



# Protecting Your Collection Part 1: The Environment

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## Tips from The Dr. Strange Archive

Comic book preservation should be a top priority for any collector. The better condition the comic is in, the more it is worth. Unfortunately, comic books, especially gold and silver age comics, were not made to last. They were meant to be read, folded up and stuck in your back pocket, read again then thrown away. Long term preservation was not a consideration. The acids and other chemicals that make up the cheap paper causes it to deteriorate which causes the paper to become brittle and change colors.

The two primary factors that collectors face when dealing with the preservation of comics, and other paper products in their collection, are the environmental conditions and what you package your comics in. Both can have a direct effect on the comics over time. Comic book packaging and storage is covered in [Protecting Your Collection Part 2: Storage \(www.DrStrangeArchive.com\)](http://www.DrStrangeArchive.com).

The environmental conditions of the room/area a collection is stored in can have devastating long term affects on paper products. The three environmental conditions that all collectors should be cognizant of are: temperature, relative humidity and light. Fortunately, these three factors can be easily manipulated with engineering controls.

**Disclaimer:** The topics discussed here are tips and tricks from lessons learned from my research and practices over the decades. These tips work for me and may work for you. The Doctor Strange Archive accepts no responsibility for any actions you take with your collection.

**1. Why Do Comics Deteriorate?:** Paper deteriorates because of the internal composition of the paper and how it reacts to its environment. Paper is made of cellulose, which is a repeating chain of glucose molecules derived from plant cell walls according to the Library of Congress. The longer the cellulose chains (paper fiber), the more flexible and durable the paper is. Moisture and acids (air pollution, enclosure types) from the environment or from within the paper itself (from the manufacturing process) cut glucose chains shorter. The Library of Congress calls this acid hydrolysis. This process itself produces more acid feeding and continues the degradation. In the mid nineteenth century, wood replaced rag as the material for paper. The process of turning wood into paper is accomplished through mechanical and chemical pulping, which produces shorter fibers. Mechanical pulping does not remove lignin from the wood. This increases acid hydrolysis. Chemical pulping does remove the lignin. Pre-1980s paper also may contain alum-rosin. This may cause the paper to be more acidic. When mixed with moisture it produces sulfuric acid. Cellulose itself generates acid as it ages (formic, acetic, lactic and oxalic). The very material comics are made of is self destructive.

**2. Temperature:** Heat accelerates the rate of most chemical reactions, including the ones mentioned in Section 1, which in turn accelerates the deterioration of paper products. Authorities differ slightly on what the ideal temperature range should be for the storage of paper products such as comics. The US National Archives recommends a temperature of below 75° F. Other sources recommend a stable temperature of no higher than 70° F. Not only is the temperature important, but a steady temperature is important. Large fluctuations in temperature can also be harmful. More on that below.

**3. Relative Humidity:** Humidity also plays a big role in the degradation of comic books and other paper products. High humidity creates moisture that can increase chemical reactions in the paper. High humidity along with high temperatures can promote the growth of mold and insect activity. On the other

hand, very low relative humidity can lead to desiccation (drying out) of the paper, which can make some material brittle. Fluctuations of humidity and temperature can also be damaging because paper readily absorbs and releases moisture. This causes the paper to expand and contract over time. These physical changes can accelerate deterioration causing inks to flake, covers to warp, etc. That's why it is important to keep the temperature and humidity levels stable and avoid constant large fluctuations. The US National Archives recommend a relative humidity of below 65% to prevent mold and reduce insect activity. The Library of Congress recommends a relative humidity of 30%-40%. Other archival sources recommend a stable relative humidity of between 30% and 50%.

**4. Light:** The third environmental hazard to paper is light, which also accelerates deterioration. It can cause the fibers in the paper to weaken and become brittle and also cause the paper to bleach, yellow or darken. Also, dyes and inks can fade or change color when exposed to light. All wavelengths of light can have negative effects on paper, but ultraviolet (UV) light can be especially damaging because of its high energy level. The total effect of light's damaging affects are a function of the intensity of the light and the duration of the exposure. The best way to store your comics would be in a light proof container. Many collectors want to view and display their comics. The next best solution would be a windowless room. If this is not an option, consider covering your windows with heat/UV reflecting film and/or blinds/heavy curtains. Many collectors have moved to LED lights for their display cases and rooms. Generally they produce less heat and have less of an effect on paper than traditional light sources. Keep in mind, LEDs are not perfect. They have been shown to cause deterioration in chromium yellow paint. LED lighting is still a pretty new technology and long term studies by museums, etc. will determine the lasting effects of such light.

**5. Final Thoughts:** There are several factors that work against us as collectors when trying to preserve our collection. The good news is, with simple engineering controls, we can overcome these issues. First, purchase an inexpensive temperature/ humidity gauge that also records the temperature/humidity high/ low over time. These can be acquired from a hardware store for around \$15. Place these gauges in rooms you display or store your collection in where you can regularly see the display. The temperature in these areas should remain below 70°-75° F. Adjust your climate control as needed. The relative humidity in these areas should remain between 30% and 50%. If your relative humidity is above 50% use a dehumidifier of adequate size to reduce the humidity in that room. Stored comics and paper products should be stored in an light proof container. Items on display should be displayed in a room with no windows. If that is not an option, use heat/UV film, metal blinds and/or heavy curtains to protect the room from sunlight. UV barrier glass can also be used on framed pieces. Rooms should be lit with LED lighting. This type of light does not produce UV or IR light and can be much safer to use than standard light bulbs.

For more guides and resources, visit [www.DrStrangeArchive.com](http://www.DrStrangeArchive.com).

Good luck and have fun!!!

Sincerely,

Dr. Strange Archive