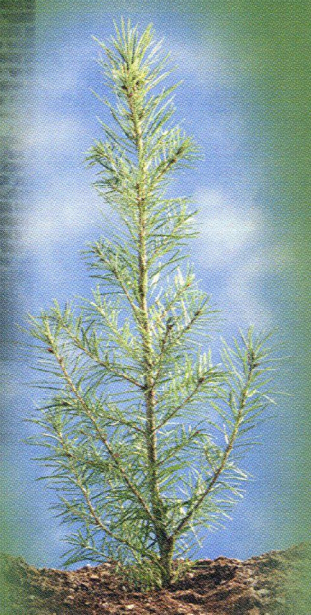
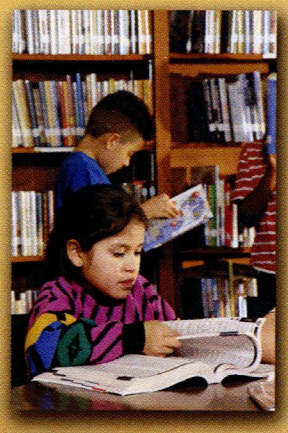
Savannah Pulp and Paper Laboratory
Savannah, Georgia
September 26, 2001

National Historic Chemical Landmark

Paper from Pine



AMERICAN CHEMICAL SOCIETY
SCIENCE THAT MATTERS



Paper from Pine

Chemistry: a new chapter in the ancient craft of papermaking

When Georgia chemist Charles Holmes Herty found a way to make quality paper from pine trees in 1932, he also founded an industry that brought much-needed jobs to the depression-crippled south. Paper producers had deemed the plentiful pine too gummy—until Herty's Savannah Pulp and Paper Laboratory wrote a new chapter in the ancient craft inspired by insects who built paper nests while dinosaurs roamed the earth.

Paper from pines makes headlines

Less than a year after Herty opened his research lab, the Georgia weekly *Soperton News* printed its March 31, 1933 edition on experimental paper made from southern pines. Other newspapers quickly followed suit.

Charles Herty, visionary and entrepreneur, had successfully countered the argument that pines were too gummy to be used for anything but cardboard and other brown paper. The forest and white paper industries were using the less sappy—and quickly dwindling—northern hardwoods and had little incentive to change during the precarious 1930s.

A passion for southern pines

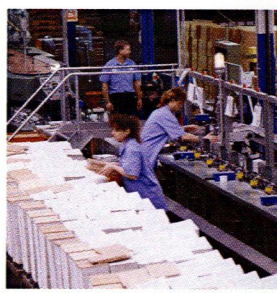
For Herty, the incentive was the Great Depression. His native south had been hard hit and the region's abundant pine forests could provide an economic boost.

Herty had saved these forests in 1903 by inventing a new method of extracting resin, used to make turpentine, that did not scar and damage the trees. Now, he turned to chemistry to address another concern: the high level of resin in the pines' wood, which was believed to block the bleaching with acidic sulfite solutions needed to make white paper.

A present from Christmas trees

During a lecture in Germany 30 years earlier, Herty had heard that the sulfite process could be applied to the *Tannenbaum* the Germans used as Christmas trees. Herty reasoned that younger pines would be less gummy than mature ones. Moreover, the pines' fast growth rate would make it possible to cultivate trees like crops, creating a renewable resource.

At age 65, Herty was ready to test his ideas.



The pine-to-pulp process

Herty directed his new research lab to make pine into the pulp that would become paper, using acidic sulfite solutions to digest the wood, remove impurities and increase the effectiveness of bleaching agents.

His staff worked around the clock to make enough pulp to produce the experimental batch of paper used by the *Soperton News*. Thus began a new era in papermaking that simultaneously breathed life into the south's devastated economy and slowed the destruction of the north's hardwood forests.

Celebrating chemistry

The American Chemical Society designated the Savannah Pulp and Paper Laboratory, founded by Charles Herty in 1932, a National Historic Chemical Landmark on September 26, 2001.

Paper from wood is a renewable resource. The United States has more trees today than 70 years ago. The forest industry alone plants more than 1.5 billion trees annually.

The average American uses about 700 pounds of paper and paper products a year. Thanks to recycling, we recover 40 percent of this paper for reuse.

The paper trail: from the age of dinosaurs to the digital era

- *Earth's first papermakers*

Ancient paper wasps chewed wood fibers into pulp to build their nests, using their protein-filled saliva to glue and link the strands of cellulose. The dates of their origin are in question, but we do know that waspish insects found trapped in amber date back at least 110 million years.

- *Mankind's first papermaking*

The ancient Egyptians, Greeks and Romans first mimicked such techniques around 3,000 B.C. They beat the soft pith of papyrus to break up the fibers which were soaked, squeezed and dried into a durable writing surface. But this process did not create the chemical bonds that the wasp had achieved.

- *The invention of real paper*

Some three millennia later, a courtier named Ts'ai-Lun practiced papermaking techniques in the Hunan province of China. His closely guarded recipes likely included cotton rags, mulberry and hemp—an innovation which qualifies his material as the first modern paper, circa A.D. 105.

- *The secret escapes east to west*

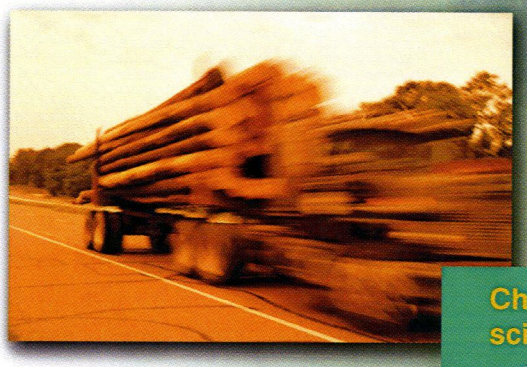
The secret reached Korea, then Japan in A.D. 610, and followed silk and trade routes west. The Arabs likely acquired the technique in Uzbekistan around A.D. 750.

- *Medieval innovations*

Starting in the 1200s, Italians furthered the Arabian rag technique, making drain screens of mesh and building a paper press. Eventually paper eclipsed parchment and vellum, advancing literacy by making the written word less costly and more accessible. By the mid-1400s, we began to see movable type, the printing press and machine-produced books.

- *Making paper from wood*

In the early 1700s, Réné de Réaumur, a French chemist and naturalist, reasoned that if wasps could make paper from wood, so could people. His research contributed to pulping techniques that redirected the paper industry by the mid-19th century. Within 80 years, Charles Herty had applied the process to southern pines.



- *Perfecting papermaking*

Fine-tuning the modern papermaking process requires chemical additives.

Sizing is added to keep the final product from being too absorptive and feathering ink. Coating finished paper with a mixture of starch and clay, then polishing it, gives us glossy magazines and book covers.

Fillers of finely ground chalky compounds are often added to make paper more dense and opaque. They might include the colored rags, dyes or pigments that produce paper in a rainbow of hues.

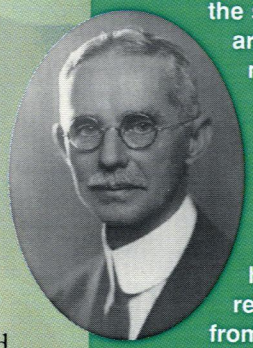
Whiteners such as titanium oxide can be blended into the spaces between fibers to make the paper a brighter white.

- *A time-honored process*

The watery pulp is sprayed onto a flat wire screen which moves through the papermaking machine, draining the water and bonding the fibers. The web of paper is pressed between cylinders, squeezing out additional water and creating a smooth surface. The paper is dried by heated cylinders and may be coated before removal from the paper machine. The finished paper may be supplied in rolls or polished or embossed and cut into sheets.

Today, new types of laser and digital photo paper meet the demands of the information age. But, at its root, the fundamental process of papermaking is still the same: the bonding of cellulose, a polymer whose long chains support plant cell walls.

Charles Herty: crusader for science and country



Born in Milledgeville, Georgia in 1867, Charles Holmes Herty was the son of a Confederate army captain turned pharmacist. Orphaned at 11, he and a younger sister were raised by a schoolteacher aunt.

Herty graduated from the University of Georgia in 1886 with first honors in chemistry. He received his doctorate from Johns Hopkins University in 1890, where he played baseball, a lifelong passion.

He began teaching at his college alma mater in 1891, also coaching the football team. Herty longed to study in Germany—then the world's center of chemical research—and in 1899 took a year's sabbatical in Berlin with his wife and two young sons.

From 1905 to 1917, Herty headed the University of North Carolina's chemistry department. When World War I threatened the United States, he helped organize chemical research to counter poison gas.

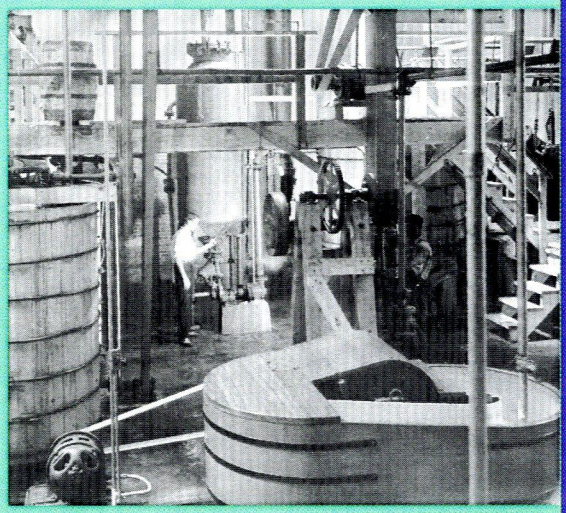
He was president of the American Chemical Society in 1915 and 1916 and became editor of the predecessor journal to today's weekly newsmagazine, *Chemical & Engineering News*.

Herty's advocacy for research into the use of chemistry to fight disease led to the creation of the forerunner of the National Institutes of Health.

In 1932, he opened the non-profit Savannah Pulp and Paper Laboratory—today called the Herty Foundation—and served as its leader until his death in 1938.

The Herty Award, a gold medal inscribed with the phrase "For science and country," is awarded each year to an outstanding southeastern chemist.

The American Chemical Society designated the Savannah Pulp and Paper Laboratory a National Historic Chemical Landmark on September 26, 2001. The plaque commemorating the event reads:



The Savannah Pulp and Paper Laboratory opened its doors in May 1932 and less than one year later had produced a high quality newsprint.

Charles Holmes Herty (1867-1938)—Georgia chemist, educator and advocate for the development of U.S. industries—founded and directed this laboratory, originally housed in a warehouse at 512 W. River Street provided by the Savannah Electric and Power Company. Herty's research proved that valuable products such as newsprint, white paper and rayon fibers could be made from young, fast-growing southern pine trees. The resulting technology catalyzed the pulp and paper industry in the South and helped revive the region's economy during the Great Depression. Cultivation of the southern pine also conserved the slow-growing northern hardwood forests. In 1938, the laboratory became the Herty Foundation now located on Brampton Road.

About the National Historic Chemical Landmarks Program

The American Chemical Society, the world's largest scientific society with more than 163,000 members, has designated landmarks in the history of chemistry for more than a decade. The process begins at the local level. Members identify milestones in their cities or regions, document their importance, and nominate them for landmark designation. An international committee of chemists, chemical engineers, museum curators, and historians evaluates each nomination. For more information, please call the Office of Communications at 202-872-6274 or 800-227-5558, e-mail us at nhclp@acs.org, or visit us our Web site: chemistry.org/landmarks.

A non-profit organization, the American Chemical Society publishes scientific journals and databases, convenes major research conferences, and provides educational, science policy and career programs in chemistry. Its main offices are in Washington, DC, and Columbus, Ohio.

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