

Digitizing, managing, and future proofing media yourself

Greg Budney and Matthew Medler
Macaulay Library
Cornell Lab of Ornithology



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Digitizing Your Media

Considerations:

- original media condition
- restoration resources
- access to playback hardware
- hardware calibration & maintenance
- experienced personnel
- cost



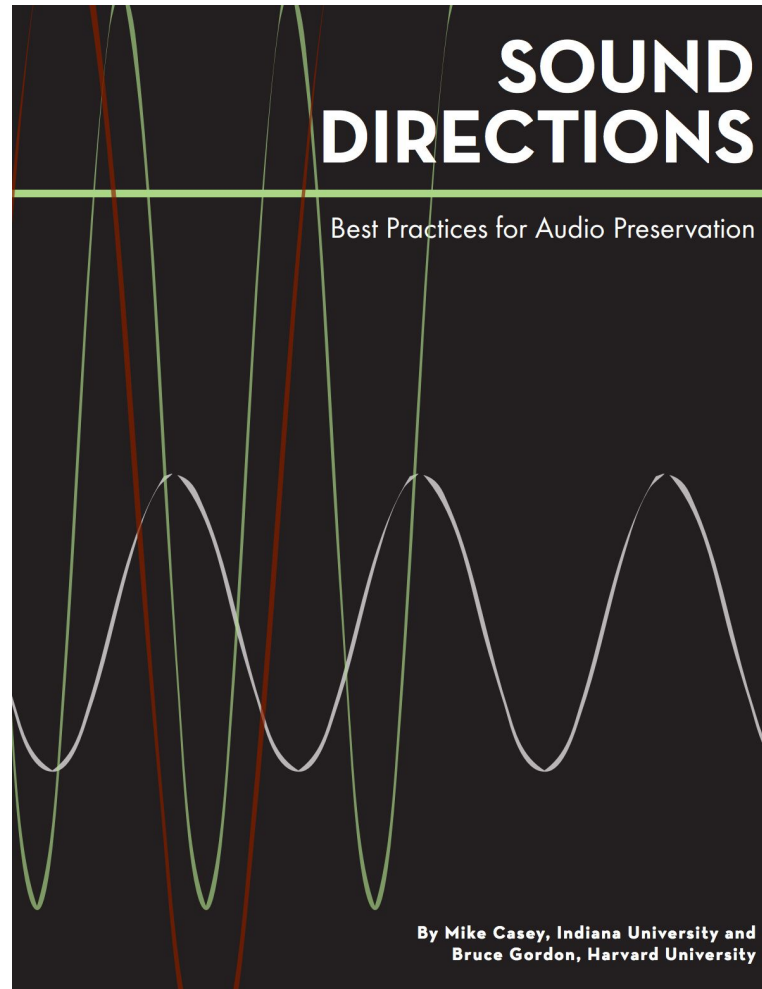
Ultimately, is preservation worthwhile?

Assessment tools from Indiana University and AVPreserve (www.avpreserve.com):

- **MediaRIVERS** (Media Research and Instructional Value Evaluation and Ranking System) guides a structured assessment of research and instructional value for media holdings.
- **MediaSCORE** (Media Selection: Condition, Obsolescence, and Risk Evaluation) enables a detailed analysis of degradation and obsolescence risk factors for most analog and physical digital audio and video formats.

- **Cost of Inaction Calculator**

http://www.avpreserve.com/wp-content/uploads/2014/10/Lacinak_COI_FIAT_IFTA_2014.pdf



<http://www.dlib.indiana.edu/projects/sounddirections/papersPresent/index.shtml>

Recording Formats Include:

- Reel-to-Reel
 - Cassette
 - R-DAT
 - MiniDisc
 - Compact Disc
 - Acetate Disc
 - Beta SP
 - Hi-8
 - MiniDV
- ...and more*



Equipment Calibration and Maintenance

- Head Alignment
- Record Bias
- Frequency Response
- Distortion (h2, h3 thd+n)
- Signal to Noise Ratio
- Channel Separation
- Absolute Speed
- Speed Drift
- Wow & Flutter
- Spooling Tensions
- Play Tensions



Audio Precision System

Calibration

Adheres to International Reference Standards



- NAB
- CCIR
- DIN
- IEC

Popular Audio Track Formats

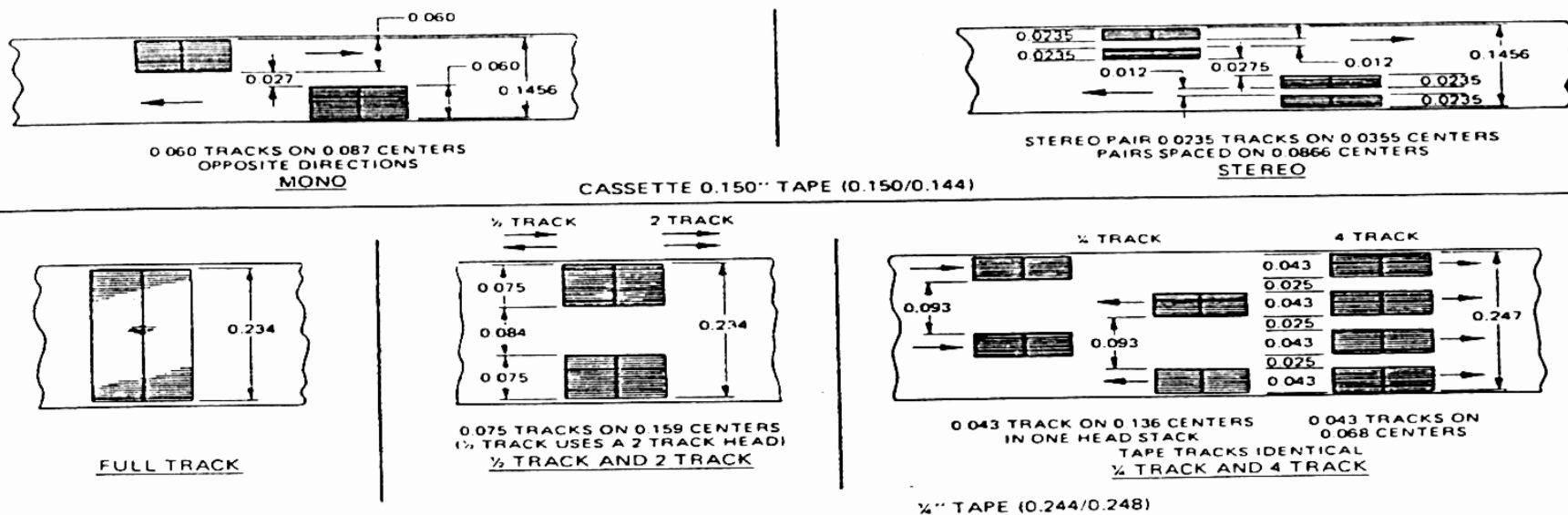
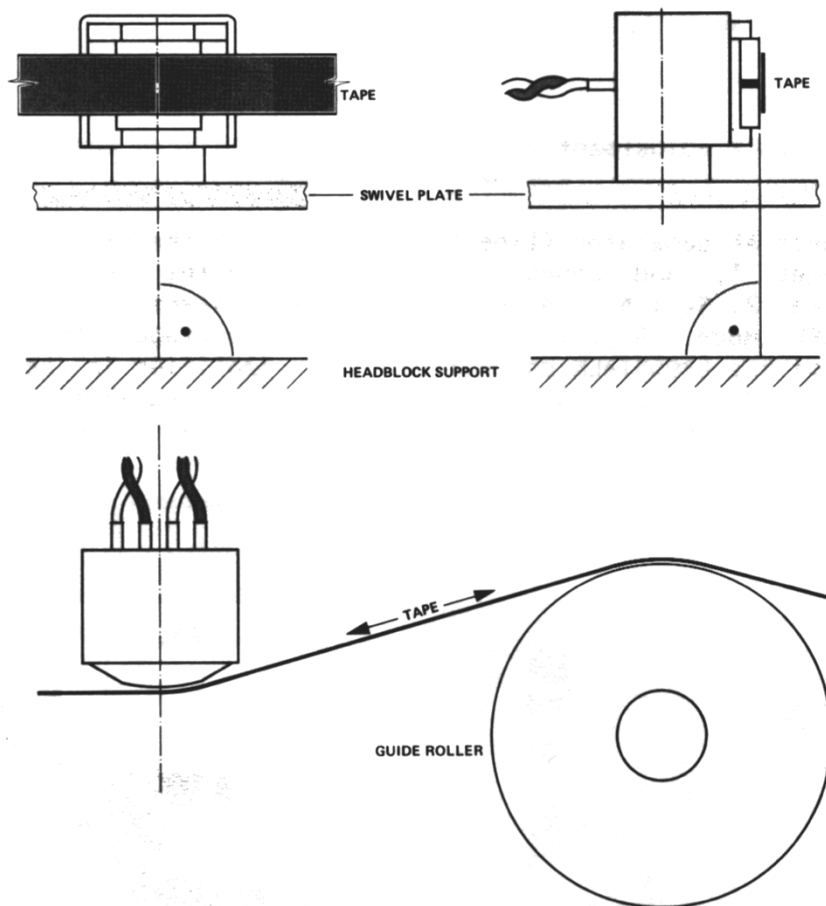
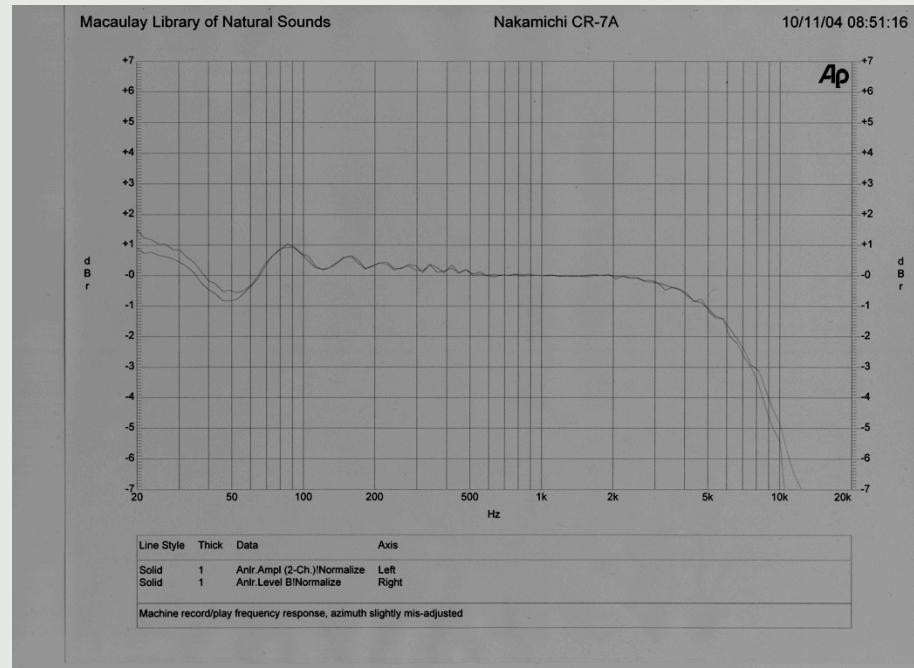


Fig. 17. Common tape recorder formats and track widths. (Courtesy Ampex Corp.)

Proper Head Alignment is Crucial to the Archival Process

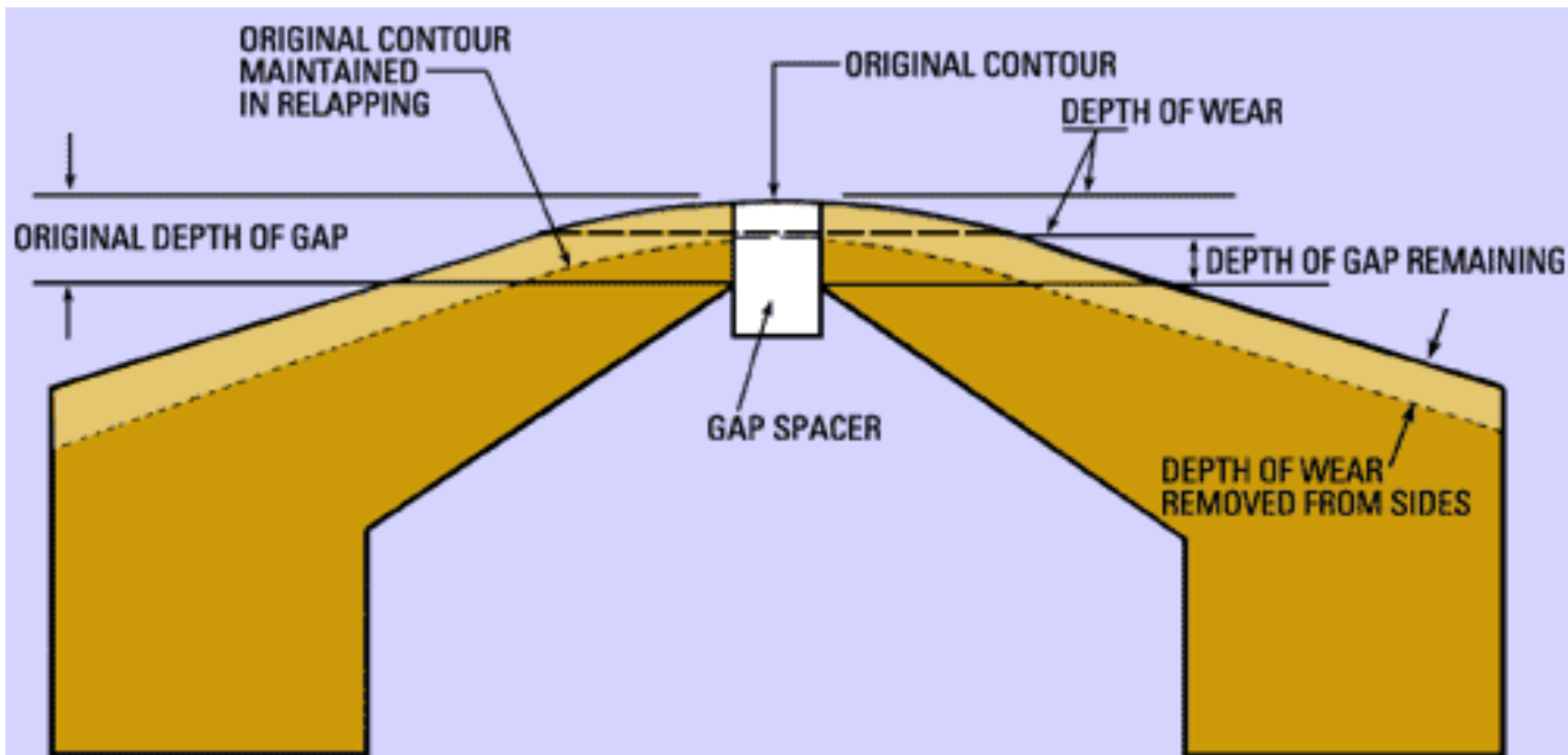


Effects of Mis-adjusted Azimuth



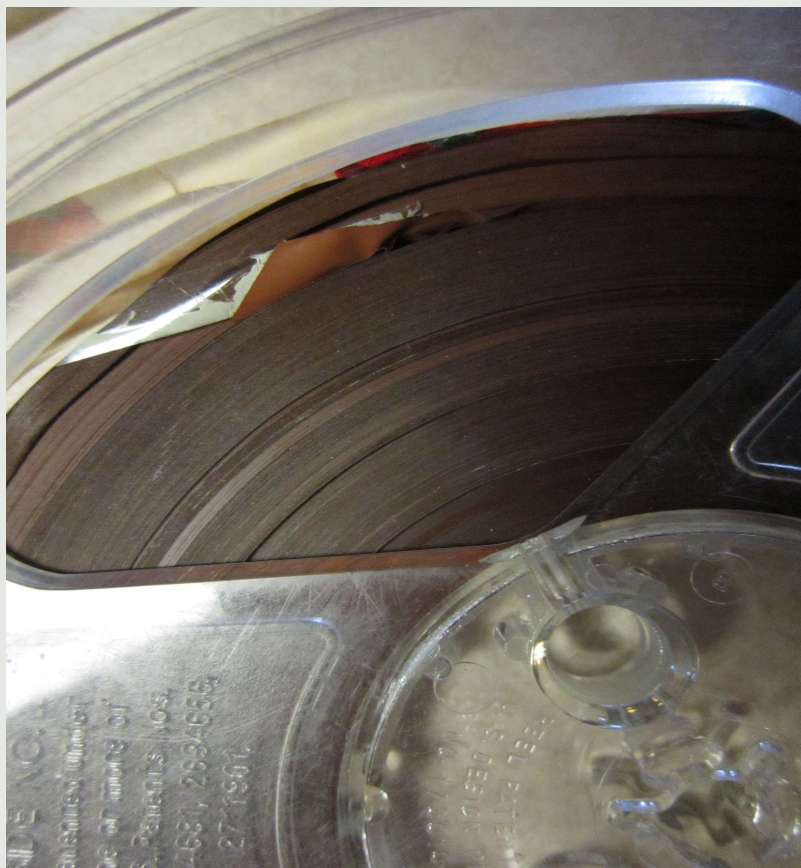
- Note the severe drop in high frequencies on the right-hand graph due to a slight azimuth error

Worn Playback Heads Degrade Playback Performance

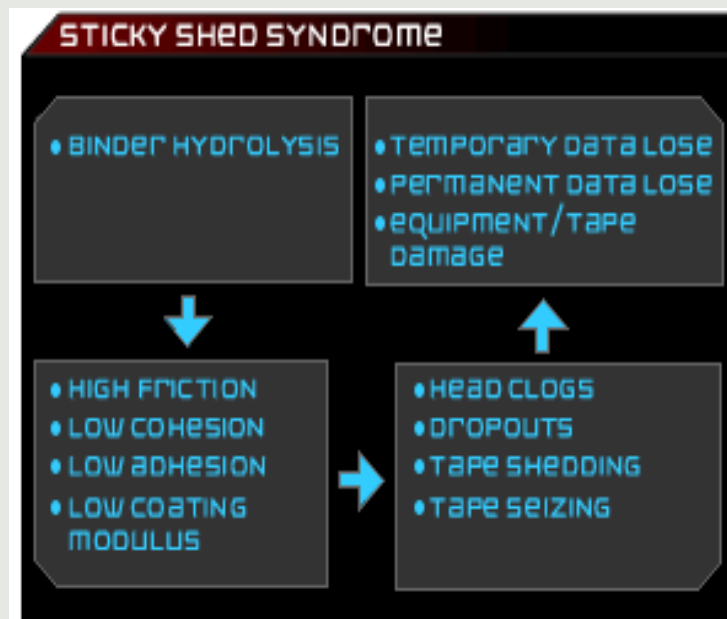
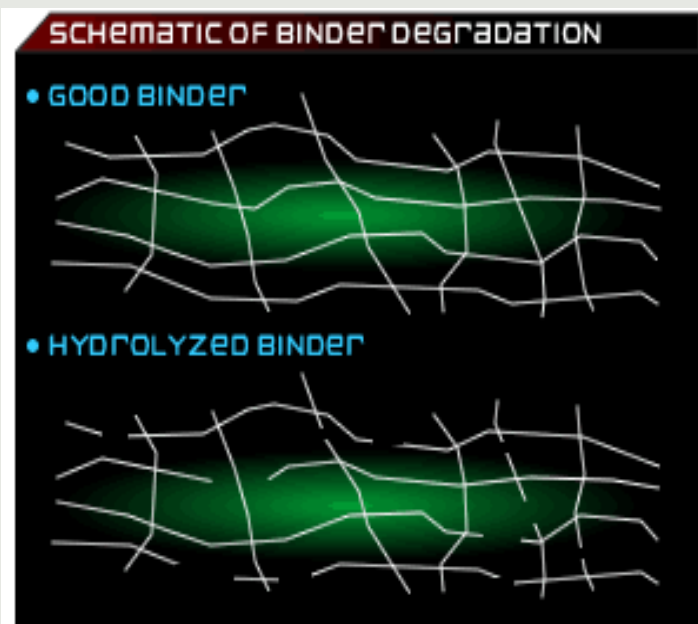


Proper Relapping Procedure Insuring Optimum Performance

Media Issues

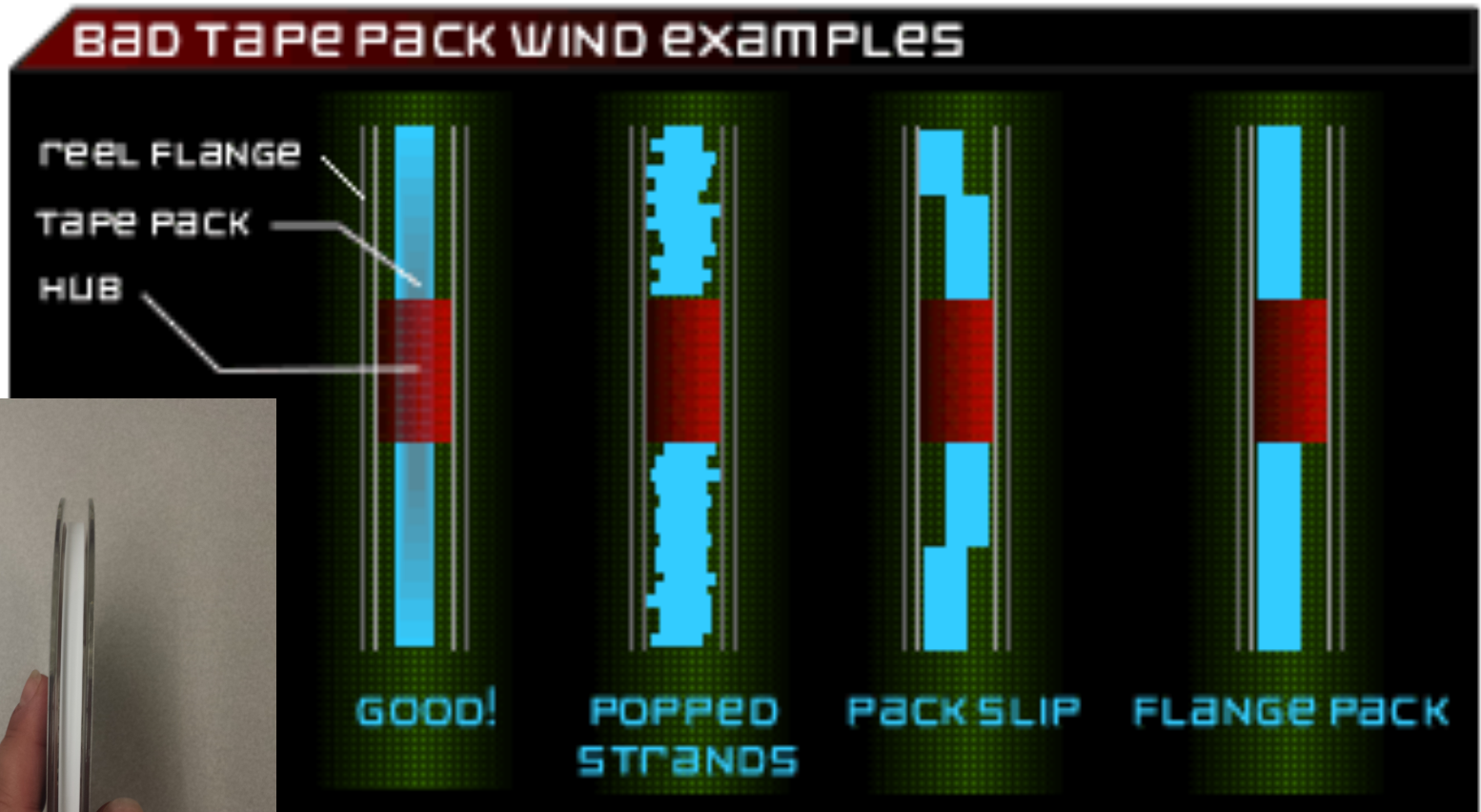


Sticky-Shed Syndrome



Fairly common problem found on open-reel and cassettes manufactured in the mid-1970's through the mid/late 1980's

Improper winding creates its own form of tape damage



Other forms of tape deterioration include:

- Delamination
- Loss of Lubricant
- Dried out/loose splices
- Splices oozing adhesive
- Layer to layer bonding
- Curling
- Stretching



Precision Playback Equipment Required For Gentle Tape Handling



Studer A-820

Analog/Digital Conversion Hardware

Typical OEM computer sound card



Typical cost ~\$40.00-\$250.00

Precision A/D & D/A Converters



~\$16,000/pair

Computer sound cards

- Share power supply with CPU, drives & video circuits
- A/D & D/A on same card
- Close proximity to all kinds of stray EMI and RFI
- Inferior metering - observed via software program
- Poorly designed anti-alias filters
- Run-of-the-mill, inexpensive clocking devices

Prism A/D converters

- Separate power supplies for each channel
- Ultra-stable precision clock
- Low jitter
- Extremely accurate anti-alias filters
- Accurate metering
- Precision matched, close tolerance components
- Published detailed specifications

EXPERIENCED PERSONNEL



Managing & Future Proofing Your Media

Strategy Considerations:

- File Format
- Storage Carriers
- Migration
- Data Integrity
- Do-It-Yourself or Persistent Archive

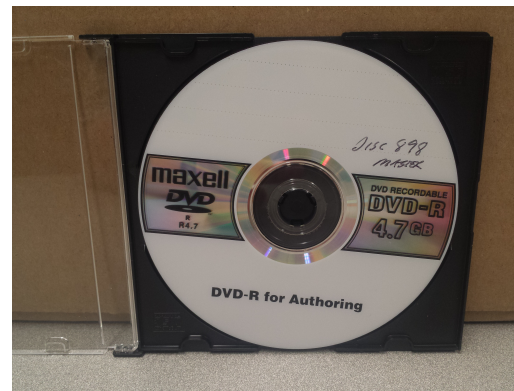


Preservation Target Formats and Systems

- Broad acceptance of format by commercial industry
- Ability to embed metadata in file header
- Recognition of Broadcast Wave Format (BWF) as the best target preservation format for audio

Preservation Target Formats and Systems

- No such thing as a permanent media carrier
- Archive-class media have projected physical life expectancies of 30, 50, or 100 years, but this should be taken as a confidence indicator



Preservation Target Formats and Systems

- Focus on building sustainable systems rather than permanent carriers
- Store data on different types of media
- Store a copy of data in an off-site location
- Use archive technologies that guarantee the ability to read multiple media generations

ML Archival Storage

- ML employs an onsite storage area network utilizing RAID 5 redundancy architecture
- Offsite campus data mirror
- LTFS tape backup (2 copies in 2 locations)

Insuring Stored Data Integrity

- Data integrity verification still necessary even with well-designed system and redundant copies
- Data integrity verification at multiple points in time through the use of a hash algorithm (e.g., MD5)
- *BWF MetaEdit*: MD5 software developed by Federal Agencies Digitization Guidelines Initiative Working Group

Assumptions for the Future

- Support of analog technology will become increasingly challenging
- Storage costs will continue to fall
- New archival formats will evolve

Thanks for your interest!

<http://macaulaylibrary.org>



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Archival Up Front Costs

- Archival studio equipment \$85,000/studio
- High-speed FibreChannel studio network and SAN \$110,000
- Storage systems \$150,000 (\$1,000/TB - RAID 5)

Recurring Costs

- Yearly maintenance contracts \$40,000
- Software site license renewals \$15,000
- Hardware upgrades \$5,000
- Insurance \$3,000
- Staff \$\$\$\$\$\$

IT Infrastructure and storage



- Web delivery formats include: WAV, MP3, & MOV
- 150TB of enterprise storage
- SAN mirror of enterprise storage
- LTFS tape library system provides data backup

