An Introduction to Silk

All about silk:

Silk is one of the oldest fibres known to man. Its discovery as a weavable fibre is credited to the Lady Xi Ling Shi, the 14 year old bride of the Emperor Huang Ti, the so-called 'Yellow Emperor'. One day in 2640BC, according to Confucius, she was sitting under a mulberry tree, drinking a cup of tea into which a silk cocoon fell from above. She noticed the delicate fibres start to unravel in the hot liquid and has been credited as the first person to 'reel' or unravel a silk cocoon and use the filament to create a yarn for weaving. Whether or not the legend holds true, it is certain that the earliest surviving references to silk production place it in China and that for nearly 3 millennia, the Chinese had a global monopoly on silk production. (More about the history of silk)

Silk is an animal fibre produced by certain insects to build their cocoons and webs. Although many insects produce silk, only the filament produced by the mulberry silk moth, Bombyx mori, and a few others in the same genus, is used by the commercial silk industry. The silk produced by other insects, mainly spiders, is used in a small number of other commercial capacities, for example weapon and telescope cross hairs and other optical instruments.

Silk filament comes from the cocoons built by 'silk worms,' which are not worms at all, but silk moth pupae. If allowed to hatch, the silkworm moth has a lifespan of up to three days. It does not eat and rarely flies, and reaches a wingspan of 40 - 50mm with a thick hairy body. The female lays 300 - 500 eggs in that time.

Cultivation of the silkworm is known as 'sericulture.' The tiny eggs of the silkworm moth are incubated until they hatch into worms, when they are placed under a fine layer of gauze covered with finely chopped mulberry leaves. For six weeks the caterpillars (silkworms) eat almost continually, reaching a length of roughly 75mm. Branches are placed in their rearing houses at the end of this period, which the silkworms will climb to build their cocoons in one continuous length of silk filament. Liquid secretions from two large glands in the insect emerge from the spinneret, a single exit tube in the head, which harden on exposure to the air and form twin filaments composed of fibroin, a protein material. A second pair of glands secretes a gummy binding fluid called sericin which bonds the two filaments together. A cross-section of a single silk filament reveals it to be triangular in shape, and it is the light reflecting off these surfaces that gives silk its sheen.

Over three days, the silkworm spins its cocoon, producing up to 950 metres of silk filament. If the moth were allowed to hatch, the silk strands would be broken. They are preserved intact by killing the pupa before it hatches with hot air or steam. The silk is then unbound from the cocoon by softening the sericin and then delicately and carefully unwinding, or 'reeling' the filaments from 4 - 8 cocoons at once, sometimes with a slight twist, to create a single strand. The amount of usable silk in each cocoon is small, and about 5500 silkworms are required to produce 1 kg (2.2 lb) of raw silk.

The strands are wound together in a process known as 'throwing' to create a silk yarn, varying in weight and texture depending on the number of strands and the twist. As the sericin protects the silk fibre during processing, this is often left in until the yarn or even woven fabric stage. 'Raw silk' is silk that still contains sericin. Once this is washed out (in soap and boiling water), the fabric is left soft, lustrous and up to 30% lighter!

The thickness of silk filament is expressed in terms of denier - the number of grams of weight per 9000 metres. Spun silk is given a numerical designation based on the number of hanks (840yd lengths) per pound.

Silk filament is strong, as strong as steel of the same thickness, resisting breakage up to a weight of 4g per filament, and much stronger than cotton or wool. Silk is also lower in density than cotton, wool or nylon and as such, is highly moisture absorbent, able to absorb as much as a third of its own weight in moisture without feeling damp.

Silk loses strength over time if kept in bad storage conditions (see our Silk Care Instructions) and weakens eventually if constantly exposed to strong sunlight (eg curtains). It is however rarely affected by mildew and unharmed by mild alkaline solutions or standard dry-cleaning processes. Interestingly, the stiff handle on some silks, known as the 'scroop,' is not a natural feature of silk, but added via various manufacturing processes. It is not, contrary to popular belief, a sign of high silk quality.

The History of Silk

The Chinese realized the value of the beautiful material they were producing and kept its secret safe from the rest of the world for more than 30 centuries. Travellers were searched thoroughly at border crossings and anyone caught trying to smuggle eggs, cocoons or silkworms out of the country were summarily executed. Demand for this exotic fabric eventually created the lucrative trade route now known as the 'Silk Road,' of which mention is made as early as 300BC in the days of the Han Dynasty, taking silk westward and bringing gold, silver and wools to the East.

We know that the ancient Persian courts, without the knowledge to make their own, would unravel Chinese silks and reweave them into Persian designs which were so beautiful that when Darius III, King of Persia, eventually surrendered to Alexander the Great, he was clothed in such silken splendour that he completely outshone Alexander, who promptly demanded as spoils of war the equivalent of £11 million in silk.

The Silk Road began at Sian and was some 4,000 miles long. Actually a caravan tract, it followed the Great Wall of China to the north-west, bypassing the Takla Makan desert, climbed the Pamirs (a mountain range), crossed modern-day Afghanistan and went on to the Levant, with a major trading market in Damascus. From there the costly merchandise was shipped across the Mediterranean Sea. Few people travelled the entire route - goods were handled mostly by a series of middlemen.

With the mulberry silk moth native to China, the Chinese had a monopoly on the world's silk production until about 200BC when Korea saw the emergence of its own silk industry thanks to a handful of Chinese immigrants who had settled there. The secret was out. Eventually other countries began to produce silk too, India and Japan being the first to do so in about AD 300. Silk had become a valuable commodity in the western world and in 550AD the Emperor Justinian I sent two Nestorian monks to China to smuggle back some moth eggs and mulberry seeds, which they did at the risk of their lives, concealing the precious goods in bamboo walking staffs. With the arrival of the silk eggs in Byzantium, China's silk monopoly was at an end.
In the C7th, the Arabs conquered the Persians, capturing their magnificent silks in the process. Along with Islam, they spread sericulture and silk weaving as they swept victoriously through Africa, Sicily and Spain.

The centre of silk production in Europe has moved fairly extensively in the last millennium.

Andalusia was Europe's main silk-producing centre in the C10th, but by the 13th century, Italy had dominance. Then, in the middle of the C15th, Lyon (France) became a major warehouse for foreign silks, but these imports caused a harmful outflow of capital, and in 1466 Louis XI declared his intention to "introduce the art and craft of making gold and silk fabrics in our city of Lyon". Later, in 1536, François I gave Lyon the monopoly of silk imports and trade, thus effectively creating the Lyon silk industry.

By the 17th century France was challenging Italy's leadership, and the silk looms established in the Lyons area at that time are still famous today for the unique beauty of their weaving.
The Revocation of the Edict of Nantes in 1685 caused the Huguenots, again subject to religious persecution, to flee France in large numbers. Many Huguenots were expert throwsters and weavers, and they contributed in a very large degree to the development of the silk industry in Germany, Italy, Switzerland and the UK. In England they established silk mill in Spitalfields, a district in the East End of London, but the silkworm has never thrived in this climate, nor indeed in the US where the first silk mill was found in 1810.

In Lyon in 1804, Jacquard perfected the method of producing figured silk fabrics, by the use of perforated cards. This was a revolution in weaving techniques and gave a tremendous boost to the French silk industry.

The nineteenth century and industrialisation saw the beginning of the end for the European sericulture industry. With the opening of the Suez Canal and cheap Japanese silk, followed by the advent of manmade fibres which were beginning to dominate traditionally silk markets, such as stockings and parachutes, the European sericulture industry went into a nosedive. Two World Wars which interrupted the supply of the raw material from Japan sounded its death knell.

After WW2, Japan's silk production was restored, with vastly improved reeling, inspection and classification of the raw silk. Japan was to remain the world's biggest producer of raw silk, and practically the only major exporter of raw silk, until the 1970's. China, thanks to a remarkable effort of organisation and planning, then gradually re-captured her historic position as the world's biggest producer and exporter of raw silk. In 1985, world production of raw silk was about 56000 tonnes (the same as in 1938) of which over 50% were produced in China.

The other major producers are Japan, India, Thailand, the Republic of Korea and Brazil and silk is still produced in smaller quantities by countries around the world.

Silk in Ethiopia

Silk has played an important part in the social and religious life of Ethiopia from the earliest days of the Kingdom of Aksum, which was converted to Christianity in the fourth century. This silk was imported in large quantities from India, Arabia and China, and stored in vast caverns in the central highlands of Ethiopia. One of the hereditary titles of the governor of Shoa province was 'Keeper of the Silk Caves'. From these storehouses, Ethiopian Emperors would make prodigious gifts of silk to other churches in Christendom. Apart from some isolated, historical traditions along the Kenyan coast, Ethiopia has long been the only major silk weaving region in eastern Africa. 1

Silk has particularly been connected to the Church. Ceremonial umbrellas, binding of sacred books, covers for wooden altars and spectacular hangings have all been produced from silk over the centuries. In addition, during the nineteenth century, an

[1] Chirs Spring and Julie Hudson. Silk in Africa. University of Washington Press, Seattle. 2002.

impressive range of woven and/or embroidered silk costumes were created to define the status of the wearer.

Despite this old and important role of silk in Ethiopian history, there are no known records of silk being produced in the country. The silk yarns used for both art and function were imported from China, often obtained from unraveled imported textiles. Though the ancient skills of weaving and design continue in Ethiopia, an exciting opportunity for producing a truly Ethiopian silk product is emerging with the introduction of silk production.

Silk production in Ethiopia

Eri silk was first introduced into Ethiopia about five years ago, with silk eggs brought from Japan to the Malkassa (EARO) Research Station for research and promotion. Since then, the Ministry of Agriculture and Rural Development as well as EARO have been training farmers and households for silk cocoon production throughout the country. Though eri silk seems particularly suitable for Ethiopian conditions, mulberry silk is also being promoted on a limited scale.2 However, most agree that eri silk is suitable for Ethiopian conditions for many reasons:

1. the worm eats castor leaves. Castor plants grow easily, even on marginal lands, and can be intercropped with coffee and enset.
2. the eri silk worm is hardy, and disease resistant. This is a clear advantage over the mulberry silk worm which is more susceptible to disease, especially given the typical rearing conditions in rural households which are not highly sanitary.
3. labor requirements for cocoon production can be easily handled at a household level. The most significant work is picking the leaves and feeding the worms, which are kept indoors. The technical knowledge required can be acquired through basic training.
4. the capital requirement for establishing household level cocoon production is minimal, and much of the required equipment can be constructed locally.
5. the production cycle of eri silk can be as short as 45 days, meaning that a household can obtain some income every 45-50 days.
6. dried cocoons are not perishable, enabling storage for long periods of time if required.
7. eri silk thread is produced by spinning the cocoon fibers. This spinning can be done easily on the drop spindle...the ancient yet appropriate spinning technique used all over Ethiopia for spinning cotton. Women can gain extra income from their silk business if they spin and sell the thread rather than selling the cocoons.

Reasons such as these were the motivation for the establishment of Sabahar, the first Ethiopian silk company focused on promoting the silk sector in the country.

[2] Mulberry silk is by far the most known silk in the world, constituting about 90% of all silk produced worldwide. This kind of silk is produced by a worm which feeds on the leaves of the mulberry tree, a plant which grows well in Ethiopia though is not indigenous. Eri silk worms eat castor or cassava leaves and are also found in India and on a small scale in other Asian countries.

The Experience of Sabahar

Sabahar is an Ethiopian company established in 2006 which produces and markets silk and silk/cotton products for local and international markets3. A pioneer in the Ethiopian silk sector, the company is committed to creating reliable employment for vulnerable households – those who produce cocoons as well as for spinners and weavers. The experience of Sabahar confirms that eri silk production is appropriate for Ethiopia. Households from the southern, western and northern parts of the country are successfully producing cocoons and earning good supplementary income from marketing their production to Sabahar. Nearly 100 women in and around Addis Ababa are gaining much needed income from spinning silk thread, and more than 20 weavers are engaged in producing silk and silk/cotton products. International reaction to the Ethiopian made products has been very positive...appreciating the hand made and organic nature of the products. The natural dyes used add their own beauty, reflecting the rich colors and hues of the beautiful Ethiopian landscape.

[3] Saba is the name of the Queen of Sheba, who came from Ethiopia and har means silk in Amharic.