Printing's Past

By Frank Granger

The Permanence of Books

"Printing – The Art Preservative of all Arts"

Early description of printing

The Gutenberg Bible and other early printed books are often in better shape than books printed fifty to one-hundred years ago. Ancient books printed on linen paper are still white and flexible, while books printed later on wood pulp papers are becoming yellow and brittle. Libraries report that from 10% to 50% of their books are in some stage of decline.

What is the cause and what is the cure? Both cause and cure are less obvious and more numerous than might be expected. The process has basically not changed, but the ingredients in the process have evolved over the years.

The chief raw material of paper is cellulose pulp or fiber. Ts'ai Lun, in the early first century A.D., is given credit for the invention of paper. His paper consisted of fibers from Mulberry tree bark, rags, hemp, and fishnets. In the thousand-year period that the process of papermaking moved from China to Europe, the recipe changed. Linen cloth became the exclusive raw ingredient? Various methods were used to break down the fibers from continuous beating to letting it ferment or rot in a lime solution. The pulp was mixed with large amounts of water and the slurry was spread across a screen that allowed the water to drain through leaving a mat of fibers that could be dried into a sheet.

The first suspect in book deterioration would be the paper. Early European papers were made exclusively from pulp derived from cloth rags. The Chinese centuries before had included some wood in their paper. Until the nineteenth century, the Europeans had lost this ability to make paper from wood pulp. The process of making paper derived from wood-fiber was rediscovered. This made paper less expensive and books became more plentiful, but the book was less likely to span the ages than to last the life span of the owner. This period was during the boom of the industrial age and much recorded information was to be lost in decaying books.

When it was rediscovered that wood fiber was a potential pulp, the wood was beaten or ground into a mechanical pulp. Along with the fibers, the paper contained the lignin that was a kind of glue that held the tree fibers together. This lignin causes the paper to rapidly yellow, much like newsprint. In time it becomes brittle. The blame was placed on the lignin and resins that were natural in the wood. Thus the papermaking process, a "cooking" of the wood pulp using various other chemicals was added to remove the unwanted chemicals.

Dr. Edwin Sutermeister, a paper chemist, discovered in the early part of the twentieth century, that the cooking chemicals, bleaches, and other additives left an acidic residue that, over time, also caused the paper to decompose. One of the chief culprits was alum. Alum is a sizing agent. To size a paper is to give it a type of waterproofing. It keeps certain writing inks from too rapidly being absorbed into the paper and allows the paper to be run on a lithographic press.

Books, older ones especially, have other aspects that have an effect on permanence. Before alum was used to size paper, gelatinous glue was applied to the surface of the paper. It was called "animal size" because it was made from animal hides and cartilage. Clay coatings were also applied to some papers to make them smoother for printing. The coatings were applied using a mixture that contained casein. Casein was derived from skimmed milk and was the adhesive in paper coatings.

Older books, unlike today, were made mostly using "natural" or "organic" materials. Modern bookmakers have many synthetic materials at their disposal. The craftsmen of years-gone-by used material that was readily

available. Paper paste was made from flour, salt, and water. Stronger hot-melt glues were made from animal hooves. Book signatures were sewn together with silk or cotton thread. Bookbindings were covered with leather or starched cloth. If gold leaf was applied to the cover it was applied using an egg white solution called glair. These ingredients added to the natural fibers provided a real feast for silverfish, lice, roaches, moths, bacteria, and fungi.

Environmental conditions also affect book permanency. Extremes and changes in temperature and humidity can speed and cause deterioration. Smog, ozone, and pollutants are damaging. Sunlight and ultraviolet radiation from some types of artificial illumination also take their toll.

The handling of books deposits acidic oils on the paper. Notes marked with pen and ink bleed through the paper. Dog eared pages and amateur repairs done with poor quality tapes and glues, also damages books.

Many books today are being printed on papers called acid-free. In the paper making process, alkaline chemicals have replaced acid based chemicals. Libraries have taken steps to control environmental factors. There are many books and other documents that are in need of book preservation. Book conservation is the science of book preservation.

Aqueous deacidification is a method of taking a book apart and soaking the paper in an alkaline solution. Paper that has ink that would be damaged by soaking can have a treatment applied by brush or spray. Vapor and gas deacidification processes are also available. These processes halt damage, but do less to restore brittle or damaged pages. Various methods of encapsulation and paper reinforcement are used to repair pages. Leather restoration and hand rebinding are used on rare and expensive volumes.

Microfilm has been used for the past few decades to record the images, if not preserve the actual printed page. To read this photographic record requires mechanical readers that are harder to handle than the original publication. Digital and web based methods of "preserving the printed word" are popular and basic for those with the right method of access, but rapidly changing technology may leave tapes, disks, compact disks and DVD unreadable in a few years.

The book remains the most portable, easily accessed medium for most people, if not the most permanent.

Death of the Book?

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The book will die, we are told.
No longer relevant - so very old.
To be digitized is the way.
Ink on paper is from yesterday.
I think there is a lesson we can learn.
Before our libraries we do burn.
Let's say you convert it all to CD.
Have you thought of compatibility?
In a century, can they access,
What you wrote with any success?
Will computers keep the CD drive?
Will the PC even survive?
Before you answer let me say,
I learned the answer another way.
In my home, music we do lack,
Because all my tapes are eight-track!

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