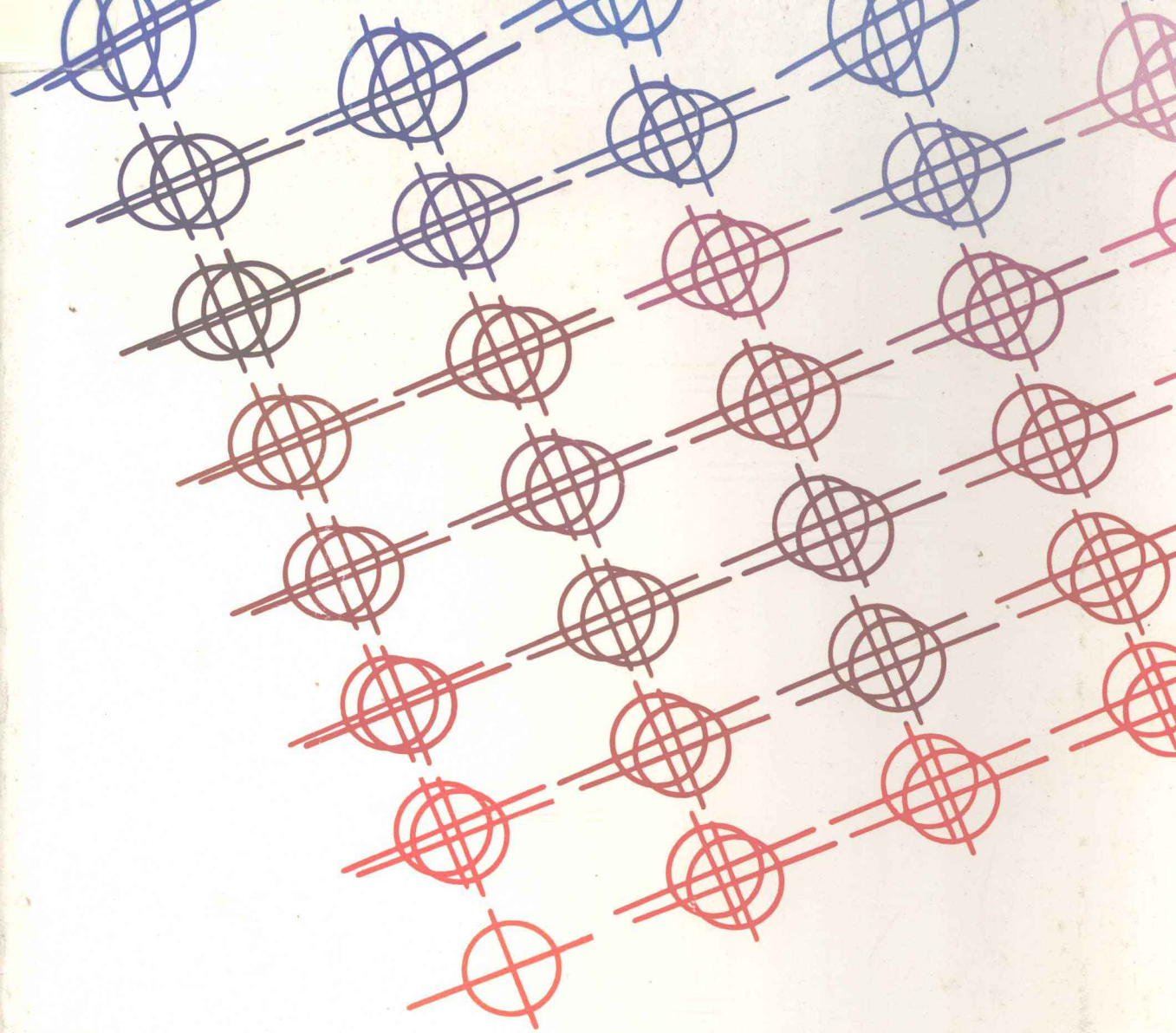

STRIPPING: THE ASSEMBLY OF FILM IMAGES

GATF Graphic Arts Technical Foundation

Stripping: The Assembly of Film Images

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Foreword

Stripping: The Assembly of Film Images provides a well-detailed description of the process called "stripping" or "film assembly." This second edition has been carefully reviewed by several GATF specialists. No effort was spared by the author and GATF's staff to make this the most useful, authoritative book on stripping. The book is made even more valuable when it is used in conjunction with GATF's extensive series of Learning Modules on film contacting, signature imposition, and film assembly.

The author of this book has worked in the areas of prepress and camera supervision and as a stripper and stripping instructor, supervisor, consultant, and writer. He worked for many years for companies such as R. R. Donnelley & Sons, Standard Publishing, and United Color Press of Dayton.

Thomas M. Destree
Publications Editor

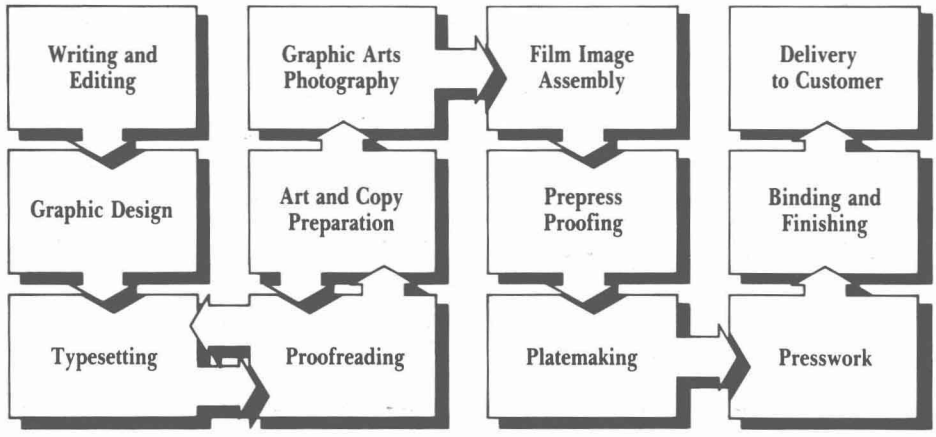
Contents

1 Introduction

Printing is the mechanical impression of ink images onto the surface of paper or other materials at generally high levels of speed, volume, and quality. The relative degrees of these characteristics vary somewhat with the class of printed product and with the printing process used.

All printing processes start with the original written and/or pictorial matter to be reproduced and proceed through stages to the output of printed products. The original written matter, called **manuscript** (or, sometimes, **copy**), is most commonly typewritten, although it may be in handwritten or other form. Original pictorial matter may be diagrams, drawings, paintings, photographs—almost any kind of **art.** The resulting product may be newspapers, books, magazines, packages, advertising brochures, catalogs, calendars, maps, art reproductions, business forms, or some other of a wide variety of printed materials. This variety accounts in part for the rise and continuing usefulness of several different methods of printing, or **printing processes.**

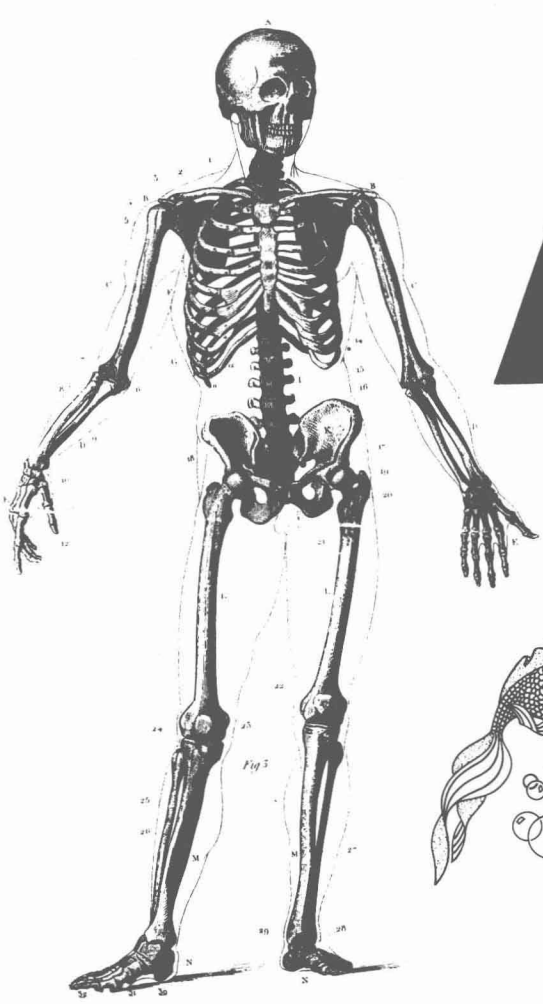
Producing a printed piece

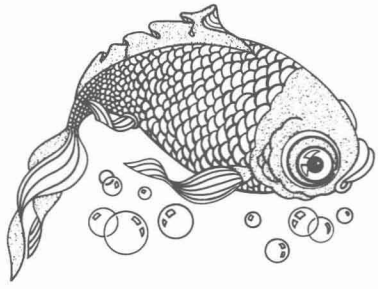


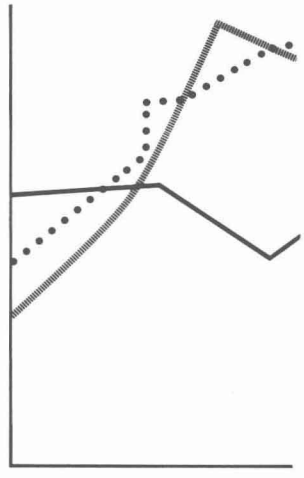
In the progression from original materials to printed reproductions, there are certain general stages common to all processes. First, the original materials must be converted and assembled into printable form. This group of operations may be called the **preparatory stage.** For example, the written matter must be **typeset**—rendered in standardized printing type forms—and the illustration matter generally requires various photographic conversions, such as enlargement or reduction. The arrangement of these different elements exactly as they will appear in the printed piece must be established.

Second, means for transferring the desired images onto the

Line images







surfaces of paper or other material must be created. These **image carriers,** which once were mainly assemblies of metal type held rigidly into forms, are now commonly flat or cylindrical plates that hold ink only on their image areas for transfer to the paper. (Since paper is not the only material printed upon, a more general term sometimes used is **substrate.**) When the image carriers are plates, as is usually the case, this stage is called **platemaking.**

Third, the plates are mounted in a press and successively inked and pressed onto paper. This stage is usually called **presswork.** The pressrun is of course only a part of the total printing production process, but is so central to it that this operation alone is sometimes referred to as "printing."

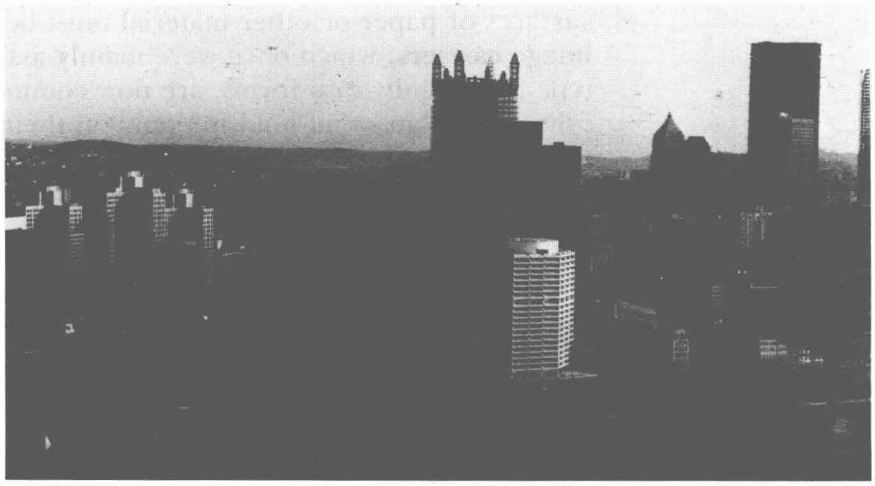
Fourth, the printed material generally needs some kind of completing operations, such as folding; trimming; assembly of sections; binding by means of sewing, wire stitching, or gluing; diecutting; and gold stamping. These may be summarized as **finishing operations,** or "binding and finishing."

Images

The images of *original artwork* as they come to the printer are of various kinds. An important distinction from the viewpoint of graphic reproduction is whether they are *single-tone* images or *variable-tone* images. The simplest image type is the single-color, uniformly solid-tone image. Most commonly (but not necessarily) black, the image contrasts strongly with the nonimage background, often white. It is called a **line image.** The distinction between the image and nonimage areas is sharp. Typical original-material line images are the characters of the manuscript written with pen or typewriter, pen-and-ink drawings, and line diagrams. Although the solid black image on a white surface is the most usual type, any sharply defined shape of a uniform tone on a contrasting background of uniform tone is a line image—e.g., a solid chalk mark on a blackboard.

A second kind of image frequently encountered in original material is one in which the image tones vary in darkness continuously (sometimes gradually and sometimes sharply) from one part of the image to another. This type is called a **continuous-tone image.** Here there is usually no sharp distinction, if any, between "image" and "background." The contrast is between the varying tones of the image. Examples are photographs, pencil drawings with lighter and darker shadings, charcoal drawings, and paintings. Continuous-tone images present special problems for printing reproduction.

Continuous-tone image (simulated)

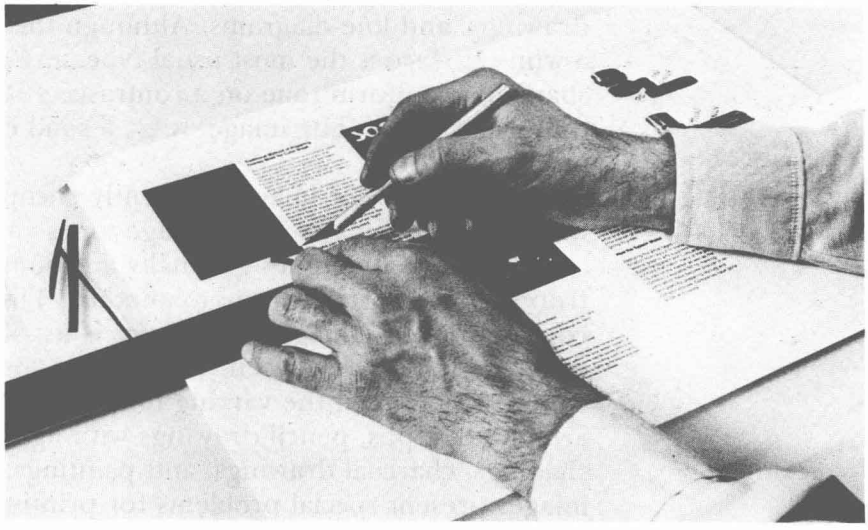


Another distinction in kinds of images in original materials is based on whether the image is viewed by light reflected from the surface, as a drawing or photograph on paper, or by light passing through the material on which the image exists, as a color transparency. The first type is called a **reflection image,** and the second, a **transmission image.**

Assembly of Reflection Images

During the preparatory stage, the different image elements are arranged exactly as they will appear on the printed piece. Reflection line images are assembled onto a stiff substrate during **paste-up.** Hence, this assembly is called a **paste-up,** or a **mechanical.** The paste-up artist assembles only line images on the mechanical.

A paste-up, or mechanical, with solid mask placed wherever *simulated* continuous-tone image will print



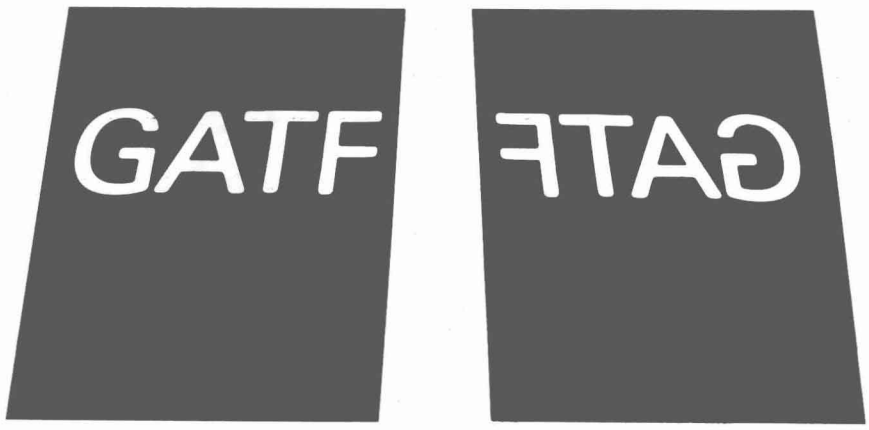
Continuous-tone images cannot be reproduced by most printing processes; rather, the continuous-tone effect must be simulated. The paste-up artist indicates the position of continuous-tone images on the mechanical. A common method is to position a solid red or black mask where the *simulated* continuous-tone image will print. (The solid mask is a *line image.*)

Photography

Reproduction photography is used to create necessary intermediate images between the original materials and the printing plate or other image carrier. In this application, photography helps convert the original material into a form usable for making image carriers.

In addition to enlarging or reducing the size of the image, reproduction photography converts original material into other types of images, and these require some additional definitions. First is the distinction between positive and negative images. **Positive images** are those whose tonal differences from one part to another vary in the same direction as those of the corresponding parts in the original (or those in the ultimate printed reproduction), although not necessarily in the same degree. Dark parts in the image correspond with dark parts in the original, light parts with light, and intermediate tones correspond similarly. **Negative images** reverse the tonal values, representing darker areas with lighter tones and vice versa. A positive transmission image on film is called a **film positive,** or simply a **positive.** Likewise, a negative transmission image on film is called a **film negative,** or a **negative.**

Another distinction is between right-reading and wrong-reading images. This distinction refers to a reversal in the



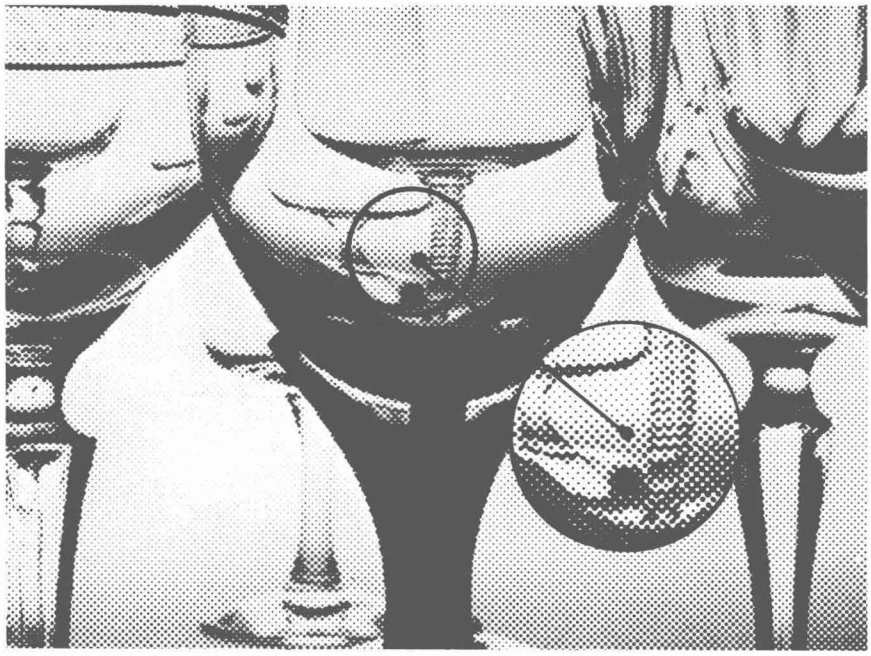
Right-reading negative image *(immediate left)* and wrong-reading negative image

relation of parts of an image ("orientation") such as that caused by mirror reflection or by viewing from behind an image that is on a transparent base. The orientation of material as it is on the original, or as it is to be printed, is called **right-reading. Wrong-reading** material is the mirror image of right-reading material. These terms apply to all images whether there is any written or type matter included.

Another type of image produced photographically is required because of limitations of certain printing processes. This type is called a "screened image" because it is produced with a special device, a screen. The most common type of screened image compensates for the fact that most printing processes lay down ink films of uniform thickness on all image areas, and therefore these printing processes cannot produce true variable-tone images. Just as pen-and-ink drawing approximates continuously variable tone by means of such techniques as cross-hatching, so printing closely approximates the tonal characteristics of photographs and continuous-tone images by means of tiny dots or lines produced from continuous-tone materials by a photographic conversion process.

The most common of such solid-tone representations of continuous tone, called **halftone,** consists of a regular pattern of fine marks, usually dots equally spaced center to center, but

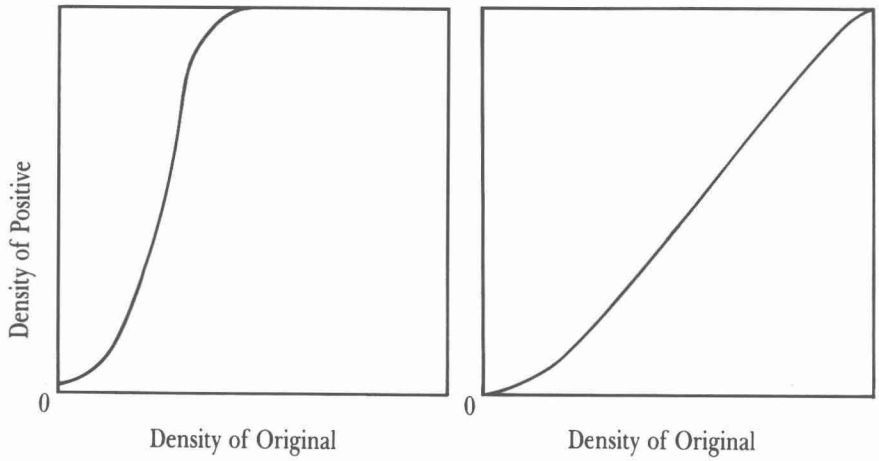
Halftone image (enlarged detail)



varying in size. Because the dot pattern is so fine (having thousands of dots in a relatively small area), it presents the illusion of continuous tone when seen from a normal viewing distance. Areas containing larger dots look darker. The biggest dots run together so that there are only tiny white dots between them, or even no white space at all.

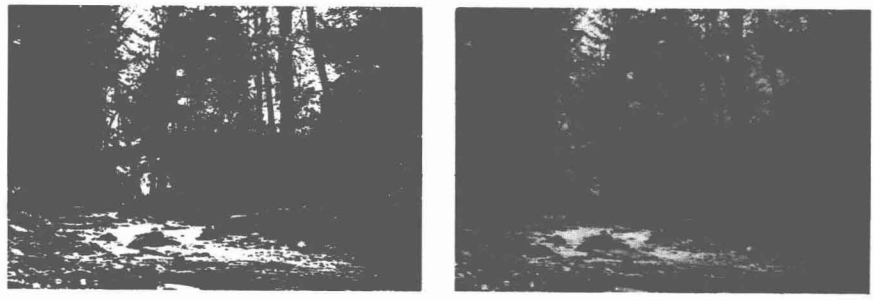
Line and continuous-tone images must be photographed separately because different techniques are used to produce the final film intermediates. Line images are reproduced using film that maintains the contrast between image areas and the background; the resulting intermediate is a **high-contrast** negative or positive. Areas masked in red or black on the paste-up will photograph the same as a type image does. On a negative, then, the areas corresponding to line images will be clear, like the type; on a positive, dense black. Continuous-tone images are also reproduced using a high-contrast film, but the screen placed over the film during exposure changes the *continuous-tone* images into *line* images composed of dots. This conversion of continuous-tone images into transmission line images permits the later assembly of film images.

Reproduction curves of continuous-tone image reproduced using high-contrast (*left*) and normal-contrast film



Continuous-tone image reproduced using high-contrast film (*left*) and high-contrast film and halftone screen

Notice the loss of detail in the first image.



A continuous-tone *color* image must be separated into four film halftones in order to be printed by most printing processes. Each halftone is made at a different halftone-screen angle through a different color filter and is printed in a different process color. The red-filter separation prints cyan ink, the blue-filter separation prints yellow ink, and the green-filter separation prints magenta ink. The separation to print the fourth ink, black, is made using various filters or filter combinations. Almost all colors can be reproduced by the proper blending of these four inks. The color filters transmit only certain wavelengths of light; hence, they selectively separate colors relative to their densities in the original. This process is called **color separation.** The set of color-separation halftones are color-corrected and proofed for color accuracy before being forwarded to the next step in the preparatory stage—film assembly.

Film Image Assembly

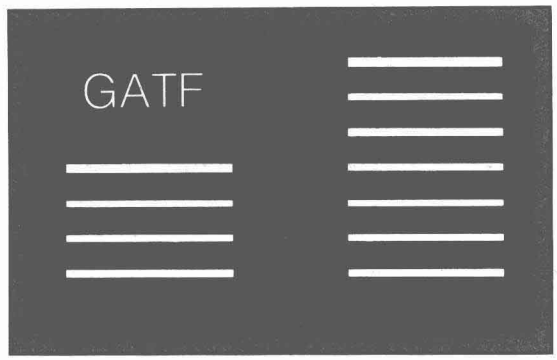
Film image assembly, or **film assembly,** the last part of the preparatory stage before the production of image carriers, is the process of taking the films that carry sections of printing images and arranging and/or modifying them so that printing plates (image carriers) can be made from them. The importance of photography in printing has made film assembly a vital part of the process.

Traditionally, film assembly has been called "stripping." But this word no longer accurately describes the process. (Formerly, the stripper would strip film emulsions from a glass plate.) Today, it is primarily a process of *assembling* imaged films and is more correctly called "film image assembly"; the shorter term "film assembly" is used in this book. The traditional term "stripper," rather than "film image assembler" or "film assembler," is used in this book when referring to the person who does film assembly.

Film assembly differs slightly for each of the printing processes. However, because there are more similarities than dissimilarities, film assembly can be described as a general process, including both assembly and associated functions.

The assembly process, in its simplest form, involves the taking of films and putting them in specific positions in a carrier called a **flat** (**cab** in gravure). A **negative film flat** consists of a base of paper or plastic into which openings (**windows**) are provided for the film negatives. The paper or plastic is of such a color that it blocks the transmission of actinic (image-forming) light. In this way, only the clear areas on the

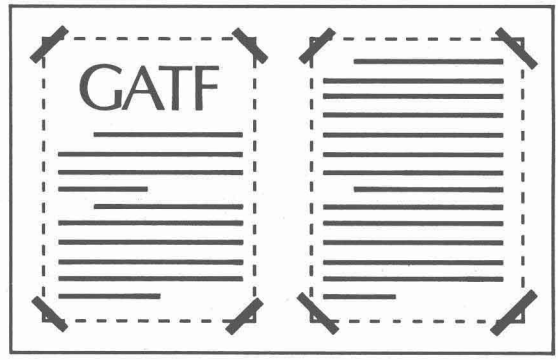
Negative film flat, with film negatives mounted on an opaque carrier sheet into which openings are cut



film will appear as images on a negative-working printing plate. The films that are inserted include the film negatives of line and halftone images (continuous-tone images in some forms of gravure) and also negatives of marks that will be used for guidance during press and finishing operations.

A **positive film flat** consists of a clear plastic base upon which film positives are assembled. This flat is exposed to a positive-working plate; the areas that are clear on the flat will be nonimage areas on the plate, and the opaque areas become image areas. Therefore, it is how the image carrier reacts to light that determines if film negatives or film positives are used for film assembly.

Positive film flat, with film positives mounted on a transparent base



During film assembly, provisions must be made for later positioning of the flat on the plate, for locating the plate on the printing press, for determining the register between colors, and for facilitating the finishing of the printed material.

Film assembly falls into two broad categories: single-color and multicolor. **Single-color film assembly** is the assembling of negatives or positives containing line images, halftones, tints, or solid areas that will be printed in one color and that do not require exacting register of images. For simple jobs, all the

films can be assembled on one flat. However, when the images to be printed in a single color are complex, they may be separated into two or more flats. These flats are called **complementary flats** because they are used to expose the same printing plate. Complementary flats are used whenever it is troublesome to splice film images together due to the closeness of the images. Complementary flats also permit the positioning of one image over another image on the printing plate; these images are assembled in register.

Multicolor film assembly usually requires at least one film flat for each printing color, because each color is printed from a separate plate. If the images to be printed are widely separated, one flat can be used for all printing colors by exposing only selected areas of the flat to the appropriate image carrier; flat, or **masking,** material covers the remaining areas of the flat. The more common situation is to have one flat or a set of complementary flats for each color. A reference, or **key,** flat is assembled first. All other flats for the multicolor job are assembled in register to it or to a blue translucent proof of it. For process-color film assembly, the color separation halftones, or **printers,** are provided to the stripper with register marks to aid in the registration of the different images. (Most color images are assembled into position *after* separation. In a technique called **emulsion stripping,** the base of reproduction-size transparencies is chemically removed and the remaining emulsions are "stripped" into a page format. Then, this assembly is color-separated, resulting in one set of separations per page instead of many. This technique is appropriately called "stripping.")

Arriving at the final flats can take many routes. If multiples of a single image are required, they can be made photographically and assembled into a flat, or one image can be assembled into a flat and the other images produced by exposing that one image in different places on the printing plate. This latter procedure for making multiple images is called **step and repeat;** the machine used is called a **step-and-repeat machine,** or **photocomposing machine.** Another way of arriving at the final flat is to contact-print complementary flats into a single film, a **composite.** Although an additional step, the production of a composite flat reduces the number of exposures made to the image carrier. Sometimes, it is just not good enough to assemble multicolor flats in register. Even the most accurate printing press has variations in register from sheet to sheet. With images (other

than color separations) printing in the same area, the intentional overlapping of images by changing their relative line thicknesses photographically can compensate for register variations on press.

Film Assembly and the Printing Processes

The transfer of an image from a plate, or image carrier, to a substrate influences the procedures followed during film assembly. Each printing process has different requirements: the method of image transfer varies, and the nature of the image carriers is different.

Film assembly for all printing processes is governed by similar press-related factors. The most important factor is the maximum image area printed by a particular press. The width and circumference of the press cylinders affect the size. However, sometimes the cylinder has a nonprinting gap for locking up plates; this reduces the maximum printing size. If the press is sheetfed, a provision for paper grippers also decreases the size of the printable area. Another factor affecting film assembly is the ability of the press to consistently register images from sheet to sheet. Depending on the accuracy of the printing press, the film image may have to be overlapped more or less to get proper image fit on press.

Also affecting film assembly is the placement of multicolor images on the printing substrate. Optimally, all multicolor images should be near the leading edge of the substrate to get the best register. If multicolor images are to be printed near the trailing edge, the tail of the film flat must be controlled using pin register during film assembly to lessen "tail-end whip," the undesirable movement of the tail of the flat.

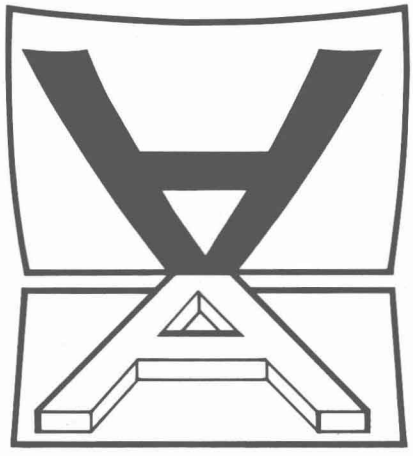
Yet another press factor affecting film assembly is the placement of solids. Solids should be placed in such a manner on the film flat that they receive an adequate supply of ink from the press. If the ink supply has been depleted by other areas of the substrate and not adequately replenished to the plate, ghosting (a light image in large shadow or solid areas) can result.

Letterpress Printing

Letterpress, a relief printing process, requires an image carrier in which areas are physically raised above nonimage areas. Ink is applied to the entire image carrier but adheres only to the image areas, which are in relief. A printing press squeezes the substrate and image carrier together, transferring the inked image to the substrate.

The two major kinds of relief printing are letterpress and

Letterpress, or relief printing



flexography. Letterpress originally used movable wooden then metal types assembled into type forms. Later, unit printing plates were made, initially by some molding process, and increasingly by photochemical means. Advancements in image carriers permitted the widespread use of photography, and film assembly, in the preparation of image carriers. Flexography, an offshoot of letterpress, is characterized by flexible plates and fluid, fast-drying ink. It is used principally in packaging, where it prints from a wide variety of rolled stocks.

In most forms of letterpress and flexographic printing, the image is transferred directly from the plate to the substrate. Therefore, the printing plate is wrong-reading.

Gravure Printing

Gravure, an intaglio printing process, requires an image carrier in which the image areas are recessed (engraved) into a flat or curved metal surface, often copper. The image is actually made up of thousands of tiny depressions, or wells, or **cells.** (In conventional gravure, the cells are of the same surface area but of different depths to produce variable tone. In halftone gravure, the surface area also varies.) Ink is applied to the entire image carrier. Then, a doctor blade scrapes the surface clean but leaves ink in the thousands of cells. When the image carrier and substrate are squeezed together, the ink is drawn out of the cells by capillary action and transferred to the substrate.

If the image carrier is cylindrical, which it nearly always is nowadays, the process is called **rotogravure** and the image carrier is called a **printing cylinder.**

Printing cylinders for gravure are prepared photochemically or mechanically, using an automatic engraving machine. In the