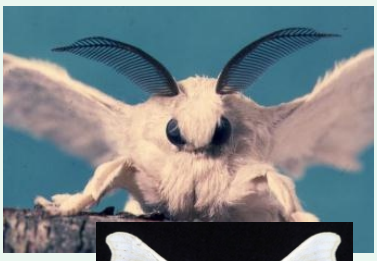
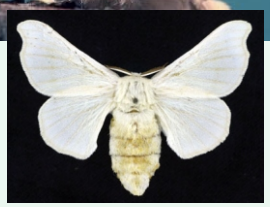
Hands On Learning
with Reading Museum Service

SILK G45

Silk is made by a moth, the silkmoth (*Bombyx mori*). Humans have made silk for about 5,000 years. During this period the silkmoth has become totally dependent on humans and no longer occurs naturally in the wild.





Silkmoth eggs hatch after ten days. The caterpillars feed on the leaves of the white mulberry tree (*Morus alba*). After they have moulted four times (which takes between four and six weeks) they pupate. The hard brown pupa is encased in a layer of raw silk produced in the caterpillar's salivary glands.





After about three weeks the adult moth emerges. It makes a hole in the cocoon so that it can get out. The adult moth can neither fly nor eat, its job is to reproduce. It dies within about five days having laid between 200 to 500 lemon-yellow eggs.





Most silkmoth pupae, however, are not allowed to live long enough to emerge from the cocoon. If they are allowed to make a hole in the raw silk it will be useless for making cloth. Instead the bulk of the cocoons are boiled. The heat kills the silkworms and the water makes the cocoons easier to unravel. In Korea the boiled larvae are spiced and made into a snack called beondegi (below right).





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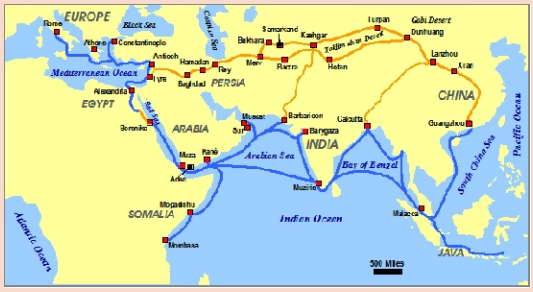
No one really knows who discovered the secret of making silk cloth from moth cocoons, though it took place in China. Tradition claims that it began with the Chinese Empress Hsi Ling Shi (also called Leizu) in about 2600 BC, who noticed the caterpillars making their cocoons in her garden and unwound one. Others say a cocoon fell in her bath and as one of her maids fished it out she noticed its beauty and ability to be unwound. A third variation on this tale says a cocoon fell into her tea and again she noted its beauty and ability to be unwound! The picture on the right shows Chinese women preparing silk.



The Chinese kept a tight grip on silk production for almost 3,000 years. Chinese law decreed death by torture to anyone who disclosed the secret. Silk was exported, earning a fortune for its makers. The famous 'Silk Road', the routes along which the cloth was carried (left), began in the second century BC. In the seventh century sea trade proved far safer. Silk was exported to Rome as early as the first century AD.

Eventually the Chinese control of silk production was broken. In around 140 BC a Chinese princess is said to have hidden some eggs in her headdress when she was married to an Indian prince from Hotan. Then sometime during third century AD the Koreans captured a number of girls who were carrying a supply of silk worms and through them the knowledge spread to Japan.



The secret reached Europe in 552 AD when two Persian monks brought the Byzantine Emperor Justinian some eggs inside one of their bamboo walking canes (right). The crusades brought silk production to Western Europe, in particular to many Italian states. King James I of England attempted to establish silkworm rearing in England, but Britain is too cold to rear silkworms successfully. However, a flourishing silk weaving industry took root in England during the sixteenth century with the arrival of French Huguenots (Protestants), fleeing persecution in their homeland, who were skilled silk workers.

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SILK G45



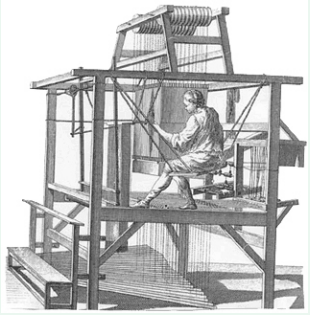


The silk manufacturing process begins with the collection of the cocoons. Each cocoon is coated in a water-soluble protective gum that solidifies on contact with the air. The larvae are killed by dunking the cocoon in hot water. This also softens the gum and causes the ends of thread to become detached. The loose threads are then unwound. In the past this was done by hand, but today it is done by machine. The photographs on the right show this in a modern factory in China.

Unlike wool and other short fibres, silk does not need to be spun to create a continuous thread. The process of turning the silk into usable thread was known as throwing. It involved cleaning (which meant getting rid of tots in the thread), spinning (twisting the thread) and doubling (twisting and combining threads). Greater detail about these processes can be found in the two booklets included in the box.



After the silk had been thrown it was woven in cloth. For thousands of years simple looms were used, some of which are still in use. The photograph on the left shows such a traditional silk loom in Khotan, China.



In Europe in the seventeenth and eighteenth centuries various technical improvements were made which increased the speed of silk weaving looms. These looms could be amazingly complicated, as the illustration of an eighteenth century example on the right shows. Again, more detailed information about this can be found in the two booklets.



Perhaps the most revolutionary technical development was the Jacquard loom (left). This was invented by Frenchman Joseph Jacquard in the early nineteenth century. It used a looped series of punched cards which allowed highly complex patterns to be woven at the same speed as a plain length of cloth. Victorian mathematician Charles Babbage was later to adapt Jacquard's punch-card system to produce a calculator that was the forerunner of today's methods of computer programming.

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SILK G45

Most of the many items in this box, which illustrate the various stages in the production of silk thread, can be explained if necessary by reference to the two booklets. Two items, though, need some further explanation:

Tussah Silk



This is a form of wild silk. It is not made from the cocoons of the silkmoth (*Bombyx mori*), but from other moths, especially the tussah moth (*Antheraea pernyi*, right). Silk can, in fact, be made from the cocoons of many moths. In north east India, for example, thousands of families produce silk from the moth *Samia ricini*. The cocoons, however, are usually harvested after the moth has matured and do not yield a continuous thread. Because of this they must be spun like cotton or wool.

Chinese Mawata Cap

This is not, actually, an item of clothing! Mawata is a Japanese word which, loosely translated, means expanded cocoon. The cocoons used to make mawata items are those that cannot be reeled to make a long continuous thread, as they have holes in them. These cocoons are soaked in warm, soapy water and then stretched over a frame. They are formed into 'hankies' which are stretched over a square frame (left), or 'caps' that are stretched over a bamboo framework, which gives them a cap-like form. Several cocoons are stretched over the frame so that each hankie or cap is composed of several layers. Mawata hankies and caps are sold to people who wish to spin their own silk thread. Each delicate layer is teased off (right) and can be made into a thread using a traditional spinning wheel. This form of silk was originally used as padding inside winter kimonos and other garments, as well as being spun into yarn.



