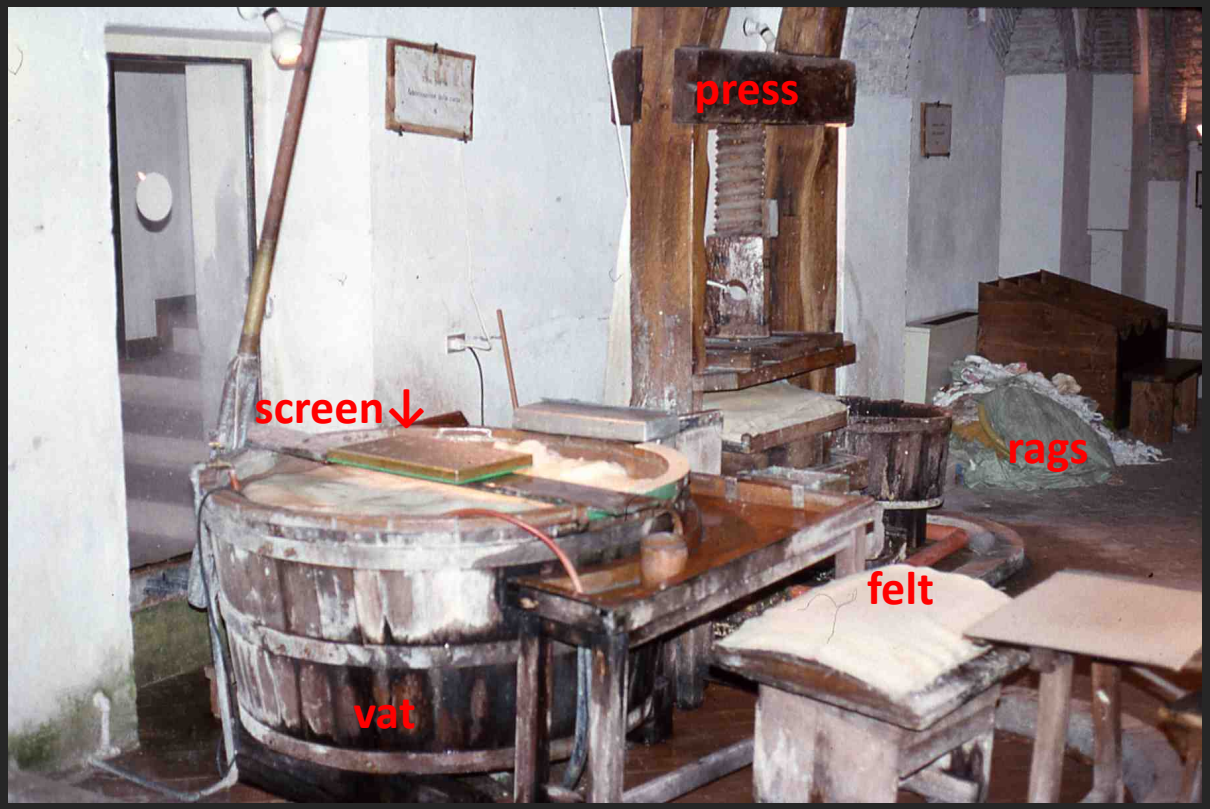
Paper & pH

Engraving on Paper

The Adoration of the Shepherds
Hendrick Goltzius,1594
MCCM 2004.52.1

Papermaking



Traditionally, paper was handmade from plant fibers such as cotton. Old rags were soaked and beaten to separate the fibers. The fibers were mixed with water to form a slurry. Sheets of paper were formed by dipping screens into a vat of slurry. The fibers intertwined as water drained through the screen. The sheets were then transferred to felts, stacked, pressed, and dried.

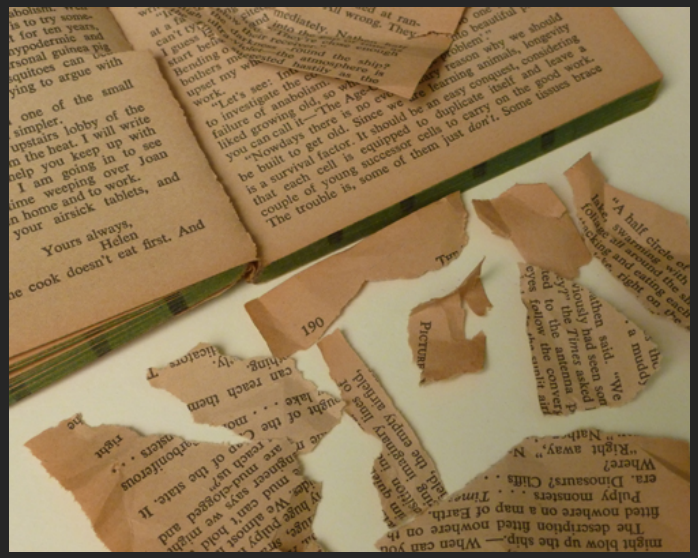
Today, paper is often made from wood, which contains acids. Paper can also become acidic through contact with acid-containing materials, such as cardboard used in framing. Paper can also absorb acid from the environment.

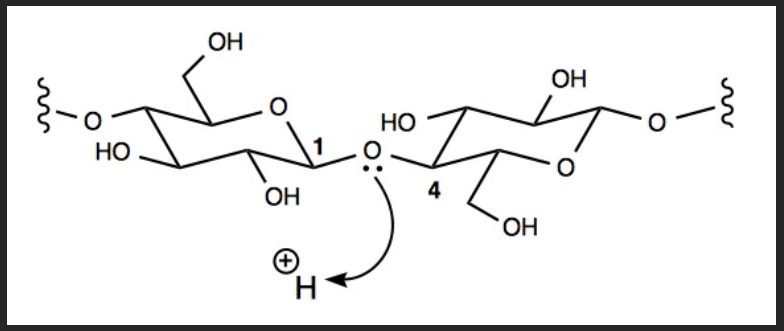
This paper is darkened by acids from the cardboard backing in a frame. The corrugation pattern is visible along the bottom edge.

Paper Fibers

Fibers from non-acidic paper are long and flexible, like the twisted round cotton fibers from archival drawing paper, seen in the scanning electron micrograph on the left. Fibers from acidic paper are short and brittle, like the broken flat wood-pulp fibers from newspaper seen on the right.

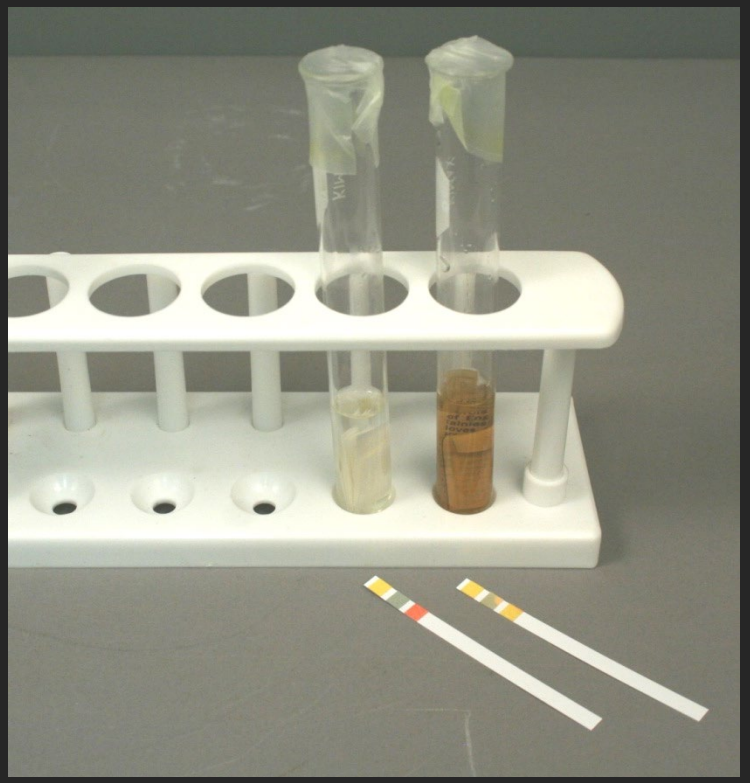
Acid Hydrolysis of Paper





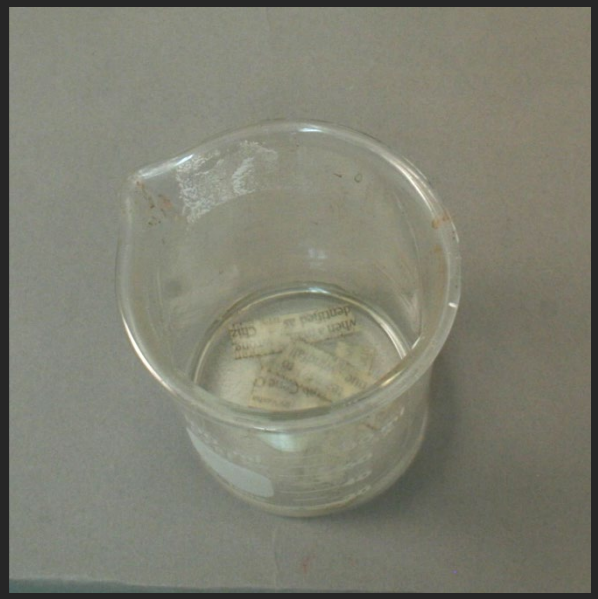
Paper fibers consist of long chains of glucose. Acids can break those chains causing the paper to be become brittle and discolored. The weak paper tears and breaks easily when it is handled or used.

Comparing Acidity



The acidity of different papers, such as laboratory filter paper and the paper in an old book, can be compared by measuring the pH. Small strips of each paper are placed into test tubes with warm water, and pH strips are used to measure the acidity.

Neutralizing Acidity



The acidity in paper can be neutralized with a base, such as calcium carbonate. The acidic paper from an old book is soaked in a calcium carbonate solution, and the pH is measured.