Hands On Learning
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EXOTIC BUTTERFLIES Z36/A

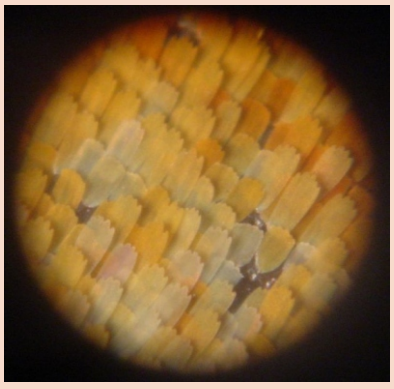
The butterflies in this box are not from Britain. The order Lepidoptera (butterflies and moths - the second largest order in the class Insecta) has more than 260,000 species and therefore it is difficult to give names to specimens without detailed information about where they were collected from. Some of the examples in this box have only been provisionally identified, so these notes will concentrate on the butterfly's most conspicuous feature - the wing.

A butterfly has four wings attached to the thorax - the middle section of the body. Strong muscles in the thorax move the wings up and down in a figure-eight pattern during flight.

When an adult butterfly emerges from its pupa, its delicate wings are crinkled, wet, and uninflated. The butterfly hangs upside-down and pumps blood into the wings to inflate them. It must then wait for the wings to dry before it can take off. When the fragile wings fray or are torn, they do not repair themselves.

Wing Structure and Scales

Butterfly wings are made of two layers supported by tubular veins. The veins also nourish and carry oxygen to the wings. Covering the wings are thousands of colourful scales, together with many hairs (setae).



These scales give the group its name - Lepidoptera, which is derived from two Greek words, λεπίδος (scale) and πτερόν (wing). The wing scales are tiny overlapping pieces of chitin, which are actually plate-like hairs. The front and back of the wings usually have different patterns.

Scent scales are modified wing scales on the forewing of female butterflies and moths that release chemicals called pheromones. These chemicals attract males of the same species.

Above: A magnified image of scales on a butterfly wing.

Reading Borough Council

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Colour

Many butterflies and moths are brilliantly coloured, while others are drab. There are often ultraviolet patterns in the wings that we cannot see, but which are visible to other butterflies. Even many of the colourful species have drab-coloured outer wings (that are visible when the animal is at rest). Wing designs are generally symmetrical along the axis of the body.



Iridescence is a phenomenon in which colour changes according to the angle from which the surface is viewed. Some butterflies have iridescent colouring, which is caused by the surface of the scales having an elaborate cellular structure known as fenestration. This interferes with light wavelengths and usually results in brilliant, shimmering blues and greens. The multitude of other colours found on the scales of butterflies and moths comes from chemical pigmentation.

Above: The menelaus blue morpho (Morpho menelaus) is an iridescent tropical butterfly of Central and South America. It has a wing span of 6 inches (15 centimeters).

Why are butterfly wings so colourful?

The colouration of these insects serves many purposes, including:



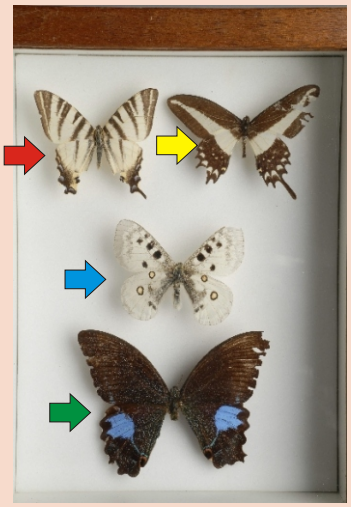
- Camouflage: the colour of the animal can help it blend into the environment. Some butterflies, for example, are shaped and coloured like a leaf.
- Warning: brightly-coloured butterflies and moths are often either bad-tasting or mimic similar bad-tasting butterflies.
- Attracting and finding mates, who look for certain colours and patterns.
- Disorientating predators: Large 'eyespots' seem to flash when the butterfly takes off, startling some predators and making them hesitate.
- Soaking up heat: dark-coloured scales soak up heat very well when the butterfly suns itself. Like all insects, butterflies are cold-blooded. When they get too cold, they need to warm themselves in the sun.

Above: The crimson patch (Chlosyne janais), from central America.

The Coupling of the Wings

During flight, the forewing and hindwing are held together and function as one wing. The coupling mechanism differs in different species. In most butterflies, a lobe on the hindwing presses against the forewing. In most moths, bristles on the front edge of the hindwings (called the frenulum) connect with hooks on the hind edge of the forewing. In some moths, a lobe at the base of the forewings (called the jugum) overlaps the hindwings.

Case 1



1. The butterfly indicated by the red arrow is probably a scarce swallowtail (*Iphiclides podalirius*). This butterfly occasionally strays into England, but only rarely, hence its name. It is found in places with sloe thickets and particularly orchards. It is also called sail swallowtail or pear-tree swallowtail. It is widespread throughout Europe as far north as Saxony and central Poland and its range extends eastwards as far as India, and western China. A photograph of a living scarce swallowtail can be seen centre right.



2. The butterfly indicated by a yellow arrow is probably a member of the *Graphium* genus, a group of mostly tropical swallowtail butterflies commonly known as swordtails. Although many do have long and swordlike tails, others lack any hindwing extensions. Native to Eurasia, Africa, and Oceania, the genus is represented by over 100 species. Their colouration is as variable as the habitats they frequent, from rainforest to savannah. *Graphium* species are often sighted at mud puddles. The photograph to the lower right shows a specimen of *Graphium sarpedon choredon*, from Australia.



Case 1 (continued)



3.The butterfly indicated by the blue arrow is probably an apollo butterfly (*Parnassius apollo)*, see photograph top right. This is a widespread and characteristic butterfly of the high mountains of Europe. It is very noticeable from May to high summer flapping across alpine meadows well above the tree line.

It is thought that the species was widespread during glaciation periods. Following the Ice Age, as temperatures increased, populations became isolated in mountainous areas and subsequently evolved into distinct forms that vary greatly in the number and intensity of their markings. They can usually be told apart by the colour (reds and yellows) and the size of the spots on the hindwing.

The apollo species belong to the swallowtail family, even though they do not have the characteristic long tail on their wings. Swallowtails differ from all other butterflies in a number of ways. Most notably, their caterpillars possess a unique organ behind their heads, called the *osmeterium*, which sticks up when the caterpillar is threatened, and gives off a nasty smell.

4. The butterfly indicated by the green arrow is probably a paris peacock (*Papilio paris*), a species of swallowtail butterfly found in South Asia. The swallow 'tails' have unfortunately fallen off this example. The striking patches of metallic colour found on the hindwings place this butterfly in a group called the gloss papilios.

Right: Two photographs of Papilio paris.





Case 2



All the specimens in this case date from the late nineteenth-century. They are mounted in 'Denton's Patent Tablet' boxes manufactured by Shelley W Denton of Regent Street. Shelley was one of four brothers from Wellesley, Massachusetts, USA. Their father, William Denton, was a naturalist and explorer who inspired his children with curiosity about the world and its creatures. The young men accompanied their father on various expeditions and two of them were with him when he died of jungle fever while exploring the wilds of New Guinea. After William's death, they continued to collect both in their immediate area and extensively in South America. One of the brothers, Sherman, patented a method for mounting butterflies called the Denton Patent Tablet which displayed the specimen without the need for impaling with a pin. These tablets were sold so that members of the general public could collect exotic butterflies without the need to travel into dangerous locations.



1. The label on the back of the tablet identifies this as a specimen of *Junonia orithya* from India. The blue pansy (*Junonia orithya*) is a South Asian butterfly which occurs in open areas, often sitting on bare ground. This species has a stiff flap and glide style of flight and maintains a territory driving away other butterflies that may enter it.

The label suggests this is a male, but the male has a bright blue hindwing with orange-red eyespots while the female is a sombre brown on the upperside. The photograph above shows the difference. Therefore this example, which has lost some of its colour, is probably a female.

Case 2 (continued)



2. The label on the back of the tablet appears to read *Satyrus schakra* from India. This species name is no longer used. The butterfly appears very similar to the wall brown butterflies which can be found in Europe, including England. There is a related butterfly known as the common wall which is found in India in the Himalayas, sometimes referred to as *Pararge schakra* or *Lasiommata schakra* which is similar to this specimen. A photograph of the common wall can be seen above right.

3. The label on the back of the tablet indicates that this is a specimen of *Euphaedra themis*. The *Euphaedra* genus is largely found in west Africa and contains more than 100 species. *Euphaedra themis* is found from Sierra Leone to Zaire.



4. The label on the back of the tablet indicates that this is a specimen of *Danaus chrysippus* (see photograph A) from India. It is one of the commonest of the Indian butterflies and is a familiar sight to practically everyone on the subcontinent. It flies from dawn to dusk, frequenting gardens, sipping from flowers and, late in the day, fluttering low over bushes to find a resting place for the night. It has the name plain tiger butterfly in India. It is a common and widespread species in both Asia and Africa. It is believed to be one of the first butterflies to be used in art, featuring on a 3,500 year old Egyptian fresco in Luxor.



The plain tiger is protected from predators by toxic alkaloids eaten during the caterpillar stages, which cause vomiting if eaten. The butterfly flies slowly, close to the ground and in a straight line, giving would-be predators ample time to recognise its patterning. An inexperienced predator might try attacking it, but will learn soon enough to avoid this species.



B: Danaus Chrysippus, *Male*.
C: Danaus Chrysippus, *Female*.