5. Duplication

To protect the film original and the information it carries, preservationists copy the content and use the new duplicates for public service. For historically and culturally significant titles, repositories invest in film-to-film duplication, creating a new viewing print, access copies, and masters that will safeguard the film for years to come. Short of this optimum long-term preservation solution, repositories can buy precious time for their films by making inexpensive video copies for service and putting the originals in cold storage. Cold and dry storage slows deterioration and permits preservation copying to be prioritized and spread over many years. However, video, while convenient and cost-effective, does not provide a lasting preservation medium.

Most libraries, museums, and archives contract with specialist film laboratories to make preservation and access copies. (For definitions see 1.3.) A basic understanding of the preservation copying process will help you manage projects. This chapter describes both the duplication process and the collaboration between the preservationist and the laboratory.[1]

5.1 Before You Start: First Do No Harm

In the conservation and restoration of any artifact or museum object, preservationists abide by the physician's oath: First do no harm. Film preservation is no different. Whatever effort is invested to save a film, the actions should not damage the original. The original should emerge intact and whole at the end of the process. As doctors reject killing the patient to cure the disease, so preservationists should avoid sacrificing the artifact to save the content. Of course, there are cases when the original is so damaged that it cannot be retained, but these are the exception.

From this first conservation principle follows a corollary: Measures taken to save artifacts and museum objects should be reversible and well documented. Film preservation again follows these basic tenets. If source material is reordered during the duplication, most preservationists insist that the changes be made in such a way that they can be undone if necessary. Furthermore preservationists document the process so that their successors will know exactly what steps were taken.[2]

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1. The primary published sources for this chapter are *ACVL Handbook: Recommended Practices for Motion Picture and Video Laboratory Services*, 5th ed. (Hollywood, CA: Association of Cinema and Video Laboratories, n.d.) and *Film Preservation 1993: A Study of the Current State of American Film Preservation*, 3 vols. (Washington, D.C.: Library of Congress, 1993), also available at lcweb.loc.gov/film/study.html.

2. For more on the professional ethics of film preservation and restoration, see Paolo Cherchi Usai, *Silent Cinema: An Introduction*, rev. ed. (London: BFI Publishing, 2000), 44–76, and the *FIAF Code of Ethics*, available online at www.fiafnet.org/uk/members/ethics.cfm.

Preservationists also have a responsibility to the public. Film audiences and scholars will experience the original through the copy created by duplication and restoration. If parts of the film are modern reconstructions, viewers deserve to know. In restoring the short films of the Edison Company, produced nearly two decades before the ascendancy of the sound film, the Museum of Modern Art worked from the company's written records to reconstruct the long-missing intertitles, the screens of text that explain the action to the viewer. The museum developed intertitles that were so similar to the Edison Company's typographical style that they were virtually indistinguishable from the originals. The museum added a small MoMA logo to each new frame to acknowledge the reconstructions.

5.2 Protecting the Original

Long-term protection: copying film on film. Film preservation is an investment in the future. Ideally, it involves creating both a surrogate for public use and one or more masters through which new copies can be made without returning to the source. The masters can take different forms—negative/positive, optical/magnetic, analog/digital—depending on the format, characteristics, and generation of the film original.

Protecting the original by creating new film masters is the gold standard in film preservation, but the process is time-consuming, exacting, and expensive. In 2003, creating a new negative and print of a 1,000-foot 16mm black-and-white silent positive cost between $1,550 and $2,800.[3] Because of the cost, this process may only be feasible at present for films of singular research value that are thought to represent the best surviving copy (see 4.4).

The preservation masters guarantee that film content is safeguarded and that the original will be shielded from unnecessary handling.[4] If a viewing copy is damaged, a new one can be made from the preservation elements without subjecting the source to additional wear and tear. Once duplicated on film, the original can be returned to cold storage.

Short of film-to-film duplication, there are significant steps that repositories can take to make the film accessible as part of their conservation strategy. These involve making video access copies and using cold storage strategically to buy time for the film original (see 6.1).

Access copies. Before video became commonplace, many films in research institutions were unviewable. Video brought a public service revolution and made it

3. Based on estimates received with National Film Preservation Foundation (NFPF) grant applications in 2003 for film source materials in relatively good physical condition. Color is generally more expensive; the creation of a new internegative and print for a 1,000-foot 16mm print is estimated to cost between $1,800 and $4,300.

4. When resources are available, preservationists may make two masters—one that is used to generate new prints and a second that is held in reserve as a safeguard.

possible to provide moving image access with off-the-shelf consumer electronics equipment. A number of repositories now routinely copy new acquisitions onto analog VHS videotape, making copies either in-house or by arrangement with a commercial facility.[5] For reference service, organizations are also increasingly relying on video copies of works protected through film-to-film duplication. The new film prints can then be reserved for screenings and exhibition loans (see 9.2, 9.5).

Thus video has given preservationists an additional tool for assessing a film's research value: actual research use. Works that are frequently consulted on video clearly have research value. Demand, along with the other factors discussed in chapter 4, should also be considered when prioritizing films for full film-to-film preservation.

Analog videotape. Analog video is a flexible and inexpensive access tool. Although the image and audio quality is relatively low, analog video carries information sufficient for most research requests. Additionally, VHS is playable on equipment already installed in most institutions. It is convenient, portable, and easy to use. VHS videotape serves as a stand-in for the original, which can be retired to safekeeping in cold storage. Under most conditions, analog videotape retains an acceptable signal for 20 to 30 years, although poor handling, dirty equipment, and heat and humidity will, of course, shorten its life span.[6]

Digital videotape. Given the fragility of VHS cassettes, and the near-obsolescence of three-quarter-inch U-matic video equipment, some organizations take the extra precaution of creating the first video copy on better-quality videotape. This video master is then used to generate VHS copies for years to come. For more than a decade the video format of choice was BetaCam SP, the half-inch analog tape that gained acceptance in the television industry in the 1980s. With the increasing popularity of digital tape, some organizations have switched to half-inch Digital Betacam tape (also known as Digi Beta or DBC), which is now preferred for broadcast. Recording image and sound digitally, Digital Betacam can be replicated without significant loss and provides a more robust platform than analog tape for making subsequent copies on DVD and other digital media.

Digital frontier. The growing use of digital records leads to the question: Why bother with duplicating film on film at all? Why make a new film master photochemically when it is possible to convert film content directly to digital files?

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5. Some organizations make low-cost VHS copies in-house on a film-video converter, sometimes known by the brand name Elmo (see 9.1), which operates like a camera hooked up to a film viewer. These VHS video copies are of lower quality than those produced by telecine equipment. Damage can occur to the original during transfer, and it is important to repair breaks and tears prior to the operation. Fragile, shrunken films should not be transferred with a film-video converter.

6. See Steven Davidson, "Videotape Issues and Concerns," in *The Administration of Television Newsfilm and Videotape Collections: A Curatorial Manual*, ed. Steven Davidson and Gregory Lukow (Los Angeles: American Film Institute; Miami: Louis Wolfson II Media History Center, 1997), 121–122. For a fuller discussion of videotape longevity, see *Television and Video Preservation 1997: A Report on the Current State of American Television and Video Preservation*, 4 vols. (Washington, D.C.: Library of Congress, 1997), 18–27, also available at lcweb.loc.gov/film/tvstudy.html. For a primer on video preservation, see the interactive DVD *Playback: Preserving Analog Video* (San Francisco: Bay Area Video Coalition, 2003).

In part the answer is another question: Does current digital technology capture the audio and image information of the original without loss? At present the answer is no. Scanning at sufficient resolutions to capture all the image and sound content of film is still in the testing stage. In the future it may become possible to scan the original and capture the inherent data at an affordable cost, but it is not yet clear which approaches will have long-term archival value.[7]

In this age of electronic initiatives, preservationists in both the private and public sectors feel growing pressure to "digitize" their holdings. Digitization, however, is not yet a practical film preservation solution. The best way to protect film content for the future is still the time-honored approach of copying film onto film and storing it in a cold, dry vault. At present film remains its own unrivaled long-term preservation medium.

Developing a long-term preservation strategy. Selecting titles for film-to-film duplication can seem a daunting decision. The preservationist weighs many factors, including the film's historical significance and uniqueness as well as research demand, availability of funding, and institutional priorities. In developing a long-range film preservation plan (see 6.8), the benefits brought by cold storage must be included in the equation. Storage is covered in more detail in the next chapter but is worth discussing here as a critical factor in decision making.

For film, cold and dry storage conditions are the equivalent of preventive medicine.[8] Good storage slows decay and extends the useful life of the original. When motion pictures last longer, title-by-title duplication can be planned in phases over many years and not driven by emergency. Proper storage buys precious time.

Budget-conscious preservationists are coming to view film-to-film duplication as the way to protect the most important research materials—the gems of the collection. They are turning to video as a convenient, cost-effective means of providing access and protecting the original from handling. Without storing the original and masters under cold and dry conditions, however, duplication and access-through-video offer few long-term benefits for film survival. Cold and dry storage is the single most important factor in extending the life of film. It provides the framework for preservation planning and scheduling duplication over time.

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7. Even with such developments on the horizon, preservationists will still face the central challenge of digitization. No matter how faithful the digital copy, it must be refreshed and reconfigured for use with changing access systems. Thus the cost of a digital copy will include not just its creation but its repeated copying and ongoing maintenance. For more on digital archiving, see *Building a National Strategy for Preservation: Issues in Digital Media Archiving* (Washington, D.C.: Council on Library and Information Resources, 2002), also available at www.clir.org/pubs/abstract/pub106abst.html, and *The State of Digital Preservation: An International Perspective* (Washington, D.C.: Council on Library and Information Resources, 2002), also available at www.clir.org/pubs/abstract/pub107abst.html. For an overview of digital preservation issues, see Margaret MacLean and Ben H. Davis, eds., *Time & Bits: Managing Digital Continuity* (Los Angeles: J. Paul Getty Trust, 1998).
8. See "Keeping Cool and Dry: A New Emphasis in Film Preservation," in *Redefining Film Preservation: A National Plan* (Washington, D.C.: Library of Congress, 1994), 33–38. Also available at lcweb.loc.gov/film/storage.html.

TABLE 7. DUPLICATING YOUR FILM: OPTIONS AND TRADE-OFFS

Duplication Approach	Benefits	Limitations
Film, along with film print and VHS tape or DVD access copy	• Long-term protection of original. Masters can last for years if properly stored. The new master is used when new copies are required. The access copy shields the original, which can be left undisturbed in cold and dry storage. • Print available for screenings and public service. • With good-quality preservation work, print quality replicates the sound and visual quality of the original. • Film playback equipment relatively unchanged over time. • Proven preservation medium that has industry standards. • New print can be copied on video for access.	• Most expensive. • Film projection and viewing equipment required for public access to film print. Projectors must be either rented or maintained in-house and regularly serviced. Flatbed editing tables are more expensive than VHS videotape players.
VHS tape copy only	• Most inexpensive to make. • Convenient to use. • Playback equipment available in most institutions. • Serves as surrogate for the original, which can be left undisturbed in cold and dry storage.	• Poorer image and sound quality than film. • Inadequate for broadcast or reuse in film production. • Shorter life span than film. • New video copy from film will have to be made within two to three decades. • Playback equipment likely to become obsolete.
Betacam SP tape, along with VHS tape copy for routine access	• Serves as surrogate for the original, which can be left undisturbed in cold and dry storage. • Provides better-quality video master than VHS for creating subsequent copies. • Adequate for broadcast.	• More expensive than VHS. • Shorter life span than film. • New video copy from film will have to be made within two to three decades. • Betacam SP in declining commercial use. • Playback equipment likely to become obsolete.
Digital Betacam tape, along with VHS or DVD copy for routine access	• Serves as surrogate for the original, which can be left undisturbed in cold and dry storage. • Provides better-quality video master than analog videotape for creating subsequent copies. • Digital Betacam tape now in widespread commercial use. • Adequate for broadcast. • Serves as platform for other digital output media, such as DVD.	• More expensive than VHS. • Shorter life span than film. • Digital records will need to be refreshed and reformatted over time. • Playback equipment likely to become obsolete.

5.3 Film Preservation Laboratories

With few exceptions, public and nonprofit archives contract with commercial film laboratories for preservation copying. The duplication of older film differs substantially from the mass production of theatrical release prints, and over the last few decades several dozen American labs have moved into this specialty. Specialists work on a smaller scale and tailor their approach to the project at hand. Some have developed areas of particular skill—8mm or Super 8mm, color, nitrate film, or sound. Given the fragility of older film and the range of its decay problems, preservation copying is a craft for experts.

Specialist laboratory work is priced by the labor and time required for the task. The cost for even a standard product such as a black-and-white silent negative varies with film condition, amount of preparation work, location of the lab, and other factors. With more complex jobs, the expense increases. Costs vary within a range and cannot be reduced to a uniform price-per-foot figure. These variables —products (see 5.4), processes (see 5.5), and costs (see 5.7)—make it all the more important for preservationists to understand the basics before undertaking a project.

5.4 Products Created Through the Duplication Process

Film-to-film duplication can produce a bewildering array of preservation masters and access copies. The masters vary with the type of source material and the level of protection needed for the original. As a rule of thumb, the more exacting and complicated the project, the more intermediate materials and testing copies required. The accompanying chart begins with four types of source materials found in cultural repositories—the silent print, the sound print, the silent negative, and positive A and B rolls with separate magnetic track—and shows the products created in the duplication chain. Note that the terminology for the preservation masters differs for color and black-and-white film.

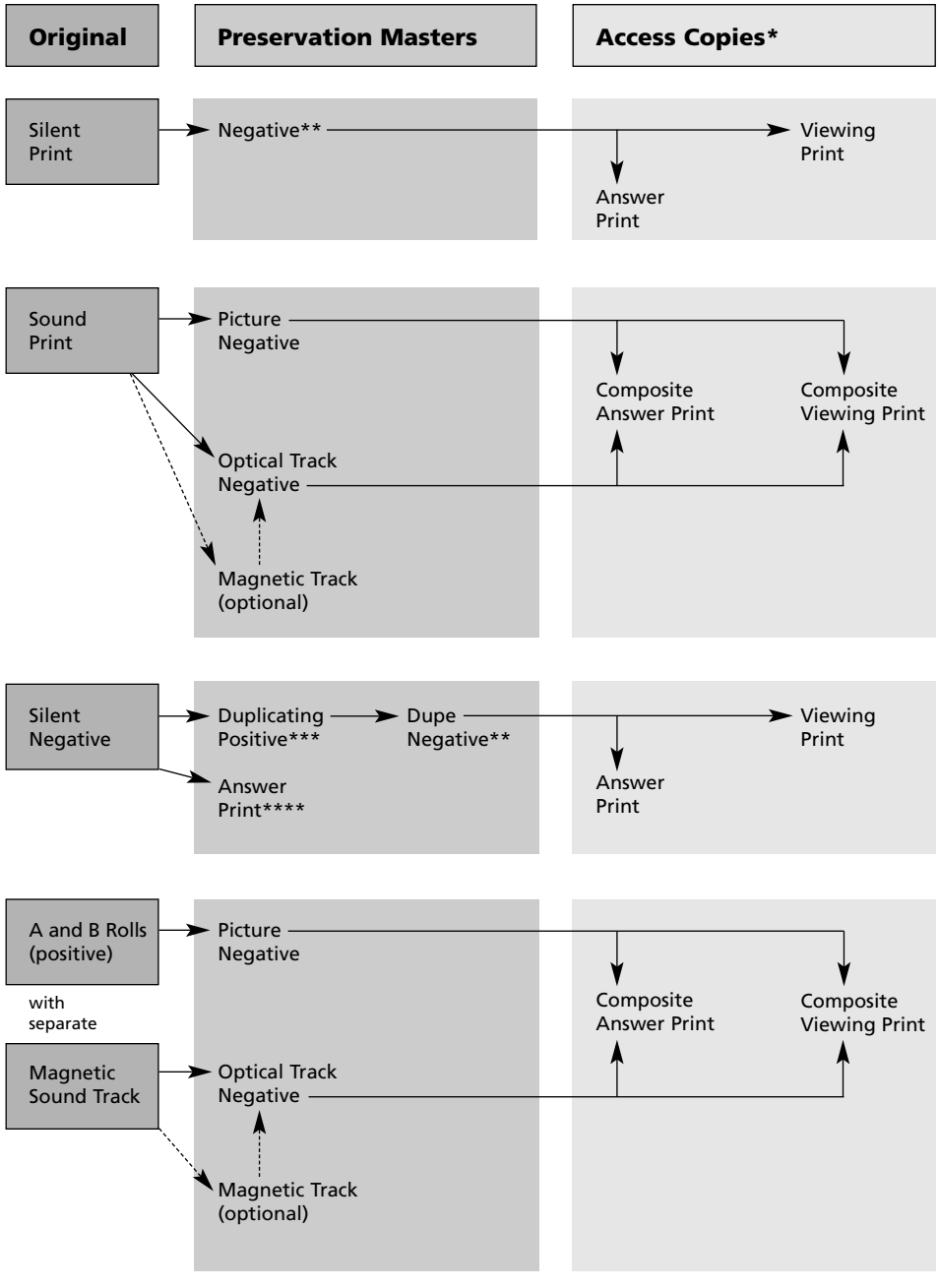
The preservation material provides a master from which copies of the film can be created without returning to the original. The answer print is used to test the quality of the preservation material. Complex restorations may require successive answer prints to obtain the correct

Labspeak

What is the difference between a first trial print and an answer print? Digi Beta, Digital Betacam, and DBC? An intermediate color negative and an internegative? There is no real difference.

Like any technical specialty, the film laboratory field has its own vocabulary. Terms sometimes have similar or even identical meanings. Don't be discouraged by the jargon. Laboratory preservation work is rooted in the processes described in chapter 2 and this chapter. If you don't understand a term that appears in a lab estimate, just ask.

Film Materials Produced in the Film-to-Film Copying Process



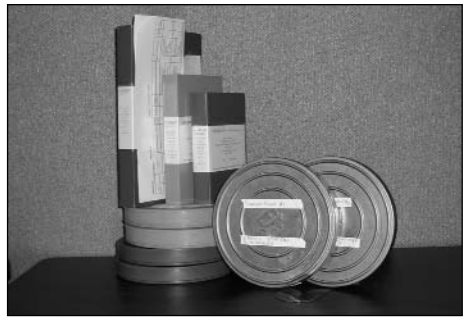
*An acceptable answer print may be used as viewing print. Chart does not include video copies.

**Usually called internegative for color.

***Usually called fine grain master for black and white and interpositive for color.

****This answer print is used to determine the timing for the duplicating positive.

color and brightness. When planning to use an answer print for access, budget-minded preservationists should be sure that the print is "well-timed," that is, produced with the correct color and brightness throughout. Once this is accomplished, subsequent access prints should match the approved answer print.



Preservation materials and access copies produced for a two-reel 1928 silent short.

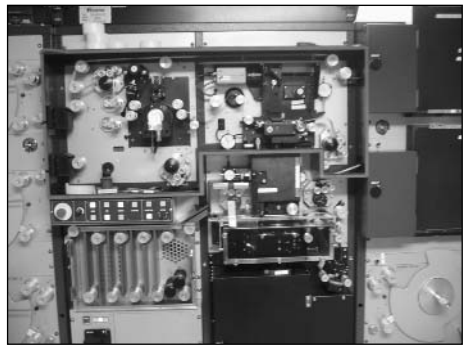
For most public and nonprofit organizations, an acceptable answer print doubles as a viewing print. Videotapes are made either from the print or, with special handling, from the preservation material or master. Having both film and video access copies gives institutions more flexibility in serving the public.

Copying sound film involves additional steps. Sound is usually transferred from the source to a magnetic intermediate, optical track negative, or computer file. This intermediate is used to create a new track negative. The track negative is then re-synchronized with the picture negative. Finally, both are used to produce a new viewing positive with a sound track, called a composite print. In some cases, preservationists will also make an additional back-up copy of the sound track on magnetic sound film, audiotape, or data file to safeguard the full audio range of the original.

5.5 Special Laboratory Processes

Laboratories have developed specialized processes to handle particular gauges and decay problems. The following are some of the more common techniques.

Wet-gate printing. Scratches and abrasions inevitably scar older film materials, particularly reversal originals that have been run through camera and projector. The damage may occur on either the film's base or its emulsion side. With regular "dry printing" lab equipment, some defects can be carried over in duplication and appear as striations or blemishes on the new print. The wet-gate process reduces this problem. During printing the film is temporarily immersed in a chemi-



Wet-gate printer.

cal bath, which helps to fill in scratches, especially on the film's thicker base side.[9] A wet gate can be incorporated into a film printer or a telecine, the device through which film is transferred to videotape.

Optical printing. Introduced to motion pictures in the 1920s for special effects, optical printers have since been adapted for other applications. Unlike contact printers, which print through direct physical contact between the master and raw film stock, optical printers work like projectors. The printer projects the image through a lens and copies it onto the unexposed stock, frame by frame.

Optical printing has long been used to create a film copy in a format different from the master and has become a common tool for transferring 8mm and Super 8mm to 16mm. Optical printers are also employed for duplicating shrunken film.

Digital image restoration. In this process, the motion picture image is scanned to a digital file. There dirt, scratches, and other imperfections are corrected digitally. Then the image can be output back to film or video. When introduced in the mid 1990s, digital restorers had to painstakingly remove damage frame by frame. Now the restoration process can be speeded with the help of computer programs, but it is still prohibitively expensive for most nonprofit and public institutions.

Digital sound restoration. As sound tracks deteriorate, the original recording suffers in quality, resulting in the all-too-familiar hiss, hums, clicks, and pops heard during the screening of older sound films. In the restoration process, the sound is transferred to a digital file, where the anomalies can be corrected at a digital audio workstation. The restored sound is then output to film, often directly from the computer hard drive to sound track elements. The digital data created during sound restoration is archived for future use. Digital sound restoration is already part of the preservation arsenal.

Redimensioning. This last-chance measure is appropriate only for severely shrunken film. Through a chemical treatment affecting the plastic, the shrunken film is allowed to return to a state closer to its original dimensions. The treated film is then fed through the printer before the chemical reaction wears off and the film reshrinks. Redimensioning is a destructive process that may permanently damage the original and should only be used in extreme cases.

5.6 Regular 8mm and Super 8mm

Commercial preservation laboratories have only recently turned attention to Regular 8mm and Super 8mm. With the film industry wedded to 35mm and the educational market to 16mm, there had been little demand. Changing scholarly interests coupled with the Association of Moving Image Archivists's 2001 Small

9. The wet-gate process often has less success in dealing with scratches to the emulsion.

Gauge Initiative have brought about a reassessment of amateur gauges.[10] A number of laboratories now have successful techniques for handling small gauge film. Because of the difficulty in finding and servicing 8mm equipment, most preservationists duplicate 8mm and Super 8mm onto 16mm film.

Some silent amateur films are composed of spliced-together color and black-and-white footage, leading to the question of how to handle differing film stocks in the laboratory. There is no simple rule. As with so many preservation practices, much depends on funding and the importance of the film as an artifact. Generally the solution is to copy the entire compilation onto color film. But, particularly with avant-garde and artist works, the original may be taken apart, the sections duplicated separately onto color or black-and-white film, and then the source material and print reassembled in the original sequence.

5.7 Understanding Laboratory Estimates

Most contractors give written estimates outlining the proposed service and cost. Laboratories are no exception. They base estimates on a description of the project, provided over the phone or by e-mail, or through a physical inspection of the film.[11] Before requesting an estimate, prepare a physical description of your film and think about the products you need. At a minimum, you should have answers to the following questions:

- What is the film title or collection name?
- What is the approximate date?
- What is the gauge?
- Approximately how long is each reel, measured in feet?
- What is the film stock or brand?
- Is the film color or black and white?
- Do you have a positive, a negative, a reversal original, or A and B rolls?
- Does your film have a sound track? What kind is it? Are there separate sound elements?
- What decay and damage does the film exhibit: color fading, shrinkage, warping and curling, image deterioration, tears, broken splices, damaged perforations, vinegar syndrome?
- What masters and access copies are required for your project?
- Will you add credits or other introductory material to the masters and access copies?

10. See, for example, Albert Kilchesty, ed., *Big as Life: An American History of 8mm Films* (San Francisco: Foundation for Art in Cinema, 1998), the catalog of a two-year retrospective organized by the Museum of Modern Art and the San Francisco Cinematheque, and Patricia R. Zimmermann, *Reel Families: A Social History of Amateur Film* (Bloomington, IN: Indiana University Press, 1995). The AMIA compiled a small gauge brochure issued for its 2001 conference; it is available at www.amianet.org/publication/resources/reports/smallguage.pdf.

11. Although more accurate, the latter can be more expensive and time-consuming. Some labs charge a fee for inspection, particularly if the client decides to use another vendor for the duplication project. Most labs bill for return shipping.

Your written inspection report (see 3.3) contains most of this data and can provide a foundation for the estimate.

To compare costs and approaches, preservationists generally recommend obtaining two estimates. The lower bid is not necessarily the better fit for your film. In choosing a laboratory, you should consider not just cost but the laboratory's experience with similar projects, proximity to your institution, scheduling, and customer service attitude. Ask questions regarding the timeline and execution of your project. Engaging a lab is the first step in a collaboration, and you should select a partner with whom you can work effectively.[12]

Ultrasonic film cleaner.

Estimates should cover all stages of the duplication process and itemize all preservation materials and access copies requested by your institution. Let's look at the estimate on the next page. The cost of each procedure is calculated by hour (for labor), by foot (for film), or by piece (for videocassettes). The evaluation and repairs are figured on the basis of time. Films with physical damage are more labor-intensive and cost more to repair. For cleaning, most commercial labs calculate the cost by the length of the original. Generally cleaning is performed with an ultrasonic cleaner, a device in which film is passed through a solvent bath where high frequency vibrations dislodge all but the most entrenched dirt. Hand cleaning is used for fragile film and requires more time.

The preservation master is generally priced per foot, based on the length of the film original. Special laboratory processes such as wet-gate or optical printing can be factored into the cost of the master or reflected as a surcharge. The answer print is also based on the per-foot charge for new film stock.

For most archival projects, the videotape estimate has two parts: the hourly fee for the technician and the use of the facility and the per-unit cost of new videotape cassettes. A closely monitored transfer, during which the lab technician corrects each scene's color, contrast, brightness, and framing, is more time-consuming and expensive than a "one-light" transfer, in which a single setting is used throughout. Finally, depending on local practices, there may be additional charges for cans,

12. Some experienced preservationists take this one step further and contract sound and video components of their projects to specialized facilities. Like general contractors on a home renovation project, they integrate work by several labs into a single project and provide overall direction and quality control.

SAMPLE LABORATORY ESTIMATE

Title: *Excavations at High Mesa*
Source Material: 16mm color reversal original, silent (450 ft.)

Procedure	Amount	Rate	Total
Evaluation and repair	1 hour	_____ per hour	_____
Cleaning	450 ft.	_____ per foot	_____
16mm internegative	450 ft.	_____ per foot	_____
Wet-gate surcharge	450 ft.	_____ per foot	_____
16mm color answer print	450 ft.	_____ per foot	_____
16mm unsupervised transfer to Digi Beta	1 hour	_____ per hour	_____
Digi Beta tape stock	1	_____ each	_____
VHS copy	1	_____ each	_____
TOTAL			_____

This estimate is based on the information provided by the client and may change on physical inspection of the film. Shipping is not included.

Note: Rates and dollar amounts are not included. Prices vary widely from lab to lab, depending on the condition of the film and other factors.

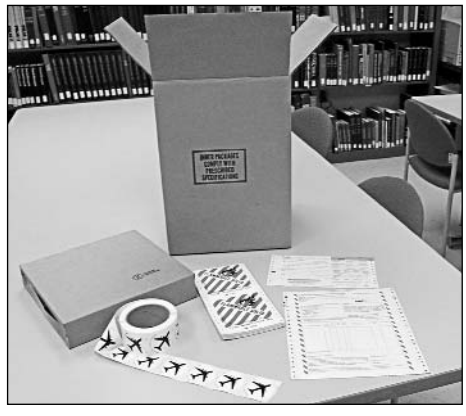
QUESTIONS TO ASK YOUR PROSPECTIVE LAB

1. Can you provide an estimate without inspecting the film? If yes, what inspection information should I provide as a basis for a reliable estimate?
2. How much preparation will be required? Are there tasks that I can do to cut down on your lab's preparation time?
3. How will the film be cleaned?
4. Will all of the operations be performed in-house or will some be contracted out to other facilities?
5. At what point will I be notified if it appears the project's cost will exceed the estimate?
6. Do I have a choice between polyester and acetate film for the preservation elements and viewing copies?
7. Will a lab technician supervise the video transfer and correct individual scenes for brightness and color?
8. What is the expected completion date of the project? Will your lab commit to that date?
9. Can I visit the lab to approve the results?
10. Can I specify the shipping service for the return of my film materials?

shipping, and insertion of credits. Before signing off on an estimate, be sure you understand each phase of the project and check the math.

5.8 Shipping Your Film

Most specialist laboratories are clustered near the East and West Coast film production centers and outside the driving range of many repositories. To transport films to and from laboratories, institutions generally engage commercial shippers. Before shipping, check with your administrative office regarding your institutional insurance policy. Depending on the value of your film, you may need to purchase additional coverage. Most preservationists prefer using carriers with Internet-based tracking services so that they can follow the progress of the shipment.



Federal rules require special packaging and shipping procedures for nitrate films.

For packing, secure the film leader with appropriate tape,[13] avoiding contact of the tape with the film image or sound track. Place the film in a can slightly bigger than the film roll. Fill the space with bubble wrap, paper, or film cores to make a snug fit. Then tape the can shut. Next, place the can horizontally in a clean and sturdy cardboard box with adequate bracing, add bubble wrap or paper to cushion the can, enclose your return shipping address as well as your transmittal memo to the laboratory, and seal the box. Films can be easily damaged in shipping, and it

Shipping nitrate film

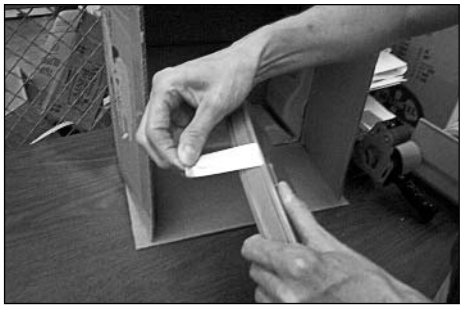
Nitrate motion picture film is considered a hazardous material by the U.S. Department of Transportation (DOT) and can only be handled by an authorized carrier. The DOT requires that the film shipping container display an exterior label declaring the nature and class of the contents and that this outer container meet departmental specifications.

The 2002 *Code of Federal Regulations* (title 49, vol. 2)* outlines special training needs for staff involved in shipping hazardous material. If you have not received this instruction, go to Federal Express or another authorized carrier to arrange nitrate packing and delivery. Avoid shipping nitrate motion picture film during warm weather.

*Available at www.access.gpo.gov/nara/cfr/waisidx_02/49cfr172_02.html. For more on shipping nitrate film, see *Safe Handling, Storage, and Destruction of Nitrate-Based Motion Picture Film*, Kodak Pub. H-182 (Rochester, NY: Eastman Kodak Company, 2003), also available at www.kodak.com.

13. George Eastman House uses an acid-free paper tape from an art supply house. Some archives use cloth tape.

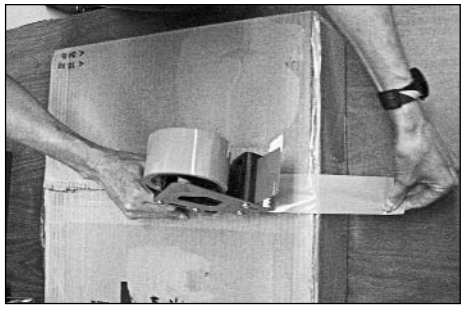
Steps in Packing a Safety Film for Shipping



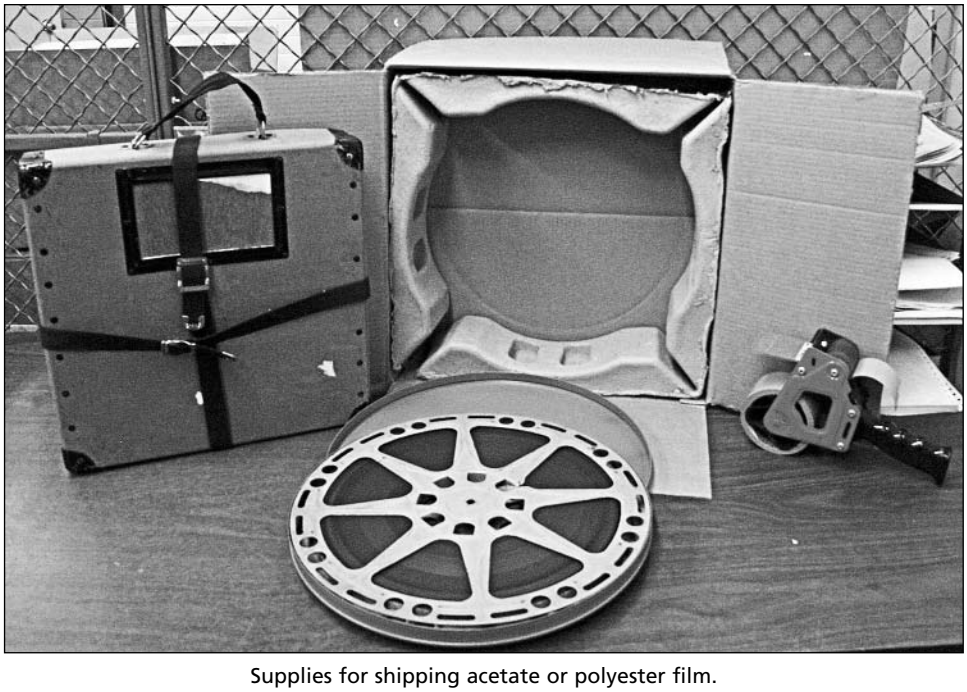
1. After packing the film roll snugly in the can, seal the can with tape.

2. Place the can in a sturdy shipping box with adequate bracing.

3. Add bubble wrap or paper to cushion the can.



4. Seal the box with packing tape.



Supplies for shipping acetate or polyester film.

is important that you and your preservation lab exercise extreme care in packing film materials.

5.9 Managing Your Project

Interested clients monitor their projects. Your availability will encourage the laboratory to consult with you should complications develop or the work cost more than expected. Once you know the approximate schedule, check with the lab by phone or e-mail as the project nears the expected date of completion. Also find out from your administrative office if your institution will require a purchase order or other special paperwork to process payment.

For the new film preservationist, often the most challenging project management task is quality control. Laboratories generally send the completed masters and access copies to the client for approval before issuing an invoice. The best way to review laboratory work is by projection. The properly projected answer print magnifies exposure and printing flaws. Check the answer print for the following: focus, image stability or "shakiness," graininess,[14] contrast, gray scale or color range, and sound quality. In addition, verify that any added credits or titles appear on the screen for the correct duration and in the specified font. In quality control, keep in mind that some damage, decay, and lighting problems found in the original will be carried over to the copy. First-time film preservationists often invite more experienced colleagues from neighboring institutions to assist in the examination.

Projection equipment must be properly set up and maintained to be used in quality control. If your institution does not have projection equipment, you might arrange to screen the answer print at a local film facility, such as a campus cinema department. Whenever possible, visit the laboratory and view the answer print in the lab's own screening room. This is an excellent way not only to review the print but also to see the laboratory in action. Using the VHS access copy of the answer print as a quality control tool is not satisfactory. Videotape lacks the full resolution of film and, depending on the transfer operation, may exhibit lighting, framing, and other problems not present in the answer print. Never inspect preservation masters by projection. Only experienced preservationists with specialized equipment should review the new preservation master itself.

The completion of a preservation copying project may mark the beginning of screenings and exhibits celebrating the film's availability to the public (see 8.5 and chapter 9). In the United States, repositories have the legal right to make preservation copies for films in their care but generally must secure permissions for public exhibition from donors and rights holders (see 8.6). As a courtesy and an expression of appreciation, organizations often contact filmmakers and donors on the completion of duplication projects involving their films.

14. Film will always lose some resolution between generations, but excess grain may also be the result of technical problems.

5.10 Securing Resources for Film Duplication

While a number of organizations set aside funds for access copies and storage, few institutions budget for film-to-film duplication. Where can repositories find the resources to start?

Many organizations begin through government grants. The National Endowment for the Arts, the National Endowment for the Humanities, the National Historical Publications and Records Commission, and the Institute of Museum and Library Services all support preservation and access projects. Each has its own funding criteria. It is worth reviewing their grant guidelines for applicability to your project.

The nonprofit National Film Preservation Foundation (NFPF) receives federal funds through the Library of Congress to distribute as film preservation grants. It also distributes donated services contributed by preservation laboratories and sound facilities. The NFPF programs give priority to the preservation of historically and culturally significant films made in the United States or produced abroad by Americans. The programs support film duplication in a diverse range of institutions and subject areas; regional materials may receive preservation support if they are indicative of broader national trends or provide important documentation of cultures and themes unrepresented elsewhere.

Other potential sources are local community foundations, private donors, and commercial sponsors, particularly those interested in the subject matter or geographical coverage of particular titles. Sometimes advertisers or film producers will pay for duplication as part of the footage licensing agreement (see 9.4). Museum planners may contribute support for films that complement an exhibition theme. Holidays, anniversaries, and festivals can trigger similar opportunities.

Films cannot be appreciated until they are seen. Some institutions new to film duplication have found it effective to begin with works of broad interest and use the access copies to leverage support and public interest. The University of Minnesota's Bell Museum of Natural History received a grant to make preservation duplicates of two ecology documentaries produced in the 1950s. Armed with video copies and the validation brought by the award, the museum incorporated the films into a local exhibit and into a new university course on the history of the nature film. East Tennessee State University won a grant to make preservation and access copies of several locally produced shorts documenting Appalachian folklife. With this success the university secured another grant to inventory the films and mustered faculty support to restructure the collection into a teaching and research resource. The importance of access in fueling preservation support is discussed in chapter 9.

In film duplication the preservationist makes a master from which copies can be created. In restoration the preservationist goes further and creates a new version that corrects past damage to the film's sound and image. The first case study profiles a duplication project; the second discusses a sound track restoration effort.

Case Study: California Pacific Medical Center

***White Water and Black Magic* (1939, 1,600 ft., 16mm, color and black and white, silent), preserved by the California Pacific Medical Center.**

Richard Gill's Amazon expedition, documented in *White Water and Black Magic*.

One of the treasures of the California Pacific Medical Center Library is the Richard C. Gill Curare Collection. Stricken by multiple sclerosis, Gill traveled in 1938 to the jungles of Ecuador in search of a cure. He returned with specimens, field footage, notes, photographs, artifacts, and raw curare, the botanical extract used to poison arrows. Gill edited his Kodachrome and black-and-white expeditionary footage into *White Water and Black Magic*. The documentary includes some of the earliest color film of the Amazon Basin and shows the process of making curare. Although curare was not effective against multiple sclerosis, medical researchers found its active ingredient a useful surgical muscle relaxant.

For years the Gill Collection was consulted largely by anesthesiologists and historians, but with the posting of photographs on the medical center's Web site, interest grew. The library realized that it needed to provide access to *White Water and Black Magic* in a way that would protect the original. The film had less than 1% shrinkage but had perforation damage.

So began the library's first film preservation project. The library selected a nearby preservation laboratory, touring the facility to learn more about the operation. The lab proposed two options for handling the compilation film: Print it entirely on color stock or print the black-and-white and color sections separately and combine the two prints. Armed with costs estimates provided by the lab, the library applied for a grant and received funding for the first approach.

As work neared completion, the library turned its attention to storage. The medical center planned a new climate-controlled vault for the library, but completion was years away. As a short-term solution, the library acquired a frost-free refrigerator to house the original as well as the new preservation masters and answer print.

The last challenge was access. Looking to the time when the film could be posted on its Web site, the library chose to make an access copy on Digital Betacam tape. From the tape it then made an inexpensive DVD for researchers.

California Pacific Medical Center's decision to preserve *White Water and Black Magic* led to improvements in the institution's film care and made it possible for researchers to study this documentary without damaging the original.

Case Study: Visual Communications

***Cruisin' J-Town* (1976, 1,200 ft., 16mm, color, sound), preserved by Visual Communications.**

Jazz-fusion band Hiroshima, profiled in *Cruisin' J-Town*.

Since the early 1970s, Visual Communications, the nation's first Asian Pacific American media arts center, has produced film, audio, and video exploring the Asian Pacific American experience. *Cruisin' J-Town*, directed by Duane Kubo, was one of the first films it produced. Set in Los Angeles' Little Tokyo, the documentary profiles the jazz-fusion band Hiroshima and discusses the social consciousness that inspired the group.

Given the importance of the music in *Cruisin' J-Town*, Visual Communications budgeted to restore the sound track as well as preserve the image. The center retrieved the best surviving source materials—the original 16mm color negative and 16mm magnetic track—from its off-site climate-controlled storage facility and began the process of restoring the sound.

First, a specialist sound laboratory cleaned the original track and recorded it to digital audiotape. Next, a restorer digitally cleaned the sound to remove the hum, pops, and hiss and equalized it to provide balance across the audio frequencies. As an extra measure of quality control, Visual Communications invited Kubo and band member June Kuramoto to review the results. The center then worked with the restorer to re-sync the sound with the image. Finally, the restored track was returned to the first sound lab, which copied it to a new magnetic track and created a 16mm optical track negative.

A third lab was then enlisted to evaluate the original negative and produce a 16mm interpositive using the wet-gate process to minimize the carryover of scratches and abrasions. From the interpositive the lab will create an internegative and finally a 16mm composite print marrying the 16mm optical sound track with the image. At the end of the process, Visual Communications plans to make available 16mm prints of *Cruisin' J-Town* for screenings. It will also copy the film to digital tape and produce VHS viewing copies for researchers.

Going the extra steps to restore the sound, Visual Communications believes, will help audiences recapture the excitement of Hiroshima's music and the period documented in *Cruisin' J-Town*.