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)

Film: emulsion on a base

Contemporary “platter” projector

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

- Cellulose nitrate
- Cellulose acetate
- Polyester

### Cellulose nitrate

- Excellent visual quality
- Scratch-resistant, durable

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

- Introduced 1923 with introduction of 16mm
- 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
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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

Gauges/Formats
- Four most common film formats
  - 35mm
  - 16mm
  - 8mm
  - Super-8

Photo: SI Human Studies Film Archive

Photo: Cinema theater plan, from Encyclopedia Britannica via widescreenmuseum.com
35mm


16mm

8mm
- Introduced 1932 by Kodak as an amateur format
- Same perforation size as 16mm; very small image size

Super 8
- Amateur format
- Same 8mm wide film; smaller sprocket holes

Emulsion position
- A-wind or B-wind
  - Side of the film, and the image is properly oriented, it is b-wind

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

Sound

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

• Optical or magnetic

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")

"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

• 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
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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