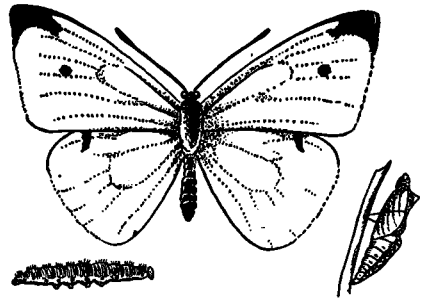
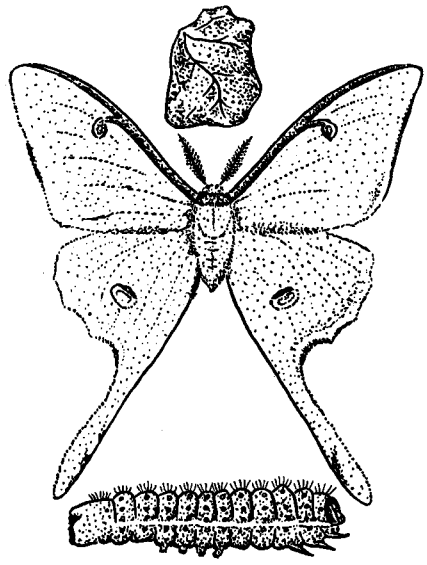
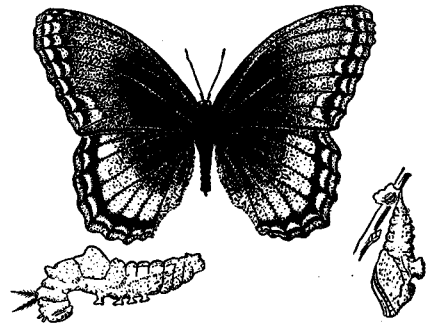


LARVAL, PUPAL AND ADULT STAGES OF CABBAGE MOTH (ABOVE), LUNA MOTH (RIGHT), AND RED-SPOTTED PURPLE BUTTERFLY (RIGHT).





*This is the forty-first in Nature Magazine's series of educational inserts.*

# Some Butterflies and Moths

*By* E. LAURENCE PALMER

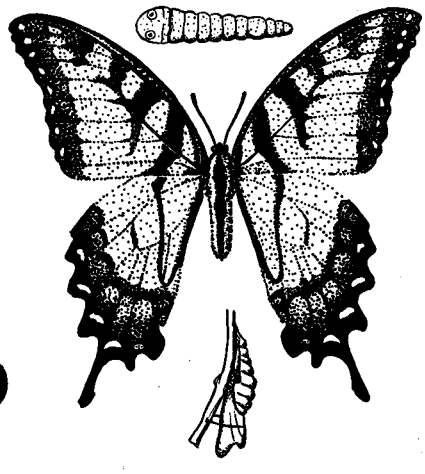
*Illustrated by E. M. Reilly*

WHEN LORD Byron wrote, "Maidens, like moths, are ever caught by glare," he could have had no possible concept of the drawing power of The Great White Way. He apparently did know that light attracts moths of some sorts, but if that was all he knew of them he only scratched the surface of a tremendously interesting field of Nature. His dilettante concept of the moth was more pleasant than the Bible's association of moths with rust in producing corruption, and so many writers have commented on the "silly moths" that are proverbially singed by the flame that it seems appropriate to find something of the truth about these tremendously interesting insects.

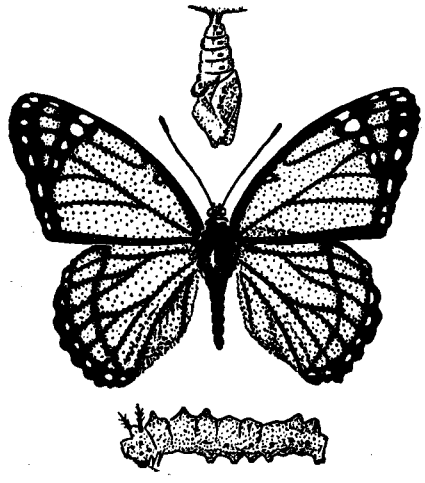
The entomologists, or insect students, tell us that moths and butterflies belong to one great order, the Lepidoptera, and our teachers like to show their erudition by explaining that this $64 word means scaly-wings. Anyone who has ever caught a moth or butterfly in his hands has discovered this character of the wings. Some concept of the relative importance of the group among the insects is indicated by the fact that approximately one-fifth of the insects known from New Jersey are members of this order, and a catalog of the lepidoptera of New York State requires between 600 and 700 pages of fine print. Under these circumstances, we cannot here attempt to treat the group exhaustively, but, with apologies to some of our good lepidopterist friends, will attempt to provide a nodding acquaintance.

I once wrote of these insects as belonging to the secret order of lepidoptera, in which there were four degrees through which the candidates for the final regalia went. These degrees began with the egg. The second degree was represented by the larva, or caterpillar. In the third degree—the pupal stage—the changes that took place were even

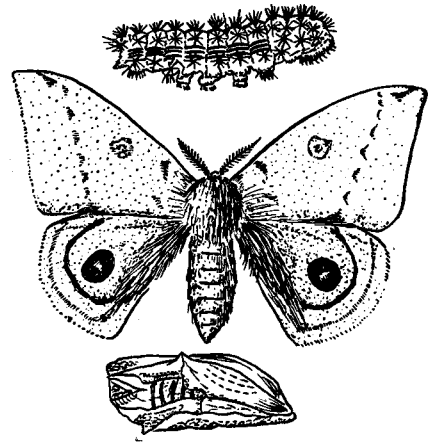
TIGER SWALLOWTAIL

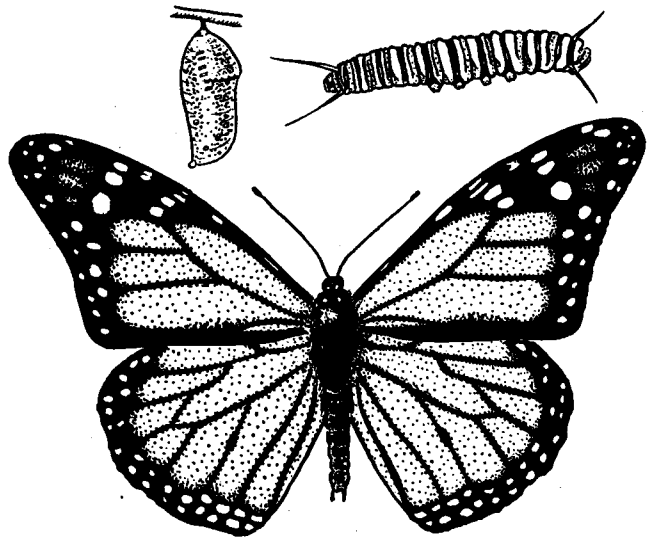


VICEROY

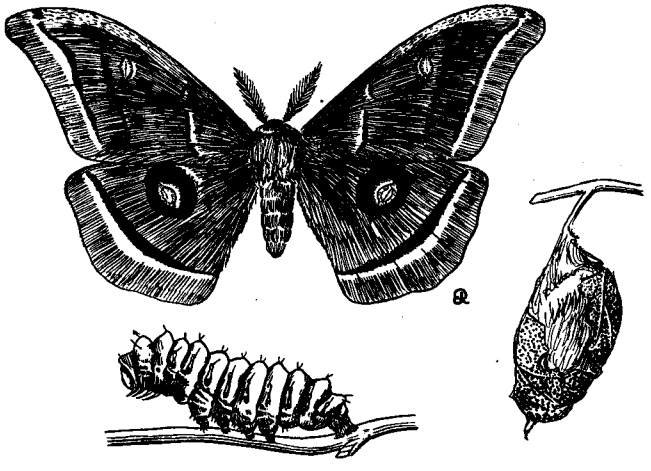


IO MOTH

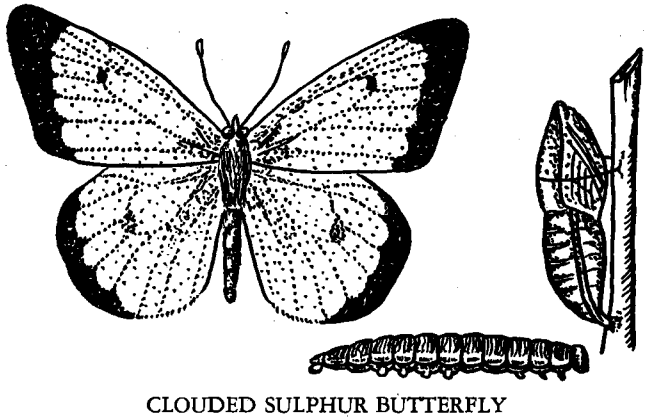




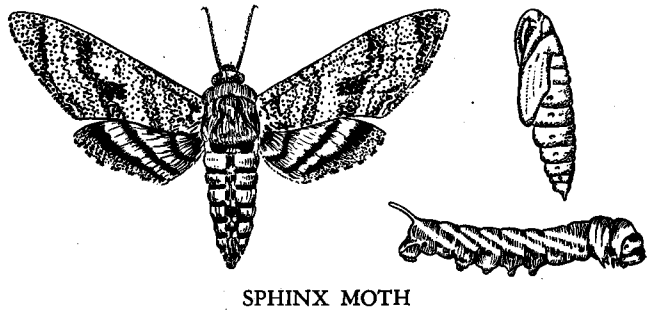
MONARCH BUTTERFLY



POLYPHEMUS MOTH



CLOUDED SULPHUR BUTTERFLY



SPHINX MOTH

greater than the changes that may take place in testimony when a prisoner is given the third degree. In the final, or fourth degree, the novitiates became full-fledged members of the order and were given appropriate regalia to testify to their success. The spangled covering of a moth and butterfly often far excels in beauty anything that man, with the help of science, can create, and it is this spangled raiment that intrigues so many amateur and professional naturalists.

*The Egg.* If moths and butterflies laid eggs the size of hens' eggs, we might raise them commercially to eat. But, if they did, the chances are that the caterpillars would be so huge that they would destroy all the plants we need for food. Since there are thousands of different kinds of moths and butterflies, it is not strange that the eggs of these animals, and the manner in which they are laid, vary greatly. Some moths may lay their eggs in flight, letting them fall wherever they may. Others help their young to survive by at least laying the eggs on a plant that may provide a suitable food supply. Still others, like the tent caterpillars of our apple and cherry trees, lay eggs in a compact, waterproofed mass on the part of a particular kind of tree that will produce fresh young leaves at the very time the eggs hatch into voracious caterpillars. While these eggs may winter over, some other lepidoptera may spend the winter just as safely in other stages.

Possibly one of the most selective placings of a butterfly egg takes place with the wanderer butterfly. The female places the egg in a mass of aphids or plant lice to provide meals for the growing wanderer butterfly caterpillars. There must be considerable seeking out of a proper place to lay the eggs. In the chart material that accompanies this article are brief descriptions of some of the eggs of the members of the group. Some of these eggs may be recognized by the color of the gum used to attach them to their support; others by shape or size; still others by color or position.

*The Caterpillar.* In this early stage of a moth or butterfly, it is essential to increase rapidly in size, and somehow to avoid as many enemies as possible in the process. Since about the only way to grow is to consume great quantities of food, this stage is usually one prolonged eating spree. In the midst of this orgy, the caterpillars stop now and then to let out their belts. Since, like all other insects, they carry their skeletons on the outside of their bodies, they must shed the skeletons, and grow some new ones big enough to provide room for the food eaten on another spree. The number, or frequency, of these changes varies with the different insects, and, in some cases, with the opportunity to gorge continuously. Life to a caterpillar is just one grand banquet after another—or it is death.

With the caterpillars of moths and butterflies, many become independent of their own kind as soon as they hatch from the egg; others stick together in spite of the fact that such crowding results in serious competition for food supply. Those that do crowd, or remain together, provide some interesting observations. Some feed in unison. Some assume a threatening post in concert. Many cooperate in the construction of a common shelter, as in the case of the apple-tree tent caterpillars.

Some of the control measures we adopt in our war

against destructive lepidoptera are based on knowledge we have of the habits of their caterpillars. For example, it is futile to destroy a tent caterpillars' nest when the insects are feeding away from home. It is better to wait until evening, or until some rainy day when the nest will be crowded. Then a twist of a wire brush in the nest, followed by a dunking in kerosene, will destroy great numbers of the pests and not injure the tree.

Not a few caterpillars leave silken trails behind them as they move about. We cannot, with much degree of confidence, presume to say why. It would seem as though this provided a guide for a return trip, but this is not necessarily so. Some enemies are known to lie in wait along these silken trails to attack the returning animals, but whether this is instinct, intelligence or accident is difficult to say.

Many of our methods of attacking an enemy are based on knowledge of eating habits. The way to a man's heart may be through his stomach, and the way to a caterpillar's grave may be by the same route, but, to get to the stomach, food or poison must get through the mouth, if the poison is a stomach poison. It happens that all of our caterpillars chew their food, so control measures are largely effected by placing surface poisons where they will be taken up with the food as it is eaten. Paris green and similar poisons are commonly used in this way.

A rather surprising variation exists in the time of day when caterpillars feed. Some of the cutworm pests of the garden forage among our choice vegetables at night, while many caterpillars take to shelter with the first suggestion of darkness. All this is taken into consideration in planning any necessary campaign against them.

When a caterpillar has reached its maximum development, it prepares for the next stage. If this is underground, the caterpillar may, like many cankerworms or measuring worms, drop from the treetop where it has fed, and, with the help of silky thread, reach the ground in perfect safety. If the next stage is spent as a naked pupa, as in the case of the butterflies, surprising changes take place in the shape and pattern of the outer surface. If the pupa is to be encased in a silken cocoon, the caterpillar may cease eating and move about nervously in search of a suitable place to make its own silken bed.

*The Pupal Stage.* Earlier in this account we mentioned the remarkable change that took place in the normally third stage in the life history of a moth or butterfly. In this pupal stage phenomenal changes take place. An animal of special characteristics becomes, in a relatively short time, another animal of radically different nature. It is not surprising that, during this period, the most effective protection is retirement to some hidden place. As already suggested, some achieve a degree of protection by preparing a weatherproof cover of silk. Frequently this is camouflaged by leaf fragments; sometimes even covered with a curled leaf. Wooly bear caterpillars rest in a covering made largely of the "wool" that covered the original caterpillar. Not a few caterpillars, like the tomato worms and the cankerworms, burrow into the ground, where they make the change of a

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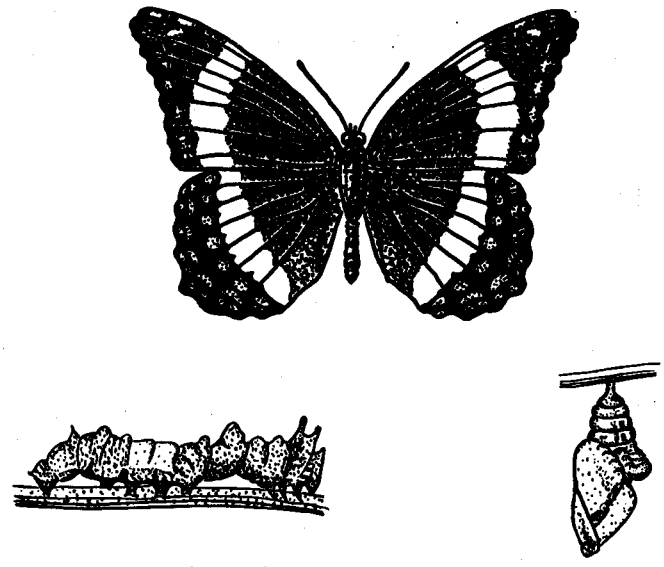
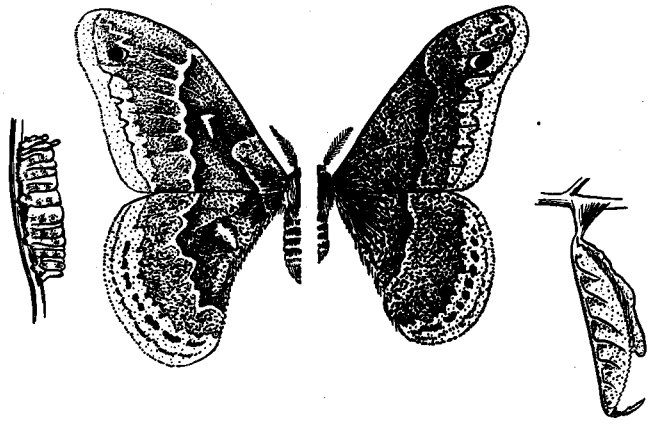
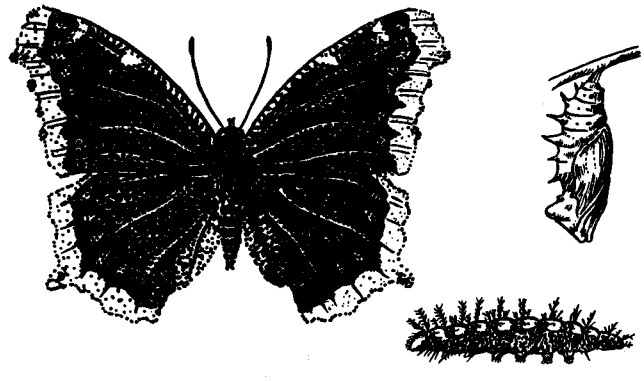


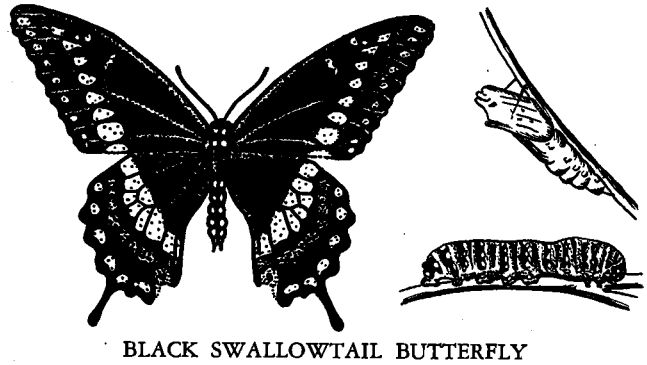
WHITE ADMIRAL BUTTERFLY



PROMETHEA MOTH (FEMALE AND MALE)



MOURNING CLOAK BUTTERFLY



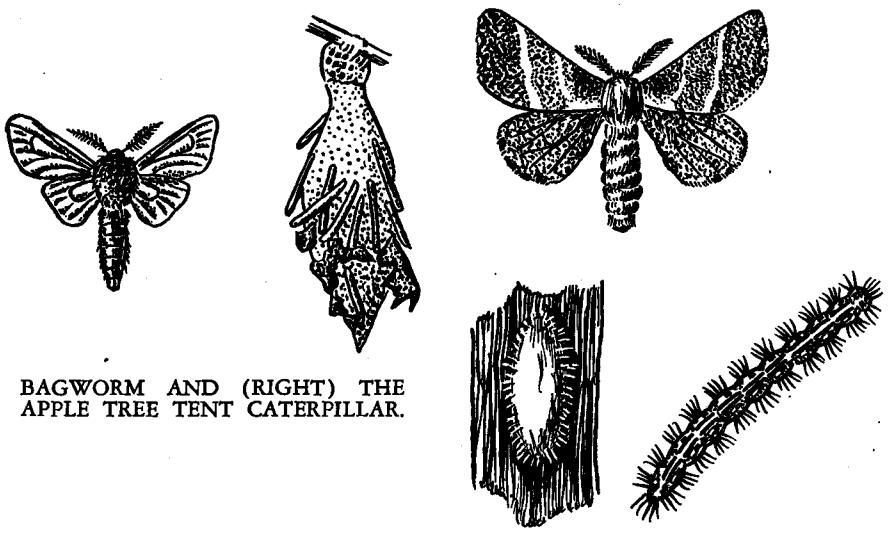
BLACK SWALLOWTAIL BUTTERFLY

| COMMON NAME<br>SCIENTIFIC NAME | POLYPHEMUS MOTH<br>*Telea polyphemus* | IO MOTH<br>*Automeris io* | LUNA MOTH<br>*Tropacea luna* | PROMETHEA MOTH<br>*Callosamia promethea* |
|---|---|---|---|---|
| DESCRIPTION | Wingspread: to 6 inches. Wings: at rest, held over the back, like butterflies. Male: fore wing; buff, olive or gray-brown, with transparent, yellow-bordered eyespot; hind wing: with dark border, and black eye-spot, deeply black-bordered. Female: much like male, but with heavier body, and with antennae, not broadly feathered. Nocturnal. | Wingspread: to 3 inches. Adult holds wings like sloping of a roof or thrown back. Male: with yellow fore wings. Hind wings: yellow, and brilliant red, with a great eyespot in center of each. Antennae: broadly feathered. Female: fore wings, dull purple to brown; antennae, not feathered. | Wingspread: to 5 inches. Fore wings: thrown back in repose. Males: beautiful, pale green moths, with small dark eyespots, on each wing; hind wings, with extraordinarily developed tails; antennae, broad. Females: with narrower antennae, and much heavier bodies, than their mates. Nocturnal. Rarely fly until near midnight. Found in May and June. | Wingspread: to 4 inches, with wings held erect over back. Male: diurnal, black, with clay-colored borders, and blue eyespots near tips of fore wings; antennae: nearly twice as wide as in the female. Female: nocturnal, light brown, with inner half of each wing darker; distinct eyespot near tip of fore wing and light dash on inner half of hind wing. |
| RANGE | Common throughout the United States and in northern Mexico wherever its food is available. | Common in North America east of the Rocky Mountains, and in northern Mexico. Seen as adults most commonly at night. The family includes 34 species. This is a common eastern species. | Common, but never abundant in the ordinary sense. In general, limited to the area where its food plants, mostly trees, may be found. | Common and widely distributed wherever its cosmopolitan food plants are to be found. |
| REPRODUCTION | Over 300, cream-colored, disc-like eggs with brown bands, usually on under leaf-surface, hatch in 10 to 12 days, into caterpillars that finally are green, with reddish heads, conspicuously segmented, with rose-red, or pale prickles, and silvery tubercles, and bright red spiracles, and 7, oblique, yellow lines on sides. Walking caterpillars may snap their jaws so hard as to be heard. Pupa: in thick, strong, light colored, oval cocoon, over winter. | Eggs: white, with a black spot, top-shaped, laid in cluster of 20 to 30, on leaves, hatch in about 10 days, into red-brown at first, then yellowish, then, bright green with red and white striped, social caterpillars, that draw together in masses when disturbed, or walk in processions. Pupae: in thin, irregular, brown cocoons, on the ground, over winter. | Female may lay as many as 200 pure white eggs, fastened with reddish cement to twigs and upper leaf-surfaces. These hatch in about 3 weeks into clear green caterpillars, with faint continuous lines over the back from the sides. Larva molts at end of 4, 7, 9, 10 days, and spins, 18 days later, a thin, leaf-covered cocoon for the wintering pupa. May be 2 generations a year. | Eggs: small, white, depressed, oval, fastened, with red cement, to under leaf surfaces, many in a cluster, that hatch in a few days. Larva: 1st, banded, yellow and black; mature, 2 inches long, smooth, clear, light green, with 6 rows of tubercles, with bluish circles around them and 1 yellow and 4 red tubercles. Caterpillars crawl in groups, and finally form pupae in silk cocoons, wrapped in leaves, fastened by silk to twig, for 3 weeks or over winter. |
| FOOD HABITS | Food: of adults, nothing; of caterpillars, leaves of such trees as oak, elm, birch, and maple. The cocoons are made of a continuous silk thread that is exceptionally strong and might be used as a substitute for silk from the regular silkworm. | Food: of larva, the leaves of corn, cherry, elm, apple, oak, willow and other plants. The caterpillars have clusters of prickly spines that secrete a stinging poison that is most unpleasant when it touches the skin. | Food: mostly leaves of birch, willow, hickory, walnut, oak and other broadleaf trees. When young, the caterpillars remain together in groups. The plain green color provides excellent protection from many enemies, but there are many parasites. | Food: of adults, nothing; of caterpillars, the leaves of cherry, sassafras, lilac, sycamore, tulip tree, ash and others. In the cocoons, the females are a bit the heavier. Swinging cocoon difficult for birds to destroy. |
| ECONOMIC IMPORTANCE | Native silkworms always interesting to amateur collectors. Silk has commercial possibilities. Gut "leaders" may be had from caterpillars by killing them in saturated solution of salt and vinegar and drawing silk glands out through solution. Each caterpillar produces two silk glands. Such leaders from cecropia may be 6 to 9 feet long, able to sustain a 4 pound pull. | Not usually abundant enough to be of any economic importance. The caterpillars are sometimes sufficiently abundant to annoy berry pickers who come in contact with them. | Of little economic importance but always popular with amateur collectors, largely because of their great beauty. During the day, the moths usually hang beneath leaves with wings folded, rarely observed by passers-by. | Of little economic importance. Gut for fishing lines may be had from the caterpillars, but they are relatively short from this species. |

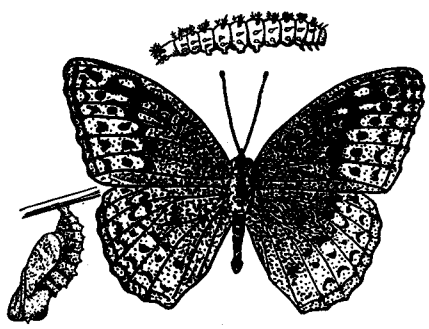
| CECROPIA MOTH<br>*Samia cecropia* | APPLE TREE TENT-CATERPILLAR<br>*Malacosoma americana* | TOMATO WORM SPHINX MOTH<br>*Phlegethontius quinquemaculata* | BLACK SWALLOWTAIL<br>*Papilio polyxenes* | TIGER SWALLOWTAIL<br>*Papilio glaucus turnus* |
|---|---|---|---|---|
| Wingspread: to 6½ inches. Wings usually held vertically. Male: somewhat like female promethea, but with large, light crescent on inner half of each wing; abdomen, red, banded with black. Female: larger than the male, with more narrowly feathered antennae, and with larger abdomen. Nocturnal. Mating takes place usually between 1 and 4 a.m. | Wingspread: of male, 1¼ inches; of female, 2 inches. Rather stout, with body reddish-brown; and fore wings, with 2, nearly parallel, oblique, whitish lines. Male: darker brown than the female. Bodies may have a banded appearance or be plain, but are abundantly covered with hairy scales. | Wingspread: 4¼ inches. Males: ash-gray, and streaked, with 5 pairs of yellow spots on the body, conical; wings, narrow and pointed; tongue, long; antennae, thick and rough. Females: antennae; thinner and smoother, as in hawk moths or hummingbird moths. | Wing-span: to 4 inches. Wings: held erect when at rest. Male: fore wings, black, with double border of yellow spots; hind wings, black with double row of yellow spots, with single row of blue ones between, orange beneath, and with ½ inch wing "tails." Female: like male, but with yellow spots smaller, the blue spots larger, and without extra spot in cell of the hind wing. | Wing-span: to 5 inches. Male: with fore wing, yellow, with a black border, with black dashes across the wings, with yellow at the base, and with broad black and blue border; hind wings, with ½ inch tails. Female: larger than the male, with broader, black stripes, and without the easily-seen claspers seen on the end of the male's abdomen. |
| Common wherever food plants are available from the Atlantic Coast to the Rockies. | Found commonly on apple, cherry and similar trees in the eastern states and Canada and west to the Rockies, with some records from California. In the northern part of the range, the adults appear late in June. | Found about deep-tubed flowers particularly in summer evenings. This species is common from Patagonia to Canada. There are about 100 species of sphinx moths found in the United States. | Common in all of the United States and in southern Canada, with special varieties from Quebec, to Cuba to Colombia. Relatively common in gardens and fields where the food plants are being raised from May to September in the North. | Common in most of the United States and in southern Canada but not on the West Coast. Found in a great variety of places but favors open sunny areas generally. |
| Eggs: to 400, egg-shaped, pink-white, fastened in rows of 3 to 20 on leaves of many plants, with red-brown cement, hatch in about 15 days. Larva: black, then red; molts at 4, 5, 6, 8 days, spins cocoon 10 days later. Mature larva: blue-green, with large yellow, red, and blue tubercles, and with blue on the sides; about 4 inches long, matures in 4 to 9 weeks. Pupates in large, tough, spindle-shaped, white, then reddish cocoon, fastened to twigs. | In summer, or fall, female lays tapering ended cylindrical bands of varnished eggs on twigs. Eggs: about 1/25 inch long, 200 in a mass, hatch with opening of the leaves. Larvae begin feeding and making tent nest of silk. Larvae are about 2 inches long, black, with a *continuous* white stripe down the back, and blue and white on the sides. Larva about 6 weeks. Pupa: in 1-inch, silk cocoon, for about 3 weeks. | Eggs: large, green, spherical, shining, laid singly, on leaves of food plants, hatch after a short period, into larvae that are green, and become about 3 inches long, stout, with a row of 7, shaded, slanting stripes on each side, with an equal number of horizontal stripes making a V, and a good-sized, rear horn. Larva: to 4 weeks. Pupa: in ground, over winter. | Winters in pupal stage. Adults emerge in May, mate, and lay smooth, round, plain, yellow-brown eggs, singly, on under side of food leaves. These hatch in 5 to 10 days and develop into caterpillars that are green, ringed with black, spotted with yellow, smooth, and when mature, nearly 2 inches long, spined, and with a white saddle. Pupa: cradle-like, for 9 days, or over winter, erect on plants or boards, free swinging. | Winters in pupal stage. Adults emerge from May to September, mate and lay smooth, green, spherical eggs on the upper surfaces of the food leaves, laid singly and hatch in about 10 days. Larva: green, with 2 large eye spots at the front end, and a yellow stripe behind. Ugly looking, and vicious acting, because of 2 smooth "horns" and because of the eye spots. Two inches long. |
| Food: of adults, nothing; of larvae, leaves of box elder, apple, cherry, willow, plum and about 50 different kinds of trees, so the caterpillars can usually be reared easily with most tree leaves used as food. | Food: of larva, mostly apple and cherry but may also attack peach, pear, plum, oak, witch hazel, birch, barberry, willow and poplar. The tents provide shelter during larval stage. In rainy seasons, they do not do well. There are many parasitic enemies, and abundance varies through the years. | Food: of larva, leaves of tomato, potato, tobacco, and similar plants; of adults, the nectar in flowers. Possibly two generations a year. Pupa: like brown jugs, with long "handles" that contain the tongues, movable. Harmful to man personally, at no stages, the horns of the larvae not being poisonous as rumored. | Food: of larva, the leaves of carrots, parsnips, caraway and the like. The larva has an offensive odor and a perfect concealing pattern that provides good protection. | Food: of larva, the leaves of birch, poplar, ash and cherry. Pupal stage lasts from 2 weeks to over winter. It hangs erect, on twigs, usually away from the host plant, is wood-brown, cradle-like in a thread loop, 1¼ inches long, and straighter than in the black swallowtail. |
| Adults popular with amateur collectors and the larvae the producers of the longest and best of gut leaders of our native species. | Control by destroying nests, spraying leaves with arsenate of lead, burning caterpillars and cocoons, encouraging natural enemies. One school of thought contends that wild cherries should be preserved as a favored food tree; others contend that these should be destroyed. Egg collecting contests popular but of doubtful value. | Sometimes seriously destructive to the host plants. Best control is by hand picking or by use of lead arsenate spray, 2 pounds of paste, to 50 gallons of water. Adults assist in the pollination of some deep-tubed flowers. | Larvae may be injurious to some crops, but are easily controlled by hand picking, since they are rarely abundant. The adults are a pleasure to see. Caterpillars are harmless in spite of their rather startling appearance. | This species is of little if any economic importance but the adults are things of beauty admired by all who care for butterflies at any time. |

| COMMON NAME<br><br>SCIENTIFIC NAME | CABBAGE BUTTERFLY<br><br>*Pieris rapae* | ROADSIDE BUTTERFLY CLOUDED SULPHUR<br><br>*Eurymus philodice* | GREAT SPANGLED FRITILLARY<br><br>*Argynnis cybele* | MEADOW OR MARSH FRITILLARY<br><br>*Brenthis bellona* |
|---|---|---|---|---|
| **DESCRIPTION** | Wing-span: to 2 inches. Male: with fore wing, white above, yellowish beneath, black-tipped, with one black spot that is sometimes absent in the spring; hind wing, white above, and yellowish beneath. Female: fore wing like that of male, but with 2 black spots that may be smaller in the spring; hind wing, like that of male. Wings folded or open when at rest. | Wing-span to 2½ inches. Male: with fore wings, yellow above, and with a narrow black border. Females: with wings broader, sometimes by an inch, and usually containing yellow spots. There are two kinds of females, one being yellow and the other being almost white. Also known as clouded sulphur butterfly. | Wing-span: to 4 inches. Male: fore wing, cinnamon, with numerous, black markings, with round silver spots beneath: hind wing, with broad yellow stripe, and brown hair-fringe above. Female: like male, except that half of the wings next the body on the upper side is dark, while in the male it is only slightly so. | Wing-span: to 1.8 inches. Female: larger than the male and darker. Cinnamon brown, with numerous black markings. No silver markings beneath, such as are to be found on the great spangled fritillary, and on the small silver-bordered fritillary, *B. myrina.* |
| **RANGE** | Very common and cosmopolitan but limited essentially to temperate zone. Found mostly about gardens, flowerbeds, and in fields where its food crops are being grown. Three groups of family are recognized: the whites, the yellows and the orange-tips, of which there are a dozen whites in North America. | Common, along roadsides, in flocks, about muddy spots, often closely crowded together. Cosmopolitan, from St. Lawrence River, south to South Carolina, and west to Rocky Mountains. Closely-related orange sulphur butterfly, *E. eurytheme,* is found west to Pacific, in Southwest, and east to Maine. | Common about fields in late summer particularly where weeds are likely to be tall. Name fritillary refers to dice-like spots on wings. Two commonest species are great spangled, and variegated fritillaries. Former ranges through eastern United States west to Great Plains. | Common, in wet fields, in the fall, ranging throughout Canada and the northern states, west to the Rocky Mountains, and south into the Carolinas. There are 16 species in the genus in North America, two of which are arctic and limited to higher mountains. *B. montinus* of White Mountains, N. H., is one of these. |
| **REPRODUCTION** | Winters as pupa or sometimes as adult. In North, 3 generations a year. Eggs: yellow, flask-shaped, with 12 vertical ribs, laid singly, on under surfaces of food leaves, hatch in 1 week. Larva: green, with fine hairs and with yellowish backband, 4/5 inch long, maturing in 2 to 3 weeks then forming the pupa that lasts from 10 days to over winter. Pupa: green, slender, 4/5 inch long, angular. | Eggs: pale yellow, changing to crimson, slender, laid singly on clover and other legumes, hatch in 4 to 5 days, and develop slender, green caterpillars, without longitudinal stripes, over an inch long, with heads lighter than the body, covered with fine hairs. Winters: in various stages. Pupates: for as short as 10 days. Pupa: pale green, straight, pointed, not angular, ¾ inch long, with narrow, yellow stripe. | Eggs: short, cone-like, higher than broad, ribbed, honey yellow, laid singly, or dropped in flight, hatch in about 15 days. Larva: at first, rough, warty, greenish brown; winters as young caterpillar, then matures following spring, becoming black, 1 1/3 inches long, with spines in belts, branching. Pupa: hangs for 14 to 24 days. | Generations a year: 1 to 3. Eggs: tall, dull olive, prominently ribbed, laid singly, on food plant, hatch in 5 to 9 days. Larva: olive-brown, with green markings, apparently spiny with spines in a belt arrangement, nearly 1 inch long; winters as half-grown caterpillar. Pupa: about 1 week. |
| **FOOD HABITS** | Food: primarily cabbage, and closely-related plants in mustard family. In South, may have 6 generations a year, and appear in great numbers. Caterpillars eat through leaves, into heads of cabbage and generally make trouble to gardener. Introduced into America in 1866. Makes chickens that eat it sick. | Food: the larvae feed on clovers and other legumes. The orange sulphur butterfly or alfalfa caterpillar is frequently a pest in alfalfa, particularly in the West. | Food: larvae eat the leaves of violets at night, spending the day in hiding. The adults eat nectar from flowers. Pupa: about 1 inch long, roughened, brown, coarsely wrinkled, and inconspicuous. Eggs may be laid on food plants or elsewhere. | Food: leaves of violet, eaten at night. The adult feeds on nectar and, in the East, seems to favor asters. Pupa: bluish-gray, with dark spots and with 2 rows of small cones on the back. Adults: gay little butterflies, are common near the centers of human population. |
| **ECONOMIC IMPORTANCE** | Control is commonly by hand picking and by spraying the leaves with Paris green using 1 pound to 50 gallons of water. Sometimes soap is added to make the spray stick to the smooth leaves of the cabbage. Plants so treated of course should be washed thoroughly before being used as food. | Not usually enough of a pest to need control. The adults are always interesting, and, to some, they provide suggestions for compass direction. This hardly seems dependable and may be in the class with the ability of daddy-long-legs to locate the cows. | Since the food of the larvae is wild violets that are not considered to be of economic importance these butterflies are not classed as pests. They are always beautiful to watch as adults. | Of little or no economic importance apparently since the food plants are mostly wild violets that have little economic importance. |

| MOURNING-CLOAK BUTTERFLY<br>*Aglais antiopa* | RED-SPOTTED PURPLE BUTTERFLY<br>*Basilarchia astyanax* | WHITE ADMIRAL BANDED PURPLE<br>*Basilarchia arthemis* | VICEROY BUTTERFLY<br>*Basilarchia archippus* | MONARCH BUTTERFLY MILKWEED BUTTERFLY<br>*Anosia plexippus* |
|---|---|---|---|---|
| Wing-span: to 3½ inches. Male: fore wing, maroon, with broad, straw-yellow border, blue spots on upper surface, and almost black beneath; hind wing: like fore wing and with suggested "tails." Female: similar to male. There is a rare variety in which the straw-colored border reaches mid wing. | Wing-span: to 3¼ inches. Male: fore wing, black, with border of blue dashes, and rusty spots beneath; hind wing, like fore wing except that the outer half is washed with green or blue. Both sexes show red spots on the under sides of the wings, the general color there being brown. | Wing-span: to 2¾ inches. Highly variable. Wings: in general, dark, with a broad, white band crossing them from front to rear. This band may become narrow or even lacking in some individuals. Hind wing: may bear red and blue, oblong or crescent spots against a black background, towards the outer edge. | Wing-span: to 3½ inches. Male: fore wing, orange brown, with white-spotted, black border, and conspicuously black veins; hind wings, like fore wings, but with extra, black, cross band about as wide as veins. Female: like male, but larger. Viceroy resembles monarch except that it is smaller, has extra band on hind wings and lacks male's scent gland. | Wing-span: to 5 inches. Upper surfaces of wings: light, reddish brown, with black veins and borders, and with two rows of white spots on the outer borders. At rest, the wings are held above the back with the hind wings covering most of the fore wings. In the male, one vein in each hind wing is swollen as shown. It is a scent gland. |
| Common through year, being seen often in winter and not infrequently coming into houses. Most common near woodlands from June to August, ranging from southeastern Canada through middle states, where there are 2 broods a year. May be found between Arctic Circle and 30° N. Lat. | Common all over the United States and Canada west to the Rockies but more uncommon in the Gulf States area and commonest in June to August. It occurs in the highlands of Mexico. The close relatives include the banded purple, the white admiral, and the viceroy. | Common from Ontario and Quebec through New England to Pennsylvania, and in the higher mountains further south; not recorded in the West, but is replaced there by a similarly marked *B. weidemeyeri,* which is found east to western Nebraska. Closely-related to red-spotted purple. | Common, particularly in open fields during August and September, from Canada to the Gulf. It is a close relative of the red-spotted purple and the white admiral butterflies. | Common in most of the United States, in fields and along roadsides, sometimes migrating in great flocks that may settle on a single tree weighting it down. The family includes subfamilies of most of our more attractive butterflies. This species is in the subfamily Danaidae. |
| Eggs: dark brown, or black, barrel-shaped, laid in rings around twigs, hatch in 9 to 16 days. Larva: head, angled; with head and body, black; body, spined and white-spotted, with red on the middle of the back; prolegs, reddish; 2 inches long; group of larvae stays together. Pupa: on twigs, 8 to 16 days, dark brown, with red-tipped swellings, often with whitish bloom, over 1 inch long. | Eggs: globular, yellow green, to dark brown, many, laid singly, on the leaves of food plants, hatch in 7 to 9 days. Larva: body, naked, humped, irregular, streaked, with a pair of rough, black, clubbed horns, with many, minute, wart-like structures over back, resembles bird dropping; 1½ inches long; winters as small caterpillar, hung on tree, 10 to 12 days. | Eggs: grayish green, with "kite-shaped" cells, laid on the food plants. Larva: greenish, to olive brown, blotched with white when mature, the white sometimes appearing as a saddle, coarsely humped, and with two prominent, but short horns near the forward end. Pupa: hangs in a tree a few days. | Eggs: deep green, globular, pitted, laid singly, on the upper or under leaf surfaces of the food plants, hatch in 4 to 8 days. Larva: resembles bird dropping, irregular, warty, with a pair of long, clubbed, prickled tubercles near the front, black, over 1 inch long, may winter as a caterpillar. Pupa: hung on a tree, for from 7 to 10 days. | Eggs: green cones, with lines of pits laid singly on milkweed leaves, hatch in 4 days or less. Larva: green with black and yellow cross marks, and a pair of slender movable "horns" at each end. Molts: 4 in about 10 days. Pupa: pale green, spotted with black and gold, free-hanging by a thread, about 12 days. |
| Food: of larvae, leaves of elm, poplar, willow, hackberry and similar trees; of adults, nectar. The mourning cloak is one of the tortoise-shell butterflies in which the adults hibernate, and are restricted to the north temperate zones, except for the colder mountains of the sub-tropics. | Food: of larva, leaves of plum, apple, pear and gooseberry, but rarely, if ever, sufficiently abundant to be considered as a pest. Pupa: queerly colored, yellow, brown, olive and salmon, is glossy, and nearly an inch long. | Food: of adult, nectar; of larva, the leaves of willows, apple, plum and thornapple. This butterfly undoubtedly comes from the same stock that the red-spotted purple does, and in territory where this northern species meets that southern species individuals may be found having the characters of each. | Food: of larva, the leaves of willows, poplars and aspens; of the adult, nectar. The pupa resembles that of the red-spotted purple, being queerly colored yellow, brown, olive and salmon, glossy and hung on a tree. | Food: of larvae, the leaves of milkweed. The larvae and adults are reputed to be distasteful to birds. Big fall migrations to the South are obvious. Northern migration may be merely the moving of individuals into new territory. May be 3 weeks from egg to adult. |
| Sometimes considered pests but only rarely so. May be controlled where abundant by picking off the egg masses on twigs of the food plants. | Control not necessary because of relatively small numbers at any one time. Adults: so attractive that they are prized by amateur collectors. | Of little economic importance but of considerable importance to naturalists who are interested in interrelationships of species and the relation between range and the persistence of given characters. | Of little or no economic importance. Interesting because of mimicry of the monarch butterfly that is reputed to be avoided by its enemies because of unpleasant scent that is lacking in the viceroy. The viceroy apparently enjoys the immunity found in the monarch. | Since the food plant is the milkweed that is not normally considered of economic importance this butterfly can hardly be considered as harmful to man's interests. Its migration habits are not completely understood but its beauty as a pupa and adult are thoroughly appreciated. |



BAGWORM AND (RIGHT) THE APPLE TREE TENT CATERPILLAR.



LARVAL, PUPAL AND ADULT STAGES OF THE GREAT SPANGLED FRITILLARY.

lifetime. Frequently these "jugs" of tomato worms are dug up, and, since they retain some ability to move, they often startle their finders by suddenly moving without warning.

Probably one of the most startling methods of getting protection during the pupal period is employed by the promethea moths. These seek, of all places, the exposed end of a fine twig. There, in view of everything that might be considered an enemy, they calmly wrap themselves in a leaf effectively reenforced by silk and firmly bound at one end to the twig. When winter comes they still swing gaily in the breeze where anyone can see them.

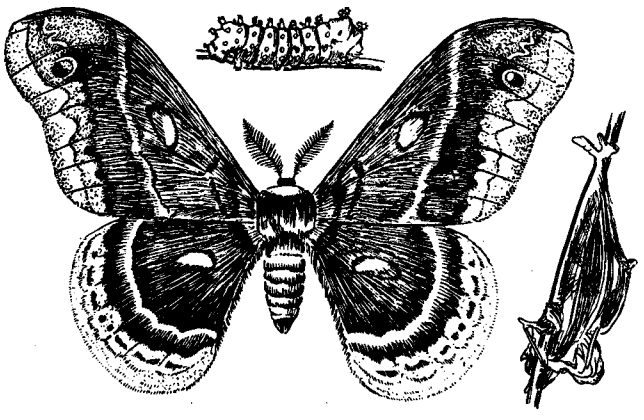
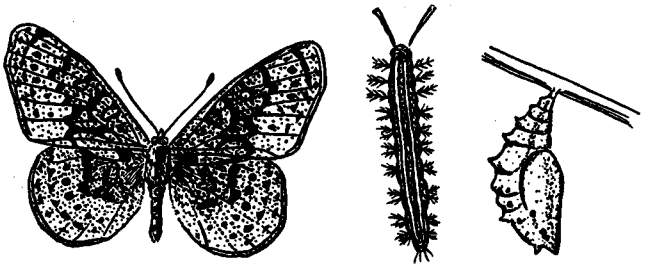
*The Adult.* For the most part, adult moths and butterflies are masterpieces of Nature in point of beauty. Even the nondescript "millers" are beautiful in themselves, or match the environment where they rest in intricate detail.

Of course the prime function of the adult is to meet a member of the opposite sex, mate and produce fertile eggs. There have been those who claim that the beauty of the insects is associated with success in this usually highly-competitive field. Unfortunately for this notion, Frank Lutz and others have shown us that what we see in these insects is not seen by others of their kind, and the part of the spectrum that discloses one pattern to us is useless to insects. There is as good, or better, evidence to indicate that scent is the factor that brings two loving lepidoptera together.

With some moths and butterflies, there are conspicuous sex differences. Frequently, at least in the large silk moths, the antennae of the males are larger than those of the females. The color pattern, or the relative size of scent glands, or the size of the abdomen, or other variations may be used to distinguish the sexes of some species. One intriguing difference is found in the promethea moth where the two sexes look radically different and behave differently. The female is a night-flier, like most of its relatives, but the males fly by night or day, as anyone may have discovered who kept some female prometheas captive in a screened box or window.

There is no month in the year when some adult moth or butterfly may not be found active outdoors, even in the northern states. A dark mourning cloak butterfly fluttering about a snow-covered woods in the dead of winter is a sight to be remembered.

We have said—and can say—nothing here about the destructive qualities of many moths and butterflies. Army worms, gypsy moths, brown-tail moths, clothes moths, tent caterpillars, cutworms, codlin moths are only a few of the hosts of these creatures whose food or other tastes are similar to ours, and which, because of this, compete with us for certain plants for which we have a use. Often, the fight is a knock-down, drag-out affair. Neither have we said anything of the hosts of parasites that attack moths and butterflies at almost any stage of their existence, or of the birds and mammals that feed on them to our benefit. Last, but not least, we have said little about the appeal of the lepidoptera to the naturalist who loves them for their beauty. One of the problems in writing these inserts is that it is hard to stop. With that, we will end the problem in this case, and tackle some others equally disturbing.



CECROPIA MOTH (LEFT) AND THE MEADOW OR MARSH FRITILLARY