Motion Picture Restoration

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ARCHIVISTS, historians, and a large segment of the general public would count it a catastrophe of immeasurable proportions if a collection—containing, for example, all the books and manuscripts of a major field of human knowledge from 1900 to the present—was destroyed by fire. Today, at this moment, the record of a whole field of human effort *is* on fire; yet so few people are concerned that the remains are likely to crumble to a foul-smelling brown dust before the holocaust can be made public, let alone put out or even controlled. The fact is that nitrate-based motion picture films—theatrical, newsreel, documentary, historical, and educational—are burning as surely as, though more slowly than, the fire that destroyed the great library at Alexandria in the third century A.D.

The photographic record of human events and human creativity spans less than 150 years of man's history, and the motion picture documents less than 80. The archival value of such photographic records, however, is in the unique dimension they have added to our understanding of the nature of the world about us and the way the course of human life has been affected by these media from the esthetic to the evidential. Without photography, much of today's world would be out of mind as well as out of sight. Without cinema we would not have what is coming to be described as "the language of our time."

The basic problem in the preservation of motion picture materials is that from 1888 to 1951 all 35mm. film was made with a cellulose nitrate base, which is highly flammable and under some circumstances highly explosive, and which, in a state of combustion, is productive of gases that combine with the moisture of the air to produce highly toxic nitric acid.[1] Sixteen-millimeter films and (since 1951) all 35mm., 70mm., and magnetic films and tapes are on a triacetate, so-called "safety" base. Fire and explosion are no longer the hazards they used to be, although acetate will burn slowly, shrink, dry out, curl, or succumb to the action of oxidizing or acidic gases, dirt, wear, fungus, water, and even insects. The proper development, fixing, and washing of photo-

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[1] Partially decomposed nitrate film may ignite spontaneously at 120° F. or, with age, at temperatures as low as 105° F. To determine the base characteristic of film, float a ¼" sample in a test tube of trichloroethylene. Acetate film will float; nitrate film will sink.

graphic images, and the conditions of their storage, of course, continue to be basic to their preservation.[2]

The immediate pressing problem is obviously to preserve early films of the nitrate-base type. The American Film Institute, established under the aegis of the National Foundation for the Arts and Humanities with support from the Ford Foundation and the Motion Picture Association of America, has compiled a "Rescue List" of 250 significant theatrical films to be given priority in an archival and restoration program for which the institute, under the direction of George Stevens, Jr., has already allocated funds. The long-range problem, of course, involves films of *all* types, both nitrate and acetate, on a continuing basis. If we fail to plan for the future as well as the past, we shall perpetuate and accelerate the loss of our film and television heritage.[3] According to an A.F.I. report, only one-fourth of America's copyrighted films is accounted for, and of this number one-third is on nitrate-base film.

The preservation of contemporary records is part of an ancient problem, which has occupied archivists from the beginning of historic time. Clay, papyrus, parchment, stone, paper, film, and videotape all have discouragingly short, precarious lives, historically speaking.[4] Eventual duplication is inevitable if film records are to be not only preserved but also disseminated. It is very probable that the library founded by Ptolemy II as the "daughter" to the original library established at Alexandria by Ptolemy I had as its purpose the preservation

[2] The U.S.A. Standard Specifications for Photographic Films for Permanent Records (PH 1.28–1957) specify a minimum residual hypo level of 0.02 mg. per square inch as anhydrous sodium thiosulfate for medium-grain camera films, and 0.1005 mg. per square inch for fine-grain duplicating, sound recording, and print films, as measured shortly after processing.

The optimum storage conditions for archival films would be in an airfiltered room at 60–70° F., with a relative humidity of 40 to 50 percent. Temperatures below zero are desirable for increasing the life of photographic materials, especially color, although careful temperature conditioning is required to bring the film to a normal temperature for use.

[3] We have almost no visual record of early television history since the first programs were all live and hence ephemeral. Where kinescope recordings (on 16mm. film) exist, these are scattered, generally inferior in technical quality, and few in number. Videotape recordings are likely to prove even more unstable than silver photographic images. Magnetic oxide coatings are subject to flaking, degaussing, and print-through. Their acetate base is subject to the same storage and retrieval conditions as acetate-base motion picture film. The National Academy of Television Arts and Sciences is developing archival collections at New York University, UCLA, and American University in Washington, D.C., to make up the deficiencies and neglect of the past. See Lillian Brown, "The National Library of Television," in *American Archivist,* 30:501–504 (July 1967).

[4] Acetate film "in good storage conditions may be expected to have a life-span of 200–300 years" according to a report on *Film Preservation* published by the International Federation of Film Archives (FIAF), in 1965. The conditions required for "good" storage, however, seem to make the odds against the probability of a 300-year-old film rather high. Film has been compared to paper records by John M. Calhoun, of Eastman Kodak, who states: "Under optimum conditions black-and-white safety films should last as long as high-quality paper records." Calhoun, "The Preservation of Motion-Picture Film," in *American Archivist,* 30:524 (July 1967).

of duplicate or "protection" copies, just as original motion pictures are protected today through the production of duplicate negatives of fine-grain positives.

The Library of Congress began the first systematic acquisition of duplicate copies of American motion pictures in 1894, not as a "daughter" collection in the manner of Ptolemy II, but for the practical purposes of the U.S. Copyright Office, which accepted a photographic print (on bromide paper) of the original 35mm. nitrate motion picture negative, as evidence of ownership. Long rolls of such photographic paper prints, often of different dimensions and with a variety of other technical standards, were accepted by the Library of Congress as protection of copyright as "still photographs" until 1912, when the copyright law was amended to recognize the motion picture as a separate category. Thousands of feet of historically valuable, but technically inaccessible "motion pictures" on paper reposed in the Library's vaults until, in 1952, Library officials requested the Academy of Motion Picture Arts and Sciences to find a way to bring these aging, brittle, nonprojectable, nonstandard, mummified images to life once again.

The system was finally worked out by Kemp R. Niver of the Renovare Film Co., in Hollywood, who had earlier rephotographed 1,500 old nitrate films on acetate stock for the Academy archives. For more than 10 years Niver labored at what came to be known as the Paper Print collection, identifying and solving some 27 separate and distinctly different technical problems in the conversion of these images from opaque paper to more than a half-million feet of 16mm. acetate film representing more than 3,000 titles of the some 6,000 paper copies deposited for copyright between 1894 and 1912. The result is a wealth of research information and "visual literature" including newsreels, advertising shorts, cartoons, comedies, dramas, and novelties—the early works of Griffith, Porter, Bitzer, and other less known American primitives in the art of "moving photography."[5]

For 2 years the Academy of Motion Picture Arts and Sciences supported the program; but, as in the case of the preservation of the Civil War photographic documents of Brady and his associates, Federal funding was finally required to ensure the preservation of the Paper Print collection. In 1958 Congress enacted into law a bill introduced by Sen. Thomas H. Kuchel of California, to appropriate public moneys to complete the restoration of the collection. After this Niver spent another 2 years compiling an index of the material, which was published by the University of California Press in 1967.[6]

[5] Twenty-six reels, including more than 100 short motion pictures made by companies such as Edison, Lubin, Selig, and American Mutoscope & Biograph, as well as some foreign companies, are available from Brandon Films, Inc., 221 West 57th St., New York, N.Y. 10019, along with "Program Notes" by Kemp Niver on these examples taken from the Paper Print collection.

[6] Kemp R. Niver, *Motion Pictures From the Library of Congress Paper Print Collection, 1894–1912,* ed. by Bebe Bergsten (University of California Press, Berkeley and Los Angeles, 1967).

DECOMPOSED 35MM. NITRATE FILM IN THE ULTIMATE STAGE OF DETERIORATION

Note erosion of container.

In 1967, Niver presented his original restoration printer to the Ohio State University's Department of Photography and Cinema, where it has been used since to restore old nitrate film to either 35mm. or 16mm. acetate as part of the department's photo history program. It was employed almost immediately in restoring locally produced 35mm. films depicting early scenes of the university and the community uncovered by members and friends of the department. A few isolated jobs came from Hollywood involving, for example, old newsreel footage needed for feature films.

The first significant task of an archival nature, however, was a joint project with the Ohio Historical Society to preserve the fast-deteriorating 35mm. newsreel prints in the Warren G. Harding collection held by the society's museum on the edge of the university campus. Daniel Porter, Director of the Ohio Historical Society, who had long recognized the problem, at once saw the potential and transferred the films to the Department of Photography and Cinema, where they were inspected (cautiously) and a decision was made about which reels could be restored and what had to be destroyed.

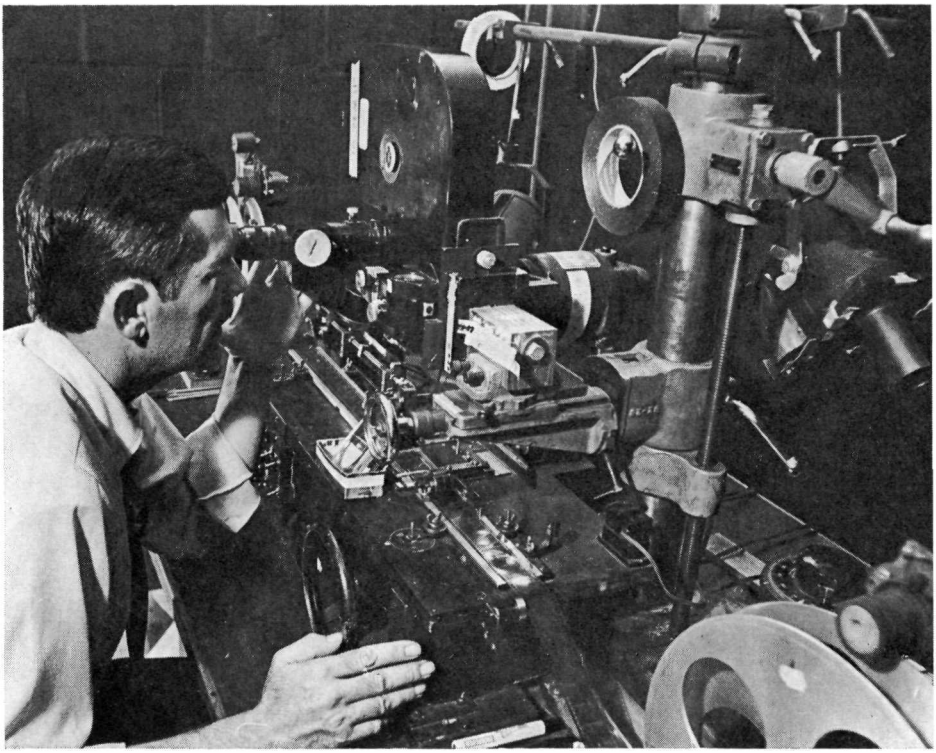
There are several generally identifiable stages in the decomposition of nitrate film, starting with discoloration and fading of the image; brittleness and flaking of the emulsion; a sticky or "tacky" condition accompanied by the erosion of the image and a softening and blistering of the base; a solidification of the layers of film with a frothy exterior appearance; and finally the appearance of a clinging, brown powder with a very acrid smell, denoting the ultimate stage of decomposition. All these stages of decay were present in films of the Harding collection. Often the first task is to get the lid off the can of film to be examined and in several cases this was no easy job. Where the lid is corroded to the can, thought must be given to opening it at all, or at least to grounding any equipment used because of static electricity.

Prints were generally found on exchange (distribution, as contrasted with projection) reels of either the closed type, or the open, wire-spoke type. In other cases prints had been rolled up on removable cores. Some of the material was in good condition, making the copy process relatively fast and easy. Other reels ranged from the first stages of decay to the evil-smelling dust that signals the operator to destroy the film before it destroys him. The material was handled in an airconditioned fireproof room, but late one evening the department chairman received a cautiously worded call from the university's service department inquiring if anything or anyone had died in the area within the last week or two without the knowledge of other members of the department. Building custodians were somewhat reluctant to explore the situation because, in addition to the odor and the unappetizing prospect of finding a cadaver, the entrance door to the area had been boldly labeled: "Explosive material!"

The films in the Harding collection were shot by the major newsreel companies of the early twenties (International, Pathé, Fox) and consisted of presentation reels depiciting highlights in the career of the President from the time just before he assumed office in 1921 until his death in 1923. It is a fragmentary and very incomplete record—newsreels are snapshots, not documentaries. It was first kept in the White House, then with the Harding family and the Harding Memorial Association, and finally in 1965 it was transferred to a small hot vault in the Museum of the Ohio Historical Society. Two years later the films were salvaged by Mr. Porter and the members of the staff of the university's Department of Photography and Cinema.[7]

The members of the department who worked on the project were

[7] Credit is due to Richard Long, production manager of the Department of Photography and Cinema; Emory Meadows, Thomas Snider, John Friend, Richard Sherman, and William Ault for their work on the project. The advice and encouragement of Raymond Fielding, noted film scholar of the University of Iowa, is acknowledged. Donald Staples, Professor of Cinema in the Department of Photography and Cinema at the Ohio State University, assisted during the early stages of the work; and Ralph Emerson Waldo III, a graduate student of film at OSU, cataloged and analyzed the collection.



ORIGINAL PRINTER BUILT BY KEMP NIVER TO RESTORE THE PAPER PRINT COLLECTION OF THE LIBRARY OF CONGRESS

Now in use by Ohio State University's Department of Photography and Cinema to restore and preserve rare, old 35mm. and 16mm. films.

reluctant to surrender a foot of film that might prove recoverable. The worst of the material was immediately immersed in water; other film in a solution of water and glycerine. Samples of film in different stages of desiccation were soaked in a commercial film conditioner.[8] In some cases, rolls that had solidified on the outside were salvaged in part, by carefully unreeling the relatively flexible film in the inside of the core. Some rolls of film which had assumed a bent, or "spoked" condition, passed through the Restoration Printer without difficulty after conditioning. Once copied, all 35mm. nitrate film was ignited in the open, on the university dump; it burned with a fury which cannot be extinguished by any known means, since it produces its own oxygen and will continue to burn under water or even when sprayed with carbonic acid snow.

The Niver Restoration Printer, as set up at the Ohio State University, operates at a continuous rate of approximately 40 frames per minute

[8] Vitafilm, a patented film conditioner, cleaner, and lubricant.

with 35mm. film in good condition. Transmitted light is used, of course, instead of the reflected light used in copying the Paper Print collection. When film is shrunken, damaged, or in some other poor condition that does not permit continuous copying, the operator must align each frame individually, using a cross-hair in a reflex finder to bring the images into registration.[9] Improved methods for speeding up this process are being developed. Some idea of the problem involved may be gained by a reminder that 1 minute of silent-screen time requires the copying of 960 images; 1 minute of sound-screen time requires 1,440 individual images. The camera used with the Niver Restoration Printer is a French Eclair, which may be equipped with either 35mm. or 16mm. magazines. It is also capable of copying 9½mm., 28mm., 32mm., and other obsolete sizes, transferring them to either 16mm. or 35mm. acetate negative or positive copies.

The Harding collection, now restored on 16mm. film, not only illuminates the flavor of the period and moments in the life of a national figure but also provides valuable clues for students in many fields. For example, it was used in a class in rhetoric at the university as a study of the "front-porch and observation-car political speaker" of a generation ago before the advent of the sound film and television. For the student of film, it illustrates the "static" camera point of view and provides a useful comparison of visual news coverage of yesterday and today. It may have a number of other uses in the fields of political science, history, sociology, and psychology.

Newsreels of the time rarely get behind the scenes. All film is only a sample, and this is especially true of a newsreel. But here are the images traditionally associated with a long-lost period of what was called normalcy. Here is the stereotyped image of "the President"—golfer, shaker of hands, friend of the continually defeated American Indian, fisherman, dedicator of monuments, saluter at parades, and lover of children and dogs. It is also the image of a man trapped by the pitfalls and privileges of high office as revealed by the innocent, unrelenting camera eye. There is something contemporary about these flickering, 16-to-18-frame-per-second images of a political figure in American life. How might history be taught today if we had motion picture records of Alexander the Great, Julius Caesar, George Washington, or Napoleon Bonaparte? What will it mean to generations thrice removed from ours to see films of Adolph Hitler, Franklin D. Roosevelt, Winston Churchill, Josef Stalin, and Charles De Gaulle?

Does it really make a difference whether archivists and historians

[9] Shrinkage of original film exceeding about 0.4 percent produces unsteady prints struck on a standard continuous motion picture printer. Where shrinkage is about 1 percent the original may not go through the printer without damage because the teeth of the sprocket fail to engage the reduced dimensions of the sprocket holes in the film. The Niver Restoration Printer is of obvious use with material in this condition, since it may be adjusted to match eccentricities of sprocket-hole dimensions caused by shrinkage, damage, or other factors.

seek out and help preserve the early records on film? Does it matter that the only copies of some of John Ford's early "westerns"—a truly indigenous form of film from the United States—exist only in Prague, with Czech subtitles; or that there are no known prints of "The Winning of Barbara Worth," Gary Cooper's first feature; or Fairbanks' "The Black Pirate," a milestone in the Technicolor process? Does it matter that old educational films are being destroyed for lack of storage space, or that motion picture documentaries and film recordings of every type on every subject are systematically disappearing? Maybe not. This is an expensive area, where a lot of people are eager to see early film work restored only until the cost is estimated.[10] There are problems of rights and residuals and revenue; and of these, the revenue is the most critical.

On November 4, 1966, floodwaters in Florence, Italy, destroyed or damaged more than 3 million books, more than 1,000 major works of art, and 40 rooms in the State Archives containing invaluable records and historic documents. Yet, in the first 10 months after this dramatic catastrophe, approximately $1.7 million had been collected from private sources in the United States alone by the Committee To Rescue Italian Art (CRIA). The response was international: Britain contributed £160,000; numbers of art experts, art lovers, archivists, scholars, students, and others volunteered time and energy to help save and restore these cultural treasures.

In contrast to the disaster of Florence, the conflagration raging in film vaults over the world is invisible. It attracts no international attention, no rush of donations, no offers of contributed time. Despite the current wave of enthusiasm for film, especially among young people, there are as yet only a few sincere film historians, archivists, teachers, critics, students, and producers concerned with the preservation and restoration of old motion pictures.

The worthy though unrewarding task is to protect and perpetuate our motion picture heritage—a form of human communication, creative expression, and historic documentation so unique to the United States that cinema has almost become our second "language." The job is to preserve this heritage on film, this visual literature for our time and for the future.

[10] Estimates of cost must be made for each reel submitted for restoration, depending upon the physical condition of the original; the time required for inspection and preparation; the timing of exposures where the original varies in density; whether it is tinted, or full color, or black and white, etc. The cost per reel for the restoration of the Harding films was from $200 to $300 per 10-minute 35mm. reel. With improved methods, this figure is expected to be reduced.