

A PICTORIAL GUIDE TO SOUND RECORDING MEDIA



AUDIO FORMATS COVERED

- Cylinders
- Discs
- Magnetic Media

Not covering Belts (mechanical or magnetic), Magneto-optical, or Optical Media (CDs and DVDs)

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CYLINDER RECORDING

- History
 - 1877 to 1929
- Materials
 - Wax Cylinders
 - Molded Cylinders
- Sizes
 - Varies in diameter and length
- Manufacturers
 - Bell and Tainter
 - Edison
 - Gramophone
 - And more

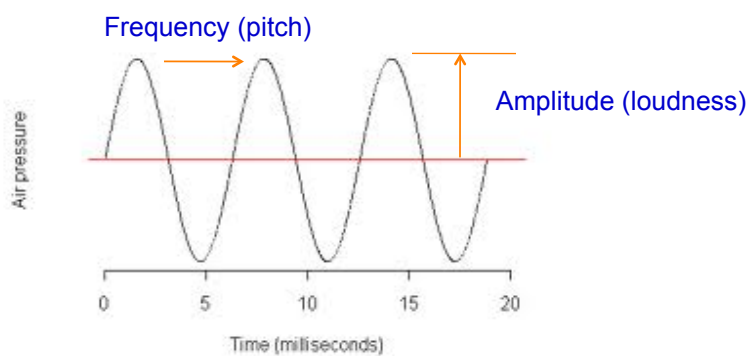
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Mountain Chief, Chief of Montana Blackfeet, in Native Dress With Bow, Arrows, and Lance, Listening to Song Being Played On Phonograph and Interpreting It in Sign Language to Frances Densmore, Ethnologist, March 1916

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PROPERTIES OF SOUND (AS A WAVE)



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CYLINDER RECORDS



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TRAITS AND PROBLEMS (CYLINDERS)

- Usually around 4 minutes recording time
- Playback around 160 rpm
- Grooved recordings (hill and dale, or side to side)

- Fragile
- Biological deterioration
- Flammable
- Incompatible (not interchangeable) formats
- Shrink over time
- Inconsistent sound

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DISC RECORDINGS

- History
 - 1887 to present
- Materials, Diameters, Rotations
 - 10" to 16" 78s: Latex, Lacquers on an inner core, Shellacs
 - 12" 33s or LPs: Thermoplastic
 - 7" Microgroove (45s): PVC
- Stability
 - Mostly stable except for Lacquers (aka Acetates)

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LATEX, SHELLAC, AND ACETATE (78S)



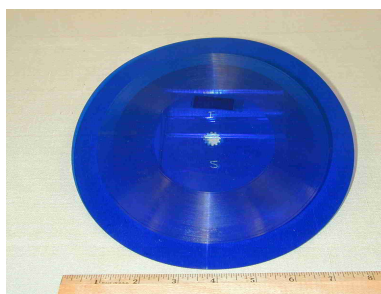
- 1887 Berliner Record
- 1897 – c. 1950s Shellac
- c. 1934 - Lacquer or “Acetate” Disc

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INSTANTANEOUS DISC

c. 1930s Aluminum Instantaneous Disc

c. 1940s Dictation Disc



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1948 - LONG-PLAY "LP" VINYL DISC (33RPM)



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1953 - MICROGROOVE 45 RPM DISC



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TRAITS AND PROBLEMS (DISCS)

- 78s are usually less than 3 minutes
- LPs are usually 15-20 minutes per side
- Grooved recordings (vertical and lateral)

- Acetates have serious delamination and palmitic acid exudate
- Glass cores are fragile (and heavy)
- LPs are flexible, fairly robust

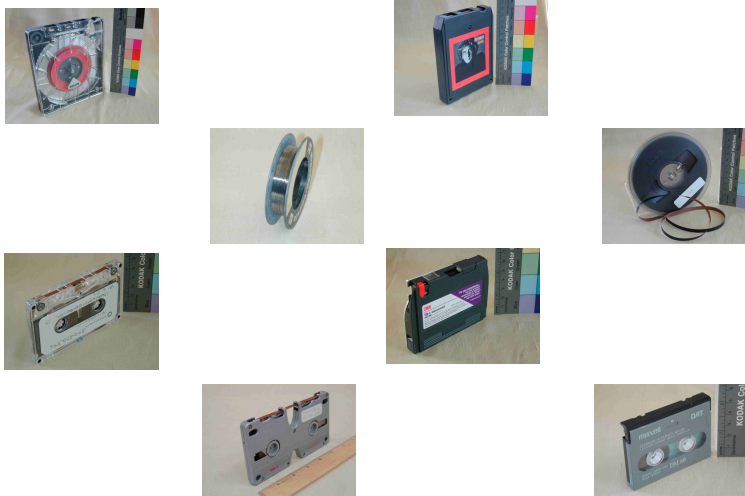
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MAGNETIC MEDIA

- History
 - Wire: 1897 through 1950s
 - Tape: 1934 to present
- Formats and Tape Track Configurations
 - Tens of formats
 - Multiple track configurations
- Materials
 - Base, binder, pigment
- Stability
 - Physical fragility
 - Chemical fragility

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MAGNETIC MEDIA



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(1898) 1920S-1950S WIRE

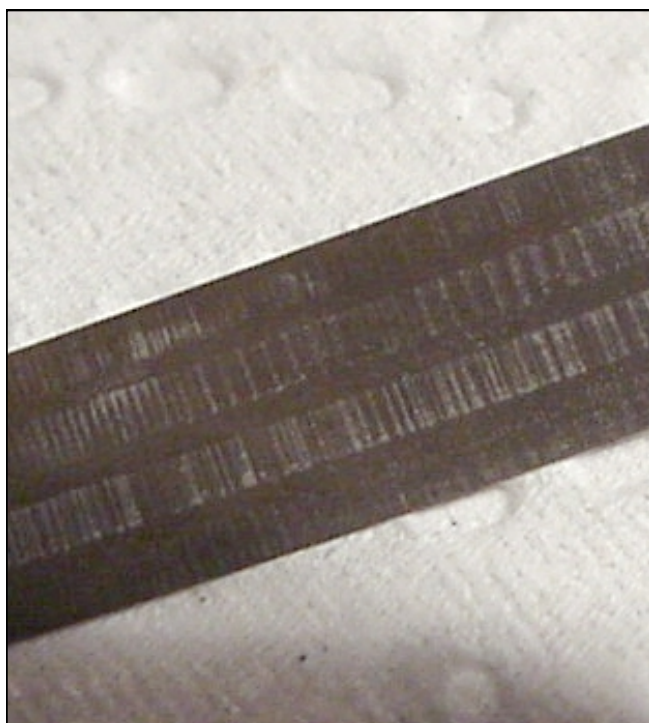


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(1934) 1946 - REEL TO REEL MAGNETIC TAPE



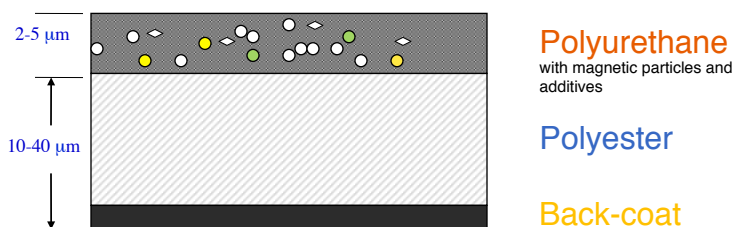
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Audio tape is recorded using electronic means either in an analog or digital fashion. In either case, the information is placed on the magnetic media as tracks.

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MAGNETIC MEDIA CROSS-SECTION



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MAGNETIC COMPONENT

- Gamma Ferric Oxide
- Barium Ferrite (BaF)
- Chromium Dioxide (CrO₂)
- Metal Particle (MP)
- Metal Evaporated (ME)

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MAGNETIC MEDIA DETERIORATION

- Physical Structure: Base, Binder, Pigment
- Binder Failure: “Sticky Shed Syndrome”
- Life Expectancy: 10 – 30 years
 - “Magnetic Tape Storage and Handling” (1995) Commission on Preservation and Access and National Media Lab

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1960S - COMMERCIAL CASSETTES AND DICTATION CASSETTES



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1970S - PROFESSIONAL CASSETTES



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1988 - DIGITAL CASSETTES

Digital Audio Tape (DAT)

Data Cartridge



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TRAITS AND PROBLEMS

- Formats, both analog and digital, can usually be identified by the shape or size of the tape cassette or reel. Formats are specific to the playback machine.
- On analog tapes there are “tape track configurations” which is essential information for optimizing playback. For instance, there are full tracks, half tracks, quarter tracks, and so on.
- The recording speed of an analog tape can be 7 ½ inches per second (IPS), 3 ¾”, 15” and so forth.
- The native format of DAT is 16bit, 44.1kHz.
- Wire is stable, but it is an obsolete format; its primary problems are mechanical. For instance, it easily tangles or breaks.
- In all studies of magnetic tape media, the least stable part is the polyurethane binder regardless of whether it is an analog or digital recording. The life expectancy of magnetic media is 10-30 years according to studies by the National Media Laboratory and the Council of Library and Information Resources.

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Q&A ON AUDIO FORMATS

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PRESERVATION AND HANDLING OF AUDIO MATERIALS

- Housing
- Environment
 - Temperature
 - Humidity
 - Pollution Control
- Treatment (prior to reformatting)
 - Cleaning
 - Desiccation

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HOUSING

- | | |
|---|---|
| <ul style="list-style-type: none">○ Cylinders<ul style="list-style-type: none">• Upright• Original containers inside handling containers• Handle only at edges○ Magnetic Media<ul style="list-style-type: none">• Upright• Open reel tape should be placed on unslotted hubs• Plastic containers• Remove record tab | <ul style="list-style-type: none">○ Discs<ul style="list-style-type: none">• Upright*• Original or replacement sleeves with good quality polyethylene sleeve○ Storage boxes should be made of acid- and lignin-free paper stock; avoid storage containers that retain static charge |
|---|---|

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WEIGHT AND SPACE REQUIREMENTS

FORMAT	WEIGHT PER ITEM (lbs)	NUMBER OF ITEMS/FOOT	WEIGHT PER 3' SHELF (lbs)
LPs	0.51	66	101
45 rpm	0.22	66	44
78 rpm	0.83	66	164
Audio cassette	0.30	18	16
10" audio tape	1.77	13	69
2" Quad	~25	> 4	262
1" SMPTE Type C	~9	>6	148
¾" U-Matic	1.85	5.5	31

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PRESERVATION ENVIRONMENT FOR AUDIO COLLECTIONS

- For institutions, review ANSI IT9.13.1996, which suggests COOL and DRY in tiers for permanence (less than 70F, less than 45% RH), but never below 46F
- Minimize light exposure; magnetic fields; heat sources (radiators/vents); vibration

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CLEANING AND TREATMENT OF AUDIOVISUAL MATERIALS PRIOR TO REFORMATTING

- Cylinders
 - Soft brush
 - Vacuum
- Discs
 - Cleaning solution for discs to remove palmitic acid (soapy residue) from acetates <http://www.loc.gov/preservation/care/record.html>
- Magnetic Media
 - Automatic cloth cleaning system to clear deposits from surface of tape
 - Desiccation of tape to temporarily reverse binder hydrolysis

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Q & A ON PRESERVATION ENVIRONMENT AND HOUSING

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RESOURCES FOR AUDIOVISUAL COLLECTIONS MANAGERS

○ VIDEO

- A Race Against Time <http://www.ccaha.org/education/videos>

○ BOOKS

- Byers, Fred R. 2003. Care and Handling of CDs and DVDs.
- McWilliams, J. 1979. The Preservation and Restoration of Sound Recordings.
- Pickett, A.G., and M.M Lemcoe. 1959. Preservation and Storage of Sound Recordings.
- Van Bogart, J. 1995. Magnetic Tape Storage and Handling: A Guide for Libraries and Archives.
- Ward, A. 1990. A Manual of Sound Archive Administration. Hants, England: Gower Publishing.

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RESOURCES FOR AUDIOVISUAL COLLECTIONS MANAGERS

○ ORGANIZATIONS

- Association of Recorded Sound Collections (ARSC)
http://www.arsc-audio.org/pdf/ARSTC_resources.pdf
- International Association of Sound and Audiovisual Archives
<http://www.iasa-web.org/>
- Electronic Media Group, American Institute for Conservation
<http://cool.conservation-us.org/coolaic/sg/emg/index.html>
- Society of American Archivists (SAA) Recorded Sound Roundtable
- Audio Engineering Society (AES)

○ Enthusiasts and Hobbyists

○ Reformatting Vendors

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PRESERVATION PRIORITY SURVEYS

- Online
- Free
- Easy
- Methodologies change from survey to survey

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SOUND SAVINGS

- By Stanford University Libraries (2003)
- Table of Survey Data Elements
- List of other surveys available
- <http://www.arl.org/storage/documents/publications/sound-savings.pdf>

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CALIPR

- By California Preservation Program (2007)
 - For paper-based or AV collections
 - Online database tool
 - Random samples
 - Creates “management reports”
- <http://www.lib.berkeley.edu/preservation/CALIPR/>

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AVDB

- By Columbia University Libraries (2008)
 - Item-level, weighted
 - Incorporates intellectual value (curator input)
 - No playback component
 - Well documented
 - Downloadable Microsoft Access tool
- <http://library.columbia.edu/content/libraryweb/services/preservation/audiosurvey.html>

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SOUND DIRECTIONS: FIELD AUDIO COLLECTION EVALUATION TOOL [FACET]

- By Indiana University Library (2008)
 - Audio only (field recordings)
 - Item-level, not weighted
 - No curator input, playback components
 - Well documented
 - Easy to break down and sort collections to facilitate analysis
 - Downloadable Microsoft Access tool
- <http://www.dlib.indiana.edu/projects/sounddirections/facet/index.shtml>

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VIPIRS VISUAL & PLAYBACK INSPECTION RATINGS SYSTEM

- By New York University Libraries (2008/9)
 - Audio and video tapes
 - Item-level, weighted
 - Includes playback component
 - Well-documented
 - Downloadable Microsoft Access tool
- <http://library.nyu.edu/preservation/movingimage/vipirshome.html>

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AVSAP

- By University of Illinois Urbana-Champaign Libraries (2010)
 - For AV collections
 - Online database tool or host-your-own SQL DB
 - Item-level or random samples
 - Evaluate repository and storage environments and item format, access, value
 - Approximately 15 multiple-choice questions per format
 - In-depth “pop-up” tutorial
- http://www.library.illinois.edu/prescons/projects_grants/grants/avsap/

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DIAGNOSTIC DATA POINTS FOR AUDIO

For all audio materials:

- Dust or dirt on container or on item
- Obvious deterioration issues such as delamination, soapy film, mold, breakage
- Degree of information on label
- Storage evaluation -- quality of housing to environment
- Playback issues (sound distortion)

In addition, for magnetic media:

- Wind of the cassette (popping, spoking)
- Presence or absence of record tab (housekeeping)
- Anecdotal evidence that a tape brand is poor quality or aging rapidly

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PRINCIPLES OF PRIORITIZATION SURVEYS

○ Value

- How unique is the documentation contained within this collection?
- How extensive/complete is this documentation?
- How deep or detailed is this collection?
- To what extent are emerging research trends or agendas addressed or documented in this collection?

○ Use

- What constitutes low, moderate, and high use
- How do you keep track use

○ Risk

- Condition
- Rarity of Format/Obsolescence
- Master/Element

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Q&A ON RESOURCES AND SURVEYS

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THANKS

- George Blood
- Conservation Center for Art and Historic Artifacts
- Heritage Preservation
- Richard Hess
- Alan Lewis
- Library of Congress, Recorded Sound (Larry Miller)
- Paul Messier
- National Museum of American Indian (Michael Pahn)
- Andrew Robb
- Art “Shiffy” Shifrin
- Steve Smolian
- Stanford University Libraries (Hannah Frost)

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