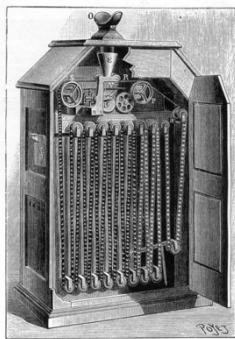


Caring for Audiovisual Materials: Introduction to Film Preservation

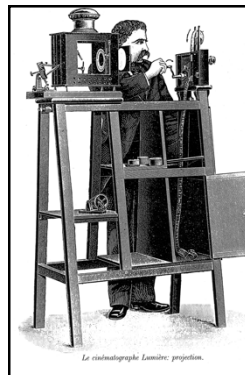
Jeff Martin
jjm332@nyu.edu

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

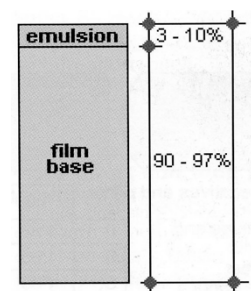


Image: Restoration of Motion Picture Film, Paul Read & Mark-Paul Meyer

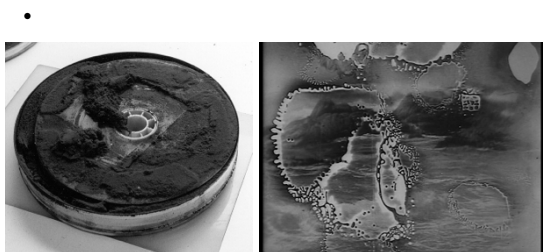
Film bases

- Cellulose nitrate
- Cellulose acetate
- Polyester

Cellulose nitrate

- -
 - prints
- Excellent visual quality
- Scratch-resistant, durable

Cellulose nitrate



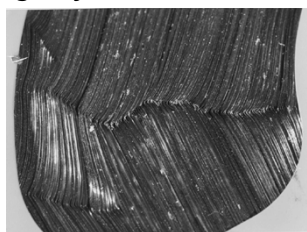
Cellulose acetate (a/k/a “Safety Film”)

- - with introduction of 16mm in 1923
- Originally cellulose diacetate
- Later cellulose triacetate
- Not flammable
- Kodak production ended in June 2013

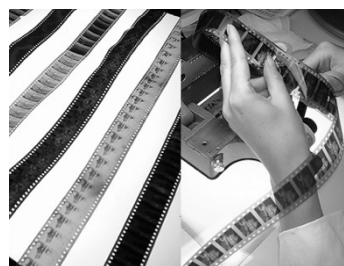


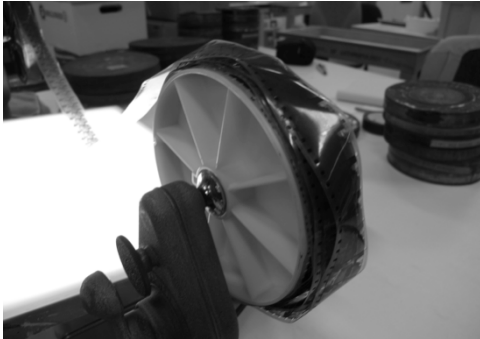
Cellulose acetate

- 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

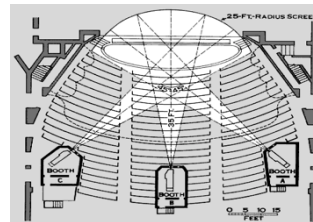


Photo: Cinerama theater plan, from *Encyclopedia Britannica* via widescreenmuseum.com

Gauges/Formats

- Four most common film formats

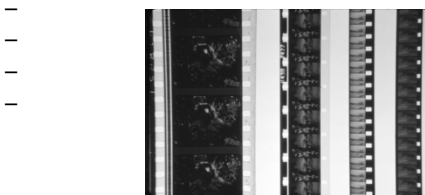
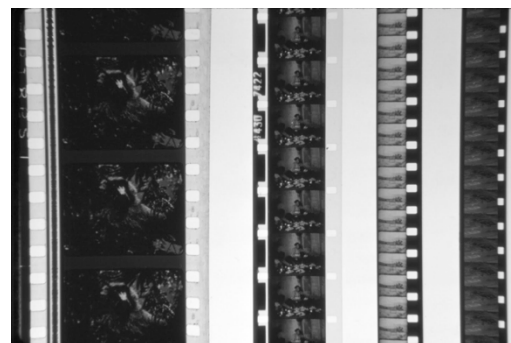


Photo: SI Human Studies Film Archive



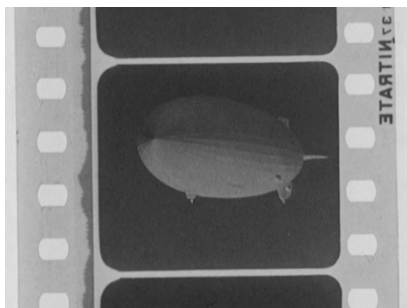
35mm

16mm

8mm

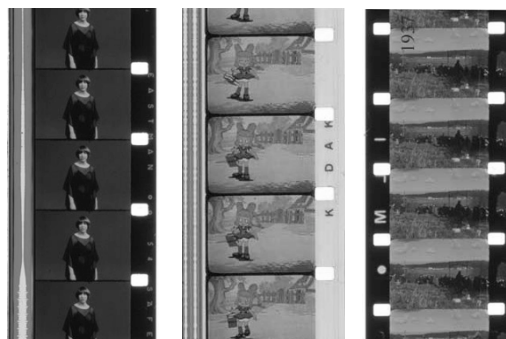
Super-8

35mm



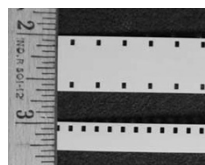
Standard Gauge, Morgan Fisher (1984)

16mm



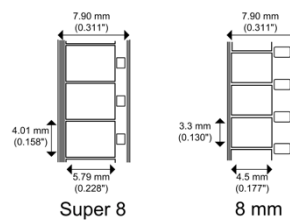
8mm

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



Super 8

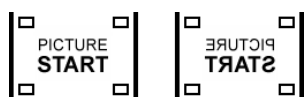
- amateur format
- Same 8mm wide film; smaller sprocket holes



Emulsion position

- A-wind or B-wind

— ^{base} side of the film, and the image is properly oriented, it is b-wind



Looking through base:

b-wind

a-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

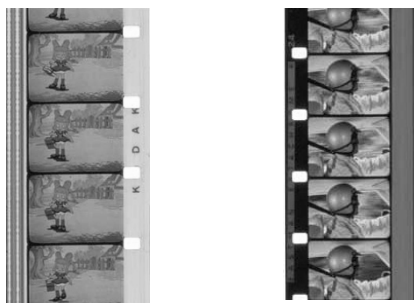
- Negative film:
 - Film in camera processed as negative and used to make prints
- Reversal film:
 - Film in camera processed as positive
 -



Sound

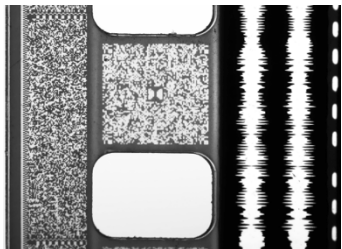
- Most commonly a track along one side of the film frame
 - Continuous, as opposed to intermittent motion of image
- Optical or magnetic

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

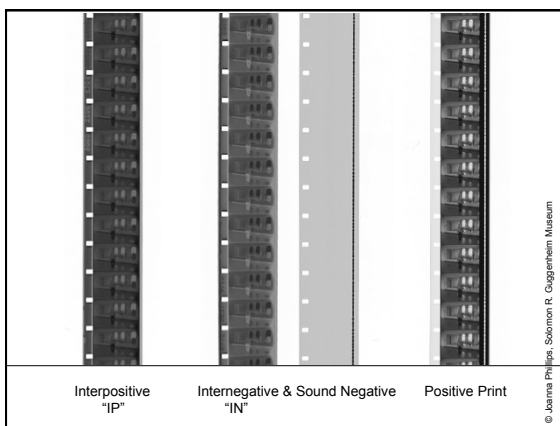
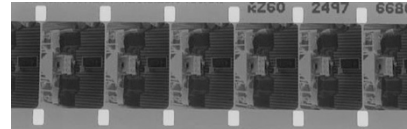
Soundtrack:

- 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



Film handling and inspection

- Best practice: film should be rehousing 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

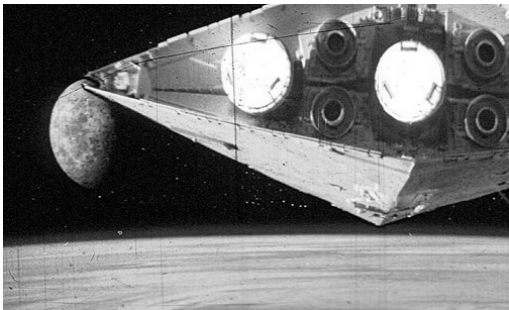


Basic film inspection



Film handling and inspection

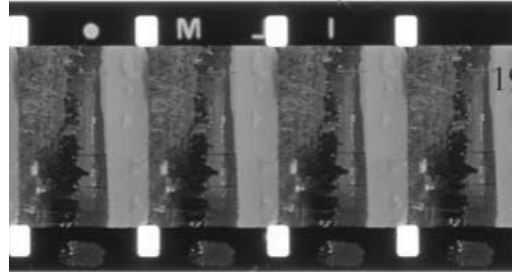
- Rules of thumb
 - Handle with gloves
 - Only handle edges



Star Wars, George Lucas, 1977

PRINT CONDITION REPORT									
Collection/Title: _____									
Length: _____									
Black & White _____	Color _____								
Silent _____	Sound _____								
Gauge: _____									
Material: <input type="checkbox"/> Triacetate <input type="checkbox"/> Diacetate <input type="checkbox"/> Polyester									
Generation: <input type="checkbox"/> Positive <input type="checkbox"/> Reversal									
<input type="checkbox"/> Fine Grain <input type="checkbox"/> Soundtrack Only <input type="checkbox"/> Image Only									
Language/Head Titles/Intertitles/Subtitles: _____									
PHYSICAL DAMAGE Marked on a scale of 1 (slight) to 4 (heavy) <table border="1"> <tbody> <tr> <td><input type="checkbox"/> Emulsion Scratches</td> <td><input type="checkbox"/> Projector Oil & Dirt</td> </tr> <tr> <td><input type="checkbox"/> Base Scratches</td> <td><input type="checkbox"/> Warpage</td> </tr> <tr> <td><input type="checkbox"/> Perforation Damage</td> <td><input type="checkbox"/> Shrinkage</td> </tr> <tr> <td><input type="checkbox"/> Edge/Perforation Repair</td> <td><input type="checkbox"/> Color Fading</td> </tr> </tbody> </table>		<input type="checkbox"/> Emulsion Scratches	<input type="checkbox"/> Projector Oil & Dirt	<input type="checkbox"/> Base Scratches	<input type="checkbox"/> Warpage	<input type="checkbox"/> Perforation Damage	<input type="checkbox"/> Shrinkage	<input type="checkbox"/> Edge/Perforation Repair	<input type="checkbox"/> Color Fading
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<input type="checkbox"/> Perforation Damage	<input type="checkbox"/> Shrinkage								
<input type="checkbox"/> Edge/Perforation Repair	<input type="checkbox"/> Color Fading								

EASTMAN KODAK DATE CODE CHART					
1922	1942	1962	●■	1982	●■X
1923	1943	1963	●▲	1983	X▲X
1924	1944	1964	▲■	1984	▲■▲
1925	1945	1965	■●	1985	■●▲
1926	1946	1966	▲●	1986	▲●▲
1927	1947	1967	■▲	1987	■▲▲
1928	1948	1968*	●●●	1988	++▲
1929	1949	1969	+	1989	X+▲
1930	1950	1970	▲+	1990	▲+▲
1931	1951	1971	●+	1991	X+X
1932	1952	1972	■+	1992	■+▲
1933	1953	1973	+▲	1993	+▲▲
1934	1954	1974	+●	1994	+●▲



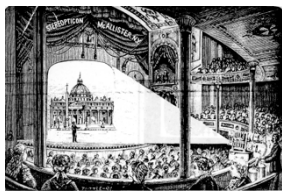
Cost: 16mm preservation
from 490' sound interneg
(roughly 12 minutes)

- 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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