

# Brushing Up On Bristles

Brushes are among the many familiar objects we use in our daily lives. From paintbrushes, to hairbrushes, toothbrushes, and lint brushes, they all require different types of bristles to perform their tasks.

Evidence for the use of brushes as early as the Paleolithic period, 2.5 million years ago, comes in the form of prehistoric paintings in the Perigord caves in France and the Altamira caves in Spain. One of the earliest brushes—the besom broom—consisted of a bundle of twigs tied to a wooden handle. Other civilizations improved on this early model by incorporating corn husks and tassels.

At the beginnings of recorded history, the early Egyptians used vegetable fiber brushes to create their elaborate tomb paintings. In the Far East, the ancient Chinese developed calligraphy into a fine art by using the tip of a long-haired brush and black ink to paint intricate characters.

Brush bristles can be made from animal

hair, plant fibers, or (in modern times) synthetic materials. Technically, a "bristle" is the stiff, uncurled back or neck hair from a wild pig. Such bristle brushes were widely used for centuries to apply paint, varnish, and enamel. Pig bristle brushes are also used for some tooth and hair brushes, as well as for industrial and household brushes.

The first hair-bristle brushes were small swatches of animal fur; later, bundles of hog hairs were tied to sticks to provide more flexibility and control over the tip. Bristle brushes were improved further by setting tufts of hair into holes in a stick, then holding them in place with pitch.

Only older pigs and hogs produce abundant bristles with the length, texture, structure, and flexibility needed for use in brushes. In the United States, bristles must be imported because domestic pigs are raised primarily for meat and slaughtered while they are still too young to

produce bristles. The United States is the world's chief market for pig bristles.

Before its 1917 revolution, Russia was the chief exporter of bristles. The sudden change in agricultural economy, however, caused Russian bristles to vanish from the world market, to be replaced by Chinese supplies. China had a great advantage because of a semiwild strain of pigs within its borders, as well as an abundance of cheap labor to strip bristles from a hide. In recent years, Russian sources have once again begun to provide a significant supply.

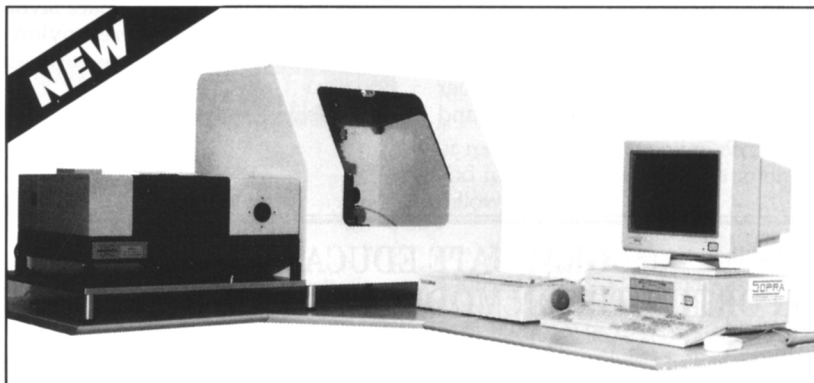
The texture of bristles ranges from coarse and stiff to soft and supple. Bristles come in various shades of white, gray, brown, yellow, or black, and may be spotted. They can be as short as two inches (5 cm) or less, or as long as six inches (15 cm).

Bristles are thickest at the flesh end, tapering in diameter toward the outer end, where they divide into two or more fine strands. The frayed end, called the "flag," is very useful because the fine strands are particularly suitable for holding and smoothly applying paints, varnishes, enamels, and other protective

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coatings. The hairs of no animal other than the pig display these consistent characteristics, providing the best brush material.

Other animal hairs used as brush bristles include ox (especially the tufts of silken hair found in ox ears), squirrel (many so-called "camel-hair" brushes are actually made from squirrel hair), goat, weasel, civet (spotted American skunk), kolinsky (Asiatic weasel), fitch (European weasel or polecat), and badger (widely used in shaving brushes). Horsehair—especially the mane hair, which is softer than the tail—is used extensively in polishing brushes. As early as about 500 B.C., the Greeks used a hare's foot set in wood to apply makeup. The tails and feet of other animals were also used as brushes.

In the 15th century, the Italian painter Cennino Cennini included a description of brushmaking in a treatise he wrote on painting. He was particularly fond of the miniver brush (made from an ermine's winter coat), the brush preferred by most of the great painters of the Renaissance. Cennini also described a much larger, serviceable brush, called the "pound brush," used for whitewashing walls. This type of brush, made with a full pound of hog's bristles, is still in use today.

Plant fibers also have long been used in brushes. Ancient Chinese, Maya, Inca, and Egyptians all used reeds for brushes. The Egyptians soaked the ends of reeds in water to separate the fibers, making something similar to a felt tip pen.

The most important common plant fibers are *piassava*, a tough brown fiber that comes from the Brazilian palm, and

*palmyra bassine*, obtained from the Palmyra palm found in Africa and Sri Lanka. Plant fibers are treated by soaking, beating, and drying, which results in suitable brush material.

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Artificially created fibers derived from vegetable material can also be used as brush bristles. For instance, cotton dissolved in acetic acid and acetone creates a solution that, when thickened, can be spun and extracted through tiny holes in a "spinneret." As the volatile acetone evaporates in circulating air, the extruded fibers harden, rendering them suitable for use as bristles.

Research into natural protein fibers (keratin in animals and cellulose in plants) provided a framework for creating synthetic filaments. Synthetic bristles remain stiff in boiling water and, in general, better resist the action of chemicals than do animal bristles.

Nylon, the first such synthetic filament, was initially used in toothbrush bristles. Tapered nylon bristles compare favorably with hog bristles; untapered nylon filaments are used in many household brushes.

Other important synthetic brush bris-

ties are made from vinyl, polystyrene, and polyethylene. Vinyl fibers are made by cutting thin sheets of vinyl into fine strips. Polystyrene fibers, which have the unusual ability to be charged with static electricity, can be used to attract dust—for example, in lint brushes. Polyethylene fibers are short and stumplike, but they are well suited to massage brushes.

Brush bristles can be made from many other materials as well, including wire, fiberglass, and numerous new polymers. In industry and the arts, as well as for common household use, the availability of materials for making many specific types of brushes has opened the door to significant advances.

KEVIN J. ANDERSON

FOR FURTHER READING: Max Bachrach, "Textile Fur Fibers, Animal Brush Fibers, and Down," Chapter 14 in *Matthews' Textile Fibers*, 6th edition, Herbert R. Mauersberger, editor (New York, 1954); and Michael R. Snow and Maryse Worrallo, *Brush Making, Craft and Industry* (Oxford Polytechnic Press, 1984). □

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