

**The objective of this web site is to provide simple guidelines for preserving motion picture film materials outside of specialized archives, with a focus on storage at home.**

## **1. INTRODUCTION**

Right now there are countless reels of movie film on shelves, in drawers, and in attics. The films themselves may be brand new 16mm experimental works or 8mm home movies from the 1930s. They may be dirty and faded or as vivid as the day they were returned from the lab. All types of film have organic components, which, like all organic material, are subject to decay. Over the past several decades, film archives around the world have discovered new techniques for preserving film, but many are prohibitively expensive or complicated for individuals with small collections and limited resources. However, many can be adapted for collections that are stored in homes and studios. This website will focus on the most common types of films found in private collections and give basic information on implementing a practical preservation strategy for film materials. This will include a basic discussion of the main factors that determine the stability of motion picture film, giving recommendations relating to inspection and handling, cleaning and repair, preparation for storage and storage conditions.

## 2. FILM SPECIFICS: STOCKS AND SOUNDTRACKS

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Motion picture film comes in countless varieties, each with its own idiosyncrasies, but all have the same essential physical structure consisting of two primary parts--the base and the emulsion. The emulsion is the image layer containing the image material (i.e., metallic silver or color dyes) within the gelatin binder. The mass of the film is the base, which is the transparent support on which the emulsion lies. There are three types of bases: acetate, nitrate and polyester.

### EMULSION

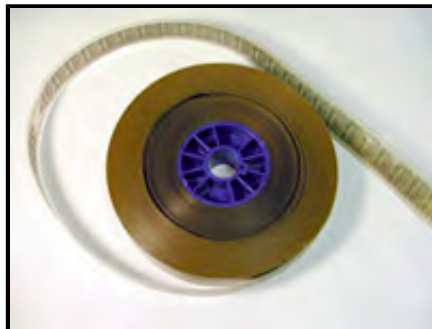
The emulsion is the thin layer of gelatin in which the photographic image resides. The emulsion side of the film can usually be identified by its dull, tacky finish. The base side appears smooth and shiny. On color film where both sides appear glossy, you may identify the emulsion side by holding the film to a light. The side on which the image appears raised is the emulsion side.

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### 2.1 FILM BASES

#### 2.11 Nitrate

The earliest 35mm professional film stocks were produced on a cellulose nitrate base. Nitrate film is highly combustible and cannot be extinguished once it has ignited; it has to be allowed to burn itself out. Nitrate film is considered a hazardous material, and as such there are strict laws for projecting, storing and shipping nitrate film. If nitrate film is found in your collection it should be kept as cool as possible, be stored in a vented (not sealed) can, and separated from acetate reels. A film archive should be contacted for further advice. Nitrate has a distinctive sweet odor, but the easiest way to identify it is to first unwind it to the picture area, and examine the edges of the film. After the introduction of safety film in the 1920s, Kodak printed the words 'Nitrate Film' along the edges of many of its stocks. If you're still unsure, there are laboratory tests that can be performed to determine if a film is nitrate or not. Despite its renowned chemical instability, recent studies indicated that nitrate base films can be preserved for extended period of time when kept in proper storage conditions. Ultimately nitrate film should be kept under cold storage temperatures.



For further information about nitrate film, see Kodak's publication *Safe Handling, Storage, and*

Destruction of Nitrate - Based Motion Picture Films (Publication H-182), which is [available online](#). This site gives information on shipping, storage, decomposition, and identification of nitrate film.



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### 2.12 Acetate

Most 16mm and virtually all 8mm film used by amateur and independent filmmakers is acetate (or more properly cellulose acetate propionate or cellulose triacetate). Acetate is commonly called 'safety' film (as is polyester) because it does not have the combustible qualities that nitrate film has, and therefore was considered to be safe for use in homes. All 16mm and 8mm film produced in the United States (as well as all 35mm film produced in the U.S. after 1951) is safety film.

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### 2.13 Polyester

Polyester film, also known as Mylar or Estar, was first introduced in the 1950s and in recent years has been increasingly popular for 16mm film negatives and prints. Kodak did not use polyester for its camera films, but they produced Super 8 projection cartridge reduction prints for the commercial market. Fuji used polyester film for its Single 8 system, which was a competitor of Kodak's Super 8. It was reversal camera stock.

Polyester is thinner than acetate film but much stronger and cannot be torn. It has greater chemical stability and is not subject to vinegar syndrome, giving it a typical lifespan at least ten times as long as acetate film. One of the main drawbacks of using polyester film is that it cannot be spliced with cement, so tape splices must be used (professionals use ultra-sonic splicers). Polyester film can often be identified by the Kodak brand name ESTAR found printed on the edge of the film.



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## 2.2 BLACK & WHITE vs. COLOR

There are crucial chemical differences between black & white and color film. In black-and-white films the image is made of silver metal particles. The silver image is very stable compared to other film components such as color dyes, and not likely to fade unless it is exposed to high humidity, contaminants or was improperly processed.

The vast majority of color films employ chromogenic dyes produced during processing. Color film consists of three layers of dyes, which render the yellow, cyan, and magenta portions of the color spectrum. Of the three, the least stable in the dark is the yellow layer, which is why faded color films frequently have a pinkish hue to them. Once color has faded, there is no way to retrieve it, aside from some (currently) expensive digital reconstruction processes.



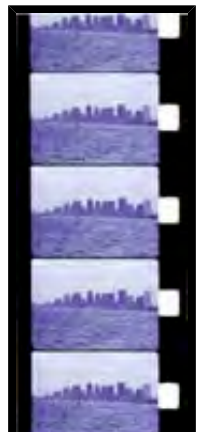
During the silent era, commercially produced films were often tinted and toned. Silent 35mm nitrate films come in a variety of colors; often many different tints and tones were used within one film. Common to small collections are Kodascope brand reduction prints from the 1920s and 1930s, which were 16mm silent and tinted amber or yellow.



Kodak's reversal color process Kodachrome film was introduced in 1935 and quickly became the standard for 16mm and 8mm color movies. The earliest types of Kodachrome were prone to fade, but Kodak perfected the process in around 1938 and these films remain remarkably vibrant, even after several decades. Kodachrome remains a standard for amateur color film.

The professional process Technicolor processes also defied fade. In Hollywood, Technicolor was replaced in the 1950s, by Kodak's Eastmancolor, which was cheaper and, incidentally, much more prone to color loss. Technicolor prints were still being made through the 1970s for some productions. Other brands of film have their own idiosyncratic characteristics, for better or worse. Despite the fact that the stability of color dyes has been improved significantly in the mid 1980s color fading remains a major threat for preserving film. This can only be addressed by providing proper storage. [\[See section 8.\]](#)

### 2.3 REVERSAL vs. NEGATIVE



The vast majority of 16mm and virtually all 8mm and Super-8 film found in both amateur and independent collections is reversal film. This means that the same piece of film that ran through the camera is developed into a positive image, intended for projection. Because there is no negative, reversal films are unique objects and should be treated with care.

The main advantage to reversal film is that it uses half as much film as the negative/positive process, and therefore is less expensive. The main disadvantage is that each time the film is run through the projector (and in some cases this might be hundreds of times), it is subject to all sorts of stresses and dangers. When duplicate copies of reversal films are made they're usually contact printed onto reversal stock. These copies are almost invariably less sharp and have higher contrast than the originals.



When there is a 16mm negative available it is important to remember that it may have gone through the same deterioration (such as color fade) as a print made at the same time. However, it has most likely not faced the same physical risks that a projection print has.

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## 2.4 SOUNDTRACKS

Older and independently produced films have two types of soundtracks: optical and magnetic. (Hollywood now uses digital tracks in addition to optical ones.) Optical tracks are read by projecting a narrow beam of light through the film, causing a sensor to translate the varying intensity of the light into electrical signals that are further converted to sound. Magnetic (mag) tracks are recorded onto oxide stripes on the edge of the film, which are read by playback heads in the projector. Mag tracks work the same way as audiotape and look similar to tape, appearing as a dull, brownish coating on side of the film.



16mm sound prints are much more common than sound Super 8, especially among independent films. Typically, soundtracks were recorded on separate audiotapes (such as reel-to-reel, cassettes, and later DATs). Following mixing, the finished audio track would be transferred to film either as an optical track (if done in a lab), a full-coat mag track, or a composite sound print (picture and track).

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### 2.41 Super 8 & 8mm

Both optical and mag tracks can be found on super 8 and 16mm, while regular 8 only rarely can be found with magnetic stripes which were added after processing. In fact, it was very rare for early home movies to have soundtracks, as only the most serious amateurs made the necessary expenditures to record sound (though equipment was available as early as the 1930s). In 1973, Kodak introduced a Super 8 sound-on-film system, and cameras began to come equipped with microphones. Additionally, Super 8 film could also have sound stripes added after processing and have soundtracks recorded later (usually in the projector). Some projectors can use it for recording an additional sound track.

To avoid having one side of the film thicker than the other, films with magnetic soundtracks often have a "balance stripe." This is a thin blank mag stripe on the opposite edge of the film from the magnetic sound track that keeps the film level on the reel. Super 8 magnetic sound cameras ran at both 18fps and 24fps, and occasionally the cameras ran at a slightly different speed (usually one frame above or below) than advertised. Obviously, this produces playback problems.

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### 2.42 Soundtrack-Picture Displacement

Because the projectors' soundtrack heads come after the lens for the picture, the soundtracks are not alongside their corresponding images, but instead precede them. This displacement is 56 frames in regular 8 magnetic (rare), 18 frames in Super 8 magnetic, 22 frames in super 8 optical, 26 frames in 16mm optical, and 28 frames for 16mm magnetic.



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### 2.43 Magnetic Sound

Films with magnetic tracks (and especially separate full-coat mag tracks) have shown to be more susceptible to vinegar syndrome, and should be monitored more closely than silent films or reels with optical tracks. When possible, tracks should be re-recorded as soon as there is any sign of deterioration. It is possible, especially if the film gets damp, that the track will become sticky and partly adhere to the wrong side of base side of the next layer of film. If this happens when the film is stored heads-out, you will hear a muffled version of the track before you're supposed to, and then again in synch with the picture. If the film is stored tails-out, the muffled sound will be heard as a less-distracting echo.



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### 3. KNOW YOUR ENEMY: DAMAGE AND DECOMPOSITION

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Film is subject to three main categories of deterioration: mechanical, biological, and chemical decay. Causes of damage and decay will be discussed in this section, and the main techniques to control film deterioration will be identified.

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#### 3.1 DETERMINING AGE

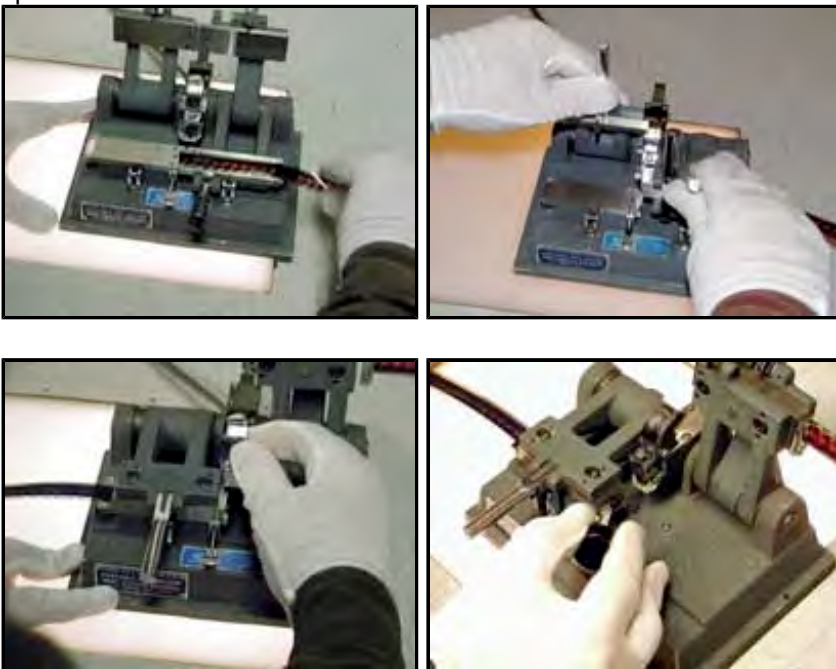
Although the condition of a reel of film is not necessarily dependent on its age, it is often helpful to know how old a piece of film is. One method for identifying the age of a film is to look for its manufacturer's date code. Kodak prints a series of small shapes along the edges of its film. [These codes](#) identify the date the film was manufactured, but remember that sometimes it may have been several years later that the film actually went through a camera. Also be aware of the fact that Kodak's codes run in twenty-year cycles, so the code for 1955 is the same as 1975. You will also have to look at the image and use other clues to determine its age. Finally, if you are looking at a copy and not the original, determine which series of codes you are reading, as you may be able to see more than one generation. Older codes may have been printed through in the laboratory printing process. Note all codes, and use the most recent one to determine the age of the piece of film you're looking at.

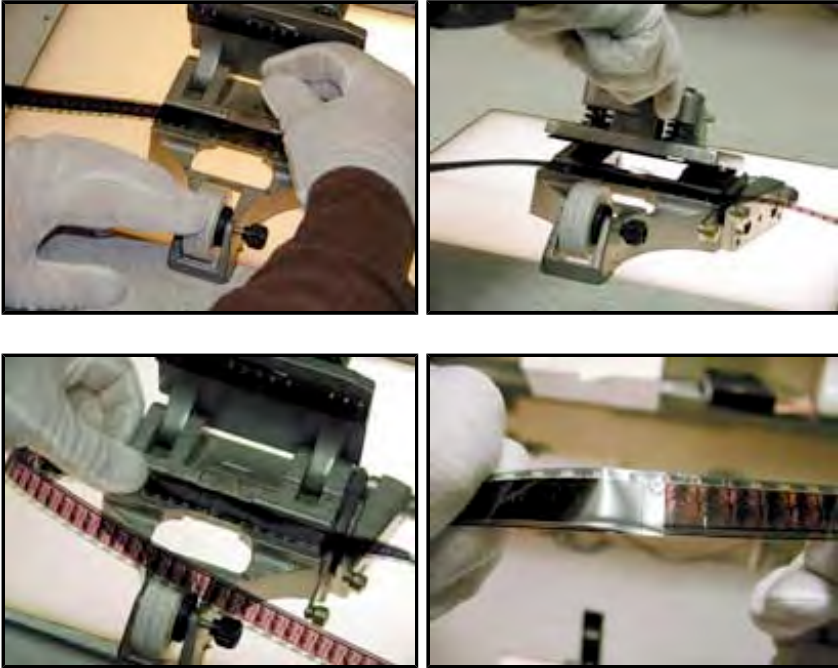
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#### 3.2 MECHANICAL DAMAGE

##### 3.21 Tears

Tears and breaks are usually the result of mishandling of film during winding or projection, or of old splices coming undone. All breaks, tears and weak splices need to be repaired with cement or tape splices.





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### 3.22 Perforation Damage

Another common type of damage is torn perforations (perfs). This is usually caused by improper threading of the film in the projector, and is usually found at the beginnings and ends of reels or after a bad splice. The best way to avoid further perforation damage is to always be sure to use sufficient leader (at both the heads and tails of reels). Repair all faulty splices, thread the film carefully in a clean, properly lubricated projector, and do not attempt to project shrunken or brittle film.



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### 3.23 Scratches

Either side of the film may be scratched by contact with dirt or worn rollers in the film path during projection. Scratching and abrasions can also occur outside of the projector if film is wound too tightly or loosely. Scratching may have occurred at the lab, in the camera, or during the editing process. Never pull the end of a reel of film to tighten it up on the reel or core. This is an easy way to scratch your film. While there are film treatments to "rejuvenate" films by applying protective coatings or lacquers, we do not recommend this because possibly harmful chemicals are involved. Base-side scratches can be minimized during the duplication process (either film-to-film or film-to-video telecine) by the use of the wet gate method, in which the film passes through a liquid solution that temporarily fills in the scratches so they do not show in the resulting copy.

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## 3.3 BIOLOGICAL DAMAGE

Mold, Mildew, Fungi

There are types of damage that can occur even while the film remains in storage. Improperly stored films, especially those in hot and humid climates or damp locations such as cellars or garages, are prone to attack by mold, mildew and fungus. These organisms can cause severe damage to the emulsion, and while they generally attack the film from the edge, they can easily make their way into the roll, sometimes resulting in dull spots or feathery tendrils on the image. Providing proper storage minimizes the risk of biological decay. This might be achieved by just avoiding sustained high humidities, typically during the summers, and by improving ventilation.

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### 3.4 CHEMICAL DAMAGE

Film components such as film supports (e.g., nitrate and acetate) and color dyes are inherently subject to chemical deterioration.

#### 3.41 Nitrate Decomposition

Cellulose nitrate film base is prone to chemical decay over time. The condition nitrate films are in today is a direct result of the conditions under which they were stored, as well as how they were manufactured.

Nitrate decay is described in terms of 5 specific stages. These descriptive stages are a widely recognized standard.

**Stage 1:** Film has an amber discoloration with fading of the image. Faint noxious odor. Rust ring may form on inside of metal film cans.

**Stage 2:** Emulsion becomes adhesive and the film tends to stick together during unrolling. Faint noxious odor.

**Stage 3:** Portions of the film are soft, contain gas bubbles, and emit a noxious odor.

**Stage 4:** Entire film is soft and welded into a single mass, the surface may be covered with viscous froth, and a strong noxious odor is given off.

**Stage 5:** Film mass degenerates partially or entirely into a shock sensitive brownish acrid powder.

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#### 3.42 Acetate Decomposition: Vinegar Syndrome

Acetate base film is subject to the so-called vinegar syndrome. The term 'vinegar syndrome' is taken from the distinct odor that is given off by deteriorating acetate film. Vinegar syndrome results from a chemical reaction that takes place at the molecular level that can cause serious and irreparable damage to film. When combined with moisture, heat, and acids, the plastic support in the film begins to release acetic acid. The process is an autocatalytic one, meaning that once the degradation begins it starts to 'feed upon itself' and the deterioration process begins to snowball. When film reaches its autocatalytic point the acetic acid released by the film grows exponentially, and with it the potential problems for the film. Climate is an important determining factor in the deterioration because humidity affects the amount of water absorbed by the film and heat supplies energy for the chemical reactions. Even more important is the "micro-environment," a term used to describe the conditions inside the film can. Vinegar syndrome appears to be contagious, so any film suffering from it should be stored apart from "healthy" reels.

The vinegar smell is the most obvious indicator of decaying acetate film, but it is by no means the only one. The condition of the film can be evaluated by using acid detector strips (e.g., IPI's A-D Strips); this approach provides an objective way to determine the state of preservation of the materials and their needs to be further stabilized. White powder on the edges of the film may indicate plasticizers loss. Because of the molecular breakdown of the plastic base, in advanced stages of deterioration the film becomes brittle and shrunken. Films with shrinkage of more than 1% could be damaged by projector mechanisms, so should not be projected. [\[See section 5\]](#) There are techniques for re-dimensioning film (restoring it to a less-shrunken state), but these are temporary measures that can permanently damage the film and should only be done in a lab situation as a last-ditch method to enable a new negative or print to be made.

Acetate Decomposition—Advanced Stages of Decay

The typical pattern for acetate decay is:

1. Vinegar odor
  2. Shrinkage
  3. Cupping: the film retains a curve. It will not lie flat, but instead appears wavy.
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4. Crazing: the emulsion cracks and the image appears as a crazy mosaic.



5. Appearance of white powder on edges (from binder deterioration, this is the plasticizer separating from the film).

6. Film becomes square on reel [Illustration].

7. Film is no longer flexible and the emulsion flakes off from the base.

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### 3.43 Color Fading and Decomposition

Color fading and other forms of chemical decomposition are usually the results of inherent problems in the manufacturing of the film, bad processing or poor storage conditions over the years. Generally there is nothing that can be done to reverse the process of color fade. However, you can stop further damage to the film by moving it into good storage conditions (see section 8).

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## 4. INSPECTION, HANDLING, CLEANING, REPAIR

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- 4.3 [INSPECTION & REPAIR](#)
- 4.4 [CLEANING](#)

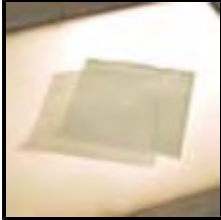
The assessment of the film's condition is key to predicting the remaining useful life of the film. Already degraded or damaged films require even more stringent climate conditions than new film to achieve the same life span. Determination of shrinkage and damage is necessary for the prevention of further damage. In cases of serious damage or deterioration, contact the nearest film archive, or consult one of the professional organizations listed in the [Resource section](#).

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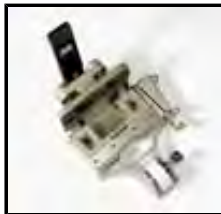
### 4.1 PREPARATION

Materials list for film handling and repair:

- Lint-free cotton cloth



- Film cleaner
- Splicers (tape and/or cement)



- Splicing tape or film cement



- Cotton gloves



- Acetate or polyester film leader (new)



- Archival cores and cans



- Split-reels



- Razors



- New pair plastic handled scissors



- Acid-free paper tape (artist or museum tape)



- Loupe or magnifying glass (or old projector lens)



- Light table and rewinds



- A-D strips



- Perforated tape



- Molecular sieves



- Dust mask



### **Before you begin:**

You will need a clean work area. A light table is very useful and fairly easy to make or procure. You should work on an uncluttered table with rewind shafts and plenty of light. It is a good idea to cover your work area with a clean towel to avoid abrasions caused by the film coming into contact with the tabletop. Clean your metal equipment (splicers, etc.) with 100% alcohol, available at hardware stores. Don't use alcohol solvent. If you have to, use 90% (the other 10% is water, available at pharmacies), making sure to clean off the metal parts so as not to invite rust. Counters and plastic equipment may be cleaned with distilled water.

When handling film, wear cotton gloves and wash your hands often. Gloves may be problematic if the film has many tape splices (they may leave fuzz on the tape) or damaged edges (they may tear the film). Handle film only by the edges. If you need to touch the image or soundtrack area, put on gloves. Your skin produces oils that you don't want to get on the film. If you do touch the film, you will leave fingerprints. Always remember that film is easy to tear, and you should take care when working with it.

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## **4.2 BEFORE UNWINDING**

### **Look**

Before unwinding any film, look at the edges. Mold sometimes attacks film, especially if it has been stored in a damp environment. If mold appears on the edge of the film, clean it off by putting film cleaner on a soft cloth and wipe gently with the direction of the film. If your film is moldy throughout, you may consider having it cleaned at a lab. Some types of mold eat the emulsion, and will take the image off your film. Be careful not to inhale the mold spores, as they can make you sick. If the film is quite moldy, you should consider wearing a dust mask. Hardware stores often sell disposable masks with specific filters for different problems (mold, fumes, etc.). Be sure to wipe down all your equipment after dealing with mold, so it will not spread to your other films.

It is a good idea to clean the edge of the film, even if it isn't moldy, before winding through it and to remove all the dirt you can before it gets on the picture area.

### **Smell**

Smell the film. An odor of camphor (mothballs) is common to di-acetate film from the 1920s & 1930s and is not an indication of decay. Camphor may also have been used to keep tri-acetate film from drying out and becoming brittle. Decaying acetate film smells like vinegar. If a vinegar smell is present, deterioration is well underway, and the film should be segregated from other "healthy" reels, and be given top priority for cold storage or film-to-film preservation. A more accurate assessment of acetate decay can be determined using A-D Strips, which are dye-coated paper strips designed to measure the presence of acetic acid off-gassing in a roll of film ([like litmus paper](#)).



In the case of vinegar syndrome, the film can be hand cleaned as described previously and stored with molecular sieves or silica gel. Molecular sieves are similar to packing desiccants. The packets are stored along the outside circumference of the film reel (inside sealed film cans) to absorb moisture, acetic acid and other contaminants.

More information about molecular sieves can be found in the Kodak publication Molecular Sieve Acid Scavenger from Kodak for Moisture Free Film Storage and Extended Dye Images, which is [available online](#).

If the film is stored under normal room conditions, providing colder storage temperature should be considered. Colder and dryer storage conditions would efficiently postpone further decay such as vinegar syndrome and color dye fading.

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### 4.3 INSPECTION & REPAIR

Wind through the film slowly, keeping the tips of your fingers on both edges of the film, so you'll be able to feel any perf damage. Carefully remove any foreign objects such as masking tape, scotch tape (non-archival tape contains acidic glue which will react with the film and initiate deterioration), paper clips or staples. Clean any glue/sticky residue off with film cleaner on a lint-free cloth and replace the splice, using clear, professional splicing tape. Make sure the edges are cleanly cut. Use your new scissors or a razor to trim the edges of the tape splice. If you are not sure if the old splice was made with professional tape or not, go ahead and replace it. Taking apart old splices (and especially old masking tape) is sometimes difficult, and film cleaner may be used liberally to loosen the tape.



If a mag track film has been stored in a damp environment, when you wind through it, do so VERY slowly. The mag stripe can peel off and stick to the opposite round of the reel. If you wind through too quickly, you can split the film right down the middle. If this happens, use splice tape lengthwise to repair the damage. Don't tape over the sprocket holes except at the point where they are torn. Tape both sides of the film. Store the film tails-out.

Check all old splices for strength by rotating the splice in opposite directions to see if both sides of the splice hold. Old cement splices can remade without losing any frames, but if you are not sure you can do this, tape splicing is acceptable.



To remove old splice and tape residue, film cleaner can be applied using a lint-free cotton cloth or cotton swabs. Torn frames may be repaired with splicing tape. Lining the pieces up on a light table and taping them down, punching out the sprocket holes on a splicer later, may be the best way to avoid seeing the tear on screen, but it is difficult.

Sprocket hole ("perf") damage may be repaired with small pieces of splicing tape, on just the edge of the film (don't tape over the image if you don't need to), and punched out with a splicer. You may also use perforated tape, which only goes on the perforated edges of the film. Pre-punched perforation repair tape is available for 16mm and 35mm film. Tapering the breaks with a new cut in the edge of the film is also a good way to avoid further damage.

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Visually inspect the image for signs of color fading. This is irreversible and due to improper storage conditions, inferior film stock, or poor processing. Color film manufactured in the 1970s is notoriously prone to fading and may not be a sign of storage problems or deterioration. It is wise to consider all chromogenic color films, including the apparently most chemically stable, as fast decaying materials. Poor storage conditions will ultimately lead to color fading at an unacceptable rate. Providing proper storage should be a priority to preserve film.

Organic film base often shrinks with age and deterioration. It is not always easy to tell by looking at it whether or not it is shrunken (although severely warped and curled film is a tip-off). One indicator of shrinkage is that the perforations will not match properly with the registration pins of a splicer. To get a more accurate measurement of a film's shrinkage, compare some new leader in the gauge of your film with the original film. If the holes do not line up perfectly, your film is shrunken. For 8mm film it is easy to use a strip of 100 frames--if the original film is short by one entire frame, the film is shrunken by 1%. Film shrunken by more than 1% should not be projected, as the projector's sprockets or claw will damage it. Shrinkage gauges are available, but they are expensive.

If your film is too deteriorated or shrunken to project, you will probably want to save it for copying. If you don't have the money to get it printed soon, consider freezing it ([see section 8.2](#)) to slow down the decomposition process quite a bit, giving you time.

Hand-painted or artfully scratched films should be treated with extreme delicacy and labeled clearly to ensure that no film cleaner will ever be used on them. This is very important if the film is to be sent to a lab for copying. If the lab doesn't know what they're dealing with, they could inadvertently destroy the film.

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#### **4.4 CLEANING (only after a full inspection)**

If the film is dirty or moldy, it can be cleaned gently by hand using a lint-free cotton cloth and professional motion picture film cleaner. Don't use this method if there is perf damage. Put the film cleaner on the cloth and run the film between the folded cloth, holding it firmly with your fingers. Wind slowly through the film so the film cleaner has evaporated before it is wound onto the take-up reel. It is important not to use water or any other fluid on film, as they could remove the emulsion. Use the film cleaner cautiously: wear clean rubber (not latex) gloves (dishwasher style, not powdered medical gloves), and clean the film in a well-ventilated area. Use only a clean soft cotton cloth that will not scratch the film. Replace the cloth as soon as there is a noticeable build-up of dirt on it.

Film can also be cleaned by use of particle transfer rollers (PTRs). These are polyurethane rollers that either come as separate units or as parts of other machines (such as 35mm projectors). The rollers have a tacky coating that removes larger particles of dust and hairs from the film surface, and can be washed clean with water. They are expensive and probably not sensible for small collections.

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## 5. PROJECTION

While a film is fairly useless without a projector, a bad projector is unacceptable if you want a long life for your film. In general, projecting a film carelessly is one of the worst things you can do to a film. Bent or damaged take-up reels or projector spindles can cause edge damage that can weaken or break a piece of film. Oil on projector parts can contaminate the surface of the film. If film becomes stuck in the gate it is subject to the intense heat of the bulb, frequently resulting in a blistered or burnt frame. Perhaps the most obvious and aggravating types of damage done to film during projection are scratches and abrasions.

Make a loop of black leader to run through your home projector before each use. Run it for a few minutes and then check it for any scratches. Do not run your film on a machine which scratches! A scratch on the base side of your film won't show up if you have it copied in a diffused light or liquid gate printer, but an emulsion side scratch removes the picture information forever. In either case, the film in hand, once scratched, is scratched forever. Make sure your equipment is clean!!

Always inspect the film before you project it. Do not attempt to project the print unless you have determined that it is in good enough condition to run through a projector without being damaged. The film must not be too shrunken to run smoothly through the projector's sprockets, and must be clean and free from tears and improper splices.

[Toni Treadway's guide to restoring equipment](#)

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## 6. COPIES

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6.2 [FILM-TO-FILM PRESERVATION](#)

### 6.1 VIDEO TRANSFERS

The primary benefit of having film transferred to videotape is that video allows convenient access to your films without subjecting the originals to any potential damage. However, we do not suggest you should present your film only on video. Watching film is as important as preserving it. It is important not to consider video transfer "preservation". If your film is old and shrunken, be aware that not all film to video transfer houses are equipped to deal with it. Although more expensive, a sprocket-less drive telecine will be less likely to do damage to your shrunken film than a process which employs sprockets. Shop around and explain your requirements to any outfit you are considering sending your film to.

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### 6.2 FILM-TO-FILM PRESERVATION

Properly stored film will outlive its video copy's usefulness, especially given how rapidly video technology and formats are changing. Archives have traditionally used the term "film preservation" in reference to creating new elements (negatives and prints) of films on film. Film-to-film preservation is expensive, but it should be considered for your more important films. More and more laboratories are becoming equipped to do archival printing of both 16mm and 8mm films.

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## 7. STORAGE PREPARATION

- 7.1 [CORES](#)
- 7.2 [SUPER/8MM](#)
- 7.3 [CANS & BOXES](#)
- 7.4 [LEADER](#)
- 7.5 [LABELING](#)

Preparation for storage means that the film is packaged using archival materials for internal protection, and is structurally protected from the outside environment. Archival cans and cores made of an inert plastic that will not chemically react with the film. Archival metal cans are coated with an inert coating that is additionally rustproof.

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### 7.1 CORES

For 16mm and 35mm, it is better to store your film wound on cores than on reels, as reels can rust, bend or break and damage your film. 3" diameter cores are preferable to 2" cores, since the wind of the film at the core is not as tight, and not as prone to curling. You will need a split-reel and a rewind bench in order to use cores.



The wind should be of an even tension - not too loose or too tight and should be consistent and flat so that edges don't stick out where they could be broken. A roll of film on a core should be wound tight enough so that it forms a solid disc. Be careful not to "pop" the core (detach the inner core from the



outer roll of film), as this will result in a spiral mess of film. It is preferable to not handle the film at all, but instead to use either cans or split reels as platters to hold the disk of film. Before you put your important film on a core, practice a number of times with some junk film. Film on cores can be tough to handle, and you don't want to find out the hard way that you needed more practice.



If the film is one you will be accessing fairly often, you may wish to leave it on a reel. Make sure the wind is consistent and flat, so the edges will not be broken or bent. Make sure the reel is in perfect condition, not rusty, broken, or bent.

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### 7.2 SUPER/8

Although there is no chemical or physical difference between 8mm/Super 8 and other film gauges, its smaller size gives it some storage problems of its own. Some archives make their own 8mm cores by using a band saw to slice 35mm cores. Because 8mm cores are so difficult to handle, however, it is a better idea to leave 8mm film on plastic reels. If you only have the original 50 ft.



reels you should consider splicing them together onto larger reels for storage. There are several sizes of Super/8mm reels; 200 ft. and 400 ft. reels are recommended. The smaller the hub (solid center) of the storage reel, the more likely it is that the film will become curled. If you do build up several reels, be sure to either keep the original boxes or copy down any information that might have been written on them. Keep this information with the newly created reel. Also, you should splice leader between reels, labeling what each one is. Don't use audiotape reels because they tend to be styrene, which is not stable for long-term

storage. They are also generally not usable for projection.

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### 7.3 CANS & BOXES



The film should be stored in clean archival plastic, archivally treated metal cans, or new archival cardboard boxes. It is important that the can or box is not airtight, and should not be sealed unless stored in freezer. A closed can is fine, and will not be airtight. However, a can that is taped shut is not fine. Cold storage is the best for the chemical stability of the film and is discussed in the following sections. Films should be stored tails-out so you will have to rewind them before projecting. You should always inspect the film before projecting.

The cans should be stored flat (horizontally), with nothing heavy stacked on top that would weigh down the lids and not allow air to circulate into the cans. It is acceptable to stack the cans on each other, but store nitrate cans only 2 high.

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#### 7.4 LEADER

Dirty or damaged leaders should be removed and replaced. Plastic leader tends to shrink at a different rate than acetate film, so it is advisable to purchase acetate or polyester leader from FPC, a Kodak company. Be sure that both the head and the tail of the film have enough leader to wrap around the reel several times. This will protect it during storage, as well as during projection. The majority of the damage done to projected films occurs at the beginning and ends of reels.

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#### 7.5 LABELING

Labeling your film is very important. Each reel of each film needs to be labeled (on the leader) with the title, reel number, and whether it's positive, negative, camera original, track only, etc. It is



also a good idea to label leaders "HEAD" or "TAIL." Use archivally inked pens, which are available at art supply stores, and make sure you pick one that won't rub off. If your film has special concerns (hand painted, for instance), note this on the film leader as well. Needless to say, the cans or boxes the film is stored in should also be labeled. It is always a good idea to label every film container and to document

every change you make to a film. Keep track of what you have and where it is. A simple list (typed or on a computer) will come in handy. Retain paperwork that goes with your films (timing sheets, etc.). A coherent labeling system will be of benefit to anyone who comes into contact with your film, including you, labs, archivists, and later generations who inherit your film.



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## 8. HOME STORAGE

- 8.1 [TEMPERATURE & RELATIVE HUMIDITY](#)
- 8.2 [FREEZING YOUR FILM](#)
- 8.3 [THAWING YOUR FROZEN FILM: STAGING](#)
- 8.4 [ALTERNATIVE LOCATIONS FOR STORAGE](#)

The ideal conditions are in a controlled environment. Low temperatures and low humidity improve the chemical stability of motion picture film. Under normal conditions, i.e., room temperature (about 70F) and moderate humidity (50% RH), color dyes fade, and triacetate base film decays at an unacceptable rate for long-term preservation of the materials. Cold and dry are the best conditions for the storage of film. A home freezer is the best option for long-term storage where access to the film is not required on a frequent basis. Long-term is defined in this case as longer than several months. Freezers and refrigerators control the temperature, but don't adequately control the amount of water in the air. Therefore, moisture-proof packaging is required to control the humidity in the microenvironment.

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### 8.1 TEMPERATURE & RELATIVE HUMIDITY

Fresh film stored at normal household conditions (70°F and 50% RH) will have an average lifespan of 40 to 50 years before significant signs of decay occur (e.g., vinegar syndrome and color dyes density loss). Reducing the temperature by 15 degrees Fahrenheit increases that number to 100-125 years.

The recommended conditions for extended-term film storage are between 40-50 F and 20%-40% RH (relative humidity). [[Preservation Calculator](#)] Excessively dry air (below 20% RH) can lead to film becoming brittle, while damp conditions will compromise the benefits of cold temperature and invite mold growth. Good air circulation will help prevent mold growth, but mold is possible any time the RH remains above 70% for more than a few days.

Rapid changes in either relative humidity or temperature should be avoided. Many people assume that freezing is dangerous for film, but tests have shown that film is not damaged by a freeze/thaw cycle in controlled settings. There is a great danger, however, in condensation accumulating on the film so film should be frozen in steps to avoid this.

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### 8.2 FREEZING YOUR FILM: FIVE EASY STEPS

Make sure that the film and packing materials are room temperature before beginning. It does not take long for film materials to equilibrate thermally. However, if the film was previously stored in a humid environment it may take two to three weeks to equilibrate to a drier climate.

This may be done by keeping the film in a can with the lid off in a room where the RH does not exceed 50-60% at room temperature. These conditions are necessary for the room in which you will prepare your film for freezing. Do not prepare film for freezer storage on a hot and humid day, or moisture will be trapped with the film in the bag and can.

If you have the space and the funds, you should consider buying a freezer just for your film. Depending on the size of your collection several options could be considered—e.g., a household freezer or industrial freezer.

1. Seal the cans or boxes with archival tape to make them as airtight as possible.



2. Use heavy-duty zip-lock freezer bags (3 mil or thicker).



3. Enclose one or several cans in the freezer bag and seal the bag with tape. Minimize the amount of air inside the bags. Label the bags clearly so they can be read without opening.



4. Double-bag the sealed bag containing the film and seal the outer bag with tape as above. Optional: enclose a moisture indicator in between the inner and outer bag.



5. Place in the freezer in an area where it is least likely to become punctured.

Inserting cardboard supports between the packages will improve the stability of the



stacks.

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### 8.3 THAWING YOUR FILM: STAGING

When going from cold storage [38 F/ 30% RH] to normal room conditions [68 F/ 50% RH], film should first be brought into an intermediate staging area in order to avoid condensation. The climate of the staging area should ideally be midway between both the temperature and the relative humidity levels of the cold storage and the working environment so that the film never reaches its dew point. Put simply, film should go from a freezer to a refrigerator and then to the workroom.

The length of staging time needed depends on the mass of the film; a single small roll will reach its equilibrium point faster than a large reel or a stack of small reels. Six 400 ft. rolls of 16mm film will reach a usable point in 25 minutes and will be fully acclimatized in about three hours. When moisture-proof bags are used, the minimum usable point will be slightly less because the condensation will occur on the outside of the bag, not on the film. Nevertheless, it is always a good idea to leave films out for at least an hour before using them.

When it is necessary to remove the film from cold storage for use, it should be allowed to come to room temperature before any attempt is made to open the outer bag.

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### 8.4 ALTERNATIVE LOCATIONS

If cold storage is not an option, where then should film be stored? Look around your house for possible storage locations and consider the following.

- Do not store films in an attic. In the summer this is too hot, and the temperatures vary too much throughout the seasons.
- Don't store film near heaters, plumbing pipes, radiators, sprinklers, windows, electrical sources, or sinks.
- Do not store film in direct sunlight.
- Avoid high humidity--do not store in a basement. Most basements are quite humid and perfect for mold. Also, there can be danger of flooding.
- Avoid exterior, south-facing walls or locations that receive direct sunlight.
- For films with magnetic soundtracks, keep away from magnets such as those found in stereo speakers as well as heavy-duty electrical cables.
- Avoid any locations near chemicals, paint, or exhaust. Chemical fumes, including those found in everyday air pollution, when combined with a high relative humidity can cause film to deteriorate and images to fade.

Many independent filmmakers leave their original materials in storage in film laboratories. Before doing this, question the lab about their storage facilities and keep tabs on the lab, as there are countless stories about films being lost after a lab has moved, been sold, or gone out of business.

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## 9. GUIDELINES IN CASE OF DISASTERS

### 9.1 GEOGRAPHICAL SEPARATION

One idea to consider if you have an original negative and a print (or two copies of the same print) is geographical separation, meaning keeping the films apart in case of catastrophe, such as fire or flood. Hollywood studios frequently store their negatives in one part of the country and their prints in another. This is only a viable option, however, if both storage conditions are properly climate-controlled.

### 9.2 FLOODING

If your film gets caught in a flood, keep the film immersed in cold, clean water. Bring the film, still immersed in the water, to a film laboratory. They will be able to rewash and dry your film.

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## 10. PRODUCTS AND SUPPLIERS

**Disclaimer:** filmforever takes responsibility for our own site. We cannot take responsibility for the information / services / etc. offered by these recommended sites. We do think they are good resources. Let us know if you have any serious complaints.

A listing of the equipment and possible vendors.

### **Action Camera (San Francisco)**

[www.vgaction.com/motionpicture.html](http://www.vgaction.com/motionpicture.html)

*Discount film, equipment & supplies*

### **Christy's Editorial**

[www.christys.net](http://www.christys.net)

*Equipment*

### **Dancan**

[www.dancan.dk](http://www.dancan.dk)

*16mm cans, cores, supplies*

### **FPC/Kodak**

[www.fpcfilm.com](http://www.fpcfilm.com)

*16mm leader, molecular sieves, PTRs*

### **Gaylord**

[www.gaylord.com](http://www.gaylord.com)

*General archival supplies*

### **Hunt's A-V (Boston and Providence)**

[www.wbhunt.com](http://www.wbhunt.com)

800-924-8682

*Supplies (Gepe reels, more)*

### **IPI (Image Permanence Institute)**

[www.rit.edu/~661www1](http://www.rit.edu/~661www1)

*A-D strips and free preservation calculator download*

*Information and products*

### **Kodak**

[www.kodak.com](http://www.kodak.com)

*Information and products*

### **Light Impressions**

[www.lightimpressionsdirect.com](http://www.lightimpressionsdirect.com)

*General archival supplies*

### **MPE (Motion Picture Enterprises)**

[www.mpe.net](http://www.mpe.net)

212-245-0969

*8mm & 16mm cans and reels*

### **Neumade Corporation**

[www.neumade.com](http://www.neumade.com)

*Cans, cores, reels.*

### **PRC (Plastic Reel Corp. of America)**

16mm cans  
(no website)  
201-933-5100

**Taylorreel Corporation**

[www.taylorreel.com](http://www.taylorreel.com)

770-503-1612

*8mm and 16mm reels and cans*

**TekMedia Supply Company**

800-323-7520

*16mm cans and supplies*

(no website, sales through RTI @ [www.rti-us.com](http://www.rti-us.com))

**Tuscan**

[www.tuscancorp.com](http://www.tuscancorp.com)

*8mm & 16mm reels, 16mm cans*

**Urbanski Film**

[www.urbanskifilm.com](http://www.urbanskifilm.com)

*Films and film supplies*

**UK:**

**Buckingham Film Services**

Fleece Yard

Market Hill

Buckingham

MK 18 1JX

(+44)(0) 1280 816758

**The Widescreen Centre**

[www.widescreen-centre.co.uk/cine.html](http://www.widescreen-centre.co.uk/cine.html)

*Supplies (Cameras, film, leader, and more.)*

## 12. GLOSSARY OF FILM TERMS

[\[#\]](#) [\[a\]](#) [\[b\]](#) [\[c\]](#) [\[d\]](#) [\[e\]](#) [\[f\]](#) [\[g\]](#) [\[h\]](#) [\[i\]](#) [\[j\]](#) [\[k\]](#) [\[l\]](#) [\[m\]](#) [\[n\]](#) [\[o\]](#) [\[p\]](#) [\[q\]](#) [\[u\]](#) [\[r\]](#) [\[s\]](#) [\[t\]](#) [\[u\]](#) [\[v\]](#) [\[w\]](#) [\[x\]](#) [\[y\]](#) [\[z\]](#) [\[links\]](#)

### [\[#\]](#)

16mm see GAUGE

35mm see GAUGE

8mm see GAUGE

9.5mm see GAUGE

### [\[a\]](#)

**ABRASION MARKS:** Scratches on film caused by dirt, improper handling, grit, emulsion pile-ups, and certain types of film damage

**ACETATE:** Type of film base. May be di- or tri-acetate. Cellulose tri-acetate is more common for modern film. Acetate safety film was first produced in the 1920s in order to avoid the risk of flammability posed by nitrate-based films. See also SAFETY FILM

**ACIDIC:** Containing acid. In regards to safety film, primarily refers to acetic acid, which is a result of acetate decomposition. Buildup of acetic acid causes VINEGAR SYNDROME.

**AMATEUR:** Non-professional. An amateur filmmaker is someone who does not make movies professionally, but makes movies as a hobby.

**ARCHIVAL:** In reference to storage supplies, refers to chemically inert materials. Archival materials will not chemically affect the item you are trying to preserve. More generally, describes the film stock and storage conditions which provide for long-term (at least one hundred years) storage of film.

**ARCHIVAL PRINTING [copying film to film]:** This can be done at a lab that has equipment that can handle shrunken, brittle, older film without destroying it.

**AUTOCATALYTIC:** This term relates to VINEGAR SYNDROME. An autocatalytic process is one which feeds upon itself. In the case of VS, the decaying acetate film creates ACETIC ACID, which in turn speeds up the process of decay.

### [\[b\]](#)

**BALANCE STRIPE:** A magnetic stripe on the opposite edge of the film from the magnetic track. It is much thinner than the stripe that is used for the soundtrack. Although the purpose of the stripe is to keep the film level on the reel, some projectors also record on it.

**BASE:** The transparent, flexible support, commonly cellulose acetate, on which photographic emulsions are coated to make photographic film.

**BINDER:** Polymers used to bind a film's emulsion to the base, or magnetic particles together and to the base of magnetic tapes.

**BLOW-UP:** A picture element which is on a larger format gauge than the original. For instance, a super 8 film can be blown up to 35mm.

**BUCKLE:** Occurs when the perforated edges of film are shorter than the center (the film has become shrunken). It is caused by the loss of solvent or moisture from the edges of the film during long storage.

## [c]

**CAMERA ORIGINAL:** Film exposed in a camera (not at the lab).

**CAMPHOR:** A PLASTICIZER used in nitrate and di-acetate film to promote flexibility and decrease brittleness. Films treated with camphor have a distinctive " mothball smell".

**CINCH MARKS:** Short scratches on the surface of a motion picture film, running parallel to its length. These are caused by dust or other abrasive particles between film coils, or by improper winding of the roll, permitting one coil of film to slide against the other (see CINCHING).

**CINCHING:** Practice of pulling the end of a roll to tighten it. Not recommended. Causes CINCH MARKS.

**CONSERVATION:** The actions taken to ensure the continued physical survival of an artifact without further degradation, for example, storing your film in archival cans and in cold vaults.

**CRAZING:** Thin fracture lines in the emulsion of film, caused by the shrinkage of the acetate.

**CUPPING:** A type of film damage in which it is impossible for the film to lie flat, due to some part having shrunk more than another. BUCKLING describes film whose edges are shorter than the center. EDGEWAVE or FLUTING occurs when the edges are longer than the center.

## [d]

**DIACETATE (or DI-ACETATE):** The initial 16 mm films were made with Cellulose Diacetate, an early form of cellulose acetate base. It has the characteristic smell of camphor or mothballs. Was replaced by Cellulose Triacetate by 1951.

**DISPLACEMENT:** The number of frames separating the sound and picture as it runs through a projector.

8mm magnetic track = 56 frames  
Super 8 magnetic track = 18 frames  
Super 8 optical track = 22 frames  
16mm magnetic track = 28 frames  
16mm optical track = 26 frames

## [e]

**EDGE CODES [or DATE CODES]** Symbols printed along the edge of film stocks indicating the year of manufacture.

**EMULSION or EMULSION LAYER:** (1) Broadly, any light-sensitive photographic material consisting of a gelatin layer containing silver halides together with the base and any other layers or ingredients that may be required to produce a film having desirable mechanical and photographic properties. (2) In discussions of the anatomy of a photographic film, the emulsion layer is any coating that contains light sensitive silver halides grains, as distinguished from the backing, base, substratum, or filter layers.

## [f]

**FILM (motion picture):** A thin, flexible, transparent ribbon with perforations along one or both edges; it bears either a succession of images or a sensitive layer capable of producing photographic images. See RAW STOCK.

**FILM ARCHIVE:** An institution dedicated to collecting and preserving motion picture film (and sometimes also film-related equipment and ephemera).

**FILM CEMENT:** A special combination of solvents and solids used to make overlap splices on motion picture film by its solvent action and subsequent welding of the film at the junction.

**FILM PRESERVATION:** The entire process of extending the useful life of motion picture film, including storage, duplication, labeling and cataloging.

**FILM-TO-FILM PRESERVATION:** The process of making new film negatives and prints from existing films. This is currently the best way to ensure the longest possible survival of a film.

**FULL-COAT MAG:** Magnetic film used for soundtracks that is entirely covered on one side with the recording medium.



## [g]

**GATE:** The aperture assembly at which the film is exposed in a camera, printer or projector.

**GAUGE:** Refers to the format/width (in millimeters) of the film stock, i.e., super 8, 16 mm, or 35mm.

35mm

Primarily professional. Introduced 1895.

16mm

Professional and amateur. Introduced by Kodak, 1923.

8mm

Primarily amateur. Introduced by Kodak, 1932. Film stock is 16mm, then split into two 8mm strips following processing.

Super 8

Amateur and professional. Introduced by Kodak, 1965.

Single 8

Primarily amateur. Polyester-based super 8 cartridge introduced by Fuji, 1965.

9.5mm

Primarily amateur. Introduced by Pathé, 1922.

28mm

Primarily amateur. Introduced by Pathé, 1912.

**GELATIN:** Substance used to hold halide particles in suspension in the emulsion. Consists of protein derived from animal hooves, bone, and hides. This is the same kind of gelatin you find in gelatin desserts, marshmallows, and other edible items, but much more pure.

**GRANINESS:** The sand-like or granular appearance of a negative, print, or slide. Graininess becomes more pronounced with faster film and the degree of enlargement.

## [h]

**HEAD:** The beginning of the (exposed) film. This is the end that goes through the projector first. If there is a person standing in the frame, their head points up toward the head of the film. See also TAIL.

**HUB:** The center of a film reel.

## [i]

**INERT:** Does not react chemically.

**[k]**  
KODACHROME: One of the earliest of the integral tri-pack (three-layer) color reversal processes. It was created by Kodak for 16mm amateur stock in 1935. It is color reversal and very stable. Available in motion picture film (8, super 8 or 16mm) and slide film.

KODACOLOR: Kodacolor was a lenticular color system introduced in the 1920s which required the use of special lenses during projection. Unprojected, Kodacolor film appears black and white with grooved lines on the film's surface.

**[l]**  
LEADER: Any film or strip of perforated plastic or vinyl used for threading a motion picture machine. Leader protects the print from damage during the threading of a projector.

LIQUID GATE: A printing system in which the original film is immersed in a liquid that refracts light at the moment of exposure in order to reduce the appearance of surface scratches and abrasions on the original during the copying process.

LEADER: Any film or strip of perforated plastic or vinyl used for threading a motion picture machine. Leader protects the print from damage during the threading of a projector.

LIQUID GATE: A printing system in which the original film is immersed in a liquid that refracts light at the moment of exposure in order to reduce the appearance of surface scratches and abrasions on the original during the copying process.

**[m]**

MAGNETIC SOUND: Soundtrack derived from an electronic audio signal recorded on a magnetic oxide stripe or on full-coated magnetic tape. It resembles audiocassette tape.

MAGNETIC SOUND HEAD: The magnetic sound reader installed above the projector head but below the supply reel support arm or magazine.

MAGNETIC STRIPING: The application of magnetic material on motion picture film intended for the recording of sound.

**[n]**

NEGATIVE: Generally not intended for projection, the negative contains the reverse picture information. Used in the printing process to create positive copies. Negative motion picture film is basically the same as negative still film.

NITRATE: Nitro-cellulose base film, used almost exclusively for 35mm film made before 1952. Nitrate has not been produced since 1952 (produced until the

1970s in the USSR) due to problems with the film catching fire. Once nitrate film is on fire, it cannot be put out. Nitrate film stock is identified by the word NITRATE written along the edge of the film, outside the perforations. Still photographic negatives were also made of nitrate base film.

## [o]

**OPTICAL SOUND:** An optical soundtrack is photographically represented along the side of the film as a wavy stripe of clear (variable area) or as gray gradations (variable density). It corresponds to the modulations of the sound. The soundtrack is read by means of an exciter lamp on the projector, which transforms the light back into sound.

**ORGANIC:** Carbon-based. Non-synthetic.

**OUT-TAKE:** A filmed scene that is not used for printing or final assembly in editing.

## [p]

**PARTICLE TRANSFER ROLLERS (PTRs):** These sticky rubber rollers are used in cleaning machines or on projectors (usually 35mm platter projectors) to clean any dust and dirt off the film.

**PERFORATION DAMAGE:** Any breaks, tears, cracks, etc., that causes the perforations to be misshapen or missing.

**PERFORATIONS:** Regularly spaced and accurately shaped holes which are punched throughout the length of motion picture film. Pins, pegs, and sprockets engage these holes as the film is transported through the camera, projector, or other equipment.

**PLASTICIZER:** Chemicals (such as CAMPHOR) added to the film base to ensure flexibility, and avoid brittleness and cracking.

**POLYESTER:** A name for polyethylene terephthalate. This is a non-organic base for film. It is used nearly exclusively now for 35mm theatrical prints. Also known as Mylar; Cronar is the trade name for Dupont motion picture products; ESTAR Base is the trade name for Kodak products.

**PRINT-THROUGH:** When a film is printed, sometimes artifacts on the original, such as edge codes, stock markings, perforations, dirt, scratches, and, can be printed into the new element. Collectively, these are called PRINT-THROUGH and will appear as white on black/grey and be reversed in comparison to the duping material's own stock markings, and will look less sharp or slightly fuzzy.

**PROCESSING:** Developing, fixing, and washing exposed photographic film or paper to produce either a negative image or a positive image.

## [r]

**REDUCTION PRINT:** A print made from a larger-gauge film, i.e. a 16mm film made from a 35mm original.

**RELATIVE HUMIDITY:** The amount of water in the air compared to the maximum amount of water that the air can hold at a given temperature. High relative humidity is extremely detrimental to the long-term life of a film.

**REVERSAL FILM:** Film that processes to a positive image after exposure in a camera, or in a printer to produce another positive film.

**REVERSAL INTERMEDIATE:** First-generation duplicate film element that is reversed to produce the same kind of image (negative or positive) as the original; used for printing.

**REVERSAL PROCESS:** Any photographic process in which an image is produced by secondary development of the silver halides grains remaining after the latent image has been changed to silver by primary development and destroyed by a chemical bleach. In the case of film exposed in a camera, the first developer changes the latent image to a negative silver image. This is destroyed by a bleach and the remaining silver halides are converted to a positive image by a second developer. The bleached silver and any traces of halides may now be removed with hypo.

[s]

**SAFETY FILM:** Non-nitrate-based film. Generally, Cellulose Acetate film is called Safety film, but it can be used to describe polyester film as well.

**SHRINKAGE:** Reduction in the dimensions of motion-picture film caused by loss of moisture, support plasticizers, and solvents, as well as heat, use, and age. The film actually shrinks, although often not uniformly.

**SILVER HALIDES:** Light-sensitive compound used in film emulsions.

**SINGLE 8:** see GAUGE

**SINGLE-PERFORATION FILM:** Film with perforations along one edge only. Often the soundtrack resides in the non-perfed side.

**SOUNDTRACK:** OPTICAL or MAGNETIC track running lengthwise on film adjacent to the edges of the image frames and inside the perforations.

**SPLICE:** A method of joining two pieces of film so they may be projected as one continuous piece. There are three types of splices: TAPE SPLICE (can be used with all film bases), the CEMENT SPLICE (used for non-polyester material), and

the far less common ULTRA-SONIC SPLICE (used for polyester-based film only).

SPLIT REEL. A reel used for holding film on cores. The two halves of which may be unscrewed and a core or film on a core placed in the middle.

SPROCKET: A toothed wheel used to transport perforated motion picture film in a projector, camera, or printer.

STAGING AREA: An area for storing film after it is removed from cold storage, allowing it to reach room temperature without attracting condensation.

SUPER 8: see GAUGE

SUPPLY REEL: The reel holding the film before it is projected in a projector.

[t]

TAIL: The end of a film. See also HEAD.

TAKE-UP REEL: The reel onto which the film is taken up after it passes through the gate of the projector.

TELECINE: An electro-mechanical machine used for transferring motion picture film to videotape.

TIMING SHEETS/STRIPS: Paper sheets or strips created and used by film labs. They are used in the printing process to ensure the correct lights and filters are used, resulting in a film with correct colors and shades of gray. Outside the United States, TIMING is referred to as GRADING.

TINT: Common to silent-era films, tinting is a means of dyeing the base of b&w film, usually after processing. Tinted prints have the color on the entire base, from edge to edge of the film including the perforated margins.

TONE: Common to silent-era films, toning is a means of changing the color of the silver in the b&w film (the non-white areas). The color in toned prints only affects the silver image, not the base.

TRI-ACETATE: See ACETATE

## [v]

VINEGAR SYNDROME: A term used to describe the process of decay of acetate-based films. The decaying film gives off acetic acid, which smells strongly of vinegar.

## [w]

WIND OF THE FILM: Term describing the relative position of the emulsion and perforations of single-perf film. Film can be either A-WIND or B-WIND. In B-WIND film, when the film is held vertically, the end of the film comes off the reel downward from the right side, with the pefs on the edge away from you and with the base side facing up

## [links]

Other Glossaries can be found at:

### **Kodak Glossary of Film/Video terms**

[www.kodak.com/US/en/motion/support/glossary/glossary.shtml](http://www.kodak.com/US/en/motion/support/glossary/glossary.shtml)

### **Screensound Technical Glossary of Common Audiovisual Terms**

[screensound.gov.au/glossary.nsf/Main/Glossary+Index?OpenDocument](http://screensound.gov.au/glossary.nsf/Main/Glossary+Index?OpenDocument)

## 11. RESOURCES AND LINKS

*Filmforever takes responsibility for our own site. We cannot take responsibility for the information / services / etc. offered by these recommended sites. We do think they are good resources. Let us know if you have any serious complaints.*

For a list of commercial companies providing small gauge film processing and transfers, see the 8mm Film Format Metadirectory

<http://lavender.fortunecity.com/lavender/569/#Processing>

or Littlefilm.org

<http://www.littlefilm.org/Labs.html>

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### AMATEUR FILM MAKING SITES

The following organizations provide technical support and screening opportunities for amateur film and video makers.

#### AMMA

Amateur Movie Makers Association

[savac.tripod.com](http://savac.tripod.com)

#### AMPS

American Motion Picture Society

They play a great organ ihorray for Hollywoodí song on their site!

<http://www.angelfire.com/movies/amps/>

#### San Diego Amateur Moviemakers Club

This group seems to be mostly video. There is an article about Sid Laverents on their site.

<http://www.angelfire.com/movies/SDAMC/>

#### SCCA

Society Canadian Cine Amateurs

<http://s-c-c-a.ca/>

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### COLLECTOR PAGES

There are a large number of wonderfully informative websites out there that have been created by dedicated film collectors. Most are amateur, enthusiastic, and very well informed. Here are just a few of our favorites. You can find many more by checking out their link pages.

#### Cinematographica

A great collectors site with film history pages, including 100 years of film sizes.

[www.xs4all.nl/~wichm/cinemat.html](http://www.xs4all.nl/~wichm/cinemat.html)

#### Jayís Movie Collector Clubhouse

A good collector/enthusiast site.

[www.capital.net/com/jaytp/club.html](http://www.capital.net/com/jaytp/club.html)

#### Paulís 16mm Film Collecting Page

Another great collectorís site. Film identification and how to show movies in your backyard are just two highlights.

[www.paulivester.com/films/films.htm](http://www.paulivester.com/films/films.htm)

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### FILM PRESERVATION EDUCATION PROGRAMS

*Schools offering graduate or certificate programs in film preservation.*



L. Jeffrey Selznick School of Film Preservation at George Eastman House  
[www.eastman.org/16\\_preserv/TOC.html](http://www.eastman.org/16_preserv/TOC.html)

Moving Image Archiving and Preservation at Tisch School of the Arts, NYU  
[www.tisch.nyu.edu/preservation/](http://www.tisch.nyu.edu/preservation/)

University of California Los Angeles Film & Television Archive Degree Program  
[www.mias.ucla.edu/intro.html](http://www.mias.ucla.edu/intro.html)

University of East Anglia Film Archiving Masters Course (UK)  
[www.uea.ac.uk/eas/Teaching/Post%20Grad/film.htm](http://www.uea.ac.uk/eas/Teaching/Post%20Grad/film.htm)

University of New South Wales (Australia): Film Preservation courses over the Internet  
[www.silas.unsw.edu.au/silas/distedu.htm](http://www.silas.unsw.edu.au/silas/distedu.htm)

## 9.5mm SITES

### 9.5USA

Organization for American 9.5mm enthusiasts and collectors  
[www.9-5usa.org/](http://www.9-5usa.org/)

### Pathescope 9.5

British 9.5mm organization  
[www.pathescope.freereserve.co.uk/Pathe95.htm](http://www.pathescope.freereserve.co.uk/Pathe95.htm)

## PROFESSIONAL ORGANIZATIONS

### AMIA

Association of Moving Image Archivists  
[www.amianet.org](http://www.amianet.org)

### BKSTS: The Moving Image Society (UK)

The British Kinematograph Sound and Television Society  
[www.bksts.com](http://www.bksts.com)

### FIAF (International)

The International Federation of Film Archives  
[www.fiafnet.org](http://www.fiafnet.org)

### Film Archive Forum (UK)

Umbrella organization representing British public sector film and television archives  
[www.bufvc.ac.uk/faf/faf.htm](http://www.bufvc.ac.uk/faf/faf.htm)

### National Film Preservation Foundation (USA)

Find out what's going on in the exciting world of film preservation at this important grant agency's site.  
[www.filmpreservation.org](http://www.filmpreservation.org)

### SEAPAVAA (International)

The South-East Asia Pacific Audio Visual Archive Association  
[www.geocities.com/seapavaa](http://www.geocities.com/seapavaa)

### SMPTE

Society of Motion Picture and Television Engineers  
[www.smpte.org](http://www.smpte.org)

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## PUBLICATIONS

*Order these fine books at your local bookshop or find them online.*

Kodak Book of Film Care  
1-800-242-2424  
Kodak Publication No. H-23

Home Movies by Alan Katelle  
[www.homemoviehistory.com](http://www.homemoviehistory.com)

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## USEFUL WEBSITES

### **8mm Film Format**

MetadirectoryA comprehensive list of links to a variety of topics relating to 8mm/Super 8 filmmaking  
[lavender.fortunecity.com/lavender/569/](http://lavender.fortunecity.com/lavender/569/)

### **A/V Geeks**

Interested in educational films? You're not alone.  
[www.avgeeks.com](http://www.avgeeks.com)

### **Conservation on Line**

A full text library of conservation information, covering a wide spectrum of topics of interest to those involved with the conservation of library, archives and museum materials  
[palimpsest.stanford.edu](http://palimpsest.stanford.edu)

### **Documentary Filmmakers Group**

A site for documentary filmmakers in the UK.  
[www.dfglondon.com](http://www.dfglondon.com)

### **Film & Video Services**

A lab in Minneapolis that will do super 8 contact printing.  
[filmvideoservices.net](http://filmvideoservices.net)

### **Film Archive Forum**

British Universities Film & Video Council sponsors this site, which is a network of British moving image archives.  
[www.bufvc.ac.uk](http://www.bufvc.ac.uk)

### **The Film Center**

An incredible collection of pages on topics ranging from film collecting, equipment maintenance and suppliers, to how to build your own home theatre.  
[www.film-center.com](http://www.film-center.com)

### **Flicker**

A bi-monthly screening series of short small-gauge films by Richmond, Virginia area filmmakers. They are in cahoots with the Richmond Moving Image Co-op.  
[www.flicker.org](http://www.flicker.org)

### **Frameworks Mailing List**

Experimental and avant garde film list with frequent discussions about 16mm and 8mm technology and preservation issues  
[www.hi-beam.net/fw.html](http://www.hi-beam.net/fw.html)

### **IPI**

The Image Permanence Institute is a research library investigating preservation of paper and media. Check out their free to download Preservation Calculator, which will show you what you can expect from your storage conditions.  
[www.rit.edu/ipi](http://www.rit.edu/ipi)

### **Kodak**

Site includes information on film preservation, history and Kodak products.

[www.kodak.com](http://www.kodak.com)

**Littlefilm.org**

Site maintained by Brodsky and Treadway including essays and help pages on 8mm preservation, filmmaking, equipment and lab services

[www.littlefilm.org](http://www.littlefilm.org)

**Smallgauge list page**

Listserv dedicated to amateur film and small gauge preservation and filmmaking

[groups.yahoo.com/group/smallgauge/](http://groups.yahoo.com/group/smallgauge/)