



KEEPING THE GROOVE: CARING FOR GROOVED AUDIO MEDIA

Foundation for Advancement in Conservation
Connecting to Collections Care
November 14, 2024

Dave Walker, Audiovisual Archivist
Smithsonian Center for Folklife and Cultural Heritage





ABOUT ME

Archivist and Media
Conservator

Specialized in analog
audio recording formats

@DWalkerAudio

WalkerDM@si.edu

Webinar Objectives



Format Identification



Common forms of
deterioration



Best practices for handling,
storage, and cleaning

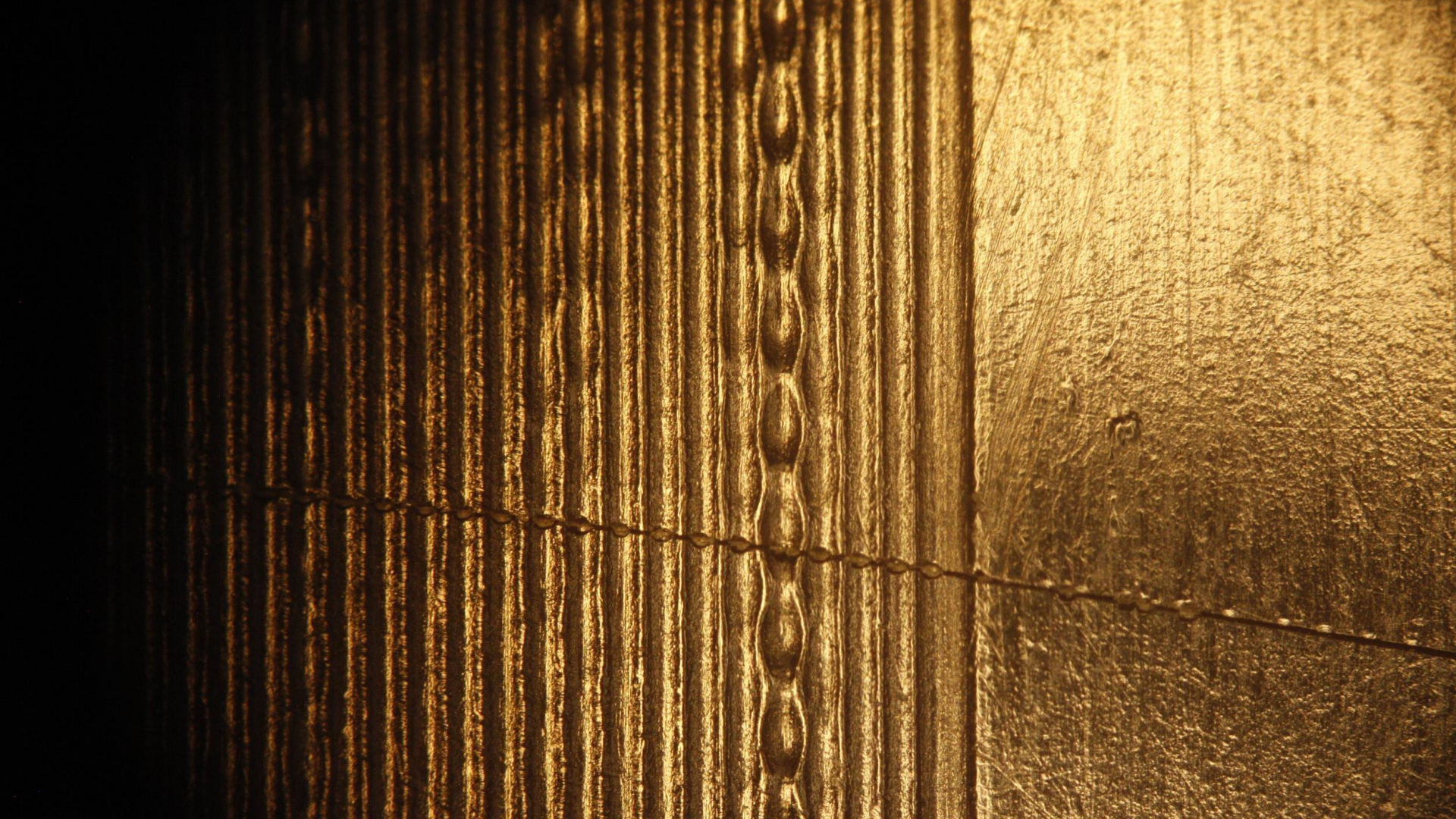


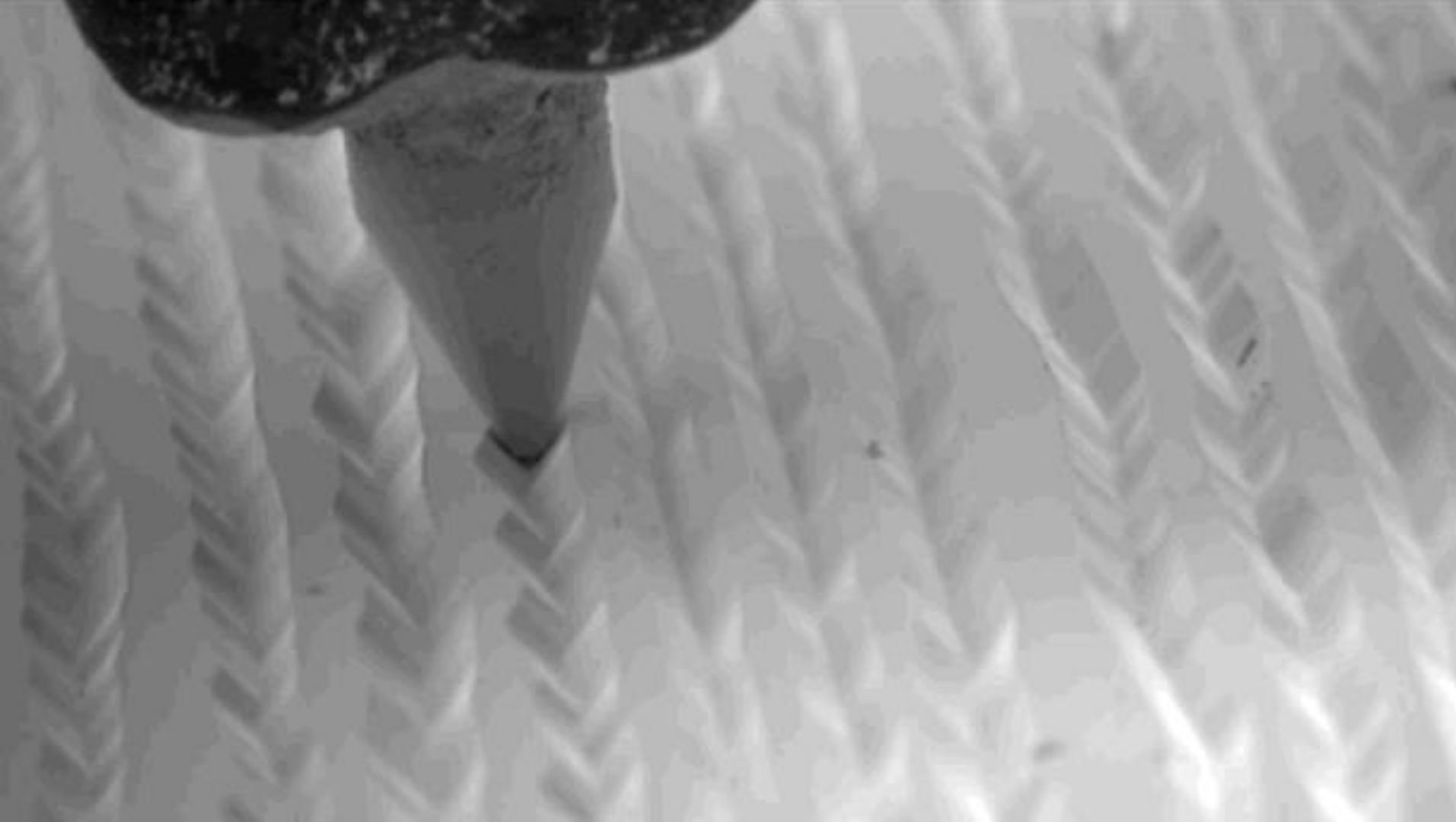
Risk assessment for grooved
media





WHAT IS GROOVED MEDIA?

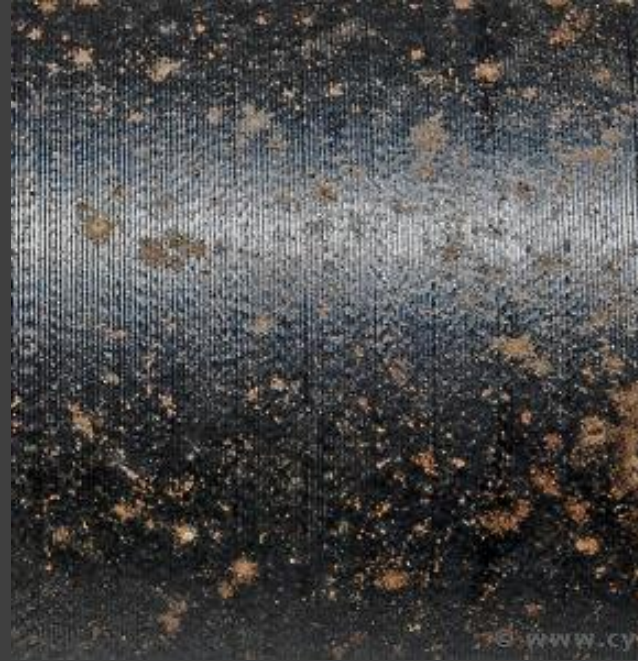






WAX CYLINDERS





FUNGAL GROWTH/MOLD



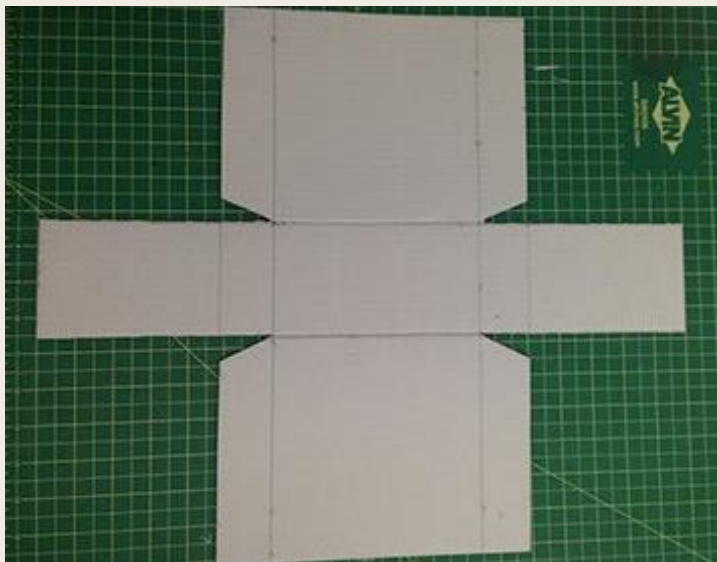
Cylinder: Handling

1. Acclimate
2. Support from
Inside or Edges
3. **Use Both Hands**
4. Rotate cylinder





CYLINDER: STORAGE AND HOUSING



OR IF YOU'RE CRAFTY!

Cylinder: Cleaning

1

Handle
Carefully

2

Dry
Cleaning

3

Spot
Cleaning

4

Avoid
Chemicals

5

After
Cleaning



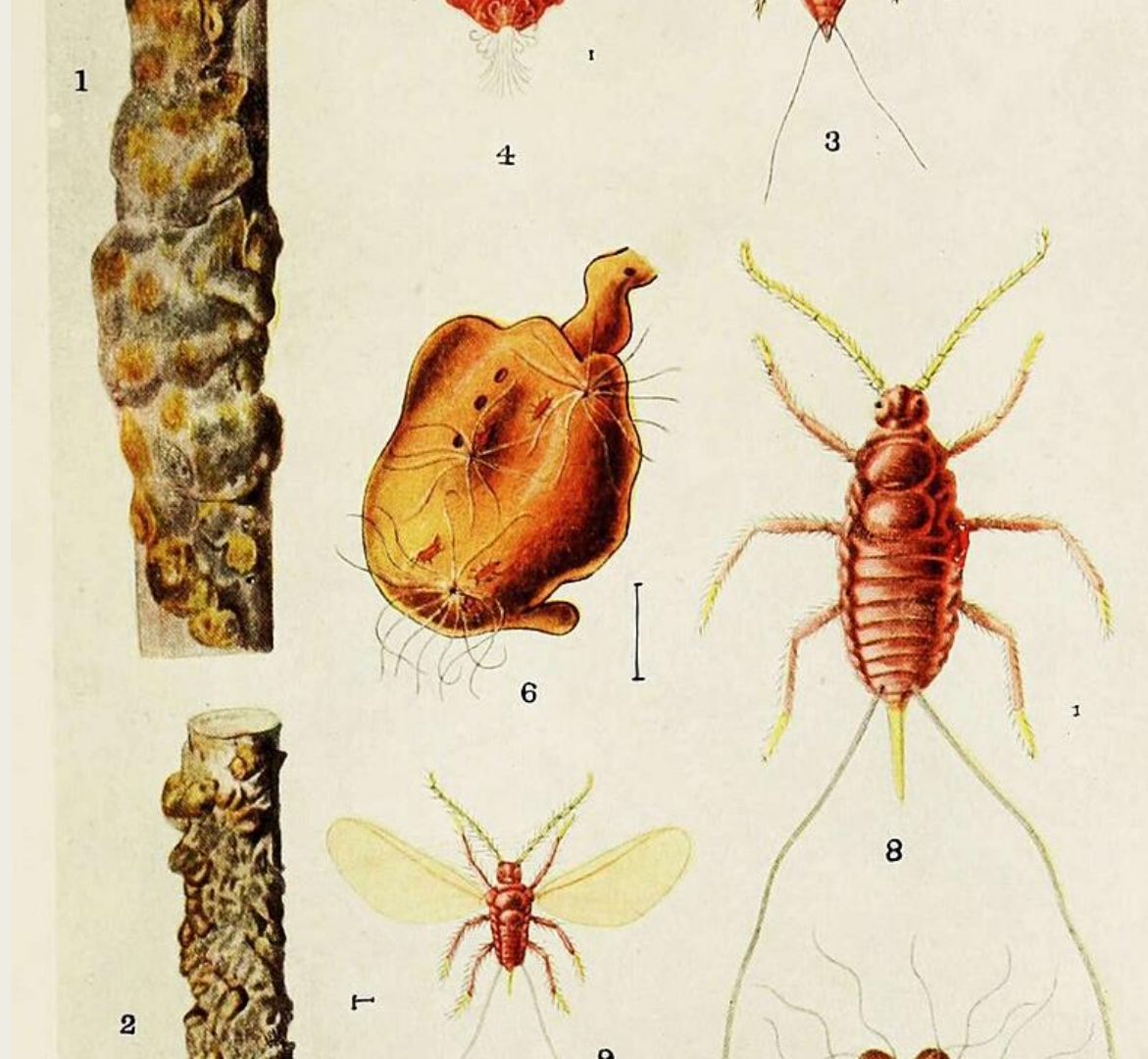
CUTTING A WAX CYLINDER

<https://rb.gy/hprxf>



SHELLAC 78- RPM DISCS

COMPOSITION





COMMON DISC SPECIFICATIONS

SELECTION

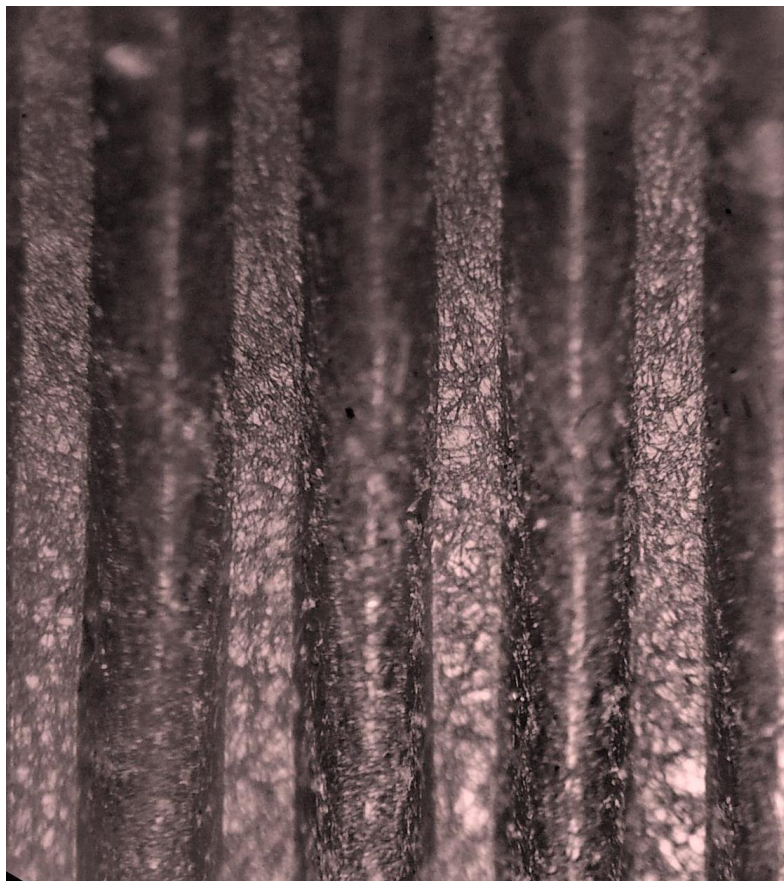
Justin Ray
VC 4/10/61

RESULT

STYLE

TALENT

Matrix No. *11A-6*





Disc: Handling

Support Properly

Avoid Excess Pressure

Temperature Sensitivity

Limit Playback

Disc: Storage and Housing

Vertical Storage

Controlled Environment

Protective Enclosures

Avoid Wooden Shelving

Disc: Cleaning

1

Inspect
Before
Cleaning

2

Dry Clean
Only

3

Avoid Water
and
Solvents*

4

Regular Dust
Removal

LACQUER DISCS



CUTTING
A
LACQUER



CRAZING



Lillian Soprano - I have
started with 10 sec. of
theme, then gone right on
with show for exactly 13
minutes. then I have
gone on with theme for
one minute more, so
you can fade out
on it.

DELAMINATION





DELAMINATION



FRACTURE



illuminate, 2 degree observer

Density

0.04

0.09

0.15

0.22

0.36

0.51

0.75

0.98

1.24

1.67

2.04

2.42

2.80

3.18

3.56

3.94

4.32

4.70

5.08

5.46

5.84

6.22

6.60

6.98

7.36

7.74

8.12

8.50

8.88

9.26

9.64

10.02

10.40

10.78

11.16

11.54

11.92

12.30

12.68

13.06

13.44

13.82

14.20

14.58

14.96

15.34

15.72

16.10

16.48

16.86

17.24

17.62

18.00

18.38

18.76

19.14

19.52

19.90

20.28

20.66

21.04

21.42

21.80

22.18

22.56

22.94

23.32

23.70

24.08

24.46

24.84

25.22

25.60

25.98

26.36

26.74

27.12

27.50

27.88

28.26

28.64

29.02

29.40

29.78

30.16

30.54

30.92

31.30

31.68

32.06

32.44

32.82

33.20

33.58

33.96

34.34

34.72

35.10

35.48

35.86

36.24

36.62

37.00

37.38

37.76

38.14

38.52

38.90

39.28

39.66

40.04

40.42

40.80

41.18

41.56

41.94

42.32

42.70

43.08

43.46

43.84

44.22

44.60

44.98

45.36

45.74

46.12

46.50

46.88

47.26

47.64

48.02

48.40

48.78

49.16

49.54

49.92

50.30

50.68

51.06

51.44

51.82

52.20

52.58

52.96

53.34

53.72

54.10

54.48

54.86

55.24

55.62

56.00

56.38

56.76

57.14

57.52

57.90

58.28

58.66

59.04

59.42

59.80

60.18

60.56

60.94

61.32

61.70

62.08

62.46

62.84

63.22

63.60

63.98

64.36

64.74

65.12

65.50

65.88

66.26

66.64

67.02

67.40

67.78

68.16

68.54

68.92

69.30

69.68

70.06

70.44

70.82

71.20

71.58

71.96

72.34

72.72

73.10

73.48

73.86

74.24

74.62

75.00

75.38

75.76

76.14

76.52

76.90

77.28

77.66

78.04

78.42

78.80

79.18

79.56

79.94

80.32

80.70

81.08

81.46

81.84

82.22

82.60

82.98

83.36

83.74

84.12

84.50

84.88

85.26

85.64

86.02

86.40

86.78

87.16

87.54

87.92

88.30

88.68

89.06

89.44

89.82

90.20

90.58

90.96

91.34

91.72

92.10

92.48

92.86

93.24

93.62

94.00

94.38

94.76

95.14

95.52

95.90

96.28

96.66

97.04

97.42

97.80

98.18

98.56

98.94

99.32

99.70

100.08

100.46

100.84

101.22

101.60

101.98

102.36

102.74

103.12

103.50

103.88

104.26

104.64

105.02

105.40

105.78

106.16

106.54

106.92

107.30

107.68

108.06

108.44

108.82

109.20

109.58

109.96

110.34

110.72

111.10

111.48

111.86

112.24

112.62

113.00

113.38

113.76

114.14



Lacquer: Handling

Handle Carefully and with Clean Hands

Avoid Touching Grooves

Support Properly

Limit Handling

Avoid Playback, esp. if damaged





HANDLING DAMAGED LACQUER DISCS

From the ARSC Guide to Audio Preservation, CHAPTER 4: Care and Maintenance, pp. 53.

Lacquer: Storage and Housing

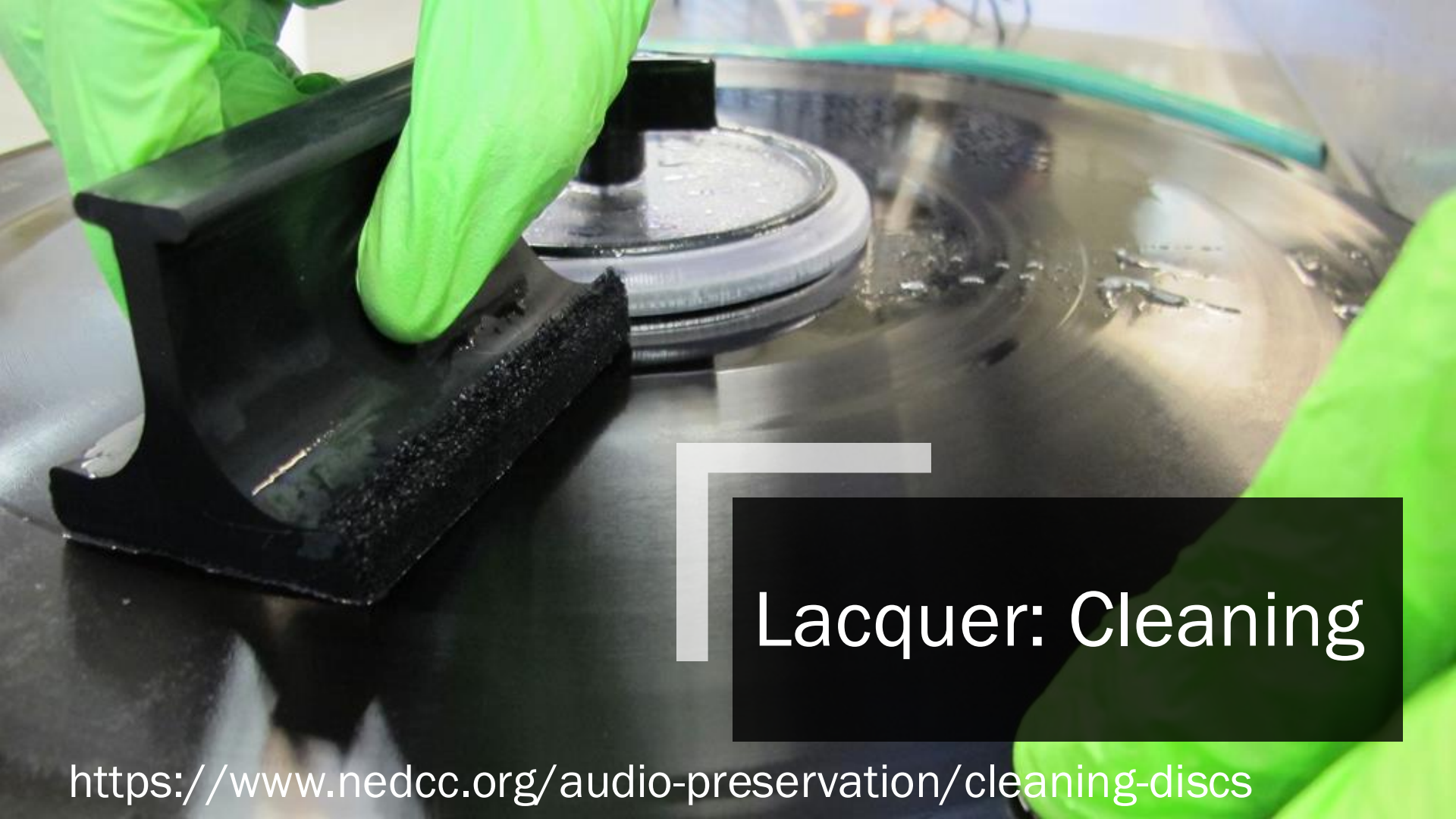
Vertical Storage

Controlled Environment

Protective Enclosures

Avoid Wooden Shelving





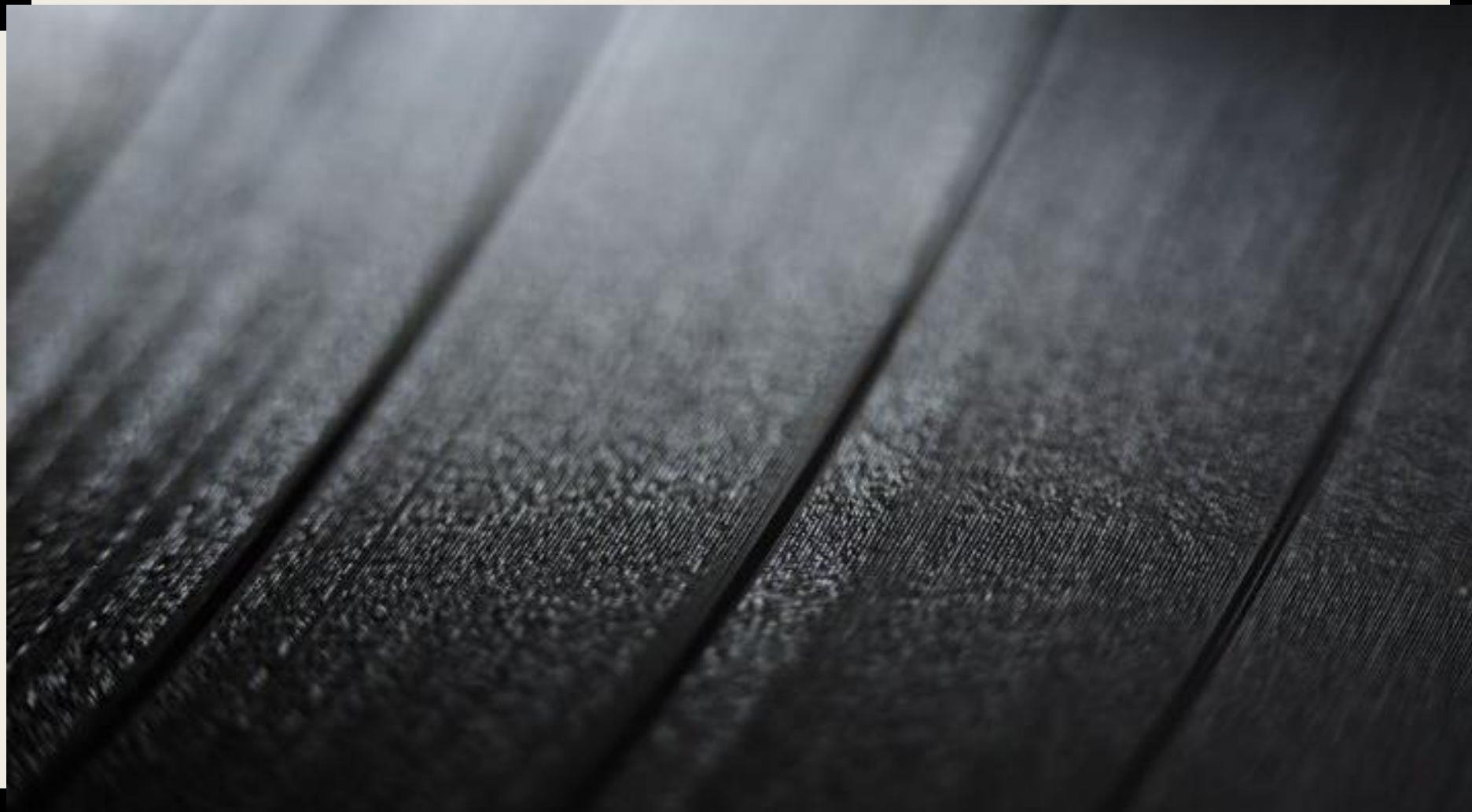
Lacquer: Cleaning

<https://www.nedcc.org/audio-preservation/cleaning-discs>



VINYL
DISCS
“LP”





Common Forms of Deterioration

A vinyl record is shown lying on a crumpled newspaper. The record is dark and has a visible center label. The background is a dark, textured surface, possibly a table or floor, with some other papers or objects visible in the distance.

■ Surface Contamination

- Dust and Oils
- Mold Growth

■ Physical Deformation (Warping)

- Heat and Humidity

■ Groove Wear and Micro-Damage

- Stylus Pressure

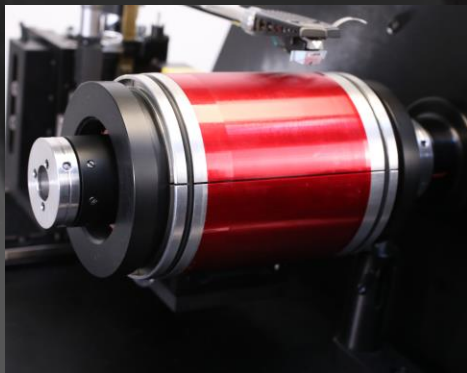
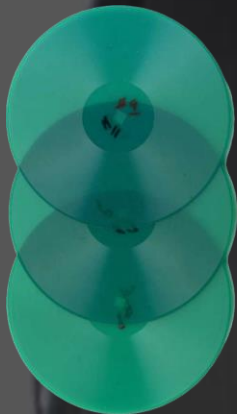
A vinyl record is shown, partially obscured by a dark circular shape. The record's label is visible, featuring the text "BOB MARLEY" and "ONE UP". The background is a light gray gradient.

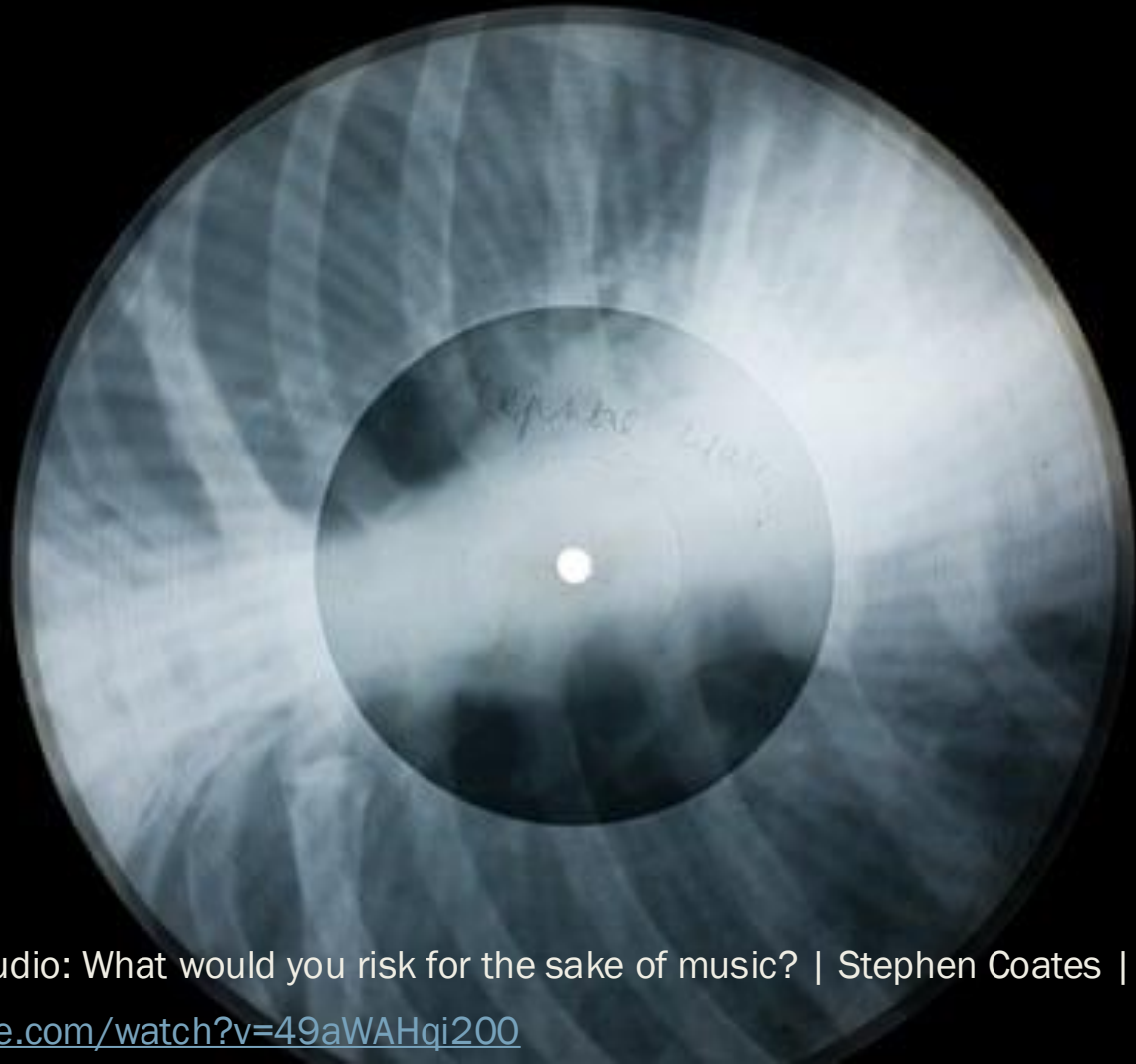
VINYL: HANDLING, STORAGE, HOUSING, AND CLEANING

Record Cleaning Machines



Other Formats and Oddballs





The story of X-Ray Audio: What would you risk for the sake of music? | Stephen Coates | TEDxKraków

<https://www.youtube.com/watch?v=49aWAHqi200>

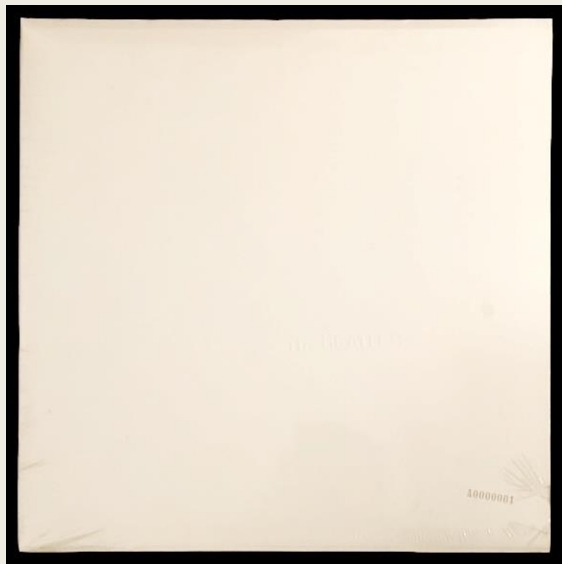


First Elvis Recording

Sold in 2015 for \$300,000

Risk Assessment

- Physical Forces
- Theft and Vandalism
 - *Some records are very valuable!*
- Fire & Water
- Pests & Pollutants
- Light and Environmental Conditions
- Custodial Neglect & Dissociation



A0000001

The BEATLES



RECORDS AND COLLECTORS

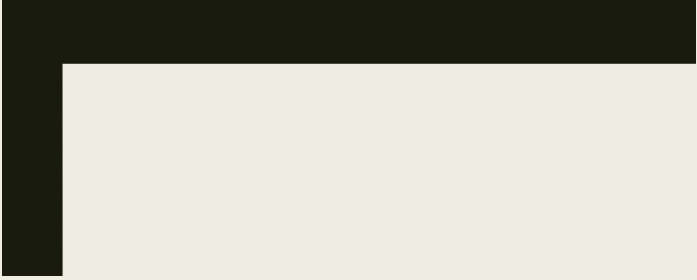
In 2015, a first-edition copy of the Beatle's White Album sold for \$790,000
Also, Elvis' first recording "My Happiness" sold for \$300,000



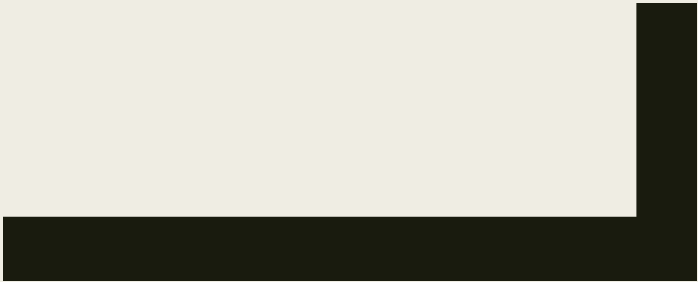
Ideal Storage Conditions for Long-Term Preservation - ANSI IT9.13 (1996)

- For materials with a minimum **10-year** preservation goal:
 - *Temperature: 65-70° F*
 - *Relative Humidity (RH): 45-50%*
 - *Limit fluctuations to $\pm 10^{\circ} F$ and $\pm 10\% RH$ over 24 hours*
- For **permanent** collections:
 - *Temperature: 46-50° F*
 - *Relative Humidity: RH: 30-40%*
 - *Limit fluctuations to $\pm 5^{\circ} F$ and $\pm 5\% RH$ over 24 hours*

See ANSI IT9.13 (1996) standard for more details



General Best Practices Review



General Best Practices

Handle with Care

Proper Storage Conditions

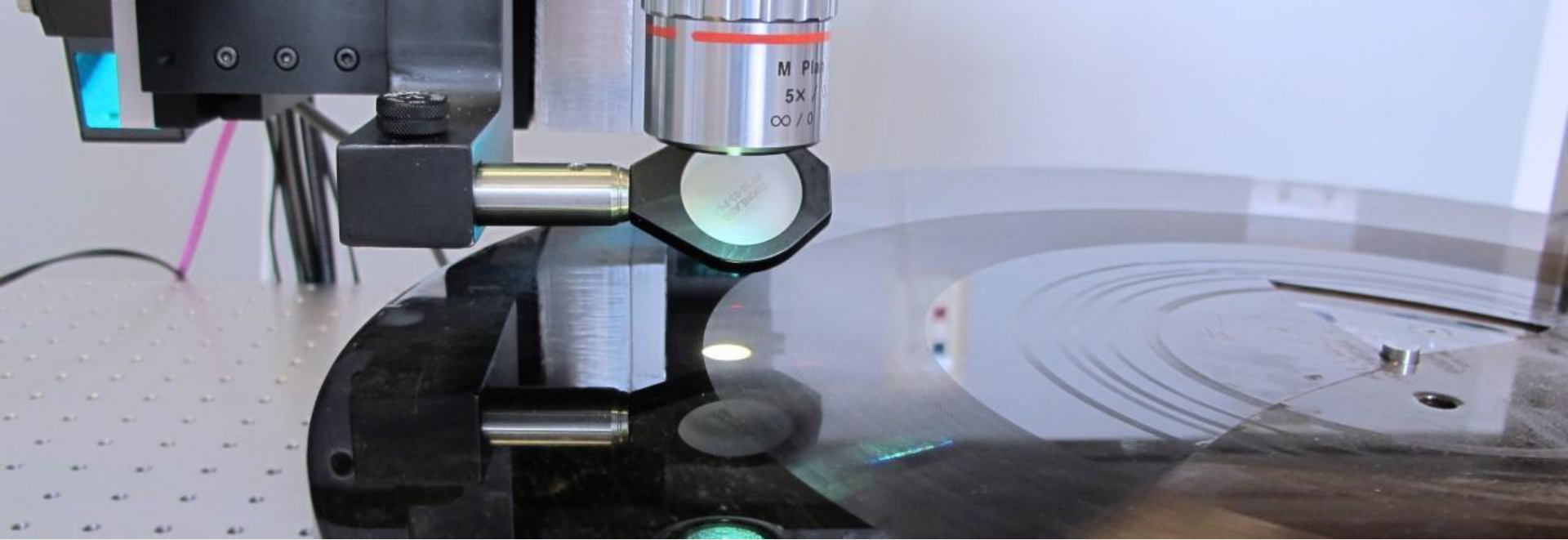
Use Archival-Quality Housing

Minimize Exposure to Light and Pollutants

Regular Cleaning and Inspection

Prioritize Preservation Efforts

Maintain Duplicates



EMERGING TECH: NON-CONTACT PLAYBACK

IRENE System: Image, Reconstruct, Erase Noise, Etc.

Additional Resources

Library of Congress: Care, Handling, and Storage of Audio Visual Materials, <https://www.loc.gov/preservation/care/record.html>

ARSC Guide to Audio Preservation,
<https://www.clir.org/pubs/reports/pub164/>

IASA TC-03, The Safeguarding of the Audio Heritage: Ethics, Principles and Preservation Strategy, Version 4.

IASA TC-04, Guidelines on the Production and Preservation of Digital Audio Object

IASA TC-05, Handling and Storage of Audio and Video Carriers

NEDCC, Cleaning Lacquer Discs, <https://www.nedcc.org/audio-preservation/cleaning-discs>



Image Credits (except those taken by author)

Frances Densmore making a wax cylinder recording of Blackfoot chief Mountain Chief for the Bureau of American Ethnology.

https://upload.wikimedia.org/wikipedia/commons/1/1b/Frances_Densmore_recording_Mountain_Chief2.jpg

Vinyl collector Claas Brieler, Berlin <https://www.facebook.com/mavmusicagency/photos/vinyl-collector-claas-brieler-berlin-mavmusic-vinylcollector-vinyl-records-berli/2166279103416812/>

Close up on vertically-cut groove, Endpoint Audio. <https://www.endpointaudio.com/endpoint-cylinder-machine>

Close up on laterally-cut groove. <https://www.whathifi.com/news/watch-needle-read-vinyl-record-in-microscopic-detail>

Brown wax cylinders, courtesy of Cutting Corporation. <https://psap.library.illinois.edu/assets/cylinder-wax-brown-group-1500-214b69ecfc5f2708e2f686148793ed944a6da9f6d637ad5713ed37a731885f3b.jpg>

Moldy cylinder images, <https://psap.library.illinois.edu/collection-id-guide/cylinder> and <https://www.cylinder.de>

Cylinder housing, <https://www.universityproducts.com/wax-cylinder-storage-boxes.html> and <https://www.arsc-audio.org/cylinderbox.html>

Picture of *Kerria lacca* from book *Indian Insect Life: a Manual of the Insects of the Plains* by Harold Maxwell-Lefroy. https://en.wikipedia.org/wiki/Kerria_lacca#/media/File:02-Indian-Insect-Life_-_Harold_Maxwell-Lefroy_-_Kerria-Lacca.jpg

Picture of Shellac disc labels. <https://www.recordedchurchmusic.org/story-of-the-record-labels>

Lacquer disc cutter, <https://afgmediacompany.com/process/>

Disc handling, ARSC Guide to Audio Preservation, Chapter 4: Care and Maintenance, p53.

Image Credits (Continued)

NEDCC Cleaning Lacquer Disc, <https://www.nedcc.org/audio-preservation/cleaning-discs>

HDPE record sleeve, <https://www.analogis.eu/6067.html>

Warped Record, <https://preview.redd.it/moved-recently-this-is-how-usps-delivered-my-first-record-v0-asf67oojjxd91.jpg?width=2510&format=pjpg&auto=webp&s=23dd06fcd54970065eaef4c42f6ec9359ddab241>

Record Cleaning Machine, <https://darklanternforowen.wordpress.com/2020/09/30/keith-monks-record-cleaning-machine/>

Sound Scribe discs, <https://southwestcollection.wordpress.com/wp-content/uploads/2014/02/discs001.jpg>

Endpoint Cylinder and Dictabelt machine, <https://www.endpointaudio.com/endpoint-cylinder-machine>

Edison Concert Cylinder, https://coimages.sciencemuseumgroup.org.uk/321/650/large_smg00069347.jpg

Pathe Disc, <https://i.ebayimg.com/images/g/1ncAAOSwqqpiDspF/s-l960.webp>

Collectibles, https://www.gottahaverockandroll.com/The_Beatles_White_Album_No_0000001_Factory_Sealed-LOT40430.aspx and <https://www.elvis-atochofgold.com/my-happiness/>

Roentgenizdat record, <https://www.theguardian.com/music/2015/jan/29/bone-music-soviet-bootleg-records-pressed-on-xrays>

I.R.E.N.E., <https://www.nedcc.org/audio-preservation/irene>

The image features a dark gray background. In the center, a magnifying glass with a dark handle and a circular lens is positioned. Inside the lens and scattered around it are numerous question marks of varying sizes and shades of gray. The text "Q&A" is written in a large, white, serif font, centered over the magnifying glass lens. On the left side, there is a thick, white L-shaped graphic element consisting of a vertical bar and a horizontal bar meeting at a corner. Similarly, on the right side, there is a thick, white L-shaped graphic element consisting of a horizontal bar and a vertical bar meeting at a corner.

Q&A