contents

Contents

Puzzles

Brick's weight

This is well-known problem that sounds so simple, yet it fools many people!

A brick weighs one kilogram plus half of the brick. What is the weight of one brick?

Average Miles per Hour

A car is going up a hill. The hill is one mile long. The driver goes up the hill at an average speed of 30 miles per hour. When the driver reaches the top of the hill, he starts down the other side. The downhill side is also one mile long. How fast must the driver go down the hill in order to average 60 miles per hour?

Here are the answers:

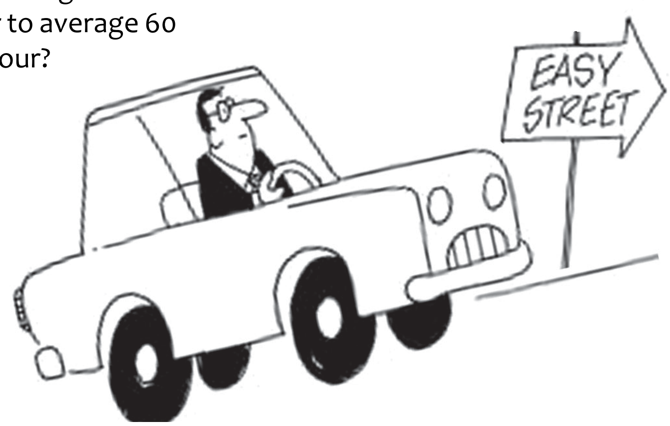
Brick's weight

It weighs 2 kg. Since a brick weighs 1 kg + half of a brick, the 1 kg gives us the weight of the other half of the brick. Since half a brick weighs 1 kg, the brick weighs 2 kg. Many people incorrectly answer 1 1/2 kg.

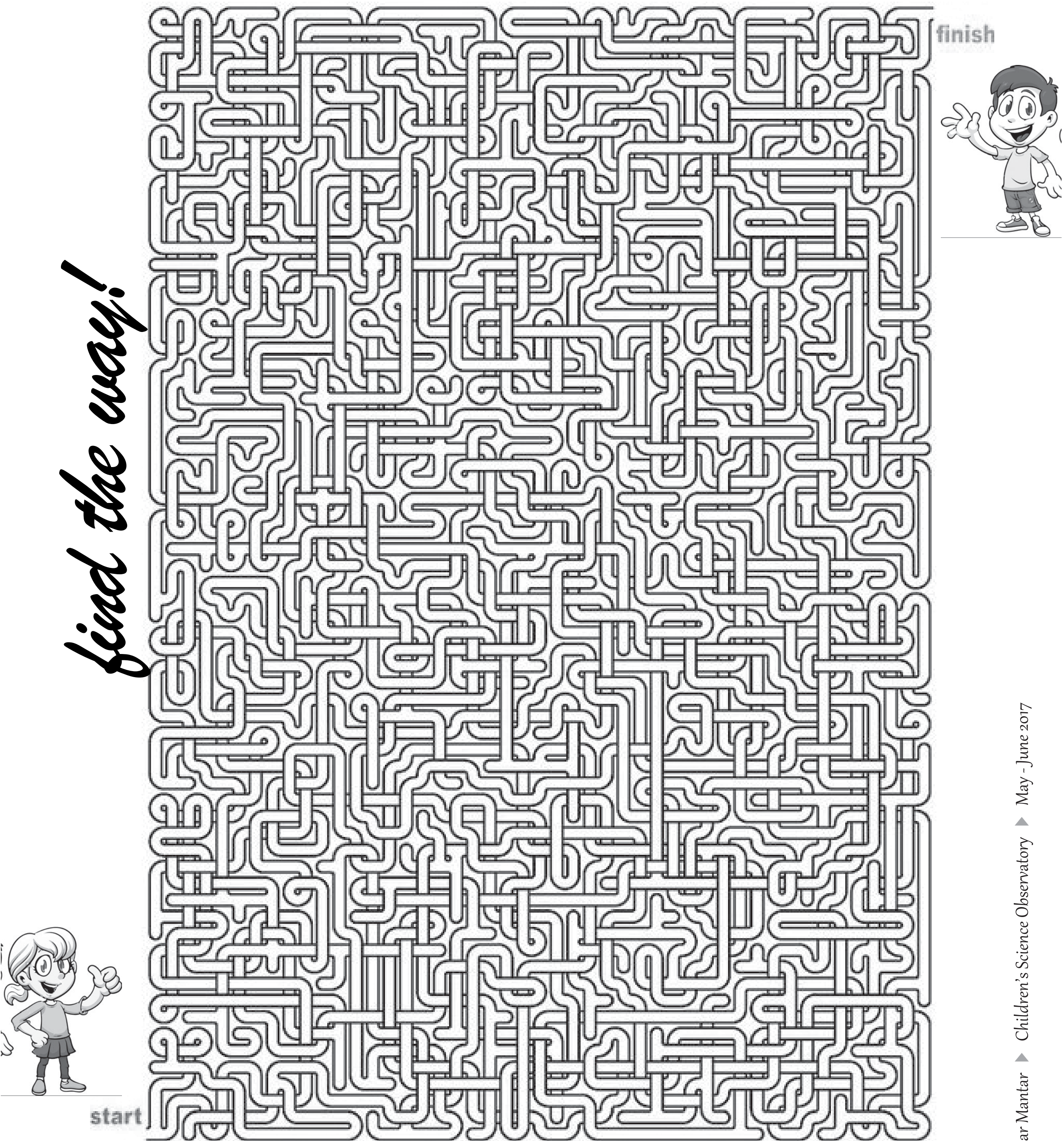
Average Miles per Hour

It is impossible to average 60 miles per hour. An average speed of 60 miles per hour requires two minutes to cover two miles. The first mile was covered at 30 miles per hour. This means that two minutes were used to travel that mile. Hence there are no minutes left to cover the second mile.

Source: Math Games and Number Tricks by Robert Yawin



find the way!



The Sun's Energy

K.Sampath
Scientist (Retd.), DRDO

Scientists develop scientific concepts in terms of quality and quantities through observations, experimentation, imagination, thought processes etc and also use the then available knowledge and instruments as a frame work for solving existing problems or for furthering knowledge.

People generally think that the scientific investigations need elaborate scientific equipments and cost; "yes" in some cases like particle accelerator, space probe or oceanographic research vessel etc. but not for all the investigations; it depends upon the problems; Einstein needed pencil and paper, Philosophers by mere thinking – meditation (brain work), Henry needed a bit of wire or metal where as Mendel needed a garden; astronomers in the beginning needed telescope to study stars and planets etc.

The Problem

This article discusses the problem of finding the amount of energy produced by our Sun, without elaborate equipments and cost. One may be wondering how the energy was measured, calculated, what sort of instruments or equipments were used and at what cost? But in this quest, everything was simple and elegant indeed!

Actually it was in the early nineteenth century the measurement of the energy of the Sun took place. In 1833 John Herschel (**John Frederick William Herschel)** travelled to the Cape of Good Hope in South Africa on an astronomical adventure and completed the work of his father Frederick William Herschel.

Scientific thinking - is the application old experience to new circumstance

It was a known fact that that the Earth gets its energy from our Sun, which is at 150million kilometres away; and no man can reach even nearby. Then how to solve the problem finding its energy? It was intriguing to calculate how much energy the Sun produces. Fortunately the knowledge of concept of energy, unit of energy, temperature measurement, specific heat capacity and instrument – thermometer etc were known by that time.

Sun's radiation

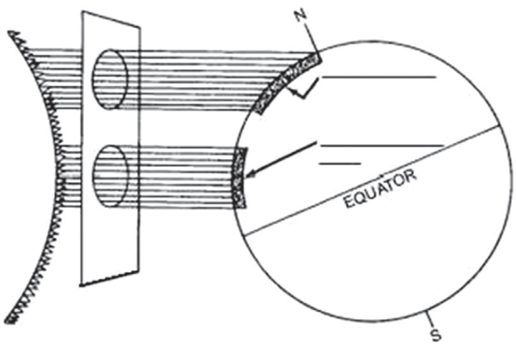
Solar constant is the average amount of the sun's energy striking one square meter each second at the top of the earth's atmosphere where as the *Insolation* is the flow rate of incoming solar radiation.

Insolation - the rate of incoming radiation on the surface of the Earth depends on the following factors:

1. The solar constant

2. Inclination of the Sun's rays

3. The amount of insolation depleted while passing through the atmosphere, besides the distance between the Sun and Earth.



Dispersion of insolation

John Herschel had taken care of all the above factors by choosing the place and time and clear sky and thus ensured the success of his experiment.

Analysis of the problem

In nineteenth century there were no facilities to perform his experiment above the atmosphere of the Earth. John Herschel knew that the radiation of the sun is minimal at Arctic and Antarctica; and the only place where maximum and direct vertical radiation is available on the Earth is Cape of Good Hope.

He also analysed the problem by thought experiment and said the Sun is radiating its energy in all direction of the space and it covers very vast area; and to measure its radiation at one stretch is difficult; therefore he felt that if the amount of radiation falls on a small area of the Earth surface could be measured then the same can be extended to the whole surface area for finding the total energy produced.

Experimentation

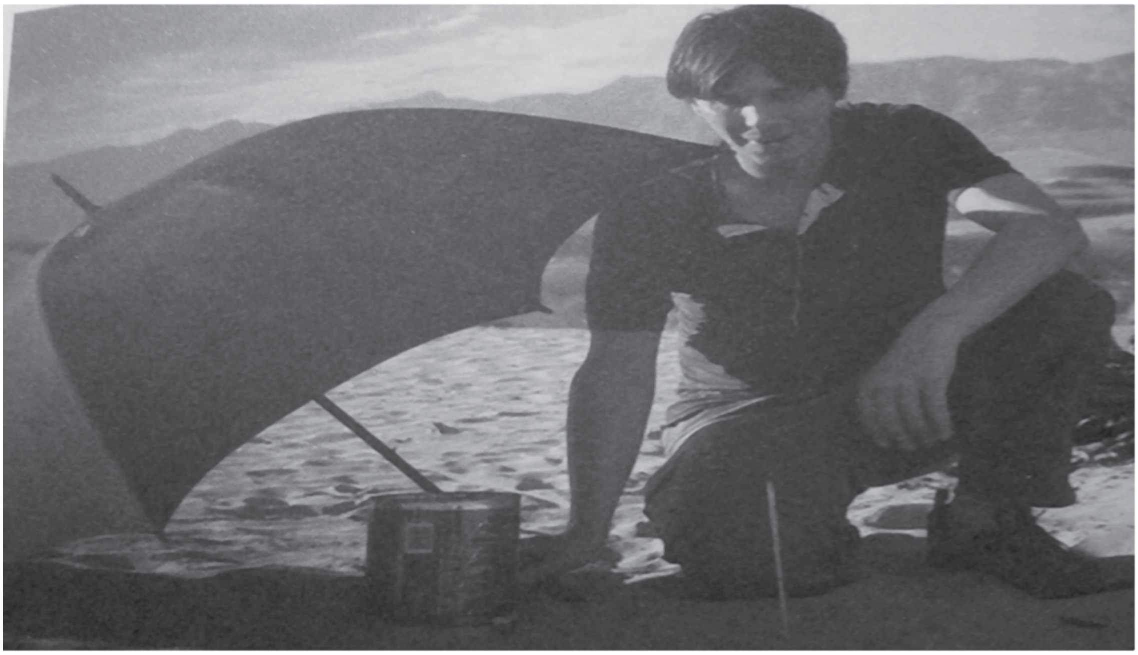
John Herschel started his plan in 1838 and waited until December of the same year, to conduct his experiment when the Sun would be directly overhead. The requirements for the conduct of his experiment were only a thermometer, a tin of water and an umbrella and predictable blue sky (a clear sky).

To calculate the energy of the Sun, he started his experiment by placing a tin full water of known volume under the shade of an umbrella in the midday sun; once the tin containing water reached ambient temperature the umbrella was removed. And then he allowed the Sun to shine directly onto the tin to heat the water by one degree Celsius and noted the time taken. Thus the experimentation is over.

Energy received per square meter

Now he could calculate the exactly how much energy the sun delivered into the can of water as the specific heat capacity of water is 4187 Joules per kilogram per Kelvin (or in other words amount of energy required to raise the temperature of one kilogram water by one Kelvin). From this calculation the energy delivered came out to be one kilowatt on one square meter surface of the Earth in one second.

[* Object too big for pasting as inline graphic. | In-line.PNG *]



Umbrella, can with water and thermometer

The Sun's rays incident on the Earth. Io = irradiance on a plane perpendicular to the Sun's rays.

Role of imagination

The final touch lies in connecting energy calculated per square meter delivered by the Sun on the Earth to whole of the sun. John Herschel's imagination played its beautiful part. He knew that sun's rays are always in straight lines; the experiment was conducted on clear sky, month day and place to avoid diffraction. Therefore the energy delivered by the vertically overhead rays of the sun, on every square meter on the top of Earth's atmosphere is proportional to the same area of the sun.

John Herschel imagined the sun as sphere or a ball of radius equal to the distance between the Earth and sun (= 150 million kilometres) and it emanates its rays in all directions of the space i.e. to say from the whole surface area of that big sphere. As the energy received by one square meter by earth was calculated it is only matter of multiplying that energy by the surface area in squared meter of the imagined sphere of the sun to arrive at the total energy.

Finally John Herschel was able to estimate sun's output energy as 400 million million million million watts (Energy = 4 x 10^{26} watts) of power per second– that is a million times the power consumption of USA every year

The average intensity of solar energy reaching the top of the atmosphere directly facing the Sun is about **1,360 watts** per square meter (or total energy is 3.9 x 10^26 watts), according to measurements made by the most recent NASA satellite missions.

Mass of (All planets + moons + Asteroids) is less than **half percent of mass of the Solar System**.

Sir John Frederick William Herschel

Sir John Frederick William Herschel, 1st Baronet KH FRS was an English polymath, mathematician, astronomer, chemist, inventor, and experimental photographer, who also did valuable botanical work. - Wikipedia

Born: 7 March 1792, Slough, United Kingdom

Died: 11 May 1871, Hawkhurst, United Kingdom

Spouse: Margaret Brodie Stewart (m. 1829–1871)

Children: Sir William Herschel, 2nd Baronet, more

Education: University of Cambridge, St John's College, Cambridge, Eton College

In, 1822 John Herschel published his first paper on astronomy - a minor work on a new method to calculate eclipses of the moon. In, 1824 He published a paper was - a catalogue of double stars in the *Transactions of the Royal Society* for which he received honours.

He received The Paris Academy award, Gold Medal from the Astronomical Society, Smith's Prize (1813), Copley Medal (1821) and Lalande Medal (1825). He was knighted in 1831.

He served as President of the Royal Astronomical Society three times: 1827–29, 1839–41 and 1847–49.

As Tait wrote:

Every day of Herschel's long and happy life added its share to his scientific services and Biot considered him the natural successor to Laplace.

Among the many important scientific advances made by Herschel in South Africa were his observations of Halley's Comet. He recognised that the comet was being subjected to major forces other than gravitation and he was able to calculate that the force was one repelling it from the sun. This lead in some sense to constitute the discovery of the solar wind; the repulsive force discovered by Herschel. He also made the important discovery that gas was evaporating from the comet.

Ref:

1. Wonders of the solar system, (BBC) Published by India Today 2011

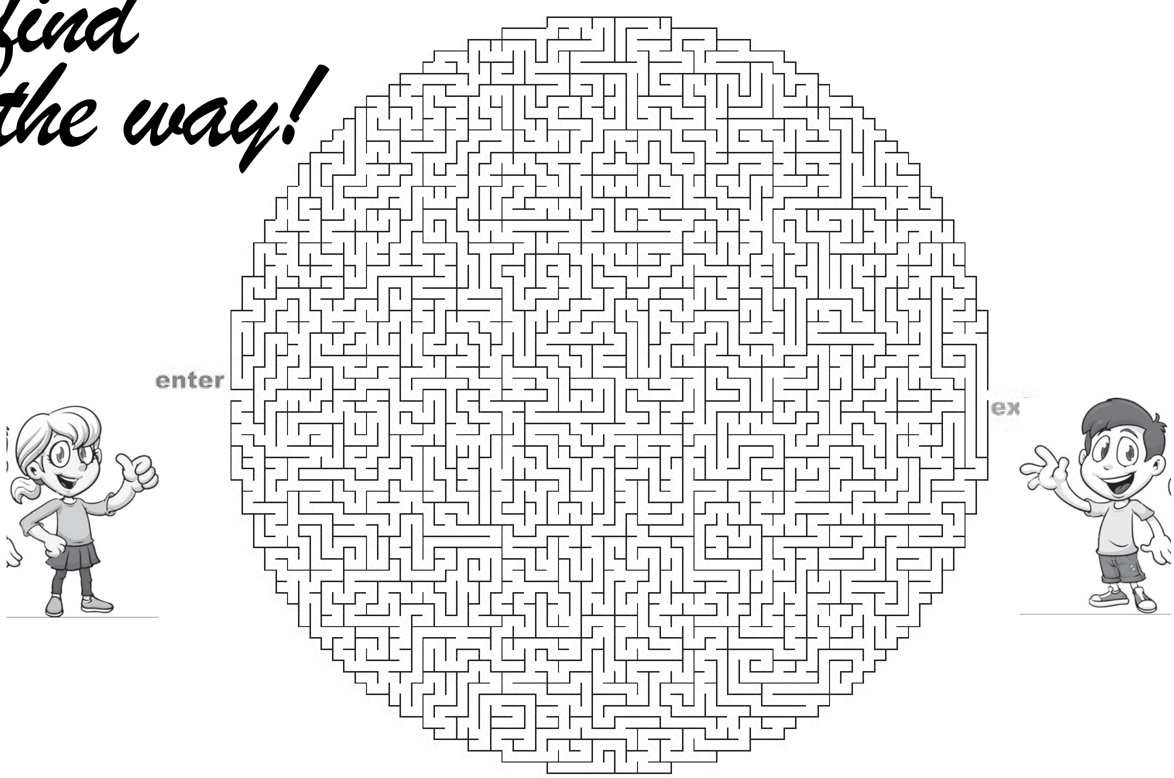
2. www.itacanet.org/the-sun-as-a...of.../part-2-solar-energy-reaching-the-earths-surface/

3. Meteorologytraining.tpub.com/14312/css/14312_19.htm

4. http://www-history.mcs.st-andrews.ac.uk/Biographies/Herschel.html

5. Wikipedia

find the way!



Cotton

Background

Cotton is a shrubby plant that is a member of the Mallow family. Its name refers to the cream-colored fluffy fibers surrounding small cottonseeds called a boll. The small, sticky seeds must be separated from the wool in order to process the cotton for spinning and weaving. De-seeded cotton is cleaned, carded (fibers aligned), spun, and woven into a fabric that is also referred to as cotton. Cotton is easily spun into yarn as the cotton fibers flatten, twist, and naturally interlock for spinning. Cotton fabric alone accounts for fully half of the fiber worn in the world. It is a comfortable choice for warm climates in that it easily absorbs skin moisture. Most of the cotton cultivated in the United States is a short-staple cotton that grows in the American South. Cotton is planted annually by using the seeds found within the downy wool. The states that primarily cultivate cotton are located in the "Cotton Belt," which runs east and west and includes parts of California, Alabama, Arkansas, Georgia, Arizona, Louisiana, Mississippi, Missouri, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas, which alone produces nearly five million bales. Together, these states produce approximately 16 million bales a year, second only to China. Business revenue generated by cotton today is approximately $122.4 billionóthe greatest revenue of any United States crop.

The cotton plant is a source for many important products other than fabric. Among the most important is cottonseed, which is pressed for cottonseed oil that is used in commercial products such as salad oils and snack foods, cosmetics, soap, candles, detergents, and paint. The hulls and meal are used for animal feed. Cotton is also a source for cellulose products, fertilizer, fuel, automobile tire cord, pressed paper, and cardboard.

History

Cotton was used for clothing in present-day Peru and Mexico perhaps as long as 5,000 years ago. Also, cotton was grown,

spun, and woven in ancient India, China, Egypt, and Pakistan, around 3000 B.C.

Cotton is not native to Western Europe. Around A.D. 800, Arabic traders likely introduced cotton to Spaniards. By the fourteenth century, Mediterranean farmers were cultivating the cotton plant and shipping the fiber to the Netherlands for spinning and weaving. British innovations in the late 1700s include water-powered spinning machinery, a monumental improvement over hand-spinning. An American named Samuel Slater, who worked with British machinery, memorized the plans for a machine spinner and returned to Rhode Island to set up Slater Mill, the first American textile mill to utilize machine spinners. This mill represents the beginning of the U.S. Industrial Revolution, built on the mechanism of the cotton industry.

Two developments spurred the cultivation of American cotton: cotton spinners and the cotton gin. The cotton gin, developed by Eli Whitney in 1793, easily removed tenacious cottonseeds. Southern plantation owners began planting cotton as a result of these innovations, using enslaved labor for harvesting the cotton. Vigorous cotton cultivation in the South using enslaved labor is considered one reason for friction between North and South that led to the Civil War.

Southern cotton was shipped to New England mills in huge quantities. As a result of machine spinning, weaving, and printing, Americans could cheaply purchase calico and it became universally worn. However, labor costs were significant in New England. Mill owners found ways to reduce those costs, first by employing women and immigrants who were often paid poorly, then by employing young children in the factories. After oppressive labor practices were largely halted, many factories moved to the South where labor was cheaper. (Unionizing efforts affected the profits of those mills.) Today, a fair amount of cotton is woven outside the United States where labor is less costly. Polyester, a synthetic, is often used along with cotton, but has little chance of supplanting the natural fiber.

Raw Materials

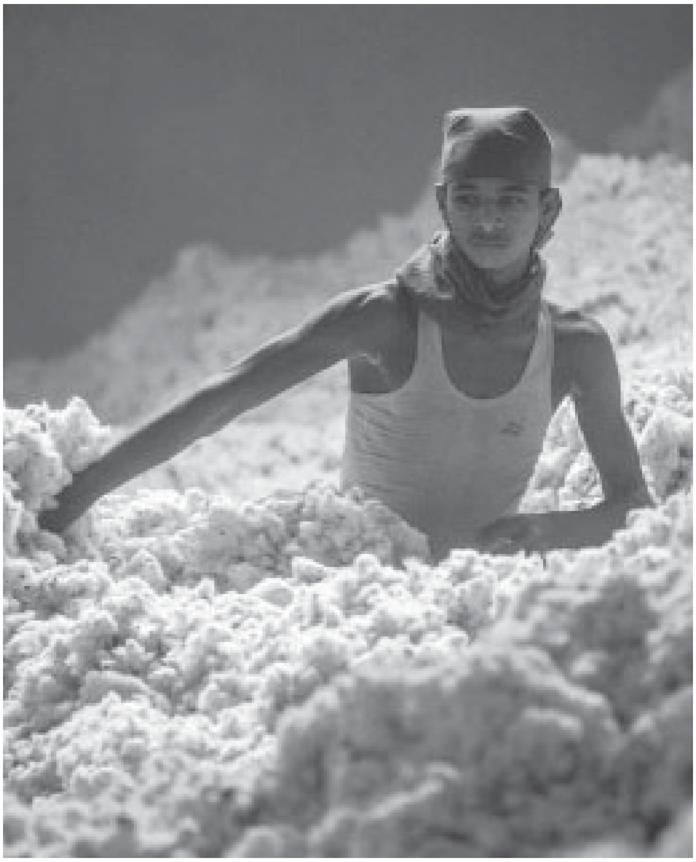
The materials required to take cotton bolls to spun cotton include cottonseeds for planting; pesticides, such as insecticides, fungicides, and herbicides, to battle disease and harmful insects; and fertilizers to enrich the soil.

There are agricultural requirements for growing cotton in the United States. Cotton has a long growing season (it can be as long as seven months) so it is best to plant cotton earlyóFebruary in Texas but as late as June in northern cotton-growing states such as Missouri. Cotton should not be planted before the sun has warmed the soil. It performs best in well-drained, crumbly soils that can hold moisture. It can be grown between latitudes of 30∞ north and 30∞ south. Good cotton crops require a long, sunny growing season with at least 160 frost-free days and high moisture levels resulting from rainfall or irrigation during the growing season. However, too much rain during harvest or strong winds during picking can damage the open bolls and load the fiber with too much water, which can ruin the cotton in storage. Generally, a cotton farmer must farm about 2,000 acres (20,000 hectares) if the operation is to be economically viable. On average, an acre will produce about 1.5 bales of cotton, or about 750 lb (340 kg).

The Production Process

In spring, the acreage is cleared for planting. Mechanical cultivators rip out weeds and grass that may compete with the cotton for soil nutrients, sunlight, and water, and may attract pests that harm cotton. The land is plowed under and soil is broken up and formed into rows.

Cottonseed is mechanically planted by machines that plant up to 12 rows at a time.



The planter opens a small furrow in each row, drops in seed, covers them, and then packs more dirt on top. Seed may be deposited in either small clumps (referred to as hill-dropped) or singularly (called drilled). The seed is placed 0.75 to 1.25 in (1.9 to 3.2 cm) deep, depending on the climate. The seed must be placed more shallowly in dusty, cool areas of the Cotton Belt, and more deeply in warmer areas.

With good soil moisture and warm temperature at planting, seedlings usually emerge five to seven days after planting, with a full stand of cotton appearing after about 11 days. Occasionally disease sets in, delaying the seedlings' appearance. Also, a soil crust may prevent seedlings from surfacing. Thus, the crust must be carefully broken by machines or irrigation to permit the plants to emerge.

Approximately six weeks after seedlings appear, "squares," or flower buds, begin to form. The buds mature for three weeks and then blossom into creamy yellow flowers, which turn pink, then red, and then fall off just three days after blossoming. After the flower falls away, a tiny ovary is left on the cotton plant. This ovary ripens and enlarges into a green pod called a cotton boll.

The boll matures in a period that ranges from 55 to 80 days. During this time, the football-shaped boll grows and moist fibers push the newly formed seeds outward. As the boll ripens, it remains green. Fibers continue to expand under the warm sun, with each fiber growing to its full lengthóabout 2.5 in (6.4 cm)óduring three weeks. For nearly six weeks, the fibers get thicker and layers of cellulose build up the cell walls. Ten weeks after flowers first appeared, fibers split the boll apart, and cream-colored cotton pushes forth. The moist fibers dry in the sun and the fibers collapse and twist together, looking like ribbon. Each boll contains three to five "cells," each having about seven seeds embedded in the fiber. Most steps involved in the production of cotton have been mechanized, including seeding, picking, ginning, and baling. Samples are taken from the bales to determine the quality of the cotton.

Most steps involved in the production of cotton have been mechanized, including seeding, picking, ginning, and baling. Samples are taken from the bales to determine the quality of the cotton.

At this point the cotton plant is defoliated if it is to be machine harvested. Defoliation (removing the leaves) is often accomplished by spraying the plant with a chemical. It is important that leaves not be harvested with the fiber because they are considered "trash" and must be removed at some point.

ensure that the moisture content is no higher than 12%, or the cotton may not be harvested and stored successfully. Not all cotton reaches maturity at the same time, and harvesting may occur in waves, with a second and third picking.

Next, most American cotton is stored in "modules," which hold 13-15 bales in water-resistant containers in the fields until they are ready to be ginned.

The cotton module is cleaned, compressed, tagged, and stored at the gin. The cotton is cleaned to separate dirt, seeds, and short lint from the cotton. At the gin, the cotton enters module feeders that fluff up the cotton before cleaning. Some gins use vacuum pipes to send fibers to cleaning equipment where trash is removed. After cleaning, cotton is sent to gin stands where revolving circular saws pull the fiber through wire ribs, thus separating seeds from the fiber. High-capacity gins can process 60, 500-lb (227-kg) bales of cotton per hour.

Cleaned and de-seeded cotton is then I 0 compressed into bales, which permits economical storage and transportation of cotton. The compressed bales are banded and wrapped. The wrapping may be either cotton or polypropylene, which maintains the proper moisture content of the cotton and keeps bales clean during storage and transportation.

Every bale of cotton produced in the

In addition, removing the leaves minimizes staining the fiber and eliminates a source of excess moisture. Some American crops are naturally defoliated by frost, but at least half of the crops must be defoliated with chemicals. Without defoliation, the cotton must be picked by hand, with laborers clearing out the leaves as they work.

Harvesting is done by machine in the United States, with a single machine replacing 50 hand-pickers. Two mechanical systems are used to harvest cotton. The picker system uses wind and guides to pull the cotton from the plant, often leaving behind the leaves and rest of the plant. The stripper system chops the plant and uses air to separate the trash from the cotton. Most American cotton is harvested using pickers. Pickers must be used after the dew dries in the morning and must conclude when dew begins to form again at the end of the day. Moisture detectors are used to

United States must be given a gin ticket and a warehouse ticket. The gin ticket identifies the bale until it is woven. The ticket is a bar-coded tag that is torn off during inspection. A sample of each bale is sent to the United States Department of Agriculture (USDA) for evaluation, where it is assessed for color, leaf content, strength, fineness, reflectance, fiber length, and trash content. The results of the evaluation determine the bale's value. Inspection results are available to potential buyers.

After inspection, bales are stored in a carefully controlled warehouse. The bales remain there until they are sold to a mill for further processing.

Quality Control

Cotton growing is a long, involved process and growers must understand the requirements of the plant and keep vigilant lookout for potential problems. Pests must be managed in order to yield high-quality crops; however, growers must use chemicals very carefully in order to prevent damage to the environment. Defoliants are often used to maximize yield and control fiber color. Farmers must carefully monitor moisture levels at harvesting so bales will not be ruined by excess water during storage. Soil tests are imperative, since too much nitrogen in the soil may attract certain pests to the cotton.

Expensive equipment such as cotton planters and harvesters must be carefully maintained. Mechanical planters must be set carefully to deposit seed at the right depth, and gauge wheels and shoes must be corrected to plant rows at the requisite spot. Similarly, improperly adjusted machinery spindles on harvesting machines will leave cotton on the spindle, lowering quality of the cotton and harvesting efficiency. A well-adjusted picker minimizes the amount of trash taken up, rendering cleaner cotton.

Byproducts/Waste

There is much discussion regarding the amount of chemicals used in cotton cultivation. Currently, it is estimated that growers use, on average, 5.3 oz (151 g) of chemicals to produce one pound of processed cotton. Cotton cultivation is responsible for 25% of all chemical pesticides used on American crops. Unfortunately, cotton attracts many pests (most notably the boll weevil) and is prone to a number of rots and spotting, and chemicals are used to keep these under control. There are concerns about wildlife poisoning and poisons that remain in the soil long after cotton is no longer grown (although no heavy metals are used in the chemicals). As a result, some farmers have turned to organic cotton growing. Organic farming utilizes biological control to rid cotton of pests and alters planting patterns in specific ways to reduce fungicide use. While this method of cultivation is possible, an organically grown crop generally yields less usable cotton. This means an organic farmer must purchase, plant, and harvest more acreage to yield enough processed cotton to make the crop lucrative, or reduce costs in other ways to turn a profit. Increasingly, state university extension services are working with cotton farmers to reduce chemical use by employing certain aspects of biological control in order to reduce toxins that remain in the land and flow into water systems.

Read more: http://www.madehow.com/Volume-6/Cotton.html#ixzz4j0aPYrGV

A Brief History of the Sewing Machine

Graham Forsdyke

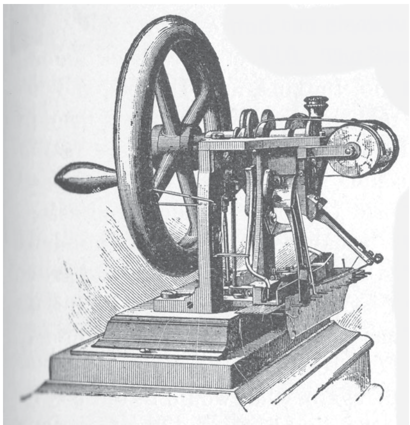
Historians of the early days of the sewing machine can argue for hours over the simple matter of who invented what is, in many ways, one of the most important machines ever devised.

The story really starts in 1755 in London when a German immigrant, Charles Weisenthal, took out a patent for a needle to be used for mechanical sewing. There was no mention of a machine to go with it, and another 34 years were to pass before Englishman Thomas Saint invented what is generally considered to be the first real sewing machine.

In 1790 the cabinet maker patented a machine with which an awl made a hole in leather and then allowed a needle to pass through. Critics of Saint's claim to fame point out that quite possibly Saint only patented an idea and that most likely the machine was never built. It is known that when an attempt was made in the 1880s to produce a machine from Saint's drawings it would not work without considerable modification.

The story then moves to Germany where, in around 1810, inventor Balthasar Krems developed a machine for sewing caps. No exact dates can be given for the Krems models as no patents were taken out.

An Austrian tailor Josef Madersperger produced a series of machines during the early years of the 19th century and received a patent in 1814. He was still working on the invention in 1839, aided by grants from the Austrian government, but he failed to get all the elements together successfully in one machine and eventually died a pauper. Two more inventions were patented in 1804, one in France to a Thomas Stone and a James



The first Howe sewing machine

Henderson -- a machine which attempted to emulate hand sewing -- and another to a Scott John Duncan for an embroidery machine using a number of needles. Nothing is known of the fate of either invention.

America's first real claim to fame came in 1818 when a Vermont churchman John Adams Doge and his partner John Knowles produced a device which, although making a reasonable stitch, could only sew a very short length of material before laborious re-setting up was necessary.

Smithsonian Report, 1929.—Lewton PLATE 7

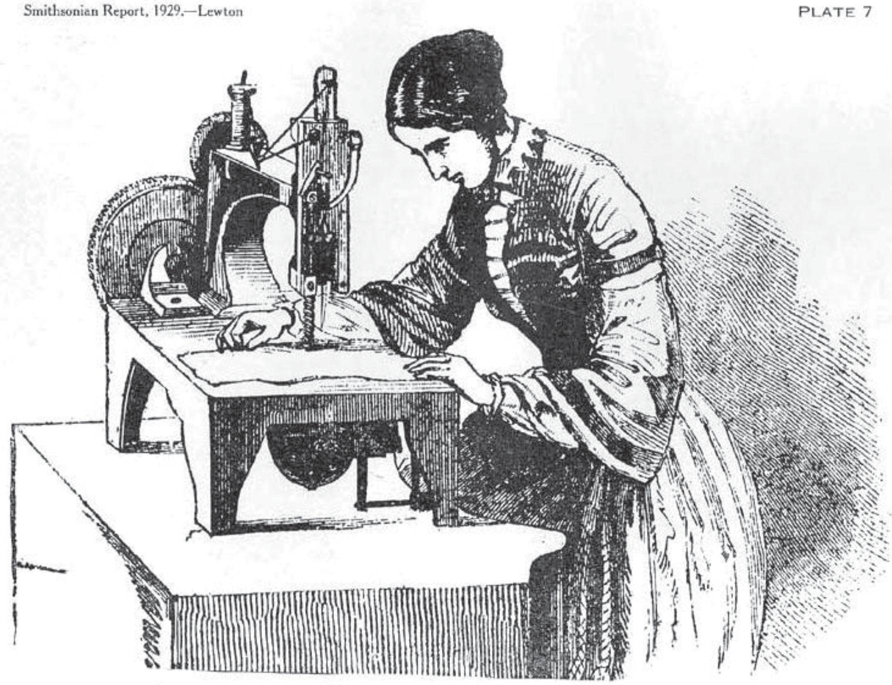


ILLUSTRATION OF SINGER SEWING MACHINE PUBLISHED IN 1853

One of the more reasonable claimants for inventor of the sewing machine must be Barthelemy Thimonnier who, in 1830, was granted a patent by the French government. He used a barbed needle for his machine which was built almost entirely of wood. It is said that he originally designed the machine to do embroidery, but then saw its potential as a sewing machine.

Unlike any others who went before him, he was able to convince the authorities of the usefulness of his invention and he was eventually given a contract to build a batch of machines and use them to sew uniforms for the French army. In less than 10 years after the granting of his patent Thimonnier had a factory running with 80 machines, but then ran into trouble from Parisian tailors. They feared that, were his machines successful, they would soon take over from hand sewing, putting the craftsmen tailors out of work.

Late one night a group of tailors stormed the factory, destroying every machine, and causing Thimonnier to flee for his life. With a new partner he started again, produced a vastly- improved machine and looked set to go into full-scale production; but the tailors attacked again. With France in the grip of revolution, Thimonnier could expect little help from the police or army and fled to England with the one machine he was able to salvage.

He certainly produced the first practical sewing machine, was the first man to offer machines for sale on a commercial basis and ran the first garment factory.

For all that, he died in the poor house in 1857.

In America a quaker Walter Hunt invented, in 1833, the first machine which did not try to emulate hand sewing. It made a lock stitch using two spools of thread and incorporated an eye-pointed needle as used today. But again it was unsuccessful for it could only produce short, straight, seams.

Nine years later Hunt's countryman, John Greenough, produced a working machine in which the needle passed completely through the cloth. Although a model was made and exhibited in the hope of raising capital for its manufacture, there were no takers.

Perhaps all the essentials of a modern machine came together in early 1844 when Englishman John Fisher invented a machine which although designed for the production of lace, was essentially a working sewing machine. Probably because of miss-filing at the patent office, this invention was overlooked during the long legal arguments between Singer and Howe as to the origins of the sewing machine.

Despite a further flurry of minor inventions in the 1840s, most Americans will claim that the sewing machine was invented by Massachusetts farmer Elias Howe who completed his first prototype in 1844 just a short time after Fisher.

A year later it was patented and Howe set about trying to interest the tailoring trade in his invention. He even arranged a competition with his machine set against the finest hand sewers in America. The machine won hands down but the world wasn't ready for mechanised sewing and, despite months of demonstrations, he had still not made a single sale.

Desperately in debt Howe sent his brother Amasa to England with the machine in the hope that it would receive more interest on the other side of the Atlantic. Amasa could find only one backer, a corset maker William Thomas, who eventually bought the rights to the invention and arranged for Elias to come to London to further develop the machine.

The two did not work well together, each accusing the other of failing to honour agreements and eventually Elias, now almost penniless, returned to America. When he arrived home he found that the sewing machine had finally caught on and that dozens of manufacturers, including Singer, were busy manufacturing machines -- all of which contravened the Howe patents.

A long series of law suits followed and were only settled when the big companies, including Wheeler & Wilson and Grover & Baker, joined together, pooled their patents, and fought as a unit to protect their monopoly.

Singer did not invent any notable sewing-machine advances, but he did pioneer the hire-purchase system and aggressive sales tactics.

Both Singer and Howe ended their days as multi-millionaires.

So the argument can go on about just who invented the sewing machine and it is unlikely that there will ever be agreement. What is clear, however, is that without the work of those long-dead pioneers, the dream of mechanised sewing would never have been realised

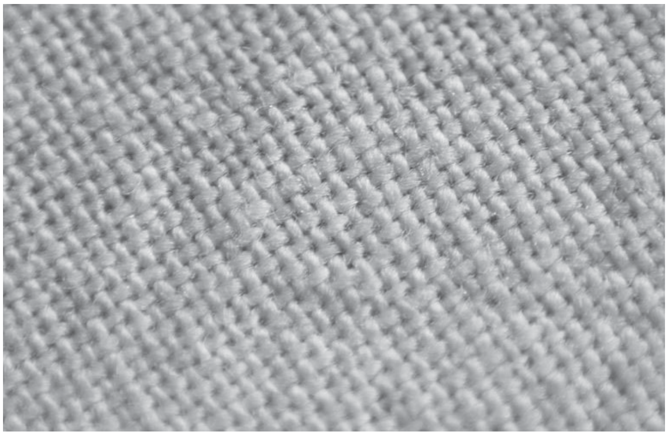
A textile or cloth is a flexible material consisting of a network of natural or artificial fibres (yarn or thread). Yarn is produced by spinning raw fibres of wool, flax, cotton, hemp, or other material to produce long strands. Textiles are formed by weaving, knitting, crocheting, knotting, or felting.

The words fabric and cloth are used in textile assembly trades (such as tailoring and dressmaking) as synonyms for textile. However, there are subtle differences in these terms in specialized usage. Textile refers to any material made of interlacing fibres. A fabric is a material made through weaving, knitting, spreading, crocheting, or bonding that may be used in production of further goods (garments, etc.). Cloth may be used synonymously with fabric but is often a finished piece of fabric used for a specific purpose (e.g., table cloth).

Etymology

The word 'textile' is from Latin, from the adjective textilis, meaning 'woven', from textus, the past participle of the verb texere, 'to weave'.

The word 'fabric' also derives from Latin, most recently from the Middle French fabrique, or 'building, thing made', and earlier as the Latin fabrica 'workshop;



an art, trade; a skilful production, structure, fabric', which is from the Latin faber, or 'artisan who works in hard materials', from PIE dhabh-, meaning 'to fit together'.

The word 'cloth' derives from the Old English cla□, meaning a cloth, woven or felted material to wrap around one, from Proto-Germanic kalithaz (compare O.Frisian 'klath', Middle Dutch 'cleet', Dutch 'kleed', Middle High German 'kleit', and German 'kleid', all meaning "garment").

History

The discovery of dyed flax fibres in a cave in the Republic of Georgia dated to 34,000 BCE suggests textile-like materials were made even in prehistoric times.

The production of textiles is a craft whose speed and scale of production has been altered almost beyond recognition by industrialization and the introduction of modern manufacturing techniques. However, for the main types of textiles, plain weave, twill, or satin weave, there is little difference between the ancient and modern methods.

Uses

Textiles have an assortment of uses, the most common of which are for clothing and for containers such as bags and baskets. In the household they are used in carpeting, upholstered furnishings, window shades, towels, coverings for tables, beds, and other flat surfaces, and in art. In the workplace they are used in industrial and scientific processes such as filtering. Miscellaneous uses include flags, backpacks, tents, nets, handkerchiefs, cleaning rags, transportation devices such as balloons, kites, sails, and parachutes; textiles are also used to provide strengthening in composite materials such as fibreglass and industrial geotextiles. Textiles are used in many traditional crafts such as sewing, quilting and embroidery.

Textiles for industrial purposes, and chosen for characteristics other than their appearance, are commonly referred to as technical textiles. Technical textiles include textile structures for automotive applications, medical textiles (e.g. implants), geotextiles (reinforcement of embankments), agrotextiles (textiles for crop protection), protective clothing (e.g. against heat and radiation for fire fighter clothing, against molten metals for welders, stab protection, and bullet proof vests). In all these applications stringent performance requirements must be met. Woven of threads coated with zinc oxide nanowires, laboratory fabric has been shown capable of "self-powering nanosystems" using vibrations created by everyday actions like wind or body movements.

Sources and types

Textiles can be made from many materials. These materials come from four main sources: animal (wool, silk), plant (cotton, flax, jute), mineral (asbestos, glass fibre), and synthetic (nylon, polyester, acrylic). In the past, all textiles were made from natural fibres, including plant, animal, and mineral sources. In the 20th century, these were supplemented by artificial fibres made from petroleum.

Textiles are made in various strengths and degrees of durability, from the finest gossamer to the sturdiest canvas. Microfibre refers to fibres made of strands thinner than one denier.

Animal textiles

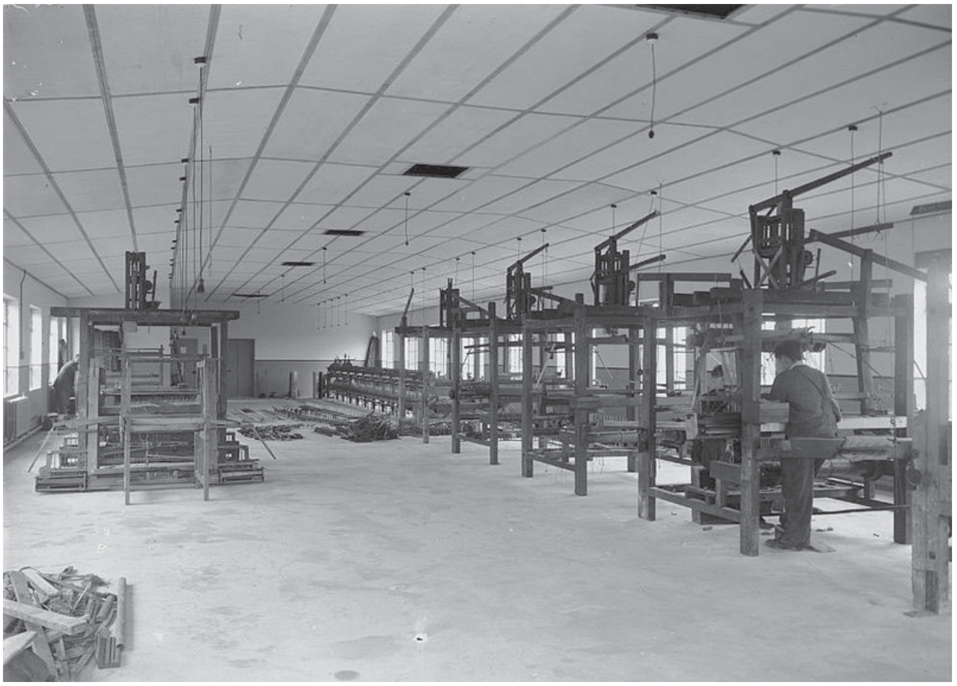
Animal textiles are commonly made from hair, fur, skin or silk (in the silkworms case).

Wool refers to the hair of the domestic goat or sheep, which is distinguished from other types of animal hair in that the individual strands are coated with scales and tightly crimped, and the wool as a whole is coated with a wax mixture known as lanolin (sometimes called wool grease), which is waterproof and dirtproof[citation needed]. Woollen refers to a bulkier yarn produced from carded, non-parallel fibre, while worsted refers to a finer yarn spun from longer fibres which have been combed to be parallel. Wool is commonly used for warm clothing. Cashmere, the hair of the Indian cashmere goat, and mohair, the hair of the North African angora goat, are types of wool known for their softness.

Other animal textiles which are made from hair or fur are alpaca wool, vicuÒa wool, llama wool, and camel hair, generally used in the production of coats, jackets, ponchos, blankets, and other warm coverings. Angora refers to the long, thick, soft hair of the angora rabbit. Qiviut is the fine inner wool of the muskox.

Wadmal is a coarse cloth made of wool, produced in Scandinavia, mostly 1000~1500 CE.

Silk is an animal textile made from the fibres of the cocoon of the Chinese silkworm which is spun into a smooth fabric prized for its softness. There are two main types of the silk: 'mulberry silk' produced by the Bombyx Mori, and 'wild silk' such as Tussah silk. Silkworm larvae produce the first type if cultivated in habitats with fresh mulberry leaves for consumption, while Tussah silk is produced by silkworms feeding purely on oak leaves. Around four-fifths of the world's silk production consists of cultivated silk.



Plant textiles

Grass, rush, hemp, and sisal are all used in making rope. In the first two, the entire plant is used for this purpose, while in the last two, only fibres from the plant are utilized. Coir (coconut fibre) is used in making twine, and also in floormats, doormats, brushes, mattresses, floor tiles, and sacking.

Straw and bamboo are both used to make hats. Straw, a dried form of grass, is also used for stuffing, as is kapok.

Fibres from pulpwood trees, cotton, rice, hemp, and nettle are used in making paper.

Cotton, flax, jute, hemp, modal and even bamboo fibre are all used in clothing. PiÒa (pineapple fibre) and ramie are also fibres used in clothing, generally with a blend of other fibres such as cotton. Nettles have also been used to make a fibre and fabric very similar to hemp or flax. The use of milkweed stalk fibre has also been reported, but it tends to be somewhat weaker than other fibres like hemp or flax.

The inner bark of the lacebark tree is a fine netting that has been used to make clothing and accessories as well as utilitarian articles such as rope.

Acetate is used to increase the shininess of certain fabrics such as silks, velvets, and taffetas.

Seaweed is used in the production of textiles: a water-soluble fibre known as alginate is produced and is used as a holding fibre; when the cloth is finished, the alginate is dissolved, leaving an open area.

Lyocell is a synthetic fabric derived from wood pulp. It is often described as a synthetic silk equivalent; it is a tough fabric that is often blended with other fabrics ñ cotton, for example.

Fibres from the stalks of plants, such as hemp, flax, and nettles, are also known as 'bast' fibres.

Mineral textiles

Asbestos and basalt fibre are used for vinyl tiles, sheeting and adhesives, "transite" panels and siding, acoustical ceilings, stage curtains, and fire blankets.

Glass fibre is used in the production of ironing board and mattress covers, ropes and cables, reinforcement fibre for composite materials, insect netting, flame-retardant and protective fabric, soundproof, fireproof, and insulating fibres. Glass fibres are woven and coated with Teflon to produce beta cloth, a virtually fireproof fabric which replaced nylon in the outer layer of United States space suits since 1968.

Metal fibre, metal foil, and metal wire have a variety of uses, including the production of cloth-of-gold and jewellery. Hardware cloth (US term only) is a coarse woven mesh of steel wire, used in construction. It is much like standard window screening, but heavier and with a more open weave. It is sometimes used together with screening on the lower part of screen doors, to resist scratching by dogs. It serves similar purposes as chicken wire, such as fences for poultry and traps for animal control.

Synthetic textiles

All synthetic textiles are used primarily in the production of clothing.

Polyester fibre is used in all types of clothing, either alone or blended with fibres such as cotton.

Aramid fibre (e.g. Twaron) is used for flame-retardant clothing, cut-protection, and armour.

Acrylic is a fibre used to imitate wools, including cashmere, and is often used in replacement of them.

Nylon is a fibre used to imitate silk; it is used in the production of pantyhose. Thicker nylon fibres are used in rope and outdoor clothing.

Spandex (trade name Lycra) is a polyurethane product that can be made tight-fitting without impeding movement. It is used to make activewear, bras, and swimsuits.

Olefin fibre is a fibre used in activewear, linings, and warm clothing. Olefins are hydrophobic, allowing them to dry quickly. A sintered felt of olefin fibres is sold under the trade name Tyvek.

Ingeo is a polylactide fibre blended with other fibres such as cotton and used in clothing. It is more hydrophilic than most other synthetics, allowing it to wick away perspiration.

Lurex is a metallic fibre used in clothing embellishment.

Milk proteins have also been used to create synthetic fabric. Milk or casein fibre cloth was developed during World War I in Germany, and further developed in Italy and America during the 1930s.[13] Milk fibre fabric is not very durable and wrinkles easily, but has a pH similar to human skin and possesses anti-bacterial properties. It is marketed as a biodegradable, renewable synthetic fibre.

Carbon fibre is mostly used in composite materials, together with resin, such as carbon fibre reinforced plastic. The fibres are made from polymer fibres through carbonization.

Top five exporters of textilesó2013

($ billion)

China	274
India	40
Italy	36
Germany	35
Bangladesh	28

Weaving is a textile production method which involves interlacing a set of longer threads (called the warp) with a set of crossing threads (called the weft). This is done on a frame or machine known as a loom, of which there are a number of types. Some weaving is still done by hand, but the vast majority is mechanized.

Knitting and crocheting involve interlacing loops of yarn, which are formed either on a knitting needle or on a crochet hook, together in a line. The two processes are different in that knitting has several active loops at one time, on the knitting needle waiting to interlock with another loop, while crocheting never has more than one active loop on the needle. Knitting can be performed by machine, but crochet can only be performed by hand.

Spread Tow is a production method

where the yarn are spread into thin tapes, and then the tapes are woven as warp and weft. This method is mostly used for composite materials; spread tow fabrics can be made in carbon, aramide, etc.

Braiding or plaiting involves twisting threads together into cloth. Knotting involves tying threads together and is used in making macrame.

Lace is made by interlocking threads together independently, using a backing and any of the methods described above, to create a fine fabric with open holes in the work. Lace can be made by either hand or machine.

Carpets, rugs, velvet, velour, and velveteen are made by interlacing a secondary yarn through woven cloth, creating a tufted layer known as a nap or pile.

Felting involves pressing a mat of fibres together, and working them together until they become tangled. A liquid, such as soapy water, is usually added to lubricate the fibres, and to open up the microscopic scales on strands of wool.

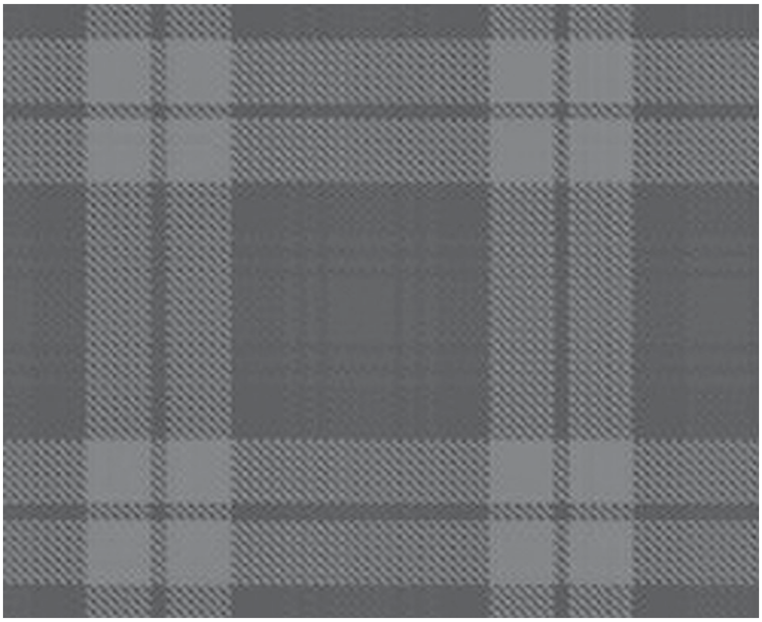
Nonwoven textiles are manufactured by the bonding of fibres to make fabric. Bonding may be thermal or mechanical, or adhesives can be used.

Bark cloth is made by pounding bark until it is soft and flat.

Treatments

Textiles are often dyed, with fabrics available in almost every colour. The dyeing process often requires several dozen gallons of water for each pound of clothing. Coloured designs in textiles can be created by weaving together fibres of different colours (tartan or Uzbek Ikat), adding coloured stitches to finished fabric (embroidery), creating patterns by resist dyeing methods, tying off areas of cloth and dyeing the rest (tie-dyeing), or drawing wax designs on cloth and dyeing in between them (batik), or using various printing processes on finished fabric. Woodblock printing, still used in India and elsewhere today, is the oldest of these dating back to at least 220 CE in China. Textiles are also sometimes bleached, making the textile pale or white.

Textiles are sometimes finished by



chemical processes to change their characteristics. In the 19th century and early 20th century starching was commonly used to make clothing more resistant to stains and wrinkles.

Eisengarn, meaning "iron yarn" in English, is a light-reflecting, strong material invented in Germany in the 19th century. It is made by soaking cotton threads in a starch and paraffin wax solution. The threads are then stretched and polished by steel rollers and brushes. The end result of the process is a lustrous, tear-resistant yarn which is extremely hardwearing.

Since the 1990s, with advances in technologies such as permanent press process, finishing agents have been used to strengthen fabrics and make them wrinkle free. More recently, nanomaterials research has led to additional advancements, with companies such as Nano-Tex and NanoHorizons developing permanent treatments based on metallic nanoparticles for making textiles more resistant to things such as water, stains, wrinkles, and pathogens such as bacteria and fungi.

More so today than ever before, textiles receive a range of treatments before they reach the end-user. From formaldehyde finishes (to improve crease-resistance) to biocidic finishes and from flame retardants to dyeing of many types of fabric, the possibilities are almost endless. However, many of these finishes may also have detrimental effects on the end user. A number of disperse, acid and reactive dyes (for example) have been shown to be allergenic to sensitive individuals. Further to this, specific dyes within this group have also been shown to induce purpuric contact dermatitis.

Although formaldehyde levels in clothing are unlikely to be at levels high enough to cause an allergic reaction, due to the presence of such a chemical, quality control and testing are of utmost importance. Flame retardants (mainly in the brominated form) are also of concern where the environment, and their potential toxicity, are concerned. Testing for these additives is possible at a number of commercial laboratories, it is also possible to have textiles tested for according to the Oeko-tex certification standard which contains limits levels for the use of certain chemicals in textiles products.

Weaving

From Wikipedia, the free encyclopedia

Weaving is a method of textile production in which two distinct sets of yarns or threads are interlaced at right angles to form a fabric or cloth. Other methods are knitting, felting, and braiding or plaiting. The longitudinal threads are called the warp and the lateral threads are the weft or filling. (Weft or woof is an old English word meaning "that which is woven".) The method in which these threads are inter woven affects the characteristics of the cloth. Cloth is usually woven on a loom, a device that holds the warp threads in place while filling threads are woven through them. A fabric band which meets this definition of cloth (warp threads with a weft thread winding between) can also be made using other methods, including tablet weaving, back-strap, or other techniques without looms.

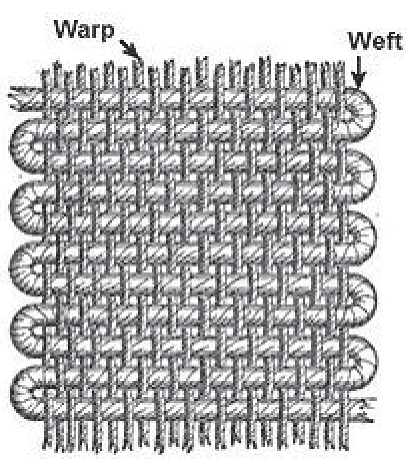
The way the warp and filling threads interlace with each other is called the weave. The majority of woven products are created with one of three basic weaves: plain weave, satin weave, or twill. Woven cloth can be plain (in one colour or a simple pattern), or can be woven in decorative or artistic design.

Loom and Power Loom

In general, weaving involves using a loom to interlace two sets of threads at right angles to each other: the warp which runs longitudinally and the weft (older woof) that crosses it. One warp thread is called an end and one weft thread is called a pick. The warp threads are held taut and in parallel to each other, typically in a loom. There are many types of looms.

Weaving can be summarized as a repetition of these three actions, also called the primary motion of the loom.

Shedding: where the ends are separated by raising or lowering heald frames (heddles) to form a clear space where the pick can pass



Picking: where the weft or pick is propelled across the loom by hand, an air-jet, a rapier or a shuttle.

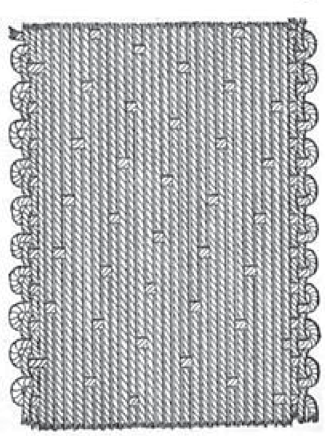
Beating-up or battening: where the weft is pushed up against the fell of the cloth by the reed.

The warp is divided into two overlapping groups, or lines (most often adjacent threads belonging to the opposite group) that run in two planes, one above another, so the shuttle can be passed between them in a straight motion. Then, the upper group is lowered by the loom mechanism, and the lower group is raised (shedding), allowing to pass the shuttle in the opposite direction, also in a straight motion. Repeating these actions form a fabric mesh but without beating-up, the final distance between the adjacent wefts would be irregular and far too large.

The secondary motion of the loom are the:

Let off Motion: where the warp is let off the warp beam at a regulated speed to make the filling even and of the required design

Take up Motion: Takes up the woven fabric in a regulated manner so that the density of filling is maintained



The tertiary motions of the loom are the stop motions: to stop the loom in the event of a thread break. The two main stop motions are the

warp stop motion

weft stop motion

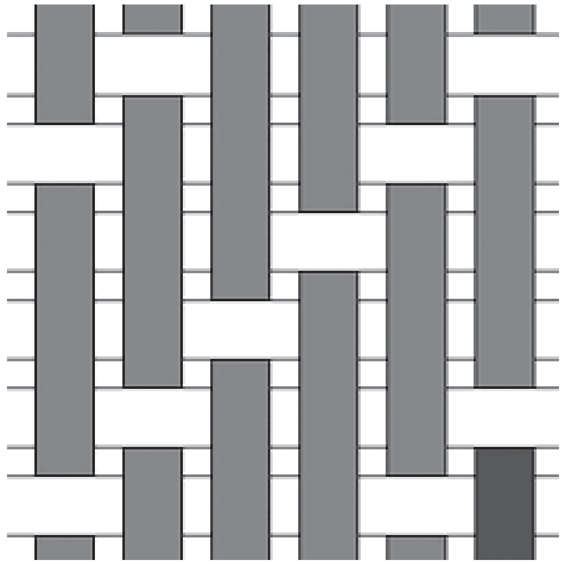
The principal parts of a loom are the frame, the warp-beam or weavers beam, the cloth-roll (apron bar), the heddles, and their mounting, the reed. The warp-beam is a wooden or metal cylinder on the back of the loom on which the warp is delivered. The threads of the warp extend in parallel order from the warp-beam to the front of the loom where they are attached to the cloth-roll. Each thread or group of threads of the warp passes through an opening (eye) in a heddle. The warp threads are separated by the heddles into two or more groups, each controlled and automatically drawn up and down by the motion of the heddles. In the case of small patterns the movement of the heddles is controlled by "cams" which move up the heddles by means of a frame called a harness; in larger patterns the heddles are controlled by a dobby mechanism, where the healds are raised according to pegs inserted into a revolving drum. Where a complex design is required, the healds are raised by harness cords attached to a Jacquard machine. Every time the harness (the heddles) moves up or down, an opening (shed) is made between the threads of warp, through which the pick is inserted. Traditionally the weft thread is inserted by a shuttle.

On a conventional loom, the weft

thread is carried on a pirn, in a shuttle that passes through the shed. A handloom weaver could propel the shuttle by throwing it from side to side with the aid of a picking stick. The "picking? on a power loom is done by rapidly hitting the shuttle from each side using an overpick or underpick mechanism controlled by cams 80-250 times a minute. When a pirn is depleted, it is ejected from the shuttle and replaced with the next pirn held in a battery attached to the loom. Multiple shuttle boxes allow more than one shuttle to be used. Each can carry a different colour which allows banding across the loom.

The rapier-type weaving machines do not have shuttles, they propel the weft by means of small grippers or rapiers that pick up the filling thread and carry it halfway across the loom where another rapier picks it up and pulls it the rest of the way. Some carry the filling yarns across the loom at rates in excess of 2,000 metres per minute. Manufacturers such as Picanol have reduced the mechanical adjustments to a minimum, and control all the functions through a computer with a graphical user interface. Other types use compressed air to insert the pick. They are all fast, versatile and quiet.

The warp is sized in a starch mixture for smoother running. The loom warped (loomed or dressed) by passing the sized warp threads through two or more heddles attached to harnesses. The power weavers loom is warped by separate workers. Most looms used for industrial purposes have a machine that ties new warps threads to the waste of previously used warps threads, while still on the loom, then an operator rolls the old



and new threads back on the warp beam. The harnesses are controlled by cams, dobbies or a Jacquard head.

The raising and lowering sequence of warp threads in various sequences gives rise to many possible weave structures: textile production went through profound changes brought about by the industrial revolution in the 19th century. At the beginning of the century in America, weaving was still done by hand, both commercially and at home. Most professional weavers were men who did their work for sale. Women wove items at home for family use. By the end of the 19th century weavers were simply mill workers who tended several water or steam powered looms at a time. The increased speed of production brought more textiles to the average farmhouse and renderd

plain weave: plain, and hopsacks, poplin, taffeta, poult-de-soie, pibiones and grosgrain.

twill weave: these are described by

weft float followed by warp float, arranged to give diagonal pattern. 2/1 twill, 3/3 twill, 1/2 twill. These are softer fabrics than plain weaves.,

satin weave: satins and sateens,

complex computer-generated interlacings.

pile fabrics : such as velvets and velveteens

Both warp and weft can be visible in the final product. By spacing the warp more closely, it can completely cover the weft that binds it, giving a warp faced textile such as repp weave. Conversely, if the warp is spread out, the weft can slide down and completely cover the warp, giving a weft faced textile, such as a tapestry or a Kilim rug. There are a variety of loom styles for hand weaving and tapestry.

Weaving in ancient Egypt

There are some indications that weaving was already known in the Paleolithic era, as early as 27,000 years ago. An indistinct textile impression has been found at the DolnÌ Vestonice site. According to the find, the weavers of Upper Palaeolithic were manufacturing a variety of cordage types, produced plaited basketry and sophisticated twined and plain woven cloth. The artifacts include imprints in clay and burned remnants of cloth.

The oldest known textiles found in the Americas are remnants of six finely woven textiles and cordage found in Guitarrero Cave, Peru. The weavings, made from plant fibres, are dated between 10100 and 9080 BCE.

Middle East

The earliest known Neolithic textile production in the Old World is supported by a 2013 find of a piece of cloth woven from hemp, in burial F. 7121 at the «atalhˆy¸k site suggested to be from around 7000 B.C. Further finds come from the advanced civilisation preserved in the pile dwellings in Switzerland.[citation needed] Another extant fragment from the Neolithic was found in Fayum, at a site dated to about 5000 BCE. This fragment is woven at about 12 threads by 9 threads per cm in a plain weave. Flax was the predominant fibre in Egypt at this time (3600 BCE) and continued popularity in the Nile Valley, though wool became the primary fibre used in other cultures around 2000 BCE.[citation needed][b] Weaving was known in all the great civilisations, but no clear line of causality has been established. Early looms required two people to create the shed and one person to pass through the filling. Early looms wove a fixed length of cloth, but later ones allowed warp to be wound out as the fell progressed. The weavers were often children or slaves. Weaving became simpler when the warp was sized.

The Indigenous people of the Americas wove textiles of cotton throughout tropical and subtropical America and in the South American Andes of wool from camelids, primarily domesticated llamas and alpacas. Cotton and the camelids were both domesticated by about 4,000 BCE. American weavers are "credited with independently inventing nearly every non-mechanized technique known today." In the Inca Empire of the Andes, women did most of the weaving using backstrap looms to make small pieces of cloth and vertical frame and single-heddle looms for larger pieces. Andean textile weavings were of practical, symbolic, religious, and ceremonial importance and used as currency, tribute, and as a determinant of social class and rank. Sixteenth-century Spanish colonists were impressed by both the quality and quantity of textiles produced by the Inca Empire. Some of the techniques and designs are still in use in the 21st century.

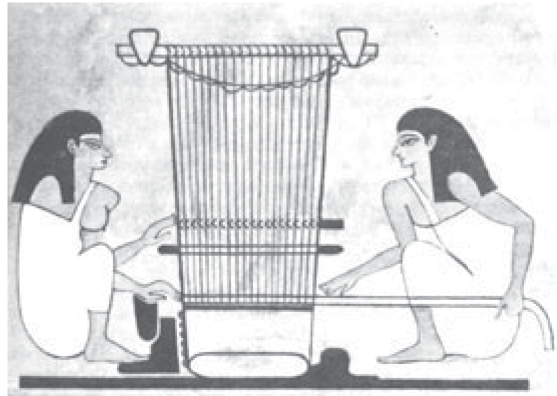
The oldest-known weavings in North America come from the Windover Archaeological Site in Florida. Dating from 4900 to 6500 B.C. and made from plant fibres, the Windover hunter-gatherers produced "finely crafted" twined and plain weave textiles.

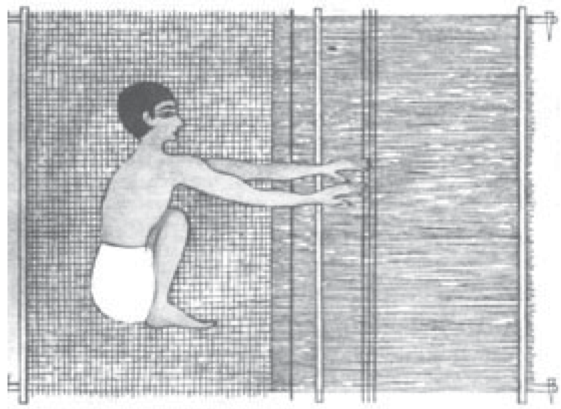
China and East Asia

The weaving of silk from silkworm cocoons has been known in China since about 3500 BCE. Silk that was intricately woven and dyed, showing a well developed craft, has been found in a Chinese tomb dating back to 2700 BCE.

Sericulture and silk weaving spread to Korea by 200 BCE, to Khotan by 50 CE, and to Japan by about 300 CE.

The pit-treadle loom may have originated in India though most authorities establish the invention in China.[24] Pedals were added to operate heddles. By the Middle Ages such devices also appeared in Persia, Sudan, Egypt and possibly the Arabian Peninsula, where "the operator sat with his feet in a pit below a fairly low-slung loom." In 700 CE, horizontal looms and vertical looms could be found in many parts of Asia, Africa and





Ткачество на фресках Бени-Хасана

Europe. In Africa, the rich dressed in cotton while the poorer wore wool.[25] By the 12th century it had come to Europe either from the Byzantium or Moorish Spain where the mechanism was raised higher above the ground on a more substantial frame.

Medieval Europe

The predominant fibre was wool, followed by linen and nettlecloth for the lower classes. Cotton was introduced to Sicily and Spain in the 9th century. When Sicily was captured by the Normans, they took the technology to Northern Italy and then the rest of Europe. Silk fabric production was reintroduced towards the end of this period and the more sophisticated silk weaving techniques were applied to the other staples.

The weaver worked at home and marketed his cloth at fairs. Warp-weighted looms were commonplace in Europe before the introduction of horizontal looms in the 10th and 11th centuries. Weaving became an urban craft and to regulate their trade, craftsmen applied to establish a guild. These initially were merchant guilds, but developed into separate trade guilds for each skill. The cloth merchant who was a member of a city's weavers guild was allowed to sell cloth; he acted as a middleman between the tradesmen weavers and the purchaser. The trade guilds controlled quality and the training needed before an artisan could call himself a weaver.

By the 13th century, an organisational change took place, and a system of putting out was introduced. The cloth merchant purchased the wool and provided it to the weaver, who sold his produce back to the merchant. The merchant controlled the rates of pay and economically dominated the cloth industry. The merchants' prosperity is reflected in the wool towns of eastern England; Norwich, Bury St Edmunds and Lavenham being good examples. Wool was a political issue. The supply of thread has always limited the output of a weaver. About that time, the spindle method of spinning was replaced by the great wheel and soon after the treadle-driven spinning wheel. The loom remained the same but with the increased volume of thread it could be operated continuously.

The 14th century saw considerable flux in population. The 13th century had been a period of relative peace; Europe became overpopulated. Poor weather led to a series of poor harvests and starvation. There was great loss of life in the Hundred Years War. Then in 1346, Europe was struck with the Black Death and the population was reduced by up to a half. Arable land was labour-intensive and sufficient workers no longer could be found. Land prices dropped, and land was sold and put to sheep pasture. Traders from Florence and Bruges bought the wool, then sheep-owning landlords started to weave wool outside the jurisdiction of the city and trade guilds. The weavers started by working in their own homes then production was moved into purpose-built buildings. The working hours and the amount of work were regulated. The putting-out system had been replaced by a factory system.

The migration of the Huguenot Weavers, Calvinists fleeing from religious persecution in mainland Europe, to Britain around the time of 1685 challenged the English weavers of cotton, woollen and worsted cloth, who subsequently learned the Huguenots' superior techniques.

Industrial Revolution

By 1892, most cotton weaving was done in similar weaving sheds, powered by steam.

Before the Industrial Revolution, weaving was a manual craft and wool was the principal staple. In the great wool districts a form of factory system had been introduced but in the uplands weavers worked from home on a putting-out system. The wooden looms of that time might be broad or narrow; broad looms were those too wide for the weaver to pass the shuttle through the shed, so that the weaver needed an expensive assistant (often an apprentice). This ceased to be necessary after John Kay invented the flying shuttle in 1733. The shuttle and the picking stick sped up the process of weaving. There was thus a shortage of thread or a surplus of weaving capacity. The opening of the Bridgewater Canal in June 1761 allowed cotton to be brought into Manchester, an area rich in fast flowing streams that could be used to power machinery. Spinning was the first to be mechanised (spinning jenny, spinning mule), and this led to limitless thread for the weaver.

Edmund Cartwright first proposed building a weaving machine that would function similar to recently developed cotton-spinning mills in 1784, drawing scorn from critics who said the weaving process was too nuanced to automate. He built a factory at Doncaster and obtained a series of patents between 1785 and 1792. In 1788, his brother Major John Cartwight built Revolution Mill at Retford (named for the centenary of the Glorious Revolution). In 1791, he licensed his loom to the Grimshaw brothers of Manchester, but their Knott Mill burnt down the following year (possibly a case of arson). Edmund Cartwight was granted a reward of £10,000 by Parliament for his efforts in 1809.[32] However, success in power-weaving also required improvements by others, including H. Horrocks of Stockport. Only during the two decades after about 1805, did power-weaving take hold. At that time there were 250,000 hand weavers in the UK. Textile manufacture was one of the leading sectors in the British Industrial Revolution, but weaving was a comparatively late sector to be mechanised. The loom became semi-automatic in 1842 with Kenworthy and Bulloughs Lancashire Loom. The various innovations took weaving from a home-based artisan activity (labour-intensive and man-powered) to steam driven factories process. A large metal manufacturing industry grew to produce the looms, firms such as Howard & Bullough of Accrington, and Tweedales and Smalley and Platt Brothers. Most power weaving took place in weaving sheds, in small towns circling Greater Manchester away from the cotton spinning area. The earlier combination mills where spinning and weaving took place in adjacent buildings became rarer. Wool and worsted weaving took place in West Yorkshire and particular Bradford, here there were large factories such as Lister's or Drummond's, where all the processes took place. Both men and women with weaving skills emigrated, and took the knowledge to their new homes in New England, to places like Pawtucket

and Lowell.

Woven 'grey cloth' was then sent to the finishers where it was bleached, dyed and printed. Natural dyes were originally used, with synthetic dyes coming in the second half of the 19th century. The need for these chemicals was an important factor in the development of the chemical industry.

The invention in France of the Jacquard loom in about 1803, enabled complicated patterned cloths to be woven, by using punched cards to determine which threads of coloured yarn should appear on the upper side of the cloth. The jacquard allowed individual control of each warp thread, row by row without repeating, so very complex patterns were suddenly feasible. Samples exist showing calligraphy, and woven copies of engravings. Jacquards could be attached to handlooms or powerlooms.

The role of the weaver

A distinction can be made between the role and lifestyle and status of a handloom weaver, and that of the powerloom weaver and craft weaver. The perceived threat of the power loom led to disquiet and industrial unrest. Well known protests movements such as the Luddites and the Chartists had hand loom weavers amongst their leaders. In the early 19th century power weaving became viable. Richard Guest in 1823 made a comparison of the productivity of power and hand loom weavers:

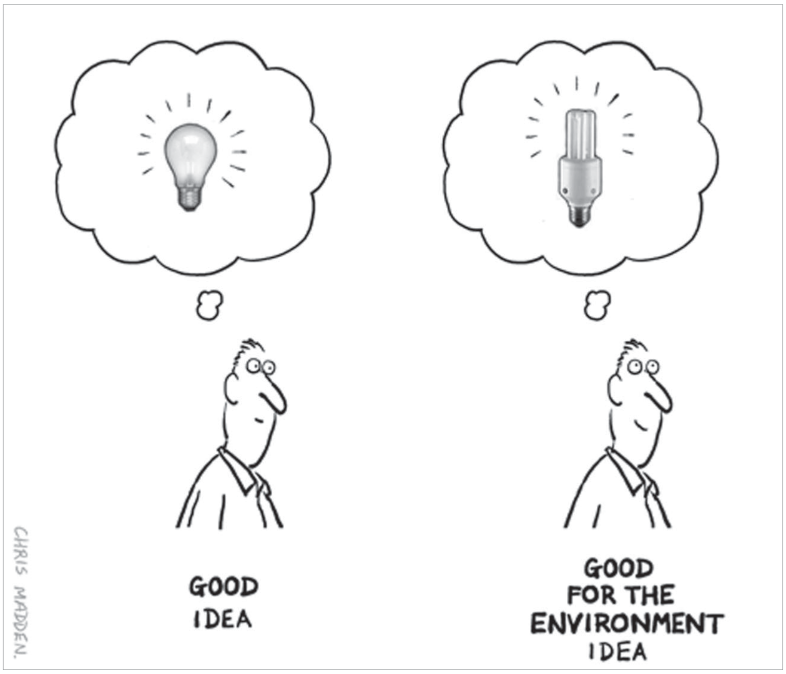
A very good Hand Weaver, a man twenty-five or thirty years of age, will weave two pieces of nine-eighths shirting per week, each twenty-four yards long, and containing one hundred and five shoots of weft in an inch, the reed of the cloth being a forty-four, Bolton count, and the warp and weft forty hanks to the pound, A Steam Loom Weaver, fifteen years of age, will in the same time weave seven similar pieces.

He then speculates about the wider economics of using powerloom weavers:

...it may very safely be said, that the work done in a Steam Factory containing two hundred Looms, would, if done by hand Weavers, find employment and support for a population of more than two thousand persons.

Publisher
C.S.Venkateswaran
TNSF, Chennai 600 086
Typeset at
Fineline
Design, Illustrations and Layout
Basheer
Rajeswari
Printed at
Print Specialities,
186, V.M.St, Royapettah,
Chennai - 600 014.

Bank Details
Jantar Mantar, Indian Overseas Bank, Dr. RK Salai Branch, Chennai - 600004
AC No: 029101000031081 IFSC Code: IOBA0000291




HAPPY EARTH DAY!
Bennett Chattanooga Times Free Press


Chattanooga Times Free Press Bennett
CONSUMPTION
SAVE OUR PLANET