Fibre (Lat. fibra, filament). A term of very common use as applied to objects of a stringy or threadlike character, whether of the animal, vegetable, or mineral kingdom. Minerals are often described as of a fibrous structure or appearance, in which there is, however, no possibility of detaching the apparent fibres from the general mass, or in which they are inflexible, and brittle if detached; but a more perfect example of mineral fibre is found in amiantus, a variety of asbestos. For the scien-
Fibre

511

Fibre

The use of the term "fibre" with regard to the animal kingdom, see the article MUSCLE and MUSCULAR TISSUE; for its scientific use with regard to the vegetable kingdom, see VEGETABLE TISSUE: Wood. In its more popular but perfectly accurate sense it includes the hair or wool of quadrupeds, the silken threads of the cocoons of silkworms and other insects, the fibres of the leaves and of the inner bark of plants, and the elongated cells or hairs connected with the seeds of plants, the ordinary materials of cordage, and of textile fabrics.

Of mineral substances, amianthus alone has been used for textile fabrics, and that only to a very small extent, and then in a form of paper; the silk of the cocoons of insects. These may be divided into 3 classes already mentioned, (1) the wool or hair of quadrupeds and (2) the silk of the cocoons of insects. These classes contain only thebyssus of mollusks, but this class includes only thebyssus of the pinna (q.v.) of the shellfish, an article of ancient and high reputation, but more of curiosity than of use. The skins and intestines of animals, although sometimes twisted or plaited for various uses, can scarcely be reckoned among the fibrous materials afforded by the animal kingdom. For information regarding the fibres obtained from the cocoons of insects, see SILK; SILK WORM. It is to the first class that the greater number of different kinds of animal fibres used for textile purposes belong; and the wool of the sheep far exceeds all the rest in importance. But the wool or hair of other quadrupeds is also to some extent used, as that of the goat, the alpaca, the camel, the musk ox, and the yak, all of which, are, like the sheep, ruminants. The hair of comparatively few animals is sufficiently long for textile purposes or can be procured in sufficient abundance to make it of economic importance. The warmth of clothing depends much on the fineness of the hair, and on other qualities in which wool particularly excels. See SHEEP; WOOL; GOAT; ANGORA; ALPACA; CAMEL; MUSK OX; YAK.

The useful vegetable fibres are far more numerous and various than are the animal. They are obtainable from plants of natural orders very different from each other. They are obtained also from different parts of plants. Wood cells are found in the bark, stem, and leaves, and are longer, finer, and tougher than those found in the wood. They form the principal part of the fibrous bark or bast layer of cells. These give toughness and flexibility to the structure, and the extracted bundles of cells form the flamentous product known as flax, hemp, and jute, derived from dicotyledonous plants. In monocotyledons the fibrous cells are built up with others into a composite structure known as fibrovascular bundles. Such fibre occurs in the palms and in the leafy-leaved agaves, the bundles being found, not as in bark, but throughout the stem or leaf forming the supporting structure. These filaments, when separated from the soft cell mass by which they are surrounded, may be known as structural fibre, of which the fibre of sisal hemp is an example. The simple cells produced on the surfaces of the seeds of endosperms, such as cotton and coconut, constitute a fibrous material, to which the name "surface fibre" has been given. For illustrations, see PLATE OF FIBRES: PLANTS under article Hemp.

The fibre bundles, therefore, whether occurring as bast fibre or structural fibre, or whether in the form of simple cells, as surface fibre, may be regarded as the spinning units—aggregations of bundles purified and cleansed of all extraneous matter and simply twisted together. The mass of cellular structures separating the fibres is removed in the process of cleaning. The fibres of the leaves of endosperms, being parallel to each other, are easily obtained of sufficient length for economical purposes; while the reticulated fibres of leaves and stems are too short, and the cells too thick, which is comparatively seldom the case, cannot be separated for use. The best fibres of exogens, however, are often of sufficient length and easily separated. This separation is generally accomplished by steeping in water or by frequent dampening with water so as to cause a partial rotting of the part of the bast and other parts of the plant which cover the fibres. Since the fibres of endosperms are in general colored and injured by this damp process to a much greater degree than are those of exogens, more mechanical means are usually preferred for their separation, such as beating, passing between rollers, and scraping. The fibres of many leaves are separated by scraping alone. The fibres of seeds, as cotton, exist in nature attached to the seed, like the wool or hair of animals, and require merely to be collected and cleaned. A method of separating animal and vegetable fibres in woven materials is based upon the fact that the alkalies destroy the former, and have little effect upon the latter. The alkali is generally caustic potash of 5 per cent strength. If a wool-cotton or a silk-cotton mix is immersed in this solution for about 15 minutes, the wool or silk is destroyed and the cotton is little affected. The test may be made quantitative. The most accurate results are obtained by removing dressing or finishing substances from the material before applying the test. There are two natural groups of fibres—the commercial species and the vast group of the so-called native fibres. Among the uncivilized races many species of fibre plants which civilized man cannot afford to employ commercially, hundreds of fibrous plants could readily be enumerated. Of the list of commercial species may be increased from time to time. Of those now important there are six bast fibres, as follows: Flax (Linum usitatissimum); China grass (Bachneria nivea); hemp (Cannabis sativa); jute (Corchorus capsularis and Corchorus olitorius); Sunn hemp (Crotalaria juncea); and Cuba bast (Ribesius tiliaceus). There are two surface fibres: Cotton (Gossypium spp.) and raffia (Raphia pinnata). The list of structural fibres numbers 15, representing agaves, palms, and grasses as follows: Cordage fibres—Sisal hemp (Agave rigida var.); Ma-nila hemp (Musa textilis); Mauritius flax (Fur-craea gigantea); New Zealand flax (Phormium tenax). Brush fibres—Tampico or istle (Agave
heretocantha); Bahia piasaba (Attalea funi-
fera); Para piasaba (Leopoldinia piasaba); 
Mexican whisk, or broom root (Epicampos ma-
croura); cabbage palmetto (Subal palmetto).
Upholstering and matting fibres—Crin végétal
(Chamarops humilis); Spanish moss (Tillandi-
sia usneoides); saw palmetto (Serenoa serru-
lata); coconut fibre (Cocos nucifera). Paper
manufacture—Esparto grass (Stipa tenacis-
sima), a substitute for bath sponges; and vege-
table sponge (Luffa egypitica).

The sources of supply of these fibres are as
follows: Flax is produced chiefly in Belgium,
Russia, Austria-Hungary, Holland, Italy,
Great Britain and Ireland, the United States,
and Canada; China grass, or ramie, comes from
China; hemp is obtained from Russia, United
States, France, Belgium, Germany, Austria-
Hungary, Italy, and the Netherlands; jute from
India and Cuba; bast from the West Indies;
cotton is chiefly produced in the United States,
Egypt, and Peru; raffia comes from Africa; sisal
hemp is produced in Yucatan, Cuba, and the
Bahamas; Manila hemp is a product of the
Philippine Islands; Mauritius, or alo, fibre
comes from Africa; New Zealand flax from the
country indicated by its name; Tampico, or
istle, is a Mexican product; Bahia or Pará
piassabas, or “bassa” fibres, are collected from
Brazilian palms, other species of bass from Afri-
can palms; broom root is a Mexican product;
the two palmetto fibres are produced from
species of Florida palms; crin végétal is derived
from an allied palm, growing in Algeria; vege-
table hair from Spanish moss is prepared in
South Carolina and the Gulf States; coconut
fibre comes from the East Indies; exparto grass
is produced in Algeria, Spain, and Portugal;
vegetable sponge largely in Japan. Other
fibrous substances appear in the form of straw
plait from Italy, Japan, and China chiefly.
The Eastern floor mattings and basketry are
made from various fibres.

The highest use for which fibre may be em-
ployed is in the manufacture of cloth or woven
fabric. The next higher uses are in the manu-
facture of threads, twines, cords, and ropes
known as cordage. A third use is in the manu-
facture of brushes and brooms, for which a
different class of fibre than either the fabric
or cordage fibres is employed. Fourth, fibres
are used in the manufacture of many plaited
or coarsely woven articles employed in domes-
tic economy, some of which are of commer-
cial importance, while the greater number are
“native” productions. A fifth form of utility
is the employment of fibres or fibrous substances
in mass as filling material, for stuffing pillows,
cushions, mattresses, furniture, etc., or as pack-
ing substances. A sixth and exceedingly impor-
tant use is in the manufacture of paper. For
further information, consult: Watt, Dictionary
of Economic Products of India (Calcutta,
1889); Morris, Commercial Fibres (London,
1895); “Vegetable Fibres,” Enc Royal Gar-
dens (ib, 1898); Dodge, “Useful Fibre Plants
of the World.” United States Department of
13 (Washington, 1897); Georgievics, Chemical
Technology of Textile Fibres (New York, 1902);
Matthews, Textile Fibres (3d ed., ib, 1913);
Mitchell and Prideaux, Fibres Used in Textiles
and Allied Industries (ib, 1911). See Flax;
Jute; Ramie.