


HISTORY OF PAPERMAKING

1. Humans have always had the need to communicate their experiences and ideas. In ancient times, people worked hard carving pictures and symbols into the walls of caves, and on rock and bone. As human civilizations developed, surfaces were found that were easier to write on, such as beeswaxed boards, palm leaves, bronze, silk, parchment made from animal skins, and clay tablets.
2. Long before humans thought of making paper, wasps were doing it. Paper wasps build their nest by chewing tiny slivers of wood to make a paste that dries as paper.
3. About 4,000 years ago, the Egyptians discovered how to make a writing surface out of papyrus, a type of reed that grows along waterways in southern Europe and North Africa. The reed was cross-woven into a mat and then pounded into a hard thin sheet. The word "papyrus" is the origin of the word "paper."
4. The Chinese invented papermaking in A.D. 105 (about 2,000 years ago). A court official named Ts'ai Lun under the Chinese Emperor Ho Ti made paper from hemp, old cloth, and mulberry bark mixed with water. This mixture was formed into a sheet, the water was squeezed out, and the sheet was allowed to dry in the sun. Paper remained a secret of the Chinese until A.D. 751, when Muslim invaders captured a Chinese paper mill and took the secret across the Near East and North Africa to Europe. In 1151, the first paper mill was built in Spain.
5. Paper was still very scarce and expensive because it was made by hand from rags of cloth - which were limited in supply. Somehow as the craft of papermaking spread across Eurasia, the technique of using wood as the source was lost. Worn-out clothing, which was mostly linen (made from flax), and cotton fiber provided the raw material for paper. Each sheet was made by dipping a screen into a mixture of 99 percent water and 1 percent pulp fibers, and then filtering the water away from the fibers. Only about 750 sheets could be made in a day. But after Johann Gutenberg invented the moveable-type printing press (in about 1450), the demand for paper grew. Mechanical pulpers and beaters were invented, and rags as raw materials became scarce.
6. In 1690, a group of Americans from Philadelphia formed a partnership to build America's first paper mill. William Penn and Benjamin Franklin were among early Americans to support the development of papermaking in America, and the industry thrived as the 18th century progressed. During the Revolutionary War, the demand for paper was so great that soldiers had to tear up old books to make wadding for their muzzle-loading guns. Messages to General George Washington were sent on small scraps of paper. By the end of the Revolutionary War, the new nation had nearly 100 paper mills and by 1810 nearly 200. In this period people used the ancient process of spreading and drying pulp in a sheet on a screen with a wooden frame called a "paper mold." The mold was dipped into a vat, and the water drained away. The wet sheets of paper were turned off the mold and layered with blankets of felt. Then they were pressed and separated for drying.

7. About the middle of the 18th century, a French scientist, Rene de Reaumur, observed wasps using tiny fibers of wood to make their nest. Some years later, a German named Friedrich Gootlob Keller invented a machine designed to turn wood into pulp by grinding away its structure with a revolving grindstone. Englishman Hugh Burgess improved this process with chemical pulping - digesting wood with solutions of various chemicals. Wood chips were boiled in a caustic chemical soda (sodium hydroxide); this was called the "soda process." Later another chemical (sodium sulfate) was used, and this was called the "sulfate process."
8. In 1798, paper went from being handmade to machine-made. Nicholas Louis Robert, a clerk at a papermaking mill in France, invented a large hand-cranked machine with an endless wire screen that filtered the pulp - the mixture of fibers ground up and suspended in water. Robert sold this design the Fourdrinier brothers, two English papermakers, who improved his design and produced the machines for sale. Paper could now be made by rollers that squeezed out the excess water from the pulp on the screens, and the damp paper was rolled up at one end of the machine. However, the raw material for pulp, cloth rags, was still in short supply.
9. America's early papermaking mills were located mostly in New York and the New England states. The spruce trees in those areas made excellent ground wood and sulfate pulp. The industry expanded to Wisconsin, Michigan, and Minnesota where there were spruce and balsam trees; to Washington, Oregon, and California where there were hemlock, fir and pine; and to the southeast, which had mostly pine. By the turn of the 20th century, the age of mass-produced paper had been launched in the United States. Newspapers and magazines appeared on stands. School slates disappeared in favor of notebooks and

lined paper. Five-and-ten-cent novels rolled off the presses. Plentiful, low-cost paper and paperboard were important to the Industrial Revolution and the development of the United States and the world.



10. Today, raw logs, industrial wood and paper waste, and recovered paper are the primary sources of paper pulp. However, fibers from cotton, flax, sugar cane, and other fibrous plants are used for special papers. The pulp can be produced by either mechanical or chemical processes. In the mechanical processes, wood logs or chips are reduced to fiber by holding them against huge grindstones. In chemical processes, wood chips are cooked in a giant pressure cooker or digester where the wood is dissolved into fibers. The chemical pulps are often bleached to produce bright paper required for books, writing, and business. Unbleached pulps are used in the manufacture of cardboard, grocery bags, and other products. Today, recycled waste paper is also being used - it is repulped and used in the production of many paper and paperboard products.