11. Print Mounting Adhesives and Techniques, Tapes, Rubber Stamps, Pencils, Inks, and Spotting Methods for Color and B&W Prints

Mounting, retouching, lacquering, and other postprocessing treatments can be just as important as fixing and washing in determining the eventual life of a photograph. For example, if properly cared for, a correctly processed fiber-base black-and-white print that has been treated with selenium or sulfur toners to protect the silver image should last many hundreds of years — and perhaps even longer than a thousand years. The same print, however, can be seriously damaged in just a few years if mounted with rubber cement. Prints mounted with contact cement of the kind used to fasten Formica plastic tabletops can suffer serious fading and discoloration of the image in less than a week. Similarly, a heavy rubber-stamp ink impression on the back of a print can transfer to the emulsion of another print, thereby ruining it. Also, the polyethylene layer beneath the emulsion of an RC print can soften and blister if heated too hot in a dry mounting press.

Although a photograph can be ruined because of a single mistake in handling, more often there are a great number of factors involved in the deterioration and eventual destruction of a photograph. With Ektacolor, Fujicolor, Konica Color, Agfacolor, and other chromogenic color prints, the inherent light fading and dark fading stability of the particular brand of print material is the most important consideration. But processing and washing are also important, as are the kind of retouching colors used on a print, whether and how a lacquer is applied, the display light level, and the storage temperature and relative humidity.

With black-and-white prints, the relationship between the many factors involved in sliver image oxidation or sulfiding (fading and discoloration) can be complex; one condition usually influences several others. For example, the rate of print fading caused by residual thiosulfate (fixer) due to inadequate washing as well as the effects of poor-quality mounting materials are both greatly influenced by ambient relative humidity. Also significant are storage relative humidity and temperature, environmental pollutants, contaminants from poor-quality storage materials, whether the print was treated with a selenium or sulfur toner, whether a print-flattening solution was used, and so forth. And there are important — but as yet poorly understood — stability differences between black-and-white fiber-base and RC prints, and even between the RC papers produced by different manufacturers.

There is usually no simple answer to such questions as: "If I choose a cheap mount board instead of a 100% cotton fiber museum board, how much will this shorten the life of a black-and-white print?" Still, if one is aware of the most important factors affecting print life, selects good-quality materials, and exercises reasonable care, making beautiful and long-lasting photographs is relatively simple.

See page 369 for Recommendations

Print Mounting

One of the current controversies in the conservation field is the practice of dry mounting or otherwise permanently attaching a print to a mount board. Before discussing the various issues involved, it will be helpful to consider four separate groups of photographs:

1. Prints that are inherently extremely stable both during prolonged exposure to light on display and during long-term dark storage under normal temperature and humidity conditions. This group includes correctly processed black-and-white fiber-base prints (both untoned prints and prints treated with selenium or sulfur toners) as well as those relatively few color pigment prints made with the UltraStable Permanent Color process or the Polaroid Permanent-Color process. (Although not as stable as UltraStable or Polaroid Permanent-Color prints, Fresson Quadrichromie prints could also be included in this group.)

2. Prints that are essentially permanent in long-term dark storage but that are subject to light fading or other deterioration during prolonged display. These include glossy, polyester-base Ilford Ilfochrome prints (called Cibachrome prints, 1963–1991), Kodak Dye Transfer prints, and Fuji Dyecolor prints. Although Ilfochrome RC prints are not physically as stable as glossy, polyester-base Ilfochrome prints, especially in long-term display, the RC prints can be included in this group. Depending on the particular type of black-and-white RC paper, RC prints treated with selenium or sulfur toners, along with some untoned RC prints, could be included in this group if storage conditions are good and relative humidity is low and without major fluctuations.

3. Chromogenic color prints that are subject to light fading on display but that have fairly good resistance to fading and staining when kept in the dark. Among this group are color prints on Fujicolor SFA3 papers, Fujichrome Type 34 and Type 35 papers for printing transparencies, and Konica Color QA Paper Type A5. Also included are Polaroid Polacolor ER peel-apart instant prints. Ektacolor Portra II, Supra, Ultra, and Edge papers, and Ektacolor Professional and Plus papers; Agfacolor Type 8 and Type 9 papers; and Konica Color QA Type A3, Type X2, and Konica Color Type SR papers also belong to this group, although these papers develop objectionable yellowish stain in dark storage much more rapidly than Fujicolor SFA3, Fujichrome Type 34 and Type 35, and Konica QA Type A5 papers. Either because of fading or staining (or both), this group is not nearly as stable in dark storage as groups 1 and 2 but is substantially better than group 4.

1978

A 1978 exhibition by documentary photographer Lewis Hine (1874–1940) at the Museum of Fine Arts in Boston, Massachusetts. Most photographs in museum collections have been processed, spotted, signed, stamped, and, frequently, mounted by the photographer — often years before the prints are acquired by an institution. Improperly done, any of these postprocessing steps can cause eventual deterioration of the image or the support; if damage does occur, it frequently is impossible to repair.

4. Prints that fade and/or stain fairly rapidly when kept under normal temperature and humidity conditions, whether or not they are exposed to light on display. In this group are virtually all pre-1984 chromogenic color prints, including prints made with Kodak Ektacolor 37, 78, and 74 RC papers. Also included are most types of pre-1991 Ektachrome reversal prints; Polaroid Spectra prints (called Image prints in Europe), Polaroid 600 Plus and SX-70 prints; and Fuji FI-10 and 800 instant color prints. Unless storage conditions and pollutant levels are carefully controlled, and depending on the brand and type of RC paper, untoned black-and-white RC prints could belong in this group.

Potential Drawbacks of Dry Mounting

The concern about dry mounting centers on the types of prints included in group 1 and, if they are kept in the dark except for short periods of display under low light levels, on the prints in group 2. Under proper conditions, the materials in groups 1 and 2 have a *very* long potential life — many hundreds and possibly even thousands of years. Dry mounting tissues, mount boards, and other materials for storing such prints must have an equally long life, and they must not cause or contribute to fading, staining, or physical deterioration of the prints during the years of display and storage. A mounting adhesive must also maintain the bond between the print and mount board during hundreds of years of fluctuating temperature and relative humidity. These requirements place very stringent demands on a mounting material; none of the products currently on the market were designed with such extremely long-term considerations in mind. Some may in fact be suitable, but at the moment we do not know which are.

Although not nearly as stable as UltraStable Permanent Color, Polaroid Permanent-Color, Ilford Ilfochrome (Cibachrome), and Kodak Dye Transfer prints in dark storage, the color print materials listed in group 3 will probably remain in reasonably good condition for 50 years or more when kept in the dark. Therefore, only high-quality materials should be chosen for mounting and storing such prints.

Following are some of the concerns and unresolved questions about mounting materials and practices:

1. At present there is little published information available on the effects of dry mounting products on the long-term stability of *any* of the various types of color and black-and-white photographs now being produced.

Recommendations

- **Borders:** Regardless of how a print will be displayed or stored, it should be made with wide borders (1 to 2 inches). If possible, print borders should be left untrimmed.

- **Dry mounting:** Prints in museum and archive collections should not be dry mounted. Likewise, valuable prints purchased by private collectors should not be dry mounted. Expendable Ektacolor portraits, wedding pictures, and other color prints intended for long-term display (where they are destined to slowly fade and stain because of exposure to light) may be dry mounted. **No** black-and-white or color print intended for reproduction should be dry mounted because this will make it impossible to wrap the print around a laser-scanner drum for making color separations, duotones, or halftones.

- **Corner mounting:** Mounting corners made with the appropriate materials are recommended for attaching prints to mounts (see discussion in Chapter 12).

- **Mounting adhesives:** If a print **must** be permanently attached to a mount, Seal Colormount dry mounting tissue is recommended for both fiber-base and RC prints. It is fervently hoped that Kodak will re-introduce the "original" Kodak Dry Mounting Tissue — discontinued in 1974 — which this author considers the finest dry mounting tissue ever made for fiber-base prints. For mounting fiber-base prints, the "original" pre-1974 type of Kodak Dry Mounting Tissue is much superior to the present Kodak Dry Mounting Tissue, Type 2.

  3M Scotch No. 568 Positionable Mounting Adhesive is recommended for polyester-base prints such as Ilford Ilfochrome prints (called Cibachrome prints, 1963–1991), Fujiflex SFA prints, Kodak Duraflex RA prints, and other polyester-base prints. No. 568 is also suitable for mounting RC prints (but not fiber-base prints).

- **Mounting adhesives to avoid:** Rubber cement, contact cement, glues, pastes, mucilage, Kodak Rapid Mounting Cement, self-stick "magnetic" album pages, and most double-sided tapes.

- **Tapes:** In general, no type of tape (or hinge) should be applied directly to a valuable photograph. Gummed fabric tape and 3M Scotch No. 810 Magic Transparent Tape are comparatively stable products that are believed to be satisfactory for use in proximity to photographs. If a pressure-sensitive tape **must** be applied directly to a photograph, Filmoplast P-90 tape, or the widely available 3M No. 810 Scotch Magic Tape (sold in the familiar green plaid dispensers), is suggested.

- **Rubber stamps:** Valuable prints should not be rubber stamped. If fiber-base prints must be stamped, a light impression with a conventional black felt-pad ink is suggested. Pre-inked porous-plastic stamp pads and "pre-inked" rubber stamps should be avoided. For RC and polyester-base prints, Photomark inks and pre-inked Mark II stamp pads supplied by Jackson Marking Products Co. are tentatively recommended.

- **Marking:** Ordinary lead pencils are recommended for writing on the backs (along the borders) of fiber-base prints. For negatives, the backsides of RC prints and polyester-base prints, and the emulsions of all types of prints, black India ink is recommended (Koh-I-Noor Black Rapidomat Ink No. 3074–F in a hollow-point technical pen is particularly satisfactory; applied to a variety of photographs, this ink has performed very well in accelerated light fading and dark storage tests). Felt-tip pens and porous-tip markers are not recommended. If one is determined to use a porous-tip pen, a black Pilot Photographic Marker is suggested.

- **Spotting and retouching colors:** For black-and-white prints, Spotone dye solutions are suggested (with the realization that they are subject to gradual light fading). For Ektacolor, Fujicolor, Konica Color, and Agfacolor prints, Kodak Liquid Retouching Colors are recommended (Kodak Dry Retouching Colors should be used **only** in the dry mode). Ilford Ilfochrome (Cibachrome) prints, should be spotted only with Ilfochrome Retouching Colors. Kodak Dye Transfer prints and Fuji Dyecolor prints should be spotted with the **same dyes** used to make the prints. UltraStable Permanent Color prints and Polaroid Permanent-Color prints should be spotted only with the **same pigments** used to make the prints.

- **Film cleaning solutions:** Pending further information, only Kodak Film Cleaner is recommended.

Meaningful information is also lacking concerning the stability of currently available mount boards during long-term contact with photographs. Dry mounting a photograph adds a significant unknown to the many factors affecting image stability.

2. No meaningful information is available on the long-term stability and adhesion characteristics of *any* currently available mounting adhesive. It is not known for how long and under what storage conditions an adhesive will maintain the bond between the photograph and the mount board or other mounting material. The adhesive bond is subject to stresses every time the relative humidity changes in a storage or display area. RC and polyester-base prints are dimensionally stable and change very little with fluctuations in relative humidity, whereas the mount board may expand or contract enough to produce significant force; this can place great stress on the adhesive bond. In addition, the polyethylene back of RC prints and the gelatin anti-curl back coating on Ilford Ilfochrome (Cibachrome) prints, UltraStable Permanent Color prints, and Polaroid Permanent-Color prints are more difficult to bond to mount board than is the porous paper base of a fiber-base print. If a print should become partially unstuck due to stresses over many years of storage, it likely will be very difficult to correct the condition.

1987

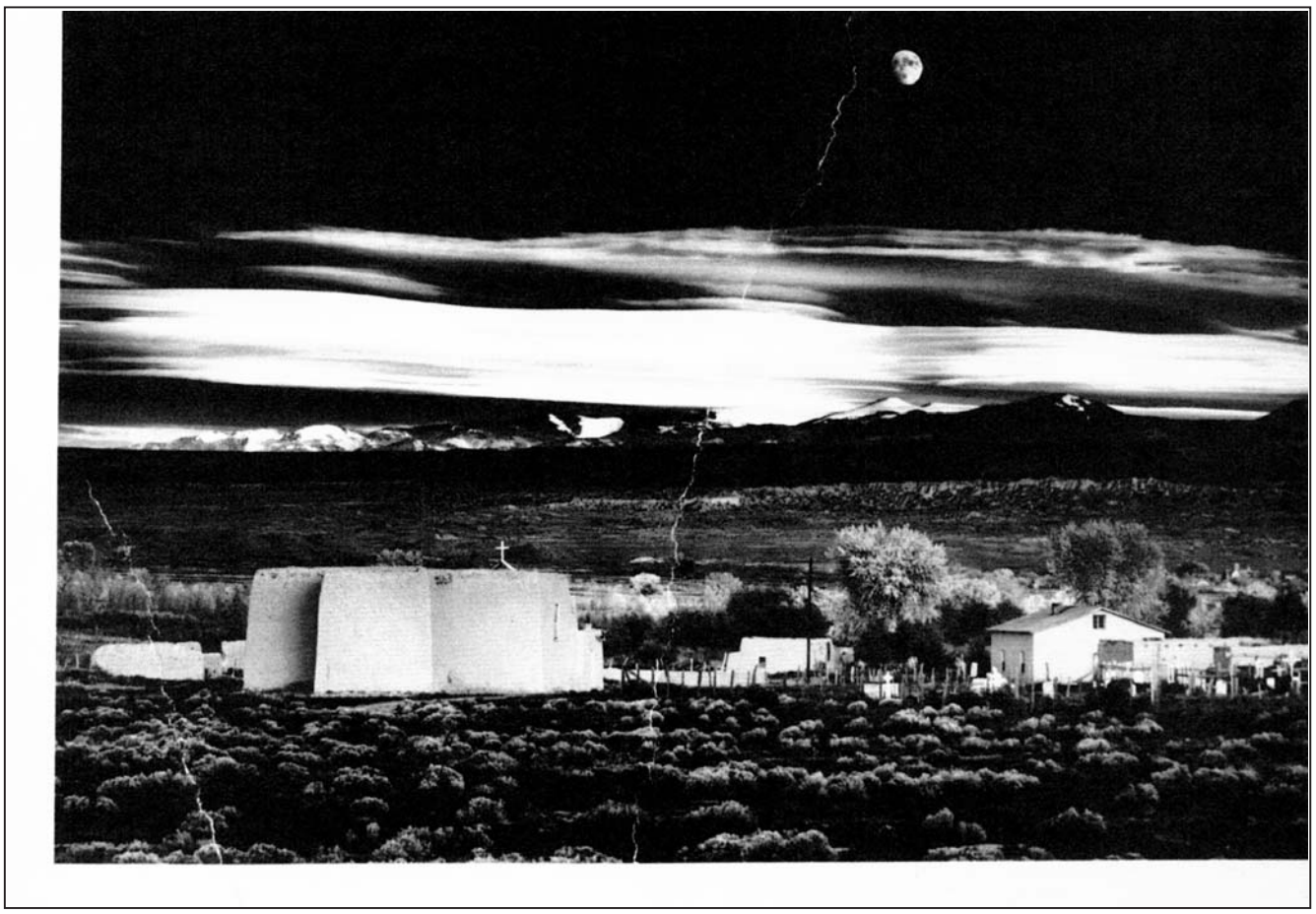
The advent of laser scanners presents a strong argument against dry mounting photographs. The scanners require that prints be wrapped around a rotating drum — a procedure that would crack and ruin a dry mounted print. Laser scanners such as this German-made Hell Chromagraph CP 341, shown above (and below) being set up by operator Ronald Anderson at Pepco Litho in Cedar Rapids, Iowa, are now almost universally used to make color separations and high-quality black-and-white duotones for book and magazine reproduction. (All of the photographs in this book were separated with laser scanners.)

3. With rotary-drum laser scanners, color separations cannot be made from dry mounted color prints — wrapping a dry mounted print around a scanner drum would crack the print and the mount. Likewise, laser-scanned duotones or halftones cannot be made from dry mounted black-and-white prints. As rotary-drum laser scanners have come into widespread use only during the last 15 years, this is a relatively recent objection to dry mounting. It should, however, be a very serious consideration for museums, archives, historical societies, and anyone else who may have occasion to publish photographs. Scanned high-resolution color separations are also required for making facsimile reproductions with the UltraStable Permanent Color process.

   Virtually all color separations are now produced with rotary-drum laser scanners. Many printers and separation firms no longer have the skills or equipment necessary to make color separations using a flat-bed process camera — furthermore, even at their best, camera separations do not equal the quality of good laser-scanned separations. Flat-bed electronic color scanners may in the future replace rotary-drum scanners in the graphic arts field, but for now, dry-mounting poses serious problems when top-quality color separations must be made.

   Most high-quality black-and-white duotones are produced with either flat-bed or rotary drum scanners (e.g.,

1987



Carol Brower 1982

For aesthetic reasons, Ansel Adams (1902–1984) preferred to dry mount his photographs; the prints were trimmed to the edge of the image before being mounted on oversize boards. This dry mounted 1978 print of **Moonrise**, photographed in Hernandez, New Mexico about 1941, suffered catastrophic cracking across the image area when the mounted print was flexed during shipping. **Moonrise** was one of Adams's best-known photographs, and more than 500 prints in various sizes were made during his lifetime; large prints have sold for more than $100,000.

Yosemite and the Range of Light and subsequent books by Ansel Adams), and it is probable that in the future most single-impression halftones will also be made with scanners.

4. A wide, untrimmed border on a print affords significant protection to the image from physical and chemical damage. If a print is trimmed to the image area before dry mounting, the edges of the image can easily be chipped or abraded during mounting and handling. Examination of both mounted and unmounted historical photographs clearly shows that chemical attack of the image by airborne pollutants tends to be concentrated near the absorbent edges of a print, and if no borders are present, the image itself will be attacked. Trimming the borders from prints is one of the most damaging practices of traditional dry mounting; the simple solution is to make prints with wide borders (1 to 2 inches) and to leave the protective borders intact when mounting (see Chapter 12).

5. Dry mounted prints cannot be removed from their mounts (and overmats) for compact storage in a frost-free refrigerator or humidity-controlled, low-temperature storage vault. Corner-mounted prints, on the other hand, can easily be removed for refrigerated storage. With prints removed, mounts and overmats can be stored safely at room temperature for future exhibition or other purposes. Mounts and overmats are bulky and should not occupy refrigerator space that otherwise could be used for storing photographs.

6. When storage humidity conditions fluctuate from very dry to humid, dry mounted prints are more likely than unmounted prints to suffer emulsion cracks.[1] These cracks are induced by expansion and contraction of the mount board as a result of changes in relative humidity. In this author's experience, stress-induced cracks of this type are more likely to occur with RC prints than with fiber-base prints; *displayed* RC prints are especially prone to stress-cracking because fluctuations in relative humidity produce less dimensional change in the print than in the mount board (these dissimilar expansion characteristics can cause severe stress on a mounted RC print) and because of embrittlement of the emulsion-side polyethylene layer resulting from expo-

A close-up of a deep crack passing near the moon in the Ansel Adams picture. Had the print not been dry mounted, it might have escaped without damage.

A corner of the mount board was also damaged. Had the print been corner-mounted, it would have been a simple process to remove it and install it in a new mount.

Carol Brower (2) 1982

sure to light on display. Fiber-base prints, on the other hand, are not nearly so affected by light on display and have a coefficient of humidity-related expansion similar to that of mount board, which tends to minimize stress.

7. A dry mounted print is likely to crack if its mount board is seriously bent or twisted during shipping or handling. However, in historical collections examined by this author, dry mounted prints were usually in better physical condition than unmounted prints; as a group, mounted prints had a much lower incidence of cracked emulsions and damaged corners than did unmounted prints. There is also evidence that dry mounting can help protect the silver image of a fiber-base print from the effects of air pollutants by keeping contaminated air away from the back of the print.

8. The back of a dry mounted print cannot be examined for the photographer's signature — if, in fact, it was signed on the back of the print — or to see possible markings, edition numbers, rubber-stamp impressions, caption information, etc. When contemporary prints are dry mounted, however, the photographer can sign the mount and put other information either on the front or back of the mount board.

9. Prints are frequently dry mounted to boards of irregular and non-standard sizes. Many museums and collectors find it difficult to mat such prints using materials, mat sizes, and board tones standardized for their collections (which enables a uniform presentation of exhibitions — see Chapter 12).

10. At some future time, it might be determined that a dry mounted black-and-white print was fixed or washed incorrectly, or it may be necessary to treat the print with a selenium or sulfiding toner, or some other as-yet-undiscovered image-protective treatment. Better types of photographic mount boards are certain to become available, and a caretaker may wish to remount prints with the improved board. In addition, as commonly happens, the corners of a mount may become bent or cracked, although the dry mounted print itself may remain in good condition. All these situations would be simple to deal with were it possible to easily replace the mount.

It is one of the tenets of good conservation that a mounting adhesive be removable, or "reversible." Once a print is dry mounted, however, it is difficult to remove it from the mount — and to remove all traces of mounting adhesive from the print — without harming the photograph. This objection to dry mounting can be partially countered with the observation that of the countless photographs produced, only a tiny fraction will ever attain sufficient importance for unmounting to be seriously contemplated; if necessary, a mount can be removed with solvents or by carefully cutting it away from the back of the print (unmounting a valuable print should be done only by an experienced conservator). An alternative to dry mounting is to attach a print to the mount with paper corners (see Chapter 12); it is then a simple matter to remove the print and place it on a new mount.

How Some Curators and Photographers Regard Dry Mounting

When Minor White established an "Archival Photographic Collection" at the Massachusetts Institute of Technology in 1968, he required that prints purchased for the collection be unmounted. This was probably the first instance of an institution asking that photographers not dry mount their prints. A statement issued at the time read: "For its permanent collection, M.I.T. will buy only unmounted, untrimmed, unbacked prints which have been given archival processing."[2] The first prints acquired for the collection were selected from the 100 prints in the *Light 7* exhibi-

tion, for which photographers had submitted about 3,000 prints.

Many photographers dry mount their prints for aesthetic reasons. They like the perfectly smooth print surface which can be achieved in no other way with fiber-base papers. The late photographer Ansel Adams preferred dry mounting — with the print trimmed to the edge of the image — for a number of reasons, both practical and aesthetic. Noting that some museums and archives favor corner-mounting because it allows the print to be readily removed from the mount, Adams said:

> . . . I find this method gives me a sense of uncertainty, as the edges of the image are not precisely defined, but are imposed by the enlarger easel or by the window of the overmat. In addition, the print is loose, with both surfaces exposed to the atmosphere, and a signature on the overmat is not permanently affixed to the image or its immediate support.[3]

Of the available means of mounting, Adams stated, "I consider dry mounting by all odds the best method. It is clean, dependable, and most unlikely to cause damage to the print."[4]

In Carol Brower's 1982 survey on the care and presentation of photographic prints (see Chapter 12), photographers and curators expressed a number of different views on dry mounting. Many of those who responded to the survey indicated that at one time they had dry mounted their work, but for various reasons abandoned the practice. Photographer Ralph Gibson said, "Years ago, in the 60's it was thought to be good — now I prefer a window mat." Miles Barth, curator of photography at the International Center for Photography in New York City, replied, "Yes, in the past but no longer." Speaking for the Museum of Modern Art in New York City, Susan Kismaric remarked, "From what we understand the controversy surrounding dry mounting has not been resolved. At this moment in time we prefer to overmat work." Grant Romer, conservator at the International Museum of Photography at George Eastman House in Rochester, New York, said that he does not dry mount photographs because he does not want to "tie the life of the print to other materials."

Arnold Newman, the well-known portrait photographer who has for many years dry mounted his photographs, had this to say: "I have prints I mounted back as far as 1938–39 and on — there has been *no* damage. When dry mounted and trimmed to the edge of the image, the print is subject to edge damage unless matted. It is better to print with a wide enough white border to sign on, and then overmat."

Requirements for Mounting Adhesives Intended for Long-Term Applications

In this author's view, the most serious concern with dry mounting is that we currently have no assurance that *any* dry mounting adhesives or mount boards are suitable for long-term use with photographs. *ANSI PH4.21–1989, American National Standard for Photography (Film) — Thermally Activated Dry-Mounting Adhesive Systems for Mounting Photographs — Specifications* offers no guidance in terms of the stability requirements of a dry mounting product, saying only that the Standard "does not address the archival nature of these mountings, since pertinent data are not available at this time."[5]

None of the manufacturers contacted by this author could supply data from meaningful accelerated aging tests (such as an extended version of the Photographic Activity Test described in *ANSI IT9.2-1991*)[6] done with their products in contact with the various types of common black-and-white and color photographic materials. The long-term effects of light on the adhesives also must be evaluated because a significant amount of light passes through the base of most papers during display. Furthermore, none of the manufacturers indicated that they had performed Arrhenius-type tests to evaluate the long-term stability, bond-retention, and stain characteristics of their products (this is a separate question from how a mounting adhesive or mount board might affect a photograph).

The 3M Company, in a statement that must be commended for its candor, said this about its mounting products:

> 3M's tapes and adhesives form a physical bond to surfaces to which they are applied and are not soluble in water. The bonds that they form can be loosened with solvents or can be reversed with heat but these methods are not without the risk of damage to the art work or surface involved. These methods also leave adhesive residue which must be removed with a solvent.
>
> It is an accepted fact that the application of any adhesive to valuable material will reduce the value of that material. This is true of any valuable, collectible item. It should retain as much of its original form or condition as possible.
>
> . . . We know that most of our adhesive products have an indefinite age life by virtue of our accelerated aging tests and natural aging experience. However, we *do not* have a test that can accurately predict how a product will hold up after 50 to 100 years, for instance. In other words, we cannot *recommend* our products for archival applications.
>
> These products are designed for general purpose use in bonding applications on items of limited value where the bonds should be long aging and permanent. They *are not recommended* for use on art of significant value and considered an investment because **(1)** the use of full mounting techniques will reduce the value, and **(2)** the resulting bond may not reverse [be removable] without causing physical damage to the item.[7]

Accelerated Testing of Dry Mounting Tissues

In 1989, Kimberly Scheneck and Constance McCabe published a preliminary study of a variety of adhesives used in photograph conservation. A number of different test meth-

ods, including the Photographic Activity Test outlined in *ANSI IT9.2-1988,* were employed to evaluate the adhesives. Seal MT5 was the only dry mounting tissue included in the study, and the authors concluded that this product might be damaging to photographs.[8]

In 1991 Nancy Reinhold published an article entitled "An Investigation of Commercially Available Dry Mount Tissues"[9] in which Seal ColorMount, MT5, ArchivalMount Plus, and Fusion 4000 Plus dry mounting tissues were evaluated using: **(1)** the fade and stain detectors specified in the *ANSI IT9.2-1988* Photographic Activity Test, **(2)** a peel strength test using a modified version of the test described in ASTM D-903-49, and **(3)** an accelerated dark aging test to assess the discoloration and yellowing characteristics of the dry mounting tissues.

After analyzing the test data, Reinhold concluded that "Although the dry mount tissues failed the strict criteria for passing outlined by *ANSI IT9.2-1988,* the results of this investigation indicate that there is little evidence to suggest that contact between dry mount tissue and black and white gelatin photographs would be harmful." (See Chapter 13 for discussion of the ANSI Photographic Activity Test and its limitations.) Reinhold also found that there were significant differences in the dark-aging yellowing behavior of the four Seal products, with Seal ArchivalMount Plus tissue yellowing much more than ColorMount, MT5 Plus, or Fusion 4000 Plus (all four of these Seal products will be discussed later in this chapter).

More Testing Is Needed

As discussed in Chapter 13, it appears that among currently available museum-quality mount boards, quite a few are probably both sufficiently stable and nonreactive with photographic images to be suitable for long-term use. But even among the best and most expensive 100% cotton fiber "museum" boards, there are some that may be unacceptable. James Reilly, who has done considerable research on factors affecting the stability of black-and-white prints, has indicated that some high-quality mount boards are reactive when tested with the *ANSI IT9.2-1991* Photographic Activity Test, causing fading and/or staining of black-and-white prints.

Although Reilly has declined to reveal the identity of the mount boards that proved unacceptable, his findings are cause for serious concern and underscore the need for more comprehensive tests of available products. The extremely long potential life of toned black-and-white fiber-base prints, UltraStable Permanent Color and Polaroid Permanent-Color prints, and dark-stable color materials such as Ilford Ilfochrome (Cibachrome) prints and Kodak Dye Transfer prints places very stringent demands on mounting materials.

The situation can be stated simply: Of currently available mount boards and dry mounting adhesives, there are probably at least a few products that satisfy all known requirements for long-term use with photographs. At the time this book went to press in 1992, however, the suitable products had not been identified, so we have no choice but to rely on mounting materials that have been used for a number of years without any observed problems as well as on practical experience with products for mounting various types of prints. This is an unfortunate state of affairs.

Because the necessary tests are not difficult to perform — meaningful tests with mount boards and mounting adhesives could probably be completed in 2 or 3 years — it is anticipated that the current impasse eventually will be resolved. Both Arrhenius-type dark aging tests and extended versions of the *ANSI IT9.2-1991* Photography Activity Test used with representative color and black-and-white print materials should be employed.

Dry Mounting Should Be Avoided in Museum and Archive Collections

When dry mounting products and mount boards of proven stability become available, many of the objections to dry mounting will no longer apply. If prints are mounted with borders intact, this author believes that dry mounting with approved materials would be acceptable, and in many instances probably even desirable. Museums and archives, however, should continue to refrain from dry mounting photographs either already in their collections or acquired unmounted in the future.

If a valuable photograph is mounted with dry mounting tissue or other adhesive, it would be worthwhile to mark the back of the mount with the date and name of the product; this information will be invaluable to anyone needing to unmount the print at some future time. This is especially important now because of the great variety of mounting tissues and pressure-sensitive adhesives on the market, with new products being introduced frequently.

Improved dry mounting tissues could probably be made with polyamide or polyvinyl acetate (PVA) thermoplastic adhesives coated on a stable, high-alpha-cellulose tissue-paper core. Both of these adhesives can satisfactorily be removed with solvents. A paper core is necessary because coreless dry mounting "tissues" are difficult to handle and to trim precisely.

Separate types of mounting tissue will probably be needed for fiber-base prints, conventional RC prints, and gelatin back-coated RC and polyester-base prints. Tissues for fiber-base papers should have sufficient "hot-tack" (that is, maintain high bond strength and not become "mushy" while hot) to prevent edge-lift of the mounted print when it is removed from the press. RC papers, on the other hand, ***must*** be mounted with a low-temperature adhesive to avoid melting the polyethylene coatings on both sides of the paper support. RC prints generally do not have edge-lift problems, and the bond strength of the adhesive when heated in the mounting press can be much less than that required for fiber-base papers.

Eastman Kodak Dry Mounting Tissue

The first Kodak Dry Mounting Tissue was marketed from 1906 to 1934. In August 1934 Kodak introduced an improved product with better adhesion and requiring less heat; this version of Kodak Dry Mounting Tissue continued in more or less the same form until 1974, when it was abruptly taken off the market and replaced with Kodak Dry Mounting Tissue, Type 2, which was intended only for RC papers. For nearly a year, until the introduction of Kodak Dry Mounting Tissue, Type 2 [Improved] in late 1975, Ko-

dak did not even sell a dry mounting material for fiber-base prints. Type 2 [Improved] remains the current Kodak dry mounting tissue, and, according to Kodak, is intended for both fiber-base and RC prints; the "Improved" designation on product packages and instruction sheets has now been dropped.

When used with fiber-base papers, Kodak's current mounting tissue is, in this author's opinion, distinctly inferior to the Kodak Dry Mounting Tissue marketed until 1974. If the mounting temperature is high enough to obtain a good, overall bond with Type 2, fiber-base prints have a tendency to pull away at the edges immediately after the print is removed from a hot mounting press. This so-called "edge-lift" affects only the outer 1/16 inch or less and results in slightly elevated edges on the print; this not only is aesthetically objectionable but also makes the edge of the print more vulnerable to emulsion chipping and other damage.

In this author's experience, edge-lift is more likely to occur in papers with a strong tendency to curl, such as Agfa Brovira, than it is with Kodak papers such as Polyfiber Paper or Elite Fine-Art Paper, although it is still a problem with these products. The earlier Kodak dry mounting tissue had a sufficiently tacky bond while hot to prevent edge-lift in fiber-base prints. Because of the edge-lift problem, this author believes that Kodak Dry Mounting Tissue, Type 2 fails to meet the adhesion requirements for fiber-base paper as specified in *ANSI PH4.21–1989,* Sec. 3.1.2.

Kodak Dry Mounting Tissue, Type 2 is made of a glassine paper sheet coated on both sides with what appears to be a wax-based adhesive. Glassine paper is not considered a high-stability material and its contact with photographs is specifically advised against in *ANSI IT9.2–1991*. The presence of glassine paper may or may not be important in the context of a dry mounting tissue. Only accelerated aging tests can properly evaluate the overall stability of this product; meaningful test data for Type 2 tissue are not presently available. Kodak has declined to reveal the composition of either the adhesive or core material of its current or previous dry mounting tissues. The adhesive of Type 2 tissue is soluble in toluene; the adhesive of the pre-1974 type of Kodak Dry Mounting Tissue is readily soluble in methylene chloride.

For mounting fiber-base papers, Kodak's pre-1974 Dry Mounting Tissue had, in this author's opinion, the best adhesion characteristics of any dry mounting tissue ever marketed — and this is a view shared by many knowledgeable photographers. The tissue had wide temperature and mounting-time tolerances; consistent mounting results with fiber-base prints were much easier to obtain than is now the case with Type 2 tissue. Kodak recommended a mounting temperature from 200° to 275°F (93° to 135°C); many photographers found that about 240°F (115°C), with a 1-minute press time, worked best. The adhesive nature of the tissue was such that sheets in a package even had a tendency to stick together ("block") during storage at normal room temperature; to prevent this, Kodak interleaved the sheets with thin, pink tissue paper.

Current Ademco dry mounting tissues, discussed later, are interleaved for the same reason. Like a number of other photographers, this author still has a small supply of the pre-1974 Kodak Dry Mounting Tissue reserved for mounting special prints.

To obtain an adequate bond with RC papers, the pre-1974 Kodak Dry Mounting Tissue had to be applied in a narrow temperature range between 210° and 230°F (99° to 110°C); this is dangerously close to the melting temperature of the polyethylene coatings on RC papers. Because mounting presses available in the early 1970's had poor temperature regulation, and were not equipped with dial thermometers to check the setting of the thermostat, photographers often had difficulty using the tissue with RC papers. Damaged prints — or prints that eventually peeled off their mounts because of poor bonds — were common. With current Kodak Dry Mounting Tissue, Type 2, Kodak recommends a press temperature between 180° and 210°F (82° and 98°C); mounting RC prints in this lower temperature range greatly reduces the likelihood of softening or melting the polyethylene layers.

Kodak did not want to market separate mounting products for RC and fiber-base papers and, apparently believing that fiber-base papers would in due time be withdrawn from the marketplace, simply discontinued Kodak Dry Mounting Tissue in 1974. Sources at Kodak have indicated that its pre-1974 dry mounting tissue had been extensively tested for possible deleterious effects on silver-gelatin prints and was considered safe for long-term use even under adverse storage conditions. Kodak has declined to comment on why the product was withdrawn; a spokesman for the company would say only, "There were internal considerations which I'm not at liberty to discuss."[10]

It is believed that Kodak has performed photographic activity tests with its dry mounting tissues in contact with common types of color and black-and-white prints. In addition, it is believed that Kodak has conducted other types of accelerated aging tests to assess the adhesion characteristics of the tissues. On inquiry to the company, Kodak declined to discuss the subject, saying only that a publication on the subject would be issued in the future.[11]

In a 1984 publication, however, Kodak stated:

> For conservation applications, we have evaluated the Kodak Dry Mounting Tissue, Type 2, using the recommended mounting procedure. This material and procedure produces no adverse dye-stability effects with prints made on Kodak Ektacolor Paper. The temperature of the press platen is important in the correct use of dry mounting tissue; too high a temperature can cause serious image degradation. The platen should be kept between 82 and 98°C (180 and 210°F) with regular checks for temperature consistency over time and from point-to-point on the heated surface. A convenient method for doing this is with temperature-sensitive strips that are commercially available.[12]

The performance of Kodak Dry Mounting Tissue, Type 2 in the "conservation mounting" of Ektacolor prints is not particularly meaningful because the Ektacolor RC papers available at the time Kodak made this statement had inherently poor image stability, both on display and when stored in the dark. Adhesives for mounting Ektacolor prints do not have to meet stringent stability requirements because the useful life of these prints is limited.

Seal Products Incorporated — ColorMount Dry Mounting Tissue is Recommended

Seal Products Incorporated was founded in 1936, and the Connecticut-based company is now the world's largest manufacturer of dry mounting presses and dry mounting materials.[13] Seal acquired Ademco Drimount Ltd. in England in 1987 and, in 1990, the combined firms were purchased by Hunt Manufacturing Company, headquartered in Philadelphia, Pennsylvania. Despite now being owned by the same parent company, Ademco — now called Ademco-Seal Ltd.[14] — and Seal continue to market separate product lines. With the exception of Ademco-Seal's heavy, hardbed dry mounting presses, Ademco-Seal products generally are not available in the United States.

Seal currently has a number of dry mounting products available, including Seal ColorMount, MT5 Plus, Fusion 4000 Plus, Fusion Ultra, MultiMount, and ArchivalMount Plus. Seal also markets a low-temperature, wax-base dry mounting tissue called Fotoflat that is easily removable when heated; it is not recommended for long-term applications with photographs.

Seal MT5 Dry Mounting Tissue — on the market since 1955 and, with a minor formulation change, now called MT5 Plus — is probably the most popular tissue in the United States for mounting fiber-base prints. The MT5 name was derived from the "5-second mounting" advertising slogan when the product was first marketed. MT5 has been recommended for fiber-base papers by *Popular Photography* magazine writer David Vestal and many others.

Asked about tests the company had done to determine possible long-term effects of its products on photographs, Maurice Wilkinson, technical development manager for Seal, replied, "We have not done any serious tests on them. All we would do normally is test the adhesive and the paper for pH." Wilkinson added, "We have had a lot of difficulty about how to test this and generally, when we talk to people about this, we get back about 27,000 different ways to test these things. We have not set up any testing program ourselves." Wilkinson said MT5 Plus is currently made by coating a "wax modified rubber-base adhesive" with a pH of 7.0 on both sides of a thin, white glassine core sheet.[15]

Seal ColorMount tissue has the same adhesive as MT5 Plus coated on a conventional porous paper core (said by Seal to have a pH of 6.9). Seal says the low air-permeability of the glassine core of MT5 Plus tissue prevents it from properly dissipating air bubbles when mounting nonporous polyethylene-coated RC prints, so ColorMount was developed to correct this problem. When ColorMount was originally introduced in 1973, it was made with a different type of wax-based adhesive and was recommended for RC prints only. After ColorMount was modified in 1975, Seal began to recommend it for both RC and fiber-base prints.

Many photographers continue to believe that ColorMount is intended only for RC color prints because it was initially advertised as being exclusively for RC papers and because it has "color" in the name (most color papers are made on an RC base). Since both ColorMount and MT5 Plus are made with the same adhesive, and ColorMount is at least as good and probably better than MT5 Plus for mounting fiber-base prints, it is unclear why Seal continues to produce MT5 Plus.

Ansel Adams began using ColorMount mounting tissue after he could no longer obtain the pre-1974 type of Kodak Dry Mounting Tissue and found the Kodak Type 2 tissue to be unacceptable. Adams continued to mount his prints with ColorMount until his death in 1984.

In 1977 Seal introduced Fusion 4000 mounting adhesive, a thin sheet of EVA-modified polyethylene made without a paper or glassine core. Seal has advertised Fusion 4000 as an "archival" dry mounting product, basing this claim on the fact that the material does not have a paper core, has a pH of 7.0, and therefore is "acid-free" (all the Seal products discussed here have an adhesive pH of 7.0, according to the company). This author does not recommend the product and agrees with David Vestal, who said, "I find paperless dry mounting tissue hard to use cleanly."[16] In 1986 Fusion 4000 was modified and renamed Fusion 4000 Plus dry mounting adhesive.

In 1984 Seal ArchivalMount Archival-Quality Dry Mount Tissue was introduced; prior to its being marketed, Seal spokesman Wilkinson said, "It will incorporate whatever qualities the company can identify as contributing to long-term stability." ArchivalMount Plus is made by coating both sides of an alkaline-buffered tissue paper core with the same EVA-modified polyethylene adhesive used in present Fusion 4000 Plus.

The "Archival-Quality" designation appears to be based on two things: **(a)** the product is made with a neutral-pH adhesive coated on a "acid-free" paper core that is buffered with calcium carbonate, and: **(b)** a print mounted with ArchivalMount can be detached by reheating and pulling the print off the mount while hot; most of the adhesive remaining on the back of the print can, according to Seal, be removed by repeatedly re-mounting the print on sheets of expendable paper and immediately pulling it off while still hot. This author advises against such "hot" methods of unmounting important photographs.

In 1984 Seal ran an advertisement that showed an Edward Weston print "ready for preservation-mounting with ArchivalMount between photo and substrate." The ad said:

> An Edward Weston photograph is too valuable to trust to an ordinary dry mount tissue, it requires extra protection against acid contamination. Now there's ArchivalMount, specially formulated for the preservation-mounting of photographs (including RC's), lithographs, documents, drawings, fabrics and more. . . . It's *absolutely* acid-free. In fact, because it's buffered, it actually *counteracts* the time-damaging acids in paper, substrates and the atmosphere. ArchivalMount is the *only* archival-quality dry mounting tissue. . . .[17]

Despite what seems to have been a sincere attempt on the part of Seal to create an improved product with ArchivalMount Plus, the product appears to have no worthwhile advantages over Colormount. In fact, in the previously discussed accelerated aging tests conducted by Nancy Reinhold, ArchivalMount Plus suffered significantly greater yellowing than did either ColorMount or MT5 Plus.

This author presently believes that, overall, Seal ColorMount is the most satisfactory of the current Seal products

for mounting either fiber-base or RC prints. Because the use of glassine paper in contact with photographs is advised against in *ANSI IT9.2–1991,* this author believes that ColorMount is preferable to MT5 Plus. Furthermore, during mounting, ColorMount is less likely to entrap air bubbles under RC prints than is MT5 Plus. In Europe, Seal ColorMount is marketed as Ademco-Seal ColourMount.

"Cold Mount" Pressure-Sensitive Print Mounting Products

Another basic type of dry mounting tissue is the pressure-sensitive adhesive sheet applied without heat. Adhesion occurs on contact at room temperature in a manner similar to that of common pressure-sensitive materials such as Scotch tape. These products are often referred to as "cold mounting adhesives," a term made popular by Coda Inc., of Midland Park, New Jersey, which was one of the first manufacturers to enter this field with its "Cold-Mount" products in the early 1970's.[18] There are now many suppliers of pressure-sensitive mounting materials in the U.S. and other countries.

3M Company, maker of Scotch Brand No. 568 Positionable Mounting Adhesive (PMA) as well as a number of spray adhesives and a heat-activated product for use with dry mounting presses, reported that it has conducted some stability tests with No. 568 and that no harmful effects to either color or black-and-white photographs were observed.[19] Few details concerning the tests have been released. In ongoing tests, according to Roger Jentink of the 3M Company, samples of the adhesive were aged for over 5 years in ovens set at a temperature of 120°F without any evidence of bond failure. At worst, a slight yellowing of the adhesive occurred.[20] This author considers the tests to be encouraging but inconclusive.

3M stated that the adhesive in No. 568 "in no way is similar to the rubber-resin types of adhesives that have earned a bad reputation in the past. They include rubber cement, masking tape and cellophane tape." The No. 568 adhesive, a blend of synthetic polymers, has a pH of 5.4, as determined by a boiling water distillation method. What significance this low pH has for photographs under normal conditions has not been determined. 3M's other products for mounting photographs have adhesive pH values between 6.7 and 7.1; No. 810 Magic Transparent Tape has a stated pH of 6.8.[21]

One theoretical advantage of No. 568 is that after the carrier sheet is stripped off, only a very thin layer of adhesive remains on the print. This eliminates concern about possible adverse affects on photographs of a carrier paper or tissue core. No. 568 PMA, sold in rolls and intended to be applied with the 3M C–35 Applicator (a hand-operated, two-roller cold press), is the same material as the now-discontinued No. 567 Positionable Mounting Adhesive, which was supplied in pre-cut sheets.

Despite the limited accelerated aging tests performed by 3M and the absence of independent test results, this author tentatively recommends No. 568 Positionable Mounting Adhesive for mounting black-and-white and color RC prints and polyester-base prints, but only when a pressure-sensitive adhesive is required. It is also recommended for mounting photographs that have gelatin back-coatings, such as Ilford Ilfochrome (Cibachrome), UltraStable Permanent Color, and Polaroid Permanent-Color prints. No. 568 adhesive can be removed with solvents. This author does not recommend No. 568 for mounting fiber-base prints.

No. 568 Positionable Mounting Adhesive is the only product this author currently recommends for mounting potentially heat-sensitive instant black-and-white prints such as Polaroid Type 107, 107C, 667, Type 52, etc., and instant color materials including Polaroid Spectra prints (Image prints in Europe), Polaroid 600 Plus, and SX–70 prints, Polaroid Polacolor 2 and Polacolor ER "peel-apart" prints, and Fuji Instant Color prints. It is also convenient in home applications, such as for mounting snapshots in albums.

3M Scotch brand No. 6094 Photomount Spray Adhesive and other aerosol-spray mounting adhesives are not recommended for general applications. The fumes are toxic and the sprays are often messy. Unless one is very careful, spray particles can accidentally fall on the emulsion side of prints, contaminate mount boards, soil hands, etc.

None of the other manufacturers of pressure-sensitive mounting materials could provide this author with meaningful information on accelerated tests with their products; the companies contacted included Morgan Adhesives Company (maker of MACtac Permacolor products, including Permaprint pressure-sensitive mounting adhesive), Seal Products Incorporated (supplier of Sealeze Print Mount products), Coda, Inc., and others.

Dry Mounting Equipment and Techniques

Dry mounting employs a heat-set tissue instead of the water-based pastes or shellac common in the early days of photography. A more descriptive name for dry mounting that is sometimes used is "hot mounting," a term which also serves to differentiate it from "cold mounting" with the increasingly popular pressure-sensitive adhesives that are applied at room temperature.

To hot-mount a print, a piece of tissue the exact size of a print is placed between the print and the mount board and heated for about a minute in a dry mounting press. The heat softens the wax or thermoplastic adhesive, causing it to bond the print to the mount board. Dry mounting is justifiably popular because **(1)** it is a relatively simple and quick process, **(2)** solvents are not released into the air, **(3)** there is no waiting for adhesives to dry, **(4)** the print is uniformly bonded over its entire surface, and **(5)** there is no warping or wrinkling such as can occur with water-based adhesives.

Fiber-base prints are usually somewhat curled or wavy after drying, particularly along the print edges. The pressure and heat of dry mounting will usually flatten the print perfectly, producing an aesthetically pleasing result; this is one of the principal advantages of dry mounting. Also, dry mounting tissue can slow, but not prevent, migration of harmful substances from low-quality mount board to a print. Other than the initial cost of a dry mounting press, it is the least expensive of all mounting methods; dry mounting tissue is much less costly than pressure-sensitive print-mounting adhesives.

Dry mounting presses are available from a number of manufacturers, including Seal Products Incorporated, Bogen Photo Corporation, and Ademco-Seal Ltd. (Ademco equip-

ment is not widely available in the U.S.).[22] The Technal presses sold by Bogen are comparatively inexpensive. For serious work, a press should be equipped with an accurate built-in dial thermometer and a thermostat capable of closely controlling the press temperature.

It is possible to dry mount photographs with an ordinary household iron adjusted to the "synthetic fabric" setting. This author does not recommend this method for any but quick jobs on snapshot-size fiber-base black-and-white prints. It is almost impossible for an iron to produce uniform adhesion for larger prints; the print may appear to be properly mounted, but in time sections of the print may bubble or pull away from the mount. There is also a danger of scorching the print if the iron becomes too hot.

Make Prints with Wide Borders

Traditional dry mounting practice involves attaching the mounting tissue to the back of the print with a tacking iron and then trimming the entire border off the print, leaving only the image area. The print is then attached to the mount board with a dry mounting press. The edge of a print mounted in this fashion is vulnerable to chipping as well as to discoloration and fading caused by atmospheric pollutants (the effects of which are often most pronounced near the edges of a print). It is much better to make prints with a protective border — at least ¾ inch wide, with 1 to 2 inches recommended — and to leave the border intact when dry mounting. Special four-bladed enlarging easels available from Saunders, Omega/Arkay (Kostiner easels), and other manufacturers allow easy and precise centering of the image when making wide-bordered prints.[23] To avoid later difficulty when overmatting a mounted print, it is vitally important that the image be "square," that is, have parallel sides and perpendicular corners. A high-quality easel with precisely parallel blades is necessary to obtain accurate image positioning and cropping.

After mounting, the print should be overmatted as instructed in Chapter 12. The overmat window can be cut so that it slightly overlaps the edges of the image, thereby completely covering the print border, or the overmat window can be cut somewhat larger so the image "floats," with a portion of the paper border surrounding the image area of the print.

Use a Cover Sheet When Mounting Prints

A cover sheet should always be placed between the print and the hot press platen to absorb moisture from the print, to prevent the emulsion from sticking, and to keep specks of mounting tissue adhesive off the platen. Cover sheets should have a smooth, absorbent, uncoated surface. Two–ply or 4–ply 100% cotton fiber mount board is excellent for the purpose; a high-quality, heavy artists' paper can also be used. (This author finds mount board or heavy paper cover sheets to be more satisfactory than the silicone-impregnated "release paper" supplied by Seal and other companies. While release papers have a nonstick surface so that adhesive from improperly trimmed prints will not adhere to them, they have no moisture-absorption capacity, and if the humidity is high this can result in an alteration of surface gloss of the print emulsion during mounting.) At the beginning of each mounting session, before any prints are placed in the press, it is good practice to pre-dry the paper or mount board cover sheets by heating them in the press for two or three 30-second periods with the press alternately opened and closed.

Cover sheets should be replaced when even slightly soiled, or if they become contaminated with adhesive from improperly trimmed prints. Particles of adhesive or other dirt on the platen (or the cover sheet) will make tiny indentations in the surface of the print emulsion which are impossible to repair.

Keep Press, Prints, Boards, and Mounting Area Clean

If a cover sheet is *always* used, the press platen will remain free of bits of adhesive from incorrectly trimmed prints. If tissue adhesive gets on the platen, it can be removed by wiping the platen with a paper towel moistened with an organic solvent such as acetone. This should be done on a *cool* press with adequate ventilation — solvent fumes are toxic. Teflon-coated platens are much easier to clean than uncoated platens. Never try to scrape particles off a platen as this will almost certainly scratch the soft aluminum surface.

The mounting area should be as clean as possible to avoid sandwiching bits of mount board, mounting tissue, or other grit between the print and mount. These particles will cause small but extremely disconcerting surface bumps on the mounted print. The emulsion over these high points is easily abraded during handling, which can result in white spots on the print. Boards should always be dusted off after cutting and again before mounting the print. The need for cleanliness and care when dry mounting prints cannot be overemphasized. The paper cutter and mounting table should be cleaned with a moistened sponge before each mounting session. Formica and similar decorative laminates make excellent table tops — these materials are smooth and easily cleaned and will not melt if a hot tacking iron should touch the surface.

Occasionally, small concentrations of fiber actually occur within a fiber-base photograph itself. Prints should be closely examined from different angles before mounting because a "lump" will become more noticeable after the affected print is mounted.

How to Determine the Ideal Mounting Temperature

As previously discussed, Seal ColorMount is recommended as the most suitable currently available dry mounting tissue for fiber-base and RC papers. For mounting fiber-base prints, ColorMount should be applied with a press temperature of about 215°F (102°C).

Most older mounting presses have poorly calibrated thermostats, and the press temperature may also fluctuate over a wide range at any given thermostat setting. Current Seal and Ademco presses are available with built-in thermometers and have reasonably accurate temperature controls. Press temperature can be checked with Seal Temperature Indicator Strips, Tempilstiks,[24] and similar products, or with an accurate surface-reading thermom-

eter. A press that is not hot enough will produce a bond with inadequate adhesion (a weak bond is usually not immediately apparent); a press that is too hot can cause print edge-lift, bubbles between the print and mount, and damage to the print and/or mount board.

The peak temperature reached by the mounting adhesive during dry mounting is influenced by several factors, in addition to the press temperature itself (which also varies between the minimum temperature "heater-on" and maximum temperature "heater-off" range of the thermostat that controls the press's electrical heating elements). The thickness of the paper or board cover sheet and the thickness of the print mount board both affect the rate of heat transmission to the dry mounting tissue. The length of time that the print is in the press is another critical factor. The temperature of the print and mount board rise rapidly when the press is closed, but if the mounting time is short — 15 seconds, for example — the print, and mounting tissue behind it, will not have an opportunity to reach the temperature of the press platen.

Some people try to speed up mounting by choosing a very high press temperature coupled with short mounting times. The theory is that, if the print is removed from the press at just the right moment, the rapidly rising temperature of the tissue interface between the print and mount board will have reached the level necessary to effect a good bond but will not yet have become so high that the print is damaged. This is a very risky approach to mounting, especially with RC prints, and is likely to produce erratic results from print to print.

In this author's experience, the most consistent results are obtained by setting the press to the temperature that **(1)** produces a strong bond with the particular dry mounting tissue, **(2)** avoids edge-lift, and **(3)** is safe for the print. The press time should be long enough for the cover sheet, print, and mount board to reach equilibrium with the press temperature. Depending on the size of the mounting press and the thickness of the cover sheets and mount board, a time between 1 and 3 minutes is required. Times less than 1 minute should not be used, even if it appears that bonding is satisfactory after a shorter period. Ansel Adams recommended a 3-minute press time for mounting with Seal ColorMount. His Seal Masterpiece 500T mounting press was set at 210° to 225°F (99° to 107°C), and the print, tacked to its mount board, was placed between two oversize 4–ply mount boards and inserted into the press.

The best way to determine the proper press temperature is to mount a scrap print. Preheat the mounting press for about 20 minutes before the test to allow the temperature to stabilize. Attach the dry mounting tissue to the scrap print so that the tissue does not cover the outer 1½ inches on two opposite sides of the print (e.g., center an 11x11-inch sheet of tissue on an 11x14-inch print). Both 14-inch sides of the print should be trimmed so that the tissue reaches all the way to the edge of the print.

Then tack the print to a mount board that is somewhat larger than the print, place between two *preheated* 4–ply cover sheets, and insert into the press. The print should be kept in the press for the customary mounting time (not less than 1 minute). After removing the print from the press, place it face up on a table, without weights, and allow it to cool completely.

Examine the edges on the long (14-inch) sides of the print to see if there is edge-lift. Then, grasping an unattached end of the print (where there was no tissue), attempt to pull the print from the mount. With a fiber-base print, either the print or mount board paper fibers should tear away, leaving the mounting tissue largely concealed. With an RC print, the tissue should remain attached to the print, and the top layer of paper fibers of the mount board should be torn away. If the print should separate from the tissue, or if the print and tissue separate cleanly from the mount board, the press temperature is not high enough — or, as this author has found to be the case with Ademco Archival Dry Mounting Tissue and some other products, the tissue simply is not capable of adequate adhesion regardless of what temperature is selected.

The test should be repeated several times, with press temperatures both higher and lower than the initial setting, to observe the effects. Be sure to allow the temperature to stabilize each time the setting is changed. When mounting RC prints with Kodak Dry Mounting Tissue, Type 2, the best mounting temperature is about 20°F (11°C) higher than the lowest temperature that produces adequate bonding. With fiber-base prints the ideal mounting temperature is usually about 35°F (20°C) higher than the lowest test temperature at which the adhesive bond is still adequate.

Once the proper mounting temperature is established, and procedures are consistently followed (i.e., use the same temperature, mounting tissue, and type of cover and bottom sheets; allow sufficient preheating time for the press temperature to stabilize; and use *exactly* the same press times), adhesion should be uniformly excellent.

Step-by-Step Procedures for Mounting Prints

1. Maintain the relative humidity in the mounting room (and in the areas where prints and mount boards are stored) at 40–50%, if possible, both to prevent emulsion damage during mounting and to reduce warping of mounted prints. Avoid mounting on particularly humid days. A room dehumidifier operated in conjunction with an air conditioner will help control humidity.

2. Preheat the mounting press until the temperature has stabilized — typically about 20 minutes. Be certain the temperature is correct for the type of tissue selected.

3. After the press has reached operating temperature, preheat two sheets of *clean,* high-quality, 2– or 4–ply mount board, which are slightly larger than the platen of the press. Alternately open and close the press for several 15-second periods to properly preheat and dry the boards. The two pieces of board will serve as cover and bottom sheets for flattening fiber-base prints (see Step 5) and to protect a print and its attached mount board while they are in the press. When a heated press is idle, leave it open.

4. To avoid fingerprints, wear clean, thin cotton gloves at all times when handling, trimming, and mounting prints. Kodak Cotton Gloves, available in small and large sizes, are suitable.

5. (Skip this step for RC prints.) Flatten a fiber-base print by pressing it between the preheated cover and bottom sheets for about 30 seconds. Remove the print, place it emulsion side down on a clean sheet of mount board, and let it cool. This operation not only helps to remove waves and wrinkles from the print but also shrinks the emulsion and base (by drying them to a low moisture content), which helps to avoid a small strip of dry mounting tissue extending past the edge of the print after mounting. Flattening a print in the press immediately before mounting also helps to reduce warping of the print/mountboard assemblage after mounting. The cover and bottom sheets should remain in the press, with the press open, after the print is flattened.

6. Examine the back of the print to be certain that it is free of dust. Then, place the print face down on a clean surface and attach a sheet of dry mounting tissue to the print with a tacking iron (units with Teflon-coated, "non-stick" surfaces, such as those made by Seal, are best). The tissue should be at least as large as the print, so that it reaches or extends beyond all four edges of the print. "Tack" the tissue in position by gently placing the tacking iron on the center of the tissue and moving it, successively, toward each of the four print edges. Do not go all the way to the edges, however, to expedite later tacking of the tissue (with the attached print) to the mount board. Be careful not to produce wrinkles when tacking the tissue to the print; always draw the tacking iron *away* from the center of the print. To avoid creases or indentations on the print, be sure the tacking iron lies flat on the tissue, and do not apply too much pressure. Placing a silicone- or Teflon-impregnated "release sheet" on top of the tissue while tacking it in place can make proper application easier.

7. With a high-quality rotary- or straight-blade paper cutter, trim off all excess mounting tissue. The print should be image-side up while trimming to avoid scratching the emulsion. If the paper cutter is not equipped with a "hold-down" bar, a perfectly straight length of wood, with a piece of mount board glued along the bottom edge, should be pressed on top of the print close to the blade of the paper cutter during trimming. This will help assure a smooth and accurate cut and minimize the chance of any tissue protruding beyond the edges of the print. This author finds it best to carefully trim about ⅛ inch from the print border on all four edges, along with the tissue; by trimming them together, there is less chance of tissue extending beyond the edges of the print, and the final result has a neater appearance. Unless a print has wide borders and is to be overmatted, it is generally unacceptable for even a tiny sliver of tissue to be visible after mounting. With practice and care while trimming (and humidity control, if necessary), good results are not difficult to obtain.

8. Preheat the board on which the print will be mounted by placing it between the cover and bottom sheets already in the press. After about 30 seconds, remove the board and allow it to cool. Preheat only one board at a time, and attach the print to it as soon as possible after it has cooled. With some mount boards (or under conditions of low humidity), this step may be skipped. Whichever method results in the least warpage of the mounted print is preferable — experience will be a guide.

9. Precisely position the print on the mount board. Place a weight, such as a 4x4x8-inch block of wood, to which a facing of mount board has been glued, on the center of the print to hold it in position. Lifting one corner of the print at a time, tack the mounting tissue to the mount board by gently touching the tissue with the tacking iron and drawing the tacking iron *away* from the center of the print. Tack the tissue to the board at the two corners nearest you and at one of the opposite corners; this will keep the print in exact position during mounting. Do not let the tacking iron slide off the tissue and onto the mount board; if this happens it will leave a permanent, shiny deposit of adhesive on the board.

10. Partially withdraw the cover and bottom sheets from the press, lift the cover sheet, and carefully insert the mount board with attached print face up. Lower the cover sheet. Holding the cover sheet and bottom sheet together, slide them back into the press.

11. Close the press for exactly 1 minute (or longer if necessary — see text above). Do not guess about the time. If possible, use an interval timer, such as an enlarger timer. If you have to rely on a clock or watch, lower the press handle when the second hand is in the "12" position, so you will not forget when you started.

12. When the press time is completed, open the press, partially withdraw the cover and bottom sheets, lift the cover sheet, and remove the mounted print. Lay it on a table, face up, and immediately place an oversize sheet of clean 4–ply mount board on top of the print. Place a weight (such as a Light Impressions Flat Plate) on top of the cover board for a few minutes, until the print has completely cooled — this will help minimize warpage of the print and mount during cooling. If, after cooling, the mounted print has an objectionable warp, place it between the cover and bottom sheets with the concave side up (i.e., with the edges of the warped board higher than the center) and reheat it in the press for about 20 seconds. Remove from the press, cover, and cool under weight.

If narrow slivers of mounting tissue protrude beyond the edges of mounted prints (this is not of great concern if the print borders will be covered by an overmat), the following procedure suggested by Seal should solve the problem: Before mounting, pre-dry the print (if fiber-base). Tack the tissue to the back of the print and trim off excess tissue (but do not trim any of the print border). Place the print face down on a sheet of clean paper and cover with a sheet of Seal silicone-impregnated "release paper" or similar product. Be certain that the release paper is larger than the print and overhangs all edges. Lay a large sheet of paper or mount board on top of the release paper and place the assemblage in the press for about 30 seconds — this will bond the tissue over the entire print surface. Remove, let

cool, and lift off the release sheet. Then, trim the outer ⅛ inch from all four edges of the print. To tack the print in position on the mount board, place a sheet of heavy paper over the center of the print and lightly press the wide, flat portion of the tacking iron on the cover paper. Leave the tacking iron in one spot and do not slide it on the print.

Counter-Mounting Prints Back-to-Back to Sheets of Photographic Paper

In some applications, counter-mounting prints to photographic paper has advantages over dry mounting on mount board. Mounting with correctly processed and washed photographic paper eliminates concern about potentially harmful effects of mount board. Print warping or curling will be minimized or eliminated because the print and backing sheet will exert approximately equal curling forces in opposite directions, thus neutralizing any tendency to curl. The emulsion coating on the backing sheet of photographic paper serves the same function as the gelatin anti-curl layer on the backs of sheet films, Ilfochrome (Cibachrome) prints, etc.

A counter-mounted print is thinner than a print mounted on mount board, thus conserving space; this may be especially advantageous if the prints are intended for packaging in a portfolio case. Counter-mounted prints are surprisingly stiff and have the rigidity one might associate with a sheet of hard plastic of equal thickness. The photographer's portrait, historical data, or other information may be photographically printed on the backing sheet; this provides a simple and safe method for attaching considerable supplementary information to the print.

When made with wide borders, a counter-mounted print can easily be attached inside a mat with paper mounting corners (see Chapter 12); the counter-mounted print will stay flat when overmatted and framed. By carefully positioning images, some photographers have made books of counter-mounted prints, with the prints themselves mounted back-to-back without separate backing sheets.

It is recommended, however, that valuable prints not be counter-mounted until a stable and properly tested dry mounting tissue becomes available; once a print is mounted in this fashion, it is almost impossible to unmount. Counter-mounting should be considered only by the photographer who made the print, and it should never be done by museum or archives personnel to prints in their collections.

To further minimize the possibility of curl or warping in counter-mounted prints, prints and backing sheets should be made of the same type of photographic paper — preferably from the same box or emulsion batch. The paper grain of both the print and backing sheet should be in the same direction (e.g., an 11x14-inch print should be backed with an 11x14-inch sheet running in the same direction, even if the print is later to be trimmed to a smaller size, such as 8x10 inches). Double-weight paper should always be backed with double-weight paper, and single-weight prints should be backed with single-weight paper.

Backing sheets should not be exposed to light prior to processing (unless text or other information is printed on them). They should receive the same processing (including immersion in the developer) and washing as the prints; if no image is printed on the backing sheets, however, there is no need to include Kodak Rapid Selenium Toner or other image-protecting treatment.

Fiber-base prints and backing sheets should be preheated and flattened in a dry mounting press prior to mounting. To keep curl to a minimum, it is essential that both sheets be thoroughly pre-dried *immediately* before mounting. Avoid counter-mounting fiber-base prints on humid days. RC prints do not need to be preheated. A sheet of dry mounting tissue should be tacked in place on the print and excess tissue trimmed off. Position the print back-to-back on the backing sheet so that all edges are aligned. With the print covered by a clean piece of heavy paper, attach the print to the backing sheet by lightly pressing the flat portion of the tacking iron on the center of the cover paper. Cover the print with an oversize sheet of "release paper" and place the assemblage in the mounting press for about 30 seconds. Remove the print and place between two sheets of mount board. When cool, trim the outer ⅛ inch from all four borders of the print and put it back in the press, between two sheets of 4–ply mount board, for 1 minute. Remove the print, place it between two sheets of mount board, and cool it under weight. If the print has an objectionable curl after cooling, try reheating (between two sheets of mount board) in the press for about 15 seconds, with the *convex* side of the curl facing the press platen. Remove the print and cool it as previously instructed.

Mounting Adhesives to Avoid

Among products which should *never* be considered for mounting photographs are rubber cement, contact cement, and most pressure-sensitive mounting materials and tapes. Rubber cement contains sulfur or other chemicals which will cause fading or discoloration of black-and-white prints. Solvents in the cement may cause staining by transferring dyes in mounting materials to the print; the stains produced are often pink. Contact cement, made by a number of firms, can cause rapid fading of photographs; this is the most harmful adhesive likely to be encountered. Also to be avoided are starch pastes and animal glues.

Kodak Rapid Mounting Cement should be avoided because it contains nitrocellulose (cellulose nitrate), which could decompose over time and damage photographs.

A number of authorities have suggested liquid polyvinyl acetate (PVA) adhesives for use with fiber-base prints as well as with such products as paper envelopes for film and prints. This author has little information on possible long-term physical and chemical effects of these adhesives on black-and-white and color photographs; at present, neither a particular type nor brand can be recommended. As a general rule, however, water-containing adhesives of all types should be avoided with photographs.

Adhesive Tapes for Use with Photographs

This author suggests that *no* adhesive tape be applied directly to a photograph because staining, fading, deformation, and physical damage may result. Tapes applied to the emulsion side of a photograph are a particular danger. Ordinary cellophane tape and masking tape (both of which have a rubber-base adhesive with poor aging characteristics), "gaffer's" tape, and virtually all other common tapes

should be avoided. Adhesives on these tapes will gradually deteriorate and discolor, become gooey, and soak into paper fibers and photographic emulsions. The tapes can cause typewriting and other inks to bleed. Citing a study by Feller and Encke, Merrily Smith *et al* of the Library of Congress describe the eventual result:

> The adhesive, having permeated the paper, continues to oxidize, and gradually loses its adhesive properties. The carrier may fall off, and the adhesive residues crosslink, becoming hard, brittle, and highly discolored. Once it has reached this condition, the adhesive residue and the stain it has created are very difficult, sometimes impossible, to remove.[25]

Some situations may require using adhesive tape in proximity to photographs, such as attaching overmats to mount boards, paper corners to mount boards, caption information to film envelopes, etc. For these and similar applications this author currently recommends two types of tape: high-quality gummed cloth tape,[26] occasionally referred to as *cambric* tape (gummed cloth tape with a shiny, coated or "glazed" backing — sometimes called Holland tape — should be avoided), and 3M Scotch No. 810 Magic Transparent Tape.

Gummed fabric tape which must be wet when applied (wet with a clean sponge and clean water; licking the tape is not advised because saliva may contain harmful substances) is particularly suited for attaching 4–ply overmats to backing boards. Once in place and dry, the gummed tape remains firmly attached and is therefore a good choice for making flexible hinges. In general, gummed cloth tape should not be applied directly to a fiber-base photograph because the wet gum will, in most cases, cause the print to deform locally and to wrinkle, and because the adhesive, which is likely to be somewhat hygroscopic, may accelerate localized discoloration. This type of tape does have the advantage that it can be removed by soaking it with water. Gummed cloth tape is available in various widths (the most common width being 1 inch) from several companies. See Chapter 12 for more information.

This author believes that Scotch No. 810 Magic Transparent Tape,[27] a cellulose acetate-base tape with a very stable pressure-sensitive adhesive, is suitable for use in proximity to — but not directly on — photographs. The tape is available from office supply stores, drugstores, and other outlets. A roll of the tape can be distinguished from other 3M Scotch tapes by its matte-surface and somewhat milky, translucent appearance. Scotch No. 810 tape is packaged in green plaid boxes and dispensers. Scotch No. 811 Magic Plus Removable Transparent Tape, introduced in 1984, should be avoided for photographic applications.

In some cases, caption sheets or other data must be attached directly to the backs of prints. From what little information is available, No. 810 tape appears to be the most suitable tape for this purpose with both RC and fiber-base prints. There is no doubt that this tape is better than rubber cement, cellophane tape, and pastes which have been used on photographs in the past. It must be emphasized, however, that only limited information is available on the long-term effects of this tape on color and black-and-white photographs. Once applied, the tape is difficult or impossible to remove from paper or photographs. It cannot be removed with water, and the adhesive is not soluble in any of the common solvents.[28] Scotch No. 810 tape recently applied to the back of an RC print can usually be removed by pulling the tape off; however, residues of the adhesive are likely to remain. If tape of any type must be removed from a valuable photograph, a qualified photographic conservator should be consulted.

The 3M Company has supplied the following information about Scotch No. 810 tape. Although not dealing with the long-term effects of the tape on photographs (3M said such tests have not been conducted), the information does suggest that the tape itself has a long life in most applications.

3M Company Scotch No. 810
Magic Transparent Tape

> 3M No. 810 Magic Transparent Tape is in no way related to cellophane tape, which over the years has been misused for long-aging applications. Cellophane tape has a rubber-resin adhesive which will start to deteriorate within a couple of years and cause the paper staining and discoloration that many people have experienced. No. 810 tape, on the other hand, was originally developed to fulfill the long term applications in which cellophane tape had failed.
>
> No. 810 consists of a cellulose acetate backing and a homogeneous, synthetic acrylic polymer adhesive. Both components are relatively inert and will not discolor or dry out with age. No. 810 also does not contain any fugitive ingredients which will leach into paper. The pH of the tape is 7.0.
>
> The aging properties of No. 810 are somewhat dependent on the surface to which it is applied. If adhered to paper which is in good physical condition and does not contain unstable components, it should last indefinitely.
>
> We have conducted natural aging tests for the 20-plus years that the product has been on the market. Lengthy accelerated aging tests were also run in artificial sunlight and elevated temperatures. None of the tests have indicated that No. 810 will deteriorate or discolor any faster than the paper substrate to which it is adhered.[29]

According to Smith *et al*, however, the adhesive of No. 810 tape can penetrate paper: "The adhesive mass does not typically soak into the paper as rubber-based adhesives do. The acrylic adhesive is, however, subject to cold flow and will penetrate to the degree that paper porosity allows."[30]

Two pressure-sensitive tapes that have been recommended by some conservators for use near photographs are Filmoplast P90, a paper-backed tape, and Filmoplast SH, a cloth-backed tape, both made by the German firm of Hans Neschen, and available in the U.S. from several suppliers.[31] Another tape of this type is the paper-backed Archival Aids Document Repair Tape, sold by the Archival

Aids division of Ademco-Seal Ltd. These tapes, all of which have stable acrylic adhesives, are marketed primarily for book and document repair; no information on possible effects of such tapes on photographs during long-term storage is currently available. Hans Neschen also produces a line of double-sided pressure-sensitive tapes, and a transfer adhesive, under the Gudy O name, which is applied in a manner similar to that described for 3M No. 568 Positionable Mounting Adhesive. Pending availability of meaningful test data, Gudy O products are not recommended for use in contact with photographs.

Marking and Other Identification

After processing and drying, photographs are often marked to identify the photographer and to indicate the date, location, title, and other information. It is helpful to mark a print with a finding key or file number of the original negative or transparency. Some photographers use a serial number that includes the year, month, and day the photograph was taken, in addition to the roll and frame number. Photographs of historical importance should be marked with as much relevant information as possible; separate caption sheets are sometimes included for this purpose. A caption sheet should be given an identification number which positively identifies it as belonging to a print marked with the same number. Because caption sheets are usually stored with photographs, they should be prepared with high-quality paper that will not harm the photographs (see Chapter 13).

Newspaper clippings should never be stored near or in contact with a photograph. Newsprint has a short life; if the information in a clipping must be retained it should be copied with a *plain-paper* copier, such as a Xerox machine, and the copy filed next to the non-emulsion side of the photograph, with the printed side of the copy placed *away* from the negative or print. A high-quality paper, such as 100% cotton fiber bond paper or Xerox Image Elite Paper (Xerox No. 3R1950), should be used in the copying machine. Plain-paper copying machines employ a thermoplastic powder containing carbon black as a pigment, which is heat-fused to the paper. This author does not have any information about the long-term effects of Xerox images — or those produced by other brands of copiers — stored in contact with photographs, but they probably will not cause any harm if stored as recommended in this paragraph.

Caption information on old mounts or negative envelopes which are being discarded can also be copied on a plain-paper copying machine. A better, but more time-consuming, method of copying caption information is to photograph it and store this supplementary photograph with the original print. Any copy photograph must be properly processed and washed; stabilization prints and Polaroid prints are not acceptable for this purpose.

Pressure-sensitive labels, 3M Scotch Brand Post-it self-adhesive note paper, and similar items should never be attached to either the back or emulsion side of photographs. Although 3M Post-it note sheets are designed to be readily removable, they can leave permanent adhesive deposits on photographs and other paper materials if they remain attached for more than a few weeks.[32] (On hot days, a residue can be deposited almost immediately!)

Pencils and Pens for Marking Photographs

The only media for marking photographs that this author can recommend at this time are water-base India ink, applied with a technical or fountain pen, and the common "lead" pencil. Pencils have traditionally been made of graphite and carbon black powder mixed with a clay binder. Pencil markings are extremely stable, and in the great many years that pencils have been used to write on photographs, they have not, to this author's knowledge, been reported to cause image deterioration. During the black-and-white era of portraiture, graphite pencils were popular for retouching prints made on the then-common matte-surface papers.

Pencil impressions are not water soluble, so prints marked with pencil can be reprocessed or rewashed with no danger of the writing bleeding or transferring to other prints. One of the great advantages of pencils over rubber-stamp markers and all inks — including so-called "waterproof" India ink — is that there is no danger of pencil lines bleeding or partially (and permanently) transferring to adjacent photographs should they accidentally become water-soaked as a result of broken pipes, floods, etc.

Care should be exercised when writing on the backs of fiber-base prints to avoid producing a physical impression that can be seen on the emulsion side of the print. Before writing, the print should be placed on a smooth, hard, and flat surface. (Mount board is *not* a suitable writing surface because it is too soft.) Apply light pressure with a medium-hard lead pencil that is not sharpened to a point. A standard No. 2½ pencil will suffice; however, a drafting pencil with an HB, H, or 2H lead would be better because softer leads are more likely to create graphite "dust," which, although erasable, smudges easily and can transfer to adjacent paper. Medium-hard lead pencils can be purchased at art supply stores.

Writing on the backs of prints should be restricted to the border areas, if possible, to prevent potential damage to the image area. Keep in mind that all markings will normally be covered if the print is mounted. Serial numbers, captions, and other information should be transcribed to the back of the mount *before* the print is mounted.

Older RC papers, from 1968 to about 1981, are almost impossible to write on with pencils. Most current RC papers have specially treated back-coatings which more readily accept pencil markings; however, it is still difficult to write on RC papers with pencils, and the pressure required to obtain a sufficiently dark line may cause an impression that is visible on the front of the print. India ink in a technical or fountain pen is probably more satisfactory for writing on the backs of RC prints — but be sure to allow adequate drying time before stacking them.

India ink is also recommended for writing on the fronts of prints because most pencil leads will not adhere to the smooth or glossy emulsions currently available.

India Ink

India ink (also known as Chinese ink when in dry, stick form) has traditionally been made of carbon black with gum arabic as a binder and water as a solvent. The original formulas of India ink were not waterproof; they would

smear when damp and could be washed from paper with water. Most of the commercially available India inks in recent years have been formulated to be waterproof once they have dried. There are no published studies establishing the safety of modern India inks on the many types of photographic materials currently available, and formulas vary with different manufacturers. However, this type of ink has been used on photographs for many years and this author has not observed any instances in which it has caused fading or staining.

Many photographers prefer India ink for marking negatives because the dense black image of the ink prints clearly on contact sheets. India ink adheres to the emulsions of most prints and negatives and to the backs of most current RC papers. The ink does not soak into emulsions and RC coatings (as it does into fiber-base papers); it is necessary, therefore, to allow sufficient drying time to guard against any smearing. Because most of the ink remains on the emulsion or RC surface, and despite being waterproof when dry, some of it will come off if the print is washed.

India ink markings on the back of a fiber-base print may bleed or show though to the front; if these prints must be marked with ink, apply it only at the margins. Lead pencils are preferred for writing on the backs of fiber-base prints.

The back side of Ilford Ilfochrome (Cibachrome) print materials — including Ilfochrome RC materials — is coated with a matte-textured gelatin anti-curl layer which readily accepts pencil, India ink, and light rubber-stamp impressions. The polyester or RC base materials of Ilfochrome prints will prevent any bleed-through of inks, but enough time must be allowed for any applied ink to dry before handling. It is a good practice to gently blot rubber-stamp impressions on Ilfochrome prints with an absorbent paper towel or, preferably, smooth blotting paper.

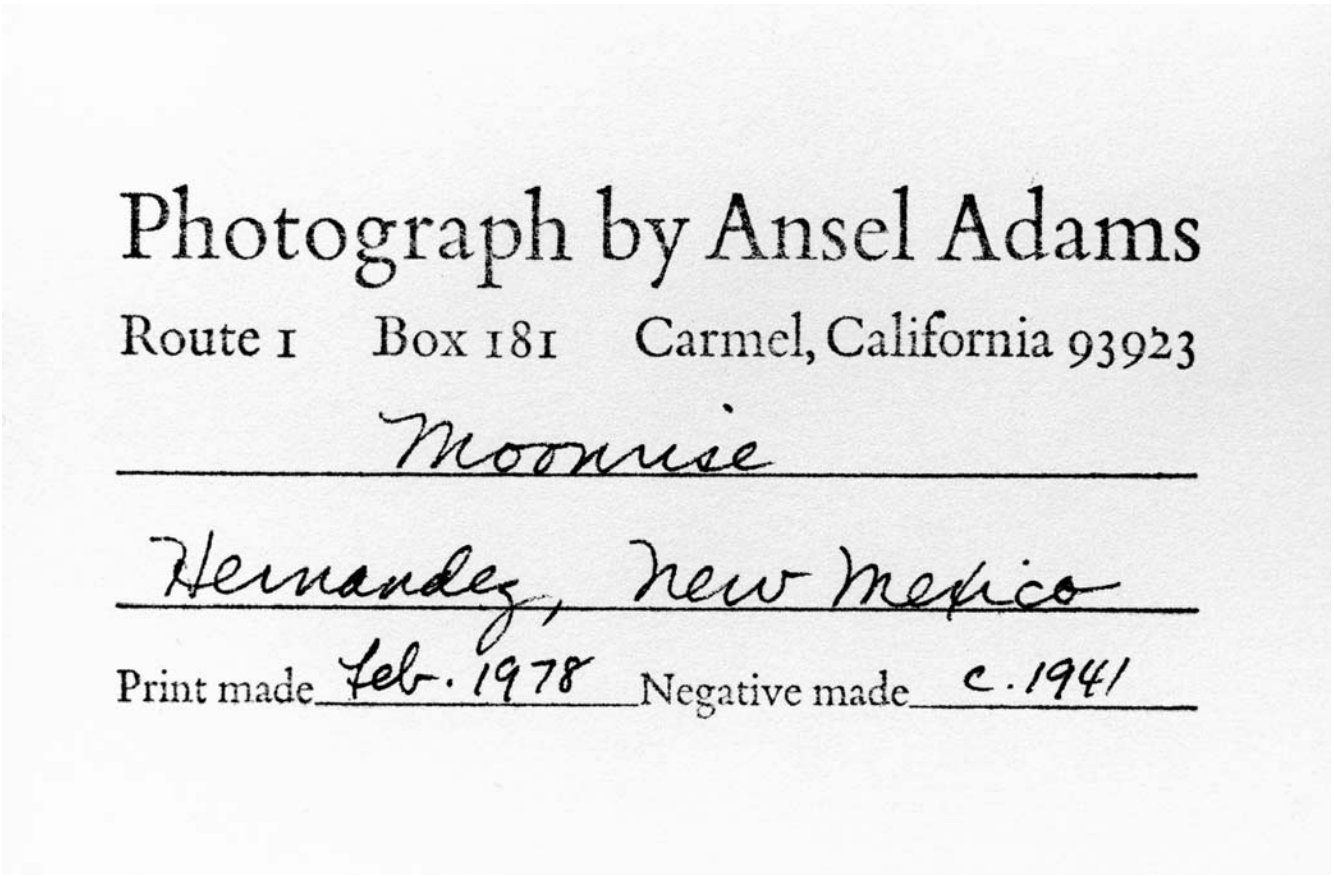
Water-base India ink, such as Faber-Castell Higgins Waterproof India Ink (No. 4415), has often been recommended as acceptable for writing on photographic materials. Other suitable inks for writing on the backs of RC prints are Koh-I-Noor Rapidomat Ink No. 3074–F and Koh-I-Noor Universal Waterproof Black Drawing Ink No. 3080–F, although this author has no information on their long-term effects on photographic images. When a graphite pencil is not appropriate, this author prefers the above inks — particularly Koh-I-Noor Rapidomat Ink — to the recently popular felt-tip photographic markers.

Felt-Tip Pens and Markers

Felt-tip pens and markers are made in two basic types: felt-tip *pens* with odorless, water-base inks that remain water-soluble after drying, and felt-tip *markers* which have rapid-drying, waterproof inks consisting of dyes dissolved in volatile solvents.

Felt-tip pens with water-base inks are often substituted for pencils, ballpoint pens, and fountain pens for general writing applications. More accurately described as "porous-tip" pens, these increasingly common pens are intended for writing on paper; the porous surface of paper readily absorbs the ink, allowing it to quickly "dry" to avoid smearing. The water-base ink solvent actually evaporates

Ansel Adams signed his prints "lightly" with a pencil on the mount board under the lower right corner of the photograph.



A rubber stamp on the back of an Ansel Adams print. The inscription was applied with India ink.

rather slowly, enabling the pens to function after relatively long periods of inactivity with the cap off. These inks are not suitable for writing on photographs; in particular, the nonabsorbent backs of RC prints should not be marked with felt-tip pens because smearing and transfer of ink to adjacent prints will inevitably result. The water-base inks of most felt-tip pens have very poor light fading stability.

Fine-point, porous-tip markers with volatile-solvent-base inks, such as Pilot's Photographic Marker and SC–UF Ultra Fine Point Permanent Marker (Pilot pens are made in Japan and widely available in the U.S.) and Sanford's Sharpie Extra Fine Point Marker, are becoming increasingly popular for writing on photographs, especially on the backs of RC prints. The inks dry rapidly, even on nonporous RC paper and smooth plastic surfaces, and are waterproof when dry.

These markers usually have black ink, but red, green, blue, and other colors are also available. They are often referred to as "permanent" markers by their manufacturers because the inks are waterproof and, in general, have light fading stability that is considerably better than the water-base inks in felt-tip pens.

Pending study of the long-term migration and transfer characteristics of the inks in porous-tip markers, and their potential effects on black-and-white and color photographic images, this author advises that they not be used on any valuable photographs, particularly fiber-base prints. Pilot Photographic Markers are better, however, for writing on RC prints than either ballpoint pens or pencils, and if India ink is deemed impractical or too time-consuming in a particular application, a Pilot Marker is probably the better choice.

Pilot Photographic Markers and similar markers are recommended for writing on polyester, polypropylene, and high-density polyethylene sleeves and other plastic enclosures provided the ink is on the *outside* of the enclosure, in a position where it cannot directly contact a film or print.

Over long periods of time, especially in conditions of high relative humidity, the ink from such markers may partially transfer from an enclosure or the back of a print or enclosure to another print when they are stacked together.

With porous fiber-base prints, the inks may migrate through a print from the back and into the emulsion. In this author's library there is an example of ink migration through two sheets of paper, leaving a visible impression on a third sheet; the migration took place over a period of about 8 years. The polyethylene layers of RC prints will probably impede ink migration through an RC print, but the danger of transfer from the back of a print to the emulsion of another remains.

This author has seen an example of severe image fading caused by volatile-solvent marker ink applied to the edges of some black-and-white prints made in the mid-1960's; the brand of marker that caused the problem is not known.

Wide-tip volatile-solvent-base ink markers, such as the

Stamp and signature appearing on the back of a black-and-white print by photographer O. Winston Link.

William Christenberry has stamped the backs of his Ektacolor RC Prints with the word "EKTAPRO" (a reference to Ektacolor Professional Paper) to indicate that they were made on post-1985 Ektacolor papers, which are considerably more stable in dark storage than Ektacolor papers marketed before 1985.

Magic Marker, Marks-A-Lot, and El Marko, are intended for writing on both porous and nonporous surfaces. The odor of the ink solvent is usually quite strong. Available in a variety of colors, these markers are handy for addressing packages, making temporary signs, and similar applications; they are *unacceptable* for marking photographs or film and print enclosures.

Ballpoint Pens

Never use ballpoint pens on photographs because the ink may smear and transfer to other prints and films; this is especially likely to happen when the ink has been freshly applied and/or the relative humidity is high. Ballpoint ink is a particular hazard on the backs of RC prints.

Wax Pencils

Wax pencils — which are made in red, orange, black, and other colors and are commonly known as *grease pencils* — are often used to indicate cropping lines, to circle images on contact prints for printing, and to give other printing instructions. Wax pencils are not suitable for writing on contact sheets or other photographs intended for long-term keeping.

Ideally, no photographs should be marked with wax pencils because in practice the wax will smear, will get on hands or cotton gloves, negatives, transparencies, and enclosures, and generally will make a mess of working areas. The wax markings never "dry" and can smear and transfer to other prints for years after their original application.

Retouching Dyes Used as Inks

Spotting dyes, such as undiluted Spotone, may be used in a fountain or technical pen to write on print and film emulsions. Do not blot, but be sure to allow sufficient drying time before handling. As discussed later, Spotone retouching dyes are subject to light fading, and for this reason India ink is preferred.

Rubber Stamps

Rubber stamps are convenient for marking the backs of prints with a photographer's name and address, an agency name, a copyright notice, etc. The long-term effects of common rubber-stamp inks on photographic images are not known; however, this author has seen a great many old fiber-base prints that have been rubber-stamped with no apparent ill effects unless the print accidentally became wet. If a rubber-stamped print — or one that has been marked with a ballpoint pen — does get wet, however, the results are usually catastrophic — ink will transfer to the emulsions of adjacent prints and can migrate through the base of a fiber-base print and stain the emulsion. These ink impressions and stains may be impossible to remove.

Transfers of rubber-stamp ink can also occur at very high relative humidities, especially if prints have been treated with hygroscopic glossing or flattening agents such as Kodak Print Flattener. Interleaving or placing prints in polyester sleeves will prevent ink transfer.

This author discourages the use of rubber stamps on fiber-base and RC prints intended for long-term keeping. If rubber stamps cannot be avoided despite the possible hazards, impressions should be made with standard inks dispensed from cloth-covered felt stamp pads. The recently introduced "self-inking" stamps and porous plastic stamp pads are undesirable because the inks in these products tend to bleed and print through photographs. This author suggests black ink since it is usually the most permanent color and its opaque quality requires less ink to produce an adequate impression. The less ink needed, the less chance there is of bleeding, print-through, and transfer to another print. Pending further information, regular black stamp-pad ink is recommended over so-called "archival" inks which may be difficult or even impossible to chemically remove from emulsions should the ink transfer from adjacent prints or diffuse through a print after becoming wet. A good procedure to follow when stamping prints is:

> Ink the rubber stamp by pressing it on the pad. Then, make an impression on a piece of scrap paper and, without re-inking the stamp, make an impression on the print. Repeat this procedure for each print. This will help avoid excessive inking.

Rubber stamps usually become clogged with dust, lint, and old ink after a period of use. Most rubber stamps can be cleaned simply by rinsing them under a flow of warm water from a faucet. Stubborn cases may require applying a liquid dishwashing detergent directly from the bottle and brushing the stamp with a toothbrush to remove adhered dirt. Kodak Photo-Flo solution or a similar photographic wetting agent can take the place of liquid dishwashing detergent. After treating with any detergent, the rubber stamp should be rinsed with running water and dried by blotting with a paper towel.

Excess base rubber outside the type area may produce unwanted marks when stamping; these extraneous sections can be trimmed away with a razor blade.

So that slight optical "print-through" will not be visually apparent, prints should be stamped in the border areas or behind dark areas of the image. Be sure to allow ample time for the ink to be absorbed by the paper before stacking prints. Interleaving papers should be placed on top of each print as an extra precaution when stacking.

If a print is mounted, the back of the mount board can be stamped; as long as the stamp impression is not too heavy, and another print is not placed against the back of the mount without an interleaving tissue or sheet of polyester between them, there should be no problems. Ansel Adams for many years used rubber stamps on the backs of his mounted prints (insofar as this author is aware, Adams never sold unmounted prints):

> I strongly urge full identification and labeling of all prints. I recommend having a large rubber stamp made up to be impressed on the back of every print mount. The stamp should give full name and address, and also provide spaces for the title of the photograph, the negative date, the printing date, and a statement of reproduction limitation or copyright, if any. Additional stamps can provide copyright notice, return shipment request, intended use (e.g., for reproduction only), etc.[33]

Stamp-Pad Inks for RC Prints

Normal stamp-pad inks consist of dyes dissolved in a water/glycol solution (or other chemicals similar in function to the glycols). As the ink is absorbed into the paper, the dyes mordant to the paper fibers; the carrier solution is dispersed into the bulk of the paper. Some of the carrier components may gradually evaporate.

Traditional stamp-pad inks have been formulated so that stamps pads will not rapidly dry out. These inks cannot be applied to the backs of RC prints because smearing or ink transfer will occur. The polyethylene layer on RC papers prevents the nondrying ink from being absorbed, and the stamp ink remains on the surface in a "wet" state.

Some stamp-pad inks, such as Sanford's Indelible Black No. 488C,[34] employ a volatile-solvent dye carrier and may be safely applied to polyethylene-coated papers. Sanford suggests a plain cloth stamp pad for this ink. The stamp pad should be kept closed between applications to prevent solvent loss; small amounts of denatured alcohol can be added to the pad should it become too dry. For stamping polyethylene-coated RC papers, Kodak has recommended the fast-drying ink supplied with Bunny's Miracle Kit, a $18 outfit consisting of a bottle of ink, ink remover, stamp pad, and rubber stamp with the word "Original," available from BWS Enterprises in San Marino, California.[35]

Robert E. Mayer, writing in *Photomethods* magazine, recommended the Mark II RC–1000 Stamp Pad System supplied by Wess Plastic, Inc. (a well-known manufacturer of plastic slide mounts).[36] Mayer also suggested the fast-drying Rexton Series–3 stamp-pad ink supplied by Rexton International.[37]

The fast-drying Photomark stamp-pad inks and Photomark pre-inked Mark II "air-tight" stamp pads supplied in a variety of colors by Jackson Marking Products Co. in Mt. Vernon, Illinois[38] were recommended for RC prints by Bill Hurter in an article in *Petersen's Photographic* magazine.

No test data have been published on the long-term effects on color or black-and-white prints of *any* of the above-mentioned products. Until more information becomes available, this author tentatively recommends the Photomark stamp-pad inks and pre-inked Mark II stamp pads supplied by Jackson Marking Products Co. (Jackson also supplies custom-made and standard rubber stamps for photographers in a vast variety of configurations).

Stamp-pad inks may fade as a result of light passing through the print support material while the print is on display. The red ink used in Kodak photofinishing labs to mark the backs of color prints with the Kodak name and the month and year of processing has very poor light fading stability; this author has seen examples which have nearly disappeared after only a few years of display.

Film Cleaning and Problems with Scratches

Prints will usually have some small white specks in the image area resulting from dust and lint on the negative. The dirt particles block the printing light, resulting in a white or low-density spot. This is a particular problem with high-magnification enlargements. Keeping the darkroom areas clean and free of dust will help reduce the problem, but even the most careful worker will encounter some dust spots. Negatives should be carefully cleaned with a soft brush or can of compressed air or other gas. Unless absolutely necessary, avoid wiping the negative with a cloth or paper towel — even one moistened with liquid negative cleaner — because of the danger of scratching the negative. The negative can be examined for dust by holding it in the negative carrier under the light beam of the enlarger lens. If a large number of prints will be made from a negative, it is helpful to make a test print to determine the location of individual dust particles missed in the initial cleaning. Effort spent in cleaning negatives is usually amply repaid in time saved in spotting prints.

A number of devices are available to clean negatives, including cans of compressed Freon or other gases, brushes,

and brushes containing an ionizing radioactive element to neutralize static electricity which attracts and holds dust. Gas in high-pressure cans, such as Omit and Dust-Off, is fairly effective in removing dust and lint. Staticmaster brushes, made by NRD, Inc.,[39] are the most common radioactive brushes; this author has found them to be only moderately effective in removing dust, however. Much more effective — and more expensive — are the static-neutralizing dust-removal devices available from the 3M Company, Cumming Corporation, Kinetronics Corporation, and a number of other companies.[40] A very effective device is the Model 520 Masterwipe film cleaner sold by the 3M Company. This unit has a slightly sticky nonwoven fabric to pick up dust and incorporates a radioactive strip to ionize the air and remove static charges from the film as it passes through the machine.

Films and prints should be handled by the edges to prevent fingerprints on the image areas. Fingerprints not only show up during printing but may also contribute to long-term chemical deterioration of films and prints. Hands should be washed frequently and, if possible, soft cotton gloves should be worn when handling negatives, transparencies, and prints. Suitable gloves are available from Kodak and other suppliers; they are often worn by motion picture editors to prevent fingerprinting.

Liquid film cleaners can remove some types of adhered dirt, including fingerprints; when such cleaners are absolutely necessary, Kodak Film Cleaner is recommended. However, this author does not suggest liquid cleaners for removing dust since the application of the fluid often adds more dust than is eliminated. This author advises against anti-static liquid cleaners because the long-term effects of the static-neutralizer residues that remain on the film after application are not known. Many anti-static agents are hygroscopic and create elevated surface-moisture levels; this could cause sticking to enclosure materials and other films, and could increase rates of fading and staining.

Films should *never* be rubbed with fingers in an attempt to remove dirt because films are easily scratched; in addition, oils, acids, and salts from the skin may cause future damage to the image.

Negatives, especially old black-and-white films and all color films, should not be washed to remove dirt except in the most severe cases. Most color films other than Kodak Kodachrome are treated with a stabilizer as a final processing step, and the effectiveness of the stabilizer in slowing image-dye fading and staining can be impaired by washing. Old films may develop emulsion blisters or other problems if washed. Cellulose nitrate films should never be washed in solutions containing water because the emulsion may separate from the film base.

Most 35mm films do not have a gelatin coating on the non-emulsion side, and dust, which often preferentially clings to the uncoated surface, may be effectively removed in stubborn cases by lightly wiping the *non-emulsion side* with a clean photographic sponge that has been slightly dampened with water. The sponge should be soaked under running water and then squeezed until reaching the proper dampness. Rinse the sponge between each use to remove accumulated dirt and squeeze it dry. Avoid getting excess water on the negative, and allow any water droplets on the surface of the film to dry before closing the negative carrier. This procedure cannot be done on some 35mm films, such as Kodak Type 2475 and Type 2485 Recording Films, nor on any sheet or roll film larger than 35mm, because they all have a gelatin anti-curl backing which will soften when damp and cause dirt and sponge particles to adhere.

Black-and-white films with minor surface scratches that have not penetrated the image layer of the emulsion can be treated with Edwal No-Scratch, available from camera stores or directly by mail from Edwal Scientific Products Corporation.[41] This solution, which has approximately the same index of refraction as plastic film base, fills in the scratches during printing. Minor scratch marks can be totally eliminated in most cases. The solution should be applied in a heavy coat over the entire negative.

After printing, the negative and the negative carrier should be washed in a strong solution of a wetting agent, such as Kodak Photo-Flo, to remove the No-Scratch and then rinsed in plain water. Allow the negative to dry on its own, but dry the negative carrier with a paper towel. (Liquid dishwashing detergent is also effective in removing No-Scratch from the negative carrier, but it should not be used on films.) *Under no circumstances* should No-Scratch be allowed to dry on the film, nor should the film be placed in a negative envelope or stored without first being washed and dried.

No-Scratch is not suitable for color films because washing the films after using the product may impair the action of the stabilizer in the processed film, leading to accelerated staining and dye fading. Edwal supplies rather inadequate instructions for this product.

Minor surface scratches on negatives and transparencies are much more apparent on prints made with condenser enlargers than with diffusion enlargers, or on contact prints made with diffuse light sources. For this and other reasons, most photographers will find diffusion enlargers to be more satisfactory for general printing than the more common condenser enlargers. If purchase of a new enlarger is being contemplated, serious consideration should be given to obtaining a diffusion color-head enlarger, which not only serves for color printing but also is excellent for black-and-white printing. In addition, the color-head filters can replace external filters for variable-contrast black-and-white printing.

Scratches may be effectively reduced by using a liquid-immersion film carrier such as those marketed by Carlwen Industries.[42] These special carriers come in a number of different models to fit different enlargers and to accommodate a variety of film sizes. Carlwen supplies a solution called Decalin, made by Eastman Chemical Products, Inc., for use with the film carriers. This solution has a refractive index similar to that of film base. Liquid-immersion film carriers are similar in theory of operation to wet-gate motion picture printers.

Carlwen could not offer any meaningful information on the long-term effects of Decalin on color or black-and-white films; however, the fluid appears to evaporate completely from the film, leaving no residue. Carlwen has reported no problems with the fluid to date. Some professional color processing laboratories routinely use liquid-immersion film carriers when making color separations for Dye Transfer printing or when making internegatives for mural-size enlargements.

Dyes for Dust-Spotting Prints

Despite diligent efforts to clean negatives, some dust spots will inevitably appear on prints. These spots may be covered and blended in with the rest of the image with dust-spotting dyes, such as Spotone, made by Retouch Methods Company.[43] In spotting, as differentiated from retouching, only marks due to dust, lint, scratches, and other negative defects are removed from a print. Retouching, on the other hand, usually implies a major alteration of the image itself, such as removing wrinkles from a person's face, covering up telephone poles, adding clouds, etc. Retouching black-and-white negatives prior to printing has been a common practice in portrait photography. Photographs of products in catalogs and advertisements are also often retouched or airbrushed (spray-painted with a tiny air- or gas-powered sprayer) to remove unwanted reflections or background details and to emphasize certain details for commercial purposes. Historical photographs should not, however, be retouched or undergo other major types of image alteration, although spotting, color correction, and minor dodging and burning to make up for photographic deficiencies are usually acceptable.

Spotone and other types of liquid dye spotting solutions have become popular because they are easy to apply and do not appreciably change the surface gloss or texture of prints. The dye is absorbed into the emulsion, leaving little or no apparent residue on the print surface. Spotone is available in a number of colors — or off-neutral tones — to match various types of paper. Neutral black No. 3 is suitable for most modern neutral or near-neutral papers. The dyes are usually applied with a very fine watercolor brush. Dark areas can be spotted with the concentrated solution directly from the bottle; the dye can be diluted for application on lighter areas by first dipping the brush in the dye directly from the bottle and then briefly dipping it in a container of water. The density can be checked by brushing a few short lines on a piece of scrap paper. Repeated water dips may be required to obtain very light tones.

When the desired tone is reached, the dye may be applied to the print. With medium to light tones, it is best to choose a dye solution less dense than the surrounding print area so that the spot density can be built up by repeated dabs with the brush. If excessive dye is applied by accident, much of it can be removed by rubbing the affected area lightly with a small piece of a *clean* photographic sponge moistened with clean water. Reserve a special sponge for this purpose. Never use any sponge that might contain chemicals or dirt that could harm the print. Spotting is something of a craft — if you are not experienced with the procedure, you should practice on some expendable prints before working on prints you want to save. Good descriptions of print-spotting techniques are contained in David Vestal's book *The Art of Black-and-White Enlarging*[44] and in the Ansel Adams book *The Print.*[45]

Opaque spotting colors, such as Kodak Spotting Colors, are suitable for covering dark spots on prints, but these pigmented colors will alter the surface gloss and texture where they are applied to the print. The practice of knife-etching to remove dark spots on prints is not recommended, particularly for RC prints, because it pits the emulsion and may serve as a starting point for flaking and other emulsion damage. Another method of removing dark spots is to chemically bleach them with products such as Retouch Methods Spot-Off; however, the entire print must be refixed, treated with a washing-aid, and washed after any bleaching treatment. It may be difficult or impossible to bleach spots on toned prints or prints treated with image-protective solutions.

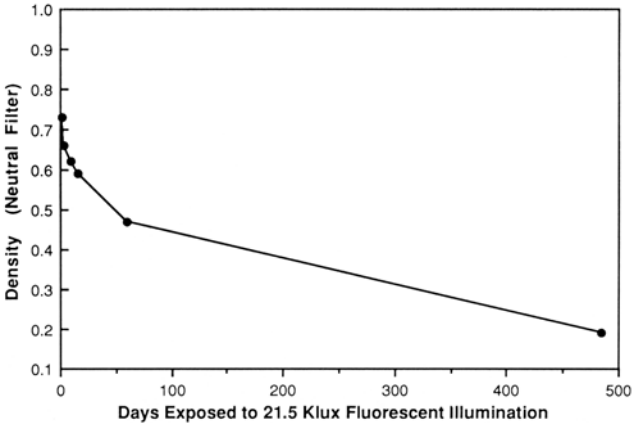


Figure 11.1 Retouch Methods Company Spotone No. 3 dye applied to a white area of a print and subjected to an accelerated light fading test. The silver images of black-and-white fiber-base prints are essentially unaffected by exposure to light, so as the spotting dye on a print gradually fades during long-term display, spots will gradually reappear. Spotting dyes may also undergo an objectionable color shift after prolonged exposure to light.

This author is not aware of any accelerated test evaluations of the long-term effects of spotting solutions on black-and-white photographs; however, to date this author has not observed any damage that could be attributed to spotting solutions.

Tests conducted by this author with Spotone No. 3 dye, the neutral black dye similar in tone to most current black-and-white papers, indicate that the dye does not have good light fading stability (see **Figure 11.1**). In fact, after 60 days of exposure to high-intensity fluorescent light, the No. 3 dye had faded more than color images on Ektacolor Professional Paper tested for the same period. However, the Spotone dye maintained reasonably good neutrality as it faded, which made the loss of density much less noticeable than it would have been had it shifted in color. In the tests, Spotone retouching dye was brushed on fixed and washed sheets of fiber-base Kodak Polycontrast Paper; several different densities of the dye were prepared. Because correctly processed and toned black-and-white prints are essentially unaffected by exposure to light on display, the original spots on the prints may start to reappear as the dye gradually fades. Retouch Methods reports that the company's basic formulations have remained the same for over 40 years and claims that it has never received a complaint that its products have caused fading or staining.[46] It is of course possible that the fading characteristics of the dyes could be improved by use of more stable dyestuffs.

If spotted prints are reprocessed or rewashed, most of the spotting dyes will be removed, thus requiring respotting

after the print is dry. If spotting dye is spilled on a print, or if an area is darkened too much by accident, the print should be rewashed to remove the dye. Most photographers who dry mount prints prefer to spot the prints after they are mounted because the moisture released from the print and mount board when heated during mounting may cause further absorption of the dye into the emulsion and therefore slightly change the apparent dye density. Of course, a mounted print cannot be rewashed in the event of an overapplication of dye or other accident during spotting. Make sure you have an uncluttered work area for spotting and place the dye bottle and water container in a safe place — on the upper right side of the print if you are right-handed, on the upper left side if left-handed — where they are not likely to be knocked over.

Spotting and Retouching Color Prints

Color prints must be spotted with dyes of the appropriate colors, and because the density as well as the color must be matched, the work is much more difficult than black-and-white spotting. Color spotting and retouching dyes are sold by Kodak, Ilford, and a number of other companies.

Ideally, spotting and retouching colors should have the same light fading and dark-storage stability characteristics as the color print material on which they are applied; in addition, the dyes should not adversely affect image dyes. The colors must be transparent and easy to apply. They should also closely match the spectral characteristics of the image dyes to avoid difficulties when color separations are made for photomechanical printing; the colors may "look the same" to the human eye, but may separate differently.

An excellent book on retouching is *The Fuji Professional Retouching Guide*, by long-time retouching expert Vilia Reed. The book, which was published in 1992 by Fuji Photo Film U.S.A. Inc.,[47] covers retouching techniques for color negatives, color prints, transparencies, and black-and-white films. Instructional videos on retouching are also available.

Retouching and spotting Dye Transfer prints have traditionally been done with the same dyes used to make the prints; this avoids any problems with stability or spectral differences between image and spotting colors. With Ektacolor prints and similar chromogenic products, however, the same dyes that form the image are not suitable for spotting, and, as might be expected, there are significant differences in the stability characteristics and other properties of the dye sets. Apparently, most of the chromogenic dyes in color photographs have very poor stability when dissolved in solutions and applied to emulsions, and this has forced the manufacturers to develop other types of dyes as retouching colors. Kodak Liquid Retouching Colors and Kodak Retouching Colors (dry) are said to be similar to Dye Transfer dyes and to have light fading characteristics somewhat similar to Ektacolor print images. The dark fading stability of the retouching colors is believed to be considerably better than that of Ektacolor image dyes.

Retouching dyes may have adverse effects on color print images; that is, contact with retouching colors may cause image dyes to fade or discolor much faster than they otherwise would. In recent years there has been a significant problem with Ektacolor 74 RC print discoloration caused by Kodak Retouching Colors (dry). The rapid image deterioration produced by these dyes was an issue in two lawsuits filed against Kodak; it has also been the subject of numerous complaints by portrait and wedding photographers (see Chapter 8).

For many years Kodak has sold a set of dry retouching colors that can be applied both in the dry mode for lightly coloring large areas of color prints and in the wet-brush mode mixed with a solution of water and Ektaprint 3 Stabilizer for correction of blemishes and dust spots. The Kodak Retouching Colors were formulated during the era of fiber-base Ektacolor Professional Paper (not to be confused with the RC-base Ektacolor Professional Paper introduced in 1985), which was marketed before the introduction of Ektacolor RC papers in 1968. Because of changes in the design of the paper and/or processing — or perhaps simply as a result of the change from fiber-base to an RC support — the dry retouching colors in the wet-brush mode have often been associated with severe localized fading and staining on Ektacolor RC prints, which develop a disconcerting orange-red color in areas where the retouching has been done. This appears to result from a near-total bleaching of the cyan dye layer where the retouching colors have been applied in sufficient concentration to penetrate the emulsions layers. In this author's accelerated dark fading tests, dry Kodak Retouching Colors used in the wet mode caused rapid cyan-dye fading in Ektacolor 74 RC prints, both when the dyes were moistened with a solution consisting of one part water and one part Ektaprint 3 Stabilizer (working solution) and when moistened with just plain water.

In January 1978 Kodak recommended in some of its technical publications that wet-mode application of its dry retouching colors be discontinued:

> We have received reports of customers having difficulties after using Kodak Retouching Colors on prints made on Kodak Ektacolor 37 and 74 RC Papers. This difficulty has been in the form of a red-orange staining in areas retouched by the wet-brush technique as outlined in E–70, *Retouching Ektacolor Prints.*
>
> . . . since all reports have involved the wet-brush retouching technique, we are suggesting that the use of the wet-brush technique be discontinued with Kodak Retouching Colors.[48]

In November 1978 the company announced that, with a modification of the previous wet-brush procedure, Kodak Retouching Colors were safe:

> Tests now indicate that the Kodak Retouching Colors *may* be used successfully in a wet form if the dyes are diluted with a solution of 30 mL of Kodak Rapid Fixer, Part B [the acid hardener] to 970 mL of water. Note: The working solution should be changed daily.[49]

In late 1981 the company introduced Kodak Liquid Retouching Colors, which can be applied with the wet-brush technique without adverse effects on Ektacolor RC images. This author's accelerated tests appear to confirm Kodak's

statements that the liquid colors do not harm Ektacolor images. However, the dry Kodak Retouching Colors are still available for dry-dye retouching.

This author recommends *only* Kodak Liquid Retouching Colors for wet-brush retouching and spotting; other brands should not be used on Kodak Ektacolor or Ektachrome papers because there is no published information on their effects on image-dye stability. When having Ektacolor prints made at a commercial lab, be certain that spotting and retouching are done with the Kodak liquid dyes. Kodak took a rather low-key approach in publicizing the potential problems of its dry colors, and it is likely that not all photographers and retouchers have heard about the problems and may be continuing to use the dry colors in the old wet-brush mode. Kodak's 1987 book *Photographic Retouching,* a detailed and generally well-written publication, is vague on this point.[50]

This author also tentatively recommends Kodak Liquid Retouching Colors for Fujicolor, Konica Color, and Agfacolor papers, as well as for reversal papers such as Fujichrome Type 35 paper, Agfachrome paper, and Ektachrome Radiance paper. Kodak Dye Transfer prints should be spotted and retouched *only* with the *same* dyes with which the prints themselves were made.

Spotting color prints made from transparencies presents a special problem because dust, lint, scratches, and other defects reproduce as dark colors or black, instead of as white or light colors when prints are made from color negatives. To correct defects on prints made from transparencies, opaque colors must be applied. As an alternative, the spot can be bleached and then the proper color built up with color dyes.

For retouching Ilford Ilfochrome (Cibachrome) print materials, Ilford supplies a set of transparent Ilfochrome Retouching Colors; these are said to have stability characteristics similar to those of Ilfochrome images. Other retouching dyes, such as the Kodak products, should not be used with Ilfochrome, nor should the Ilfochrome colors be used with other types of color prints. On request, Ilford will supply instructions for selective bleaching of the dyes in Ilfochrome prints for color control or for subsequent spotting with transparent dyes.

Because of the difficulty in spotting color prints made from transparencies, special effort should be made to clean the transparencies before printing. The previously described liquid-immersion negative carriers can be very helpful in reducing the effects of scratches. Transparencies should never be lacquered or coated with other protective substances unless this is done with materials approved by the film's manufacturer and as a part of original processing in a properly equipped lab. Unless extreme precautions are taken, application of lacquer, 3M Photogard, or other coatings will permanently bond dust and lint to the film (see Chapter 4).

Notes and References

1. Eastman Kodak Company, **Conservation of Photographs** (George T. Eaton, editor), Kodak Publication No. F–40, Eastman Kodak Company, Rochester, New York, March 1985, p. 107.
2. Jacob Deschin, "M.I.T. Starts Archival Photographic Collection," **The New York Times,** April 7, 1968, Sec. II, p. 31. Minor White established the Creative Photography Laboratory at M.I.T. in 1965. The Laboratory was abolished by M.I.T. in 1983, at which time the Archival Photography Collection was turned over to the Department of Architecture. In a statement issued at the opening of the collection, White said, "Until the present time, photographs have been sold to and collected by private individuals and museums, mounted and trimmed, packed and stored with interleaving, more or less carefully, and everyone has been more or less satisfied. Contemporary investigations of the subject of photographic permanence have made it clear that the delicate and sulphur-sensitive photographic emulsion requires special processing and rather elaborate presentation and storage precautions in order to last." The statement continued, "According to the minimum requirements of the new collection, photographs must be fully developed, rinsed in acetic acid stop bath, immersed in two hypo-washes of not more than five minutes each, selenium-toned for protection, washed for up to six hours (when using a wash-shortening preparation, triple the wash time recommended on the bottle), and dried on freshly washed plastic screens. . . . The prints are to be mounted by a narrow paper hinge, top or side, on all-rag stock, such as Strathmore Illustration (light weight) or Bainbridge Museum Stock; finished with a cut-out overmat, also of all-rag stock (no dry mounting) and, to prevent curling, a second fixed and archivally washed piece of unexposed photographic paper should be pasted onto the back of the print with library paste. . . . When prints are offered for the collection, M.I.T. will ask for validated assurance by the photographer that archival processing has been done."
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6. American National Standards Institute, Inc., **ANSI IT9.2-1991, American National Standard for Photography (Processing) — Processed Films, Plates, and Papers — Filing Enclosures and Containers for Storage,** American National Standards Institute, Inc., 11 West 42nd Street, New York, New York 10036; telephone: 212-642-4900; Fax: 212-302-1286.
7. 3M Company, **Product Information — Scotch Brand Adhesives and Tapes Aging Properties,** 3M Publication X–PISA, Professional and Commercial Products Department, 3M Center, St. Paul, Minnesota 55144.
8. Kimberly Scheneck and Constance McCabe, "Preliminary Testing of Adhesives Used in Photographic Conservation," **Topics in Photographic Preservation — Volume Three** (compiled by Robin E. Siegel), Photographic Materials Group of the American Institute for Conservation, 1989, pp. 52–61. Available from the American Institute for Conservation, Suite 340, 1400 16th Street, N.W., Washington, D.C. 20036; telephone: 202-232-6636; Fax: 202-232-6630.
9. Nancy Reinhold, "An Investigation of Commercially Available Dry Mount Tissues," **Topics in Photographic Preservation — Volume Four** (compiled by Robin E. Siegel), Photographic Materials Group of the American Institute for Conservation, 1991, pp. 14–30. Available from the American Institute for Conservation, Suite 340, 1400 16th Street, N.W., Washington, D.C. 20036; telephone: 202-232-6636; Fax: 202-232-6630.
10. Henry Kaska, Eastman Kodak Company, Rochester, New York, letter to this author, January 19, 1983.
11. Henry Kaska, see Note No. 10.
12. Eastman Kodak Company, **Post-Processing Treatment of Kodak Ektacolor Papers,** Kodak Publication No. E–176 ("Reference Information from Kodak"), Eastman Kodak Company, Rochester, New York, July 1984, p. 5.
13. Seal Products Incorporated, 550 Spring Street, Naugatuck, Connecticut 06770-9985; telephone: 203-729-5201; Fax: 203-729-5639.
14. Ademco-Seal mounting and laminating products are manufactured by Ademco-Seal Ltd., Chester Hall Lane, Basildon, Essex SS14 3BG, England; telephone: 011-44-268-287-650.
15. Maurice A. Wilkinson, Technical Development Manager, Seal Products Incorporated, telephone discussions with this author, August 26, 1983 and October 3, 1991.
16. David Vestal, **The Art of Black-and-White Enlarging,** Harper & Row, New York, New York, 1984, p. 188. This is an excellent book on making top-quality black-and-white fiber-base and RC prints.
17. Seal Products Incorporated, advertisement entitled "Edward Weston Preserved," **Art Business News,** July 1984. The ad showed a print of Edward Weston's "Two Shells" ready for mounting with Archival-Mount dry mounting tissue.

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20. Roger Jentink, telephone discussion with Carol Brower, May 16, 1985.
21. 3M Company, see Note No. 7.
22. Seal dry mounting presses are manufactured by Seal Products Incorporated, 550 Spring Street, Naugatuck, Connecticut 06770-9985; telephone: 203-729-5201; Fax: 203-729-5639. Ademco dry mounting presses are manufactured by Ademco-Seal Ltd., Chester Hall Lane, Basildon, Essex SS14 3BG, England; telephone: 011-44-268-287-650. Bogen dry mounting presses are distributed by Bogen Photo Corporation, 565 East Crescent Avenue, Box 506, Ramsey, New Jersey 07446-0506; telephone: 201-818-9500.
23. Precision four-bladed enlarging easels are available from The Saunders Group, Inc., 21 Jet View Drive, Rochester, New York 14624; telephone: 716-328-7800 (800-828-6214); and from the Kostiner Division of Omega/Arkay, 191 Shaeffer Avenue, P.O. Box 2078, Wesminister, Maryland 21158; telephone: 410-857-6353 (800-777-6634).
24. Tempil Division, Big Three Industries, Inc., Hamilton Boulevard, South Plainfield, New Jersey 07080; telephone: 908-757-8300.
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26. Suitable gummed cloth tape is available from several sources, including: Talas Inc., Ninth Floor, 213 West 35th Street, New York, New York 10001-1996; telephone: 212-736-7744; and Light Impressions Corporation, 439 Monroe Avenue, Rochester, New York 14607-3717; telephone: 716-271-8960 (toll-free outside New York: 800-828-6216; toll-free inside New York: 800-828-9629).
27. 3M Company, Professional & Commercial Products Dept., 3M Center, St. Paul, Minnesota 55144; telephone: 612-733-1110; toll-free outside Minnesota: 800-328-1600.
28. Merrily A. Smith **et al,** see Note No. 25, p. 105.
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31. Filmoplast and Gudy O products are manufactured by Hans Neschen, P.O.B. 1340, D–4967 Buckeburg, Germany. In the U.S., the products are distributed by Filmolux (U.S.A.), Inc., 39 Comet Avenue, Buffalo, New York 14216; telephone: 716-873-3480. The products are sold at retail by: Talas Inc., Ninth Floor, 213 West 35th Street, New York, New York 10001-1996; telephone: 212-736-7744; and by: Light Impressions Corporation, 439 Monroe Avenue, Rochester, New York 14607-3717; telephone: 716-271-8960 (toll-free outside New York: 800-828-6216; toll-free inside New York: 800-828-9629).
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33. Ansel Adams, see Note No. 3, p. 156.
34. Sanford Corporation, 2711 Washington Blvd., Bellwood, Illinois 60104; telephone: 708-547-6650.
35. Fast-drying stamp-pad inks and ink remover for RC papers may be obtained from Bunny West Shepherd, BWS Enterprises, 924 Huntington Drive, San Marino, California 91108; telephone: 818-570-1011. Another ink recommended by Kodak is Kodak No. 85 Ink (Black) and solvent for Eastman Visible Edge Numbering Machine, Eastman Kodak Company, 343 State Street, Rochester, New York 14650; telephone: 716-724-4000.
36. The Mark II RC–1000 Stamp Pad System is available in any of four colors for about $30 from Wess Plastic, Inc., 70 Commerce Drive, Hauppauge, New York 11788-3936; telephone: 516-231-6300; Fax: 516-231-0608.
37. Rexton Series–3 stamp-pad ink for RC prints, which is said to dry in about 3 seconds at room temperature, is available from Rexton International, P.O. Box 412, Collingswood, New Jersey 08108; telephone: 215-533-5148.
38. Jackson Photomark fast-drying stamp-pad inks for RC papers, ink solvent (serves as ink remover and stamp-pad re-activator), and special pre-inked Mark II "air-tight" stamp pads ($16), rubber stamps, and related supplies are available from Jackson Marking Products Co., Brownsville Road, Mt. Vernon, Illinois 62864; telephone: 618-242-1334; toll-free outside Illinois: 800-851-4945. Six Photomark ink colors are available: black, red, blue, green, purple, and brown (this author recommends black ink). On request, Jackson will send a catalog.
39. Staticmaster products, NRD, Inc., Staticmaster Division, 2937 Alp Blvd., Grand Island, New York 14072; telephone: 716-773-7634.
40. 3M Company, Static Control Systems Division, 6801 Riverpace Blvd., Austin, Texas 78726-9000; telephone: 512-984-1200; Cumming Corporation, 9620 Topanga Canyon Place, Chatsworth, California 91311; telephone: 818-882-0551; Kinetronics Corporation, P.O. Box 6178, Sarasota, Florida 43278; telephone: 813-388-2432; toll-free outside Florida: 800-624-3204.
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