Introduction to Fibers

Cellulose Fibers
All natural fibers, except silk are **staple** fibers that are made into spun yarn. Staple fibers are short fibers.

**Filament** fibers are a continuous fiber of extremely long continuous strand. All manufacture fibers and silk start off as filament yarn. Filament fibers can be cut into staple length and spun into yarn to modify some of the fibers characteristics.
Natural Cellulosic Fibers are divided into three major categories.

1. **Seed** fibers from the seed pod of the plant
2. **Bast** fibers from the stem of the plant
3. **Leaf** Fibers from the leaves of the plant

Manufactured cellulosic fibers including rayon and lyocell are made from regenerated cellulosic fibers, which are modified plant materials.
Seed Fibers: cotton, coir, kapok and milkweed

Bast Fibers: flax (linen), jute, ramie, hemp, and kenaf

Leaf Fibers: pina and sisal
Common Characteristics of Cellulosic Fibers

1. High fiber density
2. Low elasticity and resilience
3. Good conductor of heat and electricity
4. Burn easily
5. Good resistance to sunlight
6. Good resistance to bases, such as bleach
7. Most insect do not attack cellulose
Cotton is a soft fiber that grows around the seeds of the cotton plant. Cool, soft and comfortable, cotton is presently the world's most used fiber. Every part of the cotton plant is useful and we see its application in industries such as apparel, home furnishings, medical and surgical, automobile, etc.
Types of Cotton Fibers

1. **Short** 3/8 to 3/4 inches

2. **Intermediate** 7/8 to 1 1/4 inches the dominant cotton grown

3. **Long** 1 2/16 to 2 1/2 inches often called American Pima, Egyptian, american Egyptian and Sea Island.

4. **Organic cotton** grown on land following organic practices at least three years

5. **Fox Fibre** naturally colored cotton in shades of green, tans and reds
Common End Uses of Cellulosic Fibers

1. Apparels for its comfort, dye ability and wash ability

2. Towels and sheets for its absorbency, dye ability and washability

3. Curtains, upholstery slipcovers, bedspreads and table linens for its sunlight resistance, wash ability, affordability, and mild abrasion resistance
Linen (Flax)

Linen is a textile made from the fibers of the flax plant. Linen is labor-intensive to manufacture, but when it is made into garments, it is valued for its exceptional coolness and freshness in hot weather. Linen textiles appear to be some of the oldest in the world: their history goes back many thousands of years. Fragments of straw, seeds, fibers, yarns, and various types of fabrics which date back to about 8000 BC have been found in Swiss lake dwellings. Dyed flax fibers found in a prehistoric cave in the Republic of Georgia suggest the use of woven linen fabrics from wild flax may date back even earlier to 36,000 BP. Linen was sometimes used as currency in ancient Egypt. Egyptian mummies were wrapped in linen because it was seen as a symbol of light and purity, and as a display of wealth. Some of these fabrics, woven from hand spun yarns, were very fine for their day, but are coarse compared to modern linen.
Common End-Uses of Flax Fibers

1. Appeal for its luxury look, drape ability, wicking, and absorbency
2. Home furnishings for its luster, durability, and abrasion resistance
3. Table linens for its wash ability, luster, durability, and strength
4. Luggage and hand bags for luster, durability, abrasion resistance, and strength
Ramie also sometimes called China Grass

The properties and appearance of ramie are very similar to flax, except color. Ramie is pure white. Ramie is slightly heavier and less flexible than flax.
Common End-Uses of Ramie Fibers

1. Appeal for its luxury look, drape ability, wicking, and absorbency

2. Home furnishings for its luster, durability and abrasion resistance

3. Table linens for its wash ability, luster, durability and strength

4. Luggage and hand bags for luster, durability, abrasion resistance, and strength
Hemp

CLOTHES SHOULD BE MADE FROM HEMP. Hemp clothing is extremely strong and durable over time. You could hand clothing, made from pot, down to your grandchildren. Today, there are American companies that make hemp clothing; usually 50% hemp. Hemp fabrics should be everywhere. Instead, they are almost underground. Superior hemp products are not allowed to advertise on fascist television. Kentucky, once the top hemp producing state, made it ILLEGAL TO WEAR hemp clothing! Can you imagine being thrown into jail for wearing quality jeans?
Jute

Jute is a long, shiny vegetable fiber that can be spun into coarse, strong threads.

Jute is comprised mostly of cellulose plant material AND lignin (a wood derivative). It is thus a ligno-cellulosic fiber—partially a textile fiber and partially wood (see Wikipedia for more).

The fibers are off-white to brown, and 1–4 meters (3–12 feet) long. Bangladesh is the world’s largest exporter of jute. Jute is grown in the same land-water area as rice and is a very difficult crop to grow and harvest. Other important jute export countries include India, China, Burma (Myanmar), Pakistan, Nepal and Thailand.
Coir
Coir End Uses

Brown coir is used in floor mats and doormats, brushes, mattresses, floor tiles and sacking. A small amount is also made into twine. Pads of curled brown coir fibre, made by needle-felting (a machine technique that mats the fibres together) are shaped and cut to fill mattresses and for use in erosion control on river banks and hillsides. A major proportion of brown coir pads are sprayed with rubber latex which bonds the fibres together (rubberised coir) to be used as upholstery padding for the automobile industry in Europe. The material is also used for insulation and packaging.

The major use of white coir is in rope manufacture. Mats of woven coir fibre are made from the finer grades of bristle and white fibre using hand or mechanical looms. White coir also used to make fishing nets due to its strong resilience to salt water.

In horticulture, coir is recommended as substitute for sphagnum moss because it is free of bacteria and fungal spores, and is sustainably produced without the environmental damage caused by peat mining however, it may not have the same pH or nutrient levels. Coir is also useful to deter snails from delicate plantings.
Piña

Piña is a fiber made from the leaves of a pineapple and is commonly used in the Philippines. It is sometimes combined with silk or polyester to create a textile fabric.

Much of the appeal of the traditional Barong Tagalog draws from its sheer material of piña fabric quite remarkable for its scintillating sheen and strength.

Products of the hand looms, these fine woven materials of pale ecru, (their natural color) some with almost the soft, delicate texture of a spider's web, demand the services of only the highly skilled and exceedingly patient weavers. In fact, in the Visayan provinces of Aklan and Iloilo, weaving gossamer fabrics for the Barong Tagalog is as much a craft as it is a commitment. The weavers are mostly old and not so old women whose dedication and skills they have inherited from their elders. This is because in Iloilo and Aklan, weaving is a legacy of the ages.
Bamboo fiber is the new innovation in textile fibers. Bamboo is perfectly ecological. Bamboo fabric is incredibly soft even softer than cotton smooth and luxuriously comfortable.

What is Bamboo? Bamboo is actually a tropical plant. Bamboo is 100% naturally grown, without assistance from man. Bamboo is the fastest growing plant in the world. Bamboo grows to its maximum height in about 3 months and reaches maturity in 3-4 years and growing to heights of approximately 60 feet. Bamboo keeps you dry due to its extraordinary property of absorption. It's 3-4 times more absorbent than cotton. Bamboo fabric absorbs and evaporates sweat in a split second. It doesn't stick to the skin. Its extraordinary natural breathing ability keeps you comfortable and dry for longer. It is a fantastic clothing fabric, baby diaper, house items and accessories.
Silk cultivation is a difficult process that begins with the silk moth. The moth lays hundreds of eggs about the size of a pinhead that are examined and discarded if they are diseased. The eggs are then put in cold storage for six to ten months until the mulberry trees bud.

After incubation, the eggs hatch into larvae. For about a month these larvae live in a carefully controlled environment eating cleaned, chopped mulberry leaves. They grow quickly and become caterpillars called silk worms. The silk worm is quite discerning about its environment. If the conditions are less than ideal, the silkworm produces inferior silk, or no silk. The silkworm then starts to spin a cocoon for itself to protect it while it transforms into a moth. A single cocoon yields 1,600 - 5280 feet of continuous filament. It is this length of fiber that makes silk fabric unlike any other type of fiber.
Circular, uniform in diameter
Nylon, Polyester, Lyocell

Polygonal, lumen
Flax

Oval to round, overlapping scales
Wool
Cotton

Flat, oval, lumen, convolutions
Rayon

Circular, serrated, lengthwise striations

Lima bean, smooth
Avril™ rayon

Lima bean, serrated
Silk

Triangular, rounded edges
Trilobal

Antron™ nylon
Lobular, lengthwise striations

Dog-bone
Flat, broad
Star or concertina
Collapsed tube, hollow center

Acrylic, Spandex
Acetate

Square with voids
Anso IV™ nylon
Introduction to Fibers
Spinning
A sliver is a long bundle of fiber that is generally used to spin yarn. A sliver is created by carding or combing the fiber, which is then drawn into long strips where the fiber is parallel. When sliver is drawn further and given a slight twist, it becomes roving.
Short draw is the spinning technique used to create worsted yarns. It is spun from combed roving, sliver or wool top - anything with the fibers all lined up parallel to the yarn. It is generally spun from long stapled fibers. Short draw spun yarns are smooth, strong, sturdy yarns, and dense.
Niddy-Noddy made from ½ inch PVC piping and t joint connections.
**Singles yarns** are created by twisting the individual fibers together.

**Ply yarns** are two or more single yarns twisted together. A two ply yarn is two singles twisted together. A Three ply yarn is three singles twisted together, and so on.

**Cord or Cable yarns** are two or more ply yarns twisted together. Cord yarns are used for ropes, cordage, and sewing thread.
Spinning
Wheel

spinn'ing n. ~jenny, spinning-machine with several spindles; ~wheel, simple spinning-apparatus in which spindle is driven by wheel worked by hand or foot.
Lazy Kate is used to hold bobbins when plying yarns together. You can create your own with a shoe box and knitting needles poked through the box.