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UNITED STATES NATIONAL



no. 12

TABULAR VIEW AND KEY

OF THE

MORE COMMON FAMILIES

OF

INSECTS,

WITH CHECK TABLETS.

PREPARED BY

L. C. WOOSTER,

PROFESSOR OF NATURAL SCIENCES, STATE NORMAL SCHOOL.

WHITEWATER, WISCONSIN.



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WHITEWATER, WISCONSIN.



WHITEWATER, WIS.  
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## Table of Contents.

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Prefatory note and suggestions.

Tabular outline.

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## Prefatory Note and Suggestions.

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Feeling the lack of a work with which the subject of Entomology may be presented by a teacher to his pupils, so that their powers of observation may be educated by a study of insects, both in the field and in the laboratory, the material of the following pages has been selected, for the most part, from Packard's Guide to the Study of Insects, Harris's Insects Injurious to Vegetation, and Kellerman's Outline of Guide to Entomology, and arranged in the form of a Tabular View and Check Tablets so as to present, in as small space as possible, all the essential characters of the Class, Orders, Sub-orders, and Families of Insects, to serve as a Key to the same, and to furnish the pupil with all the terms necessary to a full description of a specimen before him. It is believed that acquiring the name of the species is far less important than gaining the ability to see, describe, name, and give the several parts of the insect: and hence it is suggested that no attempt be made to learn other than the names of the order, sub-order, and family of each specimen, and these only "incidentally." But in the check tablets the name of the genus and species, as well as family, should be written if possible:—*Muscidae, Musca domestica*, Linn., House-fly.

The descriptions may be checked off by placing a cross (X) opposite each descriptive term, in the first column for the first insect, second for second, and so on. To indicate *less, nearly* or "*Sub,*" the line from right to left (∕) may be used, and to indicate *still less*, the line from left to right (X). To indicate *prominently* or *strongly*, a double cross may be used, or *less strongly*, one line only should be doubled. In noting the color of a specimen use B for black, Br for brown, Bl for blue, Db for drab, Dk for dark, G for green, Gy for gray, L for light, O for orange, R for red, T for tawny, W for white and Y for yellow, etc. The abbreviation or cross written below a bar denotes that the character is possessed on under side, and the abbreviation or cross above the bar denotes that the character is possessed on the upper side of the insect.

The habit of the insect during flight and when at rest should be carefully observed and noted. The food, place of laying eggs, and position and kind of nest (if any) should likewise receive careful attention. The larger and more common insects should be studied first, as they present all the parts of the body in better size, and are more readily classified.

Perhaps a knowledge of the terms used in the check tablets may be gained most readily by classifying a number of specimens so far as possible by using the tabular view, and then finding the genus and species in reference books like the first and second mentioned above. Each species should then be numbered, and each member of the class required to write its description in the proper tablet. The descriptions may then be compared and corrected in class or otherwise as may be desired.

L. C. W.

Whitewater, Aug. 1879.

## Tabular Outline.

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		<i>Sub-Kingdoms.</i>	
KINGDOMS of NATURE.	{	Animal.	{ Vertebrata.—Internal jointed skeleton.—Fish, Dog, etc. { Articulata.—External jointed skeleton, Centipede, Ant, etc. { Mollusca.—Soft-bodied animals, usually protected by a shell.—Clam, Nautilus, etc. { Radiata.—Parts of body radiate from an axis.—Star-fish, Sea-urchin, etc. { Protozoa.—Minute animals, aquatic or sometimes parasitic.—Rhizopod, Sponge, etc.
		Vegetal.	
		Mineral.	

		<i>Classes.</i>	
ARTICULATA.	{	Insecta.—Breathe by means of tubes, which permeate the body.—Spiders, Moths, etc.	
		Crustacea.—Breathe by means of gills.—Crawfish, Crab, etc.	
		Vermes.—Do not breathe by means of gills or trachea.—Earthworm, etc.	

		<i>Orders.</i>	<i>Sub Orders.</i>	
INSECTA.	{	Hexapoda.	{ Mandibulata. { Coleoptera.—Beetles. { Orthoptera.—Locusts, Crickets, etc. { Hymenoptera.—Bees, Ants, etc. { Neuroptera.—Dragon-flies, May-flies, etc.	
			Arachnida.	{ Lepidoptera.—Butterflies, Moths, etc. { Heteroptera.—Bugs.
				{ Homoptera.—Tree-hoppers, etc. { Diptera.—Flies, etc.
		Myriapoda.		



# Entomology.

is the science which treats of the anatomy or structure, development, transformations, classification, and habits of insects.

## CLASS INSECTA (Insects.)

1. Hard parts external, being rings or segments, joined or articulated together. 2. Jaws move laterally, or from side to side, and not up and down as in the dog. 3. The long tubular alimentary canal occupies the center of the body. 4. Above the alimentary canal is the heart or dorsal vessel, which sends the yellow or colorless blood to the head, whence it courses throughout the whole body, returning again through valves to the dorsal vessel. 5. Below the alimentary canal or on the ventral side is the nervous system; two longitudinal cords, each with a knot corresponding to each segment. 6. Respiration is carried on by means of a system of tubes called Tracheae, ramifying throughout the whole body, and opening through the sides by pores called Spiracles.

<i>Order I.</i> —1. Segments grouped into three distinct regions.—Head, Thorax and Abdomen. 2. Eyes compound and simple. 3. Two pairs of wings (diptera one). 4. Three pairs of thoracic legs. 5. One pair of jointed abdominal appendages. 6. A more or less complete metamorphosis,—Egg, Larva, Pupa, Imago.	}	5 HEXAPODA. (Six-footed Insects.)
<i>Order II.</i> —1. Segments grouped into two regions, a false cephalothorax and an abdomen. 2. No antennae. 3. Without wings. 4. Eyes simple. 5. Four pairs of thoracic legs. 6. Three pairs of jointed abdominal appendages (Spinnerets) often present. 7. No metamorphosis.	}	3 ARACHNIDA. (Spiders.)
<i>Order III.</i> —1. Body cylindrical, worm-like. 2. Segments not grouped into regions. 3. Head free. 4. Eyes single. 5. Antennae present. 6. Wingless. 7. Numerous abdominal legs. 8. Yolk-sack present for a short period after hatching. 9. No metamorphosis.	}	4 MYRIPODA. (Many-footed Insects.)

## ORDER I—HEXACTERA

<i>Metabola.</i> —1. <i>Metamorphosis complete.</i> 2. Body usually cylindrical. 3. Prothorax small. 4. Mouth-parts more generally haustellate—formed for sucking (Hymenoptera, mandibulate). 5. Pupa inactive. 6. Larva usually cylindrical, very unlike the adult.	}	5 HYMENOPTERA, LEPIDOPTERA, DIPTERA
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*Heterometabola*.—1. *Metamorphosis in a large number incomplete*.  
2. Body usually flattened. 3. Prothorax large and squarish. 4. Mouth-parts usually adapted for biting (Heteroptera and Homoptera, haustellate). 5. Pupa often inactive. 6. Larva flattened, often resembling the adult.

6  
COLEOPTERA,  
HOMOPTERA,  
HETEROPTERA,  
ORTHOPTERA,  
NEUROPTERA.

## SUB-ORDERS.

*Sub-order I*.—1. Provided with jaws for biting. 2. Ligula (for lapping nectar) greatly developed. 3. Four wings with few and irregular veins. 4. Hinder pair smaller. 5. Female with piercer or sting. 6. Head large with large compound eyes and three ocelli. 7. Transformation complete. 8. Larva maggot-like (mostly) and very unlike the adult. 9. Pupa with legs and wings unconfined.

7  
HYMENOPTERA.  
(Membrane-winged Insects.)  
15—20

*Sub-order II*.—1. Mouth with spiral sucking tube. 2. Head small with large clypeus. 3. Wings four, covered with scales. 4. Transformation complete. 5. Larvae are caterpillars.—worm-like, with six true legs, and four to ten fleshy prop legs. 6. Pupa with wing cases and legs indistinct, and soldered to the breast.

8  
LEPIDOPTERA.  
(Scale-winged Insects.)  
30—58.

*Sub-order III*.—1. Horny or fleshy proboscis. 2. Two wings. 3. Two knobbed threads ("balancers" or "poisers") behind. 4. Transformation complete. 5. Larvae are maggots.

9  
DIPTERA.  
(Two-winged Insects.)  
50—60

*Sub-order IV*.—1. Jaws. 2. Two thick wing covers, called elytra. 3. Elytra meet in a straight line on the top of the back. 4. Two filmy wings folded transversely. 5. Transformation complete. 6. Larvae are called grubs. 7. Pupa with wings and legs distinct and unconfined.

10  
COLEOPTERA.  
(Sheath-winged Insects.)  
70—80

*Sub-order V*.—1. Head triangular and small, with horny beak for suction. 2. Face either vertical or sloping obliquely under the body so that the beak lies at rest close to the breast. 3. Fore pair of wings are generally transparent and usually net-veined, lying with the hinder pair, which are considerably smaller, roof-like upon the body. 4. The wings do not cross each other. 5. The three segments of thorax united in a mass, and prothorax generally shorter than mesothorax. 6. Transformation partial. 7. Larva and pupa nearly like the adult, but wanting wings. 8. Species terrestrial, feed on vegetable juices, and are usually small.

11  
HOMOPTERA.  
(Uniform-winged Insects.)  
90—95

*Sub-order VI*.—1. Head triangular, flattened, and small, with horny beak for suction; head held horizontally. 2. Four wings. 3. Uppermost wings thick at the base and thinner at the extremities; lie flat and cross each other on top of the back. 4. Prothorax largest segment of thorax. 5. Transformation partial. 6. Larva and pupa like the adult, but wanting wings. 7. Species in part aquatic, and many are of large size. 8. Some feed upon animal, others on vegetable juices.

12  
HETEROPTERA.  
(Non-uniform-winged Insects.)  
96—103

<i>Sub-order VII.</i> —1. Jaws. 2. Two rather thick and opaque upper wings, overlapping a little on the back. 3. Two thin wings, larger, and folded in plaits like a fan. 4. Transformation not complete. 5. Larva and pupa active and resembling the imago. 6. Species terrestrial, hind limbs large and adapted for leaping.	} 13 ORTHOP- TERA. (Straight- winged In- sects.) 104-116
<i>Sub-order VIII.</i> —1. Jaws. 2. Four netted, membranous wings. 3. Hinder pair slightly larger (or sometimes smaller or obsolete. 4. Body elongated. 5. No piercer or sting. 6. Transformation complete or partial. 7. Pupae (accordingly) inactive or active: when inactive it resides in a cocoon. 8. Larvae of various forms. 9. Most species aquatic.	} 14 NEUROPT- TERA. (Nerve- winged In- sects.) 111-121

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SUB-ORDER I.—HYMENOPTERA.

*Stingers; larvae without legs.*

<i>Family a.</i> —1. Antennae of males mostly thirteen jointed, of females twelve jointed. 2. In higher genera, mouth parts elongated. 3. Labial palpi, four jointed. 4. Maxillary palpi, one to six jointed. 5. Hind tibia and basal joint of tarsi in pollen-gathering species, very broad; in parasitic species usually narrow. 6. Body usually densely hirsute. 7. See <i>b</i> .	} 15 APIARIE. (Bees.)
<i>Family b.</i> —1. Body more attenuated, more cylindrical, and with harder and smoother tegument than in <i>a</i> . 2. Antennae eibowed. 3. Mandibles large and stout. 4. Maxillary palpi six jointed. 5. Labial palpi four jointed. 6. Paraglossae well developed. 7. Wings long and narrow and folded at once longitudinally when at rest. 8. Hind shanks and tibiae smooth. 9. Larvae with larger heads in proportion to rest of body than in <i>a</i> .	} 16 VESPA- RIAE. (Wasps.)
<i>Family c.</i> —1. Head very large, cuboidal. 2. Clypeus very short and covered for the most part with a dense silvery or golden pile. 3. Antennae geniculate, being received, when at rest, in a deep, frontal, vertical groove. 4. Mandibles large and of even width. 5. Ligula short. 6. Thorax sub-spherical. 7. Abdomen short and stout or more or less pediculate. 8. Fore feet in females fossorial. 9. Larvae short and thick,—spin either a slight cocoon or a dense, brown, oval, cylindrical case.	} 17 CRABRON- IDAE. (Hornets.)
<i>Family d.</i> —1. Head transversely longer and less cubical than in <i>c</i> . 2. Clypeus long and narrow. 3. Eyes long and narrow. 4. Antennae more clavate than in <i>c</i> . 5. Wings long and narrow. 6. Abdomen obconic when sessile, clavate when pediculate.	} 18 NYSSON- IDAE.
<i>Family e.</i> —1. Heads large. 2. Labrum very large and long; triangular, like a beak. 3. Body flattened. 4. Species very active and fly rapidly with a loud hum. 5. Female burrows in sand, burying various species of diptera.	} 19 BEMBE- CIDAE. (Hummers.)

<i>Family g.</i> —1. Posterior margin of prothorax not produced backwards to insertion of wings; anteriorly produced into a neck. 2. Mandibles large, curved, narrow, and acute.—base not toothed externally. 3. Antennae long and filiform. 4. Abdomen petiolated. 5. Legs very fossorial, long, and spiny,—posterior of unusual length. 6. Often gaily colored, being ornamented with black and red, brown and red, or are entirely black or blue.	20	SPHIN- IDAE. (Mud- wasps.)
<i>Family g.</i> —1. Antennae long, not geniculate: in males stouter with shorter joints than in females. 2. Head shorter when seen from above, being more transversely ovate than in <i>f.</i> 3. Eyes narrow oval. 4. Prothorax extended back to wings. 5. Wings large and broad. 6. Body oblong. 7. Legs long and slender with thick slender spines. 8. Maxillary palpi six, and labial palpi four-jointed.	21	POMPH- IDAE.
<i>Family h.</i> —1. Head with broad front. 2. Eyes small, indented. 3. Antennae of male long and slowly thickened toward the tip,—of female short, thick, and elbowed on second joint. 4. Clypeus large, irregularly quadrilateral. 5. Prothorax very square in front. 6. Body and legs very hirsute. 7. Labrum small. 8. Mandibles, in females especially, large and broad.	22	SCOLI- IDAE.
<i>Family i.</i> —1. Males and females winged, workers wingless. 2. Males smaller than females, and workers smaller than males. 3. Fossorial. 4. Head in general triangular. 5. Eyes large in males, smaller in workers. 6. Antennae long, slender and elbowed. 7. Mandibles stout and toothed. 8. Maxillary palpi one to six jointed. 9. Labial palpi two to four jointed. 10. The longer, more slender workers consist of two forms: one with large cubical head, worker major, and the smaller headed form, worker minor. 11. Larva short, cylindrical, with the end of body obtuse.	23	FORMICA- RIAE. (Ants.)
<i>Pierrers; larvae both with and without legs.</i>		
<i>Family j.</i> —1. The thirteen jointed antennae, elbowed. 2. Eyes oval and ocelli distinct. 3. Maxillary palpi five-jointed. 4. Labial palpi three-jointed. 5. The nearly sessile oblong abdomen has but three to five rings visible, the remaining ones forming a long, large, jointed, sting-like ovipositor, drawn in and out like a telescope. 6. Green or black. 7. Fly and run briskly in hot sunshine.	24	CHRYSID- IDAE. (Cuckoo flies.)
<i>Family k.</i> —1. Head rather square. 2. Antennae long, slender, many jointed, and not usually elbowed. 3. Body usually long and slender. 4. Abdomen inserted over hind pair of trochanters, and usually consists of seven visible segments. 5. Ovipositor long, exerted, usually protected by a sheath formed of four stylets of same length. 6. Larva a soft, fleshy, cylindrical, footless grub.	25	ICHNEU- MONIDAE. (Ichne- mons.)

<i>Family l.</i> —1. Species of small size, often of shiny colors, being either bronzen or metallic. 2. Elbowed antennae with from six to fourteen joints. 3. Wings often deficient in veins. 4. Abdomen usually seven jointed in male and six jointed in female.	26 CHALCID- IDAE. (Bronzen- flies.)
<i>Family m.</i> —1. Ovipositor slender, long, and partially coiled, arising from near the base of the abdomen. 2. Abdomen with second, or second and third segments greatly developed. 3. Straight antennae thirteen to sixteen jointed. 4. Plant parasites.	27 CYNIP- IDAE. (Gall-flies.)
<i>Family n.</i> —1. Head broad. 2. Thorax wide. 3. Abdomen sessile. 4. Wings large in proportion to body. 5. Quite net-veined. 6. Ovipositor or "saw" consists of two lamellae,—the lower edge of one is toothed and fits into a groove in the under side of upper one which is toothed above and both protected by sheath-like stylets.	28 TENTHRE- DINIDAE. (Saw-flies.)
<i>Family o.</i> —1. Abdomen of male with a long prominent horn,—of female with the ovipositor or "saw" attached to the middle of abdomen and extending far beyond its tip. 2. Large with large head and long cylindrical body. 3. Antennae long and filiform. 4. Larva a cylindrical fleshy grub, whitish, small rounded horny head, and pointed horny tail: feeds on pines and firs.	29 UROCER- IDAE. (Horn-tails.)

SUB-ORDER II.—LEPIDOPTERA.

<b>SECTION A.</b> —1. Antennae thread-like and knobbed at the ends. 2. Fore wings of some, and all the wings in greater number, elevated perpendicularly and turned back to back when at rest. 3. Hind legs generally with two little spurs. 4. Fly by day only. 5. Caterpillars have sixteen legs:—two jointed, tapering, and scaly to each of the three segments behind the head, and two fleshy legs without joints to each of the remaining segments, except the fourth, fifth, tenth, and eleventh.	30 PAPIL- LIONES. (Butterflies.) 33-34
<b>SECTION B.</b> —1. Antennae generally thickened in the middle, tapering at each end, and most often hooked at the tip. 2. Wings narrow in proportion to their length, and confined together by a bristle or bunch of stiff hairs on the shoulder of each hind wing, which is retained by a corresponding hook on the under side of each fore wing. 3. All the wings when at rest more or less inclined like a roof, the upper covering the lower. 4. Hind legs with two pairs of spurs. 5. A few fly by day, but most in the morning and evening twilight. 6. Larvae stand for hours on their fleshy or prop legs with fore part of body elevated.	31 SPHINGES. (Hawk- Moths.) 49-51
<b>SECTION C.</b> —1. Antennae taper from the base to the extremity and either naked like a bristle or feathered on each side. 2. Wings held together by bristles and hooks. 3. First pair covers hind pair and both slope more or less when at rest. 4. Hind legs with two pairs of spurs. 5. Fly mostly by night.	32 PHALAE- NAE. (Moths.) 52-58

## SECTION A.—PAPILIONES.

- Family a.*—1. Wings erect when at rest. 2. Antennae knobbed but never hooked at the ends. 3. Some have but four legs fitted for walking. 4. Head of caterpillar moderate in size. 5. Chrysalis without cocoon. } 33  
PAPILION-  
IDAE.  
(Butterflies  
proper.)  
35-48
- Family b.*—1. Hind wings nearly horizontal when at rest. 2. Body short and thick. 3. Head large. 4. Eyes very prominent. 5. Palpi short, almost square at the ends, and thickly clothed with hairs. 6. Antennae short, situated at a considerable distance from each other, and in most the knob either ends in a hook or with a point bent to one side. 7. Four hinder shanks armed with two pairs of spurs. 8. Head of caterpillar very large. 9. Most chrysalids have an imperfect cocoon, and are never ornamented with golden spots. } 34  
HESPERI-  
ADAE.  
(Skippers.)

## FAMILY a.—PAPILIONIDAE.

Generic characters are found in:—1. Antennae. 2. Shape of head-parts. 3. Venation and proportion of wings.

Specific characters are found in:—1. Size. 2. Coloration.

- Genus 1.*—1. Antennae club-shaped. 2. Fore wings are large, elongated, triangular and entire or slightly crenate on outer margin. 3. Hind wings rhombic, serro-crenate on outer margin, and each prolonged behind into a "tail." 4. Each fore-wing with an interno-median veinlet. (See fig. 28, Packard's Guide to Study of Insects.) 5. Abdomen oval. 6. Larva short, stout, and provided with a v-shaped scent organ. } 35  
PAPILIO.  
(Swallow-  
tails.)
- Genus 2.*—1. Wings rounded, entire on the edges, and grooved on the inner edge to receive the abdomen. 2. Color white. 3. Larva greenish, tapers slightly towards each end, and sparingly clothed with a short down. } 36  
PIERIS.  
(Cabbage  
Butterflies.)
- Genus 3.*—1. Six legs formed for walking. 2. Antennae short, gradually thickened towards the end. 3. Wings entire: hinder ones rounded, with a gutter on the inner edge to receive the abdomen, and the central mesh (discal cell) closed behind by an angular vein. 4. Larva cylindrical, smooth or downy, and not striped on top of the back. 5. Color of imago sulphur-yellow. 6. Females have yellow spots on dark border of fore-wing. } 37  
COLIAS.  
(Sulphur  
Butterflies.)
- Genus 4.*—1. Antennae long with a curved knob. 2. Wings rounded and entire. 3. Head and thorax spotted with white. 4. Larva has projecting thread-like horns arranged in pairs on top of second and eleventh segments. 5. Prevailing color of the imago of our species is tawny. 6. Size large. 7. See Genus 10. } 38  
DANAIS.

Genera 5, 6, 7, 8 and 9 agree in the following characters:—1. Antennae with knobs short and broad. 2. Feelers rather long and placed close together at base at least. 3. Inner margin of hind wings folded downwards and grooved for the reception of the body. 4. Central mesh (discal cell) of hind wings not closed behind. 5. Nails of four hind feet divided so as to appear double.

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| <i>Genus 5</i> .—1. Wings never angulated or toothed, and generally ornamented with silvery or pearly, rounded or triangular spots beneath. 2. Feelers spread far apart at their points. 3. The spring larvae have round heads. 4. Spines branched, two of the prothoracic ones being the largest and reaching over the head.          | } 39<br>ARGYNNIS.                                 |
| <i>Genus 6</i> .—Agrees in most respects with <i>Genus 5</i> , except:—1. Hind wings checkered with various colors but not ornamented with silvery or pearly spots. 2. Larva covered with blunt tubercles beset with very short stiff bristles.  | } 40<br>MELITÆA.                                  |
| <i>Genus 7</i> .—1. Wings more or less scalloped, but not indented or tailed or marked with metallic characters beneath. 2. Feelers much longer than head, tapering, curve upwards, and are contiguous to the extremity. 3. Branched spines on all the segments of the larva except the first and last. 4. Head of larva heart-shaped. | } 41<br>PYRAMEIS.<br>( <i>Cynthia</i> of Harris.) |
| <i>Genus 8</i> .—1. Wings jagged or tailed on hind edges. 2. Under side of hind wings, in many, marked with a golden or silvery character in middle. 3. Feelers long, curved, and contiguous, forming a kind of projecting beak. 4. Larva cylindrical and armed with long, stout, and branching spines.                                | } 42<br>VANESSA.                                  |
| <i>Genus 9</i> .—1. Smaller than the butterflies of <i>Genus 8</i> . 2. Wings deeply incised. 3. Colors red and brown. 4. Under side of hind wings has usually a silvery or golden dot and curved line or both, imitating different punctuation marks.   | } 43<br>GRAPTA.                                   |
| <i>Genus 10</i> .—1. Antennae very slender. 2. Hind wings scalloped. 3. Discal area open on both wings. 4. Larva like that of <i>Genus 4</i> . 5. Colors dark.   | } 44<br>LIMENITIS                                 |
| <i>Genus 11</i> .—1. Wings entire. 2. Veins of fore wings swelled at their base. 3. Discal area open on hind wings only. 4. Color wood-brown and ornamented, especially beneath, with eye-like spots. 5. The imago has a short, quick, jerky flight. 6. Larva green, smooth, spindle-shaped or cylindrical, and hind end notched.      | } 45<br>HIPPARCHIA.                               |

The genus *Hipparchia* in Harris is subdivided in Packard into *Satyrus*, *Chionobas*, *Hipparchia*, and *Neonymphia*, a group with the above characters in common.

Genera 12, 13 and 14 have the following characters in common:—1. Small, delicate, and of great beauty. 2. Palpi elongated. 3. Wings entire. 4. Hind pair are often once or double tailed. 5. Larvae slug-like in movement.

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| <i>Genus 12</i> .—1. Coppery red above. 2. Larva feeds on the sorrel. 3. There are three broods of butterflies in a year. | } 46<br>CHRYSOPHANUS. |
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<i>Genus</i> 13.—1. Azure blue throughout, with dark markings.	47
	} LYCAENA.
<i>Genus</i> 14.—Differs from the two preceding genera in:—1. Tails conspicuous. 2. Clubs of antennae longer. 3. Color dusky brown.	48
	} THECLA.

## SECTION B.—SPHINGES.

<i>Family</i> a.—1. Body very stout and spindle-shaped. 2. Antennae prismatic. 3. Tongue or maxillae very long. 4. Wings narrow and powerful. 5. Larvae have sixteen legs. 6. An acute horn or tubercle on the last segment. 7. At rest the fore part of the body of the larvae is elevated. 8. Transform in the earth. 9. Tongue-case usually free.	49
	} SPHINGI- DAE. (Humming- bird Moths.)
<i>Family</i> b.—1. Body small. 2. Wings narrow. 3. Antennae thickened. 4. Tufts at end of body which may be spread out fan-like. 5. Elegant and gaily colored moths which by the arrangement of their colors look like bees and wasps. 6. Larvae are borers living mostly in hollowed stems of plants. 7. No anal horn. 8. Imago flies swiftly in hottest sunshine.	50
	} AEGER- IADAЕ. (Bee and wasp- like Moths.)
<i>Family</i> c.—1. Head rather large and free. 2. Antennae simple and slightly swollen in the middle, or partly clavate. 3. Scales fine and powdery and thinly scattered over the surface. 4. Species green or deep blue with blue-black scales alternating with gay colors such as golden, bronze, or white and red. 5. Larvae short, with small heads, partially retractile, and segments with transverse rows of unequal tubercles. 6. Imago flies in hot sunshine.	51
	} ZYGAE- NIDAE.

## SECTION C.—PHALAENAE.

<i>Family</i> a.—1. Bodies thick and heavy. 2. Heads small and sunken. 3. Mouth-parts often obsolete, the maxillae or tongue being especially short. 4. Antennae usually broadly pectinated. 5. Wings broad, often falcate. 6. Habits sluggish. 7. Clypeus large. 8. Antennae inserted higher up than in other moths. (7 and 8 are especially characteristic.)	52
	} BOMBYC- IDAE. (Spinners.)
<i>Family</i> b.—1. Bodies thick. 2. Thorax often crested by the stout and well developed palpi. 3. Antennae simple and sometimes slightly pectinated. 4. Fore wings small and narrow and marked in the middle, almost invariably, by a dot and reniform spot. 5. Hind wings rather large and folded under fore wings when at rest. 6. Colors dark and dull. 7. Fly by night. 8. Larvae taper towards each end and are striped and barred in various ways.	53
	} NOCTU- AELITAE. (Night- Moths.)



<i>Family c</i> .—1. Bodies slender and covered with fine scales. 2. Wings broad and thin, and when at rest are not folded roof-like but spread horizontally, scarcely overlapping. 3. Antennae usually pectinated. 4. Palpi short and slender. 5. Tongue or maxillae weak and short. 6. Delicate, pale, often greenish or yellowish. 7. Fly more by day than the Noctuids.	54	PHALAE- NIDAE. (Geometrids or Measurers.)
<i>Family d</i> .—1. Triangular fore wings. 2. Abdomen slender. 3. Legs long and slender, front pair often tufted. 4. Palpi compressed and very long and slender. 5. Color usually dull ashen gray with a marked silken lustre. 6. Fly by night, dusk or day. (4 is most characteristic.)	55	PYRAL- IDAE. (Saw- Moths.)
<i>Family e</i> .—1. Palpi short and project beak-like. 2. Fore wings oblong, broad compared with <i>f</i> , and much rounded on the costa. 3. Wings rarely expand more than an inch, and are folded roof-like over the body. 4. Antennae filiform. 5. Legs much shorter than in <i>d</i> . 6. Fly mostly by night.	56	TORTRIC- IDAE. (Leaf-rollers.)
<i>Family f</i> .—1. Body slender. 2. Wings elongated with long or very long fringes of exceeding delicacy. 3. Maxillary palpi greatly developed. 4. Labial palpi of usual size and usually recurved in front of the head. 5. Antennae long and filiform. 6. Wings falcate or pointed acutely, and lie on top of, or are rolled around the body when at rest.	57	TINEIDAE. (Gnawing- Moths.)
<i>Family g</i> .—1. Body long and slender. 2. Antennae long. 3. Legs long. 4. Wings fissured and plumed. 5. Lowest marks of degradation.	58	PTEROP- HORIDAE. (Plume- Moths.)

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SUB ORDER III.—DIPTERA.

*Body slender. Antennae long, thread-like and many jointed (Nemocera).*  
59-62.

<i>Family a</i> .—1. Mouth-parts very long and slender. 2. Maxillae and mandibles free and lancet-like. 3. Body and legs much elongated and delicate. 4. Antennae densely pilose. 5. Transform in water: larvae stay near bottom, pupae near surface. 6. Feed on vegetable and animal juices,—females alone attack animals.	59	CULICIDAE (Gnats.)
<i>Family b</i> .—1. Body minute, delicate, slender and clothed with long hairs. 2. Wings have usually three or four longitudinal veins and are folded over the back. 3. Eggs deposited in the stems, leaves and buds of various plants.	60	CECIDOMY- IDAE. (Gall-flies.)
<i>Family c</i> .—1. Antennae and palpi slender. 2. Legs very long. 3. Abdomen very slender and cylindrical. 4. A well developed ovipositor present with a pair of long, horny, pointed valves. 5. Venation of wings complete.	61	TIPUL- IDAE. (Crane-flies.)

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| <p><i>Family d.</i>—1. Body much compressed. 2. Eyes two and simple. 3. Epicranial portion of head greatly prolonged. 4. Labrum wanting. 5. Labium small and membranous. 6. Labial palpi, always absent in other diptera, three-jointed and long and slender.</p>  | 62 | PULICIDAE.<br>(Fleas.)                            |
| <i>Antennae short (Brachycera).</i>  |    |   |
| 63—69.   |    |   |
| <p><i>Family e.</i>—1. The three basal cells of wings much prolonged, the third longitudinal vein furcate and tegulae large. 2. Proboscis of male has four and of female six bristles. 3. Third joint of antennae annulate, and always without style or bristle. 4. Eyes large. 5. Thorax oblong and flattened above. 6. Only females bite.</p>  | 63 | TABANIDAE.<br>(Horse-fly Fam.)                    |
| <p><i>Family f.</i>—1. Bodies large and stout, and covered with stiff hairs. 2. Third joint of antennae simple. 3. Labium forms a horny sheath and the empodium is like a horny bristle. 4. Abdomen long. 5. Species rapacious.</p>  | 64 | ASILIDAE.<br>(Robber-flies.)                      |
| <p><i>Family g.</i>—1. Body oval and very hirsute. 2. Proboscis long. 3. Wings with the three basal cells much prolonged,—anterior intercalary vein present, posterior absent. 4. Antennae with third joint simple. 5. Empodium rudimentary. 6. Fly very swiftly along sunny paths in spring and summer.</p>   | 65 | BOMBYLIDAE.                                       |
| <p><i>Family h.</i>—1. Head hemispherical. 2. Eyes large and broad. 3. Body somewhat flattened and ornamented with yellow bands and spots. 4. Wings with the three basal cells much prolonged; third longitudinal vein simple; spurious longitudinal vein between third and fourth; fourth longitudinal vein united at its end with third; and no intercalary veins. 5. No empodium. 6. Feed on plant lice and resemble wasps.</p> | 66 | SYRPHIDAE.  |
| <p><i>Family i.</i>—1. Body stout and hairy. 2. Mouth very small and oral organs rudimentary. 3. Middle part of face exceedingly narrow. 4. Antennae minute and inserted in rounded pits. 5. Some probably viviparous.</p>   | 67 | GESTRIDAE.<br>(Bot-flies.)                        |
| <p><i>Family j.</i>—1. Antennae three jointed, the terminal joint being flattened and with a plumose bristle in typical species. 2. Proboscis ends in a fleshy lobe with porrect single-jointed maxillary palpi. 3. The four longitudinal veins of wings simple, the first of the two veins on the hinder edge often approaching that on the apex of wing. 4. Tarsi have two pulvilli. 6. Abdomen five jointed.</p>                | 68 | MUSCIDAE<br>(Flies.)                              |
| <p><i>Family k.</i>—1. Body flattened and horny. 2. Head horizontal and flattened, and received into front edge of thorax. 3. Eyes large. 4. Rudimentary papilla-like antennae placed near together. 5. Proboscis formed by labrum and maxillae, whose palpi are wanting. 6. Labium very short. 7. Wings with veins present only on costal edge. 8. Parasitic beneath hairs of vertebrates.</p>                                    | 69 | HIPPOBOSCIDAE.<br>(Forest-flies and Sheep Ticks.) |

## SUB ORDER IV.—COLEOPTERA.

<i>Family a.</i> —1. Tarsal joints five. 2. Terrestrial. 3. Antennae filiform, eleven jointed, and on front of head. 4. Head vertical and very large, being broader than pro-thorax. 5. Outer lobe of maxillae bi-articulate, inner terminated by an articulated hook. 6. Mandibles long and curved. 7. Legs long and slender. 8. Colors brilliant.	70 CICINDEL- IDAE. (Tiger Bee- tles.)
<i>Family b.</i> —1. Tarsal joints five. 2. Terrestrial. 3. Antennae filiform and inserted behind the base of the mandibles under a frontal ridge. 4. Maxillae with outer lobe palpi-form, usually bi-articulate: inner lobe curved, acute, and ciliate with spines. 5. Legs slender and cursorial. 6. Anterior and middle coxae globular, posterior ones dilated internally. 7. Color usually black or dark brown: some times metallic or spotted.	71 CARAB- IDAE. (Hyena Bee- tles.)
<i>Family c.</i> —1. Tarsal joints five. 2. Aquatic. 3. Antennae filiform. 4. Hind-r coxae very large, touching each other on the inner edge and externally reaching the sides of the body. 5. Oar-like swimming legs covered with hairs: hind pair longest and much flattened. Body oval, flattened, elliptical.	72 DYTISC- IDAE. (Diving Bee- tles or Water Tigers.)
<i>Family d.</i> —1. Tarsal joints five. 2. Aquatic. 3. Antennae very short. 4. Body oval, bluish black. 5. Fore legs longest.	73 GYRIN- IDAE. (Whirligigs.)
<i>Family e.</i> —1. Tarsal joints five. 2. Aquatic. 3. Antennae clavate. 4. Body small, convex, oval or hemispherical. 5. Palpi very long and slender.	74 HYDROP- HILIDAE. (Water Scavengers.)
<i>Family f.</i> —1. Tarsal joints five. 2. Terrestrial and of large size. 3. Antennae very clavate. 4. Thorax broadened, nearly circular, with thin margin. 5. Body flat. 6. Head flat. 7. Emit a nauseous fluid.	75 SILPH- IDAE. (Sexton Bee- tles.)
<i>Family g.</i> —1. Terrestrial. 2. Tarsal joints five. 3. Body long, black and linear. 4. Elytra very short. 5. Maxillae bilobate, usually ciliated with four jointed palpi. 6. Mostly minute; sometimes large. 7. Abdomen with seven to eight horny segments visible.	76 STAPHYL- INIDAE. (Rove Bee- tles.)
<i>Family h.</i> —1. Five tarsal joints. 2. Terrestrial. 3. Antennae geniculate, the eighth and following joints forming a compact, annulated, rounded or (rarely) triangular club. 4. Elytra truncate behind leaving two segments of the abdomen uncovered. 5. Bodies small, oblong and flat, or round, oblong oval, globose, compressed or convex, and black with the elytra variously sculptured with striae.	77 HISTER- IDAE. (Mimic Bee- tles.)
<i>Family i.</i> —1. Tarsi five jointed. 2. Head small and deflexed. 3. Mandibles short. 4. Eyes rounded with a single ocellus. 5. Prothorax short; sometimes excavated for the reception of antennae. 6. Antennae inserted in front of eyes, eleven jointed. 7. Legs short and somewhat contractile. (Infests cabinets.)	78 DERMEST- IDAE. (Skin-Bee- tles.)

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| <p><i>Family j.</i>—1. Tarsi five jointed. 2. Terrestrial. 3. Antennae pectinate; the outer lamellate joints fixed and not so closely united into a compact club as in <b>k.</b> 4. Mandibles frequently very large.</p>  | <p>79<br/>LUCAN-<br/>IDAE.<br/>(Horn-Bee-<br/>tles.)</p>     |
| <p><i>Family k.</i>—1. Tarsi five jointed. 2. Terrestrial. 3. Antennae lamellate, and lamellae movable at will. 4. Clypeus projecting. 5. Body thick, square and usually very large. 6. Fossorial legs short. (A family of great extent; one fourth of the whole sub-order.)</p>  | <p>80<br/>SCARAB-<br/>AEIDAE.<br/>(Lamellicor-<br/>nia.)</p> |
| <p><i>Family l.</i>—1. Tarsi five jointed. 2. Terrestrial. 3. Antennae serrate, outer joints of which are usually furnished with pores. 4. Head deeply sunken up to the elliptical eyes. 5. Labrum small and prominent; mandibles short and stout. 6. Legs short. 7. Body flattened and long, and of tough consistence.</p>   | <p>81<br/>BUPREST-<br/>IDAE.</p>                             |
| <p><i>Family m.</i>—1. Tarsal joints five. 2. Terrestrial. 3. The eleven-jointed antennae serrate and inserted upon the under margin of front in grooves. 4. Thorax with movable spine (prosternal spine fits loosely into mesosternal cavity). 5. Head retracted, though sometimes free as usual from the thorax.</p>  | <p>82<br/>ELATER-<br/>IDAE.<br/>(Spring-<br/>Beetle.)</p>    |
| <p><i>Family n.</i>—1. Tarsi five jointed. 2. Terrestrial. 3. The usually eleven-jointed, serrate, rarely pectinate or flabellate antennae inserted in front rather closely together in typical genera. 4. Head usually immersed in thorax. 5. The sometimes short elytra never strongly embrace the sides. 6. No thoracic spine. 7. The anterior coxae are contiguous, conical, with a large trochantine; the middle coxae are oblique, and the hinder ones transverse. 8. Legs slender and of moderate length. 9. Bodies shorter, broader, and of softer consistence than in <b>m.</b></p>              | <p>83<br/>LAMPYR-<br/>IDAE.<br/>(Fire-fly<br/>Beetles.)</p>  |
| <p><i>Family o.</i>—1. Hind tarsi with four joints each; middle and fore tarsi with five joints. 2. No neck. 3. Body hard. 4. Colors black or brown. 5. The two lobed maxillae sometimes have the smaller lobe armed with a terminal corneous hook. 6. Palpi four-jointed. 7. Mandibles usually short, robust, and with basal tooth. 8. Eyes usually transverse. 9. Antennae usually inserted on under side of head, or at least under a small frontal ridge, and are clavate, sub-serrate, or rarely pectinate. 10. Elytra rounded at tip, cover abdomen, and frequently embrace its sides far down.</p> | <p>84<br/>TENEBRIO-<br/>NIDAE.</p>                           |
| <p><i>Family p.</i>—1. Four joints to hind tarsi; five to fore and middle tarsi. 2. Head much bent forwards and constricted into a small neck. 3. The eleven-jointed antennae inserted at the sides before the eyes. 4. Soft bodied, cylindrical, slender beetles. 5. Legs long. 6. Found on flowers.</p>   | <p>85<br/>MELO-<br/>IDAE.<br/>(Blistering<br/>Beetles.)</p>  |

<i>Family q.</i> —1. Four tarsal joints. 2. Head lengthened into a long snout or proboscis. 3. Antennae situated near middle of proboscis. 4. Mouth-parts much reduced in size, at extremity of snout. 5. Bodies hard, generally round, and often minute.	86	CURCULIONIDAE. (Weevils.)
<i>Family r.</i> —1. Four tarsal joints. 2. Body oblong, often cylindrical. 3. Recurved antennae filiform and remarkably long. 4. Powerful mandibles incurved. 5. Sometimes very large and showy.	87	CERAMBYCIDAE. (Longicornia.)
<i>Family s.</i> —1. Four tarsal joints. 2. Body short and oval. 3. Antennae not lengthened. 4. Colors brilliant. 5. Eyes round and prominent. 6. Thorax narrow, cylindrical. 7. Thighs often much thickened in the middle. 8. Abdomen with five free segments.	88	CHRYSOMELIDAE. (Leaf-beetles.)
<i>Family t.</i> —1. Three tarsal joints. 2. Hemispherical. 3. Colors red or yellow, with round or lunate black spots, or sometimes black with yellow spots. 4. Larvae and pupae devour plant lice.	89	COCCINELLIDAE. (Lady-birds)

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SUB-ORDER V.—HOMOPTERA.

<i>Family a.</i> —1. Antennae with from five to seven joints, and generally longer than body. 2. Ocelli wanting. 3. Beak in both sexes and three jointed. 4. Legs long and slender. 5. Tarsi two jointed. 6. Males, females, and last brood of asexual individuals with wings. 7. Body flask-shaped, cylindrical. 8. Abdomen thick and round. 9. Wings few veined. 10. Color usually green.	90	APHIDAE. (Plant-lice.)
<i>Family b.</i> —1. Antennae with six or more joints. 2. Tarsi two jointed. 3. Beak wanting in males. 4. Hind wings usually wanting in males. 5. Females wingless. 6. Scales made by the females are usually flattened, scale-like, or rounded hemispherical. 7. Adult females scale-like.	91	COCCIDAE. (Bark-lice.)
<i>Family c.</i> —1. Body flattened. 2. Head broad. 3. Legs short. 4. Antennae eight to ten jointed, forked—two slender terminal bristles forming the fork. 5. Epimera of metathorax terminate behind in an acute spine on each side. 6. Wings are thickened and folded roof-like over the body. 7. Limbs short with thickened shanks. 8. Tarsi two jointed.	92	PSYLLIDAE. (Small Leaf-hoppers.)
<i>Family d.</i> —1. Head broad, triangular, and obtusely pointed in front. 2. Scutellum large, triangular, not concealed by the wings when at rest. 3. Antennae short, two jointed, end in bristles, and inserted on upper edge of front, just before the eyes. 4. Prothorax large, broad, flattened, and transversely oblong. 5. Fore wings thickened. 6. Hind legs long and fitted for leaping.	93	CICADELINA. (Leaf-hoppers.)

<i>Family e.</i> —1. Antennae with but three distinct joints. 2. The two ocelli placed beneath the eyes. 3. Head very large. 4. Body high and convex, often compressed laterally. 5. Hind legs thickened, enlarged, and adapted for leaping. 6. Forehead or vertex of head frequently greatly developed.	94 FULGOR- IDAE. (Lantern-fly Fam.)
<i>Family f.</i> —1. Large and wedge-shaped. 2. Head large and broad. 3. Eyes prominent. 4. Males have musical apparatus beneath the wings on the basal ring of abdomen. 5. Tarsi with three joints. 6. Antennae short. 7. Females with piercer lodged in furrow beneath extremity of body.	95 CICADA- RTAE. (Cicada Fam.)
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SUB-ORDER VI.—HETEROPTERA.	
<i>Family a.</i> —1. Aquatic. 2. Hind legs long, ciliated, and natatorial. 3. Body convex above and flat beneath. 4. Head large, nearly as wide as rest of body, and with broad rounded front. 5. Antennae four jointed, concealed beneath the eyes. 6. Ocelli wanting.	96 NOTONEC- TIDAE. (Water- Boatmen.)
<i>Family b.</i> —1. Body very flat, and either oval or very long and linear. 2. Antennae short, three or four jointed, and concealed in cavity under eyes. 3. Beak three jointed. 4. Fore wings membranous. 5. Fore feet raptorial. 6. Hind limbs natatorial. 7. Aquatic.	97 NEPIDAE. (Scorpion Bug Fam.)
<i>Family c.</i> —1. Body wherry-shaped. 2. Legs long. 3. Course over surface of ponds in early spring. 4. Body beneath furnished with a coating of plush. 5. Antennae four jointed, and long and slender. 6. Fore legs partial raptorial. 7. Some are wingless.	98 PLOTERES (Skaters.)
<i>Family d.</i> —1. Head free from thorax, elongated, and nearly cylindrical. 2. Eyes prominent and two ocelli. 3. Antennae of moderate length, and slender toward the end. 4. Beak stout and incurved. 5. Tarsi three-jointed. 6. Legs long and cursorial. 7. Predaceous.	99 REDUV- IIDAE. (Bugs of Prey.)
<i>Family e.</i> —1. Head flat, extended horizontally and sunken up to the eyes within the prothorax. 2. Antennae long, filiform, often clavate at tip, and from three to five jointed. 3. Beak sheath (labium) four-jointed. 4. Tarsi generally three-jointed, and provided with two suction pads. 5. Membranous wing-covers have distinct, often forked, longitudinal veins. 6. Two ocelli. 7. Crust of body hard. (Comprises three distinct groups: Lygaeidae, Coreidae, and Pentatomidae.)	100 CORISIAE. (Squash-bug Fam.)
<i>Family f.</i> —1. Body convex, oval and soft. 2. Antennae elongated with second joint thickened at the tip, and the terminal joints very slender. 3. Rostrum long and four-jointed. 4. Ocelli wanting. 5. Females have an ovipositor nearly half the length of body. 6. Give the nauseous taste to raspberries. 8. Very active in their habits.	101 CAPSINI. (Fruit-eat- ers.)

<i>Family g.</i> —1. Antennae four-jointed, with the tip clavate or knobbed. 2. Beak gutter-like with a three-jointed sheath (labium). 3. Tarsi three-jointed without foot pads, (This family has given the name bug to entire sub-order.)	} 102 MEMBRANACEI. (Bed-bug Fam.)
<i>Family h.</i> —1. Body wingless. 2. Thorax small and indistinctly jointed. 3. Abdomen large, oval, and with nine segments. 4. Antennae filiform, five-jointed. 5. Eyes minute, non-faceted. 6. Tarsi two-jointed, with a large hook-like terminal joint bent back towards basal joint. 7. Mouth-parts in form of beak, which is fleshy and retractile. 8. Body white and minute.	} 103 PEDICULINA. (Lice.)
<i>Family i.</i> —1. Flattened body corneous. 2. Head horizontal. 3. Mandibles small like a hook. 4. Limbs short and thick. 5. Tarsi two-jointed.	} 104 MALLOPHAGA. (Bird-lice.)

## SUB-ORDER VII.—ORTHOPTERA.

<i>Family a.</i> —1. Body somewhat cylindrical. 2. Head large and vertical. 3. Eyes elliptical: ocelli often wanting. 4. Antennae long and filiform, and arise in front of and between the eyes. 5. Wings of moderate size, net-veined, lying flat on the back; fore pair ovate and hind pair triangular. 6. Hind femora enlarged for leaping. 7. Genital armature largely developed, forming long and slender stylets often as long as body.	} 104 GRYLLOIDAE. (Crickets.)
<i>Family b.</i> —1. Head large. 2. Body compressed. 3. Front from being vertical often inclines inward owing to the greatly enlarged vertex, which is often prolonged into a horn. 4. Eyes globular. 5. Antennae of great length. 6. Legs very long and slender. 7. Prothorax saddle-shaped. 8. Wings thin, anterior pair slightly thickened; hinder pair broad. 9. Base of upper pair of wings transparent, forming a drum in males. 10. Abdomen not of great length. 11. Ovipositor and male claspers greatly developed.	} 105 LOCUSTARIAE. (Green Locusts.)
<i>Family c.</i> —1. Body much compressed. 2. Head large: front vertical. 3. Antennae short: greatest number of joints twenty-four. 4. Prothorax very large, often reaching beyond the abdomen. 5. Wings deflexed. 6. Hind legs enlarged for leaping. 7. Tarsi three-jointed. 8. Fore wings long and narrow; hind wings broadly triangular. 9. Pupae are distinguished from larvae in having large wing-pads.	} 106 ACRYDIDAE. {(Grass-hoppers.)
<i>Family d.</i> —1. Body remarkably long and linear. 2. Wings either aborted and very small or strikingly leaf-like. 3. Head horizontal and long. 4. Antennae rather short. 5. Abdomen twice as long as rest of body. 6. Neither raptorial as regards fore legs, nor vaultatorial like grass hoppers.	} 107 PHASMIDAE. (Spectres.)

<i>Family e.</i> —1. Body large. 2. Fore legs very large, spinous, and raptorial. 3. Head horizontal and triangular in front, 4. Antennae long and filiform. 5. Prothorax very long 6. Broad wings, thin and net-veined, with long parallel veins. 7. Abdomen long, linear oval.	108 MANT- IDAE. (Prophets.)
<i>Family f.</i> —1. Body flattened ovate. 2. Head rounded and partially concealed by the expanded prothorax. 3. Fore wings large, ovate, and not much smaller than the hind wings. 4. Antennae long, filiform, and many jointed. 5. Anal stylets short. 6. Color reddish brown. 7. Nocturnal, hiding by day; found under stones.	109 BLATTA- RIAEE. (Cock- roaches.)
<i>Family g.</i> —1. Body narrow and flattened. 2. Wing covers short, coleopter-like. 3. Head free, flat, and horizontal. 4. Ocelli wanting; eyes round. 5. Antennae rise from under the eyes, filiform, and twelve to forty jointed 6. Elytra short and thick; while the rounded, broad hind wings are folded beneath, almost entirely concealed. 7. Nocturnal; rare in the U. S.	110 FORFICU- LARIAE. (Earwigs.)

SUB-ORDER VIII.—NEUROPTERA.

<i>Family a.</i> —1. Body of winged individuals somewhat ant-shaped. 2. Wings long, straight, narrow, and finely net-veined; the costâ of each wing is remarkably straight, and both wings are equal in shape, size, and venation 3. Head moderate and horizontal. 4. Eyes rather small and globose. 5. Antennae short, about twenty-jointed. 6. Mandibles small and triangular with fine teeth. 7. Social.	111 TERMIT- IDAE. (White Ants.)
<i>Family b.</i> —1. Body oval. 2. Head free from the prothorax. 3. Prothorax small and partially concealed by the wings. 4. Wings unequal in size with few veins. 5. Minute. (Resemble Aphides.)	112 PSOCIDAE. (Book-louse Fam.)
<i>Family c.</i> —1. Body long, flattened, and sides parallel. 2. Prothorax large. 3. Antennae long and thread-like. 4. Wings unequal, irregularly transverse veined, and hinder ones broad and triangular.	113 PERLIDAE. (Perla Fam.)
<i>Family d.</i> —1. Body slender and weak, being very long. 2. Prothorax of moderate size. 3. Antennae small and subulate. 4. Mouth-parts rudimentary. 5. Wings unequal in size, hinder ones being much smaller or aborted. 6. Tarsi four or five-jointed. 7. Abdomen long and slender with two or three caudal filaments. (Imago lives but a few hours.)	114 EPIHEMER- IDAE. (May-flies.)
<i>Family e.</i> —1. Head very large and globular. 2. Thorax square and large. 3. Abdomen long, slender and cylindrical. 4. Eyes very large. 5. Prothorax greatly aborted. 6. Legs weak. 7. Antennae short and setiform. 8. Mouth not furnished with palpi. 9. Wings large, densely reticulated, usually equal in size, though hind pair sometimes larger. 10. Tarsi three-jointed.	115 LIBELLU- LIDAE. (Mosquito Hawks.)



- Family f.*—1. Body short and thick. 2. Prothorax large and square. 8. Antennae long and setaceous. 4. Wings large, reticulated, and the posterior ones with the anal space plicated. 5. Tarsi five jointed. } 116  
 STALIDAE.  
 (Corydalis Fam.)
- Family g.*—1. Body long, slender and cylindrical. 2. Wings large with numerous veins, the posterior ones with no anal space. 3. Ocelli usually absent. 4. Tarsi five jointed. } 117  
 HEMEROB-  
 IDAE.  
 (Lace-winged Fly Fam.)
- Family h.*—1. Body cylindrical or conical. 2. Head exserted. 3. Antennae shorter than wings. 4. Mouth rostrated. 5. Lateral palpi biarticulated. 6. Prothorax small. 7. Wings either almost absent or narrow, equal, longer than body, and narrowed at base. 8. Posterior wings with no anal space 9. Tarsi five-jointed. } 118  
 PANORP-  
 IDAE.  
 (Scorpion-fly Fam.)
- Family i.*—1. Body compressed, cylindrical. 2. Head free. 3. Antennae long, thread-like. 4. Mouth imperfectly developed. 5. Labial palpi triarticulate. 6. Prothorax small. 7. Wings longer than body, with few transverse veins; posterior wings have anal space large and plicated (rarely absent). 8. Tarsi five jointed. (Resemble the smaller moths.) } 119  
 PHRYGAN-  
 EIDAE.  
 (Case-worm Fam.)
- Family j.*—1. Body long and flattened, with metallic scales in form somewhat like those of Butterflies. 2. Antennae very long, setiform, and many jointed. 3. Mouth parts free with long palpi. 4. Maxillary palpi seven jointed, labial palpi four. 5. Mandibles stout, sunken in the head, and armed with teeth. 6. Prothorax very large. 7. Rings of body of nearly same size. 8. Anal stylets long and large, which, with the smaller ones inserted on the sub-terminal rings of the abdomen, aid greatly in locomotion. (These agile creatures are found in turning over sticks and stones in damp situations, and, though they run with great rapidity, they do not leap like the Poduridae, (Fam. *k.*)) } 120  
 LEPISMAT-  
 IDAE.  
 (Bristle-tails.)
- Family k.*—1. Anal bristles, which are free in *j*, are here united and bent under the body, forming a spring, by which they leap high into the air. 2. Body cylindrical and covered with hair or scales. 3. Antennae four to six jointed and short and thick. 4. Eyes simple: four to eight on each side. 5. Mouth parts not well developed. 6. Legs stout. 7. Tarsi one jointed. (Found in gardens, or hot beds, on manure heaps in winter, and on the snow.) } 121  
 PODUR-  
 IDAE.  
 (Spring-tails.)





**Names, Dates, and Observed Habits.**

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# Directions

FOR

## COLLECTING AND PRESERVING INSECTS.

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There is no rest for the entomologist. Early in the morning when the dew is on the leaves, insects are sluggish and may be easily taken with the hand. They literally swarm during the day as observation in the garden, fields, and groves will prove. At dusk many species fly, and to secure many others, one must be out at night with a lantern. The sunny days of the warm seasons are the gala days for insects, yet one may entomologize successfully in the winter, under the bark of trees, in moss, on trees, &c.

The best places for collecting are gardens and farms, the borders of woods, banks of streams, and ponds. Fungi and rotten fruit attract many insects, as do also partially dried bones and skins of dead animals. Planks and chippings of wood hide many species, and are traps to be extemporized everywhere and in the greatest abundance. Trunks of fallen and decaying trees must be seen to, stones upturned, and the ponds dredged with a water net. Lures may be prepared by saturating trunks of trees with rum and molasses half and half, or with ale and sugar.

A few specimens can be handled conveniently only with forceps. A net for winged species is indispensable, and may be made of mosquito-bar, a foot or more in diameter and two or three feet long, closed at one end, the other attached to a ring of heavy wire or other material, of diameter equal to that of the net, fastened securely to a handle four or six feet long. Never go out without small bottles or boxes in the pocket. Never come in without having them at least partially filled.

Kill butterflies, moths, &c., by pouring a little benzine on the abdomen and thorax. Beetles, &c., may be put in alcohol: or put a little potassic cyanide (remember it is *poison*) in the bottom of a wide-mouth bottle, furnished with a good stopper, and cover it with "plaster of Paris" made into a paste with water. Into this put insects when captured. Larvæ may be put into glycerine or dilute alcohol.



Pin through the thorax, unless through the scutellum, which in a few cases is preferable. Beetles, however, pin invariably through the right elytron. Pin all at an equal height, with a fourth or fifth of the pin projecting above. Use entomological pins only, which may be bought of James W. Queen & Co., 924 Chestnut Street, Philadelphia, Pa., at 15 cents per hundred, Nos. 1 to 5, Carlesbader.

Moisten dry specimens by placing them in a box of wet sand, over which a sheet of soft paper has been laid: after 15 or 20 hours their wings may be easily spread. Better, however, to fasten them in position as soon as killed. Plough a deep groove in a board two inches thick and three or four inches wide, of size suitable to the body of the insect. Cut away on either side of the groove, that the wings when fastened may be elevated at an angle. Place the body in the groove, and the pin through the insect into a hole bored in the bottom of the groove, and fasten by pinning strips of paper or paste-board across the wings, or better, lay short strips of glass upon them, or fasten the insects by wrapping thread around their blocks, the setting board having been sawed into pieces three or four inches long. After a day or two they may be removed from the boards, kept in quarantine for a time, and then placed with other insects collected. Keep the collection in closed boxes, in which is kept constantly gum camphor or benzine. Fasten the pith of cornstalks, or thin cross-sections of pine, or strips of cork to the bottom, into which the pins may be thrust without being bent. Examine collection frequently for "parasites." Remove eaten specimens to a separate case. Insects soaked for a time in a solution of corrosive sublimate (poison) in alcohol, will not be touched.

Collect and rear larvae, which may be done with little trouble. Keep all the pupae found. Thus the imago or adult will be secured without injury and without exertion. Collect nests of all kinds to illustrate insect architecture, which is both interesting and instructive. Label everything when captured giving date and locality. But note especially the habits, and insert in a journal, kept for the purpose, a fully written history of the insects observed and studied each day.

## GLOSSARY.

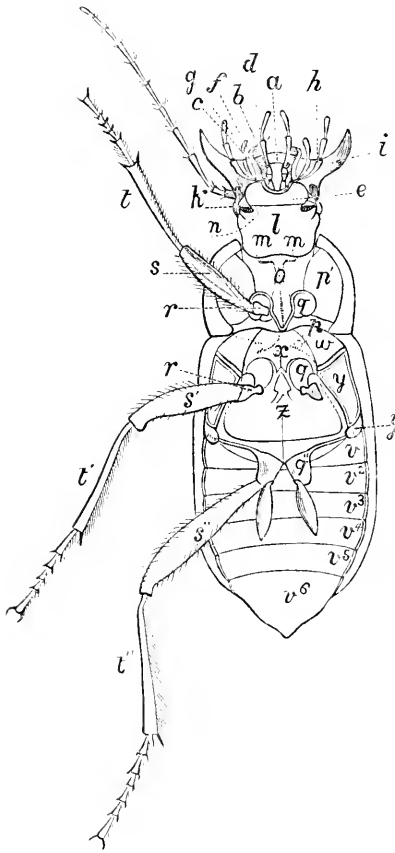


FIG. 1, under surface of *Harpalus caliginosus* (After Leconte, from Packard.) *a*, ligula; *b*, paraglossae; *c*, supports of labial palpi; *d*, labial palpus; *e*, mentum; *f*, inner lobe of maxilla; *g*, outer lobe of maxilla; *h*, maxillary palpus; *i*, mandible; *k*, buccal (check) opening; *l*, gula or throat; *m, m*, buccal sutures; *n*, gular suture; *o*, prosternum; *p*, episternum of prothorax; *p* prime, epimeron of prothorax; *q, q* prime, *q* second, coxae; *r, r* prime, *r* second, trochanters; *s, s* prime, *s* second, femora or thighs; *t, t* prime, *t* second, tibiae; *r, v* second, *v* third, etc., ventral abdominal segments; *u*, episterna of mesothorax, (the epimeron is just behind it); *x*, mesosternum; *y*, episterna of metathorax; *y* prime, epimeron of metathorax; *z*, metasternum.

It is now believed, from a study of the embryos and certain degraded forms of hexapodous insects, that the head is composed of four rings or segments, the antennae being appended to the first, the mandibles to the second, the first pair of maxillae to the third, and the labium or second maxillae to the fourth. The thorax is made up of three segments, with a pair of legs to each, and a pair of wings to the second and third segments, except in Diptera,

where the one pair is appended to the middle segment. The segments of the abdomen number ten or eleven, the tubercles forming the ovipositor being appended to the eighth and ninth segments and those forming the male genital organ to the ninth.

Each segment of the body may be divided into an upper (tergite), a side (pleurite), and an under piece (sternite). The pleural surface is composed of two pieces in the thorax,—the epimeron and the episternum—and one pair of accessory pieces (two pairs in mesothorax).

The modifications of the mouth-parts are numerous. In Hymenoptera

the ligula or front edge of labium is greatly developed. The maxillæ of Lepidoptera are prolonged into a tubular tongue; the mandibles are obsolete. The rostrum of Diptera is made up of the mandibles and maxillæ in the form of setæ ensheathed by the labium, and is accompanied by the maxillary palpi. In the last respect they differ from Homoptera and Heteroptera. In the three remaining sub-orders the mouth-parts are well developed.

## A

- ABDOMEN, The hindmost section of the body of an insect.  
 ACUTE, [Lat. *acutus*, sharp pointed.] Ending in a sharp point, pointed.  
 ALIMENTARY CANAL, [Lat. *alere*, to feed.] The duct or canal through which the food passes, including the œsophagus, stomach and intestines.  
 AMBULATORIAL, [Lat. *ambulare*, to walk.] Fitted for walking.  
 ANATOMY, [Gr. *anatomia*, to cut up.] Structure; or that which treats of structure, or composition.  
 ANTENNÆ, [Lat. *antenna*, sail-yard.] The "feelers." They are on the head of insects, in front or near the eyes, and usually believed to be organs of sensation.  
 ARACHNIDA, [Gr. *arachne*, spider.] The order of spiders, having a cephalo-thorax and abdomen.  
 ARTICULATES, [Lat. *articulatus*, jointed.] A branch of the animal kingdom, having their hard parts external formed of rings or segments joined together.  
 ARTICULATED, [Lat. *articulatus*, jointed.] Jointed; formed with joints or articulations.

## B

- BALANCERS, The "poisers" of the Diptera, situated back of the front, and in place of the hind wings.  
 BANDED, With transverse encircling lines.  
 BEAK, The sucking mouth of insects.  
 BRANCH, A collection of classes; or, a division of the Animal Kingdom.  
 BRISTLED, Furnished with bristles, or coarse stiff hair.  
 BRACHYCERA, [Gr. *brachus*, short; *keras*, horn.] Diptera with short antennæ.

## C

- CATERPILLAR, The larva of Lepidoptera.  
 CENTPEDES, [Lat. *centum*, hundred, and *pedes* feet.] A group of insects belonging to the order Myriopods, with a single pair of feet to each segment of the body.  
 CEPHALO-THORAX, [Gr. *kephale*, head, and *thorax*.] The united head and thorax, as in spiders.  
 CHARACTER, [Gr. *character*, impress, stamp.] Any distinguishing mark.  
 CILIATED, [Lat. *cilium*, an eye-lash.] Furnished with cilia or rows of hairs.  
 CLASS, A collection of orders; or, a division of a branch.  
 CLASSIFICATION, [Lat. *classis*, class, and *facere*, to make.] Arrangement into groups or classes.  
 CLAVATE, [Lat. *clava*, club.] Club-shaped; thicker toward the top.  
 CLYPEUS, [Lat. *clypus*, shield.] The shield which covers the mouth, as in beetles.  
 COLEOPTERA, [Gr. *kolon*, sheath, and *pteron*, wing.] The fourth suborder of insects.  
 COMPOUND EYES, The eyes formed of many facets.  
 COMPLETE TRANSFORMATION, All the changes or stages in development from the egg, including larval and pupal, to the adult form or imago.  
 COMPRESSED, [Lat. *com*, together, and *pressare*, *pressum*, to press.] Pressed together laterally.  
 CONICAL, [Lat. *conus*, cone.] Round and tapering to a point. Cone shaped.  
 CONTIGUOUS, [Lat. *contigere*, to touch on the sides.] In close contact; touching.  
 CORBICULUM, (Lat.) The honey basket of some of the Hymenoptera, formed by stiff bristles projecting over the cavity of the tibia.  
 CORIACEOUS, [Lat. *corium*, leather.] Tough, leathery.

- COXA. [Lat. *coxa*, the hip.] The basal division or part of the leg; that next the body.
- CRESCENTED, [Lat. *crevere*, to increase.] With the figure of a crescent, or new moon.
- CRUSTACEAN, [Lat. *crusta*, shell, crust.] The second class of articulates, including lobsters, shrimps and crabs.
- CUBSORIAL, [Lat. *curro*, I run.] Fitted for running.
- CUBOIDAL, [Gr. *kybos*, cube, and *eidōs*, shape.] Nearly in the shape of a cube.
- CYLINDRICAL, [Gr. *kyliandria*, to roll.] In the form of a cylinder.

**D**

- DEVELOPMENT, The unfolding and process in the change of growth.
- DIPTERA, [Gr. *di* for *dis*, double, and *pteron*, wing.] The third suborder of insects.
- DORSAL, [Lat. *dorsum*, the back.] Pertaining to or near the back.

**E**

- EPICRANIUM, [Gr. *epi*, upon; *kranion*, the skull.] The epicranium occupies a large part of the upper portion of the head. It is bounded in front by the clypeus, behind by the occiput, and on the sides by the eyes.
- ELLIPTICAL, [Gr. *elleiptein*, to leave in, to fall short.] In the form of an ellipse; or oblong with rounded ends.
- EPIMERON, [Gr. *epi*, upon; *meron*, the thigh.] One of the two side pieces of the segment of an insect.
- EMARGINATE, [Lat. *e* out, and *margo*, edge.] Notched at the summit.
- EMPODIUM, [Gr. *en*, in; *pous*, foot.] The membrane sometimes present between the claws of diptera.
- ENTIRE, [Lat. *in*, not, and *tungere*, to touch.] Full or undivided edge.
- ELYTRA, pl. [Gr. *elytron*, covering.] The hard wing covers of beetles.
- ENTOMOLOGY, [Gr. *entomon*, insect; *logos*, a discourse.] That part of zoology which treats of insects.

**F**

- FILIFORM, [Lat. *filum*, thread, and *forma*, form.] Long, slender, round, of equal thickness throughout.
- FOSSORIAL, [Lat. *fodere*, *fossam*, to dig.] Fitted for digging.
- FLABELLATE, [Lat. *flabella*, I fan.] Having the form of a fan.
- FRINGED, Bordered with fringe, or loose edging.
- FUSIFORM, [Lat. *fusus*, spindle, and *forma*, form.] Tapering to each end, spindle shaped.
- FALCATE, [Lat. *fals*, a sickle or scythe.] Hooked or bent like a sickle.
- FURCATE, [Lat. *furca*, a fork.] Branching, like the prongs of a fork.

**G**

- GENUS, pl. genera, a collection of species more or less alike, or alike in many characters.
- GENICULATE, [Lat. *geniculum*, a little knee.] Bent abruptly at an angle.
- GROUPS, The divisions of the Animal Kingdom: *branches, classes, orders, genera* (sing. *genus*) and *species*.
- GRUB, A fleshy larva from the egg of a beetle or other insect.

**H**

- HASTELLATE, [Lat. *hastellum*, a sucker.] Provided with a sucker.
- HEMIPTERA, [Gr. *hemi*, half, and *pteron*, wing.] The fifth suborder of insects.
- HEXAPODA, [Gr. *hex*, six, and *podes*, feet.] The order of true insects, having six feet and the body divided in three sections.
- HOOKEO, Curvated, or having the form of a hook.
- HYMENOPTERA, [Gr. *hymen*, membrane, and *pteron*, wing.] The first or highest suborder of insects.
- HETEROMETABOLA, [Gr. *heteros*, diverse; *metabole*, change.] A group of sub-orders in which the transformation is usually incomplete and various.

**I**

- IMAGO, [Lat.] The perfect or adult insect, having undergone all its transformations.
- INSECT, [Lat. *insectare*, to cut in.] The first class of articulates, including the true or six-footed insects, spiders and myriopods.

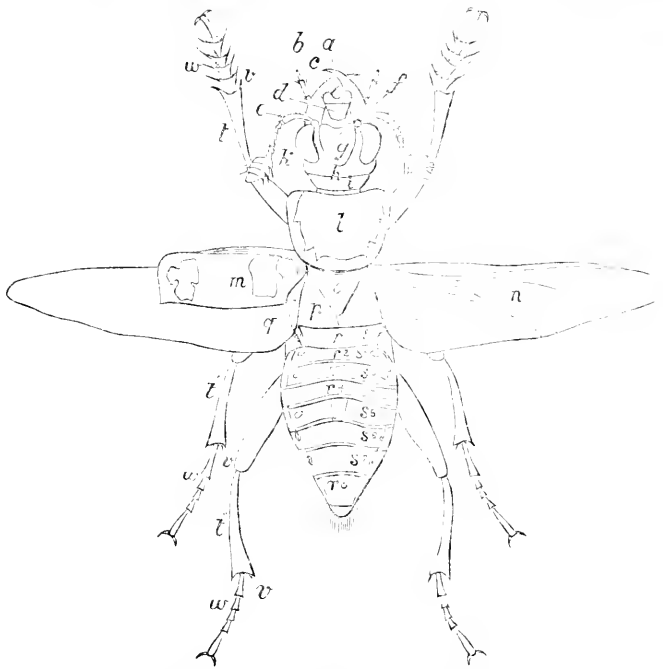


FIG. 2. upper surface of *Necrophorus Americanus*. (After Leconte, from Packard.) *a*, mandible; *b*, maxillary palpus; *c*, labrum; *d*, epistoma; *e*, antennae; *f*, front; *g*, vertex; *h*, occiput; *i*, neck; *k*, eye; *l*, pronotum (usually called prothorax); *m*, elytron; *n*, hind wing; *o*, scutellum (of mesothorax); *p*, metanotum (or dorsal surface of metathorax); *q*, femur or thigh; *r*, *r*<sub>2</sub>, *r*<sub>3</sub>, second, third, etc., tergites of the abdomen; *s*, *s*<sub>2</sub>, *s*<sub>3</sub>, second, third, etc., spiracles or stigmata; *t*, *t*<sub>1</sub>, *t*<sub>2</sub>, tibiae; *v*, tibial spurs; *w*, tarsi.

### L

- LABIUM**, The second maxillae, placed in front of the gula (under part of the head).
- LAMELLATE**, [Lat. *lamella*, diminutive, of *lamina*, plate.] Composed of or furnished with thin plates or scales.
- LANCEOLATE**, [Lat. *lanccola*, diminutive of *lancca*, lance.] Long, narrow, and tapering toward the extremity.
- LARVA**, [Lat. *larva*, mask.] The first stage of an insect after leaving the egg.
- LEPIDOPTERA**, (Gr. *lepis*, scale, and *pteron*, wing.) The second sub-order of insects.
- LIGHT**, Light-colored, not dark.
- LIGULA**, (Lat. *lingula*, diminutive of *lingua*, tongue.) The tongue as in bees, for lapping; the front edge of the labium forming the under lip.
- LINEAR**, (Lat. *linea*, line.) Like a line, slender.
- LONGITUDINAL**, (Lat. *longus*, long.) Extending in length.

### M

- MAGGOT**, The larval form of a fly; like a worm.
- MANDIBLES**, (Lat. *manducare*, to chew.) The jaws which in insects move laterally.
- MANDIBULATE**, (Lat. *manducare*, to chew.) Furnished with mandibles.
- MAXILLA**, (Lat. diminutive of *maxilla*, jaw.) The lower pair of horizontal jaws.
- MENTUM**, (Lat. *mentum*, chin.) The labium proper, or basal part of the labium.
- MESO-THORAX**, (Gr. *mesos*, middle; *thorax*, chest.) The middle ring of the thorax of insects.

**METAMORPHOSIS.** (Gr. *meta*, beyond, and *morphe*, form.) Transformation, or change of form or shape.

**META-THORAX,** (Gr. *meta*, after; *thorax*, the chest.) The posterior ring of the thorax of insects.

**METALLIC,** (Lat. *metallum*, metal.) With the peculiar lustre of metal.

**METABOLA,** (Gr. *metabole*, change.) A group of sub-orders in which the transformation is complete.

**MOLLUSKS,** (Lat. *mollis*, soft.) A branch of the Animal Kingdom, with soft body, usually protected with a shell.

**MOTHS,** Lepidopterous insects with antennae tapering uniformly to a point; usually nocturnal

**MYRIAPODA,** (Gr. *myrioi*, numberless, ten thousand, and *podas*, feet.) The order of centipedes; an insect with many legs.

## N

**NAKED,** Not clothed with hair or bristles, or scales.

**NATATORIAL,** (Lat. *natare*, to swim.) Fitted for swimming.

**NATURAL HISTORY,** Description, classification, &c., of objects in nature. It is sometimes restricted to Zoology, but often includes also Botany and Geology.

**NEMOCERA,** (Gr. *nema*, thread; *keras*, horn.) Diptera with long, thread-like, and many-jointed antennae.

**NECTAR,** (Gr. *nectar*, the drink of the Gods.) The honey or sweetish secretion of plants.

**NEUROPTERA,** (Gr. *neurou*, nerve and *pteron*, wing.) The lowest or seventh sub-order of insects.

**NOTCHED,** having notches, nicks, or indentations.

## O

**OBLONG,** with greater length than breadth.

**OCELLI,** the plural of ocellus.

**OCELLUS,** (Lat. *ocellus*, diminutive of *oculus*, eye.) An eye of some insects, small and simple, situated near the compound eyes.

**OPAQUE,** (Lat. *opacus*, shaded.) Not allowing light to pass through. Dark.

**ORDER,** a collection of allied genera, or those somewhat resembling each other.

**ORTHOPTERA,** (Gr. *orthos*, straight, and *pteron*, wing.) The sixth sub-order of insects.

**OVAL,** (Lat. *ovum*, egg) shaped like an egg. Broadly elliptical.

**OVIPOSITOR,** (Lat. *ovum*, egg, and *ponere*, *positum*, to place.) The organ by which eggs are placed or deposited.

## P

**PARTIAL TRANSFORMATION,** Not three stages in development from the egg to the adult form, the larva more or less resembling the imago.

**PECTINATE,** (Lat. *pecten*, comb.) With narrowed, close divisions, comb-like.

**PEDICELLED,** (Lat. *pediculus*, diminutive of *pes*; foot.) Furnished with a pedicel, or short stalk.

**PEDUNCULATE,** (Lat. *pedunculatus*, diminutive of *pes*, foot.) Furnished with a peduncle, stem or stalk.

**PIERCER,** the organ at the tip of the abdomen in female insects for piercing or stinging.

**PLAITS,** (Gr. *plekein*, to braid.) Folds.

**POISERS,** the organs of diptera, in place of hinder wings, called also "balancers."

**PROBOSCIS,** (Gr. *pro*, before, and *boskein*, to feed.) Snout, trunk. Horny tube.

**PROP LEGS,** the fleshy, unarticulated legs of larvae.

**PROTHORAX,** (Gr. *pro*, before; *thorax*, the chest.) The anterior ring of the thorax of insects.

**PROTOZOA,** Gr. *protos*, first, lowest, and *zoon*, animal.) A branch—so called—of the Animal Kingdom, including nearly structureless animals, as Bacteria, etc.

**PORRECT,** (Lat. *pro*, before, forward; *rego*, I direct.) Extended horizontally or at right angles.

**PUPA,** (Lat. *pupa*, doll, puppet.) The second stage in the development of an insect from the egg, that between the larva and imago.

## R

**RADIATES,** (Lat. *radius*, ray.) The branch including animals whose parts radiate from the longitudinal axis of the body, as polyps which secrete coral.

**RAMIFY,** (Lat. *ramus*, branch.) To branch or divide into parts.

**RAPTORIAL,** (Lat. *raptor*, I plunder.) Fitted for capturing prey.

REGION, any part, tract, space, or division.

RESPIRATION, (Lat. *res*, again, and *spirare* to breathe.) The act of breathing.

RHOMBOIDAL, (Gr. *rhombos*, rhomb, and *eidos* shape.) Having the shape of an oblique-angled parallelogram. Like a rhomboid.

ROSTRUM, (Lat. *rostrum*, the beak.) The beak or suckerial organ.

### S

SCIENCE, (Lat. *scire*, to know.) Classified knowledge. A distinct branch of knowledge.

SCALLOPED, edge cut or marked with scallops or segments of circles.

SCUTELLUM, (Lat. *scutellum*, diminutive of *scutum*, shield.) A triangular piece extending from the thorax backward inserted between the elytra, as in some species of the beetles.

SEGMENT, (Lat. *segmentum*, a cutting, slice.) A section, portion.

SERRATE, (Lat. *serra*, saw.) With teeth like a saw.

SETIFORM, (Lat. *seta*, bristle, *forma*, form.) Bristleform, slender, round, and tapering to a point.

SIMPLE EYE, An eye with a simple or undivided cornea, with a single facet instead of many as in a compound eye.

SLENDER, Thin or narrow, not thick.

"SNOUT," The prolonged or beak-like head, as in weevils, used for boring in objects.

SPECIES, A collection of individuals with common characters.

SPHEROIDAL, (Gr. *sphaira*, sphere, *eidos*, form.) Shaped like a spheroid, which is a figure approaching to a sphere.

SPIDER, One of the order Arachnida, having the body divided in two regions, (cephalo-thorax and abdomen,) and eight legs.

SPINNERETS, The organs of insects for spinning silk or webs.

SPIRACLES, (Lat. *spirare*, to breathe.) The pores or openings of the tracheae, or air tubes on the side of the body of an insect.

STING, A sharp pointed weapon of some insects, thrust from the hinder part of the body, used in defense or securing prey. It is a tube through which a poisonous matter is discharged into the wound.

STOUT, Strong, vigorous, robust, large.

STRIATED, (Lat. *stria*, furrow.) Streaked with lines or small groovings.

STYLE, (Lat. *stylus*, a pointed instrument.) Hair-like appendages of the abdomen of certain insects.

SUB-COSTAL CELLS, The cells or spaces between the branches of the sub-costal vein (the second of the five principal veins usually present in the wings, the first being the costal.)

SUNKEN, Immersed or partially sunk or concealed, as the head in the thorax.

### T

TAILED, Said of butterflies having wings with tail-like projections.

TARSAL, (Gr. *tarsus*, flat of the foot.) Pertaining to or belonging to the tarsus.

TARSUS, (Gr. *tarsus*, flat of the foot.) The part or division of the leg next below the tibia.

TAWNY, fulvous; a dirty yellow.

TEGULE, (Lat. *tegula*, a tile.) Shoulder lappets covering the bases of the wings in Diptera, etc.

TIBIA, (Lat. *tibia*, shin bone.) The second division of the leg, between the tarsus and coxa.

TRANSFORMATION, (Lat. *trans*, over, and *formare*, to form.) Change of form or condition as of a caterpillar to a butterfly. Metamorphosis.

TRANSPARENT, (Lat. *trans*, through, and *parere*, to appear.) Transmitting rays of light, so that objects may be distinctly seen through.

TRAPEZOIDAL, (Gr. *trapeza*, table, and *eidos*, form.) Shaped like a trapezoid, which is a four-sided figure with only two sides parallel.

TRIANGULAR, (Lat. *tres*, three, and *angulus*, corner.) Shaped like a triangle, which is a figure with three sides and three corners or angles.

TRUNCATE, (Lat. *truncare*, to cut short.) Appearing as if cut off.

### V

VALVE, (Lat. *valva*, leaf, fold.) A lid or cover to an opening allowing communication in one direction, and preventing it on the other.

VENTRAL, (Lat. *venter*, the belly.) Pertaining to or on the lower or abdominal side of the body, opposite the dorsal.

VERMES, (Lat. *vermis*, worm.) The worms or lowest class of articulates.

VERTEBRATES, (Lat. *vertebra*, joint, vertebra.) The first or highest branch of animals, including those having an internal skeleton and back bone.

VERTICAL, (Lat. *verte*, top.) Upright, plumb.

VESSEL, (Lat. *vasellum*, diminutive of *vas*, vessel.) Any tube or canal in which blood and other liquids are contained.

### W

WHERRY-SHAPED, long and narrow, and tapering at both ends like a wherry.

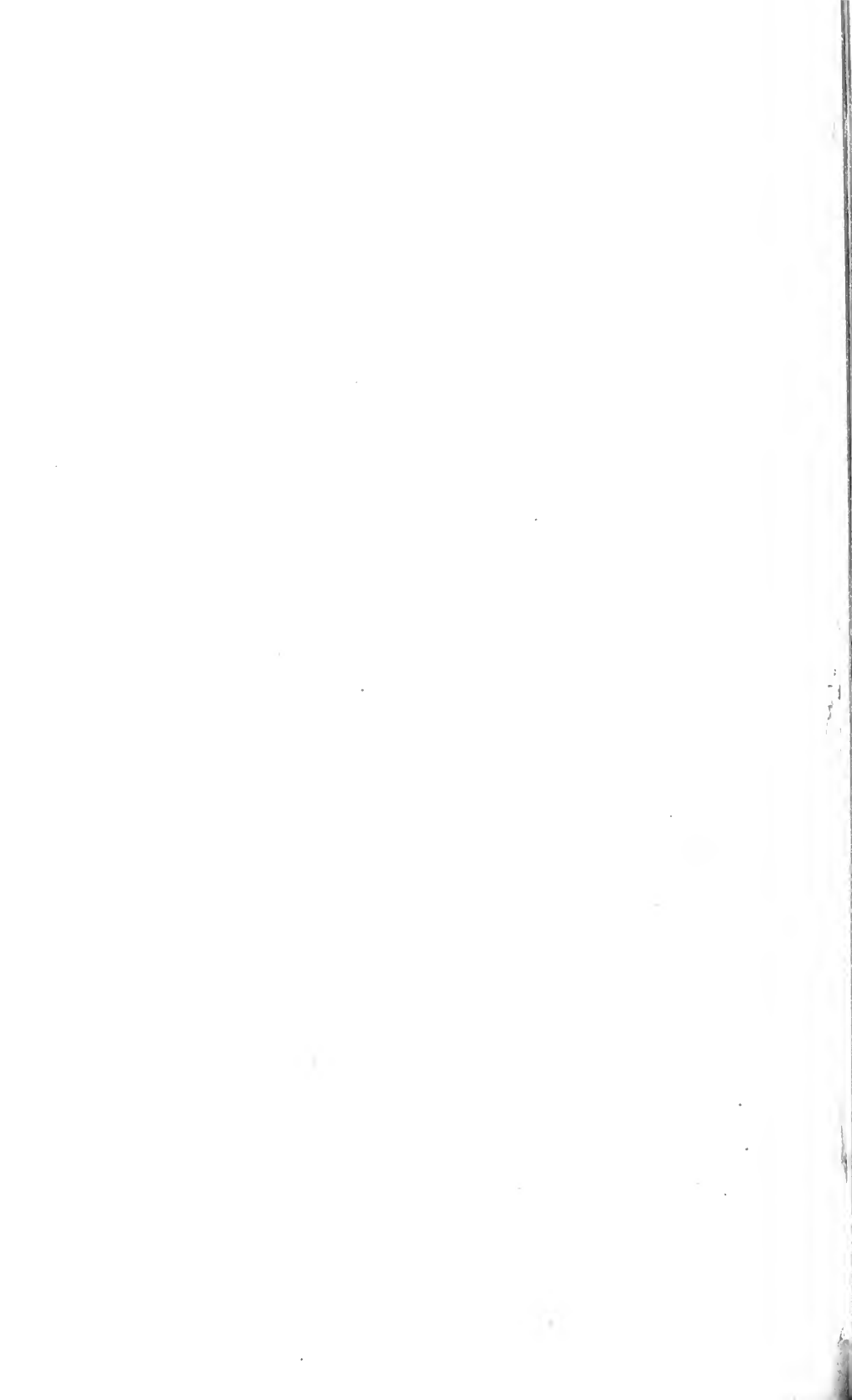
WINGLESS, having no wings.

WORMS, the third or lowest class of articulates, called vermes, including low and degraded forms, with their parts or organs often but slightly differentiated.

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