are handy. They can either be made at home or purchased rather cheaply from dealers.<sup>1</sup>

Mention of insect collecting immediately suggests a net. For the capture of adult butterflies, moths and other delicate flying creatures this should be of the lightest possible material. Fine Brussels net or bobbinet is used for the larger sizes (one or two feet in diameter) and silk veiling for the pocket sizes. The depth of this net should be at least twice the diameter of its rim, so that when an insect is caught a twist will fold the bag against the rim and leave the insect imprisoned in the lower end of the bag. Some collectors prefer green nets, believing that insects do not see them so well; and others black, because one can see through black netting readily; but most collectors use white. The beginner is apt to choose too long a handle and can then take only long slow strokes even if he does not get all mixed up with the vegetation and his fellow collectors. Three feet is long enough to handle, especially if one handles well the two feet which are covered with shoes.

The sweeping net should be made of stout white muslin or light duck on a strong rim well fastened to a handle of such a length that the user can just touch the ground with the rim of the net without stooping. The diameter of the net depends somewhat on the strength of the user and its depth may be from  $1\frac{1}{2}$ -2 times its diameter. It is used to sweep blindly through the grass, bunches of flowers, light bushes, etc., in a fairly certain expectation of getting something. Much of the material will be damaged by the rough handling, but it is the quickest way to get large numbers of specimens, and the only way to get certain things quickly. The tendency seems to be to make the

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<sup>1</sup>The principal dealers in this vicinity are Kny-Scheerer Corporation, 56 West 23d St., New York City; Ward's Natural Science Establishment, Rochester, N. Y.; New Jersey Entomological Co., Box 432, South Amboy, N. J., and O. Foulda, 63 Fifth Ave., New York City.



handle of the sweep net too short, some on the market being only six inches long. These do not tire the arm so much as nets with longer handles, but you either miss the insects living near the ground or you get a very tired back. One useful trick in sweeping is to have a small cushion (about  $2 \times 1\frac{1}{2}$  inches) of cotton covered with cheese-cloth or muslin and a bottle of chloroform or ether. After sweeping for a few minutes moisten the cushion with the anesthetic, drop it into the net and quickly twist up the bag so that the fumes are confined. In a short time even the liveliest grasshoppers will be asleep and can be picked out and either saved or rejected. If rejected they will all shortly revive and walk, hop or fly away. The cushion is not strictly necessary as the chloroform may be put directly on the net after the insects are folded in the bottom.

The third net of the complete outfit is the water net. The bag should be of some strong material through which water will run readily. The rim should be strong and may be either circular in outline or flattened at the side opposite the handle. The advantage of the flattening is that the bottom of ponds can be skimmed, but the circular rim does fairly well, as the stirring of the water stirs up even the bottom insects and they are caught in the return swish of the net. A great deal of mud and weeds will also be caught, but devices to prevent this, such as covering the mouth of the net with a coarse wire screen, do not work well in collecting insects. After clearing the net of mud as much as possible by washing it through the net, dump the rest on the bank, preferably in the sun. Some insects will probably be seen at once, others will appear as the mass dries out. After you think you have found everything, wait a while and look out for very small beetles. Many collectors miss them.

Many or most of the nets that are for sale have folding rims and jointed handles. Opinion differs as to the best. When, as is often the case, lightness and ease of transportation are objects, it is well to have but one handle and frame with interchangeable bags. The landing net used by fishermen in which the frame consists of two pieces of flexible steel that lie close together when not in use is excellent. The two-jointed handle is better than the three-jointed one, as one of the joints of the former is just right except for high flying or deep diving quarry. In these cases add the second.

A sieve is handy for getting the small insects hiding under accumulations of dead leaves, in moss, trash, etc. Two sieves with meshes of different size are handier. A good plan is to have a strong



bag about a foot and a half square by two feet deep. About nine inches from the top sew pieces across the corners so that a piece of half-inch mesh wire screen can rest on them. Sift through this until there is quite a bit of fine material in the bottom of the bag and then retire to a comfortable place protected from the wind and spread a small sheet of white muslin or canvas. Now resift, using a mesh about four or five to an inch. The flat-bottomed sieves six or eight inches in diameter which are used for making French fried potatoes and the new wire pie-pans are excellent. Sift a very thin layer on to the white cloth and examine carefully the coarse stuff for relatively large things before it is thrown away. Be patient with the small stuff. Insects have a habit of "playing possum" and have plenty of patience themselves. They do not seem to like tobacco smoke. If you do, blow some on the litter. It will hasten matters—at least, smokers think so.

This is a good place to mention collecting forceps as they are almost necessary in picking up very small insects as well as insects concerning whose ability or inclination to sting there may be some suspicion. The best forceps for handling very delicate insects do not seem to be on the market. They are made of strips of German silver and have small but rounded points. However, the small steel ones which are on the market do very well. Steel forceps about a foot long are handy for picking caddice cases, etc., out of water, but they are of little use in general work. Dealers also carry forceps having gauze covered frames at the tips. They are meant for holding stinging insects while they are being examined, but they also are of very little use to the general collector.

A strong knife for cutting off galls, stripping bark, splitting infested branches, etc., is essential. A trowel is useful in following insect burrows or digging for root borers. The entrenching tool used in the army is a handy all-round substitute for trowel, hatchet, and large knife combined.

There are two chief methods of night collecting in general use: sugaring and at light. Another, while not so productive of specimens, is more interesting. It consists in simply prowling around with an acetylene bicycle lamp examining the centers of flowers, the underside of leaves, tree trunks, etc., to find out what the nocturnal insects are doing, and also where and how the day flying insects are passing the night.



There are about as many recipes for making the sugar mixture as there are for "mother's biscuits." Baking molasses usually forms the basis. Some additions are any combination or all of stale beer,

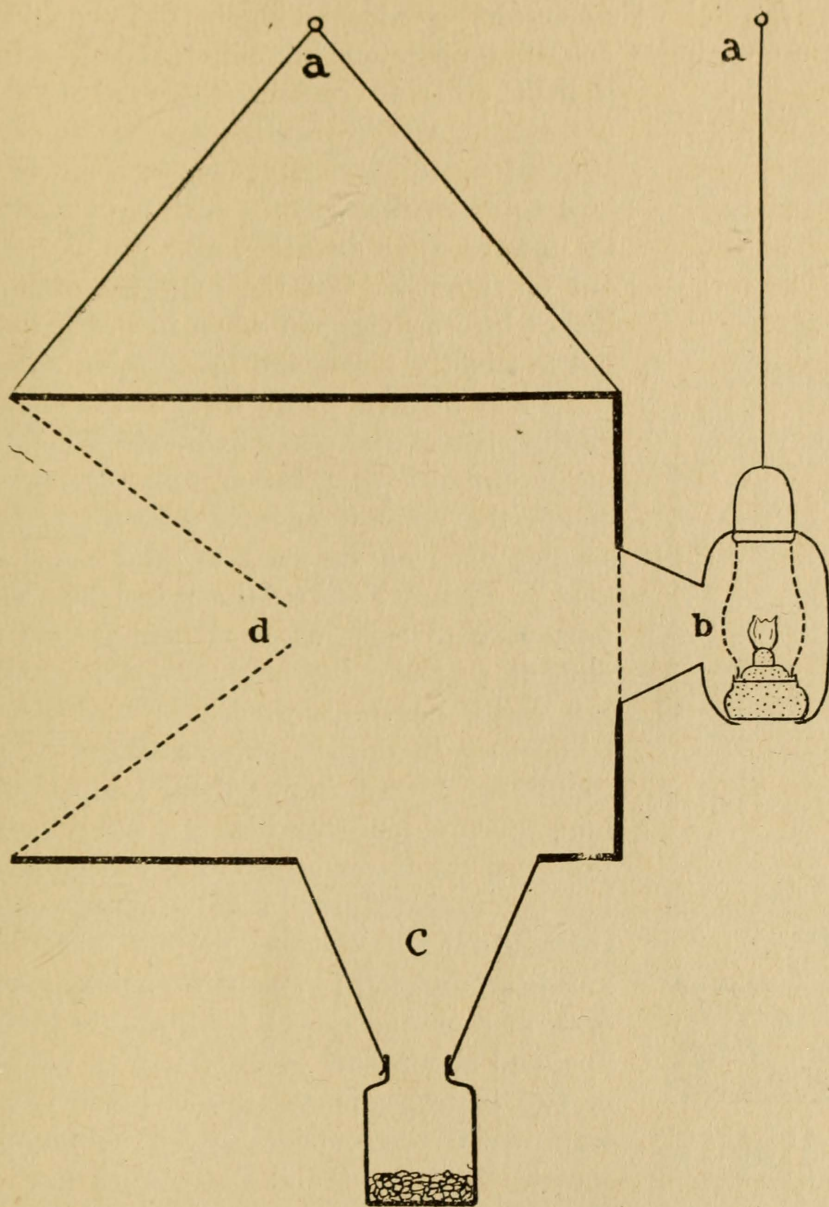


Figure 1. Diagrammatic section of a trap for insects which are attracted by light. *a*, Supporting strings; *b*, Lamp shut off from the trap by a glass plate or netting; *c*, Canvas bag with cyanide bottle; *d*, Glass plates or netting set at an angle. The space between the inner edges of *d* should be about one inch wide.

rum, asafoetida and brown sugar. The mixture should spread easily but not run badly. It is to be applied before dusk on tree trunks, fence rails and the like. Starting from some comfortable resting



place as a base, lay out a circuitous route, "sugaring" something every few feet and end at the resting place. After dark, if luck be good, the sugared strips will be full of moths, eagerly sipping the sweets. Several wide-mouthed cyanide killing bottles (see page 11) will be useful, but a net will be practically useless. It is well to have

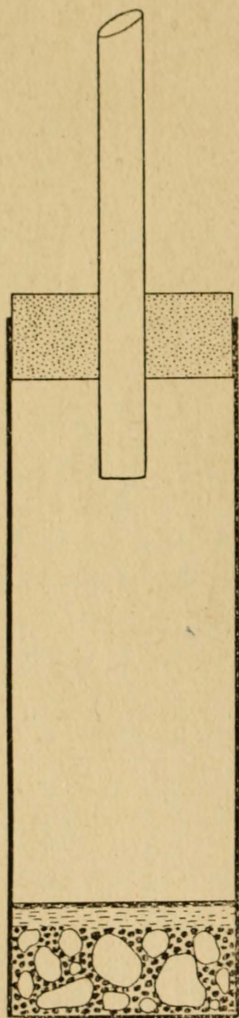


Figure 2. A collecting tube fitted with a quill for taking insects out of an umbrella.

a little ether in each bottle, and do not put a moth in a bottle until its predecessors have stopped fluttering. Only experience will teach how to catch these moths with a bottle. Some fly upward when disturbed and some fly straight out or sideways, but the majority drop a few inches before flying, so when in doubt hold the bottle slightly below the prospective captive.

Light attracts many sorts of insects besides moths. Street and porch lights are fruitful hunting grounds. A lamp by an open window makes the room it is in a splendid trap, or a smaller one can be fixed up and put "in the field." Figure 1 shows the principle. The details vary to suit collectors' whims. It is not difficult to make the box collapsible so that it can easily be transported. An ordinary barn lantern set in the center of a white sheet or a "bull's-eye" throwing a light against a sheet hung over a fence or between trees does very well. In the latter cases a net will be desirable but not easy to use. I have used, with great success, a white cheesecloth tent with a white muslin groundcloth. The best tent was A-shaped, open at each end except for inwardly projecting flys, and about 9 ft.  $\times$  6 ft.  $\times$  6 ft. high. One or two lanterns, placed inside, made it a good trap, while the outside served as illuminated sheets. Both light and sugar work best where there is a variety of vegetation as where wood-

land passes into swamp or where there is an abundance of second growth.

Many other sorts of traps have been devised. Olive bottles and fruit jars buried up to the neck in the ground and baited with molasses, meat, etc., are simple and effective. The insects



caught in this way may be washed off in alcohol and will be nearly as good as new. Boards daubed on the under side with molasses or covering meat are not bad. Girdled branches and cut limbs hung up attract wood-boring insects which can then be collected by beating them into an upturned umbrella by sharply rapping the limbs with a stout stick. In fact an umbrella is a very useful piece of apparatus. Branches, both living and dead, are full of insects. The inverted umbrella catches what are knocked off but does not hold them for long. The collector must act quickly. Some collectors put a quill in the cork of a collecting tube as shown in Fig. 2. If the outer end of the quill be put over the insect it will crawl up through the quill and into the bottle, from which exit is difficult. If the umbrella be white, or at least lined with white, the insects can be more easily seen but so can the collector—not by the insects particularly, but by inquisitive humans—and the non-committal black does very well.

Beating will knock down many larvæ. Directions for preserving them are given on page 18. Some, at least, should be reared and here ingenuity is of more value than volumes of instructions. The beginner will doubtless be inclined to give his charges more light and air than necessary. Pasteboard show boxes are excellent for large caterpillars. Tin boxes keep the food longer and are easily cleaned but must be watched carefully or the food will mold. If the food plant can be potted, a good contrivance

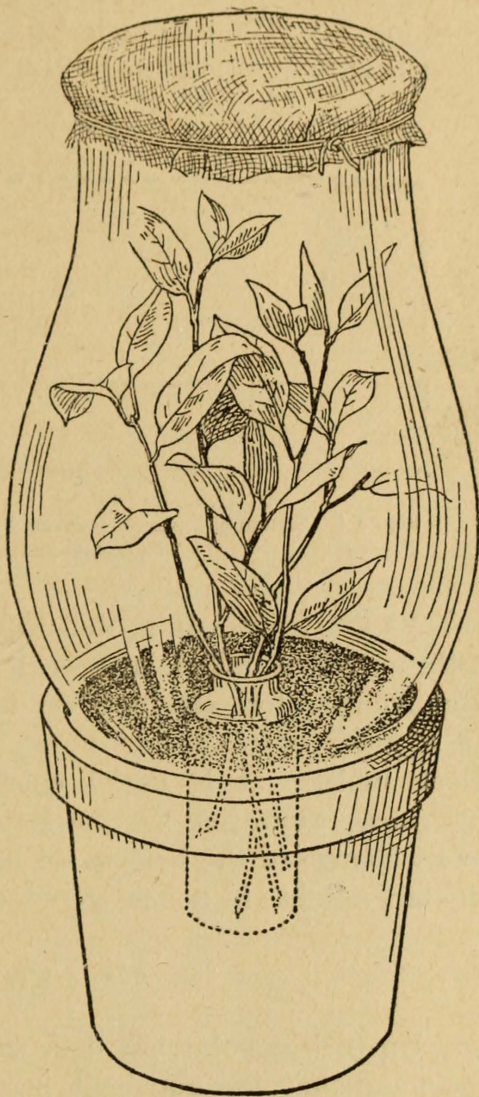


Figure 3. A breeding cage. The flower pot holds earth which contains a growing plant or a bottle with fresh twigs. The lantern globe with a netting cover confines the insects.



is to slip a lantern globe over it, sinking the bottom far enough in the ground to prevent the escape of larvæ in that direction and covering the top with cheesecloth. Even if the plant cannot be grown, twigs can be kept fresh for some time by keeping their cut ends in a small bottle of water sunk in the ground and used inside a lantern globe. (See Fig. 3.) The twigs will be held in place and the larvæ prevented from drowning if cotton be loosely stuffed in the neck of the bottle

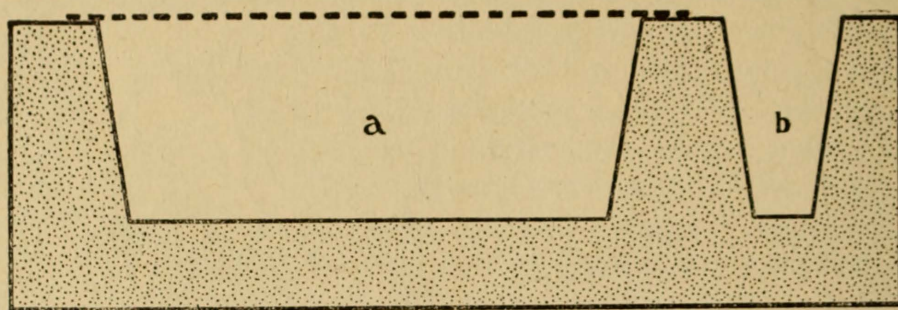


Figure 4. Section of a plaster breeding box. *a*, Space for insects; *b*, Space for water. The broken line represents a glass plate.

around the twigs. It is well to throw a thin layer of dirt over the cotton so that fallen larvæ can easily get back to their food. A useful device for certain larvæ (not leaf eaters) is shown in Fig. 4. It is made of plaster of Paris. The water at one end keeps the block moist. It is useful chiefly for ground-inhabiting larvæ or for galls. However, for the latter fruit jars with moist sand or a moist sponge in the bottom do just as well or better. Do not forget the larvæ living in hollow stems, dead wood and under bark.

### KILLING

Up to this point but little mention has been made of killing insects and that was not really necessary. Insects can be studied alive with great pleasure and profit. However, there are so many kinds (about 15,000 in the vicinity of New York City, for example) and the differences between species are often so minute that it is well to kill and preserve samples at least. Fortunately this can be done with less trouble and less injury to the balance of Nature than is the case with most animals or even plants. Furthermore the collection can be made very attractive and instructive without taking up much space.



The best all-round killing agent for adult insects is cyanide of potassium. It should be broken into pieces varying in size from that of a small pea to that of a hickory nut, according to the size of the bottle to be used. Olive bottles make good medium-sized bottles, while fruit jars are better for large moths and butterflies. Tubes even

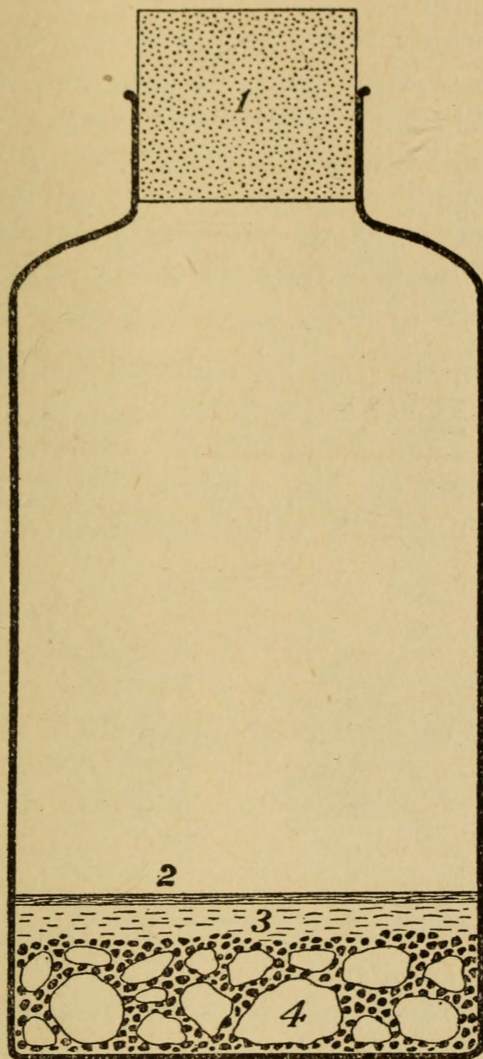


Figure 5. Diagram of a cyanide killing bottle.

- 1, Cork; 2, Blotting paper; 3, Plaster of Paris;  
4, Pieces of cyanide in sawdust.

as small as  $\frac{1}{4}$  inch in diameter by about 2 inches long are not too small for some things. Avoid bottles with strongly constricted necks. Avoid also bottles made of thin glass. There are many ways of keeping the cyanide in position and the bottle in good condition. The most general way is to pour a thin layer of plaster of Paris over a layer (from  $\frac{1}{4}$ - $\frac{3}{4}$  inch deep) of cyanide. However, since such a bottle will quickly get too moist from the specimens and decomposition of the cyanide, some further device is almost always used. The pieces of cyanide may be wrapped in soft absorbent paper or imbedded in dry sawdust before the plaster is poured on. Another way is to imbed it in dry plaster before pouring on the wet. A piece of blotting paper should be fitted tightly over the plaster after it has "set." See Fig. 5. Some do not use plaster but imbed the cyanide

in cotton and cover this with a piece of blotting paper or a thin porous cork. A dangerous but otherwise fairly satisfactory method is to imbed a piece of cyanide on the inside surface of the cork and have none in the bottle itself. This bottle will be dry but not strong and as the cork will in time become saturated with poison



it will be very dangerous. It is always well to have a few narrow strips of loose absorbent paper in the bottle. They prevent injury to the insects by shaking and will keep the bottle dry as they can be frequently changed. As ordinarily made, a bottle should be allowed to ripen for several days before using. If wanted at once, put a few drops of vinegar or a pinch of boracic acid powder with the cyanide. Collectors of delicate moths and butterflies frequently put a few drops of ether or chloroform in their cyanide bottles before starting out. This is to quiet the insects at once, for the cyanide sometimes kills slowly. Experience will teach the collector that some insects die very slowly and revive after apparent death. On the other hand ether and chloroform make insects brittle and too long an exposure to cyanide fumes changes the color of some insects.

Practically all beetles and dragon flies, together with dull colored hairless insects of other orders, can be killed in alcohol and kept there indefinitely—50% is strong enough for killing and 70% for preserving. Higher grades make them brittle. No fly, bee, butterfly, moth or any green insect other than those previously mentioned should be

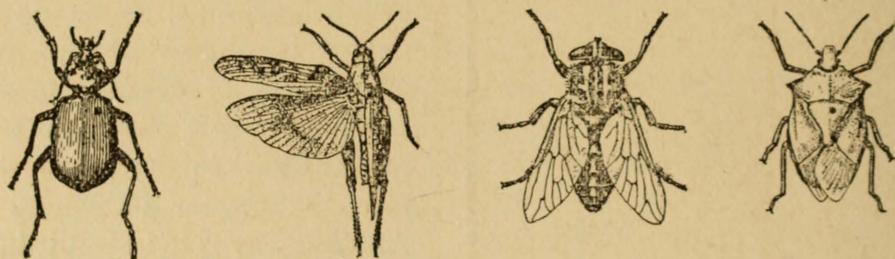


Figure 6. The black dots show where the pin should be inserted.

put in alcohol. In an emergency, kerosene, gasoline or benzine put on the thorax will kill and give satisfactory specimens. The thorax is the part of the body which bears the wings and legs. Insects breathe through holes in it and in the abdomen; not through the head. Pounded laurel leaves and peach pits make a weak killing agent, and butterflies and moths may be killed by carefully but firmly pinching the thorax between the thumb and finger, one on each side. In fact many collectors of these insects pinch their captures before taking them out of the net. This stops their injuring themselves by thrashing about.



## MOUNTING

We come now to the methods of mounting and preserving. The stock method is pinning. The almost universally adopted pin is  $1\frac{1}{2}$  inches long and has a very small head. It varies in thickness from extremely slender to as thick as an ordinary pin. The useful sizes are from No. 0 to No. 3. They are either plain "white" or enameled black. Much is to be said for both with the voting probably in favor of black. At any rate they should snap back when bent a reasonable amount. A pin that bends easily and stays bent produces profanity. Beetles are usually pinned through the right wing cover. All other insects, when pinned, are pinned through the thorax. In the case of flies it is well to pin a trifle to the right of the middle line as the bristles on the back are important in taxonomy and one side of the body should be perfect. True bugs should be pinned through the triangular portion of the thorax which is between the wings. See Fig. 6.

Very small insects are usually mounted on the tip of paper triangles, a medium-sized insect pin being stuck through the broad end of the triangle. The triangles are of about as many sizes as there are collectors. A ticket punch can be purchased which has a die suit-

able for cutting these triangles. However if they be cut out with scissors or a sharp knife, such as a razor, a variety of sizes and shapes suited to different insects can easily be made. The best way is to cut tough, rather stiff paper into strips about three-eighths of an inch wide and then snip off triangles from them by making transverse cuts. It is well to pin up a quantity of these triangles in odd moments and keep them on hand. When

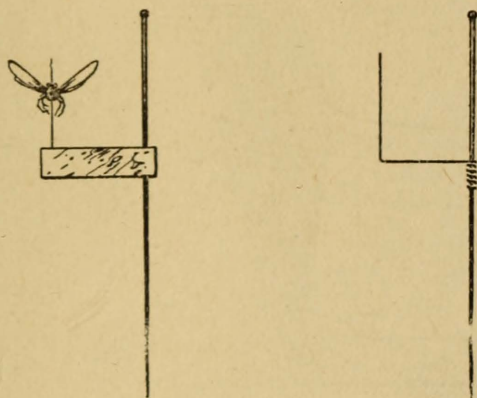


Figure 7. Pins for mounting small soft-bodied insects.

ready to mount, put a small bit of white shellac dissolved in alcohol or of some good elastic glue on the tip of a triangle and touch it to the under side of the thorax. Some difficulty will be experienced in keeping the insect straight on the point, especially if the adhesive be too thin. The triangles for ants should be fairly broad at the "point," and the front end of the abdomen as well as the thorax should be supported.



The method just mentioned is almost universally used for small beetles. Small flies and the like are frequently mounted on "minuten nadeln." These are short, very delicate, headless pins. Their use is illustrated in Fig. 7. Bits of pith, cork or firm blotting paper (used edgewise) serve to connect the two pins. In the illustration the "nadel" is shown stuck through the insect and then into the support. A somewhat better plan is to arrange a number in advance by sticking the "nadel" through the support from below, leaving the point sticking up; then mounting can be done rapidly by piercing the insects

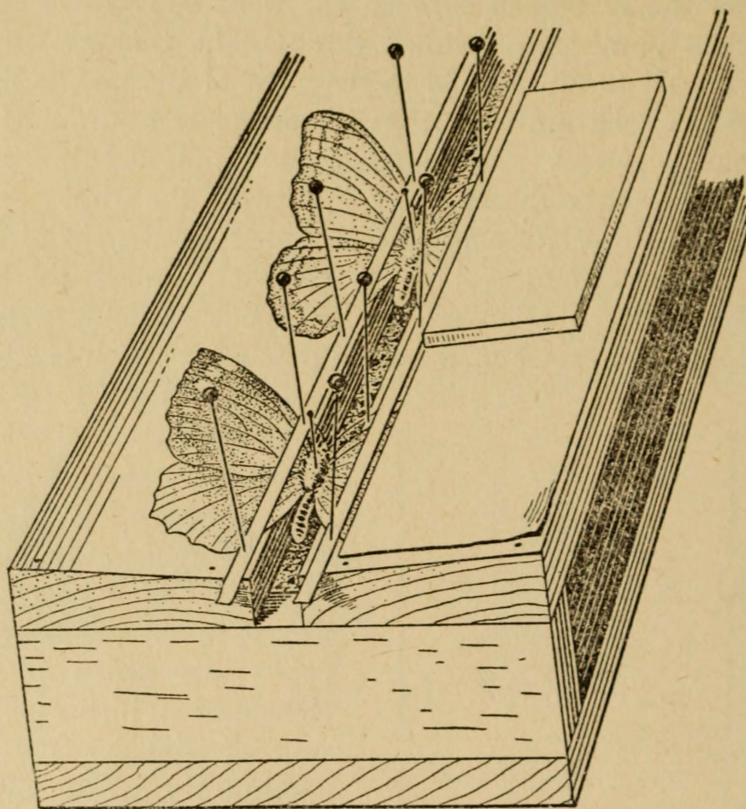


Figure 8. A common type of setting board showing different stages in "spreading."

from below. It is well, in this case, to stop before the point comes entirely through the back, as then no pin shows and furthermore the characters on the back are not marred. "Minuten nadeln" have the advantage over glue on triangles that the glue does not always hold. On the other hand, the "nadel" cannot be used with many hard-shelled beetles. Elbow pins (Fig. 7) are sometimes used but are not very satisfactory as a rule. The mounts mentioned in this paragraph are usually put on the left side of the pin.



The height of the insects on the pin is important for the final appearance of the collection. A strip of cardboard whose width is one-quarter to one-third the length of the pin makes a convenient gauge. With one edge held at the head of the pin, push the insect up until it touches the other edge. Or a block of wood containing a hole whose diameter is a trifle larger than that of the pin's head and whose depth is one-quarter to one-third the length of the pin may be used. Devices for regulating the height by sticking the point of the pin into a gauge are not satisfactory because of the varying thicknesses of the specimens.

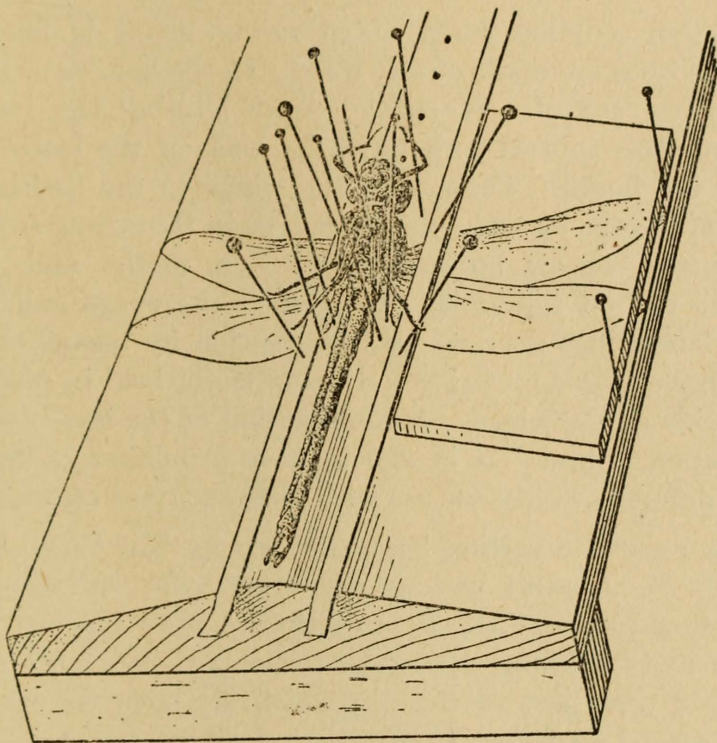


Figure 9. A setting board for use when it is desired to spread the legs.

Mounting insects in balsam on glass slides will probably not be taken up by the general collector unless he be already accustomed to making balsam mounts. It is, however, the only satisfactory method of getting extremely small mounts ready for study.

In collections, butterflies and moths usually have all four wings expanded to their utmost and more or less in line with the lateral axis of the creature's body. This makes a nice looking collection and is the best that can be done with most butterflies. However, many



moths have natural rest positions which are not only interesting but economical of space. It is well therefore to expand the wings of the left side so that the markings on both the front and hind wings show, but to leave the right wings in the natural rest position. The reason for expanding the left side rather than the right and for putting the triangles, etc. (see above) on the left side is that most people are right-handed. This arrangement makes it easy to use the pinning forceps with the right hand. Pinning forceps are strong forceps with broad roughened ends and are useful in pushing the pins into the cork of the storage boxes (see page 19). For the same reason when the wings of grasshoppers, wasps, etc., are spread it should always be the left wing.

The most common form of spreading board is illustrated in Fig. 8. The sides are made of soft wood. In the bottom of the central channel is a piece of soft cork. After pinning the insect, push the pin into this central cork until the back of the insect is nearly flush with the board. Then draw the wings to the desired position by means of forceps or a fine needle caught in the strong front margin of the wings. Never use the fingers on moths and butterflies as they will rub off the scales which cover the wings and give color to them. The wings may be held in position by means of fine pins or bits of heavy glass or strips of tracing cloth, held in place by pins placed outside of the wings. A combination of the last two methods, glass on paper, is best. It is well to have a number of boards with grooves of different widths for use with different sized insects.

Figure 9 shows a setting board devised by Mr. Chas. E. Sleight, of Ramsey, N. J.—and perhaps by others—for spreading caddice flies and other insects when it is desired to have the legs spread as well. The holes running down the center are just large enough to accommodate that part of the pin which is above the insect. The wings are spread as before except that now the under side is visible to the worker and the legs are accessible.

Flies (insects which have just one pair of wings), beetles (insects which have hard front wings) and bugs (insects which have the front part of the front wings leathery) are rarely spread although they may be. The wings on at least one side of wasps should not be spread, as the way they fold them is of taxonomic value.

Should insects get dry and stiff before they are spread they must be relaxed. This is done by putting them in a covered jar or tin box containing water or moist blotting paper. A few drops of carbolic



Figure 10. A field card such as is used at the American Museum

FIELD NOTES				
FIELD NO.	ACCESS. NO.	DATE	TIME: TIDE:	DEPT. Nos.
4127				
LOCALITY	Map		Temperature	
On, under, in			Rainy      Clear Cloudy     Fog Pt. Cloudy	
SOIL: Rock, gravel, sand, clay, humus, mud;.....Moist, medium, dry				
SLOPE: Level, slight, moderate, steep, cliff;.....EXPOSURE: N-E-S-W				
VEGETATION:				
WATER: Stagnant, still, slight current, swift;.....Fresh, brackish, salt;.....DEPTH:				
CAUGHT BY — hand, sweeping, seine, dredging, sugar, light, trap, sifting, beating				
COLLECTOR:				
REMARKS:				

FIELD NO. 4127      DATE .      LOCALITY

4127



acid added to the water will prevent mold. Twenty-four hours will usually be sufficient to relax even the driest, but more time may sometimes be necessary. If the insect has neither scales nor hairs, it can be quickly relaxed by immersing it in warm water.

It will be noticed that both the setting boards illustrated here give the wings a slight upward tilt. If they keep this position it will not be objectionable, but they are not likely to do so, since the weight of the wings will probably drop them to the horizontal at least. Large insects dry more slowly than small ones and it will probably be necessary to allow them to remain on the boards for about two weeks. They should certainly remain until thoroughly dried. No further preservation is then necessary, as a rule, for the fairly hard-bodied adult insects. Some tropical grasshoppers have large abdomens full of fat and decomposing food. These should first be opened by an incision along the belly, the viscera taken out, and the abdomen stuffed with cotton. Broken specimens may be repaired with shellac or thin glue.

Caterpillars may be prepared in the following way: Make a circular incision at the hind end, cutting the intestine loose from the outer body wall. Then, laying the caterpillar on a piece of clean blotting paper, squeeze the viscera through this opening by gently rolling the caterpillar with a lead pencil, beginning near the hind end and gradually working toward the front. After the viscera have been gotten rid of, for the most part, insert a straw and fasten the first segment of the larva to the end of the straw by means of a fine needle. Draw the hind segment up the straw until the larva is natural length and fasten it in the same manner. Then inflate the larva by gently blowing through the straw. Since the front end of the straw may get plugged up it is well to make a small hole in the side of the straw before it is inserted. This hole had best come about midway between the larva's head and tail. Since inflation must be kept up until the larva's skin is dried, gentle heat is ordinarily used. A tin can with holes punched in it for ventilation and heated by an alcohol lamp makes a good oven, or one made for the purpose can be purchased. Dealers also sell bellows, tubing, clips, etc., to make the work of inflating easier. However inflated, green larvæ are apt to lose their color, for it is chlorophyll which fades rapidly. Slow drying paints relax the skin and distort it. Therefore, if painting is done, the pigments should be mixed with benzine or the like.



### FIELD NOTES AND LABELS

It is only by the merest chance that the beginner gets a new or even a rare species on ground that has been worked over by experienced collectors, but even the primary class in entomology may add to our store of knowledge if it keeps field notes well. Date of capture and locality are considered of prime importance. They should always be known and kept with every specimen, but the distribution and time of appearance of our common species are known. It is of their habits that we are ignorant. What do they feed on? Under what conditions are they to be found when young and when old, day and night, winter and summer? What do they do and how do they do it?

A sample field card is shown in Fig. 10. The "Remarks" are really the important part. In using this card the lower right-hand number is torn off (after filling out the card *in the field*) and kept with the specimens to which the card refers until they are individually labeled. This is the card used in the American Museum. The stub is kept by the collector and the card is filed at the Museum. Such a refinement of system is not necessary in most cases, but some system is imperative if your collection is to be worth while.

The pin label should be small but legible. Certain firms make a business of printing these labels from small type, or the collector can make up a sheet by means of an ordinary typewriter (black ink is best) and have a block made from this greatly reduced in size. From this block any number of impressions can be made. Any printer will attend to the whole business. Figure 11 shows sample strips. If dates are not printed they should be filled in before cutting the labels apart. Field numbers can be written on the back of these

Tukait, BG.  
1911  
Tukait, BG.  
1911  
Tukait, BG.  
1911  
Tukait, BG.  
1911  
Tukait, BG.  
1911  
Tukait, BG.  
1911  
Tukait, BG.  
1911  
Tukait, BG.  
1911  
Tukait, BG.  
1911

Manati P. R.  
Mch 5 '14  
Manati P. R.  
Mch 5 '14  
Manati P. R.  
Mch 5 '14  
Manati P. R.  
Mch 5 '14  
Manati P. R.  
Mch 5 '14  
Manati P. R.  
Mch 5 '14  
Manati P. R.  
Mch 5 '14  
Manati P. R.  
Mch 5 '14  
Manati P. R.  
Mch 5 '14

Fig. 11.

labels or put on a separate label. The collector's name can also be put on a separate label. Similar labels should be the same height on the pin throughout the collection. This is easily accomplished by sticking the pin first through the label then into a hole of given depth or cork of a given thickness, thus pushing the labels up to a uniform height.

### STORAGE BOXES AND CARE OF COLLECTION

Since certain members of a family of beetles (Dermestidæ) are given to eating dried insects, the storage boxes should have tight-fitting lids. Except for that almost anything will do. Cigar boxes



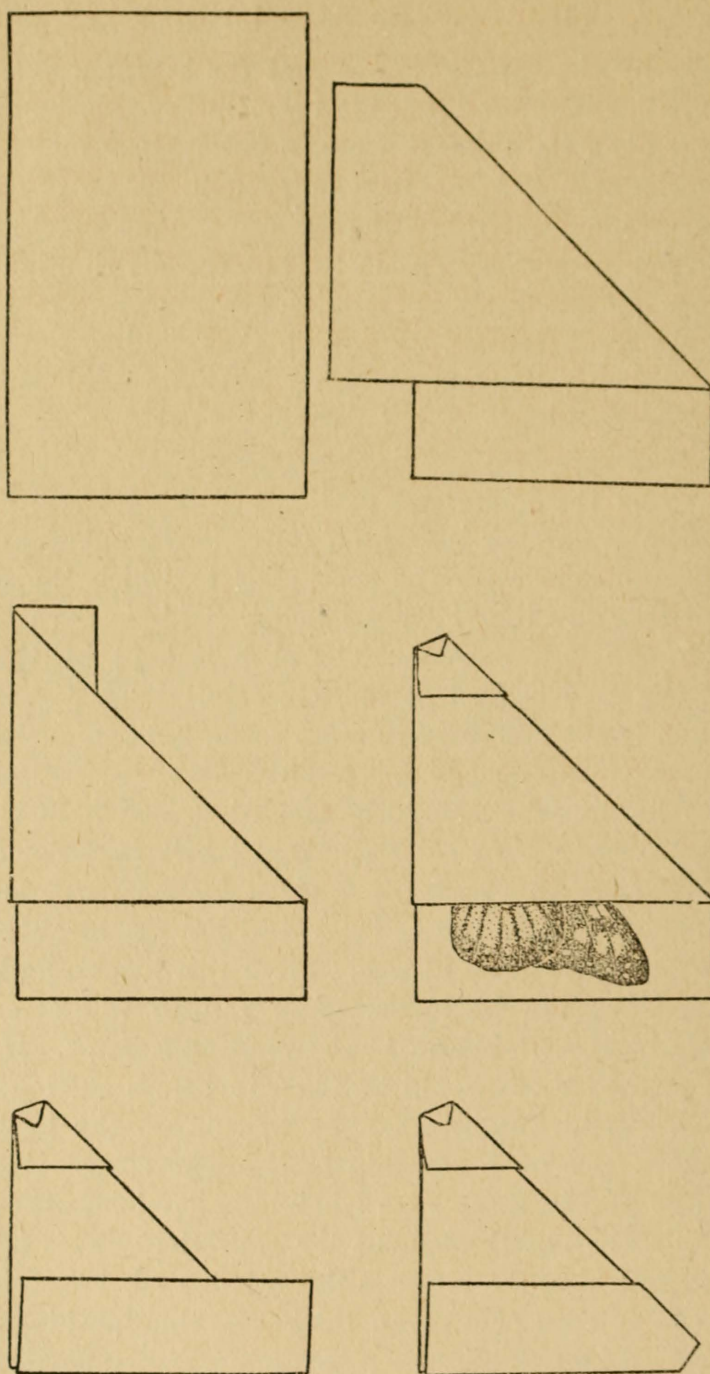


Figure 12. Method of packing a butterfly. The paper used in making the envelope should be stiff enough to protect the wings.



are not bad if carefully watched, but better boxes can be purchased at reasonable prices from dealers. Glass topped drawers are nice but not necessary. Whatever sort of box is used, the bottom, inside, should be covered with something which is soft enough to allow a pin to enter easily but which will hold the pin when it is once in. The compressed cork of the dealers is best. Sliced cornstalk is used by some beginners but two layers of corrugated paper, such as bottles are packed in, is better than corn pith. The layers should be placed so that the corrugations run at right angles to each other.

In spite of precaution Dermestids may get in, although camphor balls or flaked naphthalene will help to keep them out. If camphor balls are used, first heat the head of an ordinary pin and while hot push the head into the ball. When cool, it will be solid and the ball can be pinned into the box. If Dermestids do get in they may be killed by pouring into the box about a teaspoonful of carbon bisulphide and closing the lid down tightly. Remember that the bisulphide is very inflammable.

#### PACKING INSECTS IN THE FIELD

It frequently happens that the collector cannot attend to his catch at once, or possibly for months. Of course those things which are collected in alcohol may remain there. Butterflies and the like should be put into triangular envelopes. The manner of making these is shown in Fig. 12. Never put more than one specimen in an envelope. Other insects can be packed between layers of cotton and cheesecloth, with naphthalene flakes put in to keep out ants, etc., or they can be put in sawdust. In the latter case it is well to sprinkle carbolic acid on the sawdust to prevent mold. An excellent method of packing insects (except butterflies and moths) which are to be dried, is to make tubes of unglazed paper around a lead pencil, first writing the data on that part of the paper which comes outside. One end is closed by folding in the paper there, and then the tube is nearly filled with freshly killed insects. Finally the other end is closed by folding in the paper. These tubes and the triangular envelopes can be packed in a cigar box, and, if sprinkled with naphthalene to keep out ants and Dermestids, will keep indefinitely. Never pack moist insects in a tin box and never close even a wooden box tightly if there are many moist insects in it. Mold will result if you do.



## IDENTIFICATION

Several popular leaflets for the identification of our more common or popular insects (e. g., butterflies) have been published by the Museum and may be purchased for a nominal sum. Others are being prepared and the study collections at the Museum are open to students upon application. *The Butterfly Book* and *The Moth Book*, both by Holland, are recommended for work in those groups. Blatchley's *Coleoptera of Indiana* is useful for students of beetles, except snout-beetles and their relatives, even along the Atlantic coast. For those beetles omitted in Blatchley, see Blatchley and Lang's book on *The Rhyncophora of the Eastern States*; both these books, however, are for professionals and advanced amateurs, rather than for beginners. Comstock's *Manual for the Study of Insects* and Kellogg's *American Insects* give good surveys of American entomology, especially as regards anatomy and the broader phases of the subject. The author's *Field Book of Insects* (Putnam's) is intended to answer "common questions about insects," and to enable the beginner to identify about 1,000 of the more frequently seen or more interesting species. Volumes V and VI of the *Cambridge Natural History* form the best world-wide treatise in English.

## FINALLY

Do not forget that information about the insects is usually of as much value as the specimens— or more.



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