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47TH ANNUAL CONFERENCE OF THE INTERNATIONAL ASSOCIATION OF SOUND AND AUDIOVISUAL ARCHIVES (IASA)

A World of Opportunity: Audiovisual Archives and the Digital Landscape

Washington, DC, USA
25–29 September 2016

IASA welcomes you to participate in the 47th Annual IASA Conference hosted by and held at the Library of Congress, Washington, D.C., USA from 25-29 September 2016.

IASA invites everyone engaged in or simply curious about the discovery, care, preservation, and dissemination of our sound and audiovisual heritage, to join us in the US capital and explore the digital landscape as it impacts and benefits us all.

This year's conference theme, A World of Opportunity: Audiovisual Archives and the Digital Landscape, will touch upon and delve deeply into the following sub-themes:

- Born digital audiovisual content
- Continuing issues surrounding digitization (dematerialization)
- International access to intellectual property
- Planning for and supporting large files and large data storage
- Content integrity and authenticity
- Metadata management for internal and external uses
- Managing obsolescence in formats, software, and hardware

Programme to include papers, tutorials, and practical workshops.

Please find all conference information on the conference website at http://2016.iasa-web.org

For any further information or questions please contact the Organizing Committee and the conference administrator through enquiries@iasa-conference.com

Wait! There's more!

Extend your stay in Washington DC by one day and attend this exciting follow-on event: The National Endowment for the Humanities will host a one-day symposium on Friday, September 30 at The Constitution Center in Washington, D.C. tentatively titled Preserving Our Audiovisual Cultural Heritage. The symposium aims to foster collaboration among humanities scholars, preservationists, educators, students, curators, and filmmakers. Information about registration and the program agenda will follow. If you have questions about the event, please contact preservation@neh.gov

International Association of Sound and Audiovisual Archives
Internationale Vereinigung der Schall- und audiovisuellen Archive
Association Internationale d'Archives Sonores et Audiovisuelles
Asociación Internacional de Archivos Sonoros y Audiovisuales

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IASA JOURNAL EDITORIAL BOARD

In order to ensure diverse and clearly-articulated viewpoints in each issue of the journal, the IASA Journal solicits input and guidance from an Editorial Board consisting of the current IASA Editor and President as well as an invited group of IASA member representatives from each continental region throughout the world.

The IASA Journal Editorial Board provides general review and guidance on direction of the IASA Journal, meets once yearly during the IASA annual conference, assesses previous year's journal issues and makes general suggestions for future activities.

Board positions are entirely voluntary and receive no remuneration or financial support from IASA.

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Over the past year I have been working with our colleagues on the IASA Board to make some significant changes to the IASA Journal. As noted in the previous issue (and at the General Assembly in Paris), we are moving the IASA Journal towards being a fully peer-reviewed journal in order to grow the international reputation of the journal and to ensure diverse and clearly-articulated viewpoints in each issue.

First, IASA will coordinate a yearly meeting of a newly instituted IASA Journal Editorial Board. The Board will consist of the current IASA Editor and President as well as an invited group of representatives from each continent. Representatives will serve 3 year terms on the Board. If a member leaves before the end of the three-year term, a replacement will be sought. At the end of the three-year term, the current IASA Editor can offer the board member a renewal (3 years) or seek a replacement. Board positions are entirely voluntary and will receive no remuneration or financial support from IASA.

I am happy to report that as of this issue, the Editorial Board has been inaugurated. All positions are filled except a South American delegate. We are still in the process of identifying and selecting a candidate for this post. Nominations are more than welcome.

The IASA Journal Editorial Board provides general review and guidance on direction of the IASA Journal. The group will meet once yearly during the IASA annual conference, as well as via conference calls, to asses the previous year's journal issues and to make general suggestions for future activities. A list of the members of the IASA Journal Editorial Board will now be published in each journal and is available on the IASA website.

Members that have agreed to serve (2015-2017):

- North America Representative: Kate Murray, U.S. Library of Congress (IT Specialist - Audiovisual), Washington, D.C.
- Australia-Pacific Representative: Grace Koch, Australian National University (Senior Research Fellow) & AIATSIS (Visiting Research Fellow), Canberra, Australia
- Europe Representative: Zane Grosa, National Library of Latvia (Head of Audiovisual Reading Room), Riga, Latvia
- Africa Representative: Lekoko Kenosi, Qatar Foundation (Qatar National Library - Head of Archives), Qatar
- Asia Representative: Shubha Chaudhuri, Archives and Research Centre for Ethnomusicology (Associate Director General), American Institute of Indian Studies, Gurgaon, India
- *South America Representative*: *TBD*

The public list on IASA's website can be found here: http://iasa-web.org/iasa-journal-editorial-board.

The second change we are making to the journal lays the groundwork for peer review. Earlier this year, I released a call for volunteer reviewers to participate in the day-to-day editorial activities of the journal. Reviewers are asked to serve as peer reviewers for submissions that are in line with the reviewer's expertise and experience. They provide a double-blind peer-review; suggest improvements, corrections, and/or advice for authors; and recommend the article for publication, revisions, or rejection. Reviewer positions are also entirely voluntary and receive no remuneration or financial support from IASA.

Thanks to Richard Ranft we now have a page on the IASA website for volunteers to submit a peer-review volunteer form. Eight volunteer reviewers have signed up at this point. I will place quarterly calls to the membership to remind potential volunteers of the opportunity.

The reviewer sign-up page can be found here: http://www.iasa-web.org/iasa-journal-reviewer-volunteers.

With the help of these eight initial volunteers (who will rename nameless to ensure that our double-blind peer review system continues to be legitimate!), I am thrilled to deliver IASA's first fully peer-reviewed issue: *IASA Journal Issue 46*. Truly a momentous occasion that could not have been possible without the help and support of the IASA membership.

This issue features a wide variety of submissions and viewpoints. Grace Koch, a visiting Senior Research Fellow at Australian National University in Canberra, analyses the issue of legacy collections, looking specifically at their value and their accessibility. This is a formal publication of Koch's engaging talk from the Paris conference in 2015. Lindsay Kistler Mattock and Kara Wentworth, from the University of Iowa in the US focus their analysis on the independent media community, looking beyond the popular realm of audiovisual recordings in collections. And, from Swinburne Law School in Australia, Claudy Op den Kamp delivers a thorough explanation of copyright and the public-sector audiovisual archive, an issue that is equally challenging and compelling.

In this issue we also have two technical submissions on audio and video quality control during digitization from Sebastian Gabler of NOA Audio Solutions in Austria. Both of Gabler's articles feature detailed illustrations of common bit-loss scenarios during digitization workflows and offer illustrative solutions that can improve the outcome of analog-to-digital reformatting projects. We also have two distinct, yet similar, submissions on wire transfer projects. One from Leslie McCartney of the University of Alaska Fairbanks in the US; the other from JA Pryse of the Oklahoma Historical Society in the US. Both Pryse and McCartney creatively narrate their independent efforts to reproduce and reformat historical wire recordings in their collections. Rounding out this issue is a report from a recent IASA Research Grant recipient. Rebecca Chandler from AVPreserve in the US reports on a project to compile data on digitization costs from 2006–2015 in order to reveal historical trends in the audiovisual digitization market. This project is ongoing, and Chandler's report brings us up to speed on the initial progress.

I want to take time again to thank the volunteer reviewers who contributed to this peer-reviewed issue of the IASA Journal. Over the course of the next year, we will continue to build the foundation to support increased efficiency with the process and to re-promote the IASA Journal to the global community as a peer-reviewed journal. If you have interest in participating as a peer-reviewer, please visit the link mentioned above and fill out a reviewer form. I will be sure to include you in the next issue!

See you all in Washington, DC for the 2016 Annual Conference!

With best regards —

Bertram Lyons
IASA Editor
April 2016

With the very successful conference in Paris behind us and the 2016 conference to look forward to in Washington DC, the IASA Board pondered about an appropriate theme. While a few of us looked to music for inspiration—Bob Dylan's '*The times they are a-changin'* came to mind—the more level-headed consensus was rather to examine opportunities the digital age brings to IASA and our collections. Bearing in mind that IASA has been forward looking in promoting the digitisation of content, this is particularly appropriate. The theme for the 2016 conference is therefore: *A World of Opportunity: Audiovisual Archives and the Digital Landscape*. The theme follows neatly on last year's *All for One—One for All: Common Concerns—Shared Solutions*.

The ever-evolving digital landscape of today indeed offers a world of opportunities for us. Not only has access to information improved dramatically, but the value of our collections is increasingly being recognised, especially within the broadcast sphere where re-purposing and re-using content is vital for broadcasters wanting to reach new audiences and save costs. From a historical point of view, the digitisation of collections such as the South African Rivonia Treason Trial from obscure dictabelt carriers[1] contributed to ensuring that more cultural and historical content is preserved and shared than ever before. On the other hand, born-digital content is also becoming part of our cultural heritage. Kara Van Malssen in her article *Planning beyond digitization: digital preservation of audiovisual collections*[2] states that 'These (born-digital) collections will soon become the majority of the archive's holdings… A large amount of that data will be audiovisual media, which are some of the largest digital objects out there.'

Digitising audiovisual content, as well as managing born-digital content is of course not a simple process and many factors have to be considered, notably copyright, ownership, and intellectual property, as well as choosing file formats, codecs, storage systems, developing metadata standards and frameworks, developing new workflows, skill sets, migration strategies, to name a few factors. But, as with most challenges, the digital domain creates exciting opportunities and learning experiences.

The recent JTS (Joint Technical Symposium), held in Singapore and organised by SEAPAVAA is a case in point. The event was a great success with many interesting papers on audio and audiovisual projects which will soon be available in print. The JTS papers pointed to the many opportunities that the digital era has brought, whether in further research with regard to analogue collections, metadata standards, new thinking about restoration and digitisation, or how to manage newly created or born-digital collections.

We look forward to hearing about the opportunities digitisation has created for you, and importantly about the lessons you have learned on the road towards digitising your collections and how you manage born-digital content.

2016 will be the third time the IASA conference takes place in Washington, DC, but the first time IASA will not share the conference with another organisation. The Library of Congress, with its dynamic history spanning more than 200 years, has kindly agreed to host the conference. The IASA Board and especially Bruce Gordon and Judith Gray, are already hard at work to ensure that the conference will be a success. As usual, Richard Ranft has created the 2016 Conference website where you will be able to find all relevant information to start planning your travel.

We look forward to seeing you soon in Washington, DC.

Ilse Assmann
IASA President
March 2016

1 http://www.archeophone.org/dictabelt/windex.php.
2 https://www.avpreserve.com/papers-and-presentations/planning-beyond-digitization-digital-preservation-for-audiovisual-collections/.

In IASA Journal, Issue 45, an article was published that made specific mention of IASA member Richard Wright , including unsupported claims about his professional opinions. Dr. Wright communicated his discomfort and disapproval to the IASA Journal Editor about the way his opinions were framed in the article "Original Physical Recordings of Audiovisual Documents: Preserve or Destroy After Digitizing" in IASA Journal, Issue 45, pp. 8–10.

The IASA Journal invited Dr. Wright to make a formal response within this issue of the Journal. Dr. Wright's response follows:

> *Regarding the article "Original Physical Recordings of Audiovisual Documents: Preserve or Destroy After Digitizing," IASA Journal, Issue 45, pp 8-10.*
>
> *My name is mentioned several times in this article, including the comment that I, personally, do not 'set much store by the preservation of originals'. The evidence is an article, by me, mainly on another issue: digital preservation – written for (and to the space constraints of) the UK Digital Preservation Coalition. I suggest that the fact that the fate of originals is not discussed in that paper, is no evidence for anything.*
>
> *Richard Wright*
> *UK*
> *January 2016*

IASA'S TRAVEL AWARD PROGRAM
Experiences on attending the IASA Conference
Paris 27th September – 01 October 2016

Bertram Lyons, IASA Editor, USA

Being an international organization, IASA recognizes that travel to the annual conference can require extreme expenses for IASA members that vary from year to year depending upon the geographic location of the host organization. To supplement individual travel costs, to encourage and support diverse attendance at IASA annual conferences, and to demonstrate to the audiovisual archive community that IASA values its membership's participation in IASA activities, IASA offers yearly Travel Awards to the annual conference for IASA members (individual, institutional, or sustaining) who are in good standing.

These travel awards support up to 50% of travel costs for awardees, including an effort waive the awardee's conference registration fee. No food or lodging costs are covered, however. Only transportation costs are supported with IASA's Travel Award.

In the past, this award was referred to as the IASA Travel Grant. However, to reinforce the fact that all IASA members are eligible, the name was changed in 2013 to the IASA Travel Award. This being said, applications from IASA members from least-developed countries[1], those presenting a paper, and first-time applicants are prioritized. On average, IASA awards 15 applicants with travel support to the annual conference each year.

In an effort to promote IASA Travel Award recipients, and to illustrate the diversity of recipients, the IASA Journal is highlighting some of last year's recipients with their own words. Each recipient was asked to comment on their experience attending last year's conference in Paris. Excerpts from their responses are included in the text below. For information on how you can acquire support for this year's IASA conference in Washington, D.C., USA, see the Travel Award page on the IASA website: http://iasa-web.org/travel-awards.

Reflections on the IASA Travel Award, 2015.

> "Although I have attended IASA conferences before, I recently made the decision to begin attending regularly—and participating more deeply—as IASA is the organization that speaks most directly to the work I do as an audiovisual archivist at the UCLA Ethnomusicology Archive. Receiving a IASA travel grant eases the financial burden of attending the conference and supports me in my goal of contributing more actively to the work of IASA. It also directly informs my work in and teaching about audiovisual archives, since it is IASA members that are doing cutting edge work, helping establish standards, and setting the direction of the field. In other words, IASA is "where it's at" for audiovisual archives, and I'm grateful to be able to be there as well."
>
> **Aaron Bittel, UCLA, Los Angeles, USA**

1 Least developed countries are defined using the UNESCO scale, which is politically neutral and changes as countries become more prosperous. The UNESCO scale can be viewed in Annex I of the following PDF document (opens in new window): http://unesdoc.unesco.org/images/0022/002229/222917e.pdf.

"The conference was very enriching for me in terms of exchanges, networking, and opportunities to gather new experiences in the area of archiving processes. Thank you for everything."

Lamine Wone, Dakar, Senegal

"It was a great opportunity to present my Gramophone Museum and Gramophone Records Archive as a poster presentation at the 2015 conference in Paris. It was also beneficial for me to meet old and fresh enthusiasts in this field."

Sunny Mathew Kunnelpurayidom, India

"As an audiovisual archivist at the Public Relations Department Museum and Archive, Thailand, where we administrate the national radio and television stations, I have been responsible for collecting and preserving massive audiovisual materials produced by the PRD. Being a Travel Award recipient has allowed me not only to enhance my knowledge about moving image archiving and preservation but also to network with other professionals. I really appreciate IASA giving me an opportunity to attend the conference in Paris."

Pawarisa Nipawattanapong, The Public Relations Department Museum and Archive, Thailand

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"Travel to IASA Conferences would be very difficult without the Travel Award Program, especially since IASA involves expensive international travel. Assistance from IASA not only reduces the cost, but also provides an external show of support, which aids in obtaining internal institutional support.

Archives can easily become vacuums of knowledge. IASA Conferences provide the opportunity to be exposed to diverse ideas that are catalysts for innovation. Specifically, IASA Paris has exposed to me a new approach to workflow that will hopefully make processing more efficient and stable within the Drexel Audio Archives. This would not be entirely possible without stepping out of one's daily system and exploring what others are doing.

At Drexel, I am mainly concerned with multi-track file sets, which can be cumbersome to maintain in the digital environment. Housing the Sigma Sound Studios Collection, the Drexel Audio Archives strives to maintain the cultural heritage of Philadelphia's recorded popular music. IASA attendance allows me to share that cultural heritage and the preservation issues that surround it. The discourses surrounding intellectual property, file management, and technical concerns that occur at IASA provide fresh perspectives and assessments in audiovisual preservation practices."

Toby Seay, Drexel University, Philadelphia

"I began at Cornell University Library as the AV Preservation Specialist within the department of Digital Scholarship and Preservation Services almost 3 years ago. During my tenure in that position, I have developed and implemented an audiovisual digitization lab that handles various media formats- ¼" audio tape, VHS, U-Matic, cassette, and vinyl LPs. We've created over 70TB of digital materials and are continuing to produce around 2.5TB per week.

When planning and now moving forward expanding our lab, I heavily relied on IASA's Technical Committee's publications. I benefitted from Carl Fleischhauer, Kate Murray, and Chris Lacinak's presentation on ADC specifications, Bert Lyons' Digital Curation Tools Workshop, Pio Pellizzari's Selection workshop, George Blood's Colorspace tutorial and many others. The true benefit of attending in person was to be able to talk with and hear from the community as to challenges in digital preservation.

In the past three months I've assumed a new role at the library and now have even more duties related to conservation and digitization. I'm am now working with our stellar Conservation Department, our Digital Media Group, and our Audiovisual Lab. The IASA community is an indispensable resource to myself and many others in this work. I'm grateful."

Tre Berney, Director, Digitization and Conservation Services, Cornell University Library

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"I am currently a senior sound conservator at the Alexander Turnbull Library, which is a research library within the National Library of New Zealand Te Puna Mātauranga o Aotearoa. Our collections focus on New Zealand and the Pacific. In the field of AV preservation, I have seen many changes in my career so far. The work of the Library has been hugely supported by attending IASA conferences and technical committee meetings over the years.

AV preservation is supported by the Alexander Turnbull Library where I work but it has become increasingly difficult for the Library to fund travel to meetings and conferences, both internally and externally. As the Secretary of the Technical Committee the travel grant has meant the difference between going and not going. I was able this year to attend the conference in Paris and carry out my secretarial duties as well as attend many inspiring conference sessions and meetings. IASA is a whānau (family) and without this support AV archiving is a lonely profession. I appreciate the fact that I have been able to benefit from this Travel Award in order to support the greater good for AV archiving internationally. Thank you IASA!"

Bronwyn Officer, National Library, New Zealand

"My attendance helps me to further encourage my Asian colleagues to look beyond local possibilities and habits. It also helps to get a real picture about all issues around the world, not only in third world countries. As secretary of the T&E Committee, I feel responsible for making points and contribute to the discussion from the viewpoint of the far eastern parts of the globe, third world countries as well as developing countries alike, where many colleagues think that the West is still going ahead 'without problems.' It is tremendously important to be personally present at conferences in order to convince others, who cannot attend, about necessary changes, new views on old issues and current trends. Though many things can be done via social media and online, the personal contact to key persons and experts who do the daily work is not replaceable.

The most important impact is that the T&E Committee was not again without secretary; that I could together with a newly introduced colleague, who is going to take over archiving work dedicated to preservation at the university I was teaching for 7 years, could meet up with experts in the field and traditional places of audiovisual history. I felt honored to be supported, which encourages me to further work with enthusiasm."

Gisa Jähnichen, Berlin, Germany

"I currently work as the Head of the Audiovisual reading room and collection at the National Library of Latvia (NLL). My background is in music and before starting work at the National Library I had no experience in dealing with sound and video recordings, and wasn't aware of their specific preservation, storage and other requirements. Lucky for me, NLL is a member of IASA, and so I was able to access and read many documents on the IASA website, as well as in IASA journal, that provide really useful and necessary information for working with audiovisual materials.

Receiving travel awards from IASA has enabled me to attend several IASA conferences, which has been invaluable in my professional life. Listening to presentations and participating in tutorials has given me new and practical knowledge that I can apply at my workplace. Conferences have also served as important networking spaces for establishing new contacts which have led to new opportunities in my work, and allowed for easier solution of problems, as I now know exactly who to contact with a specific question. Receiving IASA travel awards has had a really positive impact on my professional development."

Zane Grosa, Head of Audiovisual Reading Room, National Library of Latvia

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"For the last 25 years, I have been involved in bringing together collectors of recorded music in India, through the 'Society of Indian Record Collectors,' founded in 1990. At present its 250 members are involved in preservation and digitization of over 3,00,000 gramophone discs and recordings. These are individual efforts not supported by government funds. We plan to upload data on a virtual archive

My paper was accepted for the poster presentation at IASA-2015. As a retired person I was not sure how would I finance the trip. So, I applied for the travel award.

At the conference, I met many old friends from Europe and USA who had attended earlier conferences viz. IASA-2001 (London) and IASA-2012 (India). I also made new friends. Exposure and the experience at the conference will help me in carrying out my work back home in India."

Dr. Suresh Chandvankar, Mumbai

"I am currently the Senior Conservator at the National Archives of Zambia in charge of conservation, preservation of archival library and sound and audiovisual materials. I hold a Bachelor of Arts with Library and Information Studies. Within the sound and audiovisual archiving profession, my responsibility is to preserve, conserve sound and audiovisual materials, and make these materials easily accessible by the public.

Being a travel award recipient has had a positive impact on me and my work. It has given me an opportunity to meet professionals from sound and audiovisual archives who shared their experiences and I learned a lot from these experiences. The conference brought me from "darkness to light" in terms of sound and audiovisual archiving as this was my first time to attend an IASA conference. The paper presentations, tutorials, workshops, and professional visits were very helpful to me. I am now thinking beyond what prevails at the National Archives of Zambia in terms of sound and audiovisual archiving.

Finally, I wish to express my gratitude to the IASA Board for the Travel Award which enabled me to attend the conference."

Judith Namutowe, National Archives of Zambia

LEGACY COLLECTIONS, THEIR VALUE AND THEIR ACCESSIBILITY

Grace Koch, Visiting Senior Research Fellow, Australian National University, Canberra, Australia

1. Introduction

In this article, I want to explore some of the meanings of the word, legacy, in relation to archives management and will discuss some of the possible problems raised by legacy collections. I will then move on to the extra issues that Indigenous legacy collections can raise, with some case studies from the archive I know best- AIATSIS. Finally, I would like to examine how some Australian collecting organisations are handling Indigenous collections, including legacy ones, and will move on to some funding initiatives that are targeted to legacy material. My paper focuses upon audiovisual material only, but some examples will include references to other media.

This research was supported under Australian Research Council's Linkage Program. Grant no. LP13010131, *Return, Reconcile, Renew: understanding the history, effects, and opportunities of repatriation and building an evidence base for the future*.

2. What are legacy collections?

First of all, what do I mean by the term, legacy? Generally, a legacy is something handed down from one person to another. This can mean an inheritance, personal histories, or in the case of archives, we can use the term to describe the bulk of many of our collections. Some collections may actually contain the word in their titles, such as the Toscanini Legacy Collection of sound recordings that were willed to the New York Public Library[2], or Legacy, a compilation of recordings published by the BBC consisting of oral histories of people affected by the Troubles in Northern Ireland.

In a technical sense, legacy can also be used to describe outdated or obsolete formats, either as carriers of information such as reel-to-reel tapes or as computer systems and software.

Of course, not all legacy collections are problematic; in many cases they have been carefully documented and preserved. Those are not the focus of this article. I want to examine collections that pose special difficulties in managing them, and would like to propose the following definition of *problematic legacy collections*.

Collections, often created long ago, deposited in the past with varying degrees of documentation, that may have been deposited under ambiguous or restricted access conditions that make them difficult for archives to manage.

Such collections often appear in backlogs because they take much time and effort to be properly processed. Thus, these collections are in danger of being lost simply because they are just too hard to manage. Most appear in catalogues, but difficulties arise when a client wants to see or hear them.

2 https://nypl.bibliocommons.com/item/show/11159921052907_the_toscanini_legacy_collection of_sound_recordings.

3. Difficulties in general with management of legacy collections

Management difficulties arise because:

- The original depositor may not be known or contact information may have been lost. This problem may not arise until someone wants to access a collection that is seldom used. Special problems arise if the depositor had stated that he or she must be contacted before the collection can be accessed and if he/she cannot be located.
- Provisions in access contracts have changed, but the original conditions have not been updated. The pressure upon collecting institutions to disseminate their holdings by funding bodies can spell disaster for a collection if it has stringent access conditions. Is it worth preserving if it can't be used?
- Cataloguing practices may have changed, and earlier records may not have been updated for the legacy collection because of difficulties in managing it. Greene and Meissner argue that the failure to process collections holds back research, leads to duplicates being purchased, and makes them more vulnerable to being stolen or lost because libraries and archives don't know what they have. (Greene and Meissner 2005:211)
- In a jointly-authored report surveying how many collections of sound recordings require digitization in the US, it was found that material requiring specialized workflow cost twice as much to digitize. (Lyons et al 2015:18) If part of this specialized workflow includes documentation and/or revisiting access conditions, the collection may not be digitized due to cost restraints and is in danger of being lost.

With external pressure upon archives to make their holdings available, legacy collections may be very time-consuming to manage. They need to be assessed according to their value and condition, and handled accordingly. Risk management processes are required to manage them until the final choice is made whether or not to keep them as part of the collections.

4. Legacy collections of indigenous materials

Management of audiovisual collections that document the cultural practices of the original people of a region can be very complex. I shall use the term, Indigenous, for this type of material. Contents of such collections may include ceremony, song, narratives, genealogies, or language elicitation. In Australia, research archives, small Indigenous organizations, Indigenous broadcasting organizations, regional archives, and special collections within larger libraries and archives hold most of this type of material. [3]

There are varying degrees of access conditions placed upon such collections. Janet Topp-Fargion and Paulina Proutskova (2008) described some of the reasons that ethnomusicologists place restrictions on their material, some of which overlap my earlier points:

- Some collectors who went through great difficulties in getting their recordings want to maintain close control of their collections.
- The collectors want to protect the confidentiality of the people and the groups that they study.
- Proprietary rights may not be clear; the actual ownership of the material may not be known or there may not be contact details for the owner.
- Some collectors may not have documented their recordings to a standard required of the archive with whom they place their material because it would take too much work.
- There may be gender-restricted or ceremonially-restricted content that could cause distress to Indigenous people. (Proutskova and Topp-Fargion 2008: 49)

The fact remains, though, that archives with collections that were gathered many years ago may find that documentation and access conditions make them very difficult to manage. As they

3 See Laszlo, Kristina 2005 for a discussion of issues raised by First Nations material in archives.

exist in the 'too hard basket', they are in danger of being overlooked in digitization priorities, thus risking being lost.

5. Events in Australia highlighting legacy collections

Several events within the past few decades have contributed towards the growing interest for Indigenous people to interrogate archival collections.

5.1 The *Aboriginal Land Rights (Northern Territory) Act* (Cth) 1976 (ALRA) and the *Native Title Act* 1993 (Cth) (NTA).

Both of these Acts passed by the Federal Australian Parliament created a set of procedures whereby Indigenous people in Australia could prove their rights to their traditional land and gain ownership.

The ALRA covered only the Northern Territory of Australia. Successful claims resulted in the strongest recognized title that exists for land ownership known as inalienable Aboriginal freehold. The traditional owners proved their rights to the land under claim by performing or describing ceremonies, giving detailed genealogies for the owners, and submitting many oral histories. Archival holdings of early recordings, photographs and films that were relevant to the claim group or geographical area could also serve as evidence. Aboriginal claimants requested copies of hundreds of print and audiovisual materials to strengthen their claims, and archivists' workloads increased in order to supply the items. Still, the request load was manageable within existing staffing levels.

A dramatic shift in requests came in 1993 when the NTA was enacted. Its provisions allowed Indigenous people to make native title claims in all parts of Australia. Although the 'native title' that was recognized for successful claims did not give the same comprehensive rights as the ALRA did for the Northern Territory, the claim process required some of the same kinds of proof. As for the ALRA, many early recordings, photographs, and films held by archives were sought as evidence.[4]

The amount of material requested for Native Title claims caused serious problems for AIATSIS archive staff. In 1995, the Chair of the Institute Council, Professor Marcia Langton, stated that:

The native title legislation has imposed an excessive workload on our staff because the Institute lacks the resources to deal with the ever-increasing demands for access to our collection. Almost all claimants under the legislation wish to make use of Institute resources….[5]

As a result, a Native Title Research Unit was formed to provide advice and research targeted to the needs of native title clients, and a special position was created within the AIATSIS collections to deal solely with native title requests.

5.2 Bringing them home: report of the National Inquiry into the Separation of Aboriginal and Torres Strait Islander Children from their families.

Indigenous people of mixed race who had been removed from their families up until the 1970s are trying to trace their original relatives. Genealogical records, including sound recordings and films, are vitally important for Indigenous researchers. Such materials are so important that the Australian Government has required that all records with Indigenous content held in

4 See Koch, G. 2013 We have the song so we have the land; song and ceremony as proof of ownership in Aboriginal and Torres Strait Islander land claims. http://aiatsis.gov.au/sites/default/files/products/discussion_paper/we-have-the-song-so-we-have-the-land.pdf (accessed 21/10/2015)

5 Langton, M. 1995. Chairperson's Message. AIATSIS 94-95 Annual Report. AIATSIS: Canberra. (p2)

the National Archives of Australia be exempt from disposal orders because they may contain information on family relationships.

5.3 Indigenous people using the Web to repurpose audiovisual materials from their regions.

Many Indigenous organisations are starting up their own archives, often producing audiovisual materials that use historical recordings to teach the young people.[6] Indigenous people in Australia want to see "the old stuff", and they, along with land claimants, have become the major client group at AIATSIS. In AIATSIS, some legacy collections are up to 40-50 years old and had been deposited under vastly different conditions than those now being used by AIATSIS. Many of these conditions have been updated, but some remain problematic.

5.4 Collecting organisations working to make their Indigenous material more easily accessible.

For example, the peak organization for libraries in Australasia, National and State Libraries Australasia, has issued a set of objectives to recognize the right of Indigenous people to be informed about relevant collections, to determine use and access to cultural materials, to participate in decision-making processes in managing collections, and to work with libraries to obtain copies. [7]

6. Three case studies involving legacy collections

Below are three case studies arising from difficulties raised by problematic legacy collections of Indigenous material held by AIATSIS.

- Paralysis caused by illogical policies
- Extreme closure restrictions
- Unidentified restricted material in an open collection

6.1 Case study 1. A circular argument: The Tiwi community visit

In 2008-2009, the ethnomusicologist Genevieve Campbell described a problematic set of legacy collections held at AIATSIS. The Tiwi people of Bathurst and Melville Islands wanted to gather recordings and films that had been made of their ancestors so that they could rediscover some of their early songs and dances. Several institutions in Canberra held historical collections of Tiwi audiovisual material showing early cultural practices. When the Tiwi contacted AIATSIS for copies, AIATSIS archive policy specified that copies could only be made of collections that had been digitized. The early recordings requested by the Tiwi had not been scheduled for digitization because they had not been appraised for cultural restrictions. The Tiwi who wanted the copies were the very people qualified to assess the material, yet they could not have them sent to their community because of possible sensitive cultural information!

This impasse was solved partially when a delegation of the Tiwi people was able to obtain funding to visit the AIATSIS archive. They listened to the recordings and assured the staff that there were no cultural restrictions. Even so, there were some complications with access conditions that had been set by the people who had made the original recordings. After careful consideration, the Acting Director at AIATSIS gave discretionary permission for copies of some of the collections to be made for some of the Tiwi community, several of whom were children of the people on the tapes.

6 See the Mulka Project at http://www.indigenous.gov.au/the-mulka-project-preserving-yolgnu-culture-and-language (acc. 2/11/2015)

7 See the full list of objective with several examples of proactive projects on this site: http://www.nsla.org.au/sites/www.nsla.org.au/files/publications/NSLA.Indigenous_Position_statement_case_studies.pdf (accessed 3/8/2015)

This example shows a clash of two different world views- the cultural material owned by members of the Indigenous community who want to reincorporate that knowledge into their performance practice versus the artefact, trapped in a recording that is owned by the collector and managed by an archive. Campbell says that:

In the moment it is recorded the song's ownership shifts and it is only the process of repatriation that enables that ownership to be shifted back. (Campbell 2014:124)

6.2 Case study 2: Extreme closure restrictions

From 1961 to 1966, a lay missionary and linguist (Collector A) made recordings of approximately 55 hours of language elicitation, narratives and songs from the Bunuba, Bardi, Djawi, Ngarinyin and other Aboriginal peoples from the Kimberley region of Western Australia. He chose extremely stringent access conditions requiring that he be contacted before anyone could either listen to the material on-site at AIATSIS or have copies.

In 1987, staff of the Institute circulated letters, signed by the Deputy Principal, to depositors who had lodged recordings under restricted conditions. The letters urged them to allow people recorded on the tapes, their relatives, speakers of the Aboriginal languages on the tapes and relevant culture centres to have access and/or copies.

Collector A adamantly refused to change the conditions, stating that his deep concern for the welfare of Aboriginal people had prompted him to use the most restrictive access collections possible, and that he needed to maintain personal control of all of his research material. He had not specified if any changes in access conditions could be made after his death. He felt so strongly about his position that he threatened to take legal action should AIATSIS seek to change his conditions. When he deposited his collections, such access conditions were possible, but, since then, this deposit option has been changed because it caused administrative and ethical difficulties. Thus, because of the extreme access conditions, his collection fell squarely under the category of problematic legacy collections.

When Collector A passed away in 2001, Institute staff contacted his daughter to negotiate a change to the conditions. After several years, she agreed to sign a Transfer of Materials contract that superseded the original restricted conditions, giving responsibility for all of her father's collections, both print and audiovisual, to the Institute. (Koch 2010:51)

6.3 Case study 3: Unidentified restricted material in an open collection

Another situation arose with Collector B, who, in the early 1960s, made some of the earliest recordings in Cape York of songs, narratives, ceremonial material and language elicitation. Collector B, in his documentation, indicated that some of the songs and discussion could be culturally restricted, but had not filled out a deposit form with the Institute. All of his collections were put under restricted access conditions because it was unclear how to manage it.

Over the years, several researchers had tried to locate him without success, as he was a rather colourful character who did not often have a fixed address. After at least 20 years of trying, a former Institute grantee found him, and explained that he really needed to do something about access conditions. In 1988, he sent a letter to the Audiovisual Archive at the Institute, stating that his collections would be available to anyone, in fact, "the whole world." [8]

8 His exact text was: Please place all tapes, films, and other materials deposited in the archive in the most open-to-access status possible. Anyone, whatever their credentials or lack thereof may use my field materials in any way they fancy with or without acknowledgement. I give the world carte blanche to the legal extent of my right to do so.

Shortly after that, a group of elders from Cape York visited AIATSIS in order to get copies of recordings and photographs from their area, Lockhart River. Collector B had worked there and had made many recordings with people they had known. There was no problem making copies for the elders, but as they listened to the recordings, they found that some of the songs and discussions, which had not been identified by Collector B as restricted, were to be accessed only by initiated males from Lockhart River. In this case, male staff members from the Institute worked with the elders to provide a cautionary statement. The cataloguing record was updated and now this legacy collection can be managed properly.

7. Moving towards solutions in handling problematic legacy material

Last year I began a study on access policies of 28 Australian collecting institutions, Indigenous digital archives and agencies that hold significant collections of Aboriginal and Torres Strait Islander material. I had a particular interest in how they managed sensitive materials.

All of the repositories that I examined had specific policies or protocols about the management of Indigenous material. Nearly all mentioned that they respected Indigenous protocols as set by the communities of people who had provided the information.

Collecting institutions have taken various interim measures to deal with problematic material while they await resourcing to transform it into fully documented and accessible collections. Below are some of the steps taken by the Australian organisations that I surveyed in managing sensitive Indigenous collections, some of which falls under the category of problematic legacy material.

7.1 Cautionary notes

For example, AIATSIS includes a "Cultural Sensitivity" note on its opening web page. It states:

> *Aboriginal and Torres Strait Islander people should be aware that this website may contain images, voices, or names of deceased persons in photographs, film, audio recordings or printed material.*
>
> *Some material may contain terms that reflect authors' views, or those of the period in which the item was written or recorded, but may not be considered appropriate today. These views are not necessarily the views of AIATSIS. While the information may not reflect current understanding, it is provided in an historical context.*[9]

Two more cautionary notes appear; one on the page leading to the collections, and another requiring the user to tick a box before they can search the online catalogue.

All Australian State and national archives and libraries have similar cautionary statements that address cultural sensitivity, including possible restrictions. Some of the community-based archives do not allow anyone outside their cultural group to access the databases listing their holdings, and some have restrictions based upon initiatory status and gender.

7.2 Limiting web access to some audiovisual material

Libraries and archives maintain a takedown policy for audiovisual materials on the web. AIATSIS only places images on its site that are part of specially created topical online exhibitions and does not allow web-based access to any of its audiovisual collections.

9 http://aiatsis.gov.au/sensitivity (accessed 5/8/2015)

7.3 Internal advisory committees and reference groups

According to their websites, the State Libraries of Queensland, Tasmania, SA, NSW, and the NT indicate that they have Aboriginal Advisory Committees, Councils or other advisory bodies. The National Archives of Australia, and all State Records offices have Indigenous reference groups. Both libraries and archives have Indigenous liaison officers, and the National Film and Sound Archive and AIATSIS have Indigenous staff who advise on day to day matters of access.

7.4 Proactive joint projects with Indigenous communities

As legacy collections may not have adequate documentation, cooperative projects with Indigenous communities can benefit all parties. Indigenous people can provide missing information about the collections to the institution and, in turn, can receive copies.

AIATSIS had a Community Access Program that brought people from targeted communities to Canberra to search through collections for items from their areas. Copies, where possible, were made for them to take back to their communities.

Also, the Tiwi people, mentioned earlier in this article, who visited Canberra in 2009 were able to identify the people on the recordings and to advise on access conditions. They visited several collecting institutions in Canberra, including the NFSA, where they gave a free concert.[10] One of the dances, Wallaby, had been filmed in 1912, and one of the visiting Tiwi men, Walter Kerinaiua, brought the dance to life again before the assembled audience. (Campbell 2014:119-120)

In turn, the Tiwi received copies of the recordings, including the 1912 film that inspired Walter's performance in Canberra. Campbell describes benefits to the Tiwi resulting from this return as increasing respect for the singers of the past and rediscovering song traditions. (Campbell 2014:117-118)

8. Some projects outside Australia

8.1 Hidden collections registry

The Council on Library and Information Resources was given funding by the Andrew Mellon Foundation to establish a Hidden Collections Registry[11]. These fall into my definition of legacy collections. Organisations were invited to nominate collections that were important to scholarship but did not have enough documentation to enable discovery. Grants were awarded to organisations that developed innovative and efficient approaches to describing rare collections, and it was understood that they would digitize the collections. Of 129 cataloguing grants, totaling over $27.5 million US, 103 contained significant collections of audio.

8.2 Endangered Archives Programme

Since 2004, The Arcadia Fund[12] has supported the Endangered Archives Programme at the British Library. This scheme provides grants to preserve archival material in danger of loss. These are targeted towards historical material from countries or regions where there is limited funding to save important collections. Dr. Tjeerd de Graaf, who spoke at the last IASA conference that was held in Paris in 1998, received a grant to bring together metadata and recordings of endangered Arctic languages. Other examples are preserving analog recordings in the Solomon Islands, digitizing the music of Burma recordings, and various digitization projects for photographic archives. The IASA website lists information on the scheme.

10 http://nfsa.gov.au/site_media/uploads/file/2010/11/03/09-10-Annual-Report.pdf, p.50 (acc. 4/7/2015)
11 http://www.clir.org/hiddencollections/registry#c12=all&b_start=0 (acc. 9/12/2014)

12 http://www.bl.uk/press-releases/2015/february/endangered-archives-programme-10-years (acc. 2/11/2015)

8.3 Historical Archives Program

The Wenner-Gren Foundation offers grants through its Historical Archives Program (HAP)[13] to enable established scholars or their heirs to prepare and to transfer their collections of anthropological research materials to appropriate archival institutions. This scheme serves more to ensure that the collections will not become problematic in the future rather than dealing with existing ones.

9. The importance of advocacy

Tragically there are few sources of funding available to help get problematic legacy collections into a usable form. IASA, with its connections to international archival, information management, and media organisations and their peak body, the Co-ordinating Council of Audiovisual Archives Associations (CCAAA), has publicized various funding schemes relevant to archives. As Ray Edmondson has said, we need a coordinated program of advocacy for financial assistance to audiovisual collections. [14]

Although they pose special dilemmas, problematic legacy collections often hold invaluable cultural material, as I have shown. If they are lost, an important part of our history will go with them.

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13 http://www.wennergren.org/programs/historical-archives-program-hap
14 http://unesdoc.unesco.org/images/0013/001364/136477e.pdf

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UNEARTHING THE UNDERGROUND, DATABASING THE AVANT-GARDE, AND MAPPING THE INDEPENDENT MEDIA COMMUNITY

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1. Introduction

> *The limits of cinema aren't those of intelligence or imagination, but exhibition and distribution. Most…filmmakers…cling to a slim margin of quasi-visibility – random museum unspoolings, fugitive festival bookings. Others fight for whatever space and time the few noninstitution-ridden avant-garde showcases available may have to offer.*[15]

A product of the technological and social milieu of the 1960s and 1970s, the 'independent filmmaker' was imagined as an artist who worked alone. Unlike her counterparts in Hollywood, the independent artist was in full control of the means of production and had little concern for generating profits from her creations. Former director of the Pacific Film Archives Sheldon Renan defined these independent, avant-garde, experimental, and underground films as works created by an individual for the primary purpose of artistic expression, created with limited means.[16] While the means of production may have been limited, film and video production demanded time, money, and resources.[17] Further, while the imagined audiences for these works may have been limited, independent film and video required channels for distribution and exhibition. Like all artists, independent film and video makers did not work in isolation, rather their work was supported by an entire art world, individuals and organizations that provided a host of services to support the production and circulation of the media that they produced. This support network included community organizations, artist collectives and cooperatives, equipment access centers, film and video distributors and suppliers, museums, archives, and libraries. Proposed under the moniker "Regional Film Centers" in 1972, such organizations supporting the independent media art world became known as Media Art Centers, and formed the center of a grassroots movement aimed at building a nation-wide support network for independent media artists.

Broadly conceived, Media Arts Centers provided a host of services encouraging the production, distribution, exhibition, preservation, and study of non-commercial media.[18] The National Endowment for the Arts (NEA) began supporting key organizations as "Major Media Centers" in 1972 under the Media Arts Program, and by 1980 the movement gained significant momentum uniting under the umbrella organization NAMAC — the National Alliance of Media Arts Centers. In 1991, over three decades after the first Major Media Centers were acknowledged, NAMAC became the National Alliance of Media Arts and Culture, and the designation "Media Arts Center" disappeared into the archives. Yet, NAMAC continues to serve as the umbrella organization for non-profit media arts organizations, some of which were key players in the Media Arts Center Movement.[19] However, scholars of film and media history have overlooked the movement and its impact on non-commercial media production

15 David Ehrenstein, ***Film: The Front Line 1984*** (Denver: Arden Press, 1894): 149.
16 Sheldon Renan, ***An Introduction to the American Underground Film*** (New York: E.P. Dutton & Co., 1967): 17.
17 In 1971, an entry-level portapack video camera/recorder would require an investment equivalent to approximately $12,000 when adjusted for inflation. A single videotape cost about $13 (or $75 today), while the equivalent in 16mm film with processing was priced at approximately $110 (or about $600 today). These statistics were estimated from the costs reported in Michael Shamberg, ***Guerrilla Television*** (New York: Holt, Rinehart and Winston, 1971).
18 Sheldon Renan, "The Concept of Regional Film Centers," ***Sightlines*** 7, no. 3 (1973/1974): 7-9. See also, J. Ronald Green, "Film and Video: An Institutional Paradigm and Some Issues of National Policy," ***Journal of Cultural Economics*** 8, no. 1 (1984): 61-79; and J. Ronald Green, "Film and Not-For-Profit Media Institutions," in ***Film/Culture: Explorations of Cinema in its Social Context***, ed. Sari Thomas (Metuchen, NJ: Scarecrow Press, 1982), 37-59.
19 Pittsburgh Filmmakers, Pittsburgh, Pennsylvania serves as an example, electing to continue to use the tagline "The Media Arts Center" in their advertising materials.

in the United States. *Mapping the Independent Media Community* (MIMC), a project initiated at The University of Iowa, seeks to recover this lost history from the archives.

2. Major Media Center: Carnegie Museum of Art, Pittsburgh, PA

> *A phenomenon of the [1970s], media arts centers bring works of classic and advanced media art to the public through exhibition programs, workshops, and residencies. They focus the attention of artists, critics, and public on key issues affecting our understanding of the media. And they provide a vital resource for media artists through equipment access programs and to the public through maintenance of film-video collections and publications.*[20]

The founding of the Film Library at the Museum of Modern Art (MoMA), New York in 1935 is cited as a pivotal moment for the preservation of film, the development of film archives, and the recognition of film as art.[21] Film scholar J. Ronald Green also traces the origins of the Media Arts Center Movement to this event. In fact, a number of film archives and museums such as MoMA, Pacific Film Archive (Berkeley, CA), Walker Art Center (Minneapolis, MN), and Anthology Film Archives (New York, NY) received funding from the National Endowment for the Arts (NEA) as Major Media Centers, funding that was designated for Media Arts Centers for the promotion of film, video, and radio. The NEA's definition, like Green's, embraces a variety of organizations, including those working independently as well as organizations associated with museums, universities, and state arts agencies.[22]

Situated throughout the United States, Media Arts Centers large and small provided resources to artists and audiences interested in producing and consuming independent media. In 1979, the second year of funding in this category, the National Endowment for the Arts supported twenty-one Media Arts Centers representing every region of the United States.[23] Statistics from the 1979 National Conference of Media Arts Centers further demonstrated the impact of the centers on the media arts field. The forty-seven attending organizations, representative of one-half of the nation's Media Arts Centers, reported that during the previous year these organizations: supported 835 appearances by film and video makers to which $170,000 in artist fees and honoraria were awarded, programmed 7,450 film and video screenings to audiences in excess of 850,000 people, broadcast programming to over 2 million homes, and provided equipment to 8,000 artist-members.[24] During this 1979 meeting, Media Arts Centers also began arguing for national representation that could lobby on behalf of the growing number of organizations across the country. The National Alliance of Media Arts Centers (NAMAC) was established in the following year to fulfill this role. The founding members of NAMAC included organizations with a national focus, such as The Academy of Motion Picture Arts and Sciences (Los Angeles, CA)

20 Brian O'Doherty, "Media Arts: Film/Radio/Television," in ***Annual Report 1979*** (Washington, DC: National Endowment for the Arts, 1980), 120.

21 See Haidee Wasson, ***Museum Movies: The Museum of Modern Art and the Birth of Art Cinema*** (Los Angeles: University of California Press, 2005) and Penelope Houston, ***Keepers of the Frame: The Film Archives*** (London: British Film Institute, 1994).

22 National Endowment for the Arts, ***Annual Report 1979*** (Washington, DC: National Endowment for the Arts, 1980): 125.

23 In 1984, the NEA restructured the funding mechanism, distributing funds to 7 designated regional centers: Center for New Television (Chicago, IL) for the Great Lakes Region; Pittsburgh Filmmakers for the Mid-Atlantic; The Boston/Film Video Foundation for New England; Appalshop (Whitesburg, Kentucky) for the Southeast; Southwest Alternate Media Project (Houston, TX) for the Southwest and Caribbean; Film in the Cities (St. Paul, MN) for the Upper Mid-West, and Rocky Mountain Film Center (University of Colorado) for the West and Pacific Territories. See, National Endowment for the Arts, ***Annual Report 1984*** (Washington, DC: National Endowment for the Arts, 1985). The NEA would continue funding Media Arts Centers through 1996.

24 Wanda Bershen, "Notes from Minnewaska: On Independence," ***Field of Vision*** 7 (Summer 1979): 4.

and American Film Institute (Washington D.C), state level organizations and funders such as the Ohio State Arts Council, and smaller regional or locally-based organizations such as Pittsburgh Filmmakers (Pittsburgh, PA) and the Toledo Media Project (Toledo, OH).[25]

While San Francisco and New York City would dominate the independent media arts field on the opposing coasts of the United States, regional Media Arts Centers supported the production, distribution, and exhibition of independent media arts throughout the US. In his 2005 history, Robert Haller, Director Emeritus of Anthology Film Archives, suggested that Pittsburgh, Pennsylvania came to be the third city for the avant-garde and independent media production during the 1970s. Haller argues that a combination of "institutional, geographic, financial, and personal factors were responsible for making the city a catalyst and a player in the national and international community of what had earlier been called experimental or underground film."[26] Pittsburgh's independent media culture was in fact supported by two of the NEA's designated Major Media Centers: the Film Section of Carnegie Institute Museum of Art (now Carnegie Museum of Art) and Pittsburgh Filmmakers.[27] While Pittsburgh Filmmakers offered film, video, and photography courses and workshops, Carnegie Institute scheduled screenings and lectures with traveling filmmakers. Between 1976 and 1977 artists such as Yvonne Rainer, Paul Sharits, Peter Kubleka, Malcome Le Grice, Bruce Conner, and Peter Watkins, visited the city.[28] Artists would often visit both Media Arts Centers, screening film and video at Carnegie and hosting workshops and lectures for students and artist-members at Pittsburgh Filmmakers.

Both organizations would also play a role in the Media Arts Center Movement's national efforts, jointly hosting the "Pittsburgh Regional and Major Media Center Conference" in 1978. In attendance were representatives from 18 of the NEA designated Major Media Centers, in addition to leaders from the NEA and American Film Institute.[29] During this meeting attendees lobbied for improved preservation processes and funding, advances in the hardware for media production, a recognition of scholarship in the field and the development of publication venues for the research, expansion of forums for the exhibition of independent film and video, further advocacy for artists, and the designation of film and video as art.[30] Further establishing its distinct position in the field, the Film Section of Carnegie Institute would begin publishing the Film and Video Makers Travel Sheet in 1972, connecting film and video makers and media arts organizations from around the globe.

25 Lists of members published from 1983-1989 in NAMAC's newsletter ***Media Arts*** included 221 individual organizations in the United States and Canada, representing 35 US states, the District of Columbia, Puerto Rico, and the US Virgin Islands. Lindsay Kistler Mattock, "Media Arts Centers as Alternative Archival Spaces: Investigating the Development of Archival Practices in Non-Profit Media Organizations" (PhD diss, University of Pittsburgh, 2014).

26 Robert A. Haller, ***Crossroads: Avant-garde Film in Pittsburgh in the 1970s*** (New York: Anthology Film Archives, 2005): 7.

27 Lucy Fischer and Bill Judson, "Independent Film in Pittsburgh," ***Millennium Film Journal*** 3 (Winter/Spring 1979): 100-108. Pittsburgh Filmmakers, founded in 1971, continues to support film and media production, education, and exhibition in the Pittsburgh region as one of the oldest running Media Arts Centers in the country.

28 Compiled from the 1976-1977 ***Film and Video Makers Travel Sheet***.

29 Representatives from the Major Media Centers included: Ted Perry, Department of Film, Museum of Modern Art, NYC; Richard Weise, Film in the Cities, St. Paul MN; John Reilly, Global Village, NYC; Ron Green, Media Study Inc., Buffalo, NY; Mary Macarthur, the Kitchen Center, NYC; Melinda Ward, Department of Film, Walker Art Center, Minneapolis, MN; Robert Sitton, Northwest Film Study Center, Portland Art Museum, OR; Virgil Grillo, Rocky Mountain Film Center, Boulder Colorado; Ed Hugetz, Southwest Alternate Media Project, Houston, TX; Cathy Keane, South Carolina Arts Commission, Columbia, SC; Susan Woll, John, Rubin, and Michelle Schofield of Boston Film/Video Foundation; Gisela Hoelcl, University Film Study Center, Cambridge, MA; Robert Haller and Robert Gaylor, Pittsburgh Film-Makers, Inc.; Tom Luddy, Pacific Film Archives, Berkeley, CA; Howard Guttenplan, Millennium Film Workshop, NYC; William Judson, Film Section, Museum of Art, Carnegie Institute; Michael Rothbard, Intermedia Arts Center, Bayville, NY; Jonas Mekas, Anthology Film Archives, NYC; Thomas Lennon, Association of Independent Video and Film-Makers (AIVF), NYC. As published in, Peter Feinstein, ed., ***The Independent Film Community: A Report on the Status of Independent Film in the United States*** (New York: Committee on Film and Television Resources and Services, 1977).

30 R. A. Haller, "The Pittsburgh Regional and Major Media Center Conference," ***Field of Vision*** 4 (Fall 1978): 23.

3. Social media for independent media artists: The Film and Video Makers Travel Sheet

> *A boon to librarians, programmers and others who need to know the whereabouts of independents, and a good source of major U.S. showcases for independent productions.*[31]

The Film and Video Makers Travel Sheet was an extension of the efforts of Carnegie Institute to support independent film in Pittsburgh, throughout the United States, and abroad. This monthly publication served as a social networking mechanism, intended to connect filmmakers to the organizations that supported screenings and lectures with visiting artists. This "valuable aid for organizations and institutions," was published with the support of Major Media Center funding from the NEA from January of 1973 through March of 1987. An undated departmental document in the Film Section Archives states that several years into the publication of the resource, the *Travel Sheet* was being used by over 2,000 film and video makers and institutions in the United States, Canada, and abroad.[32]

Each monthly *Travel Sheet* included listings of upcoming tours and events, installations and exhibitions, newly available film and video, and announcements of interest to film and video makers, including employment opportunities, festivals and competitions, and available grants and funding opportunities. This publication is unique in that the information was provided directly by the artists and organizations electing to submit information about tours and events through a simple paper form provided in every issue.

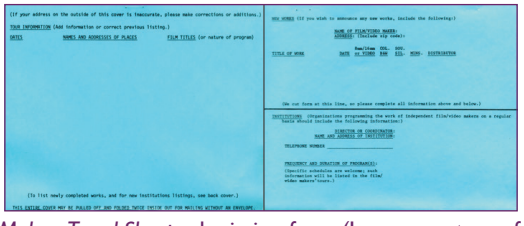


IMAGE 1: *Film and Video Makers Travel Sheet* submission form (Image courtesy of Carnegie Museum of Art, Pittsburgh, PA)

Beginning in August of 1977, the editors of the *Travel Sheet* also began to include announcements from *Filmmakers Europe*, a British publication similar to the *Travel Sheet*. The August 1977 *Travel Sheet* announced a data exchange between the two publications, affording opportunities to garner more details regarding independent film and video screening opportunities throughout the world."[33] While the global data supplied by the *Travel Sheet* is limited, records of correspondence in the Carnegie Institute Film Section Archives suggest that the *Travel Sheet* had a broad subscription base, reaching individuals and organizations from across the globe. Included in these files are letters from: Klub Filmowy Bielsko, Poland; Individual in Tehran, Iran; Stedelijk Museum Amsterdam; Universiti Utara Malaysia; British Film Institute; Archives Publiques Canada; Oslo, Norway; Hong Kong; Independent Film & Video Makers Association, London; Arts Council of New Zealand; Centro Documentazione Arti Visive Biblioteca, Rome; Cinémathèque Royale de Belgique; Australian Film Institute; Ghazvin, Iran; among others.

In a further attempt to support touring filmmakers, the Film Section of Carnegie Institute published *The Film and Video Makers Directory* in 1978 and 1979, compiling the addresses of

31 A review of the ***Film and Video Makers Travel Sheet*** published in "New Publications" ***Sightlines*** 13(4) Summer 1980: 41.

32 no title, no date, FV001 – Departmental – Publications – General – Travel Sheet and Directory Descriptions for Bawker International Series Database – 1983 – Box FF.

33 Edited by William Raban and Clyde Steiner, ***Travel Sheet August 1977***.

the *Travel Sheet* subscribers and those who elected to publish their information in previous issues.[34] Organized by US state and by country for international entries, the *Directory* included two sections: one for the contact information of individuals—active makers as well as contact persons at film and video centers, museums, universities, libraries, foundations, periodicals, and distributors—and a second, listing institutions that scheduled personal appearances by artists, those that programmed their work, and other institutions with an interest in independent film and video. In addition, the 1979 *Directory* included extensive information regarding the screening facilities and policies of those institutions exhibiting the work of independents, including: the available projection equipment, the average honoraria for artists, and the screening room seating capacity.[35] This additional data provides a sense of scale for the exhibition venues in both available resources and physical infrastructure.

Three initial motivations for the foundation of Media Arts Centers have been described: organizations that were founded with a concern for exhibition (the film society or cinémathèque), those providing resources and technology to filmmakers (artist collectives), and those primarily concerned with the collection and study of media art (film libraries and archives).[36] Each of these models can be found within the data from the *Travel Sheet* and *Directory*, along with those Media Arts Centers that embraced all of these roles. As such, the data contained within these publications provides a snapshot of the extended network of individuals and organizations supporting the exhibition, production, and distribution of independent media during one of the key decades of growth for Media Arts Centers.

4. Mapping the Independent Media Community: MIMC

> *This Directory is intended to encourage and facilitate a wider use of exhibition and lecture tours by film and video makers. It will of course, have many other uses as well.*[37]

The preceding quote from the 1978 *Film and Video Makers Directory* suggests the future uses unimagined by the publishers at that time. Editors of the Travel Sheet utilized a database to manage and organize subscription records, but could only circulate this data in paper form. The goal of the Mapping the Independent Media Community (MIMC) project is to recreate this lost database and reimagine the network of organizations and individuals represented in the Travel Sheet and Directory, developing a research tool for the study of independent media arts and the Media Arts Center Movement both in the United States and abroad.

Access to the complete publication run of the *Travel Sheet* from January of 1973 through March of 1987 has been made possible through the efforts of Carnegie Museum of Art's (CMOA) *Time-Based Media Project*. Supported by funding from the A.W. Mellon Foundation, the *Time-Based Media Project* is an effort to process the media and records from the collections of the Film Section. The Film Section archive includes film and video works collected by the museum as well as the records generated during the Section's operation from 1970 through 2002, when the Film Section was eliminated during the reorganization of the Museum of Art departments.

34 The 1978 ***Directory*** contains close to 2400 individual records, while the 1979 includes close to 3200 individuals and organizations, suggesting a 33% increase in the subscription base in the 12 months between the publication of the editions of the resource.

35 The Film Section would publish one final directory in 1986 with support from the NEA, ***MEDIA: Media Exhibitors Directory for Independent Artists***. This directory, as with the ***Film and Video Makers Directly*** listed those organizations exhibiting independent media art. ***MEDIA*** manuscript, 1986, Box FF, "Departmental – Publication – General – Media Exhibitors Directory For Independent Artists," Film Section Archives, Carnegie Museum of Art, Pittsburgh, PA.

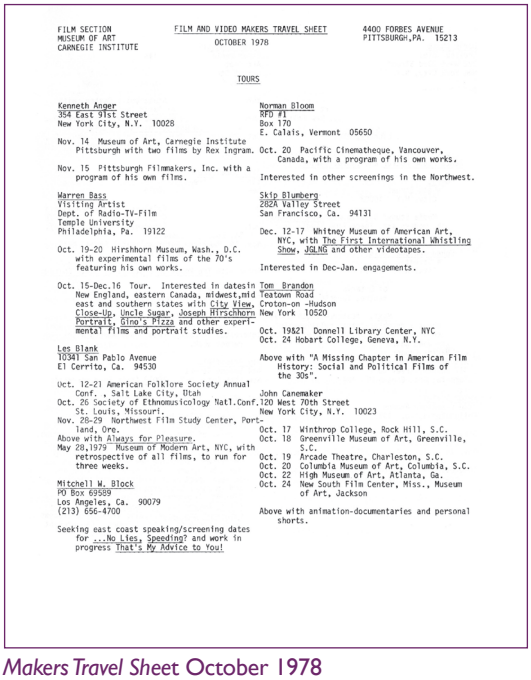
36 J. Ronald Green, "Film and Not-for-Profit Media Institutions," in ***Film/Culture Explorations of Cinema in its Social Context***, ed. Sari Thomas (Metuchen, NJ: Scarecrow Press, 1982), 45.

37 Rebecca Popovich Burdick, ed., ***Film and Video Makers Directory*** (Pittsburgh: Carnegie Institute, 1978): ii.

The ongoing work of Senior Research Associate Emily Davis and Archival Assistant Katherine Barbera has lead to a partnership between the University of Iowa and CMOA. Recognizing a similar desire to digitize and make the records available and fully searchable online, project lead Lindsay Mattock and graduate assistants from the University of Iowa have developed a workflow for the digitization of archival resources from the Film Section, focusing on the *Film and Video Makers Directory* and *Travel Sheet*. By assisting with the OCR (optical character recognition) process, this partnership has provided an opportunity for the Iowa research team to pull the data from these resources to create the *MIMC* database and provide CMOA with fully searchable digitized copies of the records for incorporation into the forthcoming CMOA digital archive resulting from the *Time-Based Media Project*.

The data being drawn from the *Film and Video Makers Directory* and *Film and Video Makers Travel Sheet* hold significant research potential. While these sources were published and circulated widely, the original databases containing the subscription data have been long lost. The subscription records, published in the 1978 and 1979 *Directory*, provide a static snapshot of the organizations, individuals, and artists supporting independent media in these years; the *Travel Sheet* provides key links between these data-points, including announcements of scheduled events and the availability of filmmakers for lecture tours. This additional data provides an opportunity to understand how this network functioned to support the work of independents throughout the 1970s and into the 1980s.

More significantly, the information published in the *Travel Sheet* and *Directory* was not curated by the editors; rather, artists and institutional leaders had simply to complete and mail the form included in each issue to be added to the next issue.



FILM SECTION
MUSEUM OF ART
CARNEGIE INSTITUTE

FILM AND VIDEO MAKERS TRAVEL SHEET
OCTOBER 1978

4400 FORBES AVENUE
PITTSBURGH,PA. 15213

TOURS

Kenneth Anger
354 East 91st Street
New York City, N.Y. 10028

Nov. 14 Museum of Art, Carnegie Institute Pittsburgh with two films by Rex Ingram.

Nov. 15 Pittsburgh Filmmakers, Inc. with a program of his own films.

Warren Bass
Visiting Artist
Dept. of Radio-TV-Film
Temple University
Philadelphia, Pa. 19122

Oct. 19-20 Hirshhorn Museum, Wash., D.C. with experimental films of the 70's featuring his own works.

Oct. 15-Dec.16 Tour. Interested in datesin New England, eastern Canada, midwest,mid east and southern states with City View, Close-Up, Uncle Sugar, Joseph Hirschhorn Portrait, Gino's Pizza and other experimental films and portrait studies.

Les Blank
10341 San Pablo Avenue
El Cerrito, Ca. 94530

Oct. 12-21 American Folklore Society Annual Conf. , Salt Lake City, Utah
Oct. 26 Society of Ethnomusicology Natl.Conf. St. Louis, Missouri.
Nov. 28-29 Northwest Film Study Center, Portland, Ore.
Above with Always for Pleasure.
May 28,1979 Museum of Modern Art, NYC, with retrospective of all films, to run for three weeks.

Mitchell W. Block
PO Box 69589
Los Angeles, Ca. 90079
(213) 656-4700

Seeking east coast speaking/screening dates for ...No Lies, Speeding? and work in progress That's My Advice to You!

Norman Bloom
RFD #1
Box 170
E. Calais, Vermont 05650

Oct. 20 Pacific Cinematheque, Vancouver, Canada, with a program of his own works.
Interested in other screenings in the Northwest.

Skip Blumberg
282A Valley Street
San Francisco, Ca. 94131

Dec. 12-17 Whitney Museum of American Art, NYC, with The First International Whistling Show, JG,NG and other videotapes.
Interested in Dec-Jan. engagements.

Tom Brandon
Teatown Road
Croton-on -Hudson
New York 10520

Oct. 19&21 Donnell Library Center, NYC
Oct. 24 Hobart College, Geneva, N.Y.

Above with "A Missing Chapter in American Film History: Social and Political Films of the 30s".

John Canemaker
120 West 70th Street
New York City, N.Y. 10023

Oct. 17 Winthrop College, Rock Hill, S.C.
Oct. 18 Greenville Museum of Art, Greenville, S.C.
Oct. 19 Arcade Theatre, Charleston, S.C.
Oct. 20 Columbia Museum of Art, Columbia, S.C.
Oct. 22 High Museum of Art, Atlanta, Ga.
Oct. 24 New South Film Center, Miss., Museum of Art, Jackson

Above with animation-documentaries and personal shorts.

IMAGE 2: *Film and Video Makers Travel Sheet* October 1978

Through this simple mechanism, artists could announce their travel plans (however vague), scheduled tour dates, and newly available work. Throughout the 1970s the *Travel Sheet* also included a list of organizations that, through use of the same form, could advertise their interest in hosting makers and their work. This lack of formal selection by the editors at the CMOA produced a self-representative database of the independent makers community providing in-

sight into the known hubs for independent filmmaking in major metropolitan areas (New York City, San Francisco, and Chicago), suspected influential cities (Pittsburgh, Pennsylvania), and other locations throughout the United States and abroad.[38]

The comprehensiveness and organic growth of the *Travel Sheet* as an opt-in resource provides important insight into areas of the United States that are often overlooked. The data related to the American Midwest illustrates this point. The Walker Art Museum in Minneapolis, Minnesota and the Art Institute of Chicago have emerged as well connected nodes in the initial analysis of the data. As known supporters of the independent media arts, this is not surprising; however, lesser-known venues in the Midwest, such as the REFOCUS group at the University of Iowa, also appear in the data. A subscriber to the *Travel Sheet*, REFOCUS held annual festivals from 1966 through 1978 hosting local artists as well as those traveling on the national circuit. The physical distance between major cities in the Midwest proved a challenge to independent artists, as Robert Pest, Director of City Movie-Center, reflected in a letter to William Judson, Director of the Film Section at Carnegie Institute: "Media arts presenters in the Midwest face serious travel costs for visiting artists; the *Travel Sheet* enabled us to connect with other presenters to share travel costs." He continues, "As the Director of City Movie-Center for six years, I was responsible for bringing approximately 25 leading film and video artists to Kansas City for guest appearances, lectures, and workshops. Most of those engagements came as the result of the *Travel Sheet* listings."[39] The *Travel Sheet* proved to be a valuable resource for artists and organizations throughout the United States and Europe, and *MIMC* will afford opportunities to study these areas, visualizing the relationships between organizations and artists in less densely populated areas alongside the more developed art centers in the US and Europe.

5. Big data and not-so big data

> *Big Data is not notable because of its size, but because of its relationality to other data. Due to efforts to mine and aggregate data, Big Data is fundamentally networked.*[40]

When measured in size against datasets emerging from the STEM fields, the records from the *Travel Sheet* and *Directory* pale in comparison. However, as Boyd and Crawford note, it is the degree to which the data is networked that complicates the representation of a dataset. The networked nature of the data from the *Travel Sheet* present issues that many working with large amounts of "fuzzy humanities data" have faced.[41] From the beginning steps of building the dataset, creating a disaggregation system that could handle the variations in both the structure of the digitized text and the frequently changing nature of the data itself (changing names, non-traditional addresses, and geographical boundaries) has been a challenge.

The complications began with the OCR process. Throughout its 13 years of publication, the *Travel Sheet* evolved in both size and scope, including not only the artists' events, new works, and organization directory, but advertisements, opportunity announcements (festivals and employment), and other relevant information for independent media artists. The increase in physical size, layout modifications, and the density of the data has posed challenges to automating the OCR process and ingestion of records into the database. Inconsistencies in the formatting of names, addresses, titles, and event data have prevented the use of standard delineators to automatically ingest the data into the database fields. At this stage in the process we are forced

38 While the ***Directory*** and ***Travel Sheet*** include data from Australia, South America, Europe, Canada, and Asia, a majority of the data represents organizations and artists in the United States.

39 Letter From Robert Pest to William Judson, June 6 1987, Box FF, "Departmental – Publication – General – Travel Sheet Fan Mail," Film Section Archives, Carnegie Museum of Art, Pittsburgh, PA.

40 danah boyd and Kate Crawford, "Six Provocations for Big Data," ***A Decade in Internet Time: Symposium on the Dynamics of the Internet and Society***, September 21, 2011, Oxford University.

41 Melissa M. Terras, "The Potential and Problems in Using High Performance Computing in the Arts and Humanities: the Researching e-Science Analysis of Census Holdings (ReACH) Project," ***Digital Humanities Quarterly*** 3, no 4. (2009).

to rely on manual manipulation of the data for both data entry and the disambiguation of multiple identical records in the *Travel Sheet* and *Directory*.

The nature of the data also poses specific challenges for the *MIMC* project. The *Travel Sheet* and *Directory* not only list the dates of screenings and events, the location of organizations, and rental information for specific works, but also the home addresses of many independent artists. While this information was circulated publicly to those with a subscription to the *Travel Sheet*, this personal information was never intended for the potential audiences on the World Wide Web, nor would the artists that supplied the data have imagined the historical use of this information. As we begin to design the visualizations of the *MIMC* database, we are cognizant of this question of privacy, but also strive to provide a nuanced understanding of circulation of independent media and movement of artists over time. When geolocating this information in some less-dense areas of the network (the state of Iowa, for example) mapping data points to a specific city will suffice, however, in dense metropolitan areas like New York City, where the database contains hundreds of entries, more nuance is required to fully understand the geographic relationship between data points.

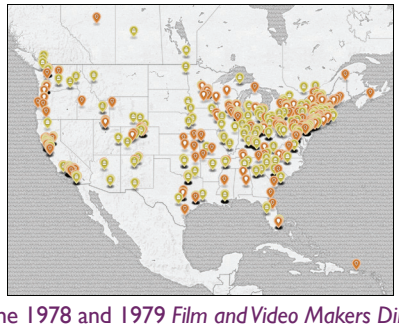


IMAGE 3: Selected data from the 1978 and 1979 *Film and Video Makers Directory*, organizations (yellow), individuals (orange)

While mapping to zip code or neighborhood presents possible solutions, the age of the data has also lead to renegotiations of boundaries as neighborhoods have changed, cities and counties dissolved, and location markers such as zip codes have been consolidated and eliminated over time.[42] As additional datasets are merged into the data from the *Travel Sheet* and *Directory*, these subtleties will continue to be important, though the *MIMC* team must balance privacy with the accuracy of the geographic visualizations of the data.

IMAGE 4: Organizations and Individuals, New York City 1979

42 Data points from the former Yugoslavia are perhaps the most illustrative of this point.

The decisions made during the construction of a database also pose specific challenges and frame the interpretation of the data, even before a thorough analysis can begin. Kenneth M. Price addressed the limits of neutrality in database creation, suggesting "Argument is always there from the beginning… the initial understanding of the materials governs how more fine-grained views will appear because of the way the objects of attention are shaped by divisions and subdivisions within the database. The process of database creation is not neutral, nor should it be"[43] As database records are generated from the *Travel Sheet* and *Directory*, the *MIMC* research team has attempted to remain unbiased, using the language from the original publications to construct the database fields. However, as analysis and visualization begin, the incorporation of additional information to the records will pose further challenges. For example, classifying the types of organizations and institutions by function — as archives, museums, libraries, cinematheques, cine clubs, film festivals, artist collectives, etc. — assumes that the missions and functions of each of these organization-types is well defined. The multi-faceted mission of Media Arts Centers begins to capture the complex role that many organizations played; however, this designation was not embraced by all. While this additional level of interpretation could provide insight into the role of organizations and the significance of different types of organizations to the media arts community over time, any imposed classification scheme will mask some roles while risking over-inflating others.

6. Beyond the Travel Sheet: MIMC, phase 2

> ...database *can be a suggestive metaphor because it points to the re-configurable quality of our material (and that of similar sites). The term also conveys simultaneously "finished" and "unfinished" qualities; while a project can be logically thought of as "done" or "not yet done," we usually conceive of a database as usable as soon as it begins to exist, and we take as a given that the data will continue to proliferate, potentially indefinitely.*[44]

Initial analysis of the partial dataset that has been incorporated into the *MIMC* database demonstrates the power and potential for this project. [include SNA and node maps] While we cannot yet draw conclusions, the initial visualizations begin to demonstrate the network that emerges from the data between organizations and artists. The *Directory and Travel Sheet* publications were important resources for film and video makers throughout the 1970s and 1980s, but they were not the only source. The ultimate goal of the *MIMC* project is to aggregate multiple historical datasets into one tool that will provide for the analysis and visualization of the Media Arts Center Movement and independent media production, distribution, and exhibition.

The *Travel Sheet* and *Directory* provide a bounded dataset from which to build a prototype of what has been imagined as a sophisticated research portal for scholars, students, and anyone from the community with an interest in this area. *MIMC* builds upon work in film, cinema, and media studies employing Digital Humanities tools and methods such as GIS (geographic information systems) to build and analyze data, such as Jeffrey Klenotic's Mapping Movies (http://mappingmovies.unh.edu/maps/erma.html) and AusCinemas, the Australian Cinema Map (http://auscinemas.flinders.edu.au). In contrast to these projects, *MIMC* will not be limited to a geographic visualization of the dataset, but will experiment with multiple visualizations of the data including timelines, social network analysis, and other representations of the linkages between organizations and artists over time.

43 Kenneth M. Price, "Edition, Project, Database, Archive, Thematic Research Collection: What's in a Name?" Digital Humanities Quarterly 3, no. 3 (2009): para 21.

44 Price, "Edition, Project, Database, Archive, Thematic Research Collection," para. 19.

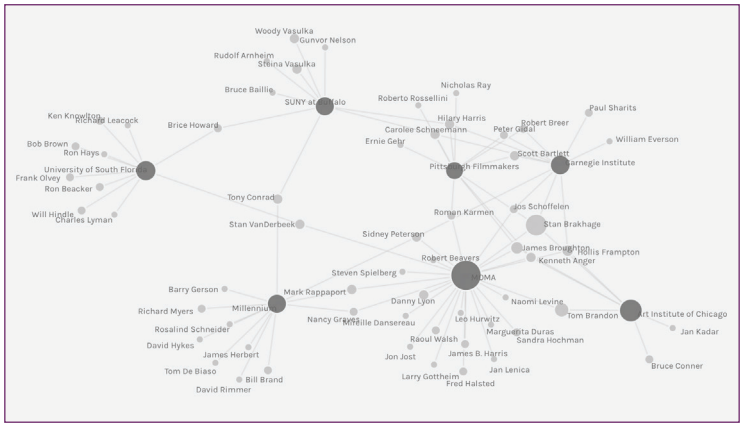


IMAGE 5: Selected data from the *Film and Video Makers Travel Sheet* January 1973 – January 1974

The *MIMC* tool will support the ingest of additional historical datasets, allowing for a comprehensive analysis of data from the 1970s through to the present.

Upon successful completion of the public prototype additional datasets will be digitized and ingested into the *MIMC* database. Publications such as *Film Resource Centers in New York City* (1976), *Filmmakers Europe*, and *Film Canadiana* have already been identified as possible sources, and will provide additional data for international venues and major metropolitan areas in the United States. Distribution catalogs from *Canyon Cinema* and the *Filmmakers Cooperative* could provide additional insight into the number of works available as compared to those announced in the *Travel Sheet.* As a key funder of Media Arts Centers in the 1970s and 1980s, data from the National Endowment for the Arts will also provide insight into the funding mechanisms supporting the artists and organizations during these key decades.

As a research tool, *Mapping the Independent Media Community* will support future scholarship related to independent media arts, the Media Arts Center Movement, and Digital Humanities methodology. Scholars of media, film, and communication studies are beginning to experiment with digital modes of analysis for film and video, using digital tools to perform color analysis, caption mining, and automated analysis of other aesthetic elements of individual works.[45] Similar to traditional studies of cinema, these tools are used in the analysis of individual films, that is, reading the film as text rather than studying the larger context of production, exhibition, collection, and study, as *MIMC* aims to do, supporting research in the area of New Cinema History — studying film without film.[46]

Beyond data visualization and aggregating data sets, *MIMC* can also serve as a tool for librarians and archivists by identifying those artists that are not represented in archival collections at present, and further identifying where collections of media and records may lie in wait to be accessioned into archival collections and preserved for posterity. As *MIMC* continues to grow, the project team welcomes collaboration so that the project may holistically represent the growth of independent media across the globe.

45 See, Barbara Flueckiger, "Analysis of Film Colors in a Digital Humanities Perspective," ***Frames Cinema Journal*** 1 (2012); Jason Mittell, "Caption Mining at the Crossroads of Digital Humanities & Media Studies," ***Just TV*** blog post, November 30, 2012, http://justtv.wordpress.com/2012/11/30/caption-mining-at-the-crossroads-of-digital-humanities-media-studies/; Adelheid Heftberger, "Do Computers Dream of Cinema? Film Data for Computer Analysis and Visualization" (p. 210-223), in ***Understanding Digital Humanities***, ed. David M. Berry (New York: Palgrave Macmillan, 2012).

46 See Jon Lewis and Eric Smoodin, eds., ***Looking Past The Screen: Case Studies in American Film History and Method*** (Durham, NC: Duke University Press, 2007).

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TOO GOOD TO BE FORGOTTEN: THE COPYRIGHT DICHOTOMY AND THE PUBLIC-SECTOR AUDIOVISUAL ARCHIVE

Claudy Op den Kamp, Swinburne Law School, Australia[47]

Abstract

Film archives own, or hold on deposit, many physical works of film, whereas the copyright holder to these might be someone quite different. The colourisation debate of the late 1980s in the US and Als twee druppels water (The Spitting Image, NL 1963, Fons Rademakers), an embargoed film in a public-sector archive, are both examples of this copyright dichotomy between material and intellectual property. The examples expose the archive as a vulnerable place. On the one hand, the archive cannot guarantee a fixed and stable environment for cinematic memories. On the other hand, an inhibited visibility of important works of film that are arguably crucial to an understanding of the history of film is the result if a film archive cannot provide access to its holdings. The examples provide new insights into the wider cultural implications of the intellectual property (IP) system. They demonstrate how IP underpins understandings of public accessibility to (a limited range of) primary source material and their subsequent potential for history making.

1. Introduction

In characterising the 1950s of European film archiving, co-founder of the Cinémathèque de Toulouse Raymond Borde describes 'the arrival of a redoubtable character in the sleepy and peaceful landscape where the film archives reside: the rights holder'.[48] He refers to rights holders as alligators hiding in the swamps where the archives peacefully conduct their historic mission of cultural preservation.[49] The time that Borde depicts is one in which secrecy belonged to the prevailing attitude of film archives.[50] Collections often originated from dubious sources and archives kept their treasures secret. Most of these public-sector institutions did not have a real accessible catalogue and rights holders who might find out about or interfere with some of the holdings were seen as a nuisance. The 1980s brought a change with a new generation of archivists spearheading the major archives, and the higher degree of transparency and a sense of collaboration in their work also extended to the relationship with third party rights holders.[51]

In this paper we will look closely at two relatively recent examples of the fragile and sometimes tense relation between copyright holders and the film archive. Rights holders can (and have the right to) change the form and version of films with the advent of a new technology. The colourisation debate of the late 1980s in the US is an illustration of this right. Alternatively, copyright holders might keep films out of the public realm altogether. The tension between rights holders who can execute control over their intellectual property versus the remit of the safeguarding institution of the material property is most palpable in the public-sector archive. We will look at an example of the public (un)availability of an embargoed film in one of those archives despite the institution's financial responsibility for the continued preservation of the work. Both examples expose the film archive as a vulnerable place: contrary to popular belief it is not a safe haven that can protect a film and guarantee its audience's memories. Access to archival materials is a constructed process in which human agency plays an important role.

47 Claudy Op den Kamp is a Postdoctoral Research Fellow at Swinburne Law School, Australia. For insightful comments, thank you to Egbert Barten, Leontien Bout, Jake Goldenfein, DanHunter, and Ronny Temme.

48 Borde, Raymond (1983) ***Les Cinémathèques***. Lausanne: Editions L'Age d'Homme; p. 121 (author's translation).

49 Ibid.

50 Kuyper, Eric de (2013) 'Werken bij een Filmarchief / Filmmuseum, of: Schizofrenie als opdracht', in: Cinémathèque royale de Belgique (ed.) ***75000 Films***. Crisnée: Editions Yellow Now, pp. 121–137; p. 121.

51 Ibid.

2. The copyright dichotomy

Copyright has a significant impact on the circumstances in which archival material is made publicly available and influences access policies of archival institutions.[52] As a result, archives are involved in what Ronan Deazley has termed the 'significant opportunity for interplay between the ownership of the physical object […] and the ability to control the subsequent use and dissemination of the work.'[53] Both in the EU and in the US, copyright currently lasts for a term of 70 years beyond the death of the author. In general, this means that the majority of all films are still under copyright, so the fear that Raymond Borde expressed in regards to the interference of rightsholders to archival holdings wasn't entirely unfounded. 'The ownership of the copyright is independent of the ownership of the physical medium in which the work is expressed, and so it is perfectly possible for one person to own copyright in an object physically owned by another.'[54] This copyright dichotomy between material and intellectual ownership is most palpable in a public-sector archive, particularly in the resultant tension for access to archival material. Although nowadays specific limitations as well as (partial) transferal of rights are usually laid down in a contract with the donating party, generally, these types of institutions own the rights to very little material. The British Film Institute, for instance, estimates that the material to which it owns the rights plus the material that is out of copyright combined amounts to little more than 5% of the whole of the national collection.[55] The archive's opportunity for the interplay between the ownership of the physical object and the ability to control the dissemination of the work mentioned above is shaped significantly by the rights holders.

3. The colourisation debate

Some of the tasks and roles of the archive came under tension and were exposed in light of the colourisation debate in the US in the late 1980s. The debate instilled the fear that the black and white films that everybody knew might be replaced by colourised copies, with no access to the black and white originals in the archive.

Although experiments with colourisation were being done for some years, the controversy really picked up speed when media mogul Ted Turner bought the MGM and RKO film libraries in 1986 and 1987 respectively, including the copyright to the films. Turner quickly announced he wanted to colourise the films. Films originally shot (and later instilled in audiences' collective memory) in black and white were colourised with the help of digital technology. A video copy of the film was colourised, while the original black and white film elements were left 'untouched':

> The team's first task was to take the best available copy of the film and transfer it to one-inch videotape. For the purpose, Turner had a freshly minted print struck from the original negative. This pristine celluloid copy was then dubbed onto videotape, and a digital computer was used to further enhance the picture by removing any discernible blemishes.[56]

52 Hudson, Emily, and Andrew Kenyon (2007) 'Digital Access: The Impact of Copyright in Digitisation Practices in Australian Museums, Galleries, Libraries and Archives', ***UNSW Law Journal***, 30(1), pp. 12–52.

53 Deazley, Ronan (2006) ***Rethinking Copyright: History, Theory, Language***. Northampton; Cheltenham: Edward Elgar; p. 124.

54 Hunter, Dan (2012) ***Intellectual Property. The Oxford Introductions to U.S. Law***. New York: Oxford University Press; p. 41.

55 General counsel of the BFI Richard Brousson, quoted in Derclaye, Estelle (ed.) (2009) ***BILETA conference***. The University of Winchester Law School, 30 March [Online]. Available at: http://works.bepress.com/cgi/viewcontent.cgi?article=1023&context=estelle_derclaye (Accessed 9 March 2016).

56 Edgerton, Gary (2000) 'The Germans Wore Gray, You Wore Blue: Frank Capra, Casablanca, and the Colorization Controversy of the 1980s', Journal of Popular Film and Television, 27(4), pp. 24–32; p. 28.

Not only were potential returns high because colour titles, as opposed to black and white ones, could be programmed on television in prime time;[57] Turner had his own television channels to distribute the materials, which presented a gigantic 'corporate coalition that controlled both the copyrights and the ancillary markets.'[58]

The decision to colourise these films seems to be fuelled by an arguably more important factor. A large amount of the black and white titles were about to enter into the public domain. But as colourised, derivative, works they were granted another 75 years of copyright protection:

> One of the major advantages of the colorization process and its competitors was that by adding color to black-and-white films, it was possible to copyright them as new titles, thus adding additional years of copyright life to a copyright protected black-and-white feature and starting a whole new copyright life for a film already in the public domain. Of course, the colorization process [did] not affect the copyright status of the black and white original.[59]

The Library of Congress confirmed the difference of the colour-converted CASABLANCA (US 1942, Michael Curtiz) from the original by awarding a new copyright to the Turner Entertainment Company in July 1988, a decision in which it was determined that a minimum of three added colours to a black-and-white film were needed to legally copyright the new version as a separate work.[60]

Colourisation as a method to extend the duration of copyright protection exposes the copyright holder of a film as the most powerful party in relation to the public accessibility of the title, irrespective of who owns the films 'creatively', or materially. Colour conversion, and a new copyright, made an investment seem profitable:

> It's only feasible to convert to color if you own the world rights, since the cost would be prohibitive for small markets. … [Turner] might have hesitated to pay 1.2 billion USD for a film library if the pictures had soon lapsed into the public domain. By converting them to color, though, he could get a fresh copyright, which would be valuable for years to come in the broadcast and cassette markets. … [T]he companies were trying to conjure private property out of the public domain.[61]

The arguments *for* colourisation often took a teleological stance: if the original filmmakers would have been able to, they would have shot the films in colour, based on the underlying idea that black and white would be a primitive version of a colour film. Most of the filmmakers themselves initially deemed the process interesting; Frank Capra, for instance, was an early adopter. When it became clear, however, that their permission was not needed for the colourising process, as in most cases the filmmakers were not the rights holders or the

57 Slide, Anthony (1992) ***Nitrate Won't Wait: A History of Film Preservation in the United States***. Jefferson: McFarland & Company.

58 Edgerton, Gary (2000) 'The Germans Wore Gray, You Wore Blue: Frank Capra, Casablanca, and the Colorization Controversy of the 1980s', ***Journal of Popular Film and Television***, 27(4), pp. 24–32; p. 25.

59 Slide, Anthony (1992) Nitrate Won't Wait: A History of Film Preservation in the United States. Jefferson: McFarland & Company, p. 124.

60 Edgerton, Gary (2000) 'The Germans Wore Gray, You Wore Blue: Frank Capra, Casablanca, and the Colorization Controversy of the 1980s', ***Journal of Popular Film and Television***, 27(4), pp. 24–32.

61 Klawans, Stuart (1990) 'Rose-Tinted Spectacles', in Miller, Mark Crispin (ed.) ***Seeing Through Movies***. New York: Pantheon Books, pp. 150–185; p. 175.

film had already lapsed into the public domain and no permission was needed at all, most of them became vehemently against the practice.[62]

The arguments *against* colourisation included ethical aspects as the practice would condone a so-called falsification of history. Anthony Slide explains that copyright holders were seen to have an 'ethical responsibility'[63] to protect and preserve the artistic integrity of black and white films. Colourisation was seen as 'cultural vandalism and a distortion of history' and an 'unwarranted intrusion into the artistry of the cinematographer.'[64] The filmmakers in their arguments against the practice focussed on the rights of the mass audience, whose sensibilities would be corrupted if they were deprived of the original black and white versions.[65]

Turner relished in the controversy and welcomed all sorts of accusations, provocatively telling reporters at a press conference in the summer of 1988 that he 'colorized CASABLANCA just to piss everybody off.... I wanted to do it and it's mine.'[66] The audience, in turn, did not seem to care all that much: they watched the broadcasts and they bought the videotapes, but had lost interest by the early 1990s as soon as the novelty wore off.[67]

For several decades, film archives have preserved colour films in black and white as an established preservation and restoration practice, both for monetary reasons as well as for long-term chemical stability reasons.[68] Although film scholars have addressed these preservation details in the context of film historical practices,[69] they have gone by fairly unnoticed and have, surprisingly, never been framed in the context of a possible distortion of film history.

Motion pictures have also been a television staple for decades. Distortions and alterations, such as panning and scanning,[70] lexiconning,[71] and other editing functions, for instance, have been used to present theatrical films in television format.[72] These techniques, although creatively controversial in their own right and often opposed by the filmmakers themselves, have also never been framed in the context of a potential distortion of film history before.

So why was the inverse of the standard archival practice, the colourisation of black and white films, such a controversy? Was it perhaps the realisation that the archive could not be a safe haven for an 'official' film history that was so unsettling? Was the controversial part of the matter

62 Directors spearheading the crusade against colourisation were, amongst others, Frank Capra, Woody Allen and John Huston; director Orson Welles, on the other hand, could base himself on a clause in his contract that prevented any tampering with his work and so, he could prevent the colourisation of Citizen Kane (Slide, Anthony (1992) ***Nitrate Won't Wait: A History of Film Preservation in the United States***. Jefferson: McFarland & Company.).

63 Slide, Anthony (1992) ***Nitrate Won't Wait: A History of Film Preservation in the United States***. Jefferson: McFarland & Company; p. 127.

64 Ibid.; p. 129.

65 Edgerton, Gary (2000) 'The Germans Wore Gray, You Wore Blue: Frank Capra, Casablanca, and the Colorization Controversy of the 1980s', ***Journal of Popular Film and Television***, 27(4), pp. 24–32.

66 Slide, Anthony (1992) ***Nitrate Won't Wait: A History of Film Preservation in the United States***. Jefferson: McFarland & Company; p. 126.

67 Edgerton, Gary (2000) 'The Germans Wore Gray, You Wore Blue: Frank Capra, Casablanca, and the Colorization Controversy of the 1980s', ***Journal of Popular Film and Television***, 27(4), pp. 24–32.

68 Read, Paul, and Mark-Paul Meyer (2000) ***Restoration of Motion Picture Film***. Oxford: Butterworth-Heinemann.

69 See for instance Lameris, Bregt (2007) ***Opnieuw belicht: de pas de deux tussen de filmmuseale praktijk en filmhistorische debatten***. PhD Dissertation, Universiteit Utrecht.

70 This is a process by which theatrical motion pictures, composed for viewing on large screens, are altered to fit on the narrower television screen (United States Copyright Office (USCO) (1989) ***Technological Alterations to Motion Pictures and Other Audiovisual Works: Implications for Creators, Copyright Owners and Consumers***. Report of the Register of Copyrights, p.6. [Online]. Available at: http://digitalcommons.lmu.edu/elr/vol10/iss1/1/ (Accessed 9 March 2016).)

71 Ibid. This technology involves the electronic time compression or expansion of a motion picture in order to fit the picture into broadcast time slots.

72 Kohs, David (1988) 'Paint Your Wagon-Please!: Colorization, Copyright, and the Search for Moral Rights', ***Federal Communications Law Journal***, 40, pp. 1–38.

related to the stability of the established film canon? Colourisation created new versions that could be protected for copyright and there was a real fear that it was these new colourised versions that would live on exclusively in favour of the black and white versions that audiences had become familiar with. And in turn, the idea that certain titles can only be accessed in a way or in a version that differs dramatically from the way the film is generally remembered shakes the very idea of what a film archive is. As opposed to a place that helps preserve the stability of the film canon, it became to be seen as a mere warehouse for copyright holders' property.

One of the outcomes of the colourisation controversy was the establishment of a national film commission with the purpose of building a National Film Registry, a canon of distinguished films. 'The National Film Preservation Act, part of a Department of the Interior appropriations bill, create[d] a 13-member panel that could name up to 25 movies a year to be included in a national registry of classic films,'[73] which are 'culturally, historically, or aesthetically significant films,'[74] showcasing the range and diversity of American film heritage to increase awareness for its preservation. Whether the name of the bill reflected what it was supposed to do has been questioned:

> The name of the bill [The National Film Preservation Act] is, of course, a misnomer. It has nothing whatsoever to do with film preservation. All the bill does is have the Librarian of Congress, in collaboration with his appointed panel, select 25 films a year *which can still be altered in any way by their copyright owners*.[75]

The Act, however, could and can also not protect the so-called safety of the film titles: 'The longest anyone would be able to thwart the colorization process would be a period equal to the duration of the copyright in the film itself. After this period […] the film falls into the public domain and anyone is free to make a colorized version.'[76]

So, the real question underpinning the colourisation controversy seems to be what 'official' film history is or where it might reside:

> Films made in the black and white era capture and record the heritage and culture of a time now passed. To present altered versions of these films, it is said, is akin to presenting an altered version of American history. Instead of educating the young as to the worth of these original films and their era, colorized films instead present a faddish and distorted view of history.[77]

Part of that fear might even be justified: given the tremendous financial investment required for colorisation, 'it is likely to be the colored version, which will, perhaps exclusively, be marketed. The public cannot [easily] go into the archive and see the original black and white print. As a result, original black and white works might indeed be effectively replaced by colorized

73 NYT (1988), 'Reagan Signs Law on Film', ***New York Times***, 28 September 1988.

74 Slide, Anthony (1992) ***Nitrate Won't Wait: A History of Film Preservation in the United States***. Jefferson: McFarland & Company, p. 131.

75 Ibid.; p. 131, ***author's emphasis***. In the UK, the situation was dealt with differently. A call for action by the British government brought a response from the Department of Trade and Industry: 'Where copyright still subsists then it is a matter for the copyright owner, and not the Government, to decide whether or not to allow coloured reproductions to be made.' (Slide, Anthony (1992) ***Nitrate Won't Wait: A History of Film Preservation in the United States***. Jefferson: McFarland & Company; p. 129.)

76 Kohs, David (1988) 'Paint Your Wagon-Please!: Colorization, Copyright, and the Search for Moral Rights', ***Federal Communications Law Journal,*** 40, pp. 1–38; p. 19.

77 Ibid.; p. 36.

copies.'[78] Not all of the filmic evidence that is kept in the archives is accessible. The colourisation debate made it obvious that what was extant was not necessarily available and that which was available was not necessarily publicly accessible. Some of the material was now under threat to only be publicly accessible in a different form.

The colourisation debate brought to light the powerful position of the rights holder and the dichotomy between intellectual ownership and material ownership (and what perhaps could be called the audience's 'cultural' ownership). Moreover, the archive was exposed as a vulnerable place:

> the innovative technologies that brought about the ability to replicate and exhibit films inexpensively also created the capacity for people outside of the archival setting to alter the content and meanings of canonical films. [...] Colorization technology also revealed a significant and troubling fact about the cinematic artefact: powerful people and new technologies could dramatically alter films sitting safely in the archive. The film archive... hardly guarantees a fixed and stable cinematic memoryscape.[79]

Not only the archive was on shaky ground, but also the writing of film history, as 'filmic meaning was not necessarily tied to or correlated with the cinematic artifact protected in the archival vault.'[80] What colourisation emphasised is that the film archive 'could not maintain, protect, or help to construct a singular cinematic meaning for any film.'[81] The stability of the cinematic canon was called into question if films could easily be altered and their carefully constructed place in film history could be unsettled. The colourisation debate threatened the established position of the archive, as well as questioned and undermined the film's and the film archive's status as a primary source.

4. The embargoed film

Another example where the copyright dichotomy between intellectual and material property is palpable is the embargoed film in the public-sector archive. Als twee druppels water (The Spitting Image, NL 1963, Fons Rademakers) was such a film; a film under copyright and initially not publicly available, as specified by the restrictions of the copyright holder. Despite the remit of the public-sector film archive that safeguarded the film's material of preservation, restoration and dissemination, it took nearly four decades for the film to return to the screen. With the intervention of the safeguarding archive's archivists, the title is currently regarded as one of the most important post-WWII Dutch feature films.

Director of the film Fons Rademakers needed 40% additional funding for his film to supplement the financing he received from the national Production Fund for Dutch Films (*Productiefonds voor Nederlandse Film*) and approached several rich industrialists.[82] He ultimately found a partner in beer tycoon Freddy Heineken who was looking to break into film producing and wanted to finance the additional budget himself exclusively.[83] By financing and producing the film, Heineken became the rights holder of the film.

The film was an international success, not in the least because of cameraman Raoul Coutard's work, who had just finished such hits as À bout de Souffle (F 1960, Jean-Luc Godard) and

78 Ibid.; p. 30.
79 Jones, Janna (2012) ***The Past is a Moving Picture. Preserving the Twentieth Century on Film***. Gainesville: University Press of Florida; pp. 18–19.
80 Ibid.; p. 78.
81 Ibid.
82 Barten, Egbert (2002) 'Een verloren klassieker', ***Skrien***, 34(8), pp. 22–24.
83 Ibid.

Jules et Jim (F 1962, Francois Truffaut).[84] The film played in competition at the International Film Festival in Cannes in 1963 with such films as Visconti's Il gattopardo and Otto e mezzo by Fellini[85] where it was nominated for a Golden Palm.

A few years later, in 1966, the film was broadcast on Dutch television for the first and only time. In search of more control over his creative efforts, Rademakers put in a request to acquire the film's rights from Heineken, but the request was denied. Heineken allegedly did so in order to retaliate against an ex-girlfriend who had played a role in the film and who had broken off the relationship. Effectively, this meant that as the rights holder, Heineken withdrew the film from circulation and what was considered, according to Dutch newspaper *Het Parool*, a 'courageous film noir of European stature,'[86] vanished behind the vault doors of the *Nederlands Filmmuseum*.

The reason why Heineken withdrew the film is unimportant, however, the fact that he could is significant. The rights holder as the sole decision maker in what happens to a film, as opposed to for instance the director, is a direct re-run of the example in the previous section, in which 'the right to exploit his creative contribution or object to an alteration of the same, is not the director's to assert.'[87] It is the rights-holder's.

After the film had been withdrawn from public viewing, it was screened a few times at special occasions, such as a Rademakers retrospective, after express permission by Heineken. One could also see the film in private viewings at Heineken's if he gave permission, however, further public cinema and television screenings were out of the question. Heineken obstructed the film's television broadcast in the 1980s, for instance.[88] Rademakers learned from his experience on Als twee druppels water and decided to produce all his subsequent films himself.[89] This meant that he was the copyright owner and therefore in charge of what would happen to the films.

In the meantime, the *Nederlands Filmmuseum* carried the financial responsibility for the continued preservation of the work. Heineken passed away in early 2002 and negotiations were re-opened between archivists at the *Nederlands Filmmuseum* and Heineken's heirs, who agreed to the restoration and re-distribution of the film.[90] The film re-premiered in September 2003 at the Nederlands Film Festival in Utrecht after having been out of the (Dutch) audience's collective memory for nearly four decades. It was heralded for its complex portrayal of the Second World War, as opposed to other films of the same era. De overval (The Silent Raid, NL 1962, Paul Rotha), for instance, confirmed the prevailing Dutch image of the war: sober and humble heroes who defended themselves against the occupiers. Als twee druppels water, however, suggested deeper philosophical questions of whether right and wrong, betrayal and resistance are what they seem, and whether a morally correct choice is at all possible.[91] The film is now considered one of the most important post-war Dutch feature films.

84 Welgraven, Co (2001) '…ging Als twee druppels water achter slot en grendel', ***Trouw***, 26 March 2001.
85 Barten, Egbert (2002) 'Een verloren klassieker', ***Skrien***, 34(8), pp. 22–24.
86 Ibid.; p. 23.
87 Kohs, David (1988) 'Paint Your Wagon-Please!: Colorization, Copyright, and the Search for Moral Rights', ***Federal Communications Law Journal***, 40, pp. 1–38; p. 10.
88 Driel, Anne van (2003) 'Ach, zo'n gerucht doet het goed voor de film', ***de Volkskrant***, 23 August 2003.
89 Beerekamp, Hans (2002) 'Wie kent de film van Freddy?', ***NRC Handelsblad***, 4 January 2002.
90 Bracht, Maarten van (2012) 'Freddy's motieven' [Online]. Available at: http://www.vpro.nl/boeken/artikelen/vpro-gids/2012/oktober/de-donkere-kamer-van-damokles.html (Accessed 9 March 2016).
91 Schoots, Hans (2004) ***Van*** Fanfare ***tot*** Spetters. ***Een cultuurgeschiedenis van de jaren zestig en zeventig***. Amsterdam: Uitgeverij Bas Lubberhuizen.

5. Conclusion

The examples in this paper have highlighted a certain instability of the film archive as a safe(guarding) place for potential historical sources, both in terms of the memories attached to certain versions of films and the availability of the physical material. Issues of intellectual property can be seen to underpin understandings of public accessibility. Powerful rights holders might change the form and version of films with the advent of a new technology or might keep films out of the public realm altogether. If films are potentially available but not publicly accessible, their possibilities to engage with the dynamics of history and to reach their potential for history making will be limited.

What the examples also have alluded to is another dichotomy: the dichotomy between film history as professed by textbooks and the actual holdings of a film archive. An inhibited visibility of important works of film that are arguably crucial to a more fully understanding of the history of film is the result if a film archive cannot provide access to its holdings. The film archive can be seen simultaneously as a result of a particular historical narrative as well as contributing to one, and the partial picture of sources is part of that historical narrative. Examining the film archive as a safe(guarding) place for potential historical sources exposes both film history and intellectual property as historically and culturally contingent concepts. The idea of what film history is or where (official) film history resides might have to start with the idea of its interconnectedness with the system of intellectual property.

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SECURING AUDIO TRANSFER

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1. Is recording safe?

Digital transmission and storage of information is widely assumed to function free of unwanted alteration and corruption. Barring an error message, we usually assume digital information to be complete and authentic.

Audio professionals however frequently report potential error conditions that often go unnotified by operators as they occur. Jargon words such as "drop-out", "glitch", or "click" were coined in that context. Often ambiguous, these terms refer to symptoms that may not be apprehended easily, but from all of which information loss, or information corruption, may be inferred.

As this affects equally the transfer of archival collections in the capturing of physical media to digital files, curators should be particularly sensitive with this phenomenon. From start to end of the transfer chain, established Quality Assurance efforts begin with controlling the conditions of legacy reproduction equipment, such as cleaning and alignment. Only the best Analogue-to Digital Converters (ADC) will be acceptable[92] in digitisation. The transmission paths of linear, digital signals are typically secured using Error Detection Code (EDC) and Error Correction code (ECC).[93] For digital documents, Fixity information such as cryptographic hashes can prove authenticity.[94]

The transition from continuous protocols to packets is a tipping point in Quality Management of digital information. When capturing the signal to a file, or when sending it through a network, the continuous signal stream has to be packetized. This is because these systems use packets, memory pages, or storage blocks. For the specific case of Hard Disc Recorders that are built on general-purpose operating systems (Linux, Windows, or Mac OS), interrupt handlers make it necessary to use comparatively large packets. Essentially, these interrupt handlers work on time slices. Specifically Second Level Interrupt Handlers scheduling kernel processes have become notorious under their Microsoft brand name *Deferred Procedure Calls*, or DPC[95], for triggering glitches when recording Video and Audio.

Notably, for most packetized domains of a transfer chain, standardised error detection methods do not exist so far. This is true for capturing to file and for some network transfer protocols based on User Datagram Protocol (UDP). Using ECC-protected Transfer Control Protocol (TCP) instead, an error would lead to re-transmission, which incurs latency that is often not acceptable due to service quality requirements. Thus, there is concern about potential corruption of the information passing through these components. Popular audio driver models such as ASIO[96] do not provide any flow control, error pointers, or detection codes. Further errors may be caused by shortcomings as trivial as protocol-specific handling of intermittent contact. Googling "firewire audio loose contact" returns more than 300,000 hits, potentially pointing to an issue too widespread to ignore.

Recently, FADGI, the Federal Agencies Digitization Guidelines Initiative, has released studies on the quality aspects of digital audio.[97] This includes a study on errors that may occur between the analogue to digital converter and the recorded file, titled "Performance Impairments

92 IASA TC-04, Second Edition, Chapter 2, Key Digital Principles.
93 AES3 CRC: See https://tech.ebu.ch/docs/tech/tech3250.pdf; SDI CRC and EDH, see: https://en.wikipedia.org/wiki/Serial_digital_interface#Line_counter_and_CRC.
94 http://blogs.loc.gov/digitalpreservation/2012/03/file-fixity-and-digital-preservation-storage-more-results-from-the-ndsa-storage-survey/.
95 Analyzing Interrupt and DPC Activity, see: https://technet.microsoft.com/en-us/library/cc938646.aspx.
96 https://www.steinberg.net/de/company/developer.html (see: "ASIO SDK").
97 http://digitizationguidelines.gov/audio-visual/documents/Interstitial_Error_Report_2013-04-08.pdf.

Caused by Interstitial Errors." The study includes a field survey leading to the conclusion that the matter of information corruption on computers is of substantial relevance. Fifty-six (56) out of 83 respondents have encountered such errors previously.[98] The occurrence rate of such errors has been stated with approximately once per 100 hours of recorded audio. This is an observation which is shared by the author. As on the other hand, audiovisual collections amount to hundreds of thousands of hours in large institutions, the issue should be of substantial importance for curators.

Against this background, the problem needs a solution that is both reliable and low-threshold for adoption and operation.

2. Error patterns

Taking a generic information technology (IT) approach, errors occur as single bit, or burst, errors. IT typically uses the bit error rate, or BER, which counts false bits per total bits transmitted. For Audio, the severity of a corruption can be judged by the audibility of a disturbance, which is not always in line with the amount of information corrupted. For instance, a single bit flip can cause a disturbance that is more obvious than hundreds or thousands of missing samples, depending on which position in the digital word it occurred.[99] Still, for the archivist, none of that is acceptable.

2.1 Missing information

Missing samples occur as the absence of a part of the signal on the time line. For instance, the picture below shows a 256 sample buffer missing from the signal. It will result in a click.

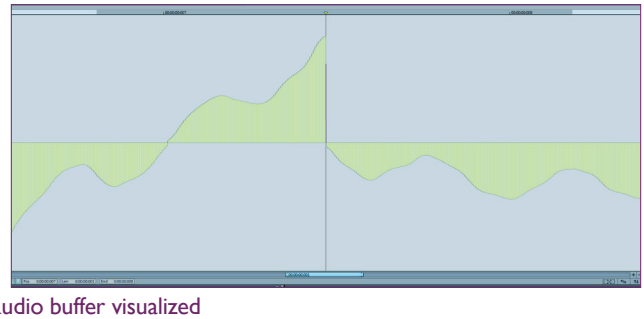

Figure 1 Missing audio buffer visualized

The author of the FADGI Study, Chris Lacinak, has coined the term "Interstitial Error" for this phenomenon, defining them with the statement, "Interstitial errors consist of lost or altered samples within the recorded file, resulting in the loss of content and integrity."[100] Occurrences have been reported as 1/100 h, or more. If caused by DPC queue overruns, they may occur as often as 1/1min.

98 http://digitizationguidelines.gov/audio-visual/documents/Interstitial_Error_Appen_2012-09-11.pdf, p. 58.
99 John Watkinson, The Art of Digital Audio, p. 17.
100 http://www.digitizationguidelines.gov/guidelines/digitize-audioperf.html.

2.2 Positional disorder

Packetizing may lead to audio samples in the wrong order. Practically, this will most likely occur with scattered blocks, instead of scattered samples.

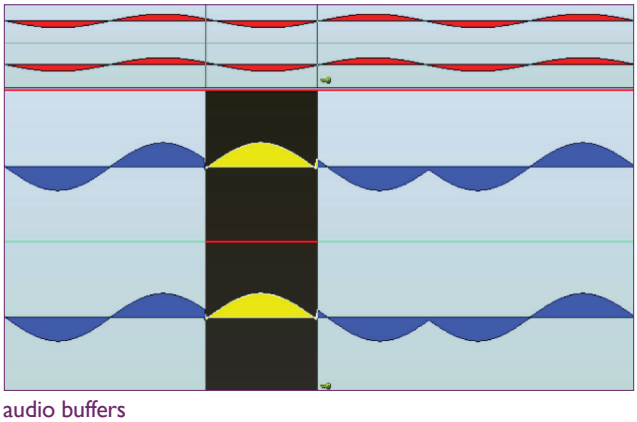

Figure 2: Swapped audio buffers

Figure 2 shows an identical signal recorded to two channels of the same interface. The lower channel exhibits audio 256 sample blocks A-D, in sequence of A-C-B-D. Note that there is no discontinuity in the time basis. The problem discovered by the author in 2008 was caused by a firmware bug in an audio interface (the blocks were already swapped when the signal hit any application), and the error would occur at least once in 10 h of continuous recording. Notably, the manufacturer acknowledged the issue, but refused to fix it. The solution was to downgrade the firmware, respectively the driver. One can imagine that with natural signals, the error may be rather subtle and hard to detect by established methods. When found, it can be completely reverted using a sample editor, however at a tremendous effort.

2.3 Corrupted information

Different error conditions may lead to wrong sample values. For example, a mute event may have occurred in the signal chain, issuing digital signal 0 instead of the actual signal values, or the signal path was affected by noise, leading to altered bits.

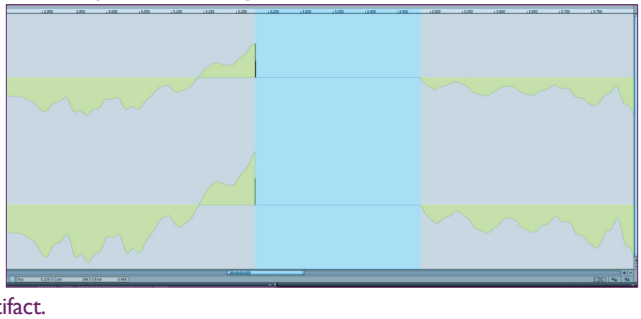

Figure 3: Mute Artifact.

Information could be corrupted by parasite signal processing that may have been introduced into the signal chain without the awareness of the system designer or operator.

While an archival signal chain will usually want to avoid the use of equipment that may alter the signal in the transcription process, such as analogue or digital mixers, specifically commodity components may have unexpected features. For instance, consumer sound cards may have a Sample Rate Converter (SRC) of unknown quality standard that will alter the signal.

On Microsoft platforms, following the implementation of the so-called *Universal Audio Architecture*,[101] legacy application programming interfaces (API) such as *DirectSound* and *Multimedia Extensions* (MME) were deprived of a direct access to the physical sound card. The API usually would still function, however the signal would be routed through the operating system's *Mixer*, detaching control over the actual sample rate and level of the signal. This may result in unwanted re-sampling, or peak limiting.

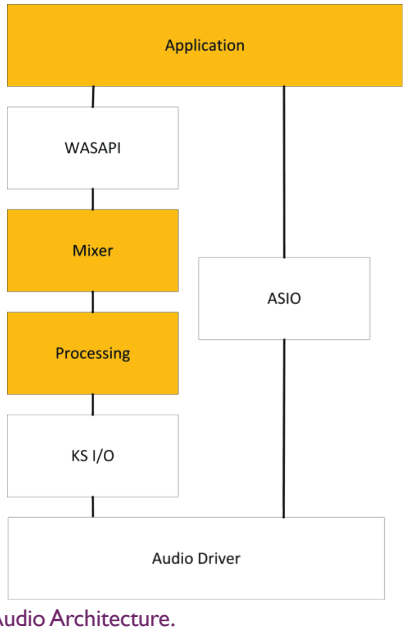

Figure 4: Microsoft Universal Audio Architecture.

The coloured elements in Figure 4 may introduce signal-altering processing.

3. Established quality assurance methods

As Quality Assurance is paramount in all archival transfer procedures, established methods to identify information corruption exist, and they should be evaluated in how successfully they can help with the subject.

3.1 Listening

Critical listening is probably the most accepted method for checking audio content. When done with 100% coverage, it does usually provide good quality assertion. On the other hand, the effort required presents a serious burden, specifically for high-throughput processes in industrialized environments. For distributed workflows, such overhead may be unacceptable. Specifically for interstitial errors, the method has two additional caveats that should not go unmentioned. First, listening fatigue which is the most critical parameter for this method may lead to error events going unnoticed, and this is specifically problematic with events that may only occur every few dozen hours. Fatigue can be regarded as a special case of reduced Quality Control (QC) coverage. Sample checking is an intentional way of reducing effort by reducing QC coverage. This however comes with a reduced detection rate, and thus will not lead to better efficiency. Moreover, listening can only identify an anomaly as such, but usually it cannot tell if it concerns a newly added error, or if the disturbance is pre-existent.

101 Microsoft, Universal Audio Architecture https://msdn.microsoft.com/en-us/library/windows/hardware/dn640534%28v=vs.85%29.aspx.

3.2 System sizing and optimisation

Over-sizing transmission paths and recording devices to prevent performance-related errors is a widespread approach. This is owed to the fact that Ethernet and computers have become commodity goods.

Audio engineers are cautious when it comes to the choice of their digital audio workstation (DAW). DAWs based on general purpose processors and operating systems have become prevalent since about 1995 when personal computers became powerful enough to crunch two channels of standard resolution audio and record them to disk. The invention of the DAW has since revolutionized audio technology.

Since 1995, single-thread processor performance has increased at an annual rate of 52% until 2004, and at an annual rate of 21% for the last decade. Today, this has resulted in a 128-fold increase[102] (for Integer instructions). Moreover, current commodity processors offer simultaneous multithreading at 4 threads, or more. In the same period, the bandwidth per information channel increased by merely six times (6x) when going from 16 to 24 bits (1.5x), increasing the sample rate to just below 200 kHz (4x). With these figures in mind, it is hard to imagine that modern computers still may cause problems when recording audio.

When looking at the above mentioned phenomenon of excessive Second-level Interrupt Handler rates, these unfortunately do not scale with performance, but may remain at the same values. It has to be observed that excessive DPC queues are regarded as an abnormal operating condition, and the most common source is a software bug, or an interoperability problem.

Figure 5: DPC Latency Analysis.

At the same time, optimisation guides exist both for MAC [103] and PC [104] which all basically aim at reducing the count of concurrent processes that may consume processor time. Some of the measures, such as deactivating serial interfaces or network controllers, may affect usability. For network transfers, similar concepts exist. A 1000 Mbit/s network link has a net capacity of approximately 100 MB/s in both directions. This is equivalent to streaming around 700 channels of 24bit audio at 48 kHz sample rate. Current commercial Audio over IP (AoIP) solutions use that bandwidth at typically 10% (64 channels).[105]

Over all, platform sizing and optimisation are absolutely relevant when it comes to production of digital audio files. The best error detection method will not prevent errors on undersized or flawed equipment; it will only provide evidence that something is not right. On the other hand, an oversized platform does not guarantee results that are free from errors. Only specific error detection methods can provide this information.

102 http://preshing.com/20120208/a-look-back-at-single-threaded-cpu-performance/.
103 http://us.focusrite.com/answerbase/optimising-your-mac-for-audio.
104 https://www.audinate.com/faq/how-can-i-tune-windows-pc-best-audio-performance.
105 https://www.audinate.com/products/manufacturer-products/dante-brooklyn-ii.

3.3 Signal analysis

Signal analysis is based on pattern recognition, raising a notice on the occurrence of the error pattern in the signal. It typically uses detection of "not natural" signal forms, such as clicks, or periods of silence, or spectral anomalies such as exaggerated high-frequency content. As long as the error keeps the pattern, these methods provide good detection rates. Unexpected error patterns will however not be detected. For detection patterns that are too generic, a high rate of false positive error pointers will be generated. Pattern detection in principle is not able to discriminate errors that have been added on transfer from those that already existed in the original. Other drawbacks are that results usually still require some manual interpretation, and that the analysis and validation are resource-costly.

3.4 Flow control

Several digital audio workstations offer error pointers to buffer underruns and overflows. Within the domain of the DAW, this method provides good protection. It does not help with signal alterations caused by software bugs, bit-rot, or parasite processing.

3.5 Process redundancy

A system recently suggested in the FADGI study[106] involves the use of a second recording system, in parallel to the actual production DAW. In short, an additional capture system, typically a standalone recorder, is defined as a reference platform that will not cause any (or at least not the same) errors during transfer. The method requires parallel systems that are sufficiently different. After the completion of the capture, both recordings will be compared, using signal processing and/or cryptographic methods, asserting the production recording being accurate as long as no difference between them can be detected. This method has several advantages above aforementioned approaches, as it is specific to errors introduced during the transfer process. However, it introduces considerable acquisition and operation overhead, which seems to reflect in the low adoption rate so far reported by the study author in personal conversation with me.

4. A new approach

Ideally, protection against information corruption in archival transfers would be non-intrusive, reliable, and affordable. As the error patterns are random and intermittent, constant monitoring is required to catch the events reliably. The domain of interest starts with the Analog to Digital Converter (ADC), and ends with the written file.

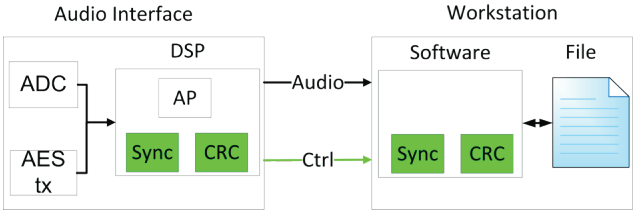

Figure 6: NOA BitProof™ block diagram.

One possibility to add Quality Assurance (QA) to the transfer chain is to use Error Detection Codes that transmit as metadata of the audio stream in real time. As already mentioned, standardised protocols for that purpose do not exist. As an implementation cuts through several functional units and protocol layers (i.e., audio interface, streaming transport, block transport, operating system APIs, application layer, file system, and block storage), vendor-independent

106 http://digitizationguidelines.gov/audio-visual/documents/Interstitial_Error_Appen_2012-09-11.pdf.

standardisation of such a process is complex, probably outstripping actual implementation by far. For NOA, as a specialized vendor in a niche market, a proprietary implementation is quite obvious. Since NOA is a manufacturer of audio transfer hardware, as well as software, we have access to the required components.

The required building blocks for implementation are available technology. As most current audio interfaces, NOA's products feature a Digital Signal Processor (DSP), and there is audio recording software, running on a general-purpose operating system. Both components are suited to crunch Error Detection Codes (EDC) on the signals passing through them, and do the same for the information written to disk, i.e., cyclic redundancy code (CRC). Additionally, NOA's interfaces provide a remote control interface between converter and the recording software that is otherwise used to control the ADC, log QA data from the ADC, and to control attached re-players. This remote control interface may be used to transmit the EDC information simultaneously to the audio signal. As the AES-3 audio interface does not allow to transmit custom data (at least not as required for the purpose), this helps to overcome an otherwise substantial impediment. At the same time, this approach allows using any audio transport path with the same safeguard, including AoIP solutions like AES-67, Dante, or AVB.

The actual working principle includes the following steps:

1. Upon record start, the host software requests a positional reference in the audio stream from the audio interface ('Sync').
2. The audio interface periodically transmits EDC to the host software.
3. The host software obtains the same information from the recorded file and compares it with the reference information from the audio interface.
4. If a mismatch is detected, an error message is provided to the operator. If the EDC codes on sender and receiver match, normal operating conditions are secured, and no further information needs to be provided.

The error patterns relevant for detection include missing information, altered information, corrupted information, and positional disorder. For these errors, any error detection code with positional weighting is suited, including the most basic CRC polynomials. Parity codes are equally useful for all error patterns, with the exception of positional changes (swapped buffers, see section 2.2), as parity does not provide positional information.

The most relevant benefits of this method are that it is immediately available, it is reliable, and it does not incur any operational overhead. In fact, the user will not recognize that any safeguarding is in place unless an error occurs.

5. Conclusions

Securing information integrity is among the most important targets in preservation systems. The proposed method addresses notorious error sources of conventional audio digitisation environments and significantly increases Quality Assurance standards. Error Detection Codes securing the entire transfer chain from the audio interface to the recorded file cause no overhead for the operator. Therefore, the same quality level is provided for small institutions, as for major archives, libraries, or broadcasters. It fits into occasional on-demand digitisation approaches in the same way as for systematic format migrations. Specifically, service providers may want to include this kind of safeguarding, creating added value for the services to their archival customers. Smaller archives that run their own on-demand digitisation activities profit from a consistent Quality Assurance, even if the equipment is only in use from time to time.

In an environment using Fixity to secure authenticity in the creation of Archive Information Packages (AIP),[107] the trusted domain can be extended towards the actual audio interface. Therefore, such Quality Assurance methods have specific relevance in Open Archive Information Management (OAIS) environments.

The method aims strictly at Quality Assurance, not at correcting errors. It helps with controlling the quality limitations imposed by the runtime environment of a preservation system; however it does not solve these limitations. For instance, a computer or a network losing information every minute will still be in the way of an efficient process. Typical commodity equipment that is working reliably, however, can be utilised with no problems, and the requirement to use specific components, like ECC memory, or very expensive audio interfaces is relaxed considerably.

107 OAIS Reference Model, CCSDS 650.0-M-2 http://public.ccsds.org/publications/archive/650x0m2.pdf.

QUALITY MANAGEMENT FOR PRESERVATION OF ANALOGUE AND DIGITAL VIDEO TAPE

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1. Formats come, formats go

At the time of writing, Sony has just given notice on the current Betacam ½-inch (Beta) Video Tape Recorder (VTR) models DVW-2000P and MSW-M2000P, as the last generation of the Betacam ½-inch (Beta)[108] family, with latest orders taken by 03/2016, and end of support as of 03/2023. With the first Beta-VTRs shipping in 1983, this puts an end to the Beta family after almost 40 years. The decision is significant for two main reasons. First, the Beta system had by far the highest market share of any professional VTR system, with emphasis on the Betacam SP (1986) format.[109] Second, the latest ½-inch Sony VTR will still play legacy formats, including Betacam SP, Digital Betacam, and Betacam SX. This is significant for the imminent transfer of large collections of those formats still sitting on the shelves. Beta SP machines, such as the BVW-75P, are still available as used stock and allow for a cost-efficient alternative for extraction of SP tapes.

For transferring video tapes it is required to have a good understanding of which parameters in the process chain are critical to reproduction and digitisation, in order to provide accurate preservation copies. For a Video Tape Recorder, key extraction parameters are:

- Intact tape-head system
- Provision of an accurate time base
- Composite-to-component conversion (for composite recording systems)
- Correct signal levels

All mentioned Sony VTR generations mentioned are comparatively easy to handle in migration projects. They are component-based (YUV), making any signal conversion in the digitisation process obsolete. Many Beta VTR models may be adapted to both 50 Hz and 60 Hz (PAL / NTSC) environments by the end user. All machines include Time Base Correction (TBC) that also compensates transitional drop-outs. Head Drum life is in the thousands of hours. The dominating issue with Quality Management regarding Beta family video therefore is the control of drop-outs, caused by the head-tape system.

The need for efficient transfer processes is amplified by the announced obsolescence of the Beta system. Exact figures about functional VTRs and playable cassettes do not exist. Experience with precedent format migrations in Broadcast collections nevertheless allows for the assumption that it will not be possible to extract all holdings with the existing machines before the Beta VTR family is to be considered extinct. Typically, operating cost will rise exponentially towards the end of the usability cycle of Beta VTRs. Additionally, Beta migration projects tend to be huge—analogous to the format's historical market share—which makes cost-efficiency and Quality Management important factors.

2. Quality Management

Quality Assurance (QA) and Quality Control (QC) are often used as synonym terms. Under the scope of ISO 9000:2015[110], they are both part of Quality Management (QM). However they have distinctly different meaning. Quality Control[111] traditionally includes item inspection. It requires the definition of quality metrics as well as the implementation of well-defined

108 http://www.sony.co.uk/pro/article/broadcast-products-vtr-announcement.
109 Schmidt, Ulrich, Professionelle Videotechnik, 6. Auflage, p. 568.
110 ISO 9000:2015 Quality Management Systems, www.iso.org/iso/catalogue_detail?csnumber=45481.
111 ISO 9000:2015, Clause 3.3.6.

processes, job management, skills, and experience, to name but a few. Quality Assurance[112] is a superordinate instance that establishes confidence that QM criteria will be fulfilled. This implies that QC will only be executed successfully with QA in effect.

The efficiency of Quality Control can be measured as the probability to detect an error. The multiplication rule of independent events—P(A,B) = P(A) x P(B)—helps us with this problem. P(A) is the error rate; P(B) is the sampling rate, thus the amount of probes to be checked in a transfer process. This could involve a complete check of every n-th transferred item, or a partial check of every transferred item. P(A, B) will, in this case, express the best possible detection rate. Obviously, this means systematic errors only need random testing to be reliably detected, but random error patterns need systematic testing, often constant testing for successful detection.

In audio-visual media, there are several initiatives dealing with QC metrics and methods. One prominent example is the EBU Quality Control group[113] which offers several tools and resources. The scopes of Quality Control in preservation and those of access/re-use of an asset differ fundamentally. Some Archives, specifically Broadcasters, are interested in signal quality parameters to ensure a low-overhead production process, aiming at high-quality playout. Moreover, regulatory requirements may be in effect. An example for this is the requirement for the BBC[114] to check programmes on *Photosensitive Epilepsy Stimuli*, rooted in a United Kingdom Independent Television Commission (ITC) guideline[115] to protect viewers' well-being. Within a preservation process, it is however fundamental to ensure that source information has been transferred accurately, including the pre-existent deformations. Preservation is inherently sensitive to newly added defects, only.

When dealing with archival collections of video material, information frequently is not available from its instantaneous carrier. In the early years of magnetic video storage, content was copied back and forth from film to video for practical reasons in TV production. The list of obsolete video formats is long, with prominent examples including the long-serving veteran Quadruplex, which was in use from 1956 until the 1980s in professional studios. However, there are quite a few cases of obsolete systems that served for considerably shorter periods, and became swiftly extinct after their commercial obsolescence, such as the Panasonic D3 system. Analogue-to-analogue migrations were common with VTR generations passing. Often, the previous carrier generation was terminally discarded, including original film stock. Against this backdrop, in contrast to the rules applicable for audio archival content[116], often the latest replication is the only accessible manifestation of certain programmes.

In the past, mass-migration was no less demanding than it is today. Replicated recordings often suffer defects originating one or several generations back. We find film scratches on IMX tapes, or defects typical for U-Matic on material played from Betacam SP.

For preservation transfers, it is important to emphasise the importance of QA as a key means of producing authentic information, and the main scope of QC here is to detect if any errors have been added in the last transfer. It is critical for efficient preservation Quality Management to provide such evidence in the Quality Check task, as otherwise any noticeable defect will raise the question of a transfer error. In an OAIS environment, Quality Management information is involved in Preservation Description Information, and is typically included when accessioning an Archival Information Package (AIP).[117]

112 ISO 9000:2015, Clause 3.3.7.
113 https://tech.ebu.ch/groups/qc.
114 BBC WHP 167, D3 Preservation File Format, http://downloads.bbc.co.uk/rd/pubs/whp/whp-pdf-files/WHP167.pdf.
115 http://stakeholders.ofcom.org.uk/binaries/broadcast/guidance/gn_flash.pdf.
116 IASA TC-04 Guidelines in the Production and Preservation of Digital Audio Objects: standards, recommended practices, and strategies: 2nd edition: 5.2.2 Selection of best copy.
117 OAIS Reference Model, CCSDS 650.0-M-2, p.4-38, http://public.ccsds.org/publications/archive/650x0m2.pdf.

With its first products released around 2000, NOA GmbH[118] has provided quality-controlled archival transfer tools and processes for over 15 years to archives and service providers. It was part of NOA's founding story to offer automated aides that allow a more reliable Quality Management than manual methods, and that allow reducing the time requirements of Quality Control at the same time.[119] The understanding is that real-time QC in audiovisual media is very time consuming, thus it becomes expensive and inaccurate (due, in part, to fatigue with the operators). Sample checking is not reliable enough, specifically not for random error patterns. That dilemma has resulted in a method called Traces Aided Spot Checking (TAS[120]), as a proven solution. The underlying principle of TAS is providing quality metrics as metadata, such as error rates and error events, or annotated re-player conditions such as Azimuth, ISR BLER, or C2-Errors, aligned in time with the extracted media. This data is produced automatically, without user interference. The generated information then may be used for automated or manual Quality Check procedures. This may happen, for example, by counting the occurrence of certain events such as ISR errors in a certain transfer, or helping a quality control operator to identify questionable portions of the signal for checking, as examples in this paper will highlight.

3. VTR drop-out detection

Typical playback interferences, such as dirt and loss of information in the magnetic layer, misalignment, clogging, and wear of the reproduction heads, manifest in transient or permanent loss of carrier signal level. The A/V Artifact Atlas project has undertaken to make examples of such defects publically available.[121] These problems are colloquially called "drop-out." In an analogue VTR they usually manifest themselves in line-based artefacts, whereas digital video usually exhibits block-based deformations. In extreme cases, for example, when the tape coating has disintegrated, or shed tape coating has clogged the video heads, the entire signal is lost, and complete break-up will occur.

Drop-outs may be detected using various approaches. Essence-based drop-out detection aims at finding typical patterns in the information (that is, in the coded picture), hinting at a problem. This usually happens in the digital domain. Pattern detection requires considerable computing resources. Its reliability depends on the accuracy of the model applied. Therefore, each specific error pattern needs explicit implementation. The main problem with preservation transfers however is that this method cannot provide the information if an error has occurred during extraction, or if it was already previously recorded. Such conclusion, without transfer quality monitoring in place, is only possible by taking assumptions from the complete genealogy of the recording. If the current media is not the instantaneous carrier, the interpretation will become complex, or a stringent assertion may even be impossible to make. This is an aspect that is relevant regardless of how accurate pattern recognition was implemented.

The carrier- and channel code based detection methods suggested here have the advantage to specifically provide information about drop-outs occuring during an extraction. They work independent of the actual error pattern in the essence, on a higher protocol layer than essence based detection. Carrier based detection measures the RF carrier amplitude periodically accumulated with the frame rate. The amplitude subsequently is statistically analysed, and compared to the expectation value. Thus, an error pointer is provided to the user, pointing at ranges with a high likelihood of a transfer-related signal error, as required for Traces Aided Spot Checking.

118 http://noa-archive.com.
119 https://web.archive.org/web/20030629072430/http://www.noa-audio.com/philosophy.html.
120 Sebastian Gabler, in 24th TONMEISTERTAGUNG – VDT INTERNATIONAL CONVENTION, November, 2006, p. 527 ff, 3.3.
121 http://avaa.bavc.org/artifactatlas/index.php/A/V_Artifact_Atlas.

4. Drop out detection on Beta SP

All analogue VTRs use a frequency modulated (FM) luminance signal. There are two main reasons for that, which both root in the characteristics of magnetic tape. Frequency Modulation shifts the lower limit upwards to approximately 2 MHz. Thus, relative bandwidth is reduced to 3–4 octaves. This removes the requirement to compensate for tape's reduced response at low frequencies. FM signals encode information by variation of the instantaneous frequency. FM encoded information is immune to level attenuation, distortion, and noise disturbance. Transmission reliability will be greatly enhanced by clipping the signal to tape-saturating levels. With Beta SP, the resulting bandwidth for the luminance FM signal is 6.8–8.8 MHz.

Figure 1 illustrates that the best measurement conditions for the purpose are to be found after the VTR's reproduction circuit, before the Time Base Correction (TBC) unit.

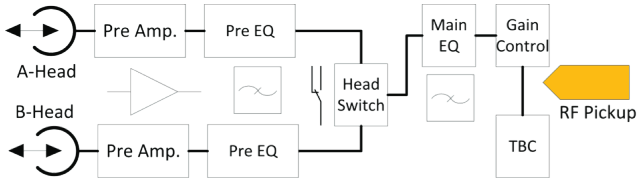

Figure 1: VTR Repro Block Diagram.

NOA has developed specific hardware to be attached directly on the VTR's reproduction circuit board (*Sensor Plate*), and connected to a processing device (name: *VTRi*). That device also includes VTR remote control interface and transmits QC metadata to NOA's proprietary Video capturing software, for two VTRs in parallel. The entire detection process spans across three main steps.

4.1 Measurement

After buffering the RF signal, the logarithmic, rectified envelope is generated. This is an analogue signal processing step. As displayed in Figure 2, the relevant signal characteristics are already apparent by an analogue measurement, using a standard vector scope.

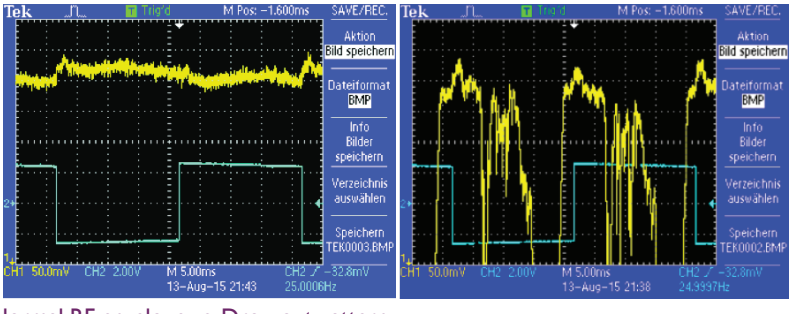

Figure 2: Normal RF envelope vs. Drop-out pattern

4.2 Sampling

Using an Analog to Digital Converter (ADC), the envelope is sampled at a rate of 4000 Hz. This results in 80 values per field for PAL, and 66-67 values for NTSC. The design thus provides sufficient precision to locate a defect within a given video frame, with robust reliability.

4.3 Evaluation

The evaluation is divided into two main steps. First, a frequency table[122] is produced per evaluation period. A frequency table is a tool used in Statistics to model the distribution of values by the frequency of their occurrence. In this case, we quantise the RF level into an evaluation range, divided into equidistant groups. These data are sent to the recording software with a time-stamp of the respective period. The sample window defaults to 25 ms, but may be adjusted to 16 ms for NTSC field equivalent. Subsequently, the frequency table is processed with a specific weighting model, rendering a dimensionless error-coefficient *m*.

$$m = \frac{\sum M_w}{n}$$

Coefficient *m* provides the key quality indicator used for traces and quality event information. The weighing model takes into account that the typical (healthy) distribution will be grouped narrowly around the maximum count with most values in a range of app. +- 2 value groups. The highest count will be towards the 0 dB margin, which relates to the nominal RF modulation level, see Figure 3 below. The weighing model returns a low error coefficient value for healthy signals.

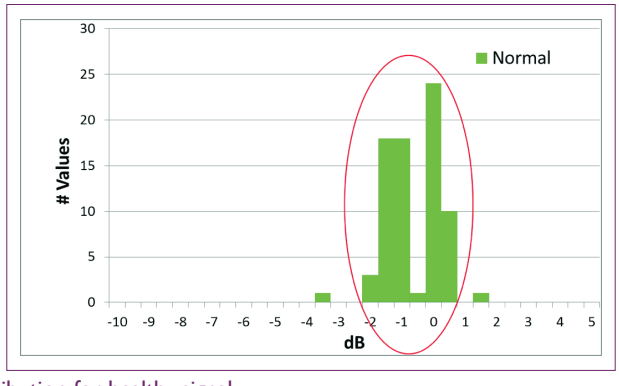

Figure 3: Value distribution for healthy signal.

In the case of an error, values down to the low end of the evaluation range exist. Values will be distributed between the low border of the evaluation range and the maximum count group. The weighing model takes these patterns into account, rendering a high error coefficient value. See Figure 4 below for an example.

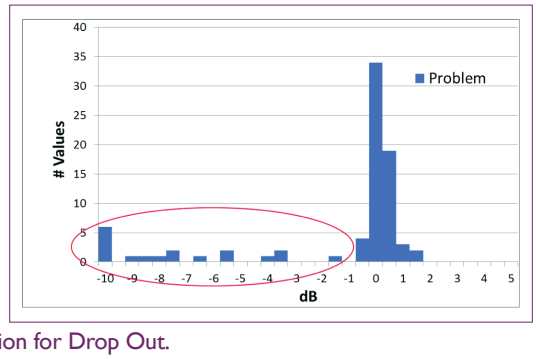

Figure 4: Value distribution for Drop Out.

122 https://en.wikipedia.org/wiki/Frequency_distribution.

Note that Figure 3 and Figure 4 are taken from the same experiment that provided the vector scope shots from Figure 2. The direct correlation of both visualisations becomes obvious. Figure 5 illustrates how a defect is presented in the capturing software to the user. The active frame shows a multi-line drop-out, in place with a highlighted error event marker (*m* below error threshold).

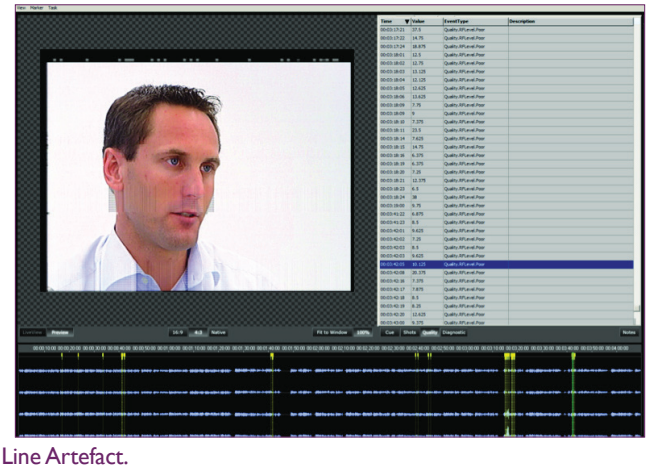

Figure 5: Beta SP Line Artefact.

On the other hand, when validating the problem shown in Figure 6, the low coefficient value (*m is* 1.8 … 2.3) of the RF trace clearly identifies the drop-out as a pre-existent part of the signal. Quality Control thus may assert that a re-transfer of this medium would be futile.

Figure 6: Burned-in defect.

5. Drop out control on digital VTRs

Digital Beta family VTRs include built-in systems for status reporting. These systems can be made usable for the QA of archival transfer processes.

ISR, or *Interactive Status Reporting,* is a protocol aiming at the remote monitoring, diagnostics, and maintenance of broadcast equipment, proprietary to Sony. Based on the SMPTE standard *Status Monitoring and Diagnostics Protocol* (SMDP, SMPTE 273M),[123] ISR features a private SMDP command set that includes functions suited for runtime signal monitoring. Sony has implemented the protocol in several generations of their professional VTRs, including professional DAT machines, Digibeta, and IMX families. Machines that support ISR bear the ISR Logo.

Details of the ISR specification are not publically available. However, copies of the original Sony documentation can be obtained. Machines supporting ISR have a dedicated RS232 port, which interfaces with a Data Terminal.[124] To make the ISR data available for use with the capturing software, NOA provides the same *VTR-i* hardware as for RF measurements. The connectivity is again 2 VTRs per *VTR-i*.

For the purpose of tape playback monitoring (LEVEL NAME PLAY[125]), ISR offers both transient and cyclic registers. Events are maintained per audio and video track and labelled as "Channel Condition". Sony specifies five event levels (0 ="good" | 1="almost good" | 2="indeterminable" | 3="doubtful" | 4="no good"). The cyclic register is supposed to store any condition events different than level 0, since the last query, together with their occurrence time code.[126] However, the authors have consistently experienced that this register misses any events classified as level 1, and reports all events of levels 2–4 as being level 4 events. The content of the transient register returns accurate information. That however is transitory in the field rate of the signal and therefore needs continuous refresh.
At the same time, ISR machines offer a Channel Condition traffic light LED (known in industry as "Lamp") on the front panel, displaying a green light to report normal operation conditions, yellow light for "somewhat deteriorated" and red light to report playback errors. In line with the specification in the *MSW2000* user manual [127] about the Channel Conditions traffic lights, ISR status flags 4 correlate with red LED signal. This falls together with the observation that ISR events from analogue tapes are only flagged with 0 and 4; hence ISR is not sufficiently accurate for the use with analogue tapes.

Used with digital tape formats, ISR results however are accurate. Figure 7 exemplifies image break-up resulting from a tape coating damage. Enlarged, one significant block artefact should reproduce well in printing. The quality problem is again in line with the highlighted error event in the marker side-panel. Ongoing experience with Digibeta transcriptions, for example, shows that ISR reliably reports any blocking artefacts, regardless of the pattern. Therefore, the detection method is universally usable for all digital formats.

123 http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=7292091.
124 http://www.ibm.com/support/knowledgecenter/ssw_aix_53/com.ibm.aix.commadmn/doc/commadmndita/asynch_modems_dataterm.htm.
125 Sony, ISR Protocol, Sony document number 9-967-614-01, p. 59 f.
126 Ibidem.
127 "During analog playback indications are by red and green only," MSW-*2000* Operation Manual 1st edition (Revised 2) p. 2-7.

Figure 7: Digital Drop Out on IMX.

6. Conclusions and outlook

Monitoring drop-outs continuously during transfer yields a very high level of Quality Management for archival transfers of video tape. Maintaining correct operating conditions, and being able to trace these is fundamental to the Quality Assurance of such a process. The error pointers generated from RF envelope processing and ISR monitoring enable efficient Quality Check procedures for the operators, and help to identify actual transfer problems, and allow for discrimination of them from burnt-in defects.

The Quality Management approach discussed in this article refers to analogue Beta SP VTRs as well as to DigiBeta and IMX VTRs, but with a different scope. Whereas the aspects relevant to analogue VTRs are developed specifically for the Beta SP format, the applied principles are applicable within certain constraints to any analogue VTR, beginning with FM-Direct systems like the original *Quadruplex*. The methods supporting ISR have only been tested in use with Sony products, even if Panasonic D3 VTRs seem to have employed similar status reporting tools.[128] That being said, any D2, D3, and D5 VTRs of Ampex and Panasonic are basically extinct, which excludes them as a subject of large-scale migration projects these days. Controlling drop-outs does not cover all possible bases of VTR related Quality Management; for example incorrect signal levels during extraction may lead to information loss in preservation. With excessive levels, clipping of the AD converters may lead to distortion artefacts. De-rated levels may incur additional noise in later processing, specifically when using 8-bit quantisation. Going into the details of component signal levels would however exceed the scope of this paper, and in specific context with broadcast-grade Beta VTRs, there is not so much focus on these aspects as usually signal level management may be assumed as efficient.

Finally, the monitoring and logging of drop-out rates also opens new perspectives for equipment maintenance. IMX VTR heads are rated with 6,000 operating hours. As any mechanically wearable part, its imminent failure will be signalled by an exponential growth of the error events. Using the long-term statistics of drop-out rates, a base line is determined for every individual device, and any change against that base line. Taking into account that the maintenance of an IMX machine costs about 1 Euro per operating hour, and that spare parts are only available for a limited time now, any maintenance that aims at leveraging wearable parts beyond their nominal lifetime has substantial efficiency potential for Archives and Service Providers. When doing so, efficient process Quality Management comes as a valuable safety net.

7. Acknowledgments

The author would like to thank Christoph Gerstbauer and Marcus Krämer for their valuable contributions. Some sample material for measurements (Figure 6) has been kindly commissioned by Slovak Radio Television, RTVS, Bratislava.

128 BBC Research White paper WHP 167, D3 Preservation File Format, p. 10 – include link to online copy? http://downloads.bbc.co.uk/rd/pubs/whp/whp-pdf-files/WHP167.pdf.

GHOSTS ON THE WIRE

Leslie McCartney, University of Alaska Fairbanks, USA

A standard file storage box of commercial strength has been sitting on a shelf in the Elmer E. Rasmuson Library at the University of Alaska Fairbanks Film Archives office since anyone can remember. When and how the box and contents came to be in the library is somewhat a mystery. At some point someone had written on the box 'Harrie Hughes electronic memory recording wire recordings.' The box was rediscovered in December 2015 when Steve Hormann, a volunteer with the Oral History Collection at the University of Alaska, asked me if we had any wire recordings in our collection. As Curator of the UAF Oral History Program I made a quick search of the over 11,000 recordings in our collection and found we did not, but only being in the position for four years decided to check with Angela Schmidt, the UAF Film Archivist to see if by chance they were in that office. When Ms. Schmidt took over reins as the Film Archivist in 2013 from Dirk Tordoff, she remembered him showing her boxes that were mysteries and sure enough, the Harrie Hughes electric memory recording wire recordings box was one of them.

Hormann is a man who wears many hats. As a retired mechanic he volunteers with the UAF Oral History Program repairing and making operable several of our old reel-to-reel recorders so we can use them for playback and digitizing thousands of recordings in our collection. He is also a volunteer disc jockey at the local Fairbanks KUAC radio station with his own show 'Any Old Time' which airs on the first Saturday of each month at 7 PM where he plays pre-1925 acoustically recorded music on 78 rpm discs which he has digitized. In Hormann's travels to a local record shop he learned of Art Thompson, a resident of Nenana Alaska and a man of many talents. Art is the Voice for Christ Radio Ministries (VFCM) Executive Director and runs KIAM radio station in Nenana. He also restores and builds pipe organs from scratch, runs a Charitable Trust, is a former employee of the Multnomah University radio department in Portland, Oregon and in his early career, was an electronic engineer in Silicon Valley (UAF News and Information 2016). Steve had visited Art's radio station and noticed when he was there several wire recorders. Art explained that he repaired and restored them to a working condition and was able to digitize the wire recordings. Art had become familiar with Wester-Chicago wire recording machines while transcribe Multnomah's wire recording collection years ago. Art agreed to make a visit to UAF and see if he could make our wire recorder operable and set up a system so we could digitize whatever was on the spools.

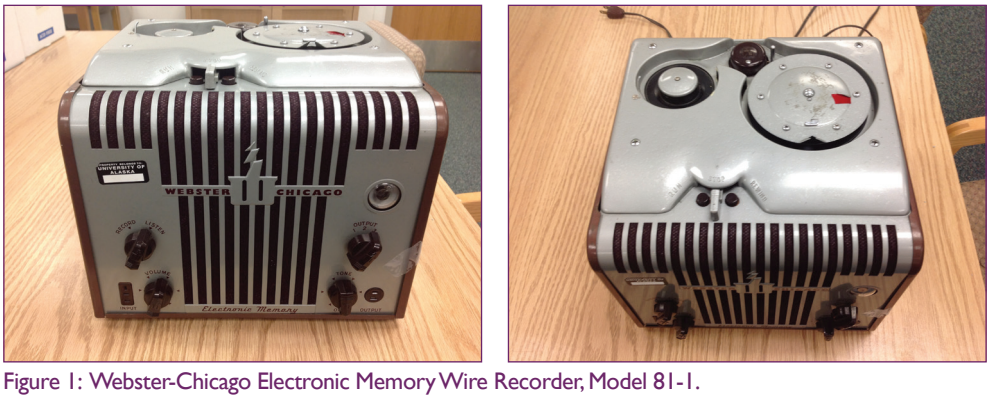

Figure 1: Webster-Chicago Electronic Memory Wire Recorder, Model 81-1.
Photo Credit: Leslie McCartney

Our wire recorder is a Webster-Chicago Electronic Memory wire recorder, model 81-1, and bears serial number 104946. This model was made to be positioned on a desk and for dictation use. There is no carrying case for it yet the machine is in mint condition. A little research about the machine revealed that the wire recorders manufactured by the Webster-Chicago

Corporation were top sellers in their day. The company specialized in office dictation and the private consumer markets.

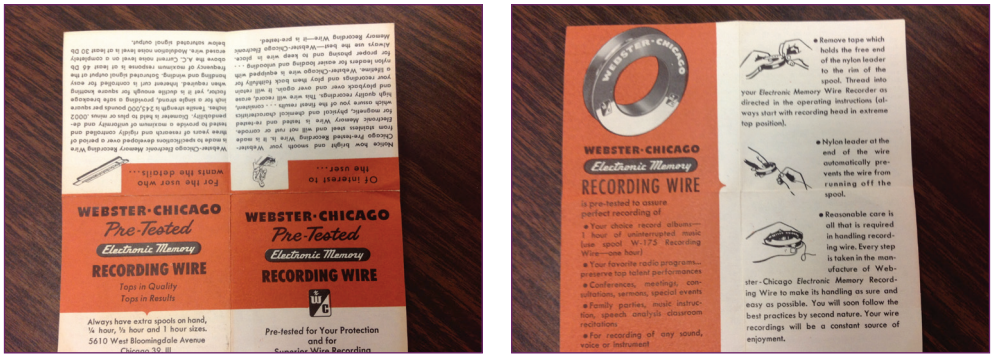

Figure 2: Wire Recorder Pamphlets. Photo Credit: Leslie McCartney

Very thin stainless steel wire, about .0002 of an inch in diameter according to a leaflet in one of the boxes; the wire and housed on three sizes of spools - quarter hour, half hour and 1 hour sizes. The wire is tensile strength of 245,000 pounds per square inch for a single strand again according to the leaflet. The wire travels past a recording head that moved vertically and rhythmically at a speed of 24 inches per second. The spools, although only 2 ¾" in width, are heavy. The quality of the recording was reported as very lifelike. One of the problems with the wire is that it would snarl and get tangled and prove almost impossible to untangle. I experienced this first hand with one of our wire recordings.

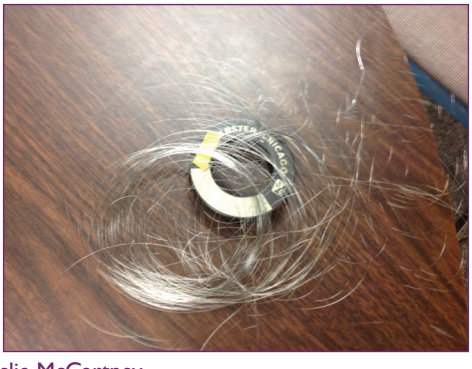

Figure 3: Photo Credit: Leslie McCartney

Production of these wire records was from 1945 to the early 1950's (Webster-Chicago 2016). When magnetic tapes (reel-to-reel to example) became available, they were easier, tangled less often and were quickly adopted thus eclipsing the wire recorders. In the box with the recorder was a smaller box containing seven smaller boxes of Webster-Chicago Recording Wire along with two spools not housed boxes. Very little legible writing if any is on any of the spools or boxes thus the mystery of what could be on these recordings deepened.

Figure 4: Wire Spools. Photo Credit: Leslie McCartney

The box containing these treasurers had the name of Harrie Hughes on it. Harrie Lewis Hughes is no stranger to the UAF Oral History Program in fact we must have over 200 recordings made by him most dating in the 1960s and just when we think we have cataloged the last recording he did, more surface. Harrie himself is quite a story. He was born on April 29, 1899 in Linden, Montgomery County, Indiana (Bostian 2006). He grew up in California and worked in Hollywood building scenery and working on machinery. He was very proud of his work card issued in 1918 by the International Alliance of Theatrical State Employees, Local No. 33. He worked for Douglas Fairbanks, Mary Pickford and the Keystone Kops. He arrived in Alaska around 1929 and worked repairing machinery in fish canneries in Alaska's costal fishing communities. From there he moved around the state trapping, mining for gold, cutting logs and building cabins. In 1937 he came to Fairbanks where he ran his own electrical shop and did various and sundry other work such as plumbing, telephone works, repairing guns and jewelry. He also worked on the Alaska Railroad, served as a night clerk at a local hotel, volunteered as a fireman and tirelessly lobbied government to create Pioneer Park in Fairbanks (Cole 2006). Hughes died in Fairbanks at the ripe age of 107 on June 20th, 2006 (Bostian 2006).

Hughes owned and operated Harrie L. Hughes Electrical Service located at several downtown addresses over the years in Fairbanks. In a search of the old telephone directories his business name first appears in the March 1953 City of Fairbanks & Vicinity Telephone Directory and stays active until he is noted as retired in the 1965 Polk's Fairbanks City Directory. Hughes was probably one of the few people in Fairbanks with recording equipment at the time and he loved to record anything. He talked with old miners, residents of many communities in Alaska, pioneers, anyone who was willing to let him record them. He would take his recorder on road trips with him and talk and talk about what he was seeing as he drove down the highway. A prime example are recordings he made describing in detail everything about one of his trips he took in July of 1963 through Alaska into the Yukon, British Columbia, Alberta, North Dakota, Iowa, India, Ohio, West Virginia, Maryland and Pennsylvania all of which is available online for your listening pleasure through the UAF Library Catalog. Technically many of his recordings are poor, low batteries led to voices recorded like chipmunks, extraneous noise makes several of them hard to hear the recorded voices; he very rarely gave a date or the names of the people he was interviewing.

As an interviewer he was far from stellar, interrupting people and frequently pontificating his opinion about something and thus silencing his narrator. He constantly stops and starts recording and thus his recordings are usually choppy and at times, difficult to listen to. Hughes also liked to record phonograph records or radio programs and then record over them. He was also a member of the Pioneers of Alaska Igloo No. 4 and recorded

many of their meetings and lectures.[129] Furthermore, Harried loved to make copies and copies of the same recording. There has been many times when patrons have brought us in a box of Harrie Hughes cassette recordings only for us to realize these are copies of what we already have. We have learned that if we hear a parakeet in the background, the recording is a copy. He liked to make copies at home and seemed to be oblivious of the fact that the parakeet in the background was also being recorded. But interestingly, in all the recordings we have by him, Harrie likes to describe what he is doing but never does he ever speak of anything of his personal life. These are just a few of the hallmarks of Harrie Hughes recordings and as imperfect as they are on technical and on an interviewing level, they are truly golden in the sense of recorded local history. They truly are a wealth of information about a slice of life in Alaska on whatever day he recorded. For collection and archival purposes, since the UAF Oral History Program was established in 1981, its mission has been to collect, preserve and provide access to audio and video recordings that provide insight into Alaska's history and the people who have contributed to its heritage. Hughes' recordings amply fit this criterion.

On January 22, 2016 Art arrived at UAF and along with Steve, Angie and I to see if the recorder would work. I had also asked George Lounsbury to attend. George is past-president of the Pioneers of Alaska Igloo No. 4 and has dozens of copies of Hughes' cassette recordings at home, copies of course of what we have in the UAF Oral History Collection. When I called to tell him about the wire recorder find, he thought these might be some of the earliest recordings that Hughes ever made. George was particularly interested to hear what might be on one wire recording spool that was in an old and battered Harrie L. Hughes business envelope with Pioneer Hotel Fire marked on it. George remembered seeing the bodies of those who perished in the Pioneer Hotel fire July 1952 laying on the street when he was a child, a very powerful memory for him.

Art carefully removed the bottom panel from the machine, inspected the machine and it appeared that wiring system and tubes at least looked intact. We plugged it in; the green glow on the front panel lit up and the motor started to purr. Art placed one his own spools on the machine, pushed a knob to listen and a switch another lever to play and the air was filled with the sounds of a big band tune from the machine and applause from us in attendance.

We were very concerned that due to how our wire recordings had been stored over the years—that is, not in the best of heat and humidity controlled conditions—if the magnetic wired and playback had been compromised in any way. To find its fate, next to be played was the spool in the envelope or as George put it, to hear the ghosts on the wire. In typical Hughes fashion, the recording starts with him blowing into the microphone and then he speaks to someone by the name of Sally Higgins Little, born in Podunk. The recorder is then turned off and starts again without the mention of date or who we are listening to but we later learn that it is Mary Alice Ovell [sp?] a tourist from Indianapolis who fell out of the hotel when it was burning onto a fireman. She suffered a bruised and cut left foot, the firefighter also suffered bruises. She tells Harrie that the north seems to attract a lot of ruffians and failures along with many fine people. Hughes says he's been in Alaska for about 17 years and has seen tourists from all over the world. And so ends the piece about the hotel fire.

129 The Pioneers of Alaska is a fraternal organization that founded in 1907 in Nome, Alaska to help members survive in the harsh environment. The group provided food, care, medical and legal assistance as well as social and recreational activities. Their mandate is to 'preserve the names of Alaska's pioneers on its rolls; to collect and preserve the literature and incidents of Alaska's history; and to promote the best interest of Alaska' (Pioneers of Alaska). 'Igloos' are the names for local organizations thus Igloo No. 4 is the Fairbanks branch number. (Pioneers of Alaska Grand Igloo – Igloo History).

As per usual, Harrie has recorded over music and when he breaks, the music is heard for seconds until a group of people are recorded just talking, telling jokes and singing ditties. Then at 12 minutes and 7 seconds into the recording, the Hughes has turned on the microphone again and says, "And now we are going to get Little Margie on this thing if we can get her to talk, don't know if she's asleep or not. What do you have to say Margie" and a woman says, "Oh I never have much to say." Hughes retorts that she knows what to say when she's on a microphone out on a stage and she replies, "Thank you, it's a pleasure to be up here in your saloon, I mean the Harrie Hughes Enterprise for Underprivileged Engineers, and Ruby you look enchanting today, looks like you fell in the mud with your feet sticking up in the air." The recording is stopped and starts again, and the woman says in a throaty voice, "This is just for you and Ruby," before she launches into the most beautiful solo of 'Pretend You're Happy When You're Blue'. The quality of the recording is outstanding; you would think it had been recorded yesterday in a sound booth. At the end of the song she says, "This is Margie Gale, from Frisco" and refuses to give Hughes her phone number or address. We all looked at each other stunned. Who on earth was this beautiful voice and what on earth was she doing on a recording with Harrie in Fairbanks?

A quick search revealed the singer was none other than Gale Storm, an American actress and singer who stared in many B movies and in her own television shows in the 1950s; *My Little Margie* which ran from 1952-55 and *The Gale Storm Show- Oh! Susanna* which ran from 1956-1960. In her autobiography, Storm makes no mention of being in Fairbanks (Storm and Libby 1981). She recounts in her book that her first recorded song, 'I Hear You Knockin" was released in October 1955 (Storm and Libby 1981). Our wire recording of her singing 'Pretend You're Happy When You're Blue' was probably recorded in 1952 and thus pre-dates her commercial recording career.[130]

Art rigged up a wire and we inserted into the output jack on the Webster-Chicago and then attached the other end to a jack and inserted it into our Marantz Professional Model PMD660. We set the wire recorder to Output 3, pressed record on the Marantz, turned the knob to play on the wire recorder and this allowed us to digitize the recordings in uncompressed .wav, 44.1 kHz/16 bit. I have now digitized and summarized most but not all the wire recordings (on one spool the wire end is buried in the wire, two others are also proving problematic to play). The digitized spools are typical Hughes recordings. The meeting where the necessity and various locations are discussed to create a Pioneer Park in Alaska is of considerable historical value. Pioneer Park was constructed for the Alaska 1967 Centennial Exposition celebrating 100 years since Alaska was purchased from Russia. Originally called the Pioneer Memorial State Historical Park, the name was changed to Alaskaland in 1968 by Mayor Red Boucher of Fairbanks. Tourists however thought that 'Alaskaland' was a theme park similar to Disneyland. In October 2001 the Borough Assembly voted to return it to its original name of Pioneer Park and in July 2002 it was officially renamed back to Pioneer Park (Pioneer Park, n.d.). The park houses many of the original downtown Fairbanks structures such as Judge Wickersham's house, original cabins, two small museums (Pioneer Aviation Museum and the Railway Museum) as well as the Bear Gallery. It is still a well-used park by visitors and locals and this recording of the challenges that those who had vision for a park faced is of a wonderful piece of history for the community.

130 Hughes has marked on the envelope that contained this particular spool the years 1951-1952. The Pioneer Hotel Fire occurred in July 14, 1952 (Fairbanks Daily News-Miner July 14, 1952). Storm's recording occurs many minutes after the story about the fire. One would assume therefore that she was recorded by Hughes after July, 1952. I have spent hours going through microfilm copies of every single edition of the newspaper from July, 1952 to December 31, 1952 and there is no article about Storm being in Fairbanks. As is typical for Hughes, he never bothered to record the date he interviewed Storm and her autobiography offered no clues as to when or why she was in Alaska (Storm and Libby 1981).

But it is the last box of wire recording I put on the machine that is one of the most fascinating. On the box is written May 20, 1950, August 30, 1950. Jack & Aggie Mamage[sp?] – Used not good. On the actual spool is written Ruby.

Figure 5: Ruby Spool. Photo Credit: Leslie McCartney

The recording opens with Harrie giving the date of March 30, 1950 in Fairbanks Alaska (as noted above he rarely gives a date, location or says he who is speaking to on his recordings). Immediately, this recording is different. It appears that he is leaving a recording for his girlfriend or wife, Ruby, to listen to at a later time as she is not present. He turns the recorder off and on constantly leaving messages of love and endearment to her. On June 2nd Harrie says that tomorrow Ruby and Caroline are going home to Louisiana and Texas but one woman (Ruby) says she will be back to Harrie soon and professes her love for him. The recording reveals that Ruby and Caroline met Harry about three weeks prior at the Rendezvous.[131] They discuss how they have had a nice time together, Ruby then sings a song. Ruby professes her love to Harrie and then recites the poem 'Somebody's Mother.'

At 9 minutes and 16 seconds into the recording Harrie says it is August 30, 1950 Ruby is back in Fairbanks to stay and they will be happy for the rest of their lives. She loves the ring he has given her. Now it is Ruby's turn to leave messages. Later, it seems to be at least one year later but no year is given, on September 1st Ruby records a letter to her daughter as it is the daughter's birthday. She lists a number of names and tells them that mother loves them all and hopes they understand why she has to come to Alaska and be with Daddy Harrie. From this day until October 14th (no year) she leaves prayers on the recording, hoping she and Harrie will be happy, reading Harrie poems, hoping one day she and Harrie can go back to her people. On October 14th she says what a dreary day it is and leaves a prayer asking for blessings and asks for blessing for a number of family members and Harrie. Music has been recorded to the end of the recording. To the best of my knowledge, these are the only personal type of recordings we have that Hughes and his wife Ruby made that still exist.

It appears that Ruby was born in Baton Rouge Louisiana in June of 1918. When she met Harrie in March of 1950, Harry would have been just shy of his 51st birthday and Ruby would have been 31 years of age. I did find some unconfirmed documentation that states they were mar-

131 I am assuming they mean the Fur Rendezvous, or as the locals call it, the 'Fur Rondy' or simply 'Rondy'. This annual winter festival, which lasts several days, started in 1935 in Anchorage, Alaska. Games held at the Rondy in the early days included skiing, hockey, and children's dog sled races down the main street (Fourth Avenue). The Rondy is an national and international draw for visitors and is usually held in mid-February each year (Rondy).

ried on September 1, 1950 in Palmer Alaska.[132] Obviously from the recording, she did not bring her children with her when she came to Alaska to marry Harrie and Harrie does mention on one of the recordings that for all the troubles she has had in her life, he will make it up to her and make her happy. Both Harrie and Ruby are listed as members of the Pioneers of Alaska Index but there is little other information about their membership (1989, no page numbers).

George Lounsbury mentioned to me that Harrie also loved to take moving pictures with his hand held movie camera and he gave me three DVDs of digitized silent home movies that Harrie had taken over the years. They all appear to have been shot from the 1950s to early 1960s. Some are in black and white, some are in colour. The films wander as much as his recordings, parades, moose in the yard, rivers, flowers, local dances, cars on the street, dog mushing races; but scattered throughout the footage appears a red haired woman who looks to be in thirties or early forties. She is always well dressed (or I would say overly fancied dress for Alaska), and she is often laughing (and the Ruby on the recordings laughs often). I can only assume this is Ruby.

Harrie and Ruby are listed in the *Polk's Fairbanks City Directory* from 1960 (p. 152) until the 1964 edition when Harrie L. Hughes is listed as retd. and at a new address (p. 137); Ruby is no longer listed with him or in the directory at all that I could find. I am assuming that they separated or divorced in 1963 or 1964. Harrie takes his road trip across American in the summer of 1963 and there is no mention of Ruby on these recordings.

I have yet to find anyone in Fairbanks who remembers Ruby in fact those who remember Harrie could not believe he was ever married. Bob and LaVerna Miller own Arctic Circle Hot Springs Resort. Bob had known Harrie since he was a child. In Hughes' twilight years, he lived at the Arctic Circle Hot Springs Resort in one of their cabins and came to eat his meals at the resort each day. After that he lived with Bob and LaVerna in Fairbanks. In total LaVerna told me they looked after Harrie for 16 years, from about 1989 to about 2005. Bob has now passed away and LaVerna told me that in all that time that Harrie lived with them, he nor Bob ever said anything about a wife or wives that Harrie might have had. In fact, at Harrie's funeral, mourners were very surprised to meet Harrie's grandson, Daniel Hughes, who according to Miller looked just like Harrie. Apparently when Harrie came to Alaska he had left a family in California without a trace and they had been looking for him all those years. With the Internet and obituaries posted online, his grandson had finally found the family patriarch albeit just after Hughes had passed away. LaVerna said there was no doubt about it; the grandson was the spitting image of his grandfather.

According to another local historian I spoke with, Harrie loved the ladies and was married at least five times but would never speak of any of the women he had married. I have no idea what number Ruby was in Hughes' marriage history. I have been unable to trace what happened to her after their marriage obviously ended. I've contacted a newspaper in Louisiana to perhaps help solve the mystery but no results have come to light as yet. I did find a quote by Hughes in a newspaper interview he did for his 100th birthday about being married, "I picked up two lemons and I ditched them both," he said (Cockerham 1999). Local historian Candace Waugaman laughed and said, "Two wives in Alaska maybe."

We will now catalog all wire recordings in the library catalog and they will join the other myriad of Hughes' imperfect but precious recordings that capture a slice of Fairbanks life in a time long since passed. We will also now be able to make the ghosts on the wire digitally available to anyone who requests to hear them. A few years ago I secured from the Pioneers of Alaska a Blanket License Agreement that gives us the right digitize and provide copies of all their recordings to interested parties. Given that we have no idea where this material came from and assume it was from Harrie directly or from the Pioneers of Alaska where he seem to

132 I have ordered a copy of their Marriage Certificate from the Alaska Vital Statistics Office but have not received a copy of as yet to confirm this date.

dump his unwanted cassettes, reels and equipment over the years, I believe this Blanket License Agreement can incorporate this new material.

The mystery ghosts on the wires have now spoken after so many years of sitting silently in a box in the UAF archives. We have managed to play back the medium they were recorded on, managed to digitize and preserve them for future generations but what happened to some of those voices is still a mystery.

Acknowledgements

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JOURNEY OF BIG BERTHA WEBSTER

JA Pryse, Oklahoma Historical Society, USA

Providing material culture through digital transformation of original sound offers societal representation for forthcoming historians to act as archival archaeologists. Shifting paradigmatically as caretakers of physical repositories into dematerialization of antiquated matter offers a new level of fruition through cultural realization of that material.

Through understanding *material*, accompanying paraphernalia, monetary influence, popular trends, and practical operation of obsolete machinery, the 'archival archaeologist' essentially provides the societal 'unpacking' of cultural moments in time. The Oklahoma Historical Society focuses research on materialization of historical evolution through creation, collection, and preservation, as well as through the dematerialization of each collectively.

For decades, the Society has collected magnetic steel wire of various lengths, stored on comparatively weighty metal spools dating from 1890s through 1960s. The Society has also preserved antiquated and obsolete playback equipment dating from statehood through present day. A Webster-Chicago Electronic Memory recorder lay dormant, vacant of life, and entombed within the audiovisual vault, conserved for those future archival archaeologists to explore.

This Webster-Chicago Electronic Memory Recorder, respectfully named, "Big Bertha Webster," weighs approximately 37 pounds without individual recordings attached. She is accompanied by a sturdy microphone approximately the size of a child's hand with heavy metal designer casing attached to 'Bertha' by a peculiar three-pin Cinch Jones connector.

'Bertha' was removed from her ossuary and purposely examined. Each knob, switch, button, and mechanism was seemingly carefully designed to reflect the purpose both aesthetically and culturally current in time. The beauty of Bertha stopped patrons and staff in their tracks as they walked past the Digitization Studio. But Bertha also came with complexities and challenges. Archivist predecessors long retired and a machine manufactured in the late 1930s posed the vexing and arduous task of resurrecting Bertha in order to explore our past.

Vigorously combing storage, collection repositories, and placing a 'call out' for donations of operational or non-operational wire recorder machines, two additional pieces arrived none too soon. The short lived lifespan of these fascinating wire machines stirred intrigue but also presented the challenge of gathering resources through virtual environment, enthusiasts, and elders who had first hand awareness.

The Digitization Studio slowly transformed into a laboratory of mad science. Bertha, now laid out, disemboweled, and poised for autopsy, was accompanied by her new companions. Electronic schematics, highlighted, starred, and strewn about, clearly extended a sense of inventive re-discovery. Pieces were laboriously cleaned, oiled, and repaired from each specimen. Each fuse, lamp, and guide was tested for vitality. A two-pin Jones plug was ordered from an audio enthusiast found online and wired into Bertha, then patched into the jackfield for digitization (see more detailed descriptions at Journey of Big Bertha Webster[133]). Each mechanism then found its place within Bertha's body to provide the essential breath of life.

Turning the 'Tone' switch in a clockwise direction caused Bertha to stir; a low humming accompanied a slight glimmer of light which struggled to illuminate the clear glass bulb that signified the machine was 'on'. Peering into the machine, one could see mechanisms, gears, and wires firing. It was time to test the playback module. An unmarked metal spool of steel wire was selected and placed on the uptake left wheel. A larger metal wheel was situated on the right to catch and wind played wire. Between the two playback wheels was a spool that rose and fell in a smooth repetitious beat to guide the wire evenly from one to the other. Bertha began

133 http://www.japryse.com/#!journey-of-big-bertha-webster-the-wire/trm9a.

to sing, a rather humorous magnetized recording of a young girl and her family recording in their home (Lyrics from *Oklahoma*! written by composer Richard Rodgers and lyricist/librettist Oscar Hammerstein II):

> "I'm jist a girl who cain't say no,
> Cain't seem to say it at all
> I hate to disserpoint a beau
> When he is payin' a call! Fer a while
> I ack refined and cool,
> A settin on the velveteen setee
> Nen I think of thet ol' golden rule,
> And do fer him what he would do fer me!
> I cain't resist a Romeo In a sombrero and chaps
> Soon as I sit on their laps
> Somethin' inside of me snaps I cain't say no!"

With a laugh and a joke, a man chimes in and we are transported to a moment in time where family is heard entering and exiting a wooden screen door that snaps and slams with each movement. We learn of war, boyfriends, baseball segregation (male and female), and school. Jokes were made about Hugo ("who go?") Oklahoma, and a "guy named Who Asked You" (Hugh Askew—who truly existed circa 1940). We hear from a father, mother, sisters, and an uncle, all sitting around this then state-of-the-art magnetic wire machine creating a lifeline into the 1940s. It is as if the lemonade served is fresh and the sun was shining. The birds in the background are singing and for an instant, frozen in time, it was though you were a part of their lives.

Illuminating the mystery of Bertha has unlocked priceless moments of historical treasure well on its way to degradation and decay, soon lost and forgotten. Recordings of specific dialect, tones, and cadence that accompany phrases of cultural significance in that particular era provides a sense of societal materialization which contributes to the analysis of present day languages.

The Oklahoma Historical Society, Digitization Division, continues to be a forerunner in modern research capability through continuous examination of anachronistic aspects of time. Exploring cultural heritage requires the exploration of *all types* of recorded sound from wax cylinders to vinyl recordings, magnetic wire to magnetic tape. Without uncovering these abilities through education, practice, and community efforts, and accommodating each mode and format, the institution of historical transference fails. Selective convenience of *available* playback equipment and limited preservation processes relegates moments in time inequitably which leads to incomplete historical experiences. As archival archaeologists it is imperative to explore and develop processes which coincide with institutional vision and to explore the cultural material accessed in order to convey factual interpretations which attaches meaning and clarification of actions from our past.[134]

134 For more information concerning wire recordings and their history, see: http://cultureandcommunication.org/deadmedia/index.php/Wire_Recording#Historical_precursors_and_futuristic_musings.

IASA RESEARCH GRANT REPORT: A STUDY ON THE CHANGING PRICES OF AUDIOVISUAL DIGITIZATION, 2006–2015

Rebecca Chandler, AVPreserve, USA

Introduction

Over the past five years in the United States and Europe there has been a decisive decline in the cost of digitization, resulting in historically low prices. This has been due to a variety of reasons, ranging from innovation to marketplace competition. With a shortening window of time in which to act, this economic advantage has been a boon to organizations with holdings of legacy audiovisual media. This is widely recognized and discussed among managers and budget holders within organizations. However, what has not been evaluated effectively is whether or not we are currently in a digitization market bubble.

We hypothesize that obsolescence, degradation, and market factors will begin to place the cost of digitization back on an upward trajectory. What we do not know is how the curve will look. Our experience indicates that organizations are unwilling to believe that prices will increase at the same rate that they decreased, or that they will ever again reach even 50% of what they were just five years ago. However, these discussions are often emotionally-driven and take place without a well-laid foundation of data from which to judge.

With the support of an IASA Research Grant, we set out to design a project that would begin to amass a shared and computable dataset that can help us ask questions and provide projections about our hypothesis. The goal of this project is to quantify and chart in detail the historical pricing trends for digitization over the past 10–15 years. We believe that having this insight and level of detail will provide a solid foundation of understanding. In combination with a strong grasp on key market factors we can assess future costs for digitization of audiovisual materials and generate data-driven predictions that are rooted in reality, and will serve as a risk mitigation tactic to help long-term digitization projects plan more effectively for expenditures and fund-raising.

Aims and Purposes

For two years AVPreserve built and tested a tool that has now been released freely to the public to show raw numbers and visualizations demonstrating the costs of inaction when it comes to caring for audiovisual collections. *COI: The Cost of Inaction Calculator* is an open and free tool that helps organizations analyze the implications of choosing various levels of response with regard to digitizing legacy collections of audiovisual materials. COI is a counter-perspective to the concept of "ROI", or Return on Investment, which is often raised with ill-effect when decision makers analyze digitization and preservation projects. COI recognizes past and present investment in collections in order to add a data point to ROI to help effectively articulate what may be lost in the way of access, intelligence, and finances based on various scenarios.

Building on the concepts behind COI and aiming to bolster an important data point within the calculations, AVPreserve, with this IASA Research Grant, has begun to develop a new dataset to be shared with the field. We have compiled pricing data for digitization going back nine years, plotted it out and analyzed historical trends. This has produced some useful insights and some basis for looking into the future and projecting what price increases in the coming years might look like. Over the next year we will be developing a mechanism to put this data online and to allow others to contribute to the data set so that the insights can be more nuanced and more accurate.

We think this is interesting for a few reasons. One because it has simply never been done. There has been a lot of conjecture but it has never been quantified in any meaningful way. Another because we see that the tendency is for administrators and executives to think that the prices that exist now will persist for the next 15 years; in reality, it is obvious that this will not be true, but it is difficult to say what will be the likely scenario.

During this phase of the project, AVPreserve used existing data, and scrubbed it to maintain complete anonymity on both the service provider side and the service procurement side. AVPreserve extracted this information from and compiled it into one dataset, supplementing the data with contextual information such as size of project, digitization specifications, formats involved, quantities of objects digitized, among others to be determined during the project. In future phases of the project, AVPreserve will reach out to preservation reformatting service providers and ask them to submit their pricing information (again keeping everything confidential and anonymous). AVPreserve will also reach out to people and organizations who have outsourced digitization asking them to provide their specifications and pricing data (again keeping everything confidential and anonymous). This dataset, as it is compiled, will document the nature of digitization service costs, revealing the shifts in costs over time and the discrepancies of pricing based on various factors. Saving our audiovisual heritage requires funding, and we need accurate data to aid our articulation of need.

Methodology

We planned for the overarching project to consist of four activities. This report focuses on activities one and the preliminary results of four. The first activity involved gathering and reporting on data already held by AVPreserve. Our approach was to use the data that was closest to hand in order to develop a stable data model for capture and reporting of the information that will make up this dataset. The second activity will be to gather data from digitization service providers. The third activity will be seeking data from organizations who have procured digitization services and have received quotes/invoices from vendors. This is seen as the most challenging of the datasets due to the variables and lack of controls in place. However, it is still a valuable dataset that is of great interest. Its importance may increase depending on the cooperation sought from vendors. The fourth activity is analysis and reporting, which we perform at the end of each of the first three activities, and is an ongoing product of this research project as the dataset grows and is shared with the field.

- Activity 1: Existing data compilation and entering: includes coming up with the data model for documentation and reporting
- Activity 2: Vendor data coordination, compilation, entering: more coordination, more data, more unknowns
- Activity 3: Client data coordination, compilation, entering: more people to organize, more follow through, more data and more unknowns
- Activity 4: Analysis, Visualizations, Reporting: this activity is repeatable as the dataset grows

Approach

The first step we needed to take in beginning to gather data was to decide on an appropriate data model for the project. As we were unsure at this point of exactly what analysis we were going to be able to perform at the end of Activity 1, we decided to record as much data as we could, in order to avoid needing to go back to retrieve more. The fields we selected are as follows:

Key

Description/Rationale: Each entry, based on format type, requires a unique identifier in order to differentiate between them.
Data type: 16 digit sequential number
Validation: n/a
Vocabulary: n/a

Date
Description/Rationale: This date corresponds to the date the vendor sent the proposal to the client.
Data type: date
Validation: ISO 8601
Vocabulary: n/a

Project ID
Description/Rationale: In order to link projects with multiple vendor responses, we assigned each project a Project ID number. A project is defined as a single client with a single RFP— a project may have multiple vendor responses.
Data type: 6 digit sequential number
Validation: n/a
Vocabulary: n/a

Batch ID
Description/Rationale: In order to differentiate between multiple vendor responses to a single project and to link multiple formats within a vendor response, we assigned each vendor response a Batch ID number. A batch is defined as a vendor's response to an RFP— a batch may have multiple format entries.
Data type: 6 digit sequential number
Validation: n/a
Vocabulary: n/a

Vendor country
Description/Rationale: The country in which a vendor is located.
Data type: free text
Validation: n/a
Vocabulary: n/a

Vendor state/province
Description/Rationale: The state or province in which a vendor is located.
Data type: free text
Validation: n/a
Vocabulary: n/a

Client country
Description/Rationale: The country in which a client is located.
Data type: free text
Validation: n/a
Vocabulary: n/a

Client state/province
Description/Rationale: The state or province in which a client is located.
Data type: free text
Validation: n/a
Vocabulary: n/a

Resource type
Description/Rationale: A generic description of the format type, e.g., is it a sound recording or is it a moving image object?
Data type: list
Validation: resource type list
Vocabulary: sound recording; moving image

Quantity of format in project
Description/Rationale: The number of items of a particular format the client requested a quote for in their RFP. Vendors may offer discounts on bulk projects.
Data type: integer
Validation: n/a
Vocabulary: n/a

Media
Description/Rationale: The method with which sound or visual elements are affixed/stored on the media type.
Data type: list
Validation: media list
Vocabulary: magnetic; optical; mechanical

Media type
Description/Rationale: A mid-level description of the format type in order to support generalizations based on geometry and physical structure.
Data type: list
Validation: media type list
Vocabulary: open reel; cassette; disc; cylinder; wire

Source format
Description/Rationale: A specific description of the format.
Data type: list
Validation: source format list
Vocabulary: audio cassette; 1/4 inch audio tape; DAT; lacquer disc; metal disc; pressed 78RPM disc; pressed LP disc; pressed 45RPM disc; CD; mini disc; wire; cylinder; VHS; U-Matic; betacam; digital betacam; DV; 8MM; betamax; HDCam; laserdisc; XDCam; 2 inch videotape; 1 inch videotape; 1/2 inch videotape; D2; D3; DVD; 2 inch audio tape; 1/2 inch audio tape; DTRS; IMX MPEG; 1/2 inch digital audio tape; D1; 1/2 inch digital audio tape; 1/4 inch digital audio tape; MII; digital compact cassette; VHS audio; instantaneous disc; transcription disc; D5; ADAT; CVC; 1 inch audio tape; 8-track; Dictaphone; flexidisc

Format type
Description/Rationale: Any additional specifications needed to differentiate one format from another.
Data type: free text
Validation: n/a
Vocabulary: n/a

Average estimated run time
Description/Rationale: The estimated runtime of an item. Vendors may charge differently based on length, making this an important variable when determining and comparing costs per minute.
Data type: integer in minutes
Validation: n/a
Vocabulary: n/a

Digitization type
Description/Rationale: Different types of digitization will result in different costs. High throughput workflows, or one operator performing multiple transfers simultaneously, will result in lower costs than one-to-one workflows, or one operator performing one transfer. It would not make sense to lump these two workflows together during analysis.
Data type: list
Validation: digitization type list
Vocabulary: high throughput; one-to-one; unknown

Preservation master target
Description/Rationale: Costs may vary based on how a client requests the preservation master be delivered - as a physical carrier or as a file.
Data type: list
Validation: preservation master target list
Vocabulary: carrier; file; na

Mezzanine target
Description/Rationale: Costs may vary based on how a client requests the mezzanine copy be delivered - as a physical carrier, as a file, or not at all.
Data type: list
Validation: mezzanine target list
Vocabulary: carrier; file; na

Access target
Description/Rationale: Costs may vary based on how a client requests the access copy be delivered - as a physical carrier, as a file, or not at all.
Data type: list
Validation: access target list
Vocabulary: carrier; file; na

Lump sum cost
Description/Rationale: Used when a vendor provides a lump sum cost estimate for digitization. Not used when the Preservation master generation cost, Mezzanine generation cost, or Access generation cost fields are used.
Data type: integer
Validation: n/a
Vocabulary: n/a

Preservation master generation cost
Description/Rationale: Used when a vendor does not provide a lump sum cost estimate for digitization, but rather breaks down the cost into separate actions. Not used when the Lump sum cost field is used. 0 is used when the action is included in another price, null is used when it is not included or it is unknown.
Data type: integer
Validation: n/a
Vocabulary: integer; 0; null

Mezzanine generation cost
Description/Rationale: Used when a vendor does not provide a lump sum cost estimate for digitization, but rather breaks down the cost into separate actions. Not used when the Lump sum cost field is used. 0 is used when the action is included in another price, null is used when it is not included or it is unknown.
Data type: integer
Validation: n/a
Vocabulary: integer; 0; null

Access generation cost
Description/Rationale: Used when a vendor does not provide a lump sum cost estimate for digitization, but rather breaks down the cost into separate actions. Not used when the Lump sum cost field is used. 0 is used when the action is included in another price, null is used when it is not included or it is unknown.
Data type: integer
Validation: n/a
Vocabulary: integer; 0; null

Inspection & prep
Description/Rationale: A vendor inspects an item for physical issues that may inhibit digitization and then prepares the item for digitization. 0 is used when the action is included in another price, null is used when it is not included or it is unknown.
Data type: integer
Validation: n/a
Vocabulary: integer; 0; null

Quality control
Description/Rationale: The cost for a vendor to inspect an item for physical issues that may inhibit digitization and then prepare the item for digitization. 0 is used when the action is included in another price, null is used when it is not included or it is unknown.
Data type: integer
Validation: n/a
Vocabulary: integer; 0; null

Metadata cost
Description/Rationale: The cost for a vendor to generate and format technical metadata - either as an XML document, spreadsheet, or embedded into the file - for delivery to the client. 0 is used when the action is included in another price, null is used when it is not included or it is unknown.
Data type: integer
Validation: n/a
Vocabulary: integer; 0; null

Cleaning cost
Description/Rationale: The cost for a vendor to clean the item in preparation for digitization. 0 is used when the action is included in another price, null is used when it is not included or it is unknown.
Data type: integer
Validation: n/a
Vocabulary: integer; 0; null

Dehydration cost
Description/Rationale: The cost for a vendor to bake or dehydrate an item, if it exhibits signs of sticky shed syndrome, in preparation for digitization. 0 is used when the action is included in another price, null is used when it is not included or it is unknown.
Data type: integer
Validation: n/a
Vocabulary: integer; 0; null

Lubrication cost
Description/Rationale: The cost for a vendor to lubricate an item, if it exhibits signs of soft binder syndrome, in preparation for digitization. 0 is used when the action is included in another price, null is used when it is not included or it is unknown.
Data type: integer
Validation: n/a
Vocabulary: integer; 0; null

Humidification cost
Description/Rationale: The cost for a vendor to rehydrate an item, if it exhibits signs of extreme brittleness, in preparation for digitization. 0 is used when the action is included in another price, null is used when it is not included or it is unknown.
Data type: integer
Validation: n/a
Vocabulary: integer; 0; null

Mold abatement cost
Description/Rationale: The cost for a vendor to remove mold from and thoroughly clean an item. 0 is used when the action is included in another price, null is used when it is not included or it is unknown.
Data type: integer
Validation: n/a
Vocabulary: integer; 0; null

Other cost
Description/Rationale: Other costs itemized in the vendor's response that do not fit in one of the cost categories above. 0 is used when the action is included in another price, null is used when it is not included or it is unknown.
Data type: integer
Validation: n/a
Vocabulary: integer; 0; null

Total cost per object
Description/Rationale: The sum of Lump sum cost, Preservation master generation cost, Mezzanine generation cost, Access generation cost, Inspection and prep, Quality control, Metadata cost, Cleaning cost, Dehydration cost, Lubrication cost, Humidification cost, Mold abatement cost, and Other cost for an item.
Data type: integer
Validation: n/a
Vocabulary: integer; 0; null

Total cost per minute
Description/Rationale: The Total cost per object divided by the Average estimated run time for the format.
Data type: integer
Validation: n/a
Vocabulary: integer; 0; null

Dataset

This project is ongoing and we do not yet have analysis and results to share. In the coming year we will run statistical tests against the dataset that we have created in order to identify trends and make assertions about the changing costs in digitization services. For the purposes of this report, we will provide a summary of the dataset and a few calculations.

The dataset that we have aggregated to-date consists of 25 projects spanning the years 2006–2015 across two countries (US and Canada) and eight different content-holder locations (New York, Maryland, Texas, Massachusetts, California, New Jersey, Iowa, and Ontario). Projects represent unique organizations who have bid out for digitization services. In response to these 25 projects, the dataset includes 59 responses from digitization service providers. The current dataset only includes data from service providers in the US. A benefit to this dataset would be the addition of project data and batch data from organizations and service providers across the globe.

Within these 59 responses from digitization service providers, we have accumulated 1,765 format-specific price points. Because these price points are for multiples of specific formats and not for individual objects, this actually represents price points for 2,682,044 audiovisual carriers.

Moving Image Format	Quantity of Carriers in Sample	Average Cost per Carrier 2006–2015
1/2 inch videotape	1951	$263.17
2 inch videotape	1612	$252.22
8MM	48786	$230.27
betamax	54831	$167.32
D2	4527	$126.87
1 inch videotape	50409	$119.55
betacam	1120604	$102.48
VHS	159596	$88.08
U-Matic	228767	$84.87
DV	364996	$76.18
D5	111	$71.17
laserdisc	234	$70.00
XDCam	44282	$64.23
D1	6521	$64.19
digital betacam	156508	$63.17
D3	2898	$60.12
DVD	73399	$57.59
MII	1163	$51.83
HDCam	45353	$51.56
IMX MPEG	12092	$38.72

Table 1. Quantity and total average cost of moving image formats represented in the dataset for this project. Average represents samples from 2006–2015.

Audio Format	Quantity of Carriers in Sample	Average Cost per Carrier – 2006–2015
2 inch audio tape	8799	$255.31
1/4 inch digital audio tape	1	$250.00
DTRS	17169	$97.84
1/2 inch audio tape	2168	$96.68
Dictaphone	204	$92.50
VHS audio	285	$83.67
wire	32	$79.60
pressed LP disc	57418	$75.86
1/2 inch digital audio tape	66	$74.87
transcription disc	816	$74.33
instantaneous disc	4598	$74.22
flexidisc	1102	$67.50
lacquer disc	168	$64.28
digital compact cassette	63	$62.16
pressed 45RPM disc	8	$50.00
1/4 inch audio tape	73908	$49.08
DAT	34406	$48.64
ADAT	9393	$47.95
CVC	2	$45.00
8-track	22	$42.50
pressed 78RPM disc	54	$39.33
audio cassette	54120	$31.95
CD	38501	$26.78
mini disc	101	$14.40

Table 2. Quantity and total average cost for digitization of audio formats represented in the dataset for this project. Average represents samples from 2006–2015.

Source Format	2010 avg/ item	2011 avg/ item	2012 avg/ item	2013 avg/ item	2014 avg/ item	2015 avg/ item
1/2 inch videotape	$331.11		$188.57		$190.00	$165.27
2 inch videotape	$292.82	$292.24		$206.75	$250.00	$229.41
8MM	$368.35		$60.00	$40.30	$61.50	$43.30
betamax	$244.91		$40.00		$51.00	$27.54
D2	$330.80		$40.00	$41.49		$71.17
1 inch videotape	$206.53	$167.24	$205.31	$76.36	$128.50	$55.95
betacam	$262.08	$82.24	$38.13	$34.44	$23.25	$23.35
VHS	$221.80		$49.40	$35.47	$38.38	$27.47
U-Matic	$204.70	$59.74	$39.06	$33.88	$27.79	$30.88
DV	$187.30	$54.74	$50.83	$36.94	$39.94	$24.28
D5						$71.17
laserdisc						$70.00
XDCam	$140.42	$84.74		$44.53	$27.38	$23.93
D1			$50.00			$87.84
digital betacam	$158.36		$26.67	$30.71	$22.38	$24.57
D3		$72.24		$41.00		$71.17
DVD	$137.41			$29.27	$18.86	$14.02
MII				$20.33		$57.38
HDCam		$92.24		$50.67		$28.93
IMX MPEG				$38.72		
2 inch audio tape	$333.33	$282.35			$234.00	$137.50
1/4 inch digital audio tape	$250.00					
DTRS		$223.60		$46.67		$65.19
1/2 inch audio tape		$168.60			$71.67	$86.86
Dictaphone						$92.50

Source Format	2010 avg/ item	2011 avg/ item	2012 avg/ item	2013 avg/ item	2014 avg/ item	2015 avg/ item
VHS audio						$83.67
wire						$79.60
pressed LP disc	$114.46	$138.25			$70.00	$60.73
1/2 inch digital audio tape	$63.34			$75.83		
transcription disc						$74.33
instantaneous disc						$64.50
flexidisc						$67.50
lacquer disc	$56.63	$87.25				
digital compact cassette				$46.67		$71.46
pressed 45RPM disc					$50.00	
1/4 inch audio tape	$51.32	$78.59	$60.00	$36.31	$92.43	$33.88
DAT	$89.82	$143.60		$39.79	$35.67	$48.90
ADAT						$47.95
CVC						$45.00
8-track						$42.50
pressed 78RPM disc						$39.33
audio cassette	$94.74	$80.77	$35.00	$30.00	$27.73	$17.89
CD	$63.85	$118.60		$28.67	$19.57	$12.44
mini disc						$14.40

Table 3. Average digitization cost per item per format per year for 2010–2015. Values represent data contained in the research data set currently.

Much work remains to be done with this dataset. We hope these brief numbers provide a summary of the dataset and an understanding of the strengths and weaknesses of the data. We welcome any additions to the dataset so that the questions asked of it reveal answers with richer nuance and accuracy.

The author wishes to thank Bertram Lyons for his support in framing and executing Activity One of this project. Special thanks also to the IASA Board for providing AVPreserve the opportunity to explore this topic in detail.

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IASA Journal

- Journal of the International Association of Sound and Audiovisual Archives IASA
- Journal de l'Association Internationale d'Archives Sonores et Audiovisuelles IASA
- Zeitschrift der Internationalen Vereinigung der Schall- und audiovisuellen Archive IASA
- El Journal de Asociación Internacional de Archivos Sonoros y Audiovisuales

The IASA Journal is published twice a year and sent to all the members of IASA. Applications for membership of IASA should be sent to the Secretary General (see list of officers below). The annual dues are €48 for individual members and €190 for institutional members. Back copies of the IASA Journal from 1971 are available on application. Subscription to the current year's issues of the IASA Journal is also available to non-members at a cost of €70.

Le IASA Journal est publié deux fois par an et distribué à tous les membres de l'association. Veuillez envoyer vos demandes d'adhésion au secrétaire don't vous trouverez l'adresse ci-dessous. Les cotisations annuelles se montent actuellement à €48 pour les membres individuels et €190 pour les members institutionnels. Les anciens numéros (à partir de 1971) du IASA Journal sont disponibles sur demande. Ceux qui ne sont pas membres de l'Association peuvent s'abonner au IASA Journal pour l'année en cours au coût de €70.

Das IASA Journal erscheint zweimal jährlich und geht allen Mitgliedern der IASA zu. Aufnahmeanträge für die Mitgliedschaft bei der IASA sind an das Sekretariat (Anschrift siehe unten) zu richten. Die Mitgliedsbeiträge betragen derzeit €48 für individuelle Mitglieder und €190 für Institutionen. Frühere IASA Journale (ab 1971) sind auf Anfrage erhältlich. Der Bezugspreis des IASA Journals für Nichtmitglieder beträgt €70.

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