

NYLON



PHOTO DU PONT COMPANY

At the 1939 World's Fair, fashion models (right) gave the public its first look at nylon stockings. When nylons first went on sale in New York on May 15, 1940 (above), customers lined up long before the stores opened. Four million pairs were sold in a few hours.



By Sally A. Kydd

Take a look at the label on your jacket. You may find that it is made of nylon. If it is, you are wearing one of the first and most successful synthetic fabrics. You can hardly get through a day without encountering nylon. Do you like to go camping? If so, your backpack, tent, and sleeping bag are probably made of nylon. Do you prefer to fish, sky dive, or sail? The fishing line that almost caught the big one, the parachute that carried you through the wild blue yonder, and the sail that helped your boat go faster were made of nylon.

Nylon is a synthetic fiber—a laboratory product manufactured by the trainload. It is made from chemicals that have their origins in coal, air, and water. Compared with natural fibers, nylon is stronger, lighter, and water resistant. Such is the magic of chemistry.

But nylon can't do everything. It is not used in sweaters because it doesn't form a soft bulky yarn; it is not used in shirts because it is not as wrinkle resistant as polyester. In the clothes you wear daily, the largest amount of nylon you might discover is 10% in your socks or thermal underwear. But where the properties of

nylon are suitable for a particular application, it usually supersedes the traditional natural fibers.

Soft landing

Soon after airplanes flew into combat in World War I, there was a demand for parachutes. They were made from a natural fiber that was strong, thin, and light—silk. However, during World War II the United States was cut off from Japan, the major supplier of the fabric. The process for manufacturing nylon had just been developed by the E.I. du Pont de Nemours Co. in Wilmington, Delaware. Nylon parachutes were manufactured by



Nylon's durability, flexibility, and strength make it ideal for camping equipment. This camper's jacket, backpack, sleeping bag cover, and tent are made of nylon; her hiking shoes are partly made of nylon fabric.

the thousands and saved countless soldiers' lives. Once the process was proven successful, many plants were built in this country and abroad.

Nylon can be manufactured with a range of properties, making it useful for different applications. Parachutes require fibers with very high strength, or tenacity. Its strength also makes nylon suitable for making ropes that are lighter, easier to handle, and more resistant to mildew than those made from natural fibers. The nylon fibers used in clothing are not as strong, but have greater stretch or extensibility.

Extensibility is very useful for the manufacture of women's hose. After it is woven from minute fibers, the stocking is pulled over a specially shaped form and set with steam. The stockings continue to maintain this shape, to a great extent, during wear. The high elasticity of nylon ensures that the stockings will not bag at the knees or ankles after each movement but will recover their original shape.

This shape retention also makes nylon suitable for women's garments and underwear. Permanent pleats and creases can be set in clothing, making it useful for skirts and pants.

Bristles, once made from hog's hair, are now made from nylon into brushes for teeth, hair, clothes, and bottles. The list of products seems endless: luggage, sails, fishing nets, reinforcing cords in airplane tires, and on and on.

Carpets made of nylon fibers can be wet-cleaned with water and soap to look like new, so they appeal to businesses with heavy traffic. Nylon carpeting lasts longer and is more economical than other natural and man-made fibers.

Playing with polymers

Nylon was discovered by a very creative chemist named Wallace H. Carothers. He worked at the Du Pont Company where he enjoyed the freedom to do as much basic research as he wanted. He produced many new

materials that were not useful, but also some that were fabulously successful, such as nylon and neoprene (synthetic rubber).

In 1928 Carothers began to study the nature of polymers—long molecules composed of much shorter molecules—at a time when the subject was not popular with other chemists. He had no products in mind at the time, and it was not possible to predict where his pursuits might lead. Carothers knew that when an organic acid (with a $-\text{COOH}$ group) is reacted with an alcohol (with an $-\text{OH}$ group), the acid group would link with the alcohol group to eliminate water and form an ester (with a $-\text{COOC}-$ group). Acetic acid, for example, reacts with ethyl alcohol to form ethyl acetate (an ester) and water:



