The Atlas of Analytical Signatures of Photographic Processes

COLLOTYPE

Dusan C. Stulik | Art Kaplan

The Getty Conservation Institute

The Getty Conservation Institute works internationally to advance conservation practice in the visual arts—broadly interpreted to include objects, collections, architecture, and sites. The GCI serves the conservation community through scientific research, education and training, model field projects, and the dissemination of the results of both its own work and the work of others in the field. In all its endeavors, the GCI focuses on the creation and delivery of knowledge that will benefit the professionals and organizations responsible for the conservation of the world's cultural heritage.

The Getty Conservation Institute
1200 Getty Center Drive, Suite 700
Los Angeles, CA 90049-1684
United States
Telephone: 310 440-7325
Fax: 310 440-7702
Email: gciweb@getty.edu
www.getty.edu/conservation

The Atlas of Analytical Signatures of Photographic Processes is intended for practicing photograph conservators and curators of collections who may need to identify more unusual photographs. The *Atlas* also aids individuals studying a photographer's darkroom techniques or changes in these techniques brought on by new or different photographic technologies or by the outside influence of other photographers. For a complete list of photographic processes available as part of the *Atlas* and for more information on the Getty Conservation Institute's research on the conservation of photographic materials, visit the GCI's website at getty.edu/conservation.

ISBN number: 978-1-937433-07-9 (online resource)

Front cover: *Dunstable Priory* (detail), 1926. Collotype print. Printed by Waterlow & Sons Ltd., London, Dunstable & Watford.

CONTENTS

COLLOTYPE

English: collotype (Albertype, Albert-type, artotype, phototint, photogelatin, hydrotype, ink-photo, autogravure, etc.)
French: *phototypie*
German: Lichtdruck

HISTORICAL BACKGROUND

The name *collotype* is derived from the Greek word *kola* ("glue"). *Collotype* designates printing from a gelatin surface in a lithographic manner. The basic principle of the collotype process (a photographic example of which is shown in fig. 1) was invented by Alphonse-Louis Poitevin (French, 1819–1882) in 1855, with early application of the process demonstrated by F. Joubert in 1859. The most important improvements were introduced in 1868 by Joseph Albert and Jakub Husnik.

The collotype process is a screenless photomechanical process that allows high-quality prints from continuous-tone photographic negatives. The process uses heat and cold water–treated dichromate-sensitized gelatin—which tends to reticulate—to create a random surface

Figure 1 *Dunstable Priory*, 1926. Collotype print. Printed by Waterlow & Sons Ltd., London, Dunstable & Watford.

micropattern. When exposed to UV light under a negative, the surface micropattern hardens and becomes more hydrophobic under light areas and remains more hydrophilic under dark areas of the negative. Because oil and water do not mix well, the areas of the pattern receiving more light exposure hold more ink than the less hardened, more hydrophilic areas of the less exposed gelatin surface. The resulting collotype matrix can then be inked and printed using a standard flatbed or rotary graphic press.

The general idea of collotype printing was proposed and patented by Poitevin in 1855. In 1859 Joubert succeeded in printing an early version of a collotype that was included in the June 1860 issue of *The Photographic Journal*. In 1865 C. M. Tessie du Motay and C. R. Marechal demonstrated their modification of the collotype process using a copper plate as the substrate for a gelatin collotype matrix. Problems with the adhesion of the gelatin to the copper substrate limited successful print runs to no more than 100 prints. The problem was solved in 1868 by Joseph Albert and Jakub Husnik, who succeeded in applying a thin layer of a dichromate-sensitized gelatin-albumen mixture to a thick glass substrate by light exposure through the substrate. This well-bonded "subbing layer" was then coated with sensitized gelatin. Albert and Husnik's process allowed for print editions of up to 1,000. Even though effective, the complicated, time-consuming process of light exposure through glass was later abandoned and replaced with a subbing layer made of a mixture of albumen and soluble sodium silicate (known also as soluble glass, or waterglass) that did not require light exposure. This preparation of a gelatin layer also allowed the replacement of the heavy, fragile glass by a thin sheet of aluminum (August Albert, 1896) and later by cellophane foil. Joseph Albert also introduced higher-speed rotary collotype printing in 1873. In subsequent years a number of workers and researchers introduced different improvements and variants of the collotype process (artotype, heliotype, hydrotype, photogelatin, phototype, etc.).

In 1874 Joseph Albert introduced the three-color collotype process using continuous separation negatives. To achieve a "real photograph" look and feel, collotype prints for the mass market were often varnished using shellac, a gelatin coating, or a combination of both. Later, several hybrid variants of the collotype process were introduced, which made identification of collotype prints more challenging and often confusing. The Aquatone process, patented in 1922 by Robert John, used a halftone negative in the preparation of an aluminum collotype cylinder plate. The Aquatone prints were then printed by offset lithography. The similar Optak process, announced in 1946, was later modified for duotype printing by Edward Stern in 1951. The Triton process, which combined the collotype process with the metal surface grain of a metal plate and offset printing from inked albumen images, was developed in 1955 for the US Air Force. The process allowed for the creation of up to 10,000 high-quality prints from aerial photographs.

Several attempts have been made to replace the gelatin of the collotype process with newly available synthetic polymers (polyvinyl alcohol, polyacrylamide, polyvinyl-pyrrolidine, etc.). These attempts focused on creating more durable printing surfaces and longer print runs but proved unsuccessful, leaving gelatin as the favored material of practicing collotypists.

Regardless of the improvements and modifications, the collotype process remained technologically challenging and expensive. As such, it was quickly replaced by high-resolution, halftone offset printing, which was faster and cheaper, and its use was narrowed to specialty printing. As of 2010 only a few collotype print facilities still existed worldwide.

Figure 2 shows a historical timeline of the collotype process.

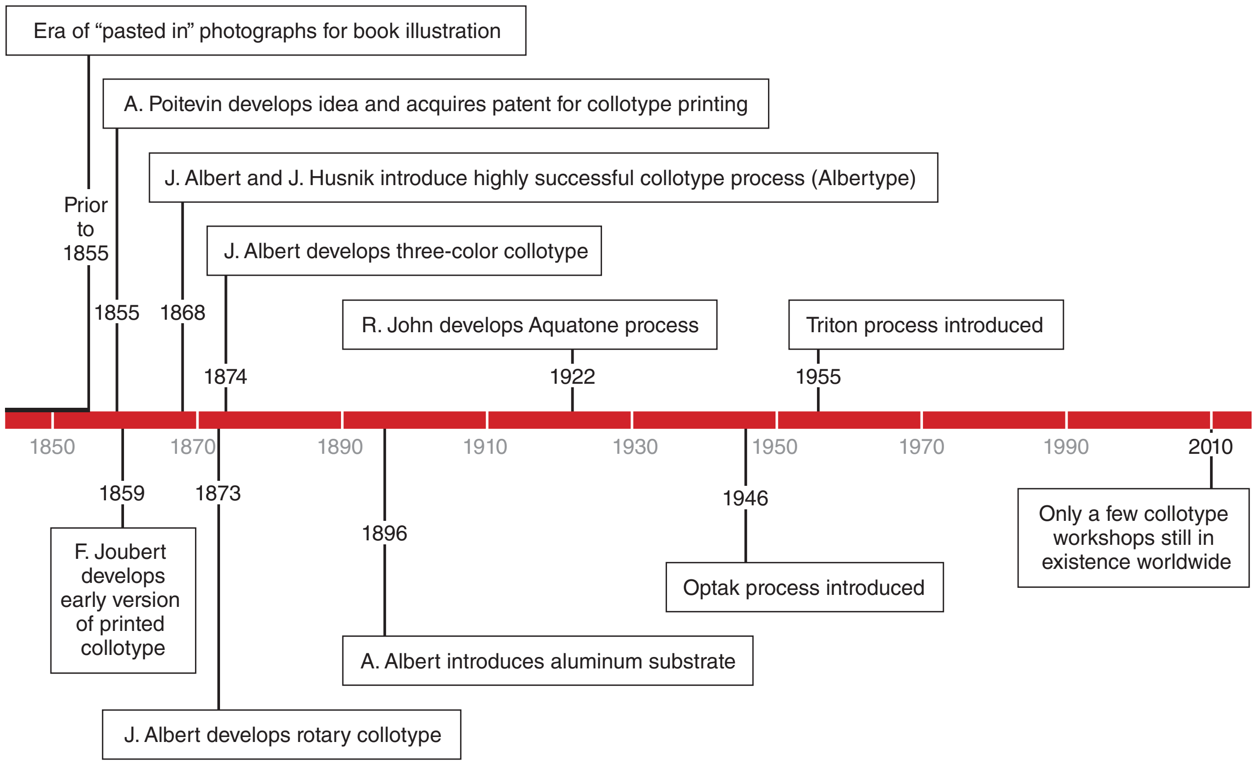


Figure 2 Timeline of the collotype process.

Process Description

The basic collotype process includes the following steps:

1. Glass or another substrate material is coated with a subbing albumen-sodium silicate solution, followed by light exposure to adhere the layer to the substrate.
2. The prepared substrate is coated with a thin layer of sensitized gelatin.
3. The sensitized gelatin is heat treated in a dark environment at 50–52 °C for no longer than 2–3 hours.
4. The heat-treated sensitized plate is exposed to daylight or UV light in contact under a reversed negative (not required with an offset printer) in a copy frame.
5. The exposed collotype plate is soaked in a cold water bath (16 °C) to remove excess dichromate.
6. The washed collotype plate is blotted and dried without the use of heat. (Curing of the gelatin layer in a cold place for 24 hours is often recommended.)
7. The cured collotype plate is soaked in a slightly acidic water/glycerin mixture.
8. The blotted plate is inked with an oil-based collotype ink using leather or velvet rollers. Collotype ink is similar to lithographic ink but has a stiffer consistency. Some printers use inks of two consistencies.
9. Collotypes are printed on rotary or offset presses on a preferably smooth paper using less pressure than in intaglio or lithographic presses.

Figure 3 shows a schematic cross section of a typical collotype print.

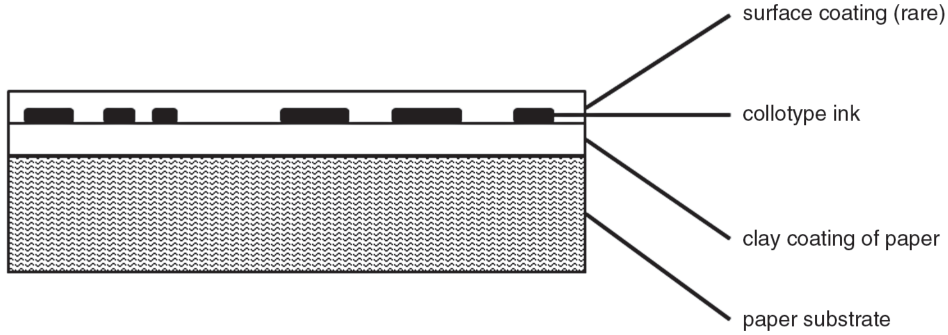


Figure 3 Schematic cross section of a typical collotype print.

Main Application of the Collotype Process

The collotype process was used for short-run printing editions from photographic negatives. Collotypes were also used for the reproduction of artwork such as pencil and crayon sketches, and for the production of greeting cards, catalog illustrations, advertising displays, and posters. Many early picture postcards were printed using this process.

Noted Photographers Using the Collotype Process

Unlike the photogravure, the collotype process was considered a photograph reproduction process. Only a limited number of photographers used the collotype as their main photographic medium. In the 1970s the photographer Todd Walker used a grant from the National Endowment for the Arts (NEA) to create an original body of art photographs using the collotype process as his primary medium.

Bibliography (by date)

Edwards, E. 1874. *The Heliotype Process*. London: Heliotype.

Vidal, L. 1879. *Traité pratique de phototypie, ou l'impression a l'encre grasse sur une couche de gélatine*. Annales de la photographie. Paris: Gauthier-Villars.

Fithian, A. W. 1902. *Practical Collotype*. London: Iliffe, Sturmey.

Collotype-Related Patents

Alphonse Poitevin, French Patent 24,592 (Aug. 27, 1855)
Alphonse Poitevin, English Patent 2,816 (Dec. 13, 1855)
E. Edwards, English Patent 3,543 (Dec. 8, 1869)
P. A. Despaquis Bolinetto, English Patent 3,947 (Nov. 17, 1874)

IDENTIFICATION: COLLOTYPES

Visual Signatures

Visual Characteristics

To the untrained eye, a collotype print looks like a black-and-white photograph (fig. 4). When left unvarnished, a collotype has a velvety matte appearance. Because of its irregular microstructure pattern, the collotype—unlike halftone screen processes—does not tend to create so-called moiré patterns when scanned.

In the late nineteenth century, printers also produced collotype photographs that resembled older albumen photographs. This could be achieved by using a black-violet printing ink that had an appearance very close to that of gold-toned albumen prints. These images were often printed on coated paper for higher glossiness or coated with varnish (fig. 5).

Figure 4 Collotype printed using black ink to resemble a matte black-and-white photograph.

Figure 5 Collotype printed using black-violet ink to resemble a gold-toned albumen photograph.

Microscopic Characteristics

The most important tools for the identification of collotypes are a powerful loupe (15×–20×), handheld microscope, or laboratory-grade stereomicroscope. Under higher magnifications, the image looks like it is made up of tiny polygon or wormlike structures. Individual polygons vary in size, but on average they are about 0.10–0.15 mm across. Figures 6a–6i show the structure of a typical collotype "grain" recorded in the light (Dmin), midrange (Dmid), and dark (Dmax) areas of the image in figure 5 at three magnifications.

Figure 6a Microscopic structure of the Dmin area of the collotype print in fig. 5 at 10×.

Figure 6b Microscopic structure of the Dmin area of the collotype print in fig. 5 at 25×.

Figure 6c Microscopic structure of the Dmin area of the collotype print in fig. 5 at 40×.

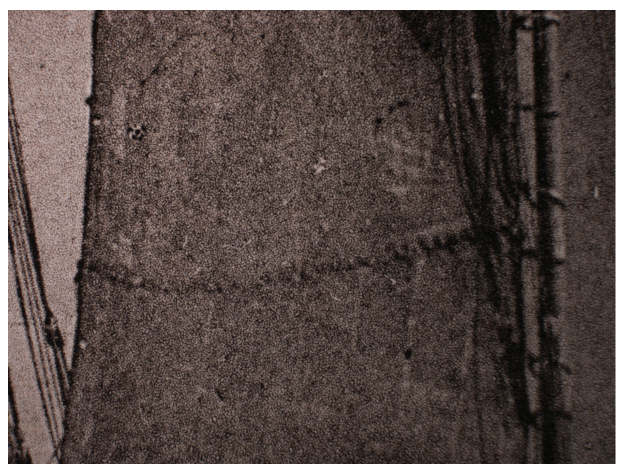


Figure 6d Microscopic structure of the Dmid area of the collotype print in fig. 5 at 10×.

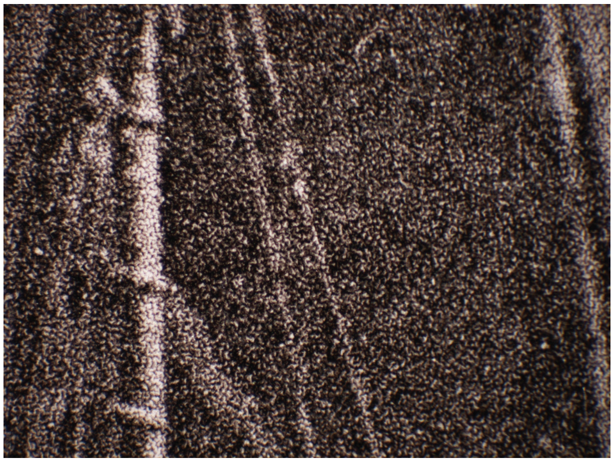


Figure 6e Microscopic structure of the Dmid area of the collotype print in fig. 5 at 25×.

Figure 6f Microscopic structure of the Dmid area of the collotype print in fig. 5 at 40×.

Figure 6g Microscopic structure of the Dmax area of the collotype print in fig. 5 at 10×.

Figure 6h Microscopic structure of the Dmax area of the collotype print in fig. 5 at 25×.

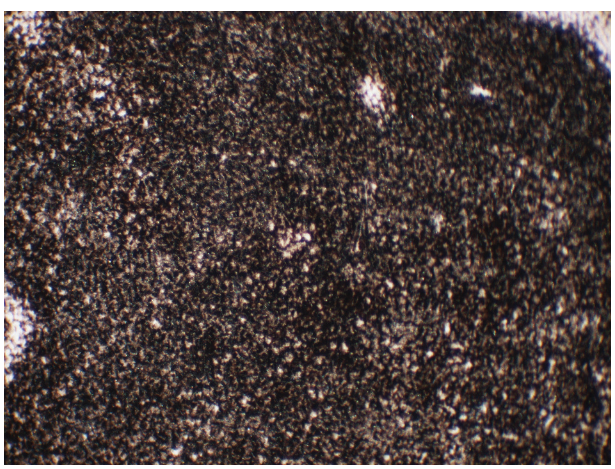


Figure 6i Microscopic structure of the Dmax area of the collotype print in fig. 5 at 40×.

Analytical Signatures

XRF and ATR-FTIR Analysis

Besides providing a negative analytical signature indicating the absence of silver and sorting the image to the nonsilver category, XRF analysis does not provide any clear analytical signatures of collotypes. XRF analysis is not necessary because the microscopic signatures of the collotype process are clear enough for process identification. XRF analysis might provide some information on inorganic pigments present in printing inks. The XRF and vacuum XRF analysis can also provide information needed for identification of inorganic materials used in the substrate.

Figure 7a shows an Albertype print made using a dark-green printing ink; figures 7b and 7c display the results of combined XRF and ATR-FTIR analysis. Figure 8a shows an Albertype print of light-brown tonality; figures 8b and 8c indicate the results of the same type of analysis performed on this print.

FTIR

Similar to XRF analysis, ATR-FTIR analysis cannot provide clear analytical signatures of the collotype printing process. A great value of the use of ATR-FTIR analysis is its ability to detect and identify the presence of varnish or surface coatings.

Varnished and Coated Collotypes

To achieve the look of real photographs, some collotype prints were coated with different types of varnishes. The most common was a shellac varnish. Figure 9 shows a pre-1889 collotype printed using black-violet ink to resemble a gold-toned albumen print. The ATR-FTIR spectrum of this image shows the presence of a surface coating. After comparison of the recorded spectrum with reference spectra of varnishes, the coating was identified as a shellac varnish (fig. 10).

Figure 7a Albertype print made using a dark-green ink.

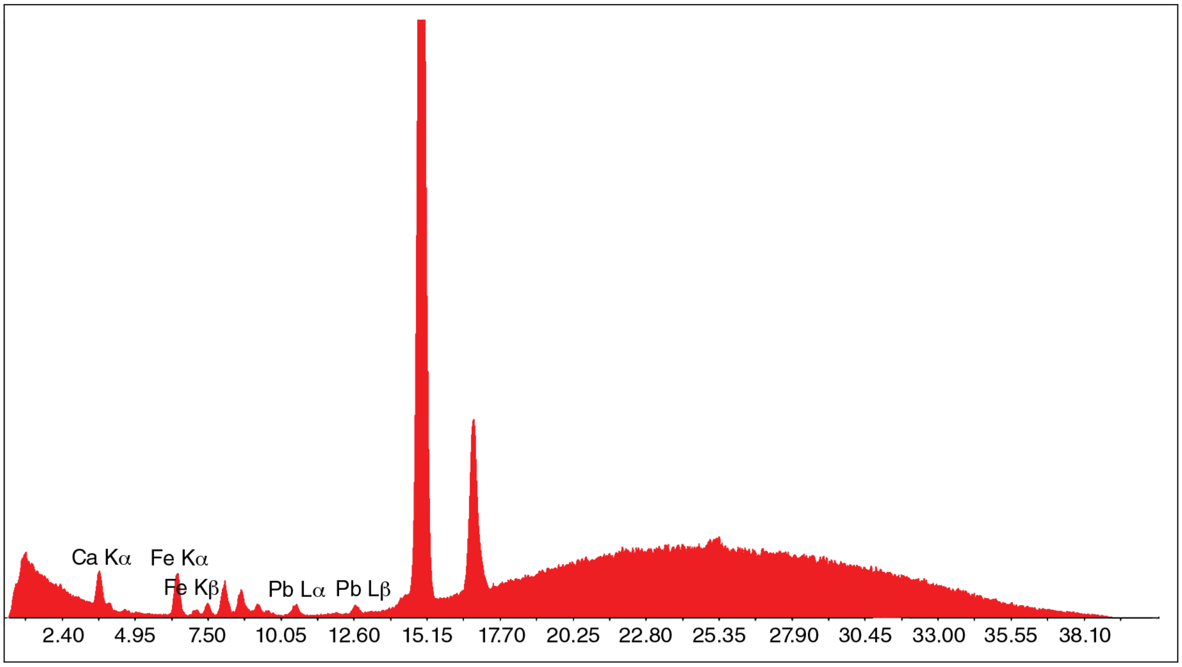


Figure 7b XRF analysis of fig. 7a.

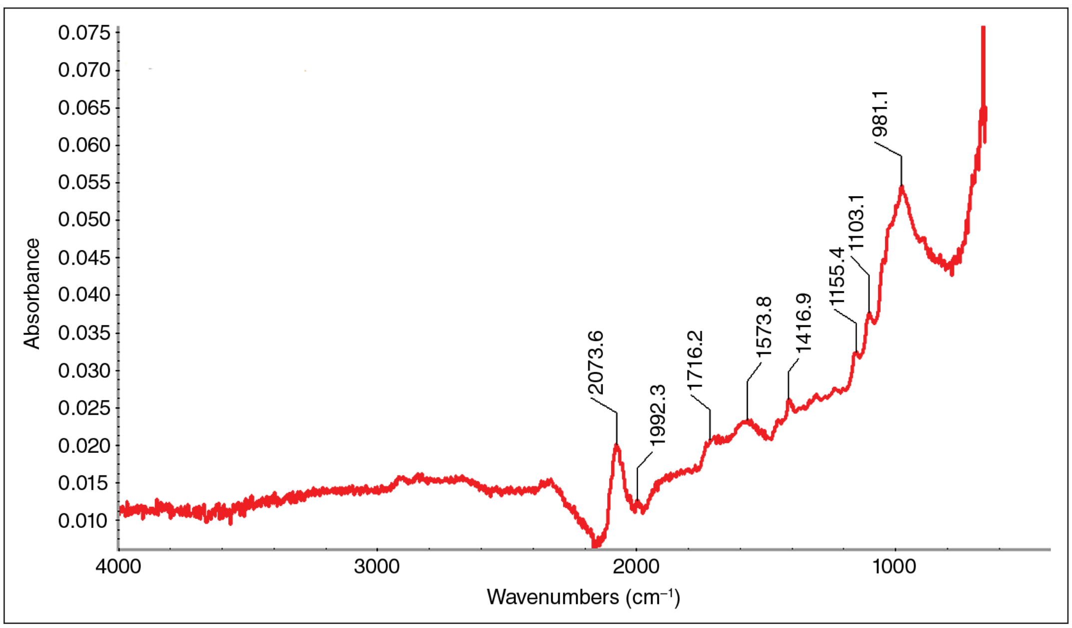
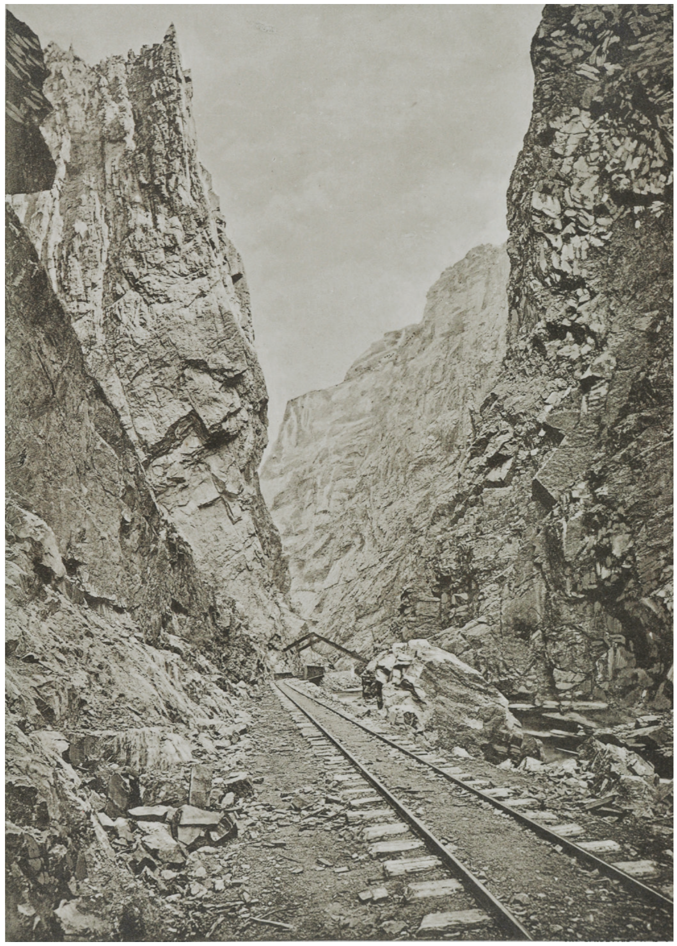


Figure 7c ATR-FTIR analysis of fig. 7a.

Figure 8a Albertype print made using a light-brown ink.



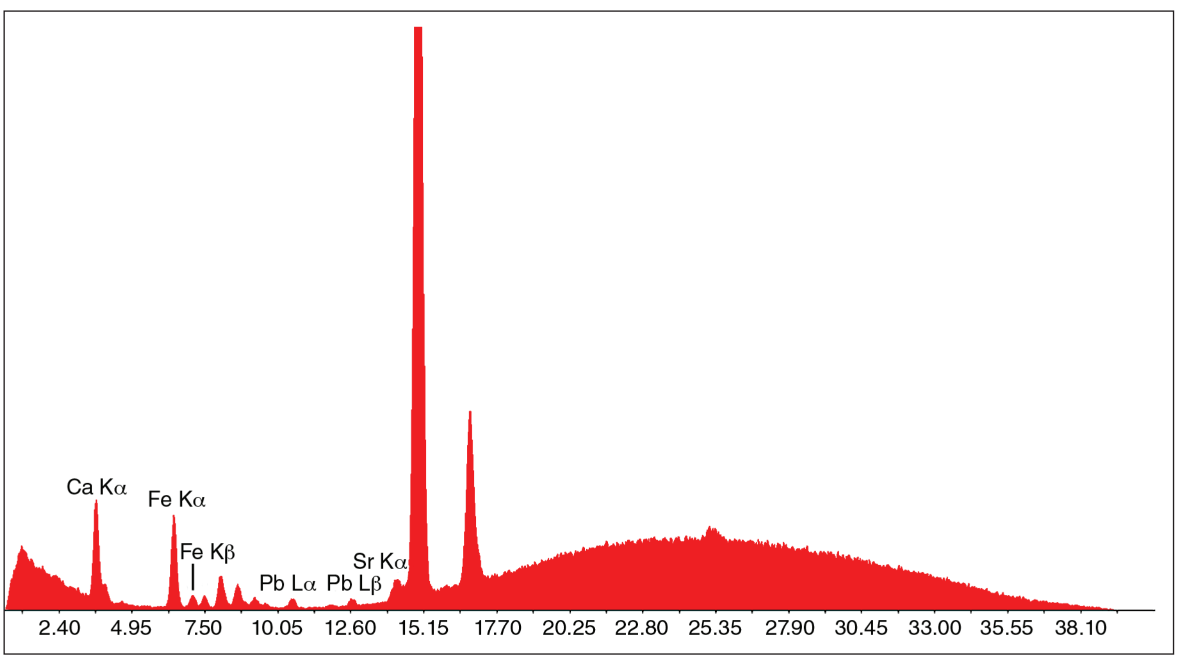


Figure 8b XRF analysis of fig. 8a.

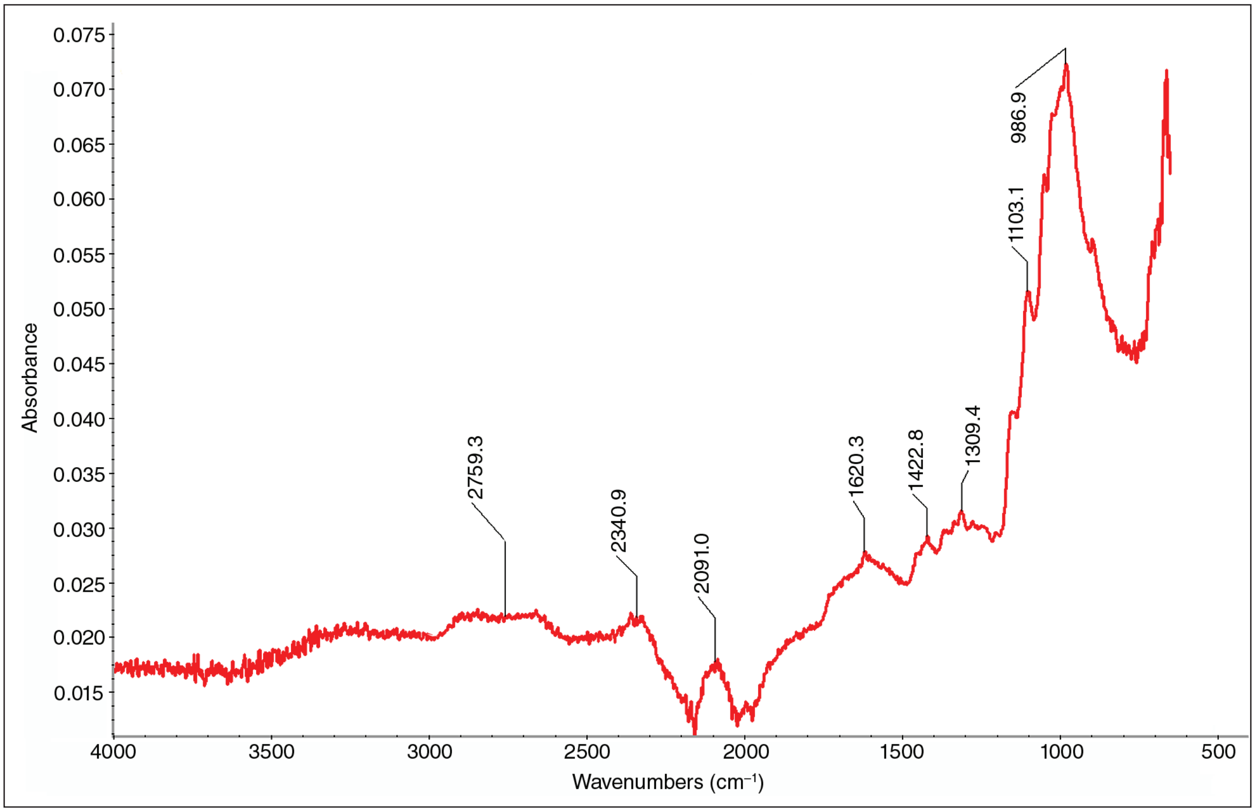


Figure 8c ATR-FTIR analysis of fig. 8a.

Figure 9 Pre-1889 collotype printed with black-violet ink to resemble a gold-toned albumen print.

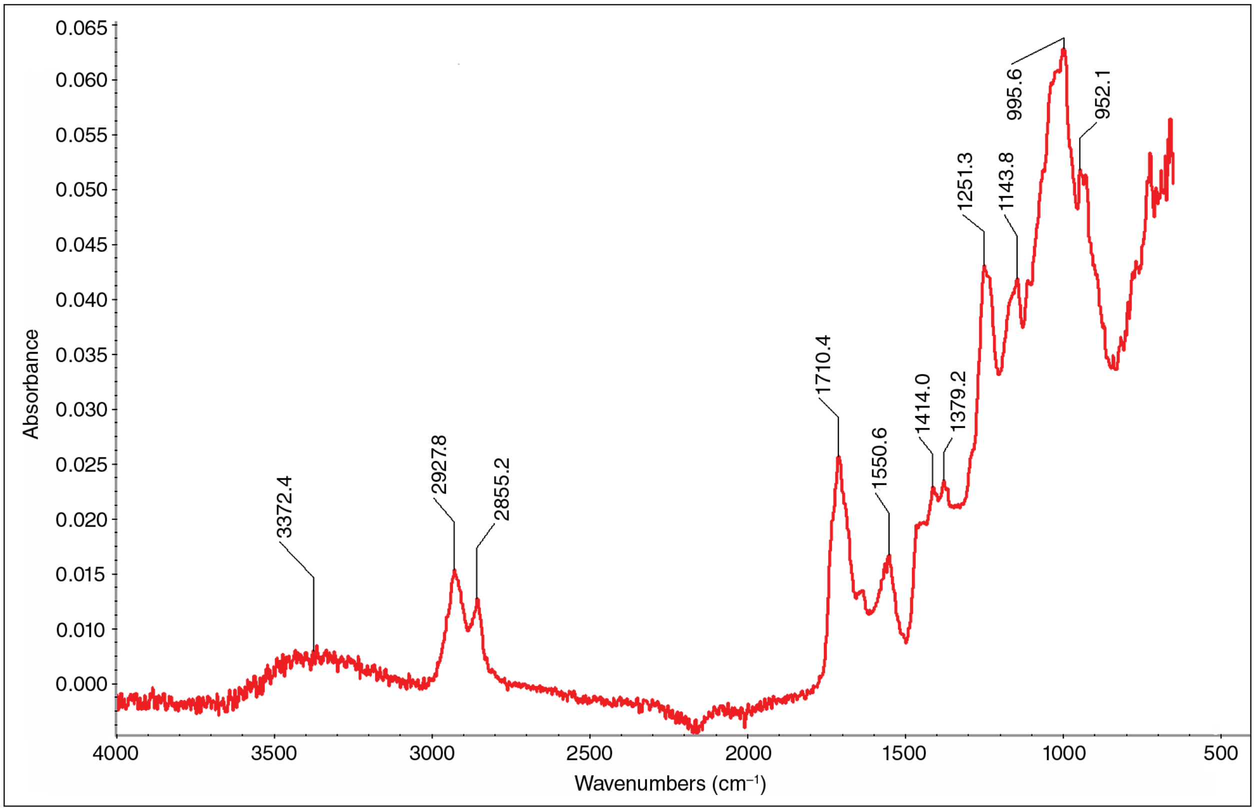


Figure 10 ATR-FTIR spectrum of fig. 9 identifying the varnish as shellac.

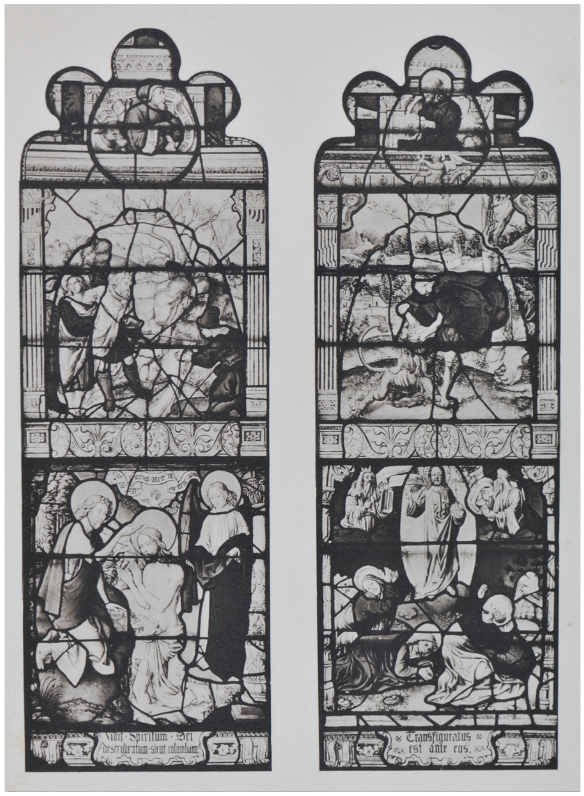
Much less commonly used was an application of a gelatin coating to the surface of a collotype print (fig. 11). The ATR-FTIR spectrum of the gelatin-coated collotype is shown in figure 12. The presence of both Amide I (1632 cm^{-1}) and Amide II (1544 cm^{-1}) spectral peaks allowed for the identification of gelatin with a high level of confidence.

IMPORTANT VARIANTS OF THE COLLOTYPE PROCESS

Halftone collotypes
Color collotypes

A number of collotype variants were developed and patented since its introduction in the 1860s. They include, among others, Alethetype, Autocopyist, Gelatinotypy, Leimtype, Heliotype, Indotint, Ink-Photo, Lichtdruck, Papyrotype, Photophane, Roto-Collotype, Rye's, and Sinop. A majority of these differ in technical details that do not have an effect on the final microstructure of the printed image. Even if a typical feature of the printed microstructure is present, such as the more pronounced grain microstructure of the Ink-Photo process, it does not provide the fully reliable visual signatures needed for process identification. The collotype process variants also do not differ in their chemical signatures; the only differences are small but atypical chemical differences in the paper substrate and the stiff oil-based collotype ink.

Figure 11 Collotype print coated with gelatin.



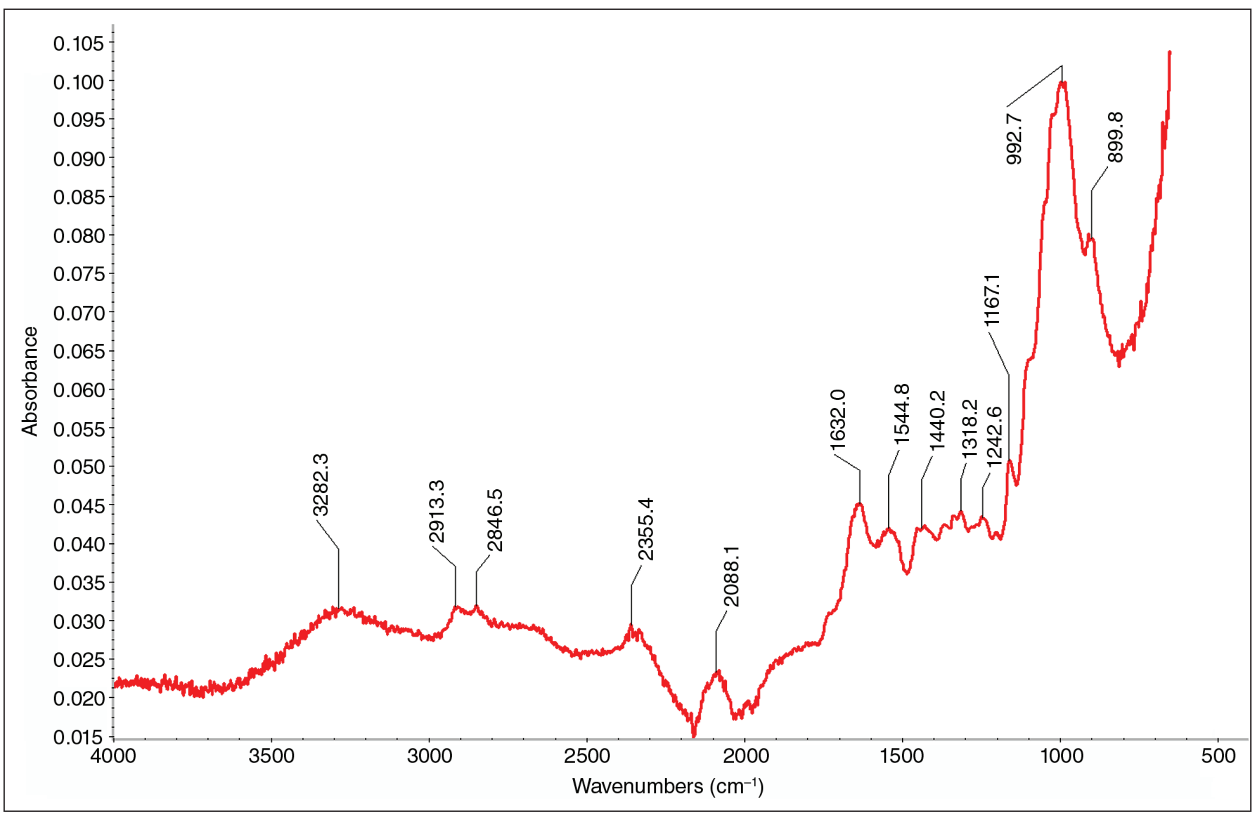


Figure 12 ATR-FTIR spectrum of the gelatin-coated collotype in fig. 11, showing the presence of Amide I and Amide II peaks.

Only two groups of variants have enough information in their visual and microscopic signatures that allow differentiation from basic collotypes: halftone collotypes and color collotypes.

Halftone Collotypes

The halftone collotype processes are hybrid photomechanical processes developed to combine the advantages of both the collotype and halftone processes. Most of these modifications focused on extending the production run of the printing process. The Jaffetype was an early halftone process invented by Max Jaffe in Vienna. During the first three decades of the nineteenth century, the so-called Aquatone process was patented and used in the United States. The process was later modified and registered by the Stern Company as the Optak process. This variant of the halftone collotype process was used for the printing of photographic images and for book illustrations until the 1950s.

Aquatone Process

The Aquatone process was patented in 1922 by Robert John in the United States. In this process the halftone collotype image developed on aluminum plates was printed by offset lithography. Figure 13a shows a black-and-white Aquatone print; figure 13b shows a detail of the typical Aquatone microscopic pattern recorded at 80× magnification.

Figure 14a shows a brown Aquatone print made in two passes using brown inks of different intensity. The duotone effect is clearly visible at higher magnification (fig. 14b).

The Optak process, which was a slight variant of the Aquatone process, was announced in 1946 by Walter K. Kaiser and used in 1951 by Edward Stern & Company for two-color reproductions, or duotones.

Gelatone Facsimiles

The Gelatone printing process used a very fine halftone screen with a resolution up to 160,000 dots per square inch (in 1939). A plate of zinc (later replaced by Monel metal to provide for longer-wearing printing plates) was coated with a dichromate-sensitized gelatin and exposed under a

Figure 13a Black-and-white Aquatone print.

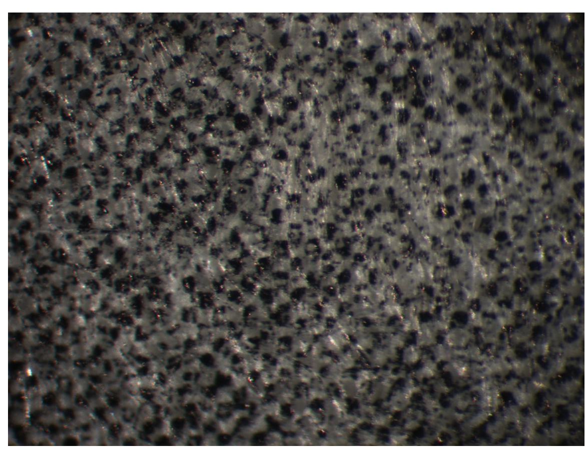


Figure 13b Detail of the Aquatone pattern in fig. 13a recorded at 80× magnification.

Figure 14a Brown Aquatone print made in two passes with different-intensity brown inks.

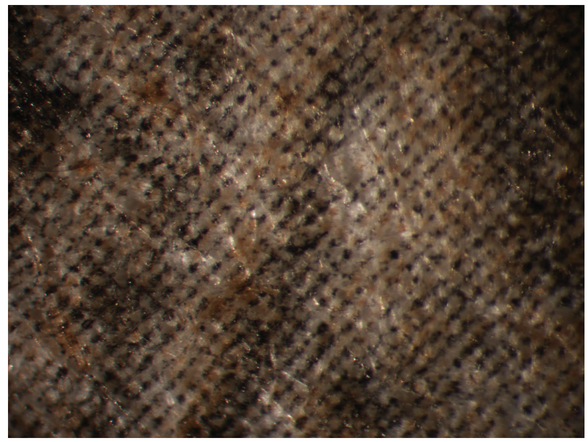


Figure 14b Detail of fig. 14a at 80× magnification. The duotone effect is clearly visible.

halftone negative of the subject to be printed. The resulting halftone collotype plate was printed using an offset printing machine. The high-quality Gelatone prints (see the example in fig. 15) were used to produce color facsimiles of paintings and graphic art pieces. The Gelatone facsimiles of the artwork of twelve American artists were exhibited in one hundred cities across the United States and were sold to the public through published catalogs.

Microscopic Characteristics

Gelatone prints were produced through a hybrid collotype offset printing process. The microscopic details of Gelatone prints look like a four-color offset print pattern, but the print in figure 15 was produced on rough paper with a pronounced surface topography (figs. 16a–16c).

Identification Problems

Most of the Gelatone prints produced were reproductions of art pieces; some were accompanied by information on the artist's work and on the Gelatone process. Microscopic identification is difficult because the microscopic pattern of the Gelatone process is almost identical to that of four-color offset processes.

Color Collotypes

The first color collotypes were made by Joseph Albert in 1874. (An example is shown in fig. 17.) The first successful attempt at producing three-color collotypes was reported by Joseph Albert

Figure 15 John Costigan, *Fishermen Three*, date unknown. Halftone collotype print reproduced using the Gelatone process.

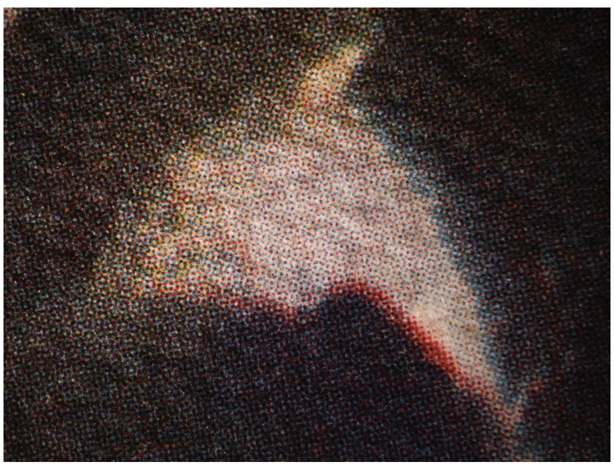


Figure 16a Detail of fig. 15 at 10× magnification, showing a pronounced surface topography.

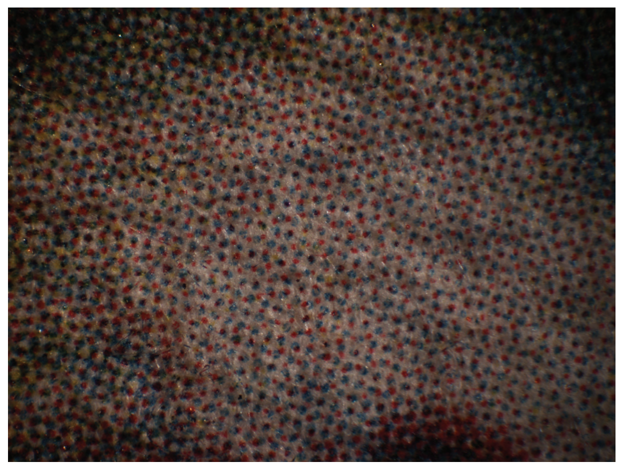


Figure 16b Detail of fig. 15 at 25× magnification, showing a pronounced surface topography.

Figure 16c Detail of fig. 15 at 40× magnification, showing a pronounced surface topography.

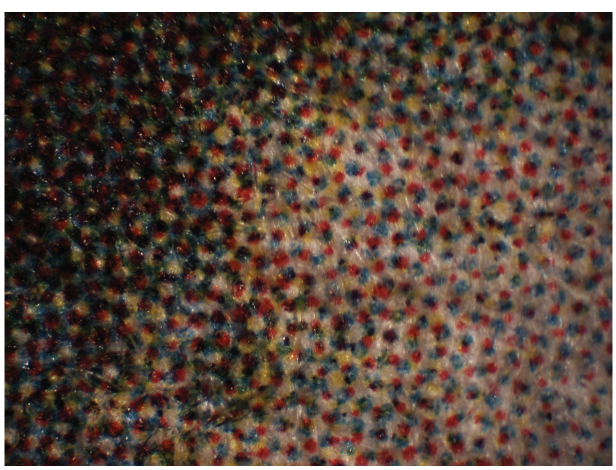


Figure 17 Kazumasa Ogawa, *Flowers*, 1897–98. Color collotype.

also in 1874, only a year after the German photographer Hermann Wilhelm Vogel (1834–1898) introduced his color sensitization of negative plates, which was important for many developments in color photography and color printing. A number of color variants of the collotype process were described and introduced later. These processes were known as color collotypes or chromo-collotypes and were based on the use of three-color separation negatives, production of three collotype plates, inking with three colors of ink, and well-registered multiple-pass printing. As in halftone printing and digital printing, some printers and printing companies expanded the range of printed colors by adding black ink as a fourth plate.

In 1882 F. C. Hoesch patented his version of the color collotype process known as the Hoeschtype, which used six collotype plates printing yellow, red, blue, black, modulating neutral tint, and brown pigment. The unused portions of each color plate were painted out in white. The Japanese collotypist Kazumasa Ogawa (1860–1930) learned the collotype process at the Albertype Company in Boston in the 1880s and produced a great number of multiple-pass color collotypes using much higher numbers of collotype plates for individual color shades. The color collotype facsimile of the illuminated manuscript *Le livre d'heures de Louis d'Orléans*, printed in 1980 in Paris, was reported by Luis Nadeau to have been produced using up to ten different collotype plates to produce colors as faithful as possible to the hand-painted illumination.

A large number of postcard printers used various versions of color collotype processes. The so-called Mezzograph process was used in England when printing postcards of the Valentine Co.'s Mezzograph series. In some cases color postcards were also printed using a combination of chromolithography and monochrome collotype. Many monochrome collotype prints and postcards were also hand colored. A more efficient method of coloring was achieved using stencils and then applying paints over these stencils. Prints produced using this method were referred to as hand-stenciled color collotypes.

True color collotypes were produced by well-registered multiple-pass printing from several collotype plates produced from separation negatives. Some color collotypes were also printed using a number of collotype plates produced from one negative but modified (painted in or blocked off) so each plate would contribute only a single color or shade.

Microscopic Characteristics

Figures 18a–18d show the surface microstructure of the color collotype in figure 17 recorded from several color fields and from the area of the color-field boundary. The boundary area is important for the differentiation of different variants of collotype prints.

Not finding a fine structure of collotype grain in all individual colors of the print indicates that it was printed using not a true multicolor collotype process but a hybrid color collotype process.

Figure 18a Black ink area of the color collotype in fig. 17 at 40× magnification.

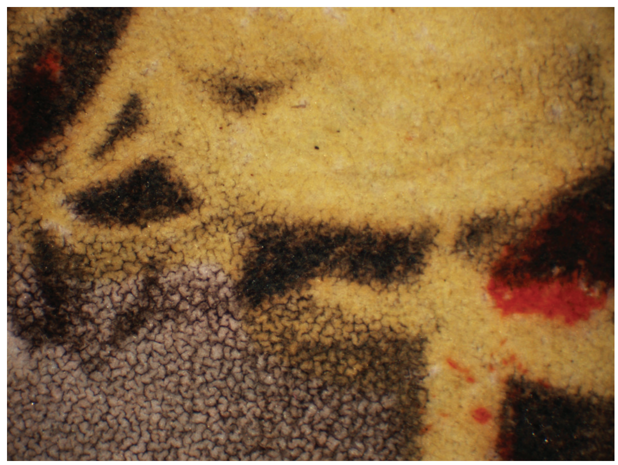


Figure 18b Yellow print area of the color collotype in fig. 17 at 40× magnification.

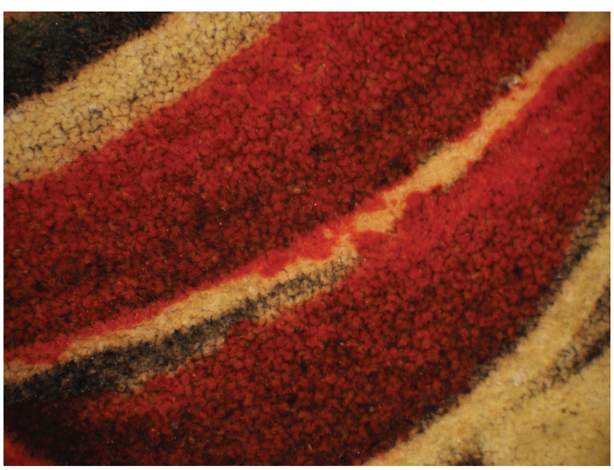


Figure 18c Red print area of the color collotype in fig. 17 at 40× magnification.

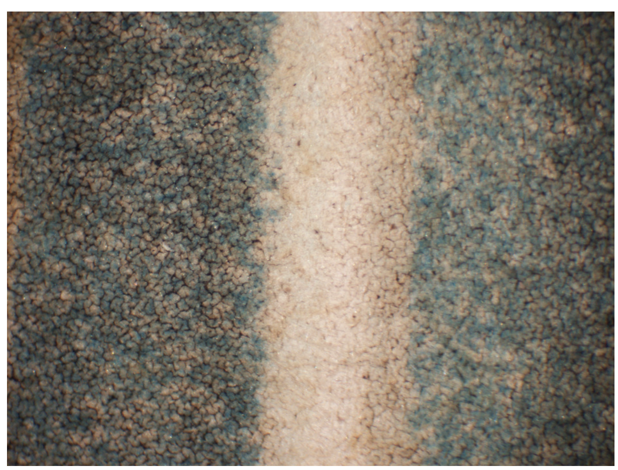


Figure 18d Blue print area of the color collotype in fig. 17 at 40× magnification.

This process was based on the key black of the print using the collotype process and underprinting or overprinting with color photolithographs.

Analytical Investigation

Kazumasa Ogawa's *Flowers* (see fig. 17) was analyzed using XRF and ATR-FTIR. The areas of analysis are highlighted in figure 19. Figures 20a–20d show XRF spectra of all individual (when possible) color fields. Figures 21a–21d show the spectra for the results of the ATR-FTIR analysis.

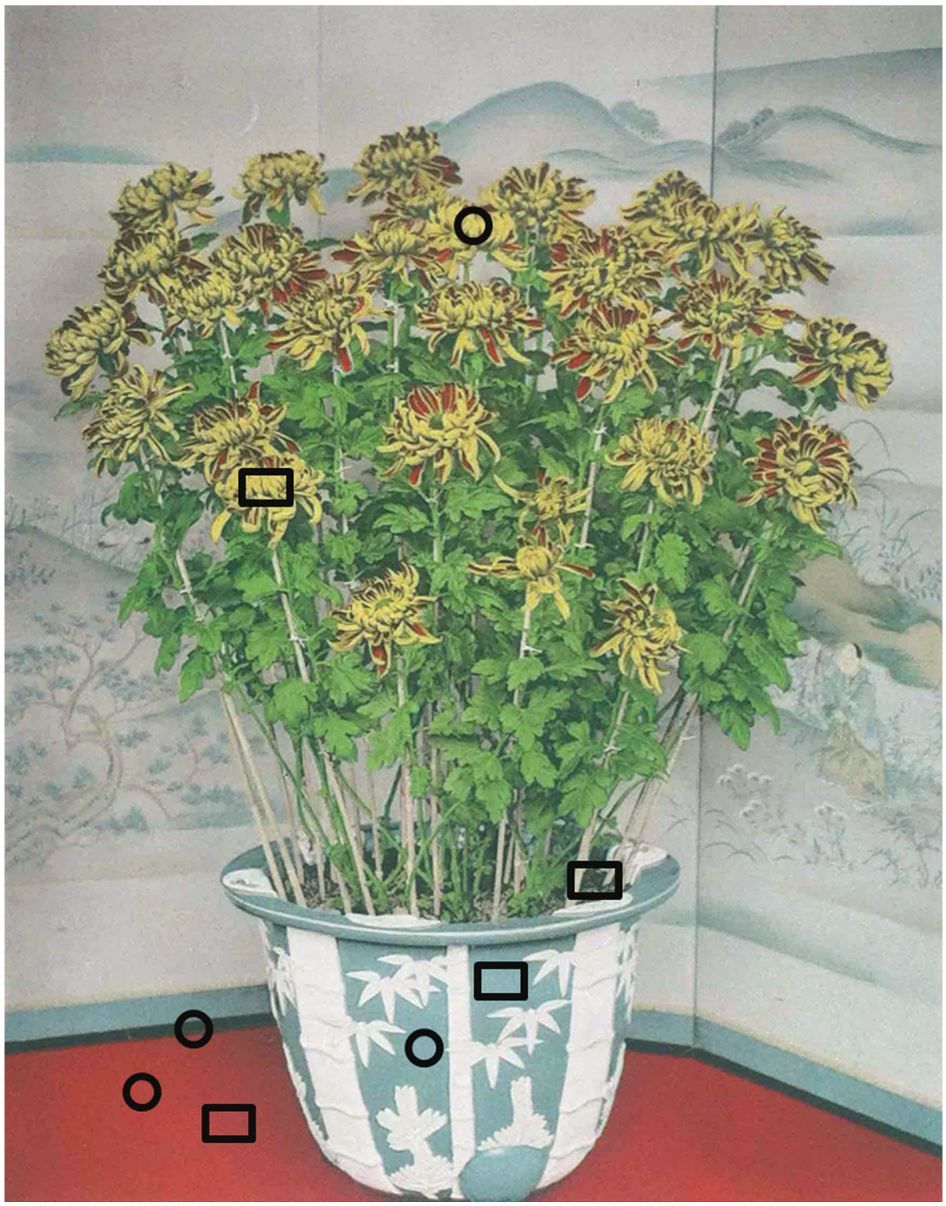


Figure 19 Color collotype print in fig. 17, showing highlighted areas of analysis. Circles indicate areas of ATR-FTIR analysis; rectangles indicate areas of XRF analysis.

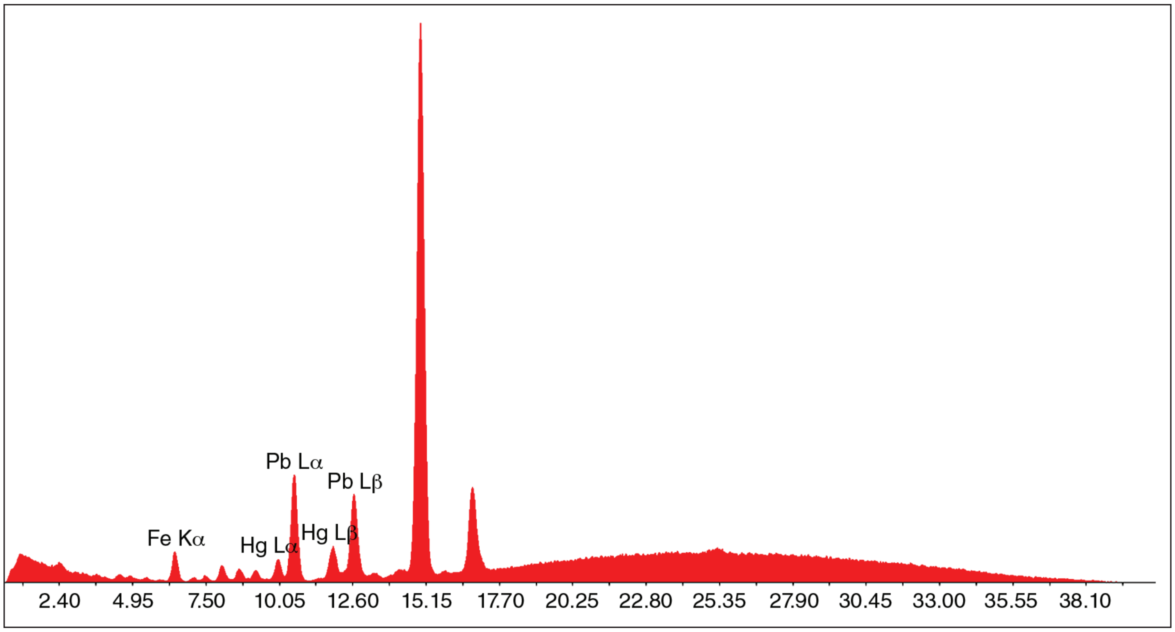


Figure 20a XRF spectrum of the black area of the collotype print in fig. 19.

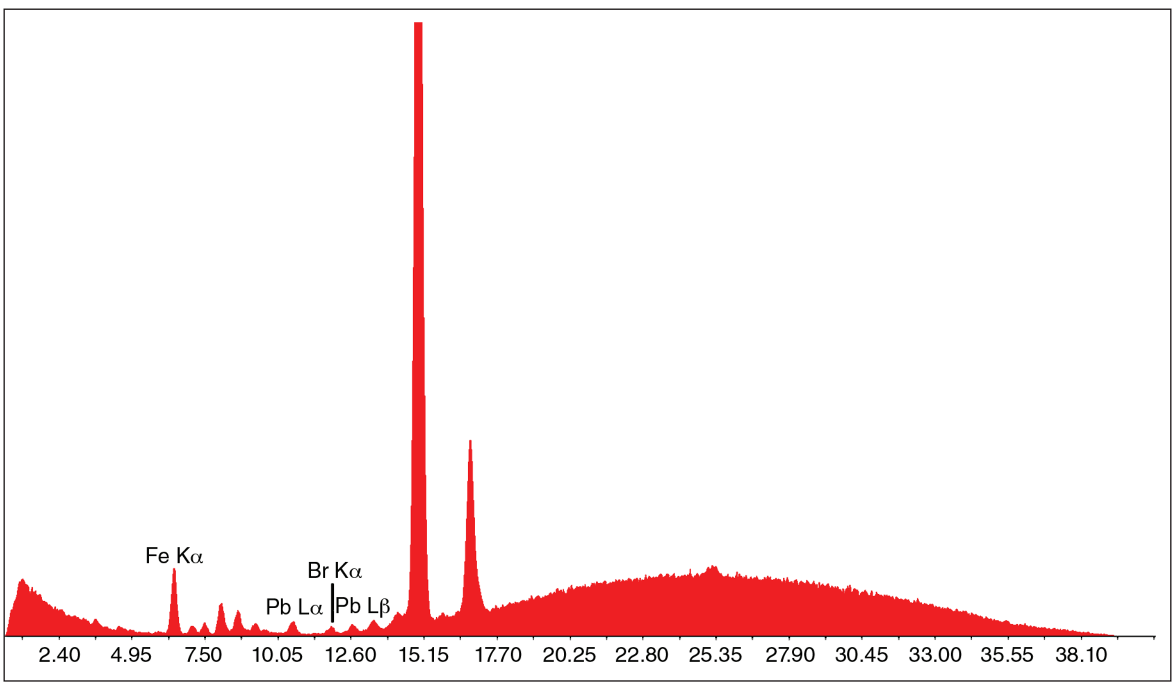


Figure 20b XRF spectrum of the blue area of the collotype print in fig. 19.

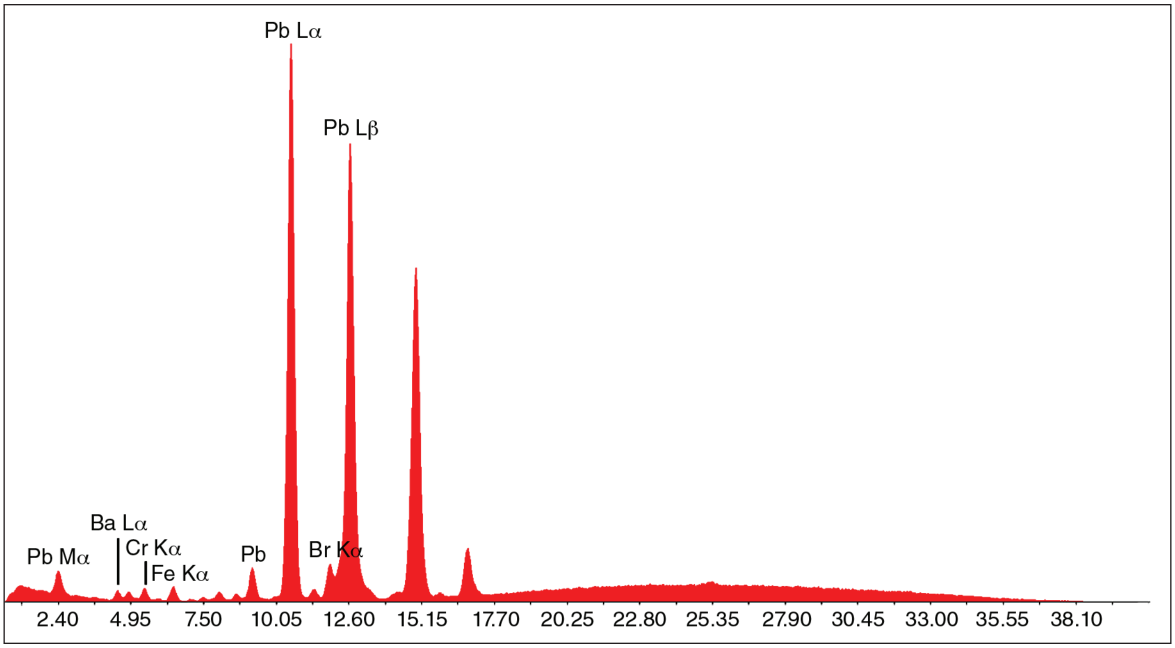


Figure 20c XRF spectrum of the red area of the collotype print in fig. 19.

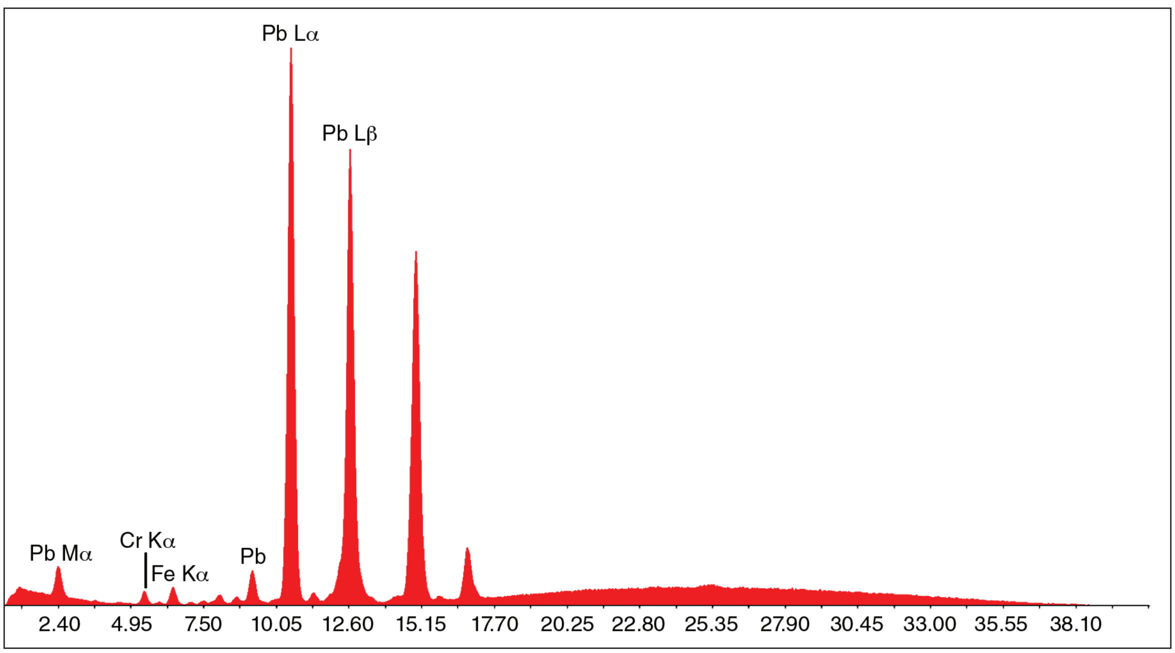


Figure 20d XRF spectrum of the yellow area of the collotype print in fig. 19.

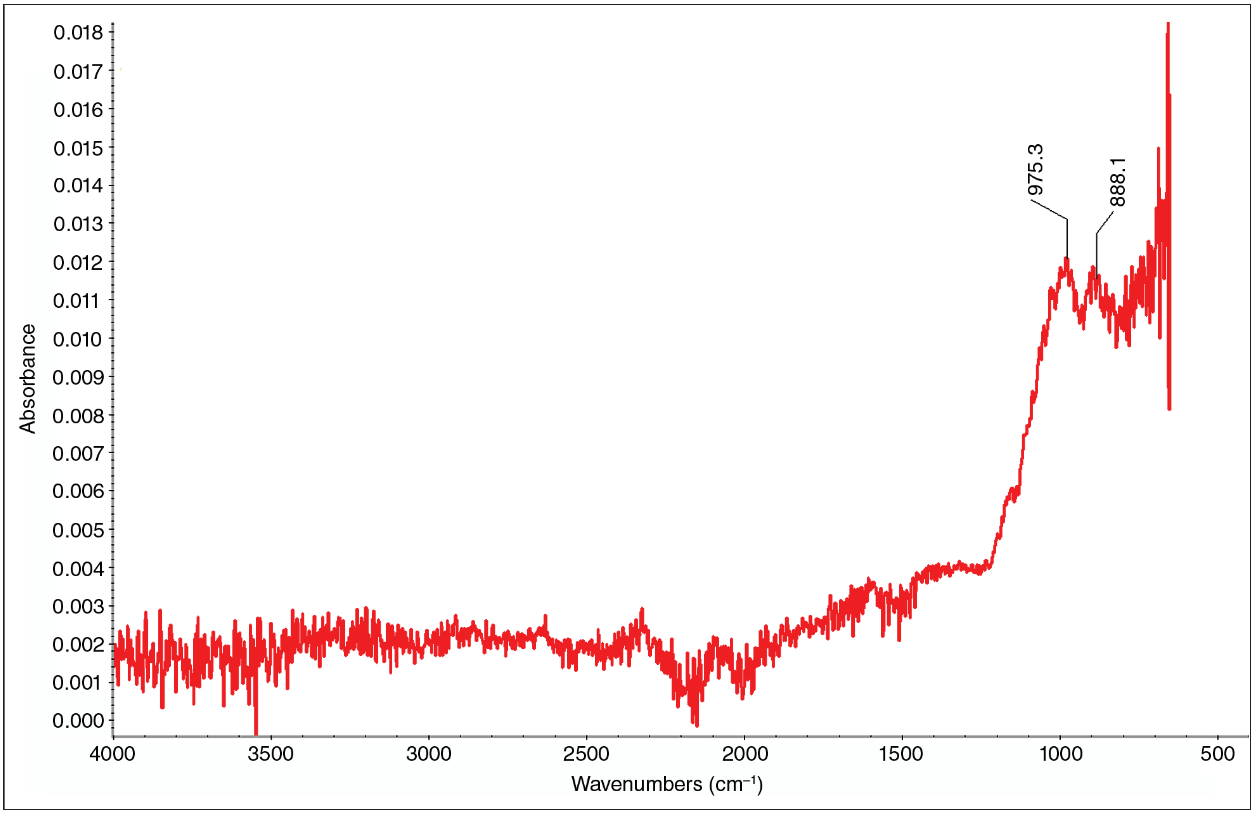


Figure 21a ATR-FTIR spectrum recorded from the black area of the collotype print in fig. 19.

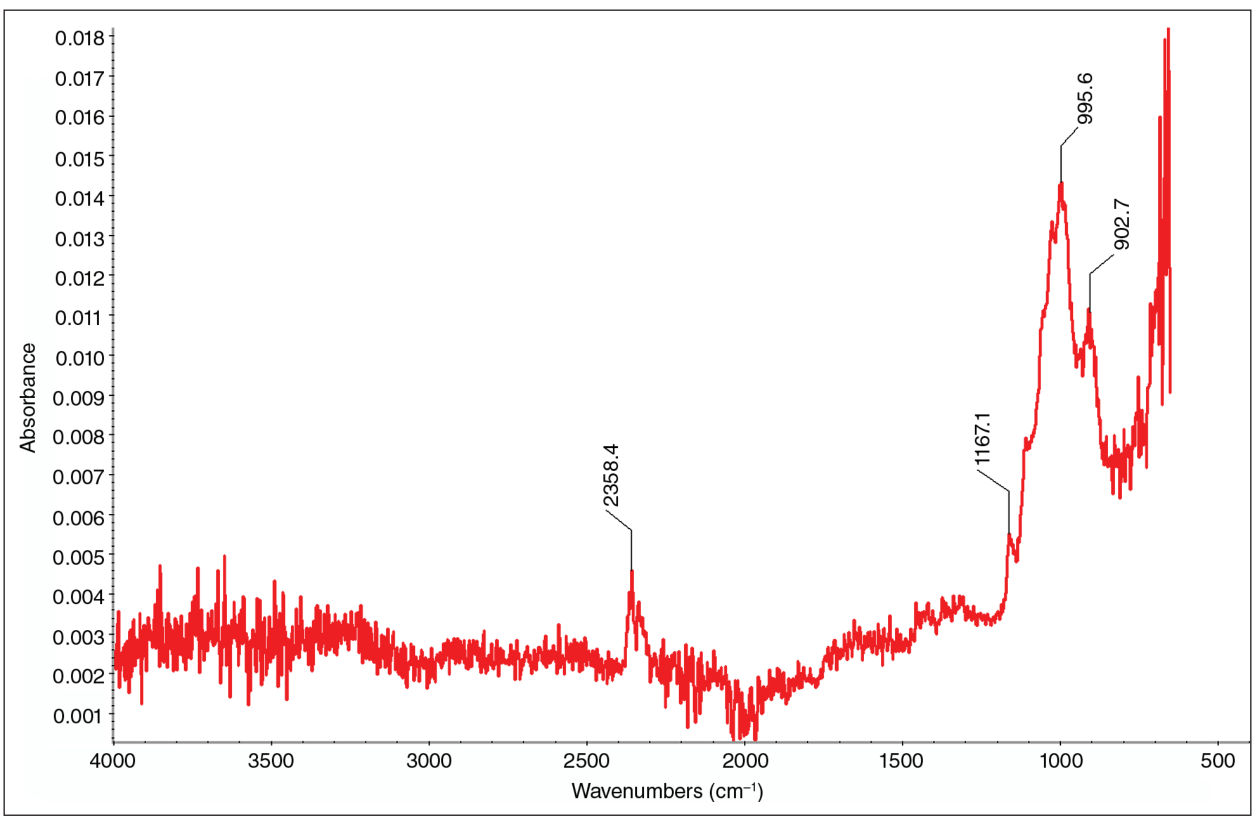


Figure 21b ATR-FTIR spectrum recorded from the blue area of the collotype print in fig. 19.

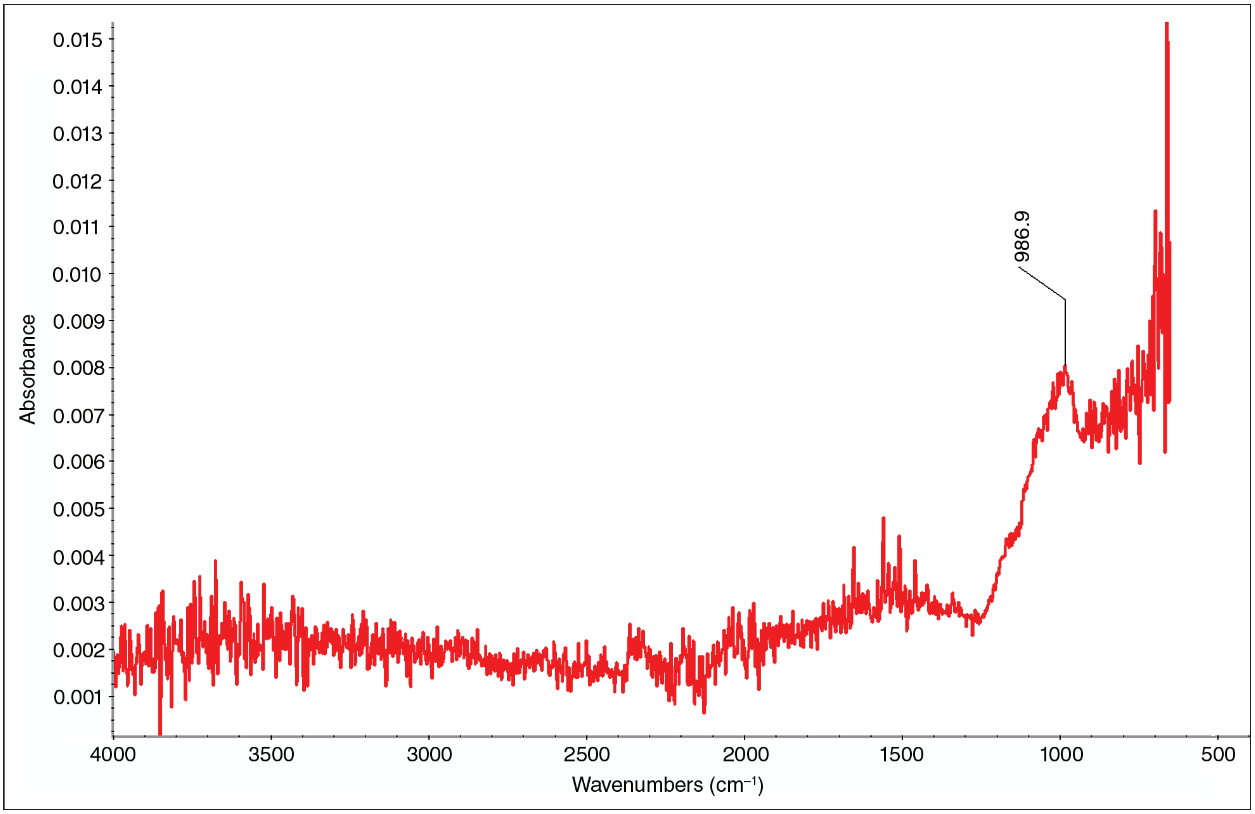


Figure 21c ATR-FTIR spectrum recorded from the red area of the collotype print in fig. 19.

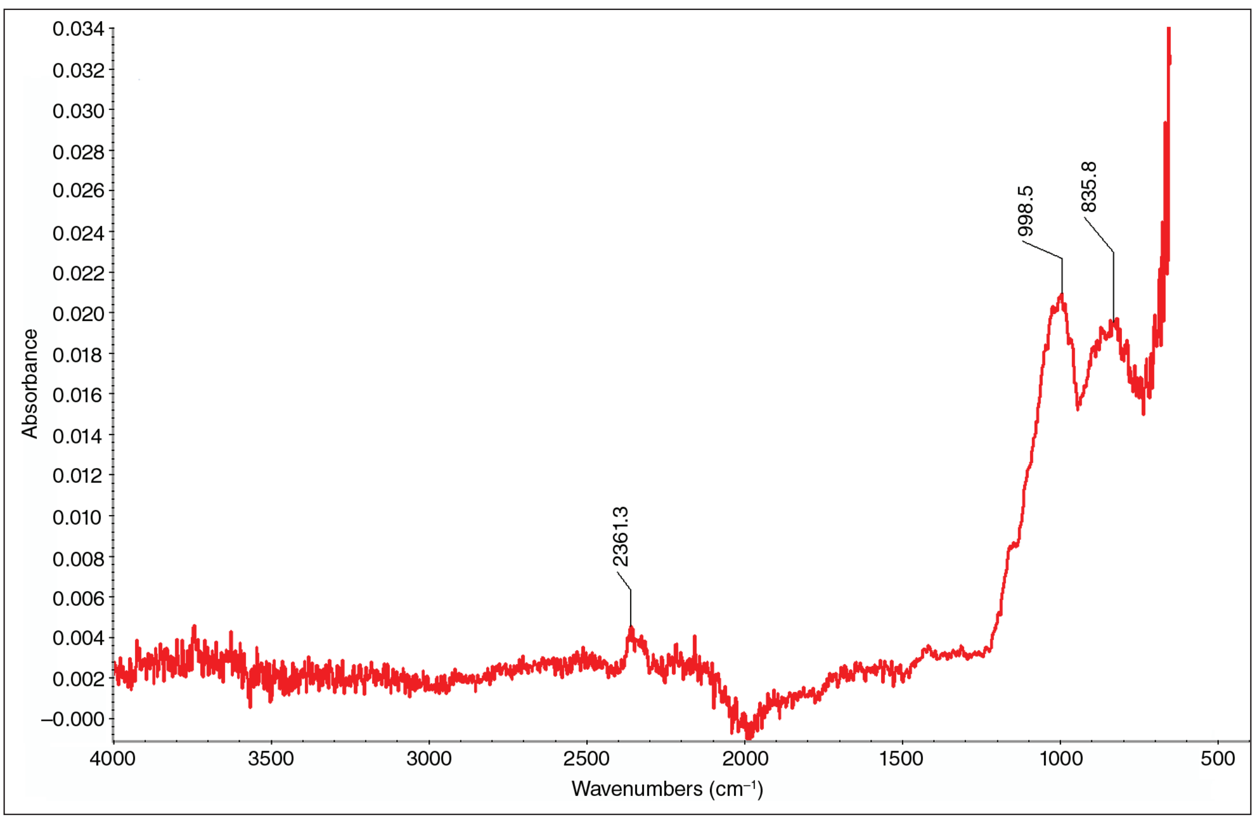


Figure 21d ATR-FTIR spectrum recorded from the yellow area of the collotype print in fig. 19.

Mezzograph Collotypes

Mezzograph was used as a trade name by the Valentine Co. Ltd. of Scotland. The company's Mezzograph series of postcards was produced at the beginning of the twentieth century (fig. 22). The Valentine Mezzograph logo was usually printed on the back of the postcard (fig. 23).

The Mezzograph color postcards have a limited palette of colors and a typically "heavy" look that can be used as a process signature when trying to identify the printing process. A detailed microscopic investigation should be used to verify the identification. Mezzograph was a hybrid printing process based on photolithography printing of color fields and on overprinting of the resulting lithographic image using one color (black) or two color (black and blue) collotype plates.

Microscopic Characteristics

A Mezzograph image shows larger, lithographically printed color fields overprinted with, in figure 22, two color collotype plates (black and blue) (fig. 24). Focusing through the individual layers of

Figure 22 Postcard from the Mezzograph series by the Valentine Co., printed using the proprietary Mezzograph process.

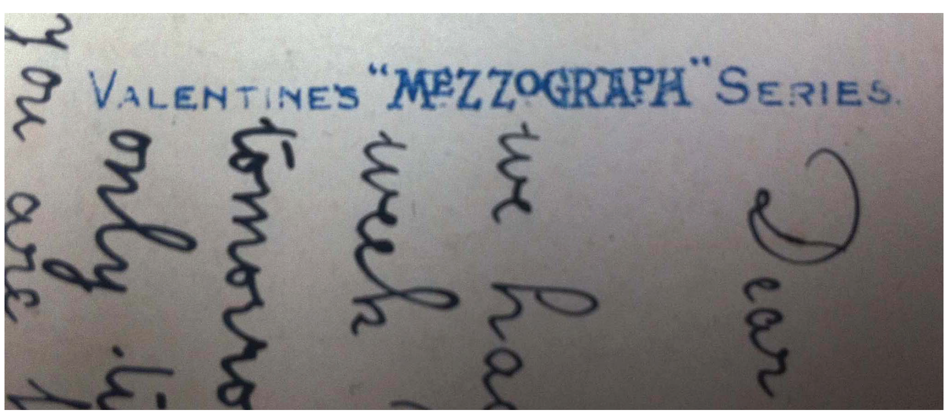
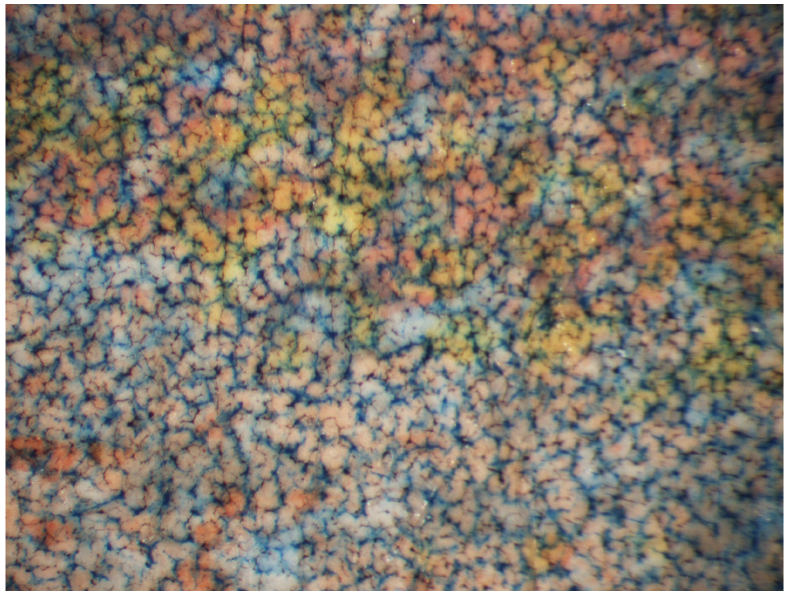


Figure 23 Typical Valentine Co. Mezzograph logo on the back of the postcard in fig. 22.

the image allows for the identification of the sequence of printed layers. Mezzograph prints were usually glossy and heavily varnished. ATR-FTIR analysis of the Mezzograph postcard in figure 22 identifies a high concentration of shellac (fig. 25).

Figure 24 Detail of the Mezzograph postcard in fig. 22 at 80× magnification, showing overprinting with black and blue collotype plates.



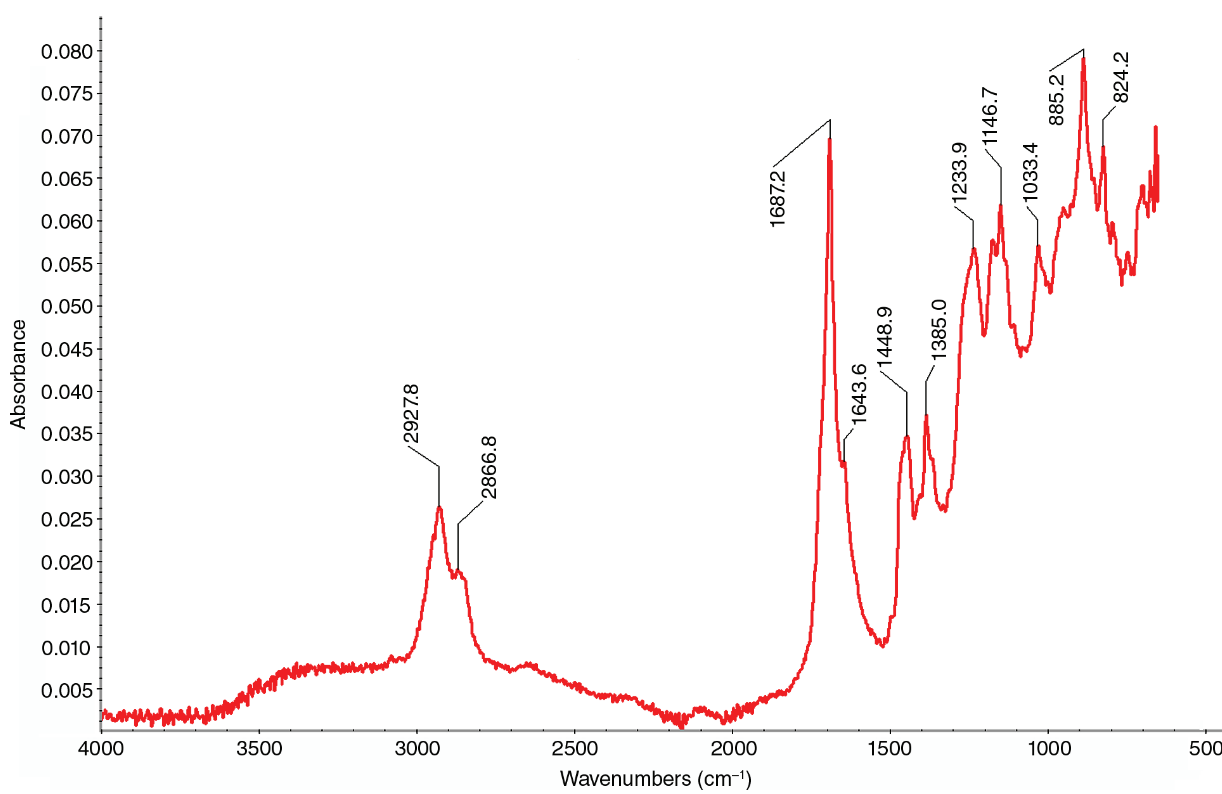


Figure 25 ATR-FTIR analysis of the surface varnish on the postcard in fig. 22, identifying a high concentration of shellac.

Hand-Painted Collotypes

Many color collotypes were produced by hand painting (coloring, tinting) printed monochrome collotypes (fig. 26). Larger, more sophisticated hand-painted collotypes need microscopic investigation to identify the hand application of colors. Some smaller hand-painted collotypes produced in large quantities can be quickly identified by the observation of color fields reaching over the collotype-delineated outlines in the image.

Microscopic Characteristics

The microscopic characteristics of the hand-painted collotype in figure 26 are shown in figures 27a–27c. The concentration of organic dyes used to paint the pink and green areas of the collotype are too low to allow for identification using ATR-FTIR nondestructive analysis. However, XRF analysis was able to identify the pigment used to paint the decorative borders on the sleeves of the woman's dress (fig. 28) as lead white.

Figure 26 Hand-painted collotype from the early 20th century.

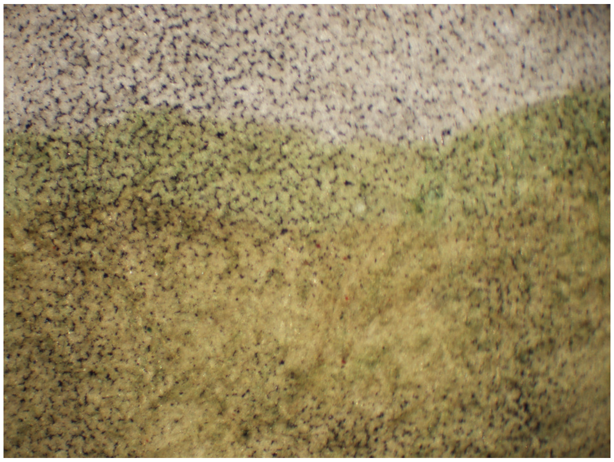


Figure 27a Detail of the edge of the hand-painted greenish field of the collotype in fig. 26 at 40× magnification.

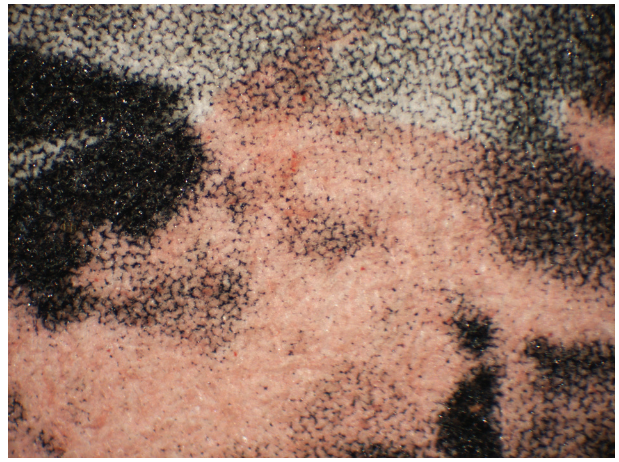


Figure 27b Detail of the edge of the hand-painted pink field of the collotype in fig. 26 at 40× magnification.

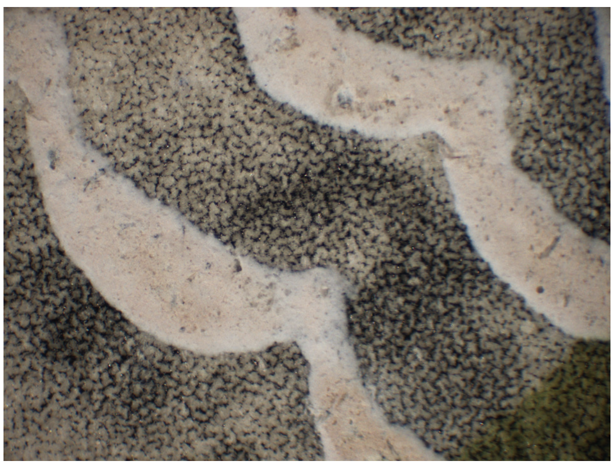
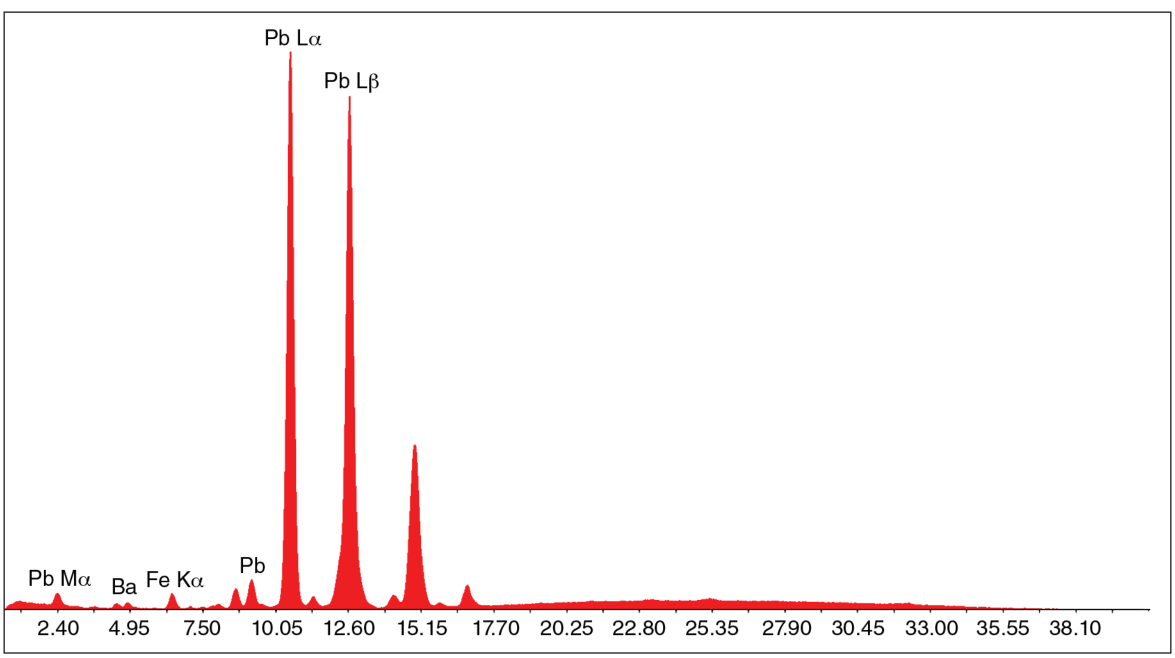


Figure 27c Detail of the thicker layer of paint applied to the white decorative borders on the sleeves of the dress in fig. 26 (40×).

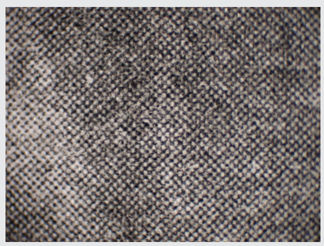
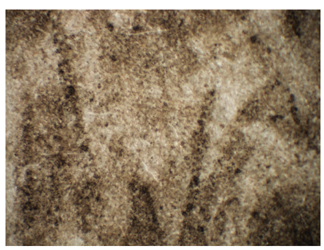
Figure 28 XRF analysis of the decorative borders on the sleeves of the dress, identifying the pigment as lead white.



INTERPRETATION GUIDE

Table 1 Summary of the main microscopic and analytical signatures of collotype prints and some processes commonly misidentified as collotype prints. The information below is for typical versions of each process. Exceptions to each entry may exist but are rare.

<table>
<tr><th colspan="6">Collotype</th></tr>
<tr><th>Process</th><th>Image Structure</th><th>Images</th><th>Paper Substrate</th><th>Tonality</th><th>Analysis</th></tr>
<tr><td>Collotype</td><td>“Worm”-like grain pattern!</td><td></td><td rowspan="4">Usually plain uncoated paper</td><td rowspan="4">Black > brown > other colors</td><td rowspan="4">XRF—no signature for carbon-based pigment (small addition of Prussian blue) for some block prints—detection of iron

ATR – FTIR—low concentration of oil-based binder; low signal of CN (Prussian blue)</td></tr>
<tr><td>Hybrid-collotype</td><td>Halftone pattern</td><td></td></tr>
<tr><td>Photogravure</td><td>Gravure pattern</td><td></td></tr>
<tr><td>Rotogravure</td><td>Light, symmetrical lines</td><td></td></tr>
</table>

The Getty Conservation Institute