Caring for Audiovisual Materials: Introduction to Film Preservation

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Film Preservation

• Historical background
• Review: physical properties of motion picture film and deterioration factors
• Production processes
• Film handling
• Preservation actions
Edison Kinetoscope (1893)

Lumière Cinématographe (1895)
Contemporary “platter” projector

Film: emulsion on a base

Image: Restoration of Motion Picture Film, Paul Read & Mark-Paul Meyer
Film bases

• Cellulose nitrate
• Cellulose acetate
• Polyester

Cellulose nitrate

• Introduced 1880s
  – Still photo negatives
  – Motion picture negatives and prints
• Excellent visual quality
• Scratch-resistant, durable
Cellulose nitrate

• Flammable, subject to decomposition

Cellulose acetate (a/k/a “Safety Film”)

• Introduced c. 1910; became common with introduction of 16mm in 1923
• Originally cellulose diacetate
• Later cellulose triacetate
• Not flammable
• Kodak production ended in June 2013
Cellulose acetate

- Subject to decomposition
- “Vinegar syndrome”

- Dimensional changes lead to problems in projection and duplication like picture instability and focus issues
Polyester

• Brand name: Estar
• Introduced 1955
• Originally for non-film/slide applications
• Dimensionally stable over time
• Not flammable
• Extremely strong and resistant to tearing
Polyester (left)/Acetate (right)

Gauges/Formats

• Have been dozens of formats of films; about a dozen widely used

Photo: Cinerama theater plan, from Encyclopedia Britannica via widescreenmuseum.com
Gauges/Formats

- Four most common film formats
  - 35mm
  - 16mm
  - 8mm
  - Super-8

Photo: SI Human Studies Film Archive
35mm

*Standard Gauge, Morgan Fisher (1984)*

16mm
8mm

- Introduced 1932 by Kodak as an amateur format
- Same perforation size as 16mm; very small image size

Super 8

- Introduced 1965 by Kodak as an amateur format
- Same 8mm wide film; smaller sprocket holes
Emulsion position

- A-wind or B-wind
  - Shorthand: if you look through the base side of the film, and the image is properly oriented, it is b-wind

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Looking through base:
  b-wind         a-wind
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Aspect Ratio—1.37:1

*Black Narcissus*, Powell & Pressburger, 1945
Aspect Ratios--Widescreen

• Became prevalent in theatrical exhibition in the 1950s
• Two types: non-anamorphic/cropped/masked, and anamorphic

Aspect Ratio—1.37:1 (full frame)

Dr. Strangelove, or: How I Stopped Worrying and Learned to Love the Bomb (Stanley Kubrick, 1964)
Aspect Ratio—1.66:1 (cropped)

Dr. Strangelove, or: How I Stopped Worrying and Learned to Love the Bomb (Stanley Kubrick, 1964)

Aspect Ratio—Anamorphic

• Wide angle of view squeezed by lenses onto a standard 35mm film
• Corresponding lenses “un-squeeze” the image into a wide on-screen aspect ratio
• CinemaScope: 2.35:1
Aspect Ratio—Anamorphic

Color

*Oklahoma!*, Fred Zinneman, 1955 (70mm)
Color

• Resistant to fade:
  – Kodachrome (post-1938)
  – IB (dye-transfer) Technicolor
  – LPP (Polyester/Estar stocks)
• Not resistant to fade
  – Color negatives
  – Pretty much everything else

Negative vs. Reversal

• Negative film:
  – Film in camera processed as negative and used to make prints
• Reversal film:
  – Film in camera processed as positive
    • Home movies are reversal
Sound

• Most commonly a track along one side of the film frame
  – Continuous, as opposed to intermittent motion of image
• Optical or magnetic
Sound

Soundtrack Clip
**Sound**

**Speed**

- Silent era: film speed variable
  - Typically between 16 and 24 frames per second
- Sound era: speed fixed
  - 24 frames per second
- Knowing footage = knowing duration
Questions about the physical aspects of film?

Workflows and Elements

• Creation of film and slide works involves a continuing series of duplication processes
• These processes are photochemical and analog
• Each step in the process introduces variation and change
• Managing and understanding this change is key to conserving these works
Traditional Film Workflow

• Shoot camera original negative
  – Could also shoot camera original positive—“reversal”
• Create “workprint”
Outtakes ("outs"):  
• Material not included in film

Trims:  
• Small bits snipped from included material

Soundtrack:  
• May be separate ("fullkote")

A "trim bin"

Traditional Film Workflow

• Shoot camera original negative  
  – Could also shoot camera original positive—"reversal"

• Create "workprint"

• After workprint is edited, cut negative
Film handling and inspection

Interpositive “IP”
Internegative & Sound Negative “IN”
Positive Print
Film handling and inspection

- Best practice: film should be rehoused in archival cans, on cores, both made of inert polypropylene
- Goals:
  - Re-housing
  - Inspection: finding out what this film is
  - Finding best possible elements for preservation

Equipment

- Film rewinds
- Film viewer and/or loupe and lightbox
- Gloves
- Splicer
- Clean leader
- Cores
- Split reels
- Cans
Basic film inspection

Film handling and inspection

- Rules of thumb
  - Handle with gloves
  - Only handle edges
Star Wars, George Lucas, 1977

Print Condition Report

Collection/Title:
Length:
Black & White _____________ Color _____________
Silent _____________ Sound _____________
Gauge:
Material: _____ Triacetate _____ Diacetate _____ Polyester
Generation: _____ Positive _____ Reversal
_____ Fine Grain _____ Soundtrack Only _____ Image Only

Language/Head Titles/Intertitles/Subtitles:

Physical Damage
Marked on a scale of 1 (slight) to 4 (heavy)

_____ Emulsion Scratches _____ Projector Oil & Dirt
_____ Base Scratches _____ Warpage
_____ Perforation Damage _____ Shrinkage
_____ Edge/Perforation Repair _____ Color fading
### EASTMAN KODAK DATE CODE CHART

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*Note: The chart includes a symbol for 1968 as an example.*
Cost: 16mm preservation from 490’ sound interneg (roughly 12 minutes)

- Evaluation & repair: 1 hour @ $90/hour
- Cleaning: 490’ @ $.60/foot
- Interpositive: 490’ @ $1.73/foot
  Dubbing audio: 1 hour @ $90/hour
- Audio stock: 510’ @ $.90/foot
- “Answer” print: 490’ @ $1.30/foot

Total: $2,417.70

Recommended Storage

- Nitrate:
  - Medium-term 40°F; 30-50% RH
  - Extended 32°F; 20-30% RH
- Acetate:
  - Medium-term 40°F; 30-50% RH
  - Extended 32°F; 20-30% RH
- Polyester (B/W)
  - Medium-term 54°F; 30-50% RH
  - Extended 40°F; 20-30% RH
- Polyester (color)
  - Medium-term 40°F; 30-50% RH
  - Extended 32°F; 20-30% RH
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