Photograph Preservation

2021 Nebraska Museums Association Half-Day Workshop

History NEBRASKA

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Objectives

- Brief History of Early Photography
- Identification of Photographs & Prints
- Identification of Negatives
- Creating the Best Conditions
- Storage
- Identifying Issues and What to Do
- Research and Identification
- Creating Access through Digitization
- Questions?

Invention of Photography

- Joseph Nicéphore Niépce
  - First to stabilize camera image
  - France in 1826
  - Exposure took 8 hours in bright daylight
  - Could not overcome long exposure time

Harry Ransom Center and J. Paul Getty Museum.
Color digital print reproduction of Joseph Nicéphore Niépce's View from the Window at Le Gras., 1826
http://www.hrc.utexas.edu/exhibitions/permanent/wfp/

Louis Jacques Mandé Daguerre

- Performing similar experiments also in France
- Partnered with Niépce
  - Niépce died in 1833
- Announced success on January 6,1839
- French government acquired patent, presented as "a gift free to the world"
- Photography became commercially viable

First Daguerreotype
Still Life
1837, daguerreotype
Société Française de Photographie

Early Photographic Processes

- Began the era of Photography
- Experimentation and new processes
  - Race to see who could make photography more effective and profitable
  - Many types of early photos
- William Henry Fox Talbot
  - British scholar and inventor
  - Calotypes (paper based negatives), patented 1841
    - Negatives used to make endless positive duplicates

Photographic Categories

- Direct Positives
  - Daguerreotypes, Ambrotypes, tintypes
  - Positive image made in camera
  - No negative
    - One-of-a-kind
- Negatives
  - Vary by substrate (paper, glass, plastic)
  - Negative image made in camera
  - Used to make positive image
- Prints (from negatives)
  - Usually on paper
  - Uncoated paper (1-layer process)
  - Coated Paper (2-layer & 3-layer)
  - Color prints

Direct Positives

History NEBRASKA

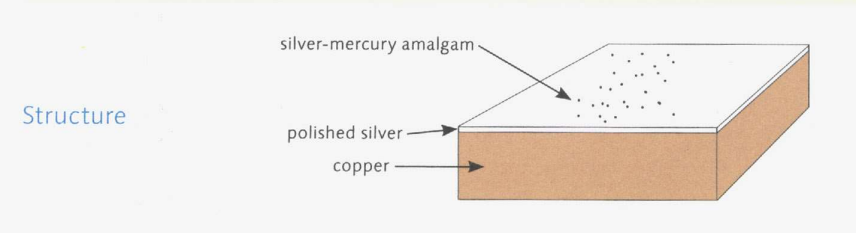
Daguerreotype

- 1839-1860s
- "Mirror with Memory"
- Highly reflective surface
- Image appears positive only under certain lighting conditions & angles of view

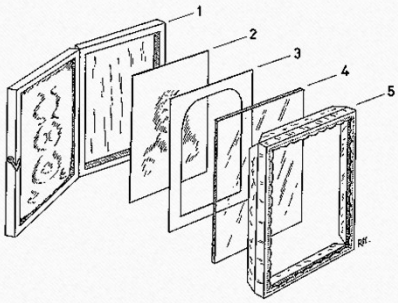
How to Make a Daguerreotype

- Copper plate covered with layer of finely polished silver
- A few crystals of iodine are used to make silver light sensitive
- Expose plate in camera
  - Few minutes to 30 minutes depending on lighting conditions
- No image visible out of camera
- Revealed only by developing plate in vapors of heated mercury
- Immerse in heated table salt to stabilize residual photosensitive components

Structure of a Daguerreotype



Parts of a Daguerreotype



- Surface very soft, easily damaged
- Always found in package
  1. Case
  2. Daguerreotype
  3. Spacer (paper or metal)
  4. Glass
  5. Brass frame
- Paper or animal intestine membrane used to make an airtight seal around the edges

Daguerreotype Care & Storage

- Deterioration is caused by pollutants and humid storage environments
- Never touch the surface
- Never take apart yourself, contact a conservator
- If seal is broken, silver will tarnish
  - Appears as a colored haze (yellow, magenta, or blue)
  - Contact a photograph conservator
  - Attempts to reseal can cause further damage

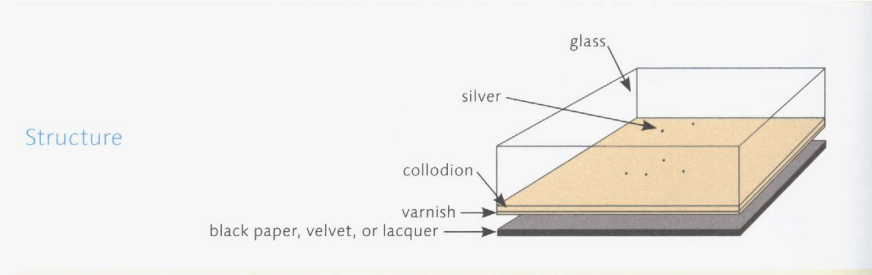
Daguerreotype Care & Storage

- Store in cool, dry environment
- Construct individual, customized boxes for storage
  - Protect against environmental changes & pollutants
- Avoid overly intense light sources if displayed
- Original glass covers also deteriorate
  - "Weeping glass"
  - Tiny whitish spots on the interior side of the glass
  - Contact a conservator

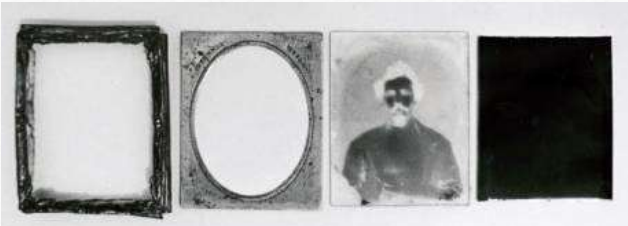
Ambrotype

- One-of-a-kind
- Patented in U.S. by James Ambrose Cutting, 1854
- Thin collodion negative on glass
  - Appear positive by placing a black background behind it.
- Usually found in a case

Structure of a Ambrotype



Parts of an Ambrotype



1. Gilt border of thin brass to edge-wrap the frame, glass, & backing.
2. Die cut frame
3. Ambrotype
4. Backing of black paper, cloth, or metal
5. Outer protective case (not shown)

Identifying an Ambrotype

- Common to be colored or tinted
  - Especially rouge cheeks and lips, but also buttons, watch chains, pendants, and broaches.
- Usually found in cases like daguerreotypes and are sometimes mistaken for them
- Image appears as negative when light is transmitted through the glass support.

Ambrotype Care & Storage

- Damage often due to the deterioration of the dark backing
  - Destroys the positive/negative effect
  - Unlike Daguerreotypes, can be carefully taken apart & backing replaced
  - Consult a conservator
- Store in a cool, dry place
- Like Daguerreotypes, custom storage boxes recommended

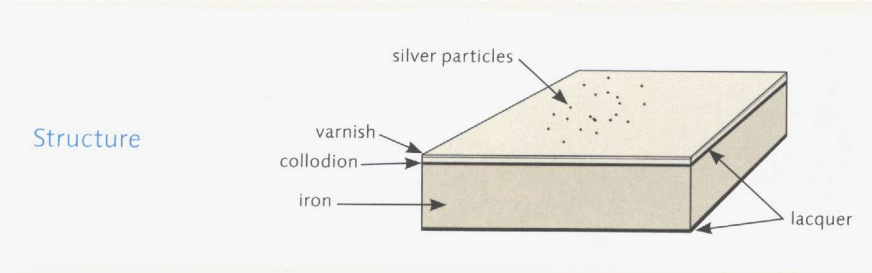
Tintypes

- Patented by Hamilton Smith in 1856.
- Also known as **ferrotype** (proper name since there is no tin) or **melainotype**
- Negative is supported by dark lacquered thin iron sheet
  - Similar to Ambrotypes, but support is different
- While considered functionally dead after 1900, examples found dating as late as 1930.

Popularity of Tintypes

- Lighter & less costly to manufacture
  - Could be sold for a penny or less
  - Making photography universally available.
- Camera was lighter & easier to handle
- Wouldn't shatter as a glass image
  - Popularity grew during Civil War
  - Tintypes could be mailed without shattering
- Like Ambrotypes, could be colored or tinted

Structure of a Tintype



Identifying Tintypes

- In a case, difficult to tell from Ambrotypes
  - If a magnet does **not** hold, it is an Ambrotype
  - If a magnet holds, it is likely a tintype
    - Darkly varnished metal backings were sometimes used for Ambrotypes.
- Deterioration often offers best clues
  - Easily bent, which can cause the varnish to crack.
  - Once air & moisture penetrates iron support, it begins to rust.

Tintype Care & Storage

- Because tintypes were meant to be handled, surface often scratched or bent
  - Even the slightest humidity will cause rust to appear
- Sometimes surface was varnished
  - Varnish can yellow when exposed to strong light
- Keep in storage envelopes
  - Protect against light and humidity
  - To prevent bending, add a piece of archival cardboard for more support

Negatives

History NEBRASKA

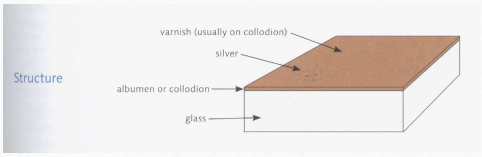
Negatives

- Negatives allowed photographer to make limitless number of copies
  - Images no longer one-of-a-kind
  - Could be shared, sold, and collected
- Earliest negatives were on paper
  - Calotype, 1840-c. 1855
  - Very rare, usually in poor condition

Collodion Wet Plate Negatives

- 1851, Frederick Scott Archer announced process using Collodion
- Used from 1851-1885
- Collodion: Cellulose nitrate dissolved in ether & alcohol
- Applied to glass to provide binder for photosensitive silver compounds
- Plate coated by hand & placed into camera wet
- Often identified by uneven emulsion coating
  - Tidal waves
  - Corners and edges uncoated

Structure of Collodion Wet Plate



Advantages vs. Disadvantages

- Advantage was greater sensitivity
  - Exposures could be counted in seconds rather than minutes
- Disadvantage was it had to be developed while collodion was still wet
  - Once dry, impermeable to the processing solutions
  - Could be managed in the studio, but made photography in open air challenging
  - Had to bring entire darkroom to site

Collodion Plate Care & Storage

- Because emulsion was soft, usually varnished
  - Helped protect against humidity and pollutants
  - Easily scratched or abraded
- Supported on glass, vulnerable to breakage
- Store in envelopes in correctly sized boxes
  - Paper enclosures add protection against changes in humidity and pollutants
  - Store vertically along long edge
    - Horizontal or flat storage not recommended

Glass plate recommended storage

4-flap negative enclosures

- Acid-free, lignin-free, unbuffered, PAT approved
- Reduces abrasions

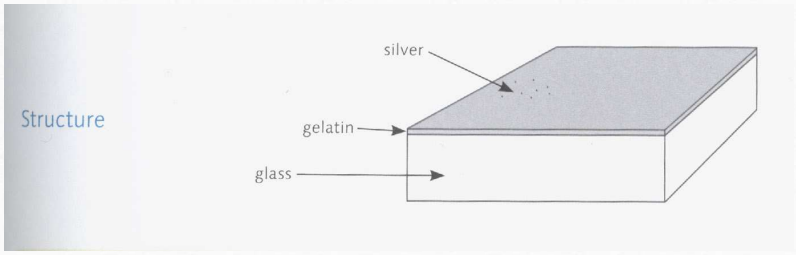
Glass plate negative boxes

- Acid-free, lignin-free, unbuffered, PAT approved
- Rigid dividers to keep plates vertical & reduce pressure

Gelatin Dry Plates

- Popular from 1878-1940
- Unlike Collodion , Gelatin negatives were "dry"
  - Retained their sensitivity for months before use
  - Could be developed long after exposure
- Could be manufactured industrially, stored, distributed throughout the world, and purchased for future use
  - Photography no longer exclusive to professionals with darkrooms
  - Very common in collections

Structure of Gelatin Dry Plate



Deterioration problems

- Physical damage: breaks and cracks
- Delamination: emulsion lifting from glass
  - Poor preparation of glass
  - Glass deterioration
  - Exposure to extremely high humidity
- All gelatin photographs (negatives & prints) subject to oxidation
  - Manifests as fading, yellowing, and silver mirroring

Silver Mirroring

- Bluish, metallic appearance
  - Often around edges
- Caused by poor storage conditions
  - Often stored in same poor quality boxes they were sold in
  - As box ages, gives off oxidizing gas that causes mirroring
- High humidity levels cause gelatin to soften and silver particles to rise to surface
  - Silver tarnishes

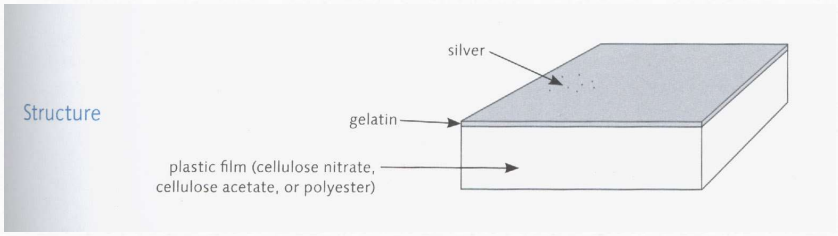
Gelatin Plate Care & Storage

- Supported on glass, vulnerable to breakage
- Choose environment that is cool and dry
  - Do not put in cold storage
- Store in envelopes in correctly sized boxes
  - Paper enclosures add protection against changes in humidity and pollutants
  - Store vertically along long edge

Cellulose Nitrate Negatives

- Commonly used from 1910-1939
  - Manufactured from 1888-1951
- Used for sheet film and motion picture film
- Usually have "NITRATE" marked on edge
- Very flammable
  - Can burn under water
  - Once ignited, nitrate fires are almost impossible to put out
  - Toxic gases produced by burning nitrates are lethal
- Inherently unstable

Structure of Flexible Negatives



Problems with Nitrate

- Unless kept at very low temperature, cellulose nitrate self-destructs at unpredictable rates
- As it deteriorates, gives off acidic by-products (nitric oxide, nitrogen dioxide)
  - These gases are deep lung irritants
  - Repeated exposure may cause eye irritation, rashes, & sores on face & neck, vertigo, nausea, headaches, swollen glands, & respiratory irritations
  - Also cause damage to materials around it
    - Embrittlement of paper & film and cumulative damage to many organic materials & metals

How to Identify Nitrate Negatives

- May have imprinted or embossed "Nitrate" along outer edge
- Look for V-shaped notch code on sheet film from Kodak prior to 1940
  - First notch from the right when the film is held with the notches in the upper right corner
- Film maybe slightly yellow or tan even without deterioration.

What to do with Nitrate Film

- Store separately from other photographic material
  - Well-ventilated
- Maintain a stable environment
  - Deterioration highly dependent on temperature & relative humidity
  - 32-40°F with relative humidity of 20-30%
- Best method is to store in a freezer
  - Slows decomposition (does not stop)
  - Special archival cold storage materials required
- Use 3 layers of protection
  - Individual sleeves
  - Archival, acid-free box
  - Place box in freezer or on shelf

What to do with Nitrate Film

- Never seal nitrate film in airtight containers
  - Gases and heat created must be allowed to escape
  - Use paper enclosures and boxes
- Reformat
  - Copy negatives
    - Considered most archival method
  - Digitize
    - Commit to changing technology
  - Copy prints
    - Negatives always hold more information than prints
    - Choose materials carefully

Cellulose Acetate Film

- 1925-present
  - Slowly replaced nitrate film
- Cellulose acetate, diacetate, triacetate, etc.
- "SAFETY" marked on edge
  - Burns with difficulty
- Stability problems
  - Autocatalytic: once deterioration has begun, the degradation produces further damage
  - Plastic supports become acidic, shrink and give off a strong vinegar (acetic acid) smell

Vinegar Syndrome in Acetate Film

- When stored in poor environment (high temperature & relative humidity) or exposed to acidic vapors
  - Undergoes chemical reaction to form acetic acid
- Causes support to become acidic, brittle, and shrink
- Six progressive stages
  1. No deterioration.
  2. The negatives begin to curl and they can turn red or blue.
  3. The onset of acetic acid (vinegar smell); also shrinkage and brittleness.
  4. The warping can begin.
  5. The formation of bubbles and crystals in the film.
  6. The formation of channeling in the film.

Polyester Film

- 1965-present
- When viewed between polarizing filters, the film is identified by interference patterns (rainbow colors)
- Much more stable over time than nitrate or acetate film

Prints

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Salted Paper Prints

- 1840-1860 (very rare)
- Positive photograph printed from negative
- Support material is ordinary paper
- Printed out solely by natural light
  - Negative placed in contact with sensitized paper and exposed to sunlight
- Print has a matte surface and warm image tones
  - Brick red or purple-brown depending on how it was processed and how the paper is sized
- 1-layer structure: image appears embedded in paper fibers

Albumen Prints

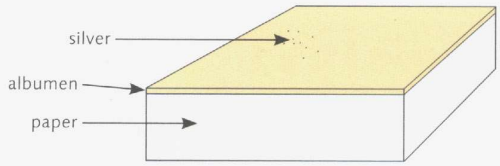
- 1850-1900
- Louis-Désiré Blanquart-Evrard showed first albumen prints to the French Academy of Science, 1850
- Quickly adopted by photographers
- Began to be replaced by industrial made gelatin & collodion printing-out papers in about 1885

How to make an Albumen Print

- A thin sheet of paper is first coated with egg whites and salt
- Floated on silver nitrate to make it sensitive to light
- The image is created by printing under a negative in sunlight
- The finished picture is fixed, washed, and often gold-toned before mounting

Structure of Albumen Prints

Structure



Identifying Albumen Prints

- Often sepia toned with a slightly glossy surface
  - Unfaded albumen prints have a purple-brown tone, rather than sepia
- No baryta layer
  - Prints are always mounted
  - Paper fibers visible through albumen
- Signs of deterioration can be helpful in identifying albumen prints
  - Yellowing
  - Localized or overall image fading

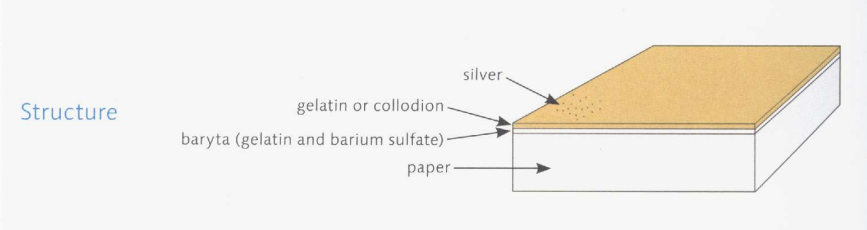
Typical Mounts for Album Prints

- Carte-de-visite (4.25 x 2.5)
- Victoria (5x3.25)
- Cabinet Card (6.5x4.5)
- Promenade (7x4)
- Panel (8.25x4)
- Boudoir (8.5x5.25)
- Imperial (9.75x 6.75)
- Stereo (3x7)

Collodion Prints

- Available in the 1860s but not popular until late 1880s
- Chief commercial portrait medium between 1895-1910.
- Made with the same sticky **nitrocellulose** emulsion as Ambrotypes and wet plate negatives
  - Mixed with **silver chloride** and coated onto paper.

Structure of POP Prints



Identifying Collodion

- Surfaces can be matte, glossy, or semi-gloss, like an albumen print
- The white areas generally lack yellowish cast of albumen prints
- Usually toned with gold or platinum
  - Show little or no fading
- They do not show silver mirroring

Silver Gelatin Print

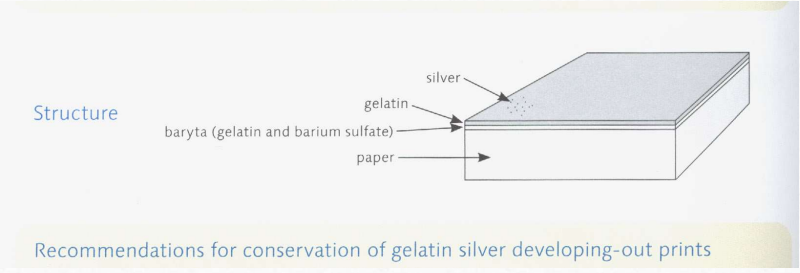
Printed Out Process

- Image developed from direct reaction to light
- Warmer in tone
- Usually very glossy
- Often faded to yellow
- First appeared in late 1880s

Developed Out Process

- Visible image through use of chemical developer
- Cooler in color (blue, neutral, or black) unless toned
- Made either by contact printing or enlarged from negative

Developed Out Gelatin Print



Recommendations for conservation of gelatin silver developing-out prints

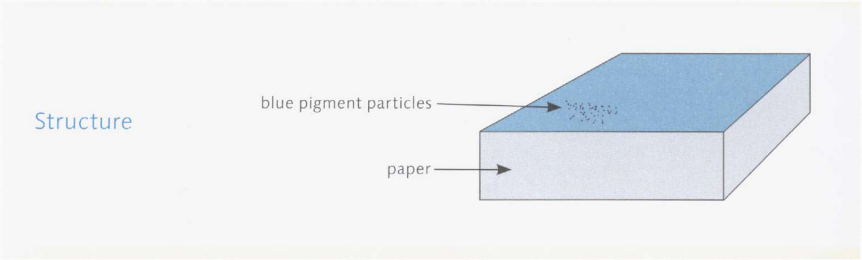
Gelatin Printing Out Paper

- By 1905, sales of developing-out papers outsold printing-out papers
- Many reasons commercial photographers preferred
  - Lower costs (no precious metal toning)
  - Faster & more reliable production
- Amateurs attracted because did not need daylight to expose
- Most black and white photographs of the 20th century are silver gelatin prints

Cyanotypes

- Developed by Sir John Herschel, 1842
  - Most date between 1880s-1920s
- Based on light sensitivity of iron salts
  - Ferric ferrocyanide (Prussian Blue)
  - Ferrous ferricyanide (Turnbull's Blue)
- Easily identified by uniform, bright blue color

Structure of Cyanotypes



Cyanotype Care & Identification

- Exposure to light chemically changes image to a colorless form
  - To some extent the change reverses itself in the dark & the blue color is restored
- Images subject to alkaline or buffered conditions fade to very pale brown & lose almost all detail and density
- Store in unbuffered or plastic enclosures

Platinotypes

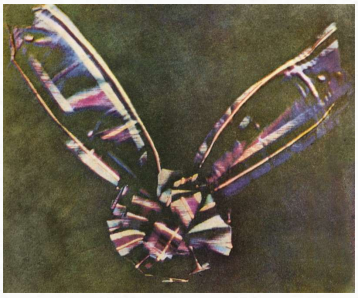
- Introduced commercially in 1879
- Manufactured until World War I
  - Revived since 1960 by photographers who like to coat their own paper.
- Widely used for commercial portraiture after the turn of the 20th century.
- With wide range of gray tones, platinotypes are among the most beautiful and permanent photographs.

Identification of Platinotypes

- In platinotypes, or platinum prints, paper is sensitized with platinum salts
- Image appears embedded in the paper fibers
- Highly stable metallic platinum
  - Resistant to fading
- Toning is generally silver to black, but warm browns were also achieved
- "Ghost" prints
  - If poor quality paper is left in contact with platinum print, platinum will accelerate cellulose degradation
    - Brownish discoloration on paper
    - Not a transfer print

Early Color Photography

- 1855, James Clark Maxwell first suggested 3-color process
  - Scottish physicist, studied color vision
  - 3 colorless photos of the same scene were taken through red, green & blue filters
  - transparencies made from them were projected through the same filters
  - superimposed on a screen the results would be an image reproducing not only red, green, & blue
  - All the colors of the original scene



Tartan Ribbon
Oldest known color photograph
Taken in 1861 by Thomas Sutton

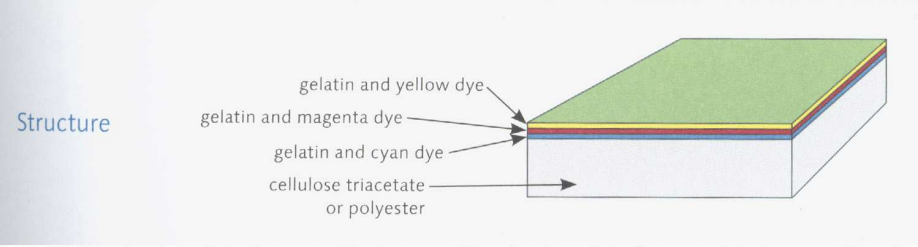
Modern Color Photograph

- Agfa released first chromogenic negative film (Agfacolor) in 1939
  - WWII delayed commercial expansion
- Eastman Kodak marketed Kodacolor film in 1942
- Positive printing papers were released commercially
  - High price of processing & printing gave it a slow start
- In 1970s, cost of color materials decreased
  - Color photography began to replace black & white photography in the mass market

Color Negative

- 3 gelatin image layers, laid one on top of the other
  - Top to bottom, yellow, magenta, & cyan
  - Modern films have more complex layered structure
- Chromogenic process
  - Dye molecules are synthesized during processing
    - Chromo = Color
    - -genic = producing
- Cold Storage recommended

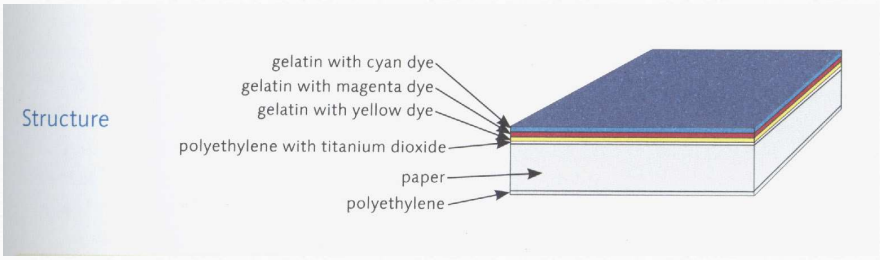
Structure of Color Negative



Color Prints

- Image consists of at least 3 separate gelatin layers, laid one on top of the other
  - Top to bottom: cyan, magenta, yellow
- Images aren't **"Turning Yellow"**
  - The magenta and cyan layers fade faster then the yellow layer
- Chromogenic process
- Modern color prints have resin coated backing
  - What makes it difficult to write on backs of photos
- Cold Storage recommended

Structure of Color Print



Questions?

Next Topic: Preservation and Storage

Preservation & Storage

History NEBRASKA

What's damaging your photographs?

- Temperature & Humidity
- Light
- Pests & other bad things
- Poor Storage
- Improper Handling

Relative Humidity (RH)

- The amount of water in the air
- Single most important environmental factor
- Ideal RH in an Archive: 40%
- Low levels (0-30%) can cause photos to become brittle and shrink unevenly
- High levels (50%-100%) cause oxidation, fading, and spread of fungus
- Important to avoid extreme fluctuations

Effects of High RH

- There is a rapidly escalating level of damage to prints exposed to high RH (50-100%)
  - 50-60%: Increase in moisture content of albumen and gelatin, but not devastating
  - Above 60%: Very rapid increase in moisture content and threat of fading becomes serious
    - The higher the humidity, the faster images fade
    - Once fading occurs, the damage cannot be reversed
    - Even short periods of high humidity can cause damage
  - 65-70%: Spread of fungus become possible

Temperature

- Deterioration is the chemical breakdown of the photograph
  - Heat increases chemical reactions
- Ideal temperature for Archives: 60-65°F
  - Anything below 65°F, no longer comfortable for people to work for long periods of time
  - Keep as low as possible without raising RH and causing condensation when moved to warmer environment

Temperature & Humidity

- Keys to preservation
- Interrelated
  - Temperature determines water air can hold
    - Warm air holds more water then cold air
- In a closed system like a room or building:
  - A rise in temperature will lower the RH
  - Cooling the air will drive up the RH
- Combination of high temperatures and high RH is one of the **worst** things to happen to your collection
  - Can cause emulsion to become sticky

What to do:

- Use proper storage and housing
- Important to create a stable environment
- Measure & track RH levels in storage & exhibit areas
  - Hygrometer (hair or digital)
  - Hydro-thermographs
  - Data loggers
- Improve HVAC system
- Room humidifiers & dehumidifiers
  - Temporary solutions
  - Cannot provide constant RH control

Low Cost/No Cost Improvements in Climate Control

- Keep winter heat low
- Seal windows
  - In storage areas, line windows with aluminum foil, and seal them more completely with gypsum wallboard and plastic
- Keep outside doors and windows closed
  - Use weatherstripping
- Block radiant heat from radiators
- Keep equipment at one level 24 hours a day
- Separate collections that need special conditions

Mold Outbreaks

- Mold is a form of fungal growth
- One of the most serious sources of damage to Library, Archival, and Museum Collections
  - As well as a potential health threat to the people caring for collections
- Attracted to starches
  - Such as: plant gums found on adhesives, sizings, and cloth; proteins, such as leather, parchment, gelatin, and animal glues; and cellulose (main component of paper)
- Mold can attack books, documents, art on paper, photographic prints and negatives, and other paper-based artifacts.

Mold Outbreaks

- As mold grows and digests collections materials, it compromises and weakens them
- Many molds contain colored substances capable of staining the material on which they grow
- Once an item has been attacked by mold, it will be more susceptible to future damage.
- The weakened organic material absorbs water more easily, resulting in an ongoing cycle of damage.

Mold Outbreaks

- Mold needs 2 things to grow
  - Organic host material to grow on
    - Paper, adhesives, cloth, wood, and leather
    - Superficial soiling deposits like skin cells, clothing fibers, external dirt, oily substances and industrial pollutants
  - Moisture
- Outdoor environment must be considered a factor in mold growth
  - Outside air is continually circulated though buildings by HVAC systems
  - Be aware of the increased possibility of mold growth during times of year when temperatures begin to drop and the amount of moisture in the air tends to be higher

A Mold Bloom

- Mold spores exist in most environments at almost all times
- A sudden mold bloom in a collection indicates that an environmental change has occurred, causing the spores to germinate.
- Such concentrated outbreaks can be caused by triggers including faulty HVAC systems (heating, ventilating, and air conditioning); water leaks; flooding; and other climactic changes.
- In instances of water-damage to collections or buildings materials, action within 24-48 hours is necessary to prevent mold growth.
- **If a mold bloom is suspected that a collection has a mold outbreak, human safety and proper personal protective equipment should always be the first priority.**

Humidity and Mold

- The mold that most commonly attack paper-based material are at the greatest risk to germinate and grow when the **relative humidity reaches or exceeds 70-75 percent** and remains at this level for several days.
  - High temperatures, poor air circulation, dim or no light, and accumulated soiling assist and accelerate the growth of mold once it has germinated
  - But only high relative humidity of the environment and moisture contents of the substrate can initiate and sustain mold growth
- EPA recommends maintaining indoor relative humidity levels **below 60 percent**
  - Ideally 30-50 percent for paper-based and photographic collections
- Mold will stop growing and become inactive when RH drops below 70 percent

In-House Assessment

- First, determine that the observed problem is mold.
  - Accumulations of dirt, dust, stains, cobwebs, and condition issues, such as fatty acids leaching out of oiled leather bindings and printing inks, are sometimes mistaken for mold.
- Check temperature and relative humidity in the area.
  - Are there any visible signs of water damage?
  - Under some circumstances, mold growth can occur within 24-48 hours.
- Does the material feel damp? Smell musty or moldy?
  - Some molds produce and emit **microbial volatile organic compounds (mVOCs).**
  - While a musty smell may not always indicate active mold, these mVOCs are the source of the musty odors often associated with mold.

Decisions on How to Proceed

- Small to moderate outbreaks involving a limited number of items can often be **handled in-house** if no highly toxic mold species are present.
  - Toxicity of mold species can only be determined by a certified mycologist; a local hospital can provide a referral for a mycologist.
- Outside assistance depend upon the extent of the outbreak, toxicity of the mold involved, resources of the institution, and the type of material affected.
- The Environmental Protection Agency (EPA) and the New York City Department of Health and Mental Hygiene have defined guidelines for cleanup methods and the protection/containment required based on size of outbreak as follows:[2]
  - Small area: Less than 10 square feet affected.
  - Medium-sized isolated areas: 10-100 square feet affected.
  - Large areas: 100 or more square feet affected. ONLY properly trained mold remediation workers should attempt clean-up and containment.

Responding to Outbreaks

- Use common sense and consider health and safety first!
  - A severe mold outbreak can be extremely hazardous to your health.
  - If the situation does not appear safe, do not attempt to touch, move or clean materials without outside help.
- If it is a small outbreak or if you are familiar with emergency mold response, do as much as you safely can to:
  - Determine the cause of the outbreak
  - Isolate materials or restrict access to the objects or room
  - Take steps to lower the temperature and relative humidity, install and empty dehumidifiers frequently
  - Consult print and web resources, preservation support organizations or your disaster recovery contacts regarding recovery, cleaning, disposal and remediation of the source problem.

Quarantine New Collections

- Incoming materials can be a blessing or a boon to your collection, depending on what they bring with them!
- Your accession protocol should provide a time period for inspection and observation in a "quarantine" room isolated (ideally, physically sealed) from the collection.
- Quarantine inspection identifies any problematic materials or possible infestation in the objects and packaging materials.
- The affected materials can then be treated before integrating them into the collection, preventing larger disasters.

Light

- Just plain BAD!
- Causes fading and yellowing
- Damage caused by light permanent
- Ultraviolet (UV) light causes the most damage
  - Protection from UV light does NOT eliminate light damage.
  - ALL light is bad
- Some types of images are particularly light sensitive
  - Albumen prints, cyanotypes, and especially color images

What to do:

- Display copies whenever possible
- Scanning or photocopying cause little harm
  - Continued light exposure & handling cause much more damage
  - Keep scanning and copying to a minimum
- Keep original photographs in the dark

If you do display an original print:

- Know that the damage is permanent
- Take precautions
  - Avoid direct sunlight
  - Choose glass with UV protection
  - Select Archival quality frame and mats
- Monitor fading

Pests & Other Bad Things

- Often the result of poor storage conditions
  - Insects and mold breed in moist, dark spaces
- Organic material that make up photographs are tasty meals for insects, rodents, and mold
  - Gelatin, cellulose, paper

Types of Pests to Watch for

- Things that will eat your collection
  - Rodents
  - Mold
  - Insects: Silverfish, firebrats, German cockroaches, furniture beetles, termites
- Things that leave behind messes
  - Rodents
  - Mold
  - Insects: Cockroaches, flies, spiders, wasps, etc.

Integrated Pest Management Policy

- Prevent photographs from being attacked and damaged by pests
  - Insects or Fungi (mold)
- Moved away from regular applications of toxic chemicals (pesticides & fungicides
- Among institutions that reported damage or loss in a 2-year period, 27% was attributed to pests
- Pests rank among the top 5 causes of damage or loss for museums and scientific collections
- Pest contributed to damage or loss in 27% of all types of institutions, including libraries, archives, and historical societies.

Common Types of Pests

- Brown banded cockroaches
  - Prefer dry environments where they like to devour paper and glue.
  - Catastrophic to libraries, archives and art museums, where old books, documents or paintings have much to offer this species of cockroach.
- Clothing moths
  - Feed exclusively on animal fibers
  - Museums housing animal pelts, textiles and/or taxidermy mounts are especially at risk of an infestation.
- Silverfish
  - Favor finished paper, glue, and wallpaper -- venturing out at night to feast on these materials common to art museums, archives and libraries.
  - Due to their weak mouthparts, their feeding is referred to as rasping and evidenced by lacelike irregularities left on surfaces.

More Pests

- Booklice
  - Wingless insects that behave similarly to Silverfish
  - Like high humidity conditions where they feed on microscopic mold
  - Don't actually cause damage to collections but often sign of mold
  - Left unchecked, mold presents its own
- Termites
  - Less common, though still concerning
  - Requires a professional pest management approach.
- Rodents
  - Mice and rats will gladly sink their teeth into until they are destroyed

Step One: Preventing Access

- Identifying and fixing problems in the building and room structure that allow pests entry
  - For example: cracks in roofs and walls, doors and window seals
  - Providing for well sealed cabinets that deter access to specimens.
- Maintaining an environment in collections areas that is not hospitable for pests.
  - Pest infestations can sometimes be directly related to temperature and relative humidity.
  - Ensure that collections areas do not have high heat or humidity conditions that will allow pest populations to flourish.

Preventing Access

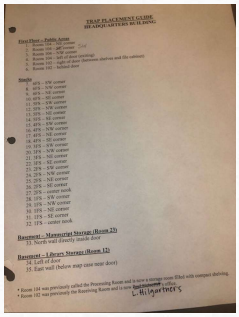
- Keeping food and food preparation far away from collections housing.
- Making sure that collection areas are kept clean and free of trash, debris and foodstuffs that could encourage pests.
  - **Good housekeeping helps prevent infestations.**
- Developing new collection procedures to make sure that new collections and packing material are safe to enter collections areas.

Step Two: Monitoring

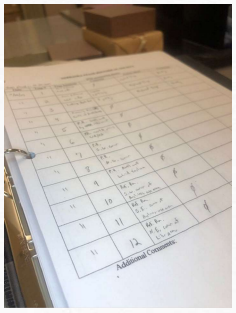
- All buildings have their own ecosystems
  - Based on their location and other historic factors
- Some pests will always be found inside
- Monitoring this ecosystem provides a useful way to determine what species are common in your facility and when conditions might change to allow one species to become more common enough to present a danger to the collections
- Insect traps, such as sticky traps or pheromone traps, are commonly placed throughout collection areas and checked on a regular basis, recording the contents.
- Pest sightings or an uptick in pest activity should prompt an investigation into potential causes.

Regularly Monitor

- Create a list or map of trap locations



- Use log to monitor what is found in traps



Step 3: Identification

- Identify the pests found in traps
  - University of Nebraska-Lincoln Institute of Agriculture and Natural Resources
    - https://extension.unl.edu/statewide/douglas-sarpy/insects/
  - Insect Identification for the Casual Observer
    - https://www.insectidentification.org/insects-by-state.php?thisState=Nebraska
- Identification will allow decisions to be made on how potentially damaging the activity may be to the collection.
- Identifying the pest also aids in ensuring that a proper course of remedial action is chosen.

Step Four: Elimination

- The use of chemical agents to deal with either routine pest mitigation or more entrenched infestations should be left to **professional pest management companies** who are trained and licensed in accordance with state regulations and health and safety standards.
- To deal with infestations at the specimen or collection level the two most common procedures are **low-temperature (freezing)** or **low oxygen (anoxia)** treatments.

Storage Conditions

- Create a safe, stable environment
  - Consistent temperature & humidity
  - Away from pests
- Protected from water damage
  - Water from any source can cause severe damage
    - Flooding by nature, broken pipes, water heaters
  - Pay close attention to water sources in storage areas

Storage Conditions

- Air Contamination
  - Impurities can speed up deterioration
    - Gases given off from wood, cardboard, newspapers, and some types of negatives can cause damage
    - Cause fading, discoloration, and embrittlement
  - Solid particulates like dust, pollen and soot can cause scratches and damage to emulsions

Photograph Storage

- Provide support and protection
  - Three levels: enclosure, box, and shelf
- Improve organization
  - Use acid free file folders or dividers
- Aid in disaster recovery

Storage of Photographs

- Use only materials that have passed the **Photographic Activity Test (PAT)**
  - Meet or exceed national standards
  - Will not harm your photographs
  - Not the same as "Archival"
- Acid-free, lignin-free, unbuffered
- Choose the size closest to what you are storing
  - Not too tight: could be damaged when removed
  - Not too loose: slide around & damage corners

Paper Housing Materials

- Chemically stable
- Specific pH level
  - Unbuffered usually recommended for all photos
- Smooth, non-abrasive
- Pass PAT test
- NO magnetic albums
  - Remove immediately

Plastic Housing Materials

- Chemically inert
  - Will not react with photographs
- No surface coatings
- Passes the PAT test
- Main types
  - Polyester
  - Polypropylene
  - Polyethylene

Paper vs. Plastic

- Use Plastic Enclosures for:
  - Damaged, weak, or brittle photographs
  - Thin prints
  - Often handled or looked at images
- Use Paper Enclosures for:
  - Nitrate or acetate negatives to allow off-gassing
  - Poorly processed prints
  - Most photographic materials
  - Less expensive then plastic enclosures

Choosing Photograph Enclosures

- Choose the size closest to what you are storing
  - Too small of an enclosure could cause damage when the photo is removed
- Too large or loose of an enclosure will allow the photo to slide around and damage corners.
- Broken glass plate negatives and items with flaking emulsions should be placed in custom sink mats.
- Custom phase boxes should be made for albums and cased photographs

Improper handling

- Even in the most ideal storage conditions, photos can still be harmed
- Improper handling causes most harm
- Easily bent, torn, and cracked
- Fingerprints damage emulsion and attract insects

General Artifact Handling

- Eating and drinking are not permitted in storage areas or work spaces
- Hands must be clean and free of substances that could stain or damage artifacts or their containers
  - This includes food, ink, toner, tobacco, hand lotion, and "Tacky Finger" or similar products.
  - Always wear gloves when handling photographic material or metal objects.
- Do Not Rush
  - This is when accidents happen and damage occurs. Take your time and plan your movements.

Rules for Work Surfaces

- **Clear a clean "landing surface"** (table or work surface) before moving items to work station.
  - The table must be larger than the records.
  - No part of a record should overhang the work surfaces (tables, desks, scanner platens, etc.).
- **Plan out the movement and pathway** of objects before actually moving anything.
  - Have a clear work space to set it down.
  - Let others around you know that you are moving through the area with fragile material.
  - Always move to the side for someone moving an item.
- **Always use a cart or support** to move more than one or two items.
  - Make sure there is adequate space for the object to sit on the cart before loading it.

General Artifact Handling

- **Maintain good body position** when moving objects. Artifacts can be very large and heavy, so don't endanger yourself or the object!
  - Use two hands (or second or third person if necessary) to support an item completely.
  - Use a step stool or ladder when you need to remove an object from a high shelf.
- **Never place records or their containers on the floor.**
  - Only tables, carts, shelves or work surfaces.
- **Do not place anything on top of records**.
  - This includes but is not limited to such objects as equipment, notebooks, order forms, books, pencils, and computer discs.

General Artifact Handling

- **Only pencils** may be used near records or records containers (such as boxes, folders, sleeves). Ballpoint pens, felt tip pens, markers, and similar items are not permitted.
- **Self-stick notes** (e.g., "Post-It Notes") may not be applied to records or their containers without curator's permission.
- **No adhesive tapes** may be applied to records or their containers.

General Artifact Handling

- **Do not rest, lean upon, sitting upon**, or otherwise exert pressure on records or containers
- **Be mindful of loose clothing or dangling materials** such as lanyards, jewelry, sleeves, or ties
  - They can damage the surface or catch archival material, tear them or cause them to fall to the ground.
- **Keep records covered or in closed boxes/folders** at all times
  - Protect records from excessive light exposure
  - Except when being copied, photographed or scanned.
- **Keep records in their original order**
  - Returned to their original folders or containers after copying.
  - Only remove one item at a time from its folder or container

Always wear Gloves With Photographs

- **Always wear white cotton or latex/nitrile gloves**
- **Nitrile** works best for glass negatives, damaged or very small prints
- **White cotton gloves**
  - Provide limited protection for collections and reduce tactile sensitivity
  - Make it difficult to handle collections carefully and ultimately increasing the chances of physical damage
  - Cotton gloves have many small hairs that can easily catch on brittle edges or worsen an existing tear
  - Cotton is also very absorbent and thus easily soiled, picking up dirt, dust, and other materials that can then be transferred to the item being handled.

Handling Photographs

- Use both hands
- Never pick up or hold photographs by corners
- Avoid touching the surface/emulsion
- Support image if you turn it over
- Use paper or mat board to add support for fragile items
- If a photograph must be moved a short distance or turned over during examination, use an auxiliary support (such as 2- or 4-ply rag board, or folder stock) to protect the item from damage caused by unnecessary touching, bending, and flexing.

Handling Photographs

- Work over an uncluttered, clean surface.
- Always use a cart when transporting photographs.
  - Never hand carry photographs or boxes containing photographs from the stacks to your workspace.
- Light damage is cumulative and permanent.
  - Limit the amount of time a photograph is exposed to light.
- Stereographs are often on curled cards.
  - Do not attempt to flatten or press down on the curve.
  - Also, do not attempt to flatten turtle-back or curved photographs.
- Give patrons viewing photograph collection a brief tutorial on proper handling

How to remove Photos and Negatives from enclosures

- **To remove photographs from either plastic or paper enclosures:**
  - Squeeze the long sides of the enclosure to open
  - Wearing gloves, gently grab photo along the center of the edge and not by a corner.
  - Slowly slide photo or negative out.
  - If the photo catches along the edge,
- Return negatives and prints to their enclosures with emulsion side away from the glued seam of paper enclosures
- Rolls of film must be rewound with the emulsion side in

Labeling Photographs

- Use pencil
  - Good old No. 2
  - General's Woodless Graphite 6B pencil
    - Writes even on modern, coated photographs
- Write along the back edge
  - Never write on front
  - Do not write over information written on the back of photos
- Pens can bleed through paper and smear
  - Especially during a disaster
- Write additional information on enclosure or photocopy rather then original photograph
  - Do not write on envelop while the photograph is inside it

"Repairing" Photographs

- Good intentions can cause more damage
- **Tears are often best left unmended**
- Do not use tape, glue, rubber cement, staples, thumb tacks, etc. to "repair" photographs
  - Place torn photographs in plastic sleeves
- Do not use rubber bands or paper clips to bind photographs together

History NEBRASKA

Preservation vs. Conservation

The goal is to prolong the existence of our collections

- Preservation: caring for collections by monitoring environmental controls, proper storage, safe handling, and leading display practices

- Conservation: the profession devoted to preserving cultural property. Includes examining, treating, and documenting artifacts

Cleaning and repair

- Do not attempt to clean or repair heirloom photographs yourself or allow anyone (even commercial photographers) not trained in photographic conservation to "restore" your photographs
  - Consult a professional conservator
- Use a soft brush to gently remove dust particles
  - Photograph brush
  - Natural makeup brushes

History NEBRASKA

Ford Conservation Center

1326 South 32nd St., Omaha, Nebraska 68105-2044
Phone: 402-595-1180 Email: hn.fordcenter@nebraska.gov

Questions?

Next topic: Identifying Issues and What to Do?

Identifying Issues & What to Do

History NEBRASKA

Albums and Scrapbooks

- Present unique challenges
  - Often feature mixed media
- Big questions: Take apart or leave as is?
  - Depends on the condition
  - Evaluate the condition of the photographs, pages and album
- "Visual Diaries"
  - Created to tell a story

Albums & Scrapbooks

- If photos appear in good condition, leave together
- Interleave pages with acid-free tissue paper
  - Tissue paper will absorb acids in album pages, so monitor and replace regularly
  - Cabinet card albums often have gilded edges
    - Can cause gold/white spots in emulation
    - Interleave with tissue or Mylar

Handling Albums, Scrapbooks and other bound materials

- Do not lean on or press down on binding
- Do not flatten out pages
- Some albums are held together by string or removable fasteners.
  - Check with curator before removing for digitization
- Carefully replace when completed

Tips for Preserving Scrapbooks

- Iowa Conservation & Preservation Consortium recommends:
- Store in archival boxes, premade or custom boxes
- Depending on size, store flat or spine down
- Shelving small and medium-sized scrapbooks on books between similar sized items, prevent warping
- Loose or detached covers can be tied up (package style) with flat cotton tape
  - Place bow at font edge to prevent pressure damage
  - For additional protection, wrap in tissue or Tyvek
- Flat storage is best if they contain pamphlets or other heavy artifacts (buttons, medals, etc.)

Taking Apart Albums

- Often the last resort
- Always remove photos from magnetic page albums
- Consider photocopying or scanning first
  - Part of the documentation
  - Helps preserve the "story"
- Document everything
  - Condition
  - Why it was taking apart
  - Which photos went on which pages, etc.

Handling Albums, Scrapbooks and other bound materials

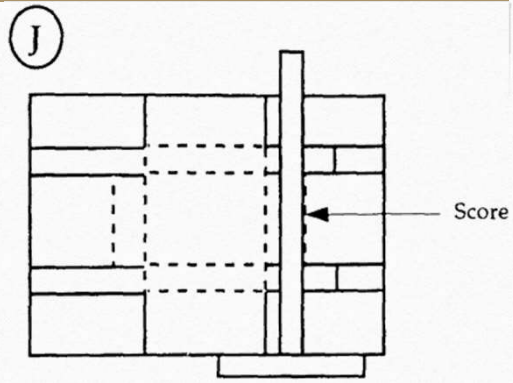
- Scrapbooks may have raised surfaces, three-dimensional decorations, or moving parts.
  - They are unique, fragile, damaged, and should be handled with care.
- Supports
  - Use book cradle to support the volume
  - Use book snake or weight to hold pages down
- Turn pages carefully by the edges
  - Fragile or heavy pages should be supported by your hand or a page turner. Page-turners can be microspatulas, thin Teflon folders, or simple items made out of stiff paper, basically, anything thin to slip in between pages

Custom Phase Boxes

- Albums, Scrapbooks and other bound materials
- Protection from wear and tear
- Accessing wear and tear
- Less expensive then premade boxes
- Can be made in about 5 minutes
- Protection from fire damage

Items needed to make Phase Boxes

- T-Square
- Utility Knife
- Bone Folder
- Steel Ruler
- Cutting Mat for working surface
- Small Cutting mat
- Pencil
- Acid-Free board
  - Corrugated (1-2mm thick)
  - Folder stock (20 pt Heavy Weight



Uppsala University Archives' 5-minute Phase Box

Rolled Photographs

- A Four-Step Procedure for Flattening a Rolled-Up Paper Document or Photograph
  - Do not use with oil paints, watercolors, charcoal, chalks or pastels
  - See NPS Conserve O Gram 13.2

- Step 1: Clean the Paper
- Step 2: Assemble a Humidification Chamber
- Step 3: Humidify the Paper
- Step 4: Flatten the Paper
  - Emulsion will be soft, do not place anything directly on top
  - Place weights around edges

Oversized Prints

- Generally prints over 11" x 14"
- Store flat
  - Drop-Front Boxes
  - Map Cases
- Encapsulate for additional support
  - Never laminate!

Slides and Transparencies

- Types of slides
  - 35mm slides
  - Lantern slides
  - Other
- 35mm slides can be stored in different ways
  - Slide protector sheets
  - Rigid slide protector sheets
  - Slide boxes with larger standard size drop-front or clamshells
  - **Do not store in slide carousel!**
- 4-flap enclosures recommended for Lantern Slides
- Monitor color slides for deterioration and fading
  - Consider cold storage for advanced deterioration.

Cold Storage for Nitrate and Acetate Negatives

- Long-term preservation of film-based photographic collections
- Provides a stable environment
- Extends longevity and preserves them for future use
- Research proves cold storage can add hundreds of years to film-based materials
- Maybe implemented using freezers or vaults

What Benefits from Cold Storage

- Negatives (Sheet and Rolled film)
  - Nitrate, Acetate, and Color
  - Not glass negatives
- Slides (or anytime of transparency)
- Motion picture films
- Microfilm and Microfiche
- X-ray film
- Aerial film

Cold Storage

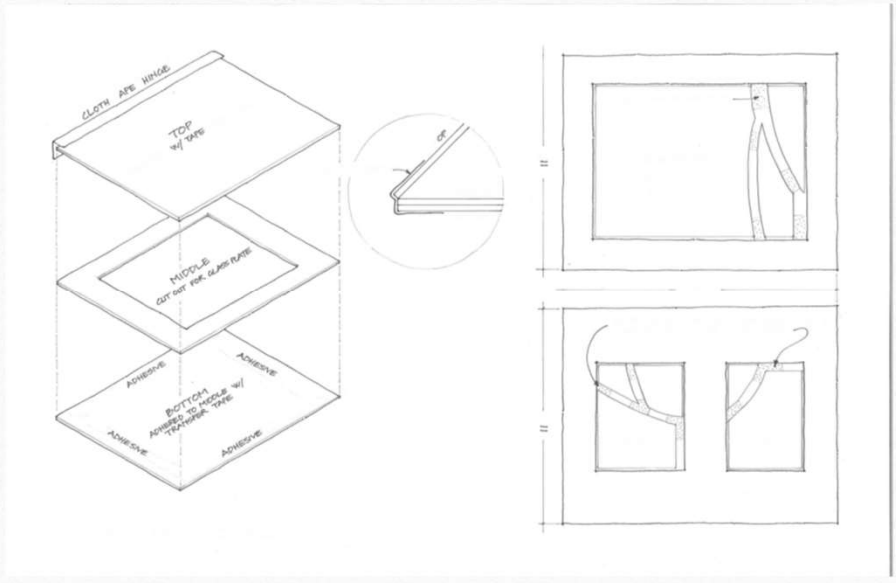
- Cold Storage space can be limited
- Important to prioritize film collections for cold storage
  - Start with Nitrate
  - Then acetate negative showing signs of deterioration
  - Finally, color negatives and slides
- ***National Park Service's Cold Storage***
  - https://www.nps.gov/museum/coldstorage/html/intro1_1.html

Broken or Flaking Glass Plate

- Store in special, custom-made sink mat housings
- Store horizontally with all the fragments in the same housing.
  - While keeping them out of direct contact with one another
- Flip-open front border allows one to remove and examine the glass plate with minimum manipulation

Making Sink Mats

- Housing should be constructed of pH neutral corrugated board
- Consists of a flat base and 4 strips which created the sink mat
- Tools needed:
  - Gloves
  - Double coated tame
  - pH neutral corrugated board
  - Volara Foam
  - Book binding tape



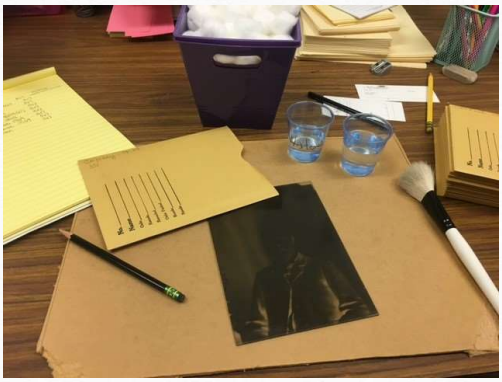
Cleaning Glass Negatives

- Items needed:
  - Soft hair brush (Chinese or Japanese Hake brush)
  - Lint-free disposable cleaning tissues or cloths
  - ethanol
  - deionized water
  - non-spilling container (Menda jar)
  - Cotton swabs
  - Paper towels and table brush for cleaning work area
  - Nitrile gloves
- The surface where the objects are to be cleaned should be clean and covered with a non-abrasive tabletop covering.
  - Adequate ventilation should be provided to reduce fumes.
- The person cleaning the negatives should be wearing long sleeves and nitrile gloves to prevent the absorption of the ethanol into the skin (the ethanol used has methanol in it, which is poisonous).
  - If any of the solution gets on the person's skin, it should be washed off immediately with soap and water.

Cleaning Glass Negatives

Emulsion side of the negative

- Gently brush away loose dust and dirt with a soft hair brush. Leave stubborn dirt as harsh rubbing or abrasion can damage the emulsion.
- ** NOTE: this should be attempted only if the emulsion is **NOT** flaking, cracking, or soft.
- If you have questions, consult the Photographs Curator or the Paper Conservator.



Cleaning Glass Negatives

Glass side of the negative

- Gently clean away loose dust and dirt with a soft hair brush.
- For more stubborn dirt, use a lint-free disposable cloth and the glass cleaner provided. Cotton swabs may also be used for smaller areas of stubborn dirt. DO NOT use ammonia-based cleaner (e.g. Windex) to clean glass plate negatives; ammonia is too harsh a cleaner for these objects.
- When the negative is clean, place it in a proper enclosure to protect it from future dust and dirt.
- Occasionally sweep away excess dust and dirt in your work area with a table brush. This is to prevent more dust and dirt from getting onto the negatives.
- If you have any questions or concerns, please consult the Photographs Curators or the Paper Conservator.

Questions?

Next Topics: Researching & Identifying
and Creating Access with Digitization

Researching & Identifying

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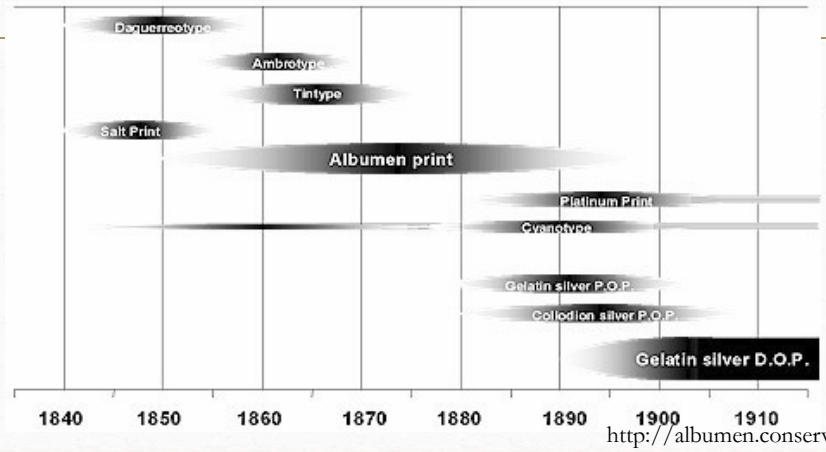
Who is in your photos?

- Photograph with incomplete information very common
  - Undated
  - Unidentified
- Combine the clues
  - Type of photo
  - What's in the photo
  - Family history

Major Photographic Processes



http://albumen.conservation-us.org/

Style of photograph

Real Photograph Postcards, 1903-1930

- 1903, Kodak introduced the No. 3A Folding Pocket Camera
  - Used postcard sized film
  - 3-1/2" x 5-1/2“
- Allowed the general public to take photographs and have them printed on postcard backs
- Easy to share & send
  - Family & **friends**

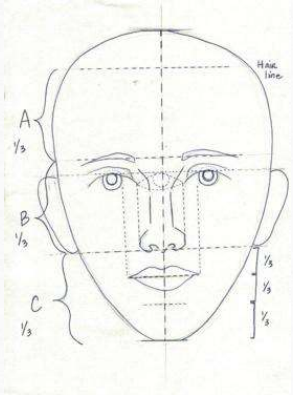
When was this photograph taken?

- Narrow down the possibilities
  - Who was the photographer and when were they in business?
  - What is going on in the photograph?
    - Photographer's props
    - Fashions, hairstyles
  - Where does it fit in the historical context of your family history?
    - Can you compare it with identified photographs?

Comparing Photos

Elements of a face

- Ear
- Nose
- Eyes
- Upper lip
- Chin
- Hair line



Document your guesses

- Most identifications are our best guesses
  - If you can't confirm with outside sources
  - Explain your reasoning
  - Another person might look at your evidence and come to a different conclusion

Creating Access through Digital Imaging

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Making copies

Analog

- Copy negatives
  - Considered the safest, most archival
  - Technically challenging
    - Equipment, lighting
- Copy prints

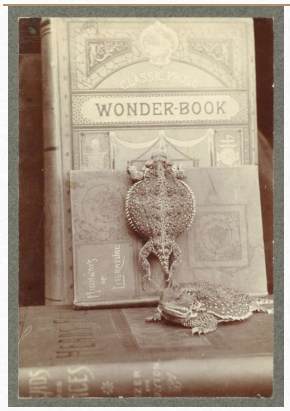
Digital

- Scanning/Digitizing
  - Can be done by anyone with a scanner
  - Quality issues
    - Resolution/size/format
    - Equipment
  - Digital Commitment

What are digital images?

- Digital surrogates
  - Digital copy made from original print or negative
  - Can be made by scanner or digital camera
- Born digital
  - Original made by digital camera
  - No prior analog copy

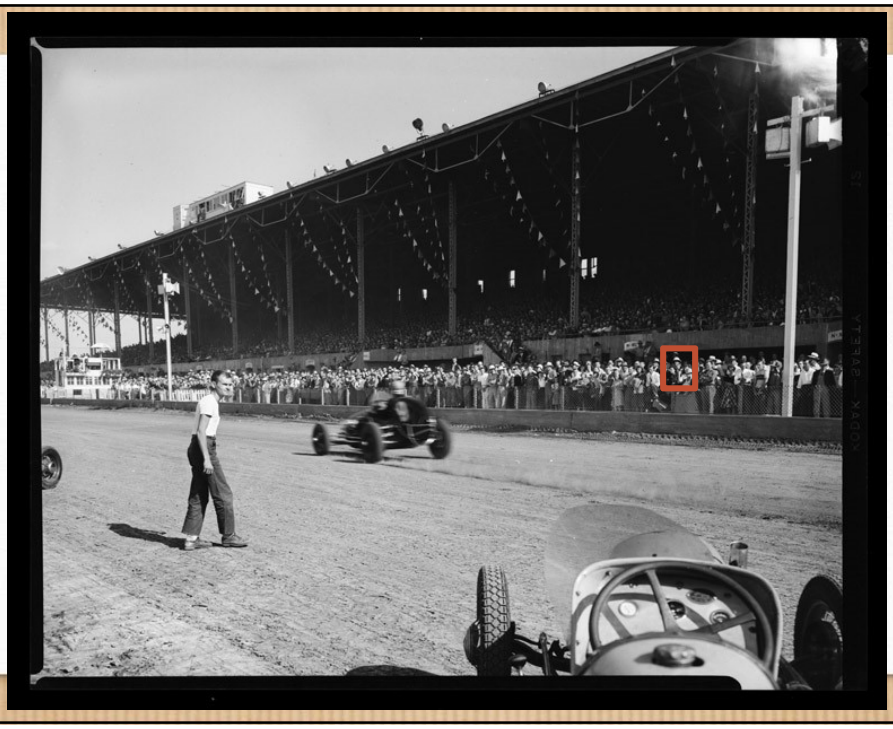
Commitment Issues



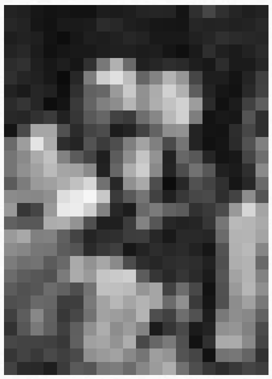
- Technology is constantly changing
  - "Obsolete before you take it out of the box"
- By going digital, you are committing yourself to keeping up with technology
  - It will be an on-going project
  - Floppies ▶ Disks ▶ CD ▶ DVD ▶ Blu-ray ▶ Cloud Storage ▶ ???
  - Gold CD say they will last 75-100 years
    - Will there be hardware & software capable of reading them in 5 or 10 years?

Special Resolution and PPI

- Pixels per inch (ppi) most accurately describes digital image
  - On-screen display
- Dots per inch (dpi) describes output
  - Printers
- Special Resolution is the number of dots per inch
  - High resolution has many pixels per inch
  - High resolution shows high details
  - Low resolution has few pixels per inch
  - Low resolution shows less details



Resolution

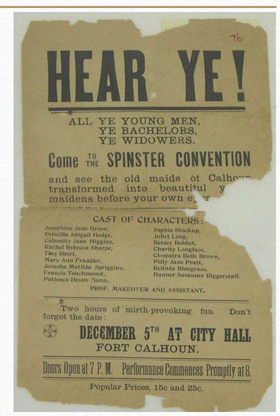


150 ppi

1200 ppi

Digital threshold

- Higher is not always better
- Maps and documents do not contain as much detail and tonal variation as photographs
- Digital threshold is where high resolution does not obtain additional information
  - Scanning the paper fibers
  - Create noise



All part of the plan

- What do you want to scan?
  - Everything? Only the most vulnerable?
  - Set priorities
- Why are you digitizing?
  - Preservation of the original
  - Share with others
- The "why" determines
  - Priorities, equipment, & standards

Equipment

- Hard to give advice
  - The scanner I recommend will be obsolete tomorrow
- Do your research
  - Check reviews
    - CNet, Consumer Reports, Imaging Resources, etc.
  - Talk to friends, fellow techies, strangers on the street
- Decide what you want and your budget
  - Find the scanner that best matches your needs

Quality Control

Master files

- Create a standard
- High resolution (600-1200 ppi)
- Uncompressed .tiff
  - No information lost
- Not altered or edited
  - No "Photoshopping"
- Backed up and stored separately

Derivative or Access files

- Size & resolution based on project or need
- Lower resolution
  - Print: 300 dpi
  - Screen: 150 ppi
- Compressed files: .jpg
- Edit the copy
  - Adjust color
  - Remove dust, scratches, tears, etc

Storage

- Master files will be large
  - The larger the file, the more information there is to access
- Choose media that best fits your needs
  - Plan on refreshment and upgrades

Backup Plan

- Plan for failures and disasters
  - Think of your worst case scenario
- The multiple media approach
  - Redundant or Twin hard-drives (back each other up)
  - Media output (CD, DVD, Blu-ray, flash drives, etc)
  - Cloud storage (virtual storage over the internet)
- Make copies and put somewhere safe
  - Off-site storage (friend, safety deposit box, etc)
- Refresh your backups regularly
  - Make it part of your routine

In Conclusion…

History NEBRASKA

History NEBRASKA

Remember these simple rules:

- Control temperature and humidity levels
  - No attics, basements, and garages where temperature is not controlled
- Avoid light exposure
  - Display copies when possible
- Watch for things that want to eat your photographs
- Create a safe environment
- Use storage materials that have passed the PAT test
- Be mindful of how you handle your photographs
- Use a pencil and gloves
- Don't attempt repairs yourself

Handouts

- http://www.nebraskamuseums.org/2021-virtual-conference/
- PDF copy of slides
- How to Clean Glass Plate Negatives
- How to Make Sink Matts
- How to Make Boxes for Cased Photos
- How to Make Phase Boxes
- How to Make a Humidity Chamber for Rolled Photos & Documents
- HN Photo Archives Volunteer Training Documents
  - How to Handle Photographs
  - Identifying Photographs

Questions?

History NEBRASKA

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