Issues and Answers in Digitization

A Joint CENDI/FLICC Workshop Series

Workshop 4: Audio: Digitizing for the Future

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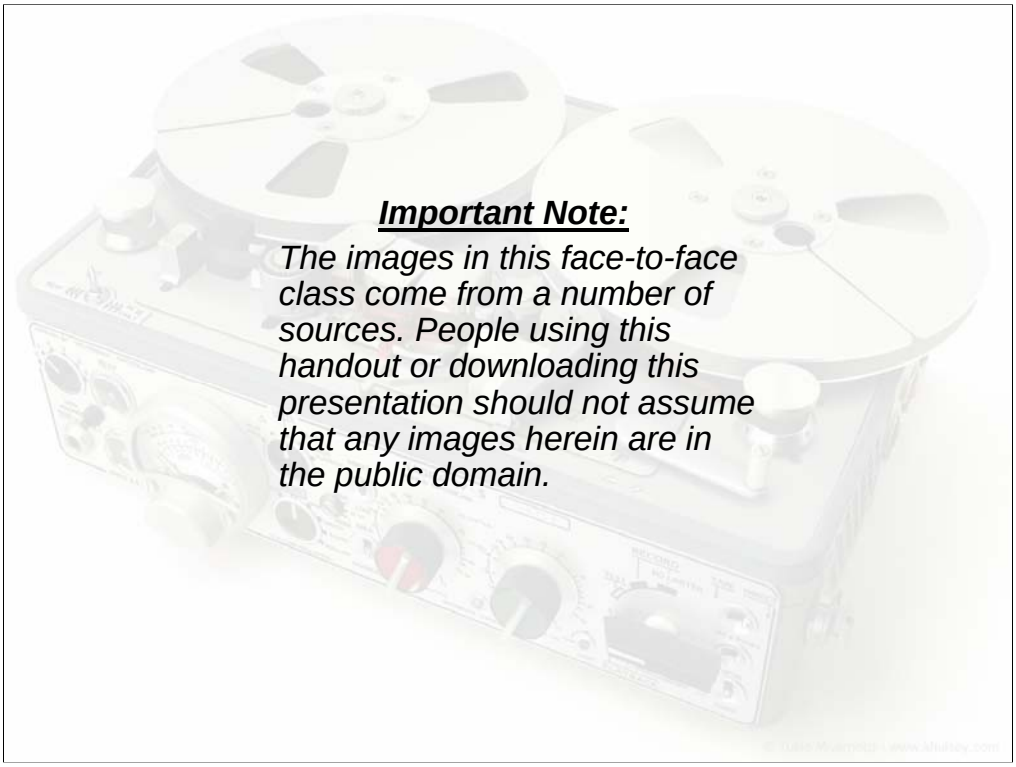
Thursday, December 2, 2010



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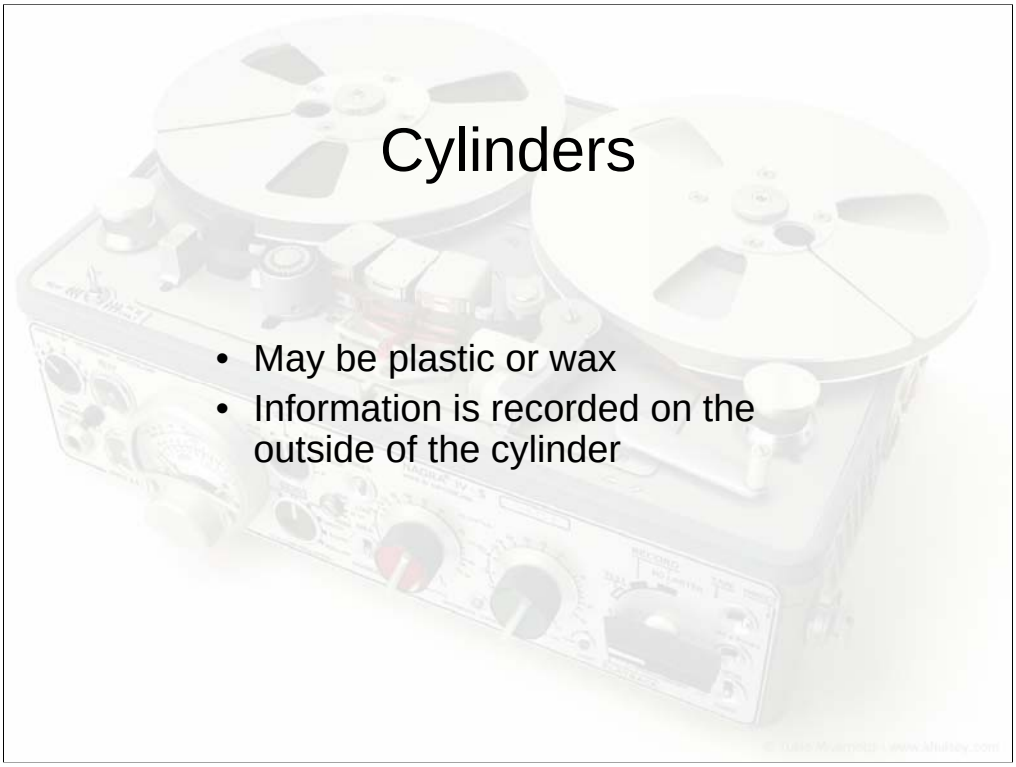
Types of Audio Carriers

Acoustic Audio Recordings

Acoustic/Mechanical =
stylus travels through grooves and physical vibrations are turned into sound

recording of sound by means of embossing or engraving modulated grooves on the surface of a cylinder or disc. A stylus was attached to a diaphragm and grooves were etched by a stylus corresponding to changes in air pressure created by the original sound. The recording are played back with a stylus following the groove and amplifying the resulting vibrations.



•One of the earliest forms of audio recording/playback media.

•Wax cylinders could be shaved down and rerecorded over

•The next innovation – grooved discs

•These can be found in three forms of composition, in order of development:

•Shellac (solid) – commercially pressed

•Laminate (sometimes called lacquer) – can be original recordings

•Vinyl (solid) – usually commercially pressed and not originals

Sound is recorded when sound waves that vibrate the diaphragm are converted into a varying electric current, which is then converted into a varying magnetic field on magnetic particle coating on a tape by an electromagnet.

•Predate magnetic tape but also encode information magnetically.

•Very prone to breakage

•*an electromagnetic recording head recorded sound onto steel wire.*

•We differentiate acetate and polyester bases by holding the tape up to the light. If you look at the wound tape pack and it is translucent, it is acetate. If it is pretty opaque, it is polyester (this is the opposite of motion picture film).

•Three different bases, in order of development:

Paper (fairly rare)

Acetate

Polyester (strongest and most common)

•Cassettes enclose and protect the tape

•Also serves as a delivery mechanism for the tape

•In the sound world optical discs contain information that is digitally encoded – more about digital formats and digitization in a bit
•The information is read with a laser and then turned back into sound information by the playback speakers
•Pits – holes where the laser goes in and doesn't bounce back and Lands – where the laser bounces back from the shiny, reflective layer

Now that I've briefly discussed the basic kinds of carriers commonly found in memory institutions we should briefly talk about some of the common problems found with audio materials. I will also touch on when it's best to send out problem materials and when it's best to treat materials in-house.

•Unsurprisingly, cylinders – especially wax cylinders – are highly prone to breakage

•Remember that the information on a cylinder is stored on the outside circumference of the cylinder. This makes it hard to handle a cylinder without wearing down the grooves and depositing finger oils and dirt into the grooves

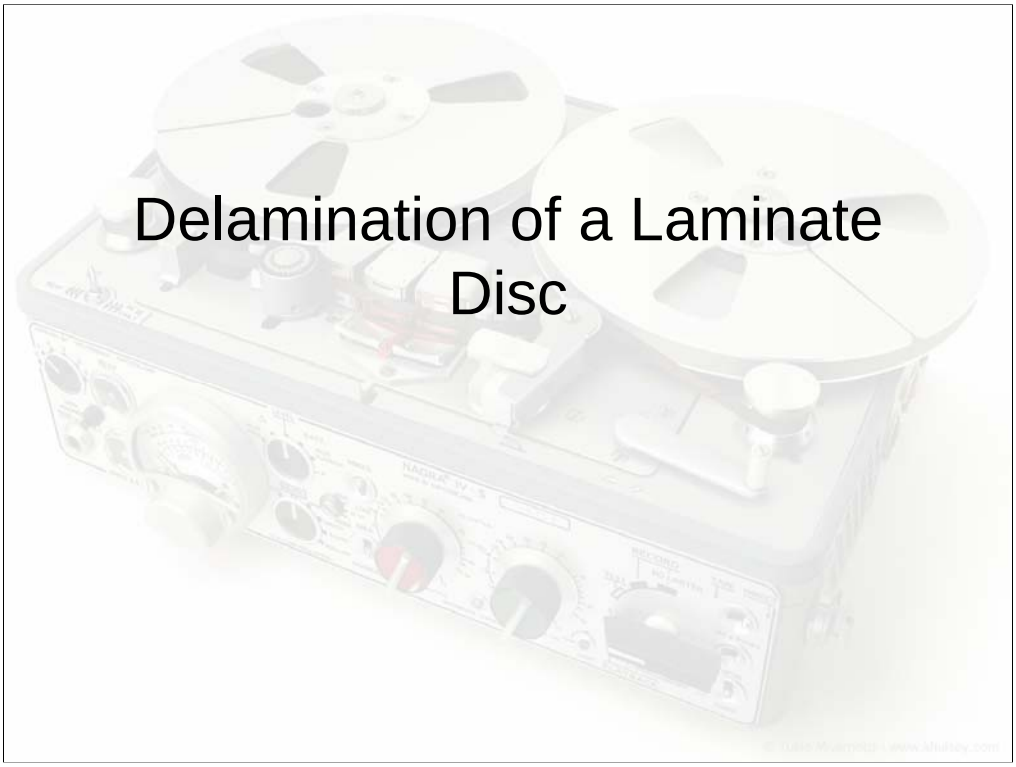
•Digitization of cylinders – especially damaged ones – is usually done outside the repository by experts

•Breakage is very common with grooved discs

•Delamination of the outside laminate material is common in the laminate discs

•Dust and dirt contamination which, by the way, can cause styli (needles) get contaminated and give bad sound playback for other discs

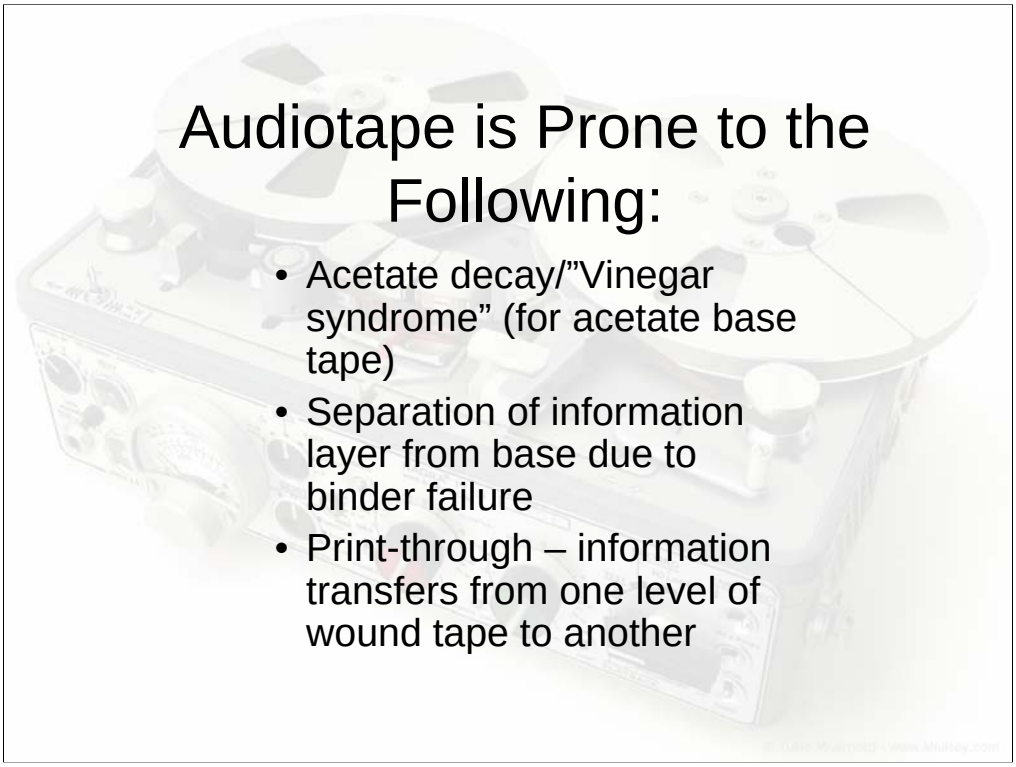
•Using the wrong stylus on the wrong kind of disc – for example a 78 stylus on a 331/3 vinyl record – can cause the record to get its grooves worn down



•Delamination is when the laminate shrinks and pulls away from the core material in a laminate disc

•Harvesting the sound information from a delaminating disc is best left to experts

- Can over time exude the plasticizer, called “palmitic acid”
- This plasticizer was used to make the laminate plastic/pliable enough to be molded
- Can be cleaned off but the lack of plasticizer within the laminate will make the disc more brittle over time
- This is an “inherent vice” that cannot be reversed
- Can be easily mistaken for mold
- Storing discs in carefully control humidity (30-40% can help slow this problem)



•Vinegar syndrome – not just for motion picture film. This also happens to acetate-based audiotape. This breakdown of the plastic base of the tape can cause embrittlement and curling of the tape. It can, in fact, be more aggressive with tape than movie film. Motion picture film can be frozen to halt vinegar syndrome. With magnetic tape freezing can damage the tape so we don't have that option.

•Digitizing of tapes suffering from acetate decay is usually best handled by experts outside the repository.

•Binder failure I will explain in a moment

•Print through is when an echo of the information from one layer of a tape can be heard on the layer wound around it.

•Minimizing the effects of print-through is why we wind tapes "tails out" or end-out to minimize pre-choes in favor of post-echos, which are less offensive.

- Magnetic tape: a coating of binder in which magnetic particles are suspended is applied to a base.
- Three strata:
    - Base
    - Binder
    - Recording information stratum

- Similar to videotape structure
  - Base
  - Binder
  - Recording information stratum

Sticky Shed or “binder hydrolysis”, the binder resin "consumes" water drawn from humidity in the air, that results in the binder shedding a gummy and tacky material which causes tape layers to stick together and inhibits playback when it is deposited onto the tape recorder heads. Hydrolysis also causes a weakening in the bond holding the binder to the backing, which results in shedding or possible detachment. Often called “sticky shed”. Sticky shed residue gums up playback machines so it’s doubly-important to minimize it. It doesn’t just give bad playback for the tape suffering from it, it can affect playback of other tapes.

•This is definitely an outsourcing kinda thing

•Bake tapes at low heat: 130° F, +/- 10°F, for between 4 and 8 hours.

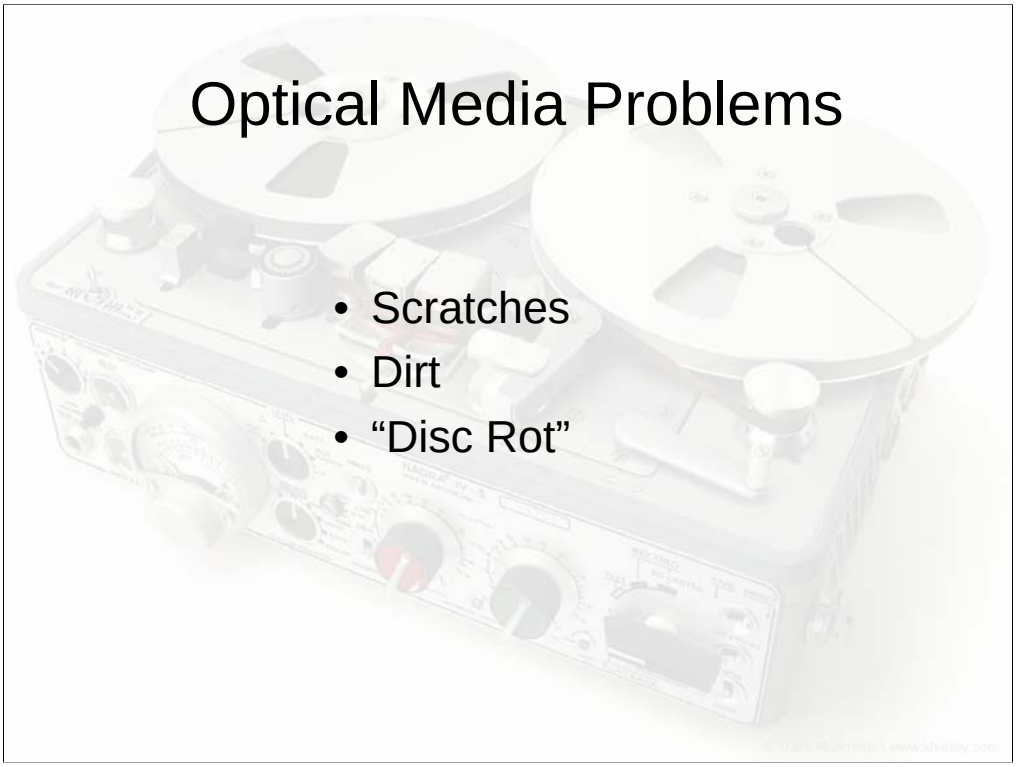
•Time varies with the thickness of the tape: four hours for ¼” tape, and eight hours for 2” tape.

•Tape binder will return to its problematic state – not a permanent fix

•Done to get a playback pass – often to digitize

•Cassette-based media have the added potential for difficulty because the moving parts within a cassette (and the cassette shell itself) can have problems over and above the problems with the tape itself

•Here is an 8-track cassette with a cushion that has desiccated over time and will no longer function to help keep the tape up against the playback head

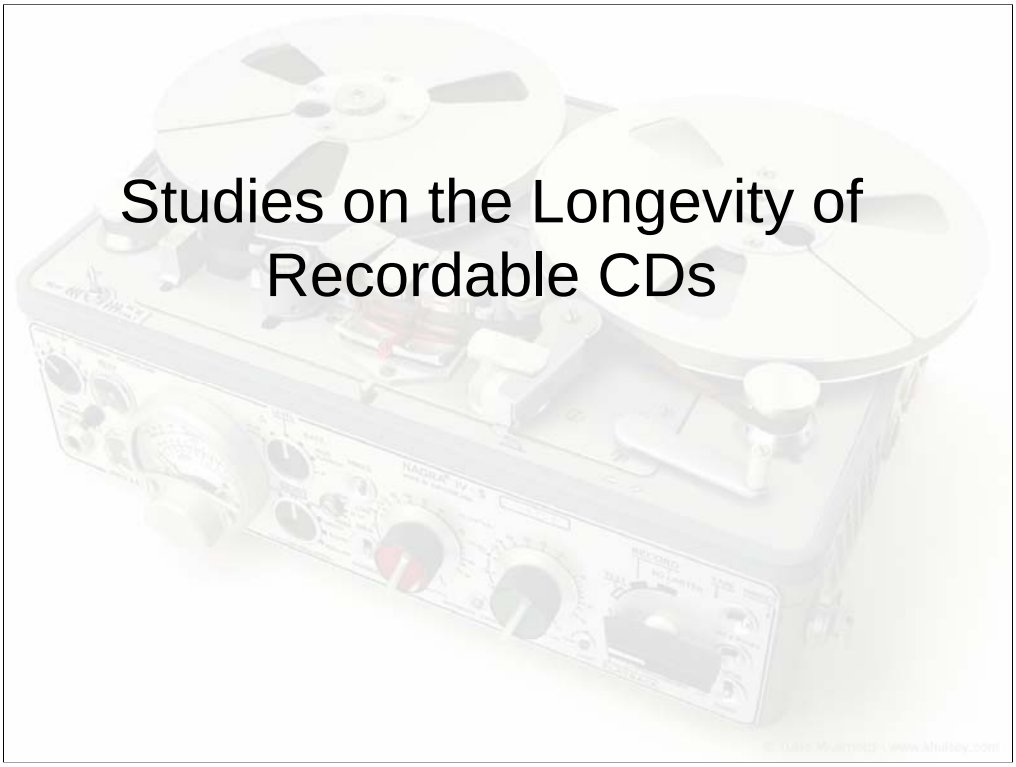


•Scratches – most will not affect playback unless very deep
•Dirt – gently cleaning in a lateral NOT a spiral motion with deionized water or special non-solvent CD cleaner **NOT Windex or eyeglass cleaner**
•“Disc Rot”

Factory-Recorded Vs. Recordable Optical Discs

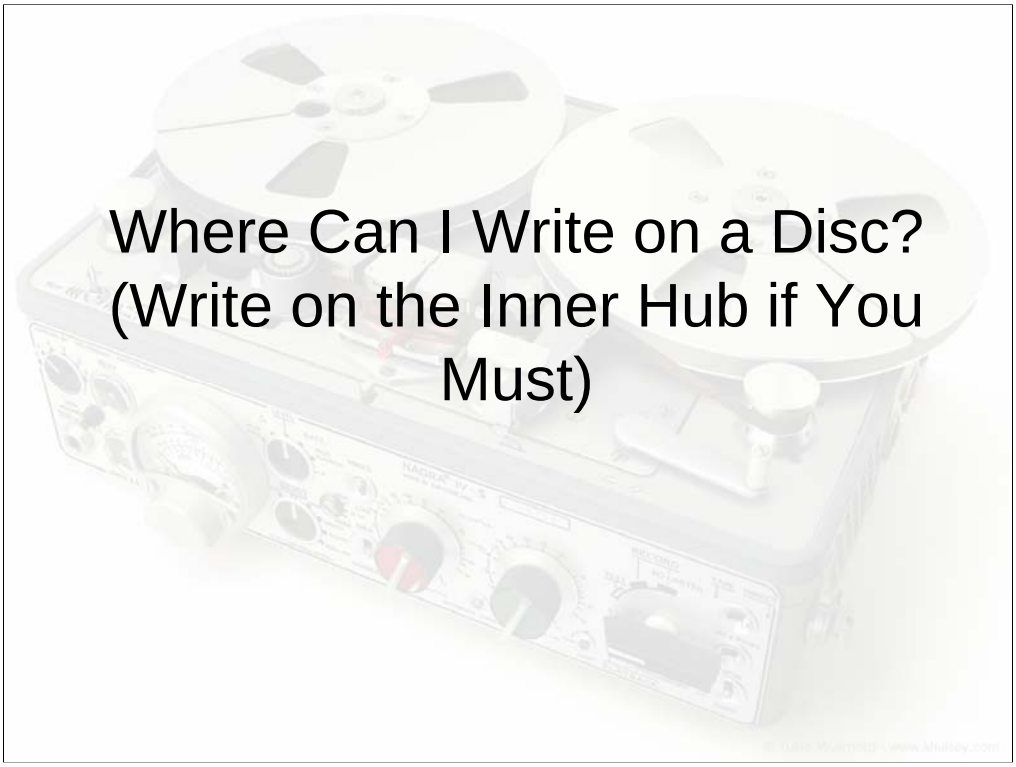
- Recordable discs use a gel layer to record information
- Pre-recorded discs use a sheet of aluminum
- Gold discs are believed to be more stable and long-lived

•Recordable discs use a gel layer to record information
•Pre-recorded (“factory-recorded”) discs use a sheet of aluminum
•Gold discs – believed to be more stable and long-lived



- Dutch magazine called PC-Active found in 2003 that CD-Rs can show information loss in as little as two years.
- Due to the organic nature of the dye in the recordable disc, degradation and breakdown of the transparent portion of the dye layer will occur over a long period of time as a natural process.
- It can take several years in normal environment conditions, high temps and humidity will accelerate this process.
- In this image, the disc on the right shows places (the colored places) where information has been lost
- The image here is from this Dutch study. There is a great deal of work being done on the longevity of recordable optical media (including DVDs) here at the Library of Congress' Preservation Directorate. See our "For More Information" citations at the end of this presentation for more information.

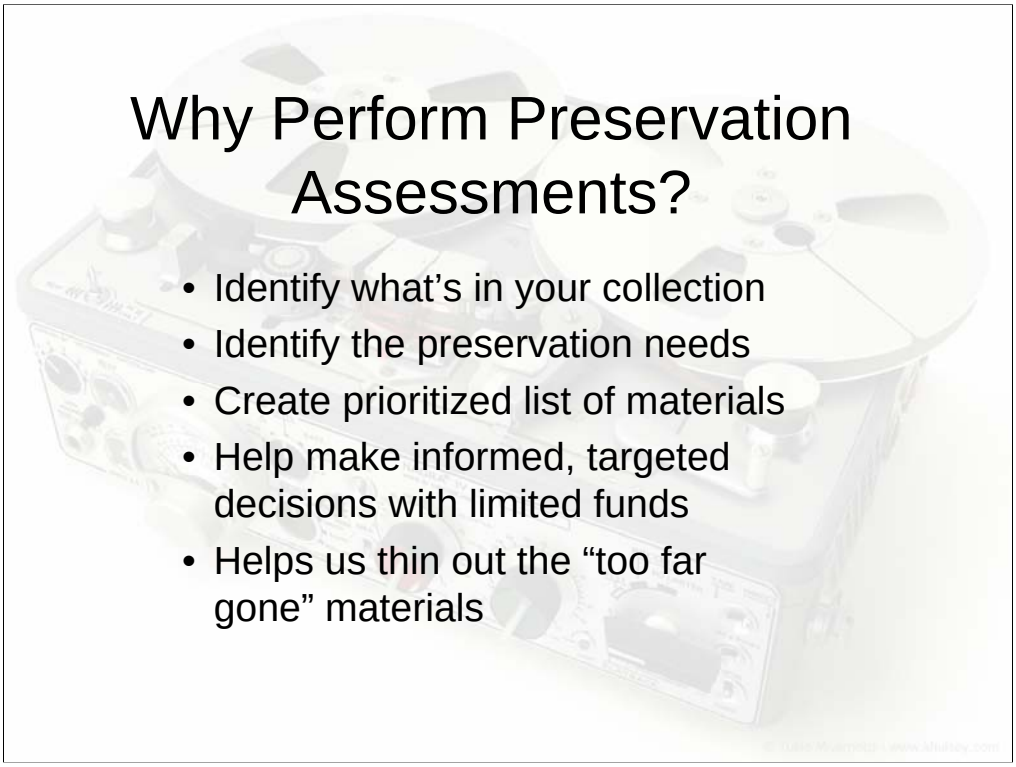
•The dark place here is disc rot.
•Disc rot is an umbrella term referring to the breakdown of the adhesives holding disc layers apart
•Can also refer to the breakdown of the reflective surface of the disc
•Can cause poor sound, sound dropouts or can render a disc completely unplayable
•Can also show as discoloration of a disc or “bronzing” – disc can start to get a dirty bronze color
•Avoiding direct light, heat and humidity can help minimize this problem



•If you must write on a disc, use special solvent-free marking pens (available through Gaylord, among others) to write on that clear inner hub.
•Sharpies and many other markers have solvents in their inks that can break down the disc
•Ball point pens can scratch the disc

•All materials can be covered by and/or aggressively attacked by mold
•Preventing mold is critical – very difficult to get rid of it once you have it in your repository
•Mold outbreaks are hazardous to humans' health – mold cleanup is best left to trained professionals

Now I'd like to talk about the use of assessment in the preservation and reformatting of audio materials.



•Identify what's in your collection

- •Turns that jumble of stuff in the closet into a logically-organized list of materials

•Identify the preservation needs

•Create inventory of materials prioritized by conservation/reformatting need

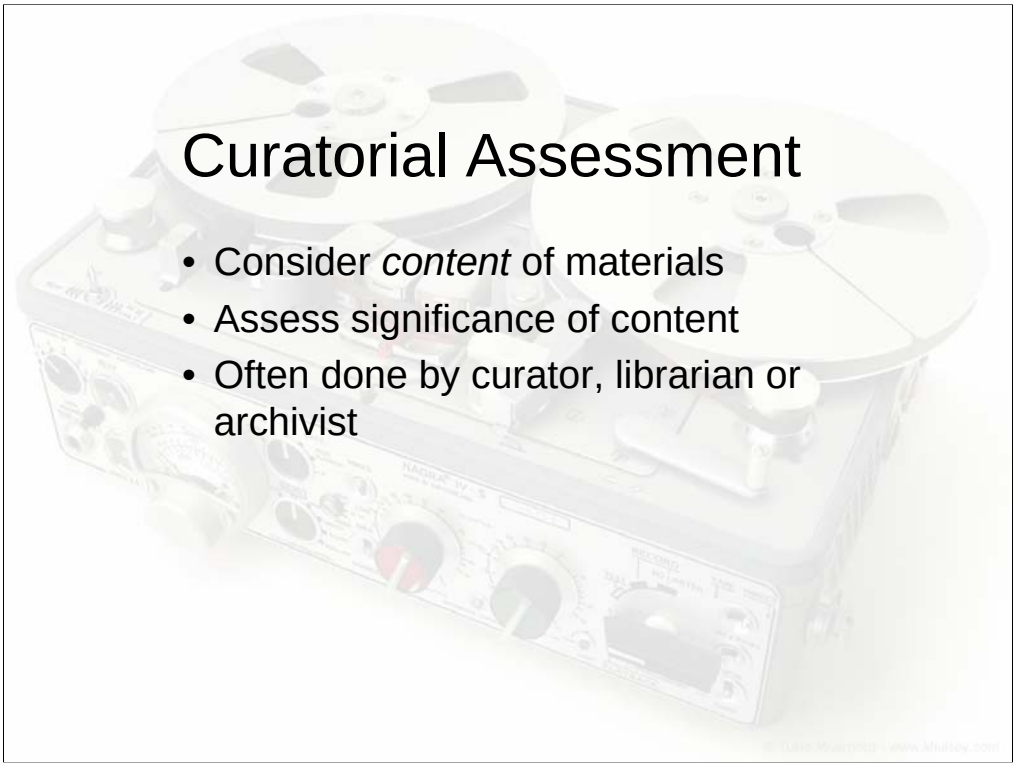
- •Usually the higher the need, the higher the item is on the list

•Help make informed, targeted decisions with limited funds

•Also helps you have preservation-related conversations with those who hold the purse-strings

•Also can help describe what you have for grant applications

•Helps to thin out the "too far gone" materials

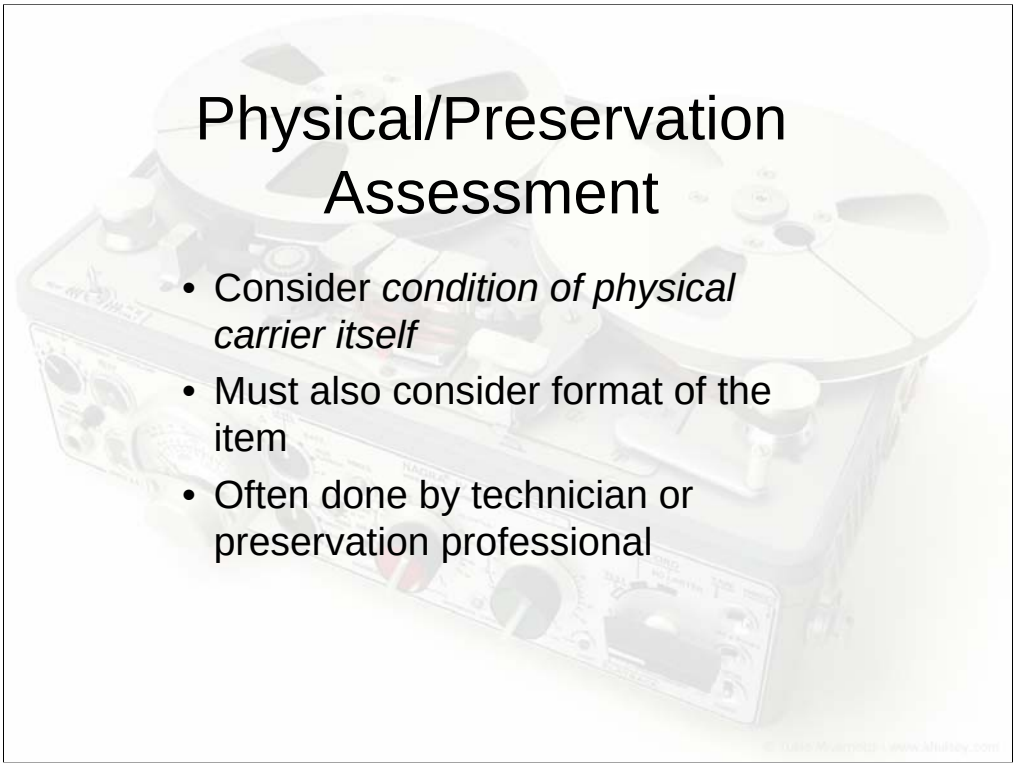


Two broad kinds of assessment:

Curatorial Vs. Physical/Preservation assessment

Curatorial

- Consider *content* of materials – "**what's on the tape"**
- Assess significance of content
- Often done by curator, librarian or archivist



Physical or Preservation Assessment:

- Consider **condition of physical carrier itself – "the tape itself"**
- Must also consider **format** of the item
  - The format itself, depending on the format's obsolescence can bump it up on the list regardless of its condition
  - Sometimes a format can strongly imply the rarity of a recording – in the case of a laminate disc (likely original/rare) vs. vinyl (unlikely that the recording is original or rare)
- Often done by technician or preservation professional

Preservation Assessment Tools

•New York University's Visual and Playback Inspection Ratings System (ViPIRS):
http://library.nyu.edu/preservation/movingimage/vipirshome.html
This program is based in Microsoft Access and can assess moving image and sound materials. This tool is designed for users with little familiarity with audiovisual materials.

•Columbia University's Audio/Moving Image Survey Instrument:
http://www.columbia.edu/cu/lweb/services/preservation/index.html
This program is based in Microsoft Access and can assess moving image and sound materials. This tool is designed for users with little familiarity with audiovisual materials.

•New York University's Visual Playback Inspection Ratings System (ViPIRS)
•Columbia University's AVDb

•Both designed as in-house tools around Microsoft Access.
•Both are for sound and moving image materials
•Both designed for users with little familiarity with audiovisual materials

Preservation Assessment Tools

•Indiana University Archives of Traditional Music's Field Audio Collection Evaluation Tool (FACET):
http://www.dlib.indiana.edu/projects/sounddirections/facet/index.shtml
This tool is designed to be used with audio materials only. This is a very high-end assessment tool that is designed for users with more than a basic level of familiarity with audio materials.

•University of Illinois at Urbana-Champaign's Audiovisual Self-Assessment Program (AvSAP):
http://www.library.uiuc.edu/prescons/AVSAP.htm
This program assesses both sound and moving image materials. This is a simplified assessment tool that is designed for users with little to no familiarity with audiovisual materials.

•Indiana University's FACET tool

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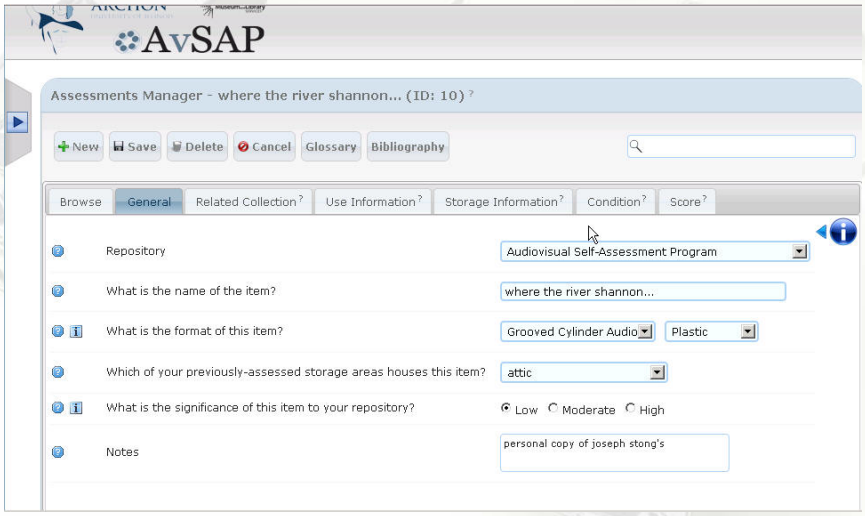
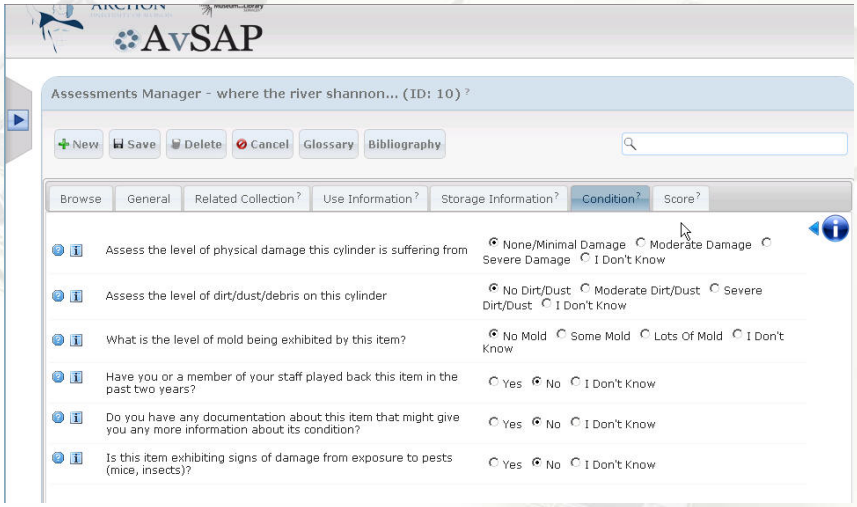
AvSAP



- University of Illinois' Audiovisual Self-Assessment Program (AvSAP)
  - Assesses both sound and moving image materials
  - Simplified assessment ("quick and dirty")
  - For users with little to no familiarity with audiovisual materials

- Here we see the first part of the item-level assessment in AvSAP
  - Asking about the format – this is where scoring begins

AvSAP



- AvSAP gives an item a score out of 100
- Here we see questions about the condition of an item.
- With each question you take off (or don't take off) points from that 100

AvSAP

Repository Audiovisual Self-Assessment Program

Show 10 entries Search:

Collections	Items	Location	Score	Format	Significance	Notes
	test 2	attic	15.44	35mm	Medium	
	test 1	Archives Research Center	28.17	16mm		
	test 5	attic	30.63	16mm		
	test	Archives Research Center	32.97	Super 8		
Conservation Lab	Family Recordings	Ben's test	36.53	Betamax	Medium	
	Stars and Stripes Forever Sound Recording	Archives Research Center	40.27	Grooved Cylinder Audio	High	Unique recording conducted by Sousa in 1910 before his World Tour.◆ Recording utilized Baroque ripeano and concertino performance technique
Conservation Lab	Where the River Shannon Flows	Ben's test	41.15	Grooved Cylinder Audio	Medium	
	1962 presidential lecture	Archives Research Center	44.13	1" open reel	High	
	where the river shannon...	attic	45.11	Grooved Cylinder Audio	Low	personal copy of joseph stong's
	family recording	Archives Research Center	52.84	1/4" open reel	Medium	

Showing 1 to 10 of 11 entries

- Here's the final AvSAP output
- Took a term from the film world and repurposed it: we call this the "decision list"
- Shows the item, its collection, its location, format and, most importantly the final score.
- The lower the score the more pressing its preservation needs
- AvSAP is ONLY a preservation assessment. We have the significance field but it does not affect the numerical AvSAP score

AvSAP Rubric For Scoring

The five basic vectors of the AvSAP assessment are (in no particular order):

- Environment (as Storage Facility Manager section)
- Container
- Format
- Use/Access
- Physical Condition

Here is how AvSAP tabulates the final score:

Environment Conditions (70%) + Disaster Preparedness (30%) = **Environment**

Then

Format (40%) + Environment (10%) + Container (5%) + Use/Access (5%) + Condition (40%) = **AvSAP Score**

•Here we see the basic factors taken into account by AvSAP in an assessment and the percentage of the score (again, out of 100) that they affect.

•The first section shows the factors

•The second section shows the formula by which AvSAP does the tabulation. This took us about a year and a half to work out. We used the video preservation assessment work of Sarah Stauderman at the Smithsonian as our basis. We also looked to the CALIPR project developed by the UC Berkeley Library for this rubric.

•Is easily navigable

•Is self-contained

•Avoids free-text in the answer fields as much as possible

•Yields clear, unambiguous results as often as possible

Digitization Basics

What is Sound?

What we hear as sound is actually a pattern of pressure waves that move through the air. The frequency of these waves determines the pitch of the sound — how low or high it sounds.

Sound frequency is measured in cycles per second, or Hertz (Hz). When the pressure wave reaches your ear, it pushes on your eardrum slightly, causing you to hear the sound.

How is Sound Recorded?

- Sounds begin as physical waves in the air, these airwaves vibrate a small membrane in a microphone and the membrane translates those vibrations into fluctuating electronic voltages.
- During recording these voltages are stored as a representation of the sound waves on a medium which when played back will duplicate the original voltages.
- They can be stored as grooves on a record, or magnetically charged particles on tape, or as digital information.

How is Sound Recorded Digitally?

- To get audio into a computer, we have to digitize it, that is, convert it into a stream of numbers.
- Sound pressure waveforms and other analog signals vary continuously; they change from instant to instant, and as they change between two values, they go through all the values in between.
- Analog recordings represent real world sounds and images that have been translated into continually changing electronic voltages.
- Digital recording converts the analog wave into a stream of numbers and records the numbers instead of the wave.

Analog-to-Digital Converter

- The main device used in digital recording is a Analog-to-Digital Converter (ADC), which captures a snapshot of the electric voltage and represents it as a digital number that can be sent to a computer.
- By capturing the voltage thousands of times per second, you can get an accurate reproduction of the original audio information.

Sample Rate and Bit Rate

- Sample rate: How often the original is sampled per unit of time, measured in Hertz (Hz), or samples per second. For digital audio, the higher the sampling rate, the smoother the transitions between the individual packets of sound. A low sampling rate results in clipping, the audio equivalent of jerky animation. An audio CD has a sample rate of 44,100 Hz, often written as 44 KHz for short.
- Bit Rate or Sample size: The amount of information that is recorded in each sample, the sampling precision, which controls how many different gradations (quantization levels) are possible when taking the sample. An audio CD has a precision of 16 bits.
- The current preservation standard is 96kHz and 24 bits.

Fidelity

- The fidelity of the reproduced wave can never be as accurate as the analog original; the difference between the analog signal and the closet sample value is known as quantization error.
- Since it can be regarded as noise added to an otherwise perfect sample value, it is also often called quantization noise.
- This error is reduced by increasing both the sampling rate and the sampling precision. As the sampling rate and quantization levels increase, so does perceived sound quality.

How often should you sample?

- The frequency response of the digital audio file is slightly less than half the sampling rate (Nyquist Theorem).
- Because of sampling, a digital signal is segmented into steps that define the overall frequency response of the signal.
- These samples are represented by bits (0's and 1's) that can be processed and recorded.

Nyquist's Sampling Theory

- If we sample at 1 time per cycle, we can think it's a constant.

- If we only sample at 1.5 times per cycle, it is read as a lower frequency sine wave

Nyquist rate

- For lossless digitization, the sampling rate should be ***at least*** twice the maximum frequency responses.
- The more often the signal is sampled, the more accurate the representation will be.

Levels of Achievement

- A decision will need to be made on when analog sources are best outsourced for digitizing, as compared to digitizing in-house.
- Primary considerations may include total costs, schedule, logistics, your existing capacity to do the work in-house, and whether or not staff have the skills to handle certain source material.

Candidates for outsourcing

- I would recommend that all cylinders and be sent to a professional for transfer.
- Cylinders are extremely fragile, require expensive and rare equipment and considerable knowledge to handle and transfer properly.

Candidates for outsourcing

- Lacquer discs are extremely fragile and made of a soft material that is easily damaged and worn.
- Lacquer discs are production disc, not mass produced copies.
  - There is usually no printed label, identification is often written by hand on the disc
  - they will often have 3 holes instead of one
  - often one-sided (the other side is blank and shiny)
  - During WWII disc had glass bases, otherwise aluminum
- Broken, cracked and delaminated discs can sometimes be transferred, but only by a skilled professional.

In House Candidates

To digitize audio in-house the following basic equipment is needed:

- Playback equipment for original source
- Analog to digital converter
- Cables
- Computer with Audio software

Playback Equipment

- All analog gear to manufactures spec, calibrate and clean before each use.
- Set output levels: It is important to keep your levels high enough for a good digital conversion. But be careful not to turn it up too much. Listen for distortion and watch for over levels.

VU Meter

- If you have a VU meter, it measures the voltage of the signal passing through it, calibrated with values both above and below a zero point (its 'best' operating level).
- As signals go above the zero mark they will become progressively distorted and compressed until you reach the maximum voltage the gear can handle and get nasty 'clipping'.

Digital Meter

- Keep your eye on your digital meter. Over levels are not acceptable, but keep the loudest audio as near to zero as possible without going over.

Discs

To transfer shellacs and 78's you ***must*** have:

- A turntable with variable speed adjustments to pitch correctly.

Discs: Stylus

- Must have a variety of stylus sizes and shapes. For example:
- 2.5, 2.7, 2.8, 3.0, 3.2, 3.5 stylus
- a truncated elliptical and a truncated conical for each size.

Discs: Cartridge and Pre Amp

- Must have a cartridge with no more than 1.5-3 grams of tracking force
- Use a stereo cartridge to transfer both groove walls separately.
- Note: Sum to mono only for listening file
- Must have a phono pre-amp with a flat setting.
  - do not apply an EQ curve to create preservation file

Tape

- **must** have tape heads and transports the same width and track configuration as your source tape
- **must** have deck that plays back at same speed tape as it was recorded

- These are vintage machines and cannot be purchased new:
  - Studer
  - Tascam
  - Otari

Cassette, DAT, CD

- Many decks are currently available for sale.

- http://www.sweetwater.com/c797--TASCAM--Cassette_Decks?gclid=CJSy8f2is6UCFRhg2godlBHrYA

Analog to digital converter

- There are some cost options when purchasing analog to digital converter. The quality of the conversion is crucial for a good transfer, and it will suffer significantly with lower end gear, so purchase as good a unit as your budget will allow.

Best A/Ds

Find a 96k/24 2ch model $1700 and up (best to also buy master clock source and sync AD to lock to it.)

- Prism
- Apogee
- Benchmark
- Tascam

Resources: http://www.sweetwater.com/c796--AD_DA_Converters

Mid-Line A/D

- 2ch $800-$1000
  - Benchmark
  - RME

Budget A/D

- M-Audio
- Resources: http://www.m-audio.com/
- For some institutions there may be no money at all, making it necessary to use the soundcard that came factory installed on your computer.
- This is not recommended because the analog to digital conversion that is the product of this soundcard is extremely poor.

Audio software

It is necessary to have audio software installed on your computer to record the digital files.

Best Audio Software

- Best turn-key systems:
  - Sonic Studio
  - Pyramix
  - Hi end ProTools

Mid-Range Software

- Samplitude 9 LE
- Apple Final Cut
- Sonar Cakewalk
- mid level Pro-Tools

Budget Software

- **Audacity -** free, open source audio software for both Mac's and PC.

- Resources: http://audacity.sourceforge.net/

For the best professional transfers you need not only the best equipment, but extensive knowledge about to use them properly.
Here is a list of equipment used at the Library of Congress:

- Simon York Turntables
- Shure and stylus and cartridges
- KAB and Millennia Phono Pre-Amps
- Studer Tape Decks
- Sony PCM-R700 DAT player
- Sony CDR-W66 CD player
- Tascam 122 MK II cassette player
- Maselec MTC-2 for analog input level control
- Lucid GENx192 master clock
- Prism Sound Dream ADA-8XR AD/DA converters
- Pyramix Digital Audio Workstations

Storage and Data Management

- Digital files are commonly stored on hard disc drives, data tapes, and CD-Rs or DVDs. None of these media was designed or intended for long-term storage.
- Custodians of digital preservation media cannot “shelve it and forget it” but must establish and follow systematic processes to monitor files for their integrity.
- Periodically, digital sound files will need to be refreshed by migrating them to new formats.

To read more go to:
http://www.clir.org/pubs/abstract/pub148abst.html.

Best Storage

- **Digital Repository**

- A digital repository is a storage system designed to provide reliable, long-term access to managed digital resources. It includes routines to verify the integrity of its files; it is protected by firewalls; within it are backup and redundancy systems; and it is financially structured for long-term sustainability.

Mid-Level Storage

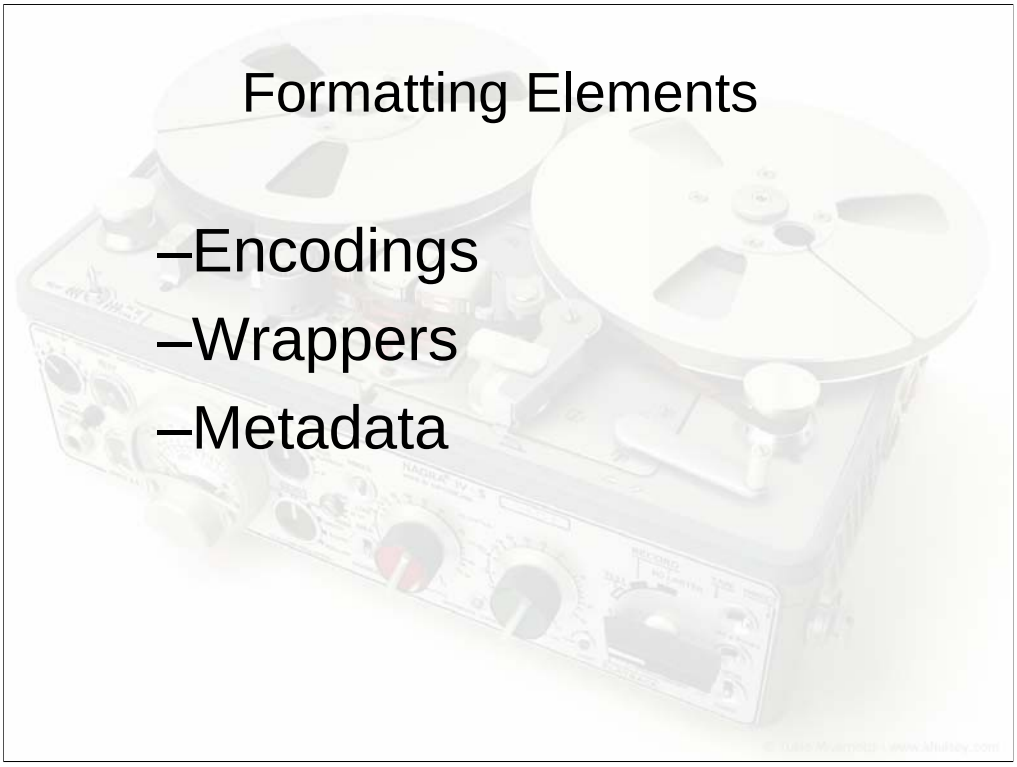
- Some programs can load its digital preservation files onto the facilities' servers and depend on those files being backed up during regular cycles of the systems.

- In other archives, portable hard disc drives are used for storage. A second set of drive is often used to backup the drives. But unless the data's integrity is monitored, and periodic migration guaranteed, a hard disc drive sitting on a shelf may be no safer a medium than a CD-R, and maybe less safe than the original source.

Budget Storage

- Small archives do not have the resources to build repositories, and most of these archives may have had little introduction to solutions other than CD-R storage. If this is your situation, use archival optical media such as gold CD-Rs or the new CD-R for Masters, which are designed to reduce error correction rate and jitter components close to the theoretical limits.
- Additional provision needs to be made for a migration strategy to assure that audio captured on CD-Rs or data tapes will be protected in the long term.

For more information go to:
http://www.film-to-video.com/study/StabilityStudy.htm



[Three elements.] I'll frame my report in terms of three elements: encoding, wrappers, and metadata.

Encoding

Encoding

- Bitstream structures appropriate for our purposes
- For waveform sound (as you have learned): Linear Pulse Code Modulation (LPCM)
  - BTW: there are other flavors of PCM, e.g., Adaptive Delta PCM
  - BTW: you may also hear about DSD (Delta Sigma Audio Encoding aka Direct Stream Digital)
  - BTW: and for non-waveform sound, there is also MIDI

By encoding, I mean the bitstream structures that are appropriate for our purposes. To define by example – PCM and LPCM, what we have been talking about today.

Wrapper

Wrapper

- File formats that encapsulate one or more constituent bitstreams and include metadata
- Archetypal examples:
  - WAVE and Broadcast WAVE, TIFF
- Complex examples:
  - QuickTime, MXF

By wrappers, I mean file formats that encapsulate one or more constituent bitstreams and include metadata that describes what's inside. Archetypal non-video examples include Broadcast WAVE and TIFF. More complex (video) examples include QuickTime or MXF may contain multiple objects, e.g., one or more video and audio streams.

Metadata

Our emphasis: technically oriented chunks of administrative metadata.

- Metadata overlaps with wrapper issues.
- To what degree is metadata embedded in the wrapper or even the bitstream?
- To what degree is such embedded metadata standardized?

Regarding metadata, my talk will emphasize technically oriented chunks of administrative metadata. To what degree is metadata embedded in the wrapper or even the bitstream? To what degree is such embedded metadata standardized?

AES-57 (former AES X098b) Selected Tech Metadata Elements

- **format**
- **physicalProperties**
- **appSpecificData**
- **audioDataEncoding**
- **byteOrder**
- **firstSampleOffset**
- **audioDataBlockSize**
- **firstValidByteOfBlock**
- **lastValidByteOfBlock**
- **primaryIdentifier**
- **secondaryIdentifier**
- **fileChecksum**
- **soundDataChecksum**
- **objectLink**
- **formatList**
- **analogDigitalFlag**
- **generation**
- **disposition**
- **schemaVersion**
- **timeRange**
- **timeRangeType**
- **numChannels nonNegativeInteger**
- **conditionNote**
- **conditionNoteType**
- **securityNote string**
- **stream streamType**
- **formatRef**
- **faceRef**
- **label**
- **physicalProperties**
- **physicalPropertiesType**
- **Speed**
- **speedType**
- **bitDepth**
- **sampleRate**
- **wordSize**
- **trackLayout**
- **grooveOrientation**
- **grooveWidth**
- **grooveWidthType**
- **grooveCreationMethod**
- **grooveCreationMethodType**
- **soundField**
- **noiseReduction**
- **equalization**
- **bitrateReduction**
- **bitrateReductionType**
- **Label string**
- **ownerRef**

Technical metadata – one of the subtypes -- here are the names of some of the data elements in the Audio Engineering Society standard, AES 57.

Descriptive metadata

- Libraries prefer bibliographic records
  - Tilt toward single item, “monograph”
    - Notional digital package, intellectual entity
  - Metadata: author, title, subjects, publication
- Archives prefer finding aids
  - Collections and series, made up of items
    - Notional digital package may be a multipart item
  - Little or no item-level description

Descriptive metadata is another matter. I don't have to tell this audience that descriptive metadata takes very different forms in libraries and archives. In simplified terms, the librarian’s bibliographic record uses tagged elements to provide such information as author, title, publication place and date, and subject terms, generally selected from a thesaurus. When producing digital entities, at least at my library, we see a tilt toward the monograph as a conceptual model. Meanwhile (simplifying again), the archivist’s finding aid helps researchers see the coherence of a given collection, the archival *fond*, and the finding aid presents blocks of related documents in what are often called *series*. Only a handful of finding aids describe content at the level of an individual document and it is rare for them to provide author’s names, titles, and formal subject terms.

Structural (“packaging”) metadata

- “Packages” contain multiple files
- Some at LC use METS

http://lcweb2.loc.gov/diglib/ihas/loc.natlib.ihas.100010622

Some at the Library of Congress use the METS standard to package multi-file items. This is a band score but you could imagine doing something like this with, say, a two-sided 78 rpm disc (and images of the label art), or for a two track audiocassette. At this time, however, none of the participants in the federal audio-visual working group are METS users.

Metadata variation

- Federal agency members: *libraries* and *archives*
- Agreement that “packages” contain multiple files (altho package concepts vary)
- No clear pattern for *descriptive* and *packaging* metadata – local implementations
- For now, the federal WG looks at files-as-files
- What metadata ought be embedded in files?
  - Most important: identifier, name of the archive, date that digital resource was created, title or quasi-title
  - This is our WAVE “header” recommendation

http://www.digitizationguidelines.gov/audio-visual/documents/wave_metadata.html

The Federal Agencies Working Group includes representatives from both archive and library organizations, and their practices for resource description vary in significant ways. In addition, their approaches to content packaging—the “binding together” of multiple related files—also vary. For these reasons (it’s too wet to plow), the Working Group’s guidelines are not likely to emphasize descriptive metadata nor are we likely to offer particular recommendations for the packaging of multi-file digital resources. Our guideline emphasis will tilt toward the technical, with more attention paid to the file than the package. I have no doubt that we will recommend--as we did for audio files--that everyone embed some basic information right in the file – for example: an identifier, the name of the archive that takes responsibility for the content, the digital entity creation date, and a title or something like it.

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