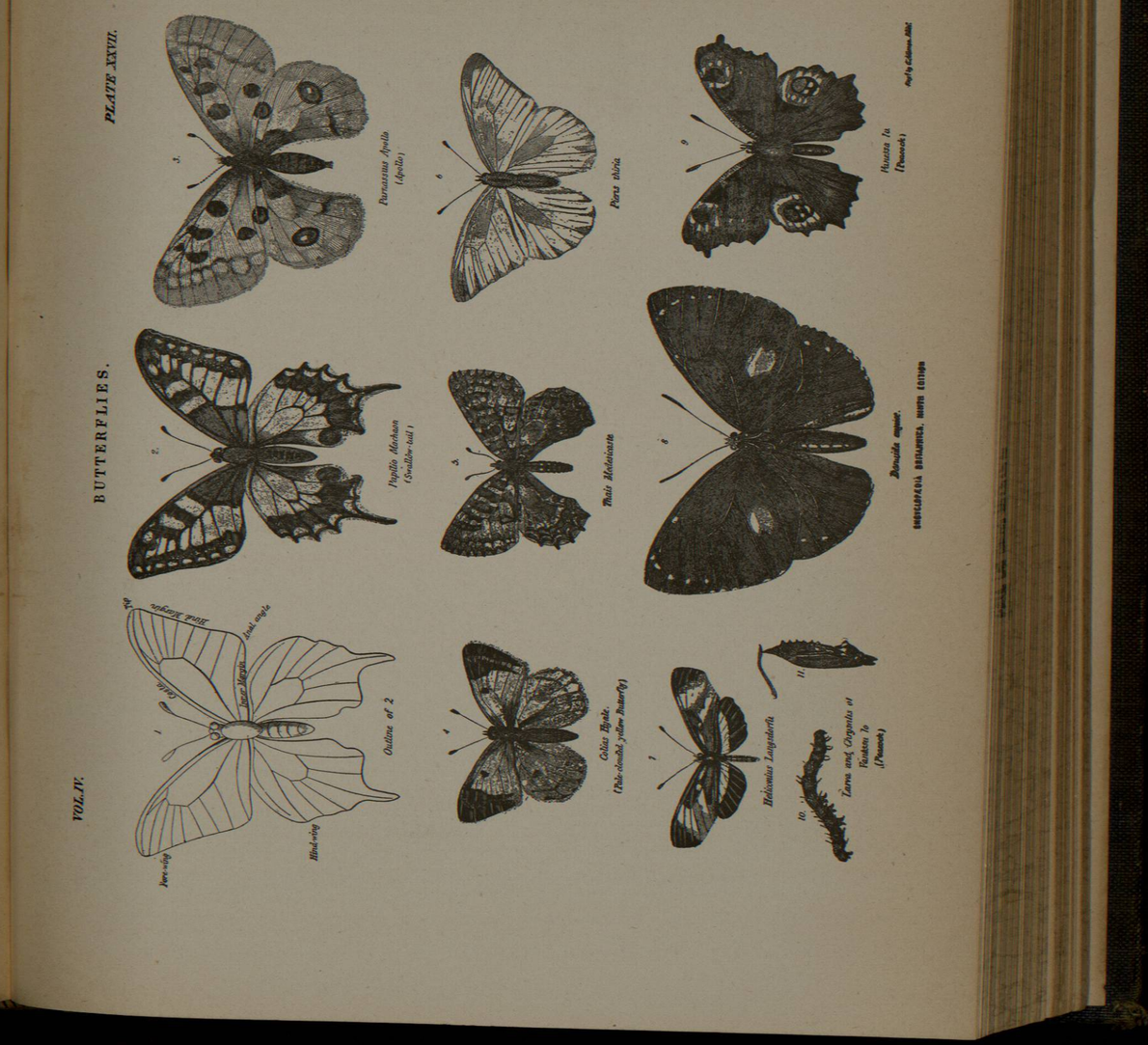
is remarkably constant, and that it is affected in proportion to the amount and sinking point of any adulterant fats used. Their analysis of butter depends upon the much smaller proportion of non-volatile, insoluble fatty acids it contains, as compared with fats used as adulterants.

Under the name of butterine an artificial substitute for butter has been introduced in America, and imported into England from New York. It is the same as the artificial butter or "margarine-mouries," which has been for some years manufactured in Paris according to a method made public by the eminent chemist M. Mège-Mouries. Having surmised that the formation of butter contained in milk was due to the absorption of fat contained in the animal tissues, M. Mouries was led to experiment on the splitting up of animal fat. The process he ultimately adopted consisted in heating finely-minced beef suet with water, carbonate of potash, and fresh sheep's stomachs cut up into small fragments. The mixture he raised to a temperature of 45° C. (113° Fahr.) The influence of the pepsine of the sheep's stomach with the heat separated the fat from the cellular tissue; he removed the fatty matter, and submitted it when cool to powerful hydraulic pressure, separating it into stearin and oleomargarin, which last alone he used for butter-making. Of this fat about the proportions of 10 lb with 4 pints of milk and 3 pints of water were placed in a churn, to which a small quantity of arnotto was added for colouring, and the whole churned together. The compound so obtained when well washed was in general appearance, taste, and consistency like ordinary butter, and when well freed from water it was found to keep a longer time. According to French official reports artificial butter goes much further as food than the genuine article, and forms a perfectly wholesome dietetic material. The Parisian *octroi* officials have recognized the efficiency of the substitute by imposing on it the same duties which are chargeable on ordinary butter. The company established for the manufacture in France had in 1874 seven manufactories, in which four hundred men were employed. There can be no doubt that a pure, sweet fat, such as is manufactured by the process of M Mège-Mouries is a safer and more wholesome article than the unsavoury rancid butter which is sold so freely among the poorer classes. See DAIRY.

BUTTERFLIES AND MOTHS, the common English names applied respectively to the two groups of Insects which together form the order *Lepidoptera* (Gr. λεπίς, a scale, and πτερόν, a wing), an order characterized by the constant presence, in a greater or less degree, of scales on the wings. The two groups may, as a rule, be readily distinguished from each other, although, so far as our present knowledge goes, there is nothing in the structure or habits of either group which divides it entirely from the other. All butterflies are diurnal in their flight, while moths, with many exceptions, are crepuscular or nocturnal.

The bodies of butterflies and moths, like those of all other insects, consist of three distinct parts—the head, bearing the organs of sense; the thorax, the organs of locomotion; and the abdomen, the organs of generation. On the head are placed (1) the antennæ, composed of numerous articulations, and supposed to be organs of hearing. They differ greatly in form among the *Lepidoptera*; those of butterflies, however, agreeing generally in having their ends knobbed or clubbed, hence the term Rhopalocera (ῥόπαλον, a club; κέρας, a horn), often applied to this group. The antennæ of moths assume a great variety of forms—prismatic, serrate, pectinate, moniliform, and filiform,—and are often beautifully feathered, especially in the males, whose antennæ are usually ampler than those of the females; but in no case are they knobbed, as in the great majority of butterflies. Owing to this variety in the form of their antennæ, moths have been termed Heterocera (ἕτερος, various; κέρας, a horn). In butterflies these organs are also straight, and stand out rigidly in front of the head, while in moths they are usually curved and can generally be folded back on the body. (2) The eyes in the *Lepidoptera* consist of two masses of hexagonal facets, placed one on each side of the head, and forming what are known as compound eyes. These contain in some cases no fewer than 16,000 facets each, while in many species a pair of *ocelli*, or simple eyes, are found concealed among the scales and placed between the compound organs. The hairy appearance of the eyes in many of the *Nymphalidæ* is owing to the presence of minute hairs planted at the angles of the numerous facets. Compound eyes are not found among the larvæ of butterflies and moths, but they are in most cases provided with six ocelli on each side of the head. (3) The mouth, the parts of which in insects are considered by comparative anatomists to be typically developed in the masticatory mouth of beetles (*Coleoptera*), assumes in butterflies and moths the suctorial form—the latter being merely a modification of the former; thus the mandibles, labium, and labrum, which are fully developed when the nature of the food renders mastication necessary, are in a rudimentary condition in the *Lepidoptera*, whose chief food is the nectar of flowers, while the maxillæ, on the other hand, are enormously developed; being concave on their inner sides, these by approximating form a tube known as the proboscis or tongue. This when at rest is coiled up into a ball in front of the head, and is partly concealed by the palpi projecting on both sides. In the moths belonging to the family *Bombycidæ*, the organs of the mouth are rudimentary, so that these insects after entering upon the imago state are incapable of feeding.

The thorax bears the organs of locomotion, consisting of three pairs of legs and two pairs of wings. The former are covered with hairs and scales, and terminate in hooks modified to suit the habits of the various species. Butterflies use the legs almost entirely for resting, very rarely for walking, and in some groups, as the *Nymphalidæ*, the front pair is rudimentary. The wings consist of a double layer of colourless membrane traversed by numerous nervures (Plate XXVII. fig. 1), and covered with minute scales implanted in the wing membrane by a short stalk, and placed together like tiles on a roof. The scales vary in form in different species and in different portions of the wings of the same species, while under a high power of the microscope they are seen to be minutely corrugated; and it is to these corrugations acting upon the colourless rays of light, and producing the phenomena of "interference," that many of the loveliest butterflies owe the brilliancy of their wings. The splendour of those organs in the majority of butterflies, and in some moths, is sometimes equally shared by both sexes, but more usually the females are less conspicuously coloured than the males. This difference, amounting often to total dissimilarity, Darwin, in accordance with his descent-theory, attributes in great part to the action of sexual selection. "Several males," he says, "may be seen pursuing the same female." The latter he supposes selects the most gaily-coloured, and thus the plainer-coloured males have been gradually eliminated; but there is no proof whatever that the female shows any such discrimination in selecting a mate, while many known facts seem to point in an opposite direction. Mr A. R. Wallace maintains, on the other hand, that the duller colours of the females have been acquired for protective purposes, the females requiring such protection more than the males owing to their generally slower flight, and to the fact that after impregna-




1
Vanessa callithea

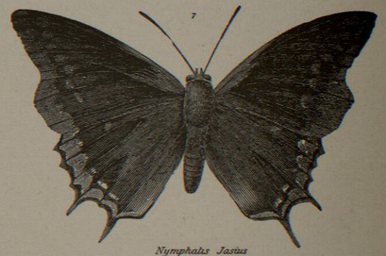

2
Argynnis moneta
(Silver spotted Fritillary)


3
Larva of
Argynnis paphia
(Silver washed Fritillary)


4
Larva of
Nymphalis ilia

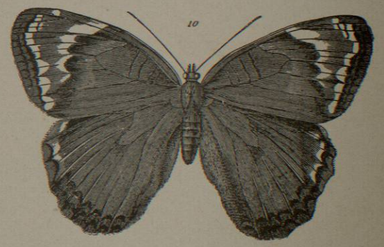

5
Nymphalis ethea


6
Chrysalis of
Nymphalis ilia


7
Nymphalis Jasius


8
Morpho actoron


9
Nymphalis Jasius


10
Paronia acadina


1
Chrysalis of Morpho phidippus.


2
Erycina virginiensis.


3
Brassolis astyra.


4
Erycina virginiensis.


5
Eumonia taxea.

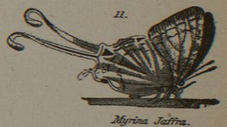

6
Satyrus Balder.


7
Zephyrius amor.


8
Larva of Morpho phidippus.

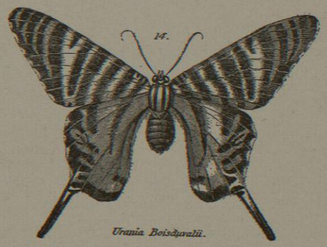

9
Urania Boisduvalii.


10
Eurybia carolina.


11
Myrina Jaffna.


12
Polyommatus Thoe.


13
Hesperia sabadius.


14
Urania Boisduvalii.


15
Chrysalis and larva of
Hesperia tages.
(Dingy Skipper)