Medium Matters: Photography in the Age of Mechanical Reproduction

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Photographs in Books

- Photographs (salted paper prints, albumen silver prints, platinum prints…)
- Photogravure (hand-pulled photogravures, rotogravure)
- Photo-relief (most commonly half-tone block printed with type)
- Photolithography (collotype, photo-offset lithography)
Why do we care?

- Conservation
- Collection building
- For study
- For appreciation
- Current revivals of early processes
What is a photograph?

An image created by light and chemistry.
Salted Paper Prints

History

• Earliest paper photograph process
• Announced by William Henry Fox Talbot in 1839
• In use until the 1860s
Talbot’s Announcement of 1839
Photogenic Drawing

- Sensitized paper in contact with flat, semi opaque objects exposed to sunlight
- cameraless (photogram)
- Paper immersed in salt water and brushed with silver nitrate
• AgNO\(_3\) + NaCl → AgCl + NaNO\(_3\)

created silver chloride within the fibers of the paper, making it light sensitive

• light +AgCl → Ag + \(\frac{1}{2}\) Cl\(_2\)

upon exposure to sunlight metallic silver was produced in the paper
• Talbot’s earliest photogenic drawings produced a negative image
• You are highly unlikely to find a photogenic drawing in a book!
An Image Is a Mystery for Photo Detectives

NY Times, April 17, 2008
What to Look For

- Continuous tones or patterned grain?
- Publication dates or print dates
- Subject
- Overall tone
- Mount
- Thickness and structure of the paper and coatings
- Surface sheen
- Characteristic deterioration
Salted Paper Prints
Calotype Technology

- Patented by Talbot in 1840
- Possible because of development of paper negative (calotype process)
- Negative provided for multiple prints
- Improvement in fixing the positive using hyposulphite of soda. “Hypo”. It removes the silver chloride, providing a much more stable image
- Printing done in a printing frame. Contact print.
- Improvement in papers with sizing
Salted Paper Prints

- Can be made from paper or glass negative
- Calotype process refers strictly to the paper negative itself
- Gustave Le Gray introduced the process to France and the use of prewaxed papers (pub. 1851). “Le Gray’s process.”
Salted Paper Prints

Terminology

• Calotype was Talbot’s term for his paper negative process
• Talbotype was coined by others for the process in honor of Talbot
Salted paper prints
Landmark Publications

Salted Paper Prints
Identification

• Matte surface
• Usually thin paper
• Tones range. Chocolate brown, purple, lavender. Purple if gold-toned
• Continuous tone.
• tipped in or full mounted
• Often exhibit fading overall or at edges
• At 30X, image appears in, not on the paper. Paper fibers visible
Salted Paper Prints

[Digital Sample Book](#)
Salted Paper Prints
Deterioration

Signs of deterioration
– Edge fading
– Loss of highlight detail
– Shift toward yellow-brown
Salted Paper Prints
Blanquart-Évrard Process

• Blanquart-Évrard improved stability of the image by developing his positive prints (DOP) making it commercially viable for publication use.

• *Imprimerie photographique* est. 1851, published 24 albums of landscapes and art

• Published Marville, Régnault, Le Secq, Du Camp, Bayard, Salzmann, J.B.Greene

• Also printed photographs for other publishers, notably Gide & Baudry

• Blanquart-Évrard published the process in France in 1847.
Blanquart-Évrard Process
Landmark publication

- 125 plates
Blanquart-Évrard Process
Landmark publication

- 174 plates
Blanquart-Évrard Process Identification

- Catalogue raisonné by Isabelle Jammes
- Many in ambitious publications
- May have more neutral color than POP salted paper prints
- Pre-1855-56
Cyanotype History

• Invented by Sir John Hershel in 1842
• One of several processes developed by him. Also the anthotype – water and alcohol extracts of flowers. Exp time of 5 weeks. Also Chrysotype.
Cyanotype History

- 1840s and 1890s/1900s
- Used by elite amateur botanists, most notably, Anna Atkins
- Lacemakers
- 1872 re-styled ferroprussiate process in France, a reprographic medium
Cyanotype Technology

- Based on the light sensitivity of iron salts
- These are iron salts used to make blue pigments
- Simple technology, practiced primarily by amateurs and for “blueprints”
- Very stable image, fades in sunlight, but reverses in the dark
Cyanotype Identification

- Blue
- Matte finish
- Commonly use to make photograms
- Unmounted
- unmistakable
Cyanotype


[Digital Sample Book](#)
Cyanotype
Landmark publication

Anna Atkins. *British Algae: Cyanotype Impressions*, 1843-61
First photographically illustrated publication
British Algae
Vol. I.
Cyanotype Preservation concerns

- Cyanotypes fade in strong light, but action reversed in the dark
- Prussian blue reacts with alkalines. Store in a neutral or slightly acidic environment (i.e. pH of 6-7)
- Otherwise very stable
Albumen

- Invented 1850 by Louis Desire Blanquart-Evrard
- Popular through 1880s
- Paper manufactured commercially by late 1850s
- Prints well-suited to travel photography (as opposed to salted paper prints) but also prevalent in portraiture

Carleton E. Watkins, American, 1829 – 1916, Mirror View of Cathedral Rocks, Yosemite, ca. 1872, printed ca. 1876. 1986.1189.39
Albumen

- Made from wet collodion negative on glass
- Paper coated with egg white and salt then dried
- Sensitized with silver nitrate solution and dried again
- Contact printed in sunlight (i.e. printed out)
- Exposures minutes to hours
- Fixed in solution of hyposulfite of soda or “hypo” then washed and dried
- Most toned with gold chloride to strengthen tones and increase permanence

Fig. 34. An indoor printing studio, ca. 1890. A south-facing orientation was best for printing.
Albumen

- Continuous tone
- Thin paper with binder layer; image lies on top of paper in binder layer, not embedded in paper fibers
- Smooth surface with slight sheen
- Long tonal range
- Cream-colored highlights and chocolate darks, often red to purple in tone
- Under magnification, binder layer can be cracked, fine grain
- Often mounted; unmounted prints curl easily
- Applied color common
- Characteristic deterioration includes the yellowing of the albumen layer seen in the highlights and fading of the darks

Julia Margaret Cameron, Déjatch Alámayou, King Theodore’s Son, 1868, The Metropolitan Museum of Art, Gilman Collection, Gift of The Howard Gilman Foundation, 2005 (2005.100.239)
Albumen


[Digital Sample Book](#)
Carbon

- Patented 1855 by Alphonse Louis Poitevin; modified 1866 by Joseph Swan
- Popular 1864-1910, though artists continue to use variant techniques
- Named for carbon black pigment often used in the process
- Autotype, pigment printing

Carbon

- Thin paper coated with gelatin containing potassium bichromate and pigment, usually carbon black
- Contact printed with glass negative in sunlight
- Gelatin exposed to light hardens proportionately
- Face of exposed sheet pressed onto second, insoluble sheet of gelatin coated paper
- "Sandwich" soaked in water so original support detaches with unhardened gelatin
- Immersed in alum solution to further harden gelatin and remove stains

Frantisek Drtikol, *The Composition*, 1927
Carbon

- Continuous tone
- Thin paper support
- Indistinguishable from Woodyburiytype
- Image reversed
- Permanent, no silver impurities
- Smooth surface, can be matte or glossy
- Long tonal range
- Small specks of pigment sometimes visible under magnification
- Paper fibers visible in highlight areas
- In raking light, image relief visible (darker areas are thicker)
- Dark tones usually black or chocolate brown in tone but colors varied depending on choice of pigment
- Usually mounted to secondary support
- Generally larger in size than Woodyburiytypes
- Characteristic deterioration includes cracking of surface in dark areas, which can flake; much coarser than Woodyburiytype
Carbon


Digital Sample Book
Woodburytype

• Patented in 1864 by Walter Bentley Woodbury
• Published between 1866 and 1925 with most between 1870 and 1895
• A.k.a. Woodbury Process, photoglyptie
• Used mostly for book illustrations

Etienne Carjat, French, 1828-1906, Charles Beaudelaire, ca. 1863
The Metropolitan Museum of Art, The Elisha Whittelsey Collection,
The Elisha Whittelsey Fund, 1964, 64.677.4
Woodburytype

- Like carbon print, uses pigmented gelatin
- Collodion coated glass dusted with talc then dried
- Coated with bichromated gelatin, which hardens when exposed to light
- Sensitized gelatin stripped from glass and exposed with negative
- Unhardened gelatin washed away
- Gelatin “mold” pressed into soft lead
- Lead mold filed with pigmented gelatin and pressed into paper and dried
- Very permanent

Lead Woodburytype matrix, or printing plate of an interior scene with chest
Woodburytype

Woodburytype

- Photomechanical process indistinguishable from carbon print
- Continuous tone, no screen pattern or grain but pigment may be visible under magnification
- May be any color but usually purple-brown, which mimics albumen print
- In raking light, relief of dark areas clearly visible
- Generally very glossy; can be less glossy in the highlights
- Paper fibers visible in highlight areas
- Generally not larger than 8 x 10 inches
- Prints always trimmed; never appear with white borders
- Tipped in or mounted to page with text printed separately and usually identified as a Woodburytype or a carbon print
- Characteristic deterioration includes cracking of binder layer, especially in darks, this is generally finer than with carbon prints
- Only photomechanical process to not use a screen or a grain

Unmounted Woodburytype relief film of Head of St. John the Baptist by O.G. Rejlander
Woodburytype at 30x magnification


[Digital Sample Book](#)
Platinum prints
History

• Decades long effort to create images using platinum rather than silver, for greater permanence
• Began to appear in 1873, perfected in 1892 when platinotype paper perfected
• “permanent, artistic, and simple”
Platinoype (Platinum Print) History

- Medium for “artistic” photography
- During 1890, silver paper manufacturers tried to copy platinotype’s look
- 1906, price of platinum rose
- Substitution of palladium (palladiotype)
Platinum prints Technology

- Papers sensitized with a mixture of iron salts and potassium chloro-platinate
- Perfecting of process included discovery of a cold, rather than scolding hot bath. Secret.
- Based on the sensitivity of iron salts
Platinum prints

- Matte surface
- Very delicate
- Blacks not as dark as silver-based prints
- Very stable images
- Usually on excellent paper
- “transfer” image may be present
Platinum prints
Terminology

- Palladiotype, or palladium print replaces platinum print
- Platinotype usually refers to either platinum or palladium prints
Platinum Print


[Digital Sample Book](#)
Platinum prints
Conservation concerns

• Platinum promotes the formation of strong acids within paper fiber. The paper can become brittle, although the image is pristine.

• Require careful handling.
Platinum prints
Landmark publication

- 40 Platinum prints
Photogravure
History

The creation of a photo engraved print was a concern from the earliest days of photography.
Intaglio print
or Relief print
Photoengraving

Talbot

- Photoglyphic engraving
- 1852 patented
- “Improvements in the art of engraving in which photographic processes are used”
- Steel plate, coated with photosensitized gelatin (potassium bichromate). Waxed paper positive. Gelatin hardens with light exposure.
Talbot’s engraving

- fine screen “photoveils”
- Use of fine powdered resin, as in aquatint
Hippolyte Fizeau

- 1841, Hippolyte Fizeau, made etching plates from daguerreotypes
- Complicated process, not well understood
- *Excursions Daguerriennes*, 1842 (3 of the illustrations), published by Goupil in 1842
Terminology

• Talbot named his invention Photoglyphic Engraving
• Also referred to as heliographic etching, photographic etching, photoglyphy and photoglyphic engraving
• In French, all photoengraving referred to as heliogravure
• Talbot-Klič process introduced in 1879, two years after Talbot’s death.
Photogravure
Identification

- Matte surface
- May be of any color
- Excellent reproduction of detail
- Some have aquatint grain
- Some have regular screen pattern in middle tones, grid of white lines on a darker field
- No sign of fading
- Plate mark may be present
- Some “enhanced” by hand engraving
Photogravure


Digital Sample Book
Photogravure surface
Photogravure
Deterioration

• Discoloration and embrittlement of primary support, foxing, etc.
• No signs of image fading
• Recommend good quality interleaving
• Finger oils can cause staining
• Oils of ink can seep through the paper
Photogravure
Landmark publications


Rotogravure History

- Invented in 1890
- Printing is done from a rotating copper cylinder, mechanically inked
- Rather than aquatint, a screen is usually used to break to make intermediate tones
Rotogravure Identification

- No plate mark
- Often screen pattern
Karl Blossfeldt. Urformen der Kunst. Berlin, 1928
Collotype History

- Patented in a successful process by Alphonse Poitevin in 1855
- First practical process of photolithography
- Basis of later photolithic processes
Collotype


[Digital Sample Book](#)
Collotype Terminology

Also known as:

- Albertype
- Artogravure
- Artotype
- Dallastint
- Heliochrome (2 color collotypes)
- Heliotype (term also used for etched dag plate)
- Humphrey’s process
- Lichtdruck
- Phototint
- Phototype
- Phototypie
Collotype History

- Commercialized in France in 1857. “Phototypie”
- Improved in Munich in 1868 “Albertype”
- Edward Bierstadt’s first Albertypes, 1870
- Became very popular for high art reproduction and cheap postcards
Collotype Identification

- No screen pattern
- Matte to glossy surface
- Any color
- No fading
- Inks glossier than photogravure inks
- Under 30X reticulation pattern is distinctive
Letterpress Halftone

• Nicephore Niepce creates first photomechanical plate in 1826
• Talbot suggest method for breaking images up into lines and dots and creates first halftone images ca. 1852
• Numerous patents for grained and screened photomechanical and photolithographic processes are obtained by a variety of inventors though the 1870s
• First halftone made from a photographic negative is published in March 4, 1880 issue of Graphic
• Frederick Ives creates first practical halftone screen ca. 1885
• Popular from 1880s to present
• Cheaper and less labor intensive than photoengraving, photolithography, and Woodburytypes
• Adopted quickly by newspaper industry
• Half-tone relief
• Halftone screens are also used with gravures and lithographs

Robert Demachy, Severity, Camera Work No. 5, 1904, The Metropolitan Museum of Art, Alfred Stieglitz Collection, by Exchange (53.701.5)
Letterpress Halftone

- Photomechanical process, letterpress or engraving
- Copy photograph made through ruled screen which creates negative image with dots of varying sizes
- Negative used to expose metal plate coated in sensitized gelatin
- Developed with water to create a relief plate
- Plate is warmed and inked before using in mechanical press
- Could be produced using multiple inks in different colors to create color image
Letterpress Halftone

- Printed on any paper in any color or any combination of colors
- Distinctive dot pattern, often compared to waffle or checkerboard, can usually be seen with the naked eye
- Ink thicker at edge of dot, in dense areas, the larger dots join
- Dot size less refined in 19th century
- Detail is difficult to capture, lacks contrast, “flat”
- Slight indentation wherever ink deposited
- Text and image can be printed together

Letterpress Halftone


Digital Sample Book
Gelatin and Collodion POP

- Gelatin-based dry-plate conceived in 1871 by Richard Maddo; improved upon by Charles Harper Bennett in 1878
- Simultaneously, a British Company was testing a silver bromide paper with gelatin-based emulsion, which was faster and easier to use than albumen
- Commercially manufactured; could be coated mechanically in continuous rolls
- Popular from the late 1880s – 1920s
- Long exposure times led to their being replaced by developed-out prints
- Printing-out Paper Print
Gelatin and Collodion POP

- Gelatin or collodion replaces albumen as binder
- Paper coated with “baryta” (barium sulfate) layer consisting of gelatin and white pigment before being sensitized
- Baryta layer could be rough or smooth and sensitized coating would take on same texture
- Sensitized with silver salts in binder of gelatin or collodion
- Contact printed
- Exposed until image visible (printed-out)
- Washed and gold-toned
Gelatin and Collodion POP

- Paper thicker than albumen, very smooth, burnished surface; collodion papers also appeared in matte surface, which resembles platinum prints
- Often highly glossy; can be confused with ferrotyping of developed-out prints
- Bright whites though baryta layer sometimes tinted pink or blue
- Tend to be blue/purple in tone but available in a variety of tones, surfaces, and contrasts
- Difficult to distinguish from albumen prints and some DOPs
- Characteristic deterioration includes overall fading and larger losses of emulsion where creased or chipped

Unknown Artist, American School, [Buffalo Bill Cody and Members of His Wild West Show], 1890s, The Metropolitan Museum of Art, Gift of M. Knoedler and Co., Inc., 1958 (58.553.44)
Gelatin and Collodion POP

Gelatin Silver DOP

- Late 1890s sees “slow” DOP introduced, making contact printing by artificial light possible and a few years later faster papers make enlarging possible
- By 1905, sales exceed those of POP
- Desirable traits: no sunlight necessary for exposure, no expensive precious metal toning require
- Like POPs, these papers were commercially manufactured on rolls
- Majority of black and white prints today
Gelatin Silver DOP

- Paper support, baryta layer, sensitized binder
- Contact printed or enlarged
- Dry paper exposed, then chemically developed, fixed, and washed
- Prints could be toned, have color applied, and burnished (ferrotyped)
Gelatin Silver DOP

- Predominant process throughout 20\textsuperscript{th} century
- Baryta layer
- Continuous grain
- Can be highly glossy or matte
- Neutral blacks and whites though toning is common
- Characteristic deterioration: silver mirroring
Gelatin Silver DOP

Illustration from: James M. Reilly, Care and Identification of 19th-Century Photographic Prints (Rochester: Eastman Kodak Company, 1986)

Digital Sample Book
Photographic Color Processes

Chromogenic:
- print made from negative
- 3 layers of silver salts sensitive to blue, green, and red
- “dye-couplers” are added during development process to create dyes
- Most common color print; drug store prints
- Less stable, certain dyes deteriorate faster

- Dye Bleach (Cibachrome or Ilfochrome)
  - Print made from positive
  - Dye is in paper and is bleached out during development
  - More permanent

- Dye Transfer
  - Print made from a positive original from which 3 separation negatives are made thought red, green, and blue filters
  - Three layers of dyed gelatin are made and superimposed
  - Very stable, very saturated colors

- Carbro
  - Offshoot of carbon process using 3 pigmented gelatin layers which are stacked in registration
  - Permanent
Photomechanical Color Processes

- Photomechanical
  - Letterpress Halftone
  - Collotype
  - Photochrom
  - Offset Lithography
  - Color gravure

**Digital Sample Book**

Photochrom

- Color photolithography method patented in 1898 by Swiss firm of Orell Füssli
- In 1890s, a method is introduced which allows stones to be produced directly from a negative
- Used by WH Jackson and the Detroit Publishing Company and later a popular method for printing postcards
- Photochrom, Photochrome, Photstint
- Technique later adapted to offset lithography

William Henry Jackson, [Portrait of Indian with a Medal of President Garfield], ca. 1890-1910, The Metropolitan Museum of Art, Gilman Collection, Gift of the Howard Gilman Foundation, 2005
Photochrom

• Produced from a black-and-white negative and combined photographic and manual work on grained stones
• Each color required a separate stone, sometimes as many as 25 might be used for one image
• Colors were applied by highly-skilled lithographers
Photochrom

• To naked eye, can be confused with hand-colored albumen print or true color photograph
• Often had a publisher’s copyright near the margin
Offset Photolithograph

- Invented ca. by Rosé-Joseph Lemercier 1852 but paractical alternative patented in 1855 by French chemist Adolphe Louis Poitevin
- “Litho” implies the use of stone printing plates though metal is the prevalent material used today
- Use of three colors of ink to produce color images from color originals introduced in 1870s
- Offset process incorporating halftone screens developed ca. 1904 by Ira Rubel
- Improvements resulted in popularity rising by 1920s
- Today, offset lithos represent at least 50% of photographic reproductions today
Offset Photolithograph

- Planographic technique based on inability of oil and water to mix the ink rejecting or accepting properties of prepared plates
- Gelatin surface applied to stone or zinc for printing like traditional, hand drawn lithograph
- Plate is exposed and the soft gelatin is washed away
- Plate is dampened and ink is applied; ink only sticks where gelatin has hardened
- Blanket cylinder (rubber) rolled over it and picks up the image
- Paper passes through rubber roller with image and impression roller
- Separate plates are used for each color

Anton Bruehl, *Still Life*, 1930s
Offset Photolithograph

- Like letterpress halftones, there is a screen, sometimes a halftone screen
- Unlike letterpress halftones, the ink is very flat, does not build up at the edges

Georges Hugnet, Modern Energy, 1936
Offset Photolithograph

Digital Sample Book
Care and Preservation

• Light: certain inks can fade; paper supports can yellow and become more brittle
  – Purchase archival enclosures for books; house prints in archival boxes or folders
  – Use UV protective glazing in frames and display cases
  – Use low lights and avoid direct sunlight
Care and Preservation

- Temperature and Humidity: prints with multiple layers of differing materials can crack and curl with fluctuating environmental conditions; mold can flourish and insects will flourish in poorer conditions
  - Ideal temp and RH: 60 degrees +/-5 and 50%RH +/-5
  - Avoid rapid fluctuations
  - Wrap books and use housing that allows contents to “breathe”

- Pollution: paper absorbs smoke, smog, and dust
  - Archival enclosures are helpful
Care and Preservation

• Materials: mounts, adhesives, interleaving, and inks can all react with prints
  – If prints in a century-old book look great, it may not be necessary to do anything
  – If original interleaving or mounts are “burning” the print, adding a protective layer of interleaving tissue may help