



Threads Crossing the Warp

MODULE 12

The relation of weaving to other practices and knowledge involved in the exploitation of natural environment



Partners



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THE RELATION OF WEAVING TO OTHER PRACTICES AND KNOWLEDGE INVOLVED IN THE EXPLOITATION OF NATURAL ENVIRONMENT

Weaving is an amazing craft which utilizes beautiful wooden tools: looms, shuttles, frames and more. These tools are works of art in and of themselves, and even more incredible is the fact that they have been around since the same time our ancestors were developing stone tools- around 10,200 BC. Although weaving is a traditional craft, which was developed alongside ceramics, woodworking, stone and metalwork.

Looking at traditional textiles throughout the world is also a way to aesthetically define culture, geography, and social structure. Textiles are made with different patterns, colors, textures and densities for all different purposes.



Exquisite handwoven Italian tapestries that you see at all the art museums. Created by hundreds of people but made by hands nonetheless!



Guatemala- This woman is working on a back strap loom, an ingenious invention that allows weaving to be done almost anywhere without lugging around a big cumbersome floor loom. This is how Living Threads' natural dye blankets are made!

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The first evidence for the technique of weaving and the known oldest woven textiles are found in the context of the Eurasian Palaeolithic. This suggests that the 'know how' of plant utilisation, beyond their consumption as food, was linked with the cold climate and harsh environment that prevailed at this time. Animals skins and fur unarguably provided the best protection against the cold.

In Peru, hats, scarves, bags, socks, sweaters and headbands are weaved with care using locally-sourced fabrics like alpaca, vicuna and sheep. “The weaving tradition also embodies a wealth of traditional knowledge, from techniques of spinning and weaving, to which plants are useful for dyeing – when they grow, and how to prepare them – as well as the range of symbols particular to a community and what they mean to that community.”

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There is much more to weaving than just connecting thread. It all starts with shearing the animals and washing the fibers. From there, the fibers are spun into a fine yarn using a very old tool, a drop-spindle. These consist of a wooden stick with a weight at one end. Weavers clasp the stick in their hands and give it a spin, letting it hang freely as it spins. The energy from the spinning motion of the spindle travels into the fiber, twisting the fibers together to form yarn.

In the Andes, there is a history of using locally available plants, minerals and insects to impart color to animal fiber. This usually involves collecting the materials necessary, preparing them for use by, for example, drying and grinding leaves, and then adding them to boiling water in various quantities and combinations in order to produce myriad different shades.

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The weaver will decide what designs and colors she will use for the finished product in order to begin with the warping process, which prepares the yarn for weaving.

Wooden or bone tools are used to ensure a tight and compact weaving before a second row is started, with the weaver selecting each yarn necessary for the next line of the design. This is a much different process still in use in villages of Peru and in some other places around the world, from what many people use in modern times; however, it is the traditional method and also produces a quality product.



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- It is worth noting that weaving, in addition to the unique values it represents, remains one of the intermediate links of human connection and coexistence with nature with all its resources. Even today, besides the unstoppable momentum of modernization, weaving remains connected and harmonized with natural values in all aspects of environmental biodiversity.
- In many different countries of the world, such as Albania, Romania, Turkey, or in Morocco, Spain, Tibet, Mongolia, India and many countries and continents across the globe have maintained the perfect relationship between the natural values associated with the products of the craftsmen , especially with the manufacture of fabrics, woolen products, crochet weaving where all the constituent elements are accommodated.
- The ever-increasing demands for products of these crafts have also brought a greater concentration of state and private attention to preserving biodiversity and fostering and sustaining in all forms of cooperation this rich tradition, which the invasions of globalization have not affected and replaced with any other area of social activity.

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- Natural resources are resources that exist without any actions of humankind. This includes all valued characteristics such as commercial and industrial use, aesthetic value, scientific interest and cultural value. On Earth, it includes sunlight, atmosphere, water, land (includes all minerals) along with all vegetation, and animal life. Natural resources can be part of our natural heritage or protected in nature reserves.
- Natural resources may be further classified in different ways. Natural resources are materials and components (something that can be used) that can be found within the environment. Every man-made product is composed of natural resources (at its fundamental level). A natural resource may exist as a separate entity such as fresh water, air, as well as any living organism such as a fish, or it may exist in an alternate form that must be processed to obtain the resource such as metal ores, rare-earth elements, petroleum, and most forms of energy.

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- There are various methods of categorizing natural resources. These include the source of origin, stage of development, and by their renewability.
- On the basis of origin, natural resources may be divided into two types:
- Biotic — Biotic resources are obtained from the biosphere (living and organic material), such as forests and animals, and the materials that can be obtained from them. Fossil fuels such as coal and petroleum are also included in this category because they are formed from decayed organic matter.
- Abiotic – Abiotic resources are those that come from non-living, non-organic material. Examples of abiotic resources include land, fresh water, air, rare-earth elements, and heavy metals including ores, such as gold, iron, copper, silver, etc.
- Considering their stage of development, natural resources may be referred to in the following ways:

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- Potential resources — Potential resources are those that may be used in the future—for example, petroleum in sedimentary rocks that, until drilled out and put to use remains a potential resource
- Actual resources — Those resources that have been surveyed, quantified and qualified, and are currently used in development, such as wood processing, and are typically dependent on technology
- Reserve resources — The part of an actual resource that can be developed profitably in the future
- Stock resources — Those that have been surveyed, but cannot be used due to lack of technology—for example, hydrogen

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Textile consists of filaments or fibres. Filament is a synthetic fibre. Synthetic fibres are formed by spraying a syrupy liquid under high pressure through the spinnerets. With this method endless yarns are created which are ready for production.

Fibres are formed through short, twisted fibres. When these fibres are twisted into yarns they are ready for production.

Through these two types of textile we can divide the raw materials into:

Natural materials; such as cotton, linen, wool, silk.

Synthetic materials; such as polyester. At the end of the 19th century the first synthetic fibres were made and the discovery of nylon and later, for example, polyester followed in the 20th century.

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To make textile, you need yarns or filaments. Fabric is processed by knitting or weaving, thus creating a cloth. This fabric is made into textile products.

These days synthetic fibres are still being invented. Therefore durability is becoming a more important factor as well. Nevertheless, the large majority of textile products continue to be made from natural materials. The cotton shirt has become an indispensable feature in the world of textiles.

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Natural fibres can be defined as bio-based fibres or fibres from vegetable and animal origin. This definition includes all natural cellulosic fibres (cotton, jute, sisal, coir, flax, hemp, abaca, ramie, etc.) and protein based fibres such as wool and silk. On the other hand there are manmade cellulose fibres (e.g. viscose-rayon and cellulose acetate) that are produced with chemical procedures from pulped wood or other sources (cotton, bamboo). Similarly, regenerated (soybean) protein, polymer fibre (bio-polyester, PHA, PLA) and chitosan fibre are examples of semi-synthetic products that are based on renewable resources.

Practically everywhere and in all countries natural fibres are produced and used to manufacture a wide range of traditional and novel products from textiles, ropes and nets, brushes, carpets and mats, mattresses to paper and board materials. The long fibres are transformed to threads or yarns that are used to join, connect or attach and to form bonds, networks or weaves.

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Some companies have developed new eco-friendly textiles from algae, soya, milk casein, bamboo, etc. Ingeo, a natural synthetic fibre made by distilling plant sugar from plant starches such as corn, has made its high-fashion debut thanks to the Italian jean designer Diesel, and soon Versace Sport.

Other firms make clothes from natural or recycled materials. In China, Bambro Textiles works with bamboo fiber, spun from bamboo grown in Yunnan province, to propose a range of household linens in this 100% natural and biodegradable material. Patagonia has been manufacturing fleece sweaters from recycled plastic bottles for several years.

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Milk Yarn

Cyarn milk protein fiber is healthy for skin, comfortable, with bright colors due to good dyeability, etc. The milk protein fiber can be spun purely or spun with cashmere, silk, spun silk, cotton, wool, ramie and other fibers to weave fabrics with the features of milk protein fiber. It can also be used to create top-grade underwear, shirts, T shirts, loungewear, etc. to satisfy people's pursuit of comfortable, healthy, superior and fashionable garments.

The milk protein fiber is a fresh product as a superior green, healthy and comfortable fiber, milk protein fiber will certainly become popular goods in the market as new favorite of the Textile.

Spun from milk protein (casein), our milk yarn combines properties of natural and synthetic yarns. It's glossy and luxurious like silk; antibacterial and antifungal like bamboo; and strong, durable, and wrinkle-free like acrylic. Colors shimmer in gorgeous pastels or vibrant jewel tones. All milk yarns are machine-washable, so they're a great choice for baby clothes, garments, and accessories.



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Hemp, The Natural Choice

Hemp plants grow very quickly and densely. Along with bamboo, hemp is one of the fastest growing plants on Earth. It was also one of the first plants to be spun into usable fiber 50,000 years ago. It can be refined into a variety of commercial items, including paper, rope, textiles, clothing, biodegradable plastics, paint, insulation, biofuel, food, and animal feed

Hemp has naturally long fibres which makes it suitable for spinning with a minimum of processing. Those fibres are also long-lasting, in fact, historically hemp has been used for making naval ropes that were used in and around water because they resist rot. Hemp fabrics come in a variety of weights and textures. You can purchase fabric or clothing, woven or knit; buy yarn, rope, belts and a wide range of products made of this versatile plant.



Just Hemp fits all temps! This yarn is 100% hemp, which feels cool in the summer and warm in the winter. Like linen and other plant fibers, hemp works up into a durable fabric with wonderful drape. The yarn will soften as you stitch with it and get even softer with every wash, dry, and wear! Create beautiful projects like skirts and sweaters, washcloths and bags, and even blankets.

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Soy silk

Soy silk is made from the by-products of the tofu-making process. The liquefied proteins are extruded into fibres which are then spun, and used like any other fibre (woven, knitted, etc.). The high protein content makes it receptive to natural dyes, so you can create your own colours.



Soybean plant, soybean seeds and soybean fiber (SPF)



Soybean protein fiber is under the classification of Azlon group and it is also known as “vegetable cashmere,” “artificial cashmere,” and “soy silk” due to its cashmere feel. The natural color of soybean protein fibers is pale yellow or cream. Soybean fiber is soft, smooth, light and has natural luster like silk fiber, which contributes a luxurious appearance to its fabric. Soybean fiber exhibits perfect draping ability leading to elegant appearance and feeling with comfortable wearing conditions

Ingoe Corn Fiber

Ingoe is created by extracting the starch and then sugars from corn, and processing them to make a fibre, which can be spun into a yarn or woven into fabric.



(a)



(b)



(c)



(d)



(e)



Corn fiber is comparable to the man-made polyester fibre. From the spinning of the fibre, the spinning of the yarn, the fabric production, dyeing and finishing, both compare similarly. In physical characteristics, both are available in filament and staple form, they are both melt-spun, the weaving and knitting set-ups for each is roughly the same, both can withstand fair amount of heat treatment and both get dyed by disperse dyes.

During spinning, the roving is attenuated to the desired diameter called the final draft and the desired amount of twist is inserted. After this it is the weaving of the corn fiber cloth that has two stages – Warping and Sizing.

Corn fiber – an exciting addition to the world of fabrics.





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Animal products used in clothing include fur, leather, silk, and wool. Wood, iron, copper, silver, also have a special place in the use of the natural environment.

The objects made of bone, stone, antler or baked clay were used to make the clothing. Thread was spun using a drop spindle weighted at one end by a stone or clay whorl to provide tension and momentum. Spindle whorls are usually circular with a hole in the middle. Loom weights, generally of baked clay with a hole poked through before firing, could be triangular or rectangular. Weaving swords, combs and needles were made from leftover animal bone or antler. From this evidence we can deduce that Iron Age people spun thread and used upright warp-weighted looms to weave cloth.



Objects used for preparing clothing made by stone, clay and wood



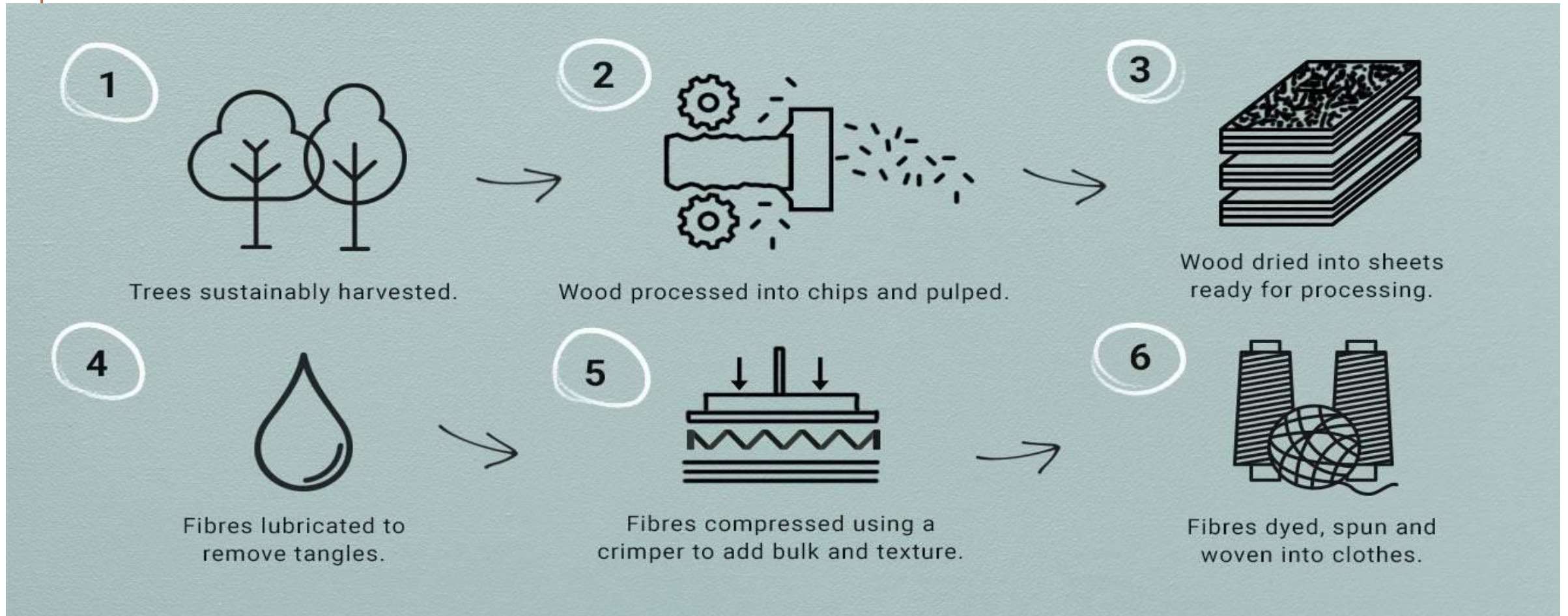
WOOD

- Wood, the basic construction material of the looms, is the most widespread representative of the earth flora which is reported in the very distant past of our earth.
- At a higher stage of self-development, man, aware of the properties of certain qualities of wood, cuts and saws the tree (oak) and uses its parts to improve the conditions of survival and life. It is interesting for us today as a human being until he has created himself (even with the help of wood) the conditions of survival on earth and even when he has provided these conditions there is a feeling and need for decoration, giving the artistic form of wood and products his. Without wood products such as cellulose, paper production cannot be considered.



Different types of wood

WOOD



Tencel process banner

WOOD

Tencel is a natural, man-made fiber. It has many of the qualities of synthetics, but is made of natural cellulose found in wood pulp.

It all starts with wood from sustainable tree farms. Specifically eucalyptus, oak and birch. After being harvested, the wood is ground into a pulp and dissolved with amine oxide which is a non toxic surfactant. It is commonly used in shampoos and conditioners. What remains is raw cellulose – a sticky, viscous liquid. The mixture is pushed through spinnerets that transforms the cellulose into fibres. After washing, drying and compressing, the bio-fibres are spun into yarn and eventually woven into fabric.

WOOD

This entire process is used in a closed looped system which means that the solvent is recycled time and time again to produce new fibres and minimise harmful waste.

Products that can be made from this material include all forms of clothing such as shirts, pants, skirts, and suits, as well as sheets or any other cloth application where something other than cotton is desired. Tencel can be blended with other materials to produce other effects, however depending on the materials it is blended with it may or may not affect the biodegradability of the product. Tencel could be an excellent replacement for synthetic materials such as Rayon. The full product lifespan has been taken into consideration during design as well

WOOD



WOOD

Any product, which is made, used or disposed of in a way that significantly reduces the harm it would otherwise cause to the environment, could be considered as eco-friendly product. Slowly, consumers in India are taking lead in prompting manufacturers to adopt clean technologies to produce eco-friendly products.

Eco-clothes are made from organic raw materials that are grown without pesticides. This reduces damage to the environment, animals and peoples health. Other eco-clothes are made using recycled textiles or plastics, saving on waste, landfill space and the amount of raw materials used.

Wood was used to build loom machines but in nowadays we can see as I wrote above the wood is used even for prepare textile, in this case denim.

The loom marks belong to the Neolithic period. They were very simple constructions, little more than a rectangular frame built with branches or wooden pillars placed in a vertical position.

The tension of the vertical tissue fibers was realized by means of weights, in clay or stone, which are found very numerous in archeological excavations.



Ancient wooden loom



Vintage loom

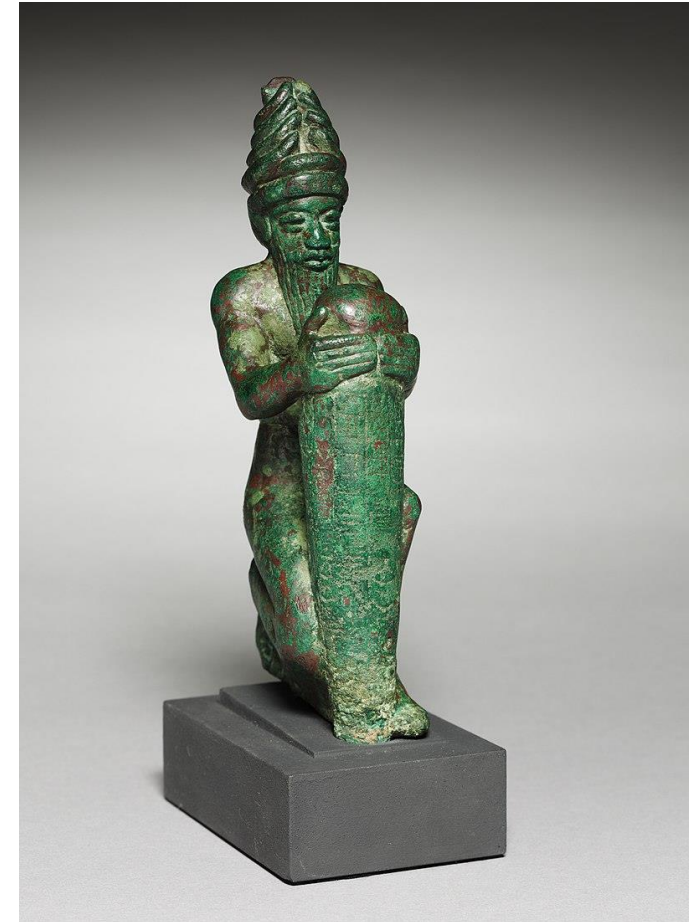
IRON

- It is by mass the most common element on Earth, forming much of Earth's outer and inner core.
- Humans started to master that process in Eurasia only about 2000 BCE and the use of iron tools and weapons began to displace copper alloys, in some regions, only around 1200 BCE. That event is considered the transition from the Bronze Age to the Iron Age. In the modern world, iron alloys, such as steel, inox, cast iron and special steels are by far the most common industrial metals, because of their mechanical properties and low cost.



COPPER ALLOYS

- Copper alloys are metal alloys that have copper as their principal component. They have high resistance against corrosion. The best known traditional types are bronze, where tin is a significant addition, and brass, using zinc instead. Both of these are imprecise terms, having both been commonly referred to as lattens in the past. Today the term copper alloy tends to be substituted, especially by museums
- Example of a copper alloy object: a Neo-Sumerian "Foundation Nail" of Gudea, circa 2100 BC, made in the lost-wax cast method, overall: 17.5 x 4.5 x 7.3 cm, probably from modern-day Iraq, now in the Cleveland Museum of Art (Cleveland, Ohio, USA)



Copper

Venezuelan textile artists, Mariá Dávila and Eduardo Portillo describe their work as “driven by our relationship with our surroundings and how it can be communicated within a contemporary textile language”.

Nebula



Copper

Using primarily natural dyes and a combination of indigenous palm fiber (morange), silk produced on their farm, and metallic fiber, Davila and Portillo's Nebula is a mosaic of light and color. It is a triple weave structure with two warps: one made using a combination of very fine 22 denier silk and coarser 300-400 denier silk; and the second made from morange that gives shape to each mosaic cell. Davila and Portillo explain that “the metallic yarn and copper filament are the light,” and help to bridge the piece while providing a new dimension in their pursuit of color.

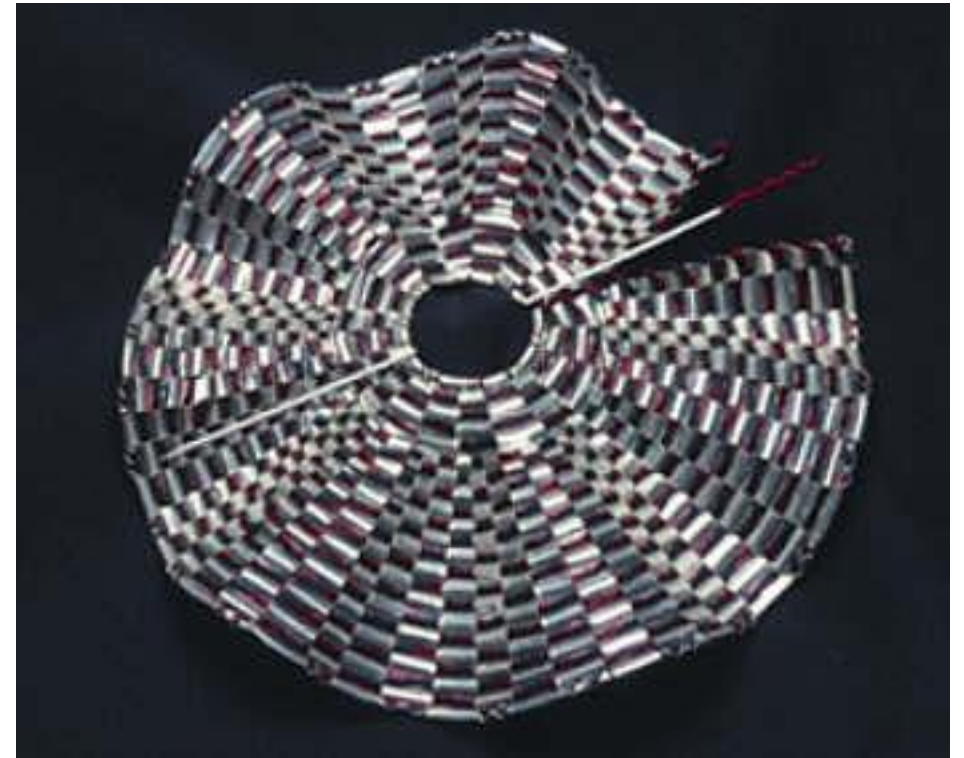
SILVER

- Silver has long been valued as a precious metal. Silver metal is used in many bullion coins, sometimes alongside gold: while it is more abundant than gold, it is much less abundant as a native metal. As one of the seven metals of antiquity, silver has had an enduring role in most human cultures.
- A pure ($>99.95\%$) silver crystal, synthetic electrolytic made with visible dendritic structures. Weight ≈ 11 g. this image was made from 12 single pictures via focus stacking



Silver

Barbara M. Berk writes that textile techniques are traditionally worked with fibers such as linen, cotton and silk. However, they can also be applied to metal. She weaves in high karat gold and platinum sheet and wire by hand. By the process of weaving is created “fabric”. She shape that “fabric” into ribbons and ruffles, spirals and loops, which become earrings, brooches, necklaces and pendants.



Large Ruffle Brooch by Barbara M. Berk

Silver

Weaving is the interlacing of two sets of elements, one vertical and one horizontal. The vertical element – the warp – is sheet that is cut into strips or wedges. The horizontal element – the weft – is multiple strands of thin wire twisted together. The pattern is a Plain Weave, in which the wire crosses over the sheet, then under the sheet, continuing over one warp, under one warp. The strong color contrast in Large Ruffle Brooch makes it easy to read the Plain Weave: the warp, the vertical element, is sterling silver sheet; the weft, the horizontal element, is comprised of red magnet wire (resin coated copper) twisted with black silk thread.

Textile techniques in general, and weaving in particular, offer the opportunity to work in new ways with familiar forms of sheet and wire. In the process of mastering these techniques, one can explore color, pattern, texture, structure and scale.

WOOL

Wool is the textile fiber obtained from sheep and other animals, including cashmere and mohair from goats, qiviut from muskoxen, hide and fur clothing from bison, angora from rabbits, and other types of wool from camelids





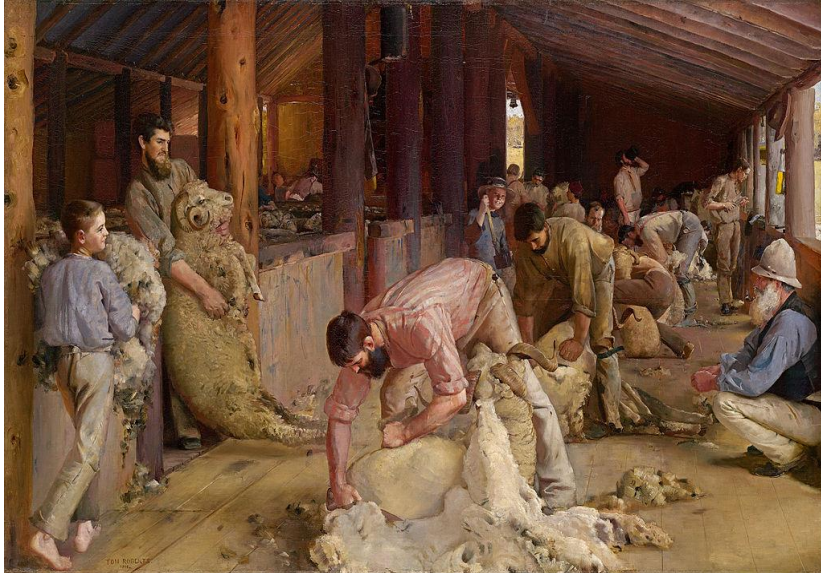
Fine Merino shearing in
Lismore, Victoria



Shorn sheep



Shears and cowbells
c.250AD Spain



Shearing the Rams by Tom Roberts, 1890



Blade shears



Various types and natural colors of wool, and a picture made from wool

Sheep shearing is the process by which the woollen fleece of a sheep is cut off. The person who removes the sheep's wool is called a shearer. Typically, each adult sheep is shorn once each year

WOOL

- The quality of wool is determined by its fiber diameter, crimp, yield, color, and staple strength. Fiber diameter is the single most important wool characteristic determining quality and price.
- Any wool finer than 25 microns can be used for garments, while coarser grades are used for outerwear or rugs. The finer the wool, the softer it is, while coarser grades are more durable and less prone to pilling.
- In the United States, three classifications of wool are named in the Wool Products Labeling Act of 1939. Wool is "the fiber from the fleece of the sheep or lamb or hair of the Angora or Cashmere goat (and may include the so-called specialty fibers from the hair of the camel, alpaca, llama, and vicuna) which has never been reclaimed from any woven or felted wool product"

WOOL

- Wild sheep were hairier than woolly. Although sheep were domesticated some 9,000 to 11,000 years ago, archaeological evidence from statuary found at sites in Iran suggests selection for woolly sheep may have begun around 6000 BC.
- Prior to invention of shears—probably in the Iron Age—the wool was plucked out by hand or by bronze combs. In Roman times, wool, linen, and leather clothed the European population; cotton from India and silks, imported along the Silk Road from China.
- A great deal of the value of woolen textiles was in the dyeing and finishing of the woven product.
- Dyeing is the application of dyes or pigments on textile materials such as fibers, yarns, and fabrics with the goal of achieving color with desired color fastness. The primary source of dye, historically, has been nature, with the dyes being extracted from animals or plants.

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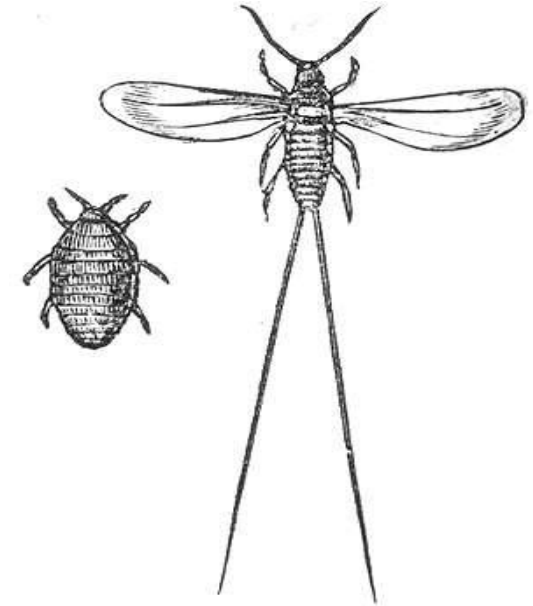
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The Navajo spun their yarn by hand from cotton and wool, coloring it with indigo purchased from the Spanish and other plant dyes purchased from the Pueblo Indians. They also incorporated the natural color of wool, creating a neutral palette of browns and creamy whites. The Germantown yarn came in vivid hues unfamiliar to the Navajo—made from synthetic dyes derived largely from aniline, a derivative of coal tar, which produces bright reds, blues, blacks, violets, and magentas.

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Natural insect dyes such as Cochineal and kermes and plant-based dyes such as woad, indigo and madder were important elements of the economies of Asia and Europe until the discovery of man-made synthetic dyes in the mid-19th century.

The cochineal is a scale insect in the suborder Sternorrhyncha, from which the natural dye carmine is derived. A primarily sessile parasite native to tropical and subtropical South America through North America (Mexico and the Southwest United States), this insect lives on cacti in the genus *Opuntia*, feeding on plant moisture and nutrients. The insects are found on the pads of prickly pear cacti, collected by brushing them off the plants, and dried.



Cochineal drawing



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- Cochineal dye was used by the Aztec and Maya peoples of North and Central America as early as the second century BC. Eleven cities conquered by Montezuma in the 15th century paid a yearly tribute of 2000 decorated cotton blankets and 40 bags of cochineal dye each. Production of cochineal is depicted in Codex Osuna. During the colonial period, the production of cochineal (grana fina) grew rapidly. Produced almost exclusively in Oaxaca by indigenous producers, cochineal became Mexico's second-most valued export after silver.
- Natives of Peru had been producing cochineal dyes for textiles since at least 700 CE, but Europeans had never seen the color before. When the Spanish invaded the Aztec empire in what is now Mexico, they were quick to exploit the color for new trade opportunities. Carmine became the region's second-most-valuable export next to silver. Pigments produced from the cochineal insect gave the Catholic cardinals their vibrant robes and the English "Redcoats" their distinctive uniforms. The true source of the pigment—an insect—was kept secret until the 18th century, when biologists discovered the source.

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The two principal forms of cochineal dye are cochineal extract, a coloring made from the raw dried and pulverized bodies of insects, and carmine, a more purified coloring made from the cochineal.

Mexican Indian Collecting Cochineal with a Deer Tail by José Antonio de Alzate y Ramírez (1777). The host plant is a prickly pear.



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- Traditionally, cochineal was used for coloring fabrics. During the colonial period, with the introduction of sheep to Latin America, the use of cochineal increased, as it provided the most intense color and it set more firmly on woolen garments than on clothes made of materials of pre-Hispanic origin such as cotton or agave and yucca fibers.
- For the past several centuries, it was the most important insect dye used in the production of hand-woven oriental rugs, almost completely displacing lac. It was also used for painting, handicrafts, and tapestries. Cochineal-colored wool and cotton are important materials for Mexican folk art and craft.



Wool dyed with cochineal



A cluster of females



Zapotec nests on *O. ficus-indica*

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Rubia is a genus of flowering plants in the family Rubiaceae. It contains around 80 species of perennial scrambling or climbing herbs and subshrubs native to the Old World. Rubia was an economically important source of a red pigment in many regions of Asia, Europe and Africa. The genus name Rubia derives from the Latin *ruber* meaning "red".

The plant's roots contain an anthracene compound called alizarin that gives its red colour to a textile dye known as Rose madder. It was also used as a colourant, especially for paint, that is referred to as Madder lake. The synthesis of alizarin greatly reduced demand for the natural compound



Rubia tinctorum, Rubiaceae, Common Madder, inflorescence. Botanical Garden KIT, Karlsruhe, Germany.



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- Indigo dye is an organic compound with a distinctive blue color. Historically, indigo was a natural dye extracted from the leaves of some plants of the Indigofera genus, in particular Indigofera tinctoria; dye wielding Indigofera plants were commonly grown and used throughout the world, in Asia in particular, as an important crop, with the production of indigo dyestuff economically important due to the previous rarity of some blue dyestuffs historically.
- Most indigo dye produced today is synthetic, constituting several thousand tons each year. It is most commonly associated with the production of denim cloth and blue jeans, where its properties allow for effects such as stone washing and acid washing to be applied quickly.

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The oldest known fabric dyed indigo, dated to 6,000 years ago, was discovered in Huaca Prieta, Peru. Many Asian countries, such as India, Japan, and Southeast Asian nations have used indigo as a dye (particularly silk dye) for centuries. The dye was also known to ancient civilizations in Mesopotamia, Egypt, Britain, Mesoamerica, Peru, Iran, and Africa. Indigo was also cultivated in India, which was also the earliest major center for its production and processing.



Yarn dyed with
indigo dye



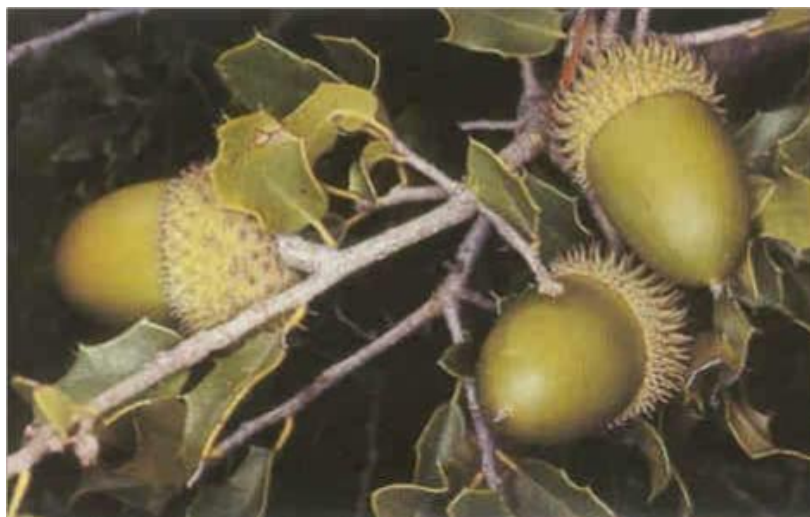
Indigo, historical dye collection of the Technical
University of Dresden, Germany



Indigo dye

THE RELATION OF WEAVING TO OTHER PRACTICES AND KNOWLEDGE INVOLVED IN THE EXPLOITATION OF NATURAL ENVIRONMENT

- Kermes is a red dye derived from the dried bodies of the females of a scale insect in the genus Kermes, primarily Kermes vermilio. The Kermes insects are native in the Mediterranean region and live on the sap of the Kermes oak. They were used as a red dye by the ancient Greeks and Romans. The kermes dye is a rich red, a crimson. It has good colour fastness in silk and wool. It was much esteemed in the medieval era for dyeing silk and wool, particularly scarlet cloth. Post-medievally it was replaced by other red dyes, starting with cochineal.
- Kermes dye is of ancient origin; jars of kermes have been found in a Neolithic cave-burial at Adaouste, northeast of Aix-en-Provence.



Mini Carvalhos, kermes oak



The Coronation Mantle of Roger II of Sicily, silk dyed with kermes and embroidered with gold thread and pearls. Royal Workshop, Palermo, Sicily, 1133-34, Kunsthistorisches Museum, Vienna.

THE RELATION OF WEAVING TO OTHER PRACTICES AND KNOWLEDGE INVOLVED IN THE EXPLOITATION OF NATURAL ENVIRONMENT

- In the Middle Ages, rich crimson and scarlet silks dyed with kermes in the new silk-weaving centers of Italy and Sicily exceeded the legendary Tyrian purple "in status and desirability". The dyestuff was called "grain" in all Western European languages because the desiccated eggs resembled fine grains of wheat or sand, and textiles dyed with kermes were described as dyed in the grain.[4] Woolens were frequently dyed blue with woad before spinning and weaving, and then piece-dyed in kermes, producing a wide range colors from blacks and grays through browns, murreys, purples, and sanguine.
- *Isatis tinctoria*, also called woad, dyer's woad, or glastum, is a flowering plant in the family Brassicaceae. It is occasionally known as Asp of Jerusalem. Woad is also the name of a blue dye produced from the leaves of the plant. Woad is native to the steppe and desert zones of the Caucasus, Central Asia to Eastern Siberia and Western Asia but is now also found in South-Eastern and Central Europe and western North America. Since ancient times, woad was an important source of blue dye and was cultivated throughout Europe, especially in Western and Southern Europe.



*Isatis tinctoria*02



Fruits and seeds of *Isatis tinctoria*
(Muséum de Toulouse)



The tapestry series The Hunt of the Unicorn (here No. 6: The Unicorn is Killed and Brought to the Castle, c. 1500), was dyed with weld (yellow), madder (red), and woad (blue).

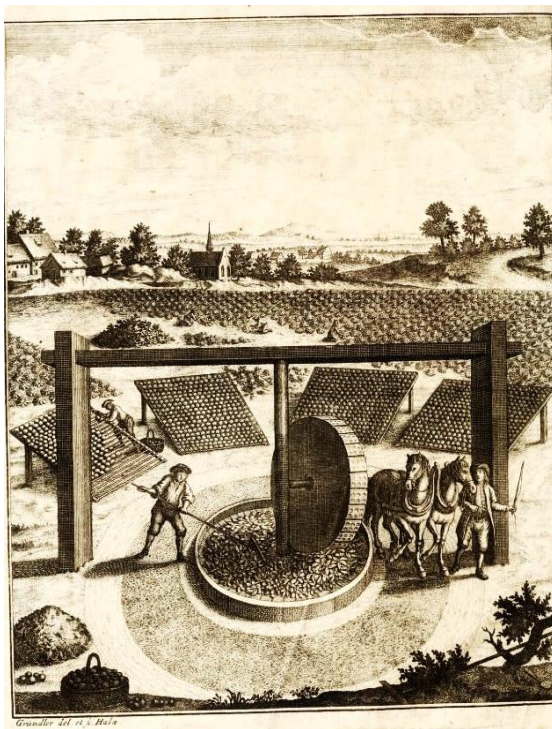


Illustration of German woad mill in Thuringia, 1752



Dyed wool reels (CSIRO)



COTTON

- Cotton is a soft, fluffy staple fiber that grows in a boll, or protective case, around the seeds of the cotton plants of the genus *Gossypium* in the mallow family *Malvaceae*. The fiber is almost pure cellulose. Under natural conditions, the cotton bolls will increase the dispersal of the seeds.
- The plant is a shrub native to tropical and subtropical regions around the world, including the Americas, Africa, Egypt and India. The greatest diversity of wild cotton species is found in Mexico, followed by Australia and Africa. Cotton was independently domesticated in the Old and New Worlds.

COTTON

The fiber is most often spun into yarn or thread and used to make a soft, breathable textile. The use of cotton for fabric is known to date to prehistoric times; fragments of cotton fabric dated to the fifth millennium BC have been found in the Indus Valley Civilization, as well as fabric remnants dated back to 6000 BC in Peru. Although cultivated since antiquity, it was the invention of the cotton gin that lowered the cost of production that led to its widespread use, and it is the most widely used natural fiber cloth in clothing today.



Balls of cotton ready for harvest



A cotton field, late in the season.



A display from a British cotton manufacturer of items used in a cotton mill during the Industrial Revolution.



Picking cotton in Armenia in the 1930s. No cotton is grown there today.

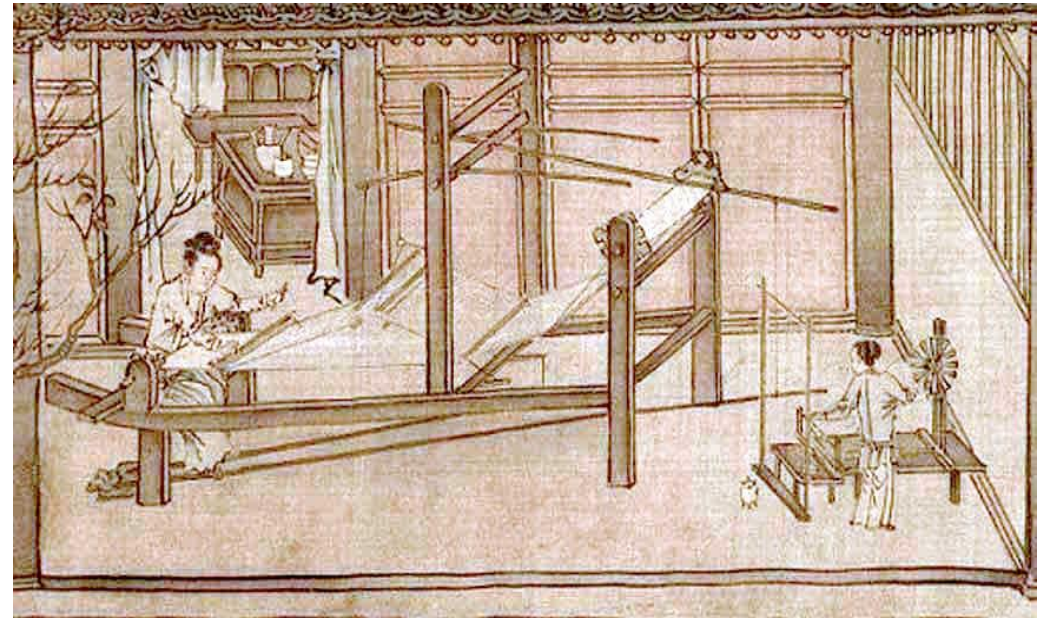


SILK

- Silk is a natural protein fiber, some forms of which can be woven into textiles. The protein fiber of silk is composed mainly of fibroin and is produced by certain insect larvae to form cocoons. The best-known silk is obtained from the cocoons of the larvae of the mulberry silkworm *Bombyx mori* reared in captivity (sericulture). The shimmering appearance of silk is due to the triangular prism-like structure of the silk fibre, which allows silk cloth to refract incoming light at different angles, thus producing different colors.
- Silk is produced by several insects; but, generally, only the silk of moth caterpillars has been used for textile manufacturing.
- Silk use in fabric was first developed in ancient China. The earliest evidence for silk is the presence of the silk protein fibroin in soil samples from two tombs at the neolithic site Jiahu in Henan, which date back about 8,500 years.

SILK

Silks were originally reserved for the Emperors of China for their own use and gifts to others, but spread gradually through Chinese culture and trade both geographically and socially, and then to many regions of Asia. Because of its texture and lustre, silk rapidly became a popular luxury fabric in the many areas accessible to Chinese merchants. Silk was in great demand, and became a staple of pre-industrial international trade.



The silk is woven using a loom.



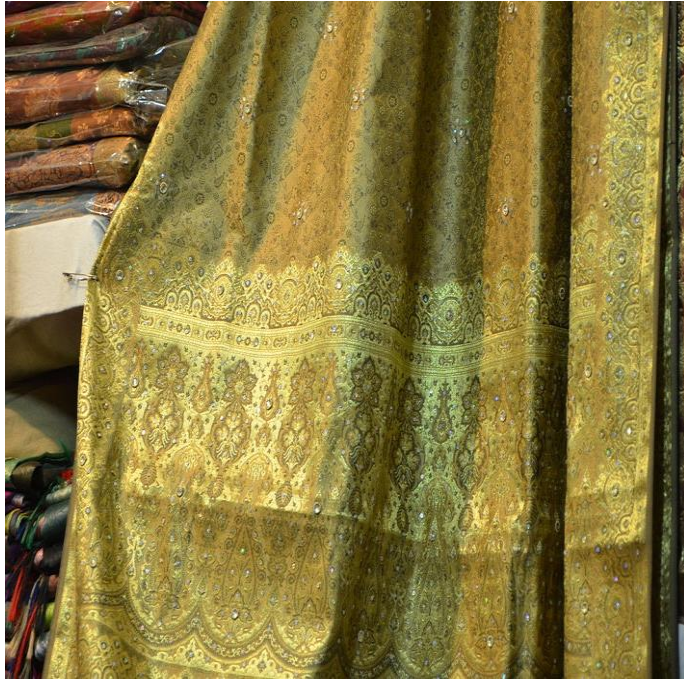
Four of the most important domesticated silk moths. Top to bottom: *Bombyx mori*, *Hyalophora cecropia*, *Antheraea pernyi*, *Samia cynthia*. From Meyers Konversations-Lexikon (1885–1892)



Silk sari weaving at Kanchipuram

Antheraea assamensis, the endemic species in the state of Assam, India





A traditional Banarasi sari with gold brocade



Silk satin leaf, wood sticks and guards, c. 1890



The Gunthertuch, an 11th-century silk celebrating a Byzantine emperor's triumph

The relation of weaving to other practices and knowledge involved in the exploitation of natural environment

Most common natural fibre textiles for clothing are produced from cotton or to a lesser extent from other fibres such as flax linen yarns, silk and wool. The sequence of fibre preparation for spinning and weaving and finishing comprises a number of processes that require energy and chemical additives, and process water.

Textiles nowadays are often produced from blended yarns (with synthetic or other natural yarns) to improve the wear comfort or appearance of the end product (gloss, elasticity). Traditional hemp textiles were too coarse for apparel, but improved techniques allow production of lighter and softer texture and enhance its utility. Similarly, the jute fibre applications are far extended beyond the traditional jute bags used for packing of agricultural products.

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