

Author(s): Paul Conway, 2008-2010.

License: Unless otherwise noted, this material is made available under the terms of the **Creative Commons Attribution 3.0 License:**

<http://creativecommons.org/licenses/by/3.0/>

We have reviewed this material in accordance with U.S. Copyright Law **and have tried to maximize your ability to use, share, and adapt it.** The citation key on the following slide provides information about how you may share and adapt this material.

Copyright holders of content included in this material should contact open.michigan@umich.edu with any questions, corrections, or clarification regarding the use of content.

For more information about **how to cite** these materials visit <http://open.umich.edu/education/about/terms-of-use>.

Any **medical information** in this material is intended to inform and educate and is **not a tool for self-diagnosis** or a replacement for medical evaluation, advice, diagnosis or treatment by a healthcare professional. Please speak to your physician if you have questions about your medical condition.

Viewer discretion is advised: Some medical content is graphic and may not be suitable for all viewers.

Citation Key

for more information see: <http://open.umich.edu/wiki/CitationPolicy>

Use + Share + Adapt

{ Content the copyright holder, author, or law permits you to use, share and adapt. }



Public Domain – Government: Works that are produced by the U.S. Government. (17 USC § 105)



Public Domain – Expired: Works that are no longer protected due to an expired copyright term.



Public Domain – Self Dedicated: Works that a copyright holder has dedicated to the public domain.



Creative Commons – Zero Waiver



Creative Commons – Attribution License



Creative Commons – Attribution Share Alike License



Creative Commons – Attribution Noncommercial License



Creative Commons – Attribution Noncommercial Share Alike License



GNU – Free Documentation License

Make Your Own Assessment

{ Content Open.Michigan believes can be used, shared, and adapted because it is ineligible for copyright. }



Public Domain – Ineligible: Works that are ineligible for copyright protection in the U.S. (17 USC § 102(b)) *laws in your jurisdiction may differ

{ Content Open.Michigan has used under a Fair Use determination. }



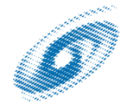
Fair Use: Use of works that is determined to be Fair consistent with the U.S. Copyright Act. (17 USC § 107) *laws in your jurisdiction may differ

Our determination **DOES NOT** mean that all uses of this 3rd-party content are Fair Uses and we **DO NOT** guarantee that your use of the content is Fair.

To use this content you should **do your own independent analysis** to determine whether or not your use will be Fair.

SI 678 Preserving Sound and Motion

Class 6 – Motion: Processes and Digital Cinema



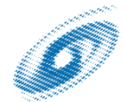
Themes

Themes



- Film preservation
- Media Transfer
- Artifact and product

“Colorization modifies and shifts what is presumed to be the permanent arrangement of the film as historical artifact in cultural history: it tampers with the inventory.”

Acland, 1990.



Film-based Artifacts

Media Transformations Over Time						
	Production of Artifact 					
				<i>"Original"</i>	<i>As Is</i>	<i>As Was</i>
Time	Source	Prod. Intermediate	Record	Pres. Intermediate	Restored	
	1970	Film	Film	Film	Film	Film
	1990	Film	Mix	Film	Mix	Film
	2010	Mix	Digital	Mix	Digital	Mix
	2020	Digital	Digital	Digital	Digital	FILM

 Source Undetermined

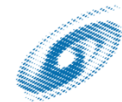
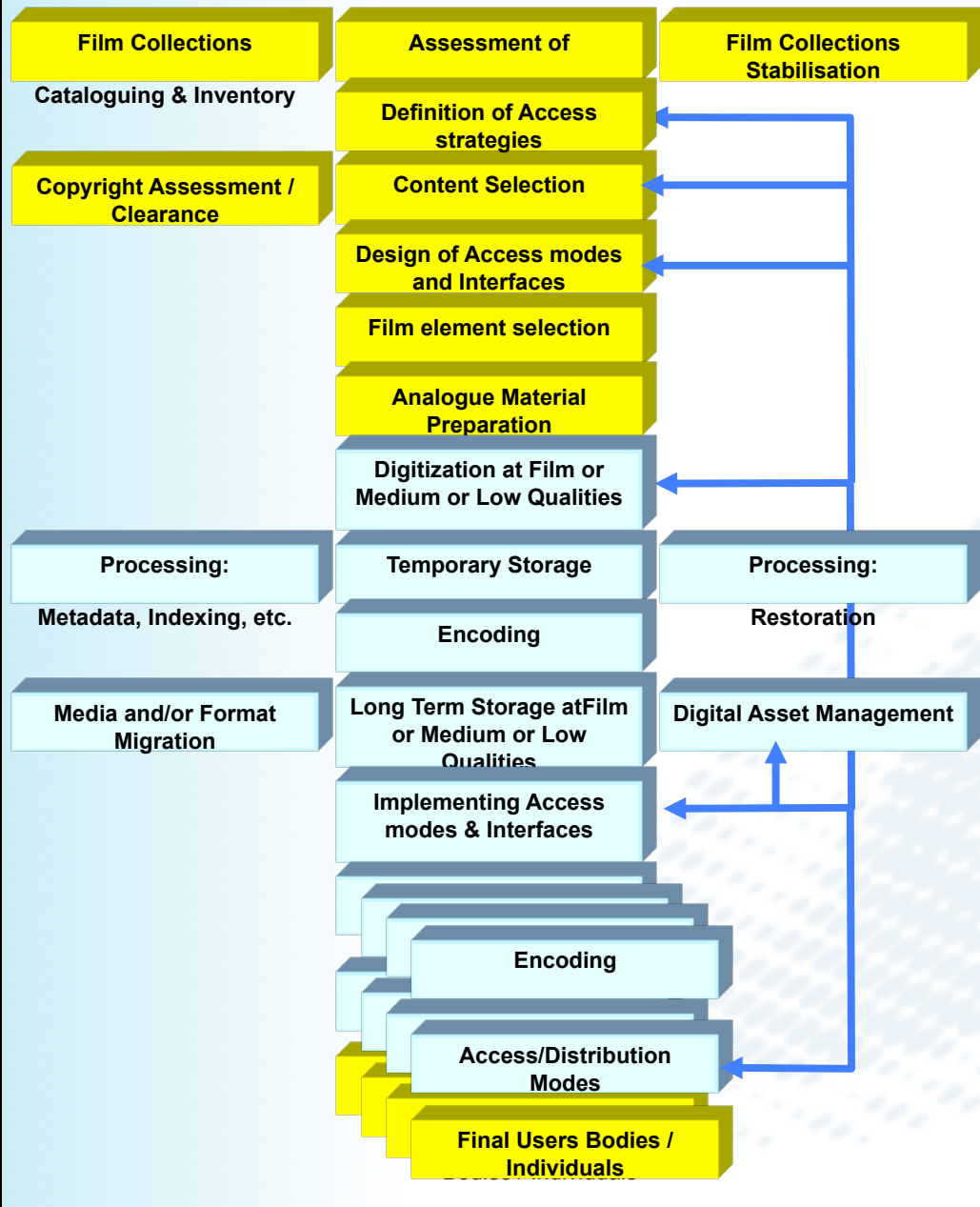


Diagram 1: A simplified view of an Archive Film Digitization Chain



“Digitization Chain: An Integrated Process.”
 European Film Heritage on the Threshold
 of the Digital Era.
 The First Project’s Final Report (2004)

Digital Data Storage

EXAMPLE OF DIGITAL STORAGE: a lot of data.....a lot of tapes

Capacity for 10,000hrs of digitised film

	Output format →	HDTV	2K	4K	Nb Tapes at 4K
Transparent Storage → No degradation	Native Capacity	3.74 PB	10 PB	41.3 PB	82,600
Transparent Storage → No degradation	LLC 2.6	1.4 PB	3.85 PB	15.9 PB	31,800
Degradation →	Lossy Compression of 5	0.75 PB	2 TB	8.26 PB	16,520

© PD-INEL

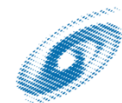
Source Undetermined

1 PB = 1,000 TB = 1,000,000 GB

1 Tape = 0.5 TB

Maximum Throughput 30 Mbytes/sec

Time to UP/Download 0.5 TB: 278 minutes = 4hr 38 minutes



Film preservation process

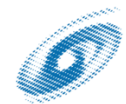
Color and culture

Film preservation

Colorization

Artifact and product

- Proper storage as foundation
- Duplication of film stock
 - Pre-inspection
 - Detailed preparation
 - Printing
 - Inspection and QC
- Restoration
 - Color correction (intent)
 - Assembly from multiple sources



• Winston, *The Case of Colour Film*, 1996.

Color and culture

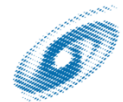
Color and culture

Film preservation

Colorization

Artifact and product

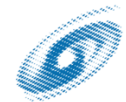
- Reproduction of Caucasian skin color as dominant force in color film technology
- Color films are cultural creations
- Laboratory control
- Production and film processes controlled for “white”



Color restoration

Color and culture
Film preservation
Colorization
Artifact and product

- Documentation on film production and manufacture is an important part of the film’s context.
- Modern science in the service of authenticity
- Tension between authenticity and modern



• Acland, “Tampering with the Inventory,” 1990.

Artifacts and archives

Color and culture

Film preservation

Colorization

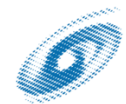
Artifact and product

■ Is authenticity relative?

“There is a lot at stake in the establishment of stable reference points – the reproduction of the authentic.”

“In the end, the question of colorization is emblematic of the impossibility of stable histories.”

Popular culture’s “resistance to the kind of cultural stability signified by museums, archives, catalogs, artists and originals.”



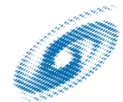
Themes

Themes

- What is digital cinema?
- Digital intermediates
- Managing a film restoration project

“ For media of the Internet age, the only alternative to storing fragments that point to a foregone experience is to accept the necessity of remaking that experience even if the work changes in the process.”

(Jon Ippolito, 2007)



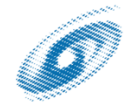
Digital intermediates

Digital cinema

Intermediates

Project management

- Quality of digital conversion tools
- Data transfer versus digitization
- Sampling
 - Resolution
 - Color spaces and gamma correction
 - Dynamic range issues
 - Data tradeoffs
- Film to video and digital
 - Keys, time, bar coding



What is digital cinema?

Digital cinema

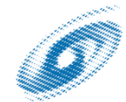
Intermediates

Project management

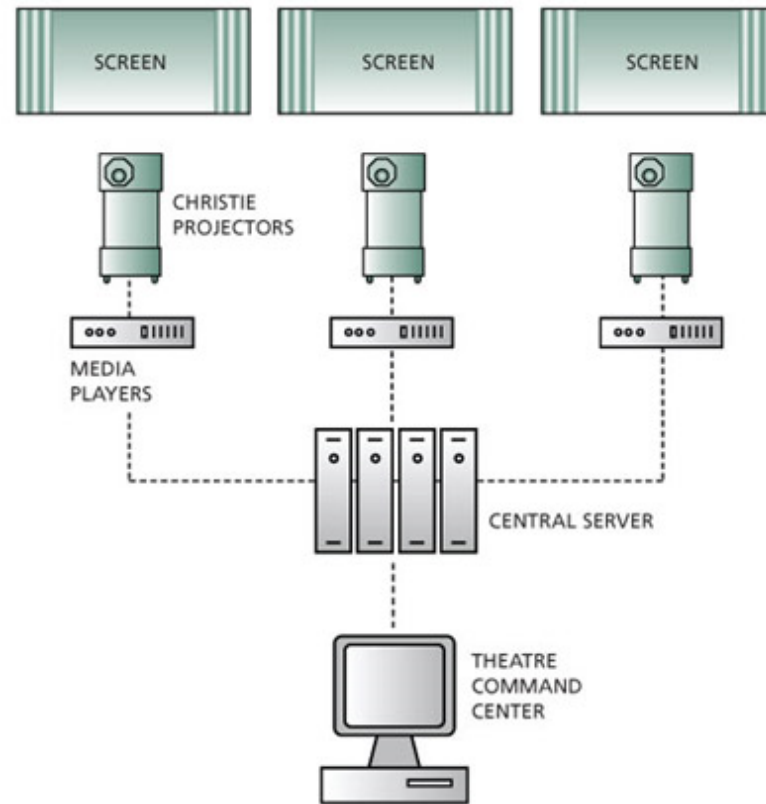
- Capture, production, mastering
 - Distribution, projection, re-use
- Lucas, *Star Wars II* (2001)
- Advantages
 - Copying, some simplicity, control, delivery
- Disadvantages
 - Immaturity, cost, some complexity, impermanent (formats, media)

McKernan, *Digital Cinema* (2005)

Schwartz, *Understanding Digital Cinema* (2005)

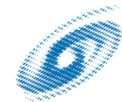


DLP Cinema Projection



© PD-INEL

<http://www.dlp.com/default.aspx>



SCHOOL OF INFORMATION
UNIVERSITY OF MICHIGAN

Hard lessons learned so far

Digital cinema

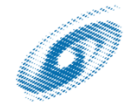
Intermediates

Project management

Early lessons learned on preservation

- No technological quick fix (video)
- Don't compromise quality (nitrate)
- Preservation isn't one shot
- Look to multiple re-uses

Usai: “There is something depressingly safe, condom-like, in the digital image, and as much as I respect it and realise its creative potential, I cannot really feel anything when I experience it.” [*Film Is Dangerous*, p. 137]



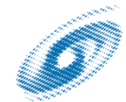
Why is this important?

Digital cinema

Intermediates

Project management

- Bleeding edge with deep pockets
- Consumer market drives affordable technology
- Partnership between government (R&D) and business
 - IS&T (www.imaging.org)
- Potential to adapt technologies for quality and cost effectiveness



Thank you!

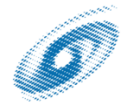
Paul Conway

Associate Professor

School of Information

University of Michigan

www.si.umich.edu



SCHOOL OF INFORMATION
UNIVERSITY OF MICHIGAN