



Dietrich Schüller

Digitisation - The Only Viable Way to Preserve  
Audio Recordings in the Long Term



## **audio(and video) materials -**

endangered by

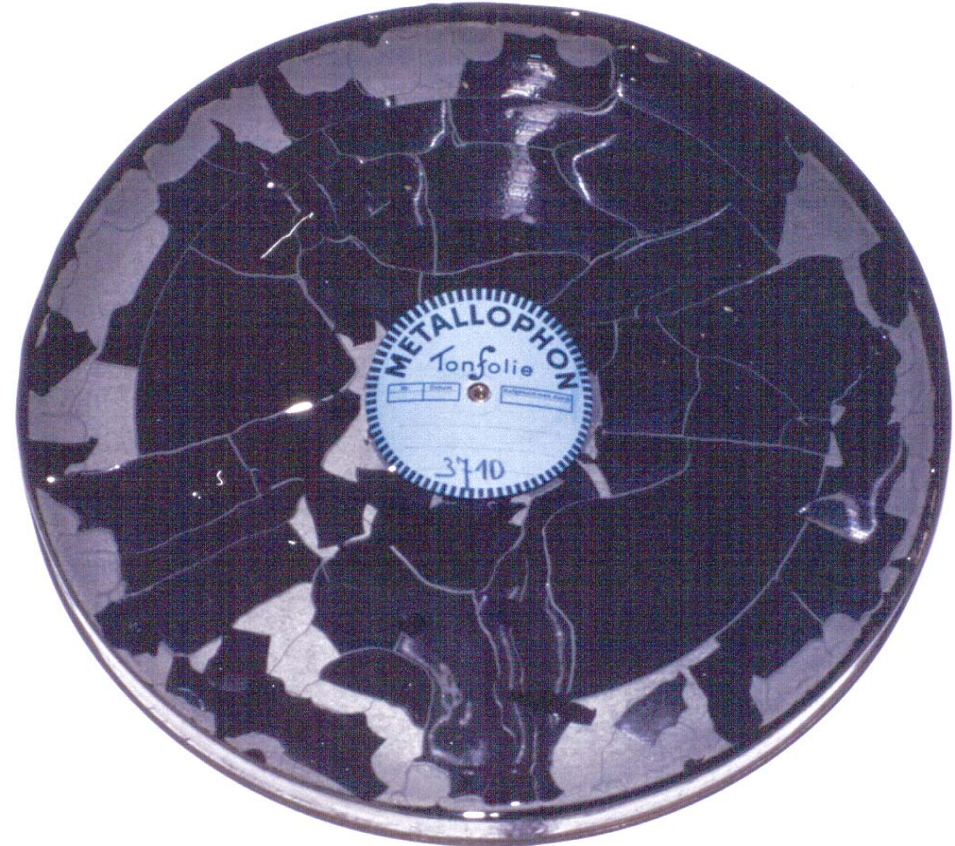
- carrier deterioration
- obsolescence of format specific hard and software





instantaneous disc 1990

2001

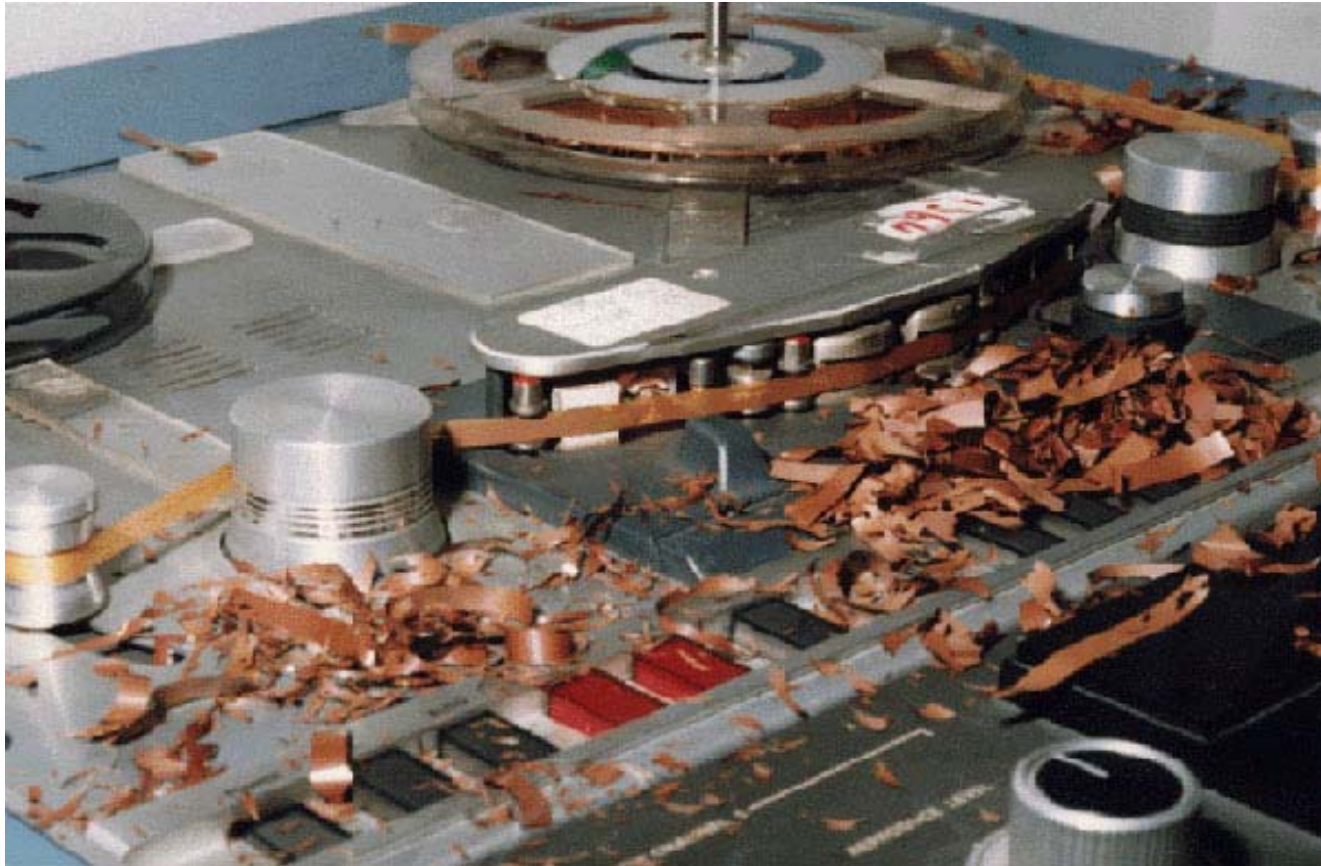






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## Compact Discs - Digital Versatile Discs

replicated CDs + DVDs      fairly stable ?

recordable CDs + DVDs      highly endangered

DVDs: higher data density - lower data security



## format obsolescence and availability of equipment

### audio

format	obsolete		equipment
	now	soon	
cylinders	x		specialist only
coarse groove discs	x		specialist only
micro groove discs (vinyls)		x	fading out
quarter inch tape		x	fading out
micro cassettes		x	fading out
compact cassette		?	?
R-Dat		x	fading out
MiniDisc		?	?



## format obsolescence and availability of equipment video professional

format	obsolete		equipment
	now	soon	
2" quadruplex	x		specialist only
1"	x		specialist only
Umatic	x		fading out
M II	x		specialist only
Betacam SP		?	?
D 1	x		fading out
D 2	x		fading out
D 3		x	?
D 5		x	?
DigiBeta		?	?
IMX		?	?



## format obsolescence and availability of equipment video home

format	obsolete		equipment
	now	soon	
VCR	x		specialist only
Video 2000	x		specialist only
Betamax	x		specialist only
VHS		?	?
S-VHS		?	?
Video8		x	?
Video Hi8		?	?
Digital 8		?	?
DV		?	?



## format obsolescence and availability of equipment video home - disc formats

format	obsolete		equipment
	now	soon	
LVD	x		specialist only
VCD no international format		?	?
DVD		?	?



preserving carriers plus maintaining dedicated equipment of ever growing numbers of formats in playable condition is hopeless

1989/90 shift of paradigm:

***“Preserve the content – not the carrier”***

***“Vom ewigen Tonträger zum ewigen Datensatz”***



audio (and video) preservation must be based on  
subsequent digital (=lossless) copying of contents

analogue holdings must be digitised first

vision 1990: digital mass storage systems (DMSSs)

- self-checking
- self-regenerating
- self-migrating



DMSSs additionally offer new dimensions of access to  
audiovisual collections

consequently, radio sound archives took the lead:

1992/93 first pilot project SWF Baden-Baden

1994 Archivarbeitsgruppe der ARD

later 1990s national and research sound archives following



## IASA – International Association of Sound and Audiovisual Archives

*Standards, Recommended Practices and Strategies:*

### **IASA-TC 03**

The Safeguarding of the Audio Heritage: Ethics, Principles  
and Preservation Strategy

version 1, February 1997

version 2, September 2001

version 3, Summer 2004

<http://www.iasa-web.org/iasa0013.htm>



forthcoming (summer 2004)

## Guidelines for the Production and Preservation of Digital Audio Objects



## IASA-TC 03

optimal signal retrieval from analogue carriers

unmodified transfer to new target format

improvements of transfer technology

digital formats and resolutions

data reduction

digital archival principles

digital mass storage systems (DMMS)

solutions before DMSSs become affordable



## **optimal signal retrieval from analogue originals**

digitisation most likely a once-and-only event

use well maintained, last generation (!) equipment adapted  
to replay parameters of historic recordings

- speed
- equalisation
- track format, etc.



## **unmodified transfer to new target format**

signal must be preserved free of

- alterations,
- “improvements”,
- de-noising etc.

signal restoration permitted as a second step only



## **improvements of transfer technology**

mechanical carriers: optical, contactless replay upcoming

magnetic tape (audio): current transfer technology does not fully exploit information on tape which may assist in correcting recording inaccuracies – implementation on a broader scale unlikely

keep the originals for possible later consultation



## digital target formats

digital audio streams (CD-Audio, R-Dat)

*versus*

file formats:

- **de-facto standard: WAVE (.wav)** extended by EBU to Broadcast Wave Format (BWF)\*
- AIFF (Mac/OS – Audio Interchange File Format)

\* recommended by IASA



## digital target resolutions for analogue sources

present practice:

radio sound archives 48 kHz, 24 bit = 1GB/h

heritage and research archives 96 kHz, 24 bit = 2 GB/h

*“intended signal is only part of the sound document.. ....unintended and undesirable artefacts (noise, clicks, distortions) are also part of the sound document, even if they have been subsequently added to the original signal by mishandling or poor storage. Both have to be transferred with utmost security.” (IASA-TC 03, para 10)*

*“The worse the signal, the better the resolution!”*



## **digital target formats and resolutions for digital sources**

preserve as WAVE-files in original resolution



**data reduction (lossy codecs) (mistakenly called data compression)**

must not be employed for **archiving** analogue or digital linear sources

does not apply to recordings originated in data reduced form ( eg MP3)

problem with present (MiniDisc) and future proprietary formats: MD should be pseudo-linearised

**however:** MP2, MP3 useful and widely accepted for **browsing** purposes



## **digital archival principles**

produce digital preservation copies free of uncorrectable errors, with lowest possible rate of correctable errors

produce and keep error status report

check error status at regular intervals

refresh before uncorrectable errors occur

migrate before systems/formats become obsolete

produce and preserve a reasonable number of identical copies



## **Digital Mass Storage Systems (DMMS)**

combination of HD array and robotic tape store

custom built

cost intensive – specifically software

Small, scalable, modular solutions needed (*“Personal”  
DMSS*)



solutions before DMSSs become affordable

manual imitation of DMSS

- Recording quality determines life expectancy - avoid CD-Rs, DVD-Rs....
- go to computer back-up formats immediately: DLT, LTO...

problem: data integrity checking



## **predominant technical task ahead:**

feeding estimated 100 million hours (!) analogue and digital holdings into a digital preservation environment

- time consuming
- labour intensive



## **time factors for “classical” transfer for one operator**

cylinders, instantaneous discs: open ended

78 rpm discs: 1: 5 ?

vinyl discs: depending on condition

magnetic tape : 1:3 minimum

including content description: 1:6

....or: **1 hour of original tape material takes one day !**



## **“factory” transfer**

software supported quality control of transferred signals -  
one technician operates 3-4 workstations parallel

prerequisite:

- uniform source material (CDs, LPs, radio archive tapes)
- high investment for workstations



## **predominant strategic task ahead:**

80% of audiovisual materials related to cultural and linguistic diversity are outside proper archival custody

private collections and small research/cultural units, unaware of necessary preservation measures – or lacking financial and personal resources

unique sources of the last 50 years are left unattended and will rot away within 10-30 years

spotting and preserving these collections must be organised on a great scale!



## **summary:**

digitisation is imperative for the long term preservation of  
audio (and video) documents

systematic efforts must be made to transfer contents into the  
digital domain

massive investment is needed to upgrade infrastructures of  
heritage institutions



**Thank you!**

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