

Interview with James Snyder

Senior Systems Administrator, National Audio Visual Conservation Center, Library of Congress

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Interviewers: Crystal Sanchez, James Smith, Lauren Teal

Please describe your experience working in the field of media stewardship, preservation, etc.

The top-level view would be I've been working in television and radio since I was fifteen when I started working for the public radio and television stations of the Ball State University in Muncie, Indiana. That's how I got started in my career. I've been doing this in various forms for 33 years. I got involved in the mainstream media when I came to Washington, D.C. to go to college at George Washington University (GWU) School of Engineering. I started freelancing for many of the various media organizations in D.C. I did a number of functions at a couple of different universities as I was working my way through college. I was the chief engineer for the radio station at GW and I was chief engineer for both the radio and television stations at American University when I went up to AU. At the same time, I did a lot of freelancing. Most of it was production but I started moving into engineering. I went to engineering school and I started moving from production to engineering basically because people wanted me too. This was because I was a good translator for folks who didn't understand technology or how production processes and systems worked. I could understand the production side, the operations side, and the engineering side. I got involved in advanced technologies in this line of work back in 1993 when I got a job at the Discovery Channel as the operations coordinator for international program sales. I basically had to deal with all of the assets of Discovery. This included not only the finished programs but all of the film and tape archives: the raw footage collection. I was there when we started to sell raw footage for Discovery. That led to the Advanced Television Test Center (ATTC) in Alexandria, Virginia, where we tested what is now the digital television standard for the United States (the ATSC standard). I was part of the very beginnings of digital television in the United States. That led to a whole bunch of different projects involving the roll out of digital television and the testing of digital radio, now called "HD Radio" but known as IBOC (In Band On Channel) at the time, and the roll out of things like high definition television via satellite. After the ATTC closed I worked for Sarnoff Laboratories and Turner Engineering organizing demonstrations of HDTV and digital television transmissions. I was tape operator for the first program transmitted, what we called an HD "pretty pictures reel", when the first digital TV station, known as the "Model HDTV Station Project Inc. (WHD-TV)", went on the air in July 1996 from the basement master control room of WRC-TV in Washington, DC. For example, we did the

first high definition baseball broadcast, which was, the Baltimore Orioles and the Texas Rangers in Arlington, Texas in 1996. We did the first high definition NFL game, which was the Washington Redskins versus the Dallas Cowboys at RFK Stadium in early 1998.

I spent a year and half at Fox News. I was part of the team that put the Fox News Washington Bureau on the air. After I left Fox I worked on a project called the Unity Motion High Definition Satellite Service, which was the first direct-to-home HDTV service to consumers and launched on June 8th, 1998. It predated DirecTV and DISH Network's services by nearly 2 years. After getting Unity Motion up and running, I was asked to go on a 15 month, 49 city road tour called the Harris/PBS DTV Express where we introduced digital television to the citizens, state governments and TV industry people of the United States. We had a fully operational digital television station in a double expanding tractor-trailer truck and we went around the country for 15 months and basically teaching people how to do digital television and digital audio. This included everything from the camera and the microphone all the way to the bitstream going to the transmitter. I taught about analog audio and video, digital audio and video and the difference between them.

What was new back then was MPEG-2, which is what the digital television standard was based on. I taught them about how MPEG-2 works, up to the point where the bitstream goes off the transmitter. Then another instructor, Ed Williams, took it from there and taught the basics of digital over-the-air transmission.

A whole bunch of other consulting work came after that. After the DTV Express was over in August of '99, I worked part-time for the PBS DTV Strategic Services Group, where we helped the 348 stations in the PBS system get their digital transmitters on the air and start designing the digital upgrades to their studios. At the same time I also worked for the ABC Radio Network as an engineer working on Capitol Hill and ABC Television on various HDTV projects where we did a whole bunch of demos up on Capitol Hill. I finished at PBS in 2003, and I went over to Intelsat in July. I was part of the Ground Network Engineering team that privatized Intelsat and built the first Ground Network. Before 2003, they were a treaty organization and they were only allowed to design and fly satellites around the globe; they were not allowed to own the ground stations or any kind of ground communications network infrastructure. When they privatized, they were allowed to own facilities on the Earth and the Ground Network was built. I was part of the team that designed and built Intelsat's Ground Network.

In 2005 I went over to MCI' Digital Media Technologies (DMT) group to start building an uncompressed high definition video transmission system over long-distance fiber. DMT was a technology incubator group within MCI to figure out new and innovator ways of using MCI's global fiber optic network and data centers. We were the first ones to do uncompressed HD digital video over nearly 5000 miles of MCI's SONET-based fiber optic

network. Then when Verizon took over MCI they fired all of us because that's what Verizon does. At the point I got a phone call from a group called CEI (Communications Engineering, Inc.) saying, "Hi, we understand you are good at history and you know a lot about high technology. Would you be interested in this project at the Library of Congress?" I got hired at CEI to be one of the two principal design engineers for the building I am now sitting in. In February of 2009 the folks at the Library said, "Would you like to come over and maintain and run and continue the roll out of this system that you helped design and build?" That's how I ended up here at the Library.

Do you work with artworks or components of artworks? Does the Library of Congress collect art?

The Library of Congress is the Copyright registry and repository of the United States, so the quick answer is yes. From our perspective it doesn't really matter if you define something as an artwork or not, you can copyright it. If you can copyright it, the Library has to handle it. After the Copyright Office registers a work, it goes to one of five depository divisions (based on content types, like books, manuscripts, photographs, audiovisual works, etc) who are responsible for the maintaining accessibility and usability of the deposited work for the Copyright registration period. In the MBRS division's case, that period usually starts at 150 years.

Do you see any differences in the way you care for an artwork as opposed to any other work that you have in your collection?

When you are trying to preserve something, especially if it involves something ephemeral like electronics or electrical signals, you have to ask, "What is this thing at its essence? What is it trying to do?" One of the nice things about our line of work in the Motion Picture Broadcasting and Recorded Sound Division (MBRS) is that it is a pretty straightforward answer most of the time. It's an audio recording, it's a video recording, or it's a film recording. They all have certain technical parameters, and with very few exceptions those technical parameters, big picture wise, are always the same. In the case of artworks, if they are audiovisual artworks that are just straight audiovisual recordings that need to be played back in a certain way, that's a pretty straightforward technology implementation. When it comes to more complex implementations, like if you have a computer controlled set of devices that need to do things in a certain sequence because that sequence, that visual or aural experience, is in fact that artwork, that's where things get a little more involved.

From my perspective, the challenge for an artwork is answering, "What is this artwork? What is the artist trying to do?" If the artwork is the relationship between different elements, our job as conservators is to preserve as close as possible the intent of the original artist, what those relationships were, whether it be timing relationships or

physical relationships; whatever those relationships would be. What we can't reproduce is if the experience is time-based, as in a certain point in time. For example, the artists (Christo and Jeanne-Claude) who did *Running Fences* installed the work from a certain start date to a certain end date, and in this situation all you can do is document the artwork. You can't *reproduce* the artwork because it no longer exists. That's where things get a little more interesting. If we want to keep a record of this artwork that no longer exists or will no longer exist, how do we do that? How do we in some way document properly and maybe even reproduce the experience of someone having seen *Running Fences*?

That's where curatorial decisions need to be made. At that point that's where the curators get involved with the recorded sound and the moving image (or both). Even in other parts of the Library or even with third parties outside the Library, that's where we have to collaborate and figure out what it is we are trying to do. We don't do a lot of that, it's very rare. Most of the time we are asked to consult on how to do something but we don't actually have to do it ourselves because for the most part, probably 99.99% of the items here in Culpeper, are artworks that are standalone audiovisual works.

One of the things we have not done in any significant quantity—we've done tests but we haven't done any significant quantity— is things that are time-based but are not single instantiation time-based works. In other words, they are not an audiotape or a videotape or a CD. What they are, are a set of slides with an audio cassette with certain triggers on it where if you have the proper system it presents the slide in a certain order and leaves them up on the screen for a certain period of time. In other words, there is a relationship between the images, and we have to find a way to recreate this relationship that people can still experience.

Since the bulk of our efforts here have been getting the mass migration facility online, and the vast majority of our collection is audio-visual works that are fairly straightforward to preserve, we will get to the time-based works that are not single instantiations, either on demand as we need to or when we get through all of the rollout of the migration systems.

You work on a scale that is larger than most collections.

As a collection, we are larger than most television networks.

So you have these classes of media works, for example- video based, audio based, and artworks. Each work is one piece. Do you have policies, guidelines, or standards for how you treat those classes?

Absolutely. The only way you can really migrate on a mass scale is if you have common technical parameters for sections of the collection. In other words, you have 750,000 $\frac{3}{4}$ inch tapes or 100,000 1 inch video tapes or you have 500,000 open reel $\frac{1}{4}$ inch audio

recordings. Because those have certain technical parameters, the vendors who came up with the original machines and original recording media had to come up with technical standards- even if they are not standards in the ISO sense - but they are standardized ways of reproducing content. ¼ inch open reel recorders are pretty standardized. You only have a couple of different choices.

How many tracks are on the tape? How fast the tape is moving and maybe different bias settings depending on what type of magnetic media is actually on the tape. And whether the recordings were done to spec or there was something unusual about the recording (like the record heads weren't set up correctly). That's it. The only thing you really have to do is to get that combination right, and as long as the documentation on your collection is good enough, the audiotapes and the videotapes really are what the catalog says they are, you can mass migrate that stuff until the cows come home. That's what we are doing here; we are doing mass migration. Even if its on an individual-medium basis.

If it's a more esoteric format - where somebody came up with an experimental format or it was a format that was sold to the public but was only there for a short period time, like ¼ inch open reel Akai videotape. It was only marketed between 1970-1974. Those are very rare and they are hard to recreate, or find and restore to operating condition. That makes things a lot more resource and personnel intensive. Part of our focus has been getting the mass migration stuff out of the way so that we can then spend more time on getting the more esoteric formats and styles migrated as well.

Also, the other way things are done are with other works, like motion pictures, they are not always single instantiations. Many times motion pictures come in as 35mm reels, with no sync sound soundtrack. They also come with 35mm full coat magnetic stripe (aka magstripe) film, and the sound track you have to run in tandem to be able to migrate the work. So you have multiple-instantiation single works. Obviously in the big picture sense, those are artworks as well. Folks consider *Casablanca* or other motion pictures to be artworks as well. They may not be artworks from the perspective of artists who work for museums, but they are still artworks nevertheless. They are also works that can be copyrighted and that's why we are doing what we are doing because we are the copyright collection for the United States. So the experience we get working with multiple-instantiation single works is not unlike what we have to do for things that folks would term with a capital A—Artworks, things that would exist in museums. Many artists use the same technologies that were used to generate the rest of our collection but they are just putting them together in different ways than are done for mainstream entertainment or instructional media. They're using cameras or screens or audio in different ways or in different combinations. In that combination or the relationship of those combinations, that is the artwork itself - not just what is appearing on the screen or what is being heard. How it's being presented is the artwork. To a great extent we don't have a lot of those, but we do

have them. At some point, we have to find out what those relationships are and when we migrate that media—assuming it can still be migrated—we have to recreate as close as possible the original intent of the artist.

That's a fascinating model. The work you have to do with the artwork in your collection is exactly what we are looking at right now.

Part of the challenge is working with time-based artworks in ways that are not traditional time-based media. It's still time-based but it's time-based in a different way. Unlike a television program, which always runs at 29.97 frames per second regardless of what the material is and regardless of what the artistic value of the material is, it always runs 29.97 frames per second. In capital A capital W, museum artwork, that isn't necessarily the case. We have to be able to accommodate different implementations of the same technologies.

If you are able to create general policies around those kinds of classes of objects, but with artworks it can be so varied. Were you able to create a migration policy for the films that you were just referencing?

Sure, absolutely. We couldn't build this place without.

Do you think you could take this model and apply it to your time-based media art pieces?

With some tweaks, yes, absolutely. If it's time based media, the essence of what we do here is time based media. Ultimately the question here is can you reproduce the artwork as the artist intended with the timing relationships maintained. That's the ultimate question. If so, how do you do it? That's pretty much it. The only third question would be if there is some presentational relationship where it needs to be presented in a certain way (say TV screens set up in a particular order or physical configuration); like the set-up has to be a particular set up to be what the artist intended. That would be the third question. Can we reproduce that and if so, how?

I know you work a lot with standards and standards-making bodies. Do you think there is space for dealing with the technical needs of fine artworks within the standards that you are familiar with or work with?

The quick answer is yes, but, it's a qualified yes. Standards tend to get set because folks need to solve a problem; they need to be able to do something. That's why all the AES and SMPTE standards exist: because someone needed to be able to do something that is reproducible across multiple pieces of equipment in a consistent way. In other words you take a piece of media from one machine that was recorded on one machine, then you take it over to another machine and you should be able to play it back. That's why standards exist. All of the signal transmission into and out of those devices, both the recording and playback device, have to be standardized. So strictly speaking, the kind of time based artworks we

are talking about need those same things but they need different implementations of them. We can take some standardized ways of doing things now; there is a standard called MXF (the Material eXchange Format, SMPTE standard 377) which is a file format that allows for the interchange of audio visual content between different vendors' file-based equipment. MXF or something like MXF will have to be able to be adapted to do the different types of time-based content that artworks require. In other words, if they are not just straight audio, video, or film, which are easy to do, relatively speaking, most of those standards have already been set and the ones that haven't been set are the ones we are working on right now. We will have to adapt those standards which are for continuous media, like the same tape speed for audio playback across an entire work. We will have to take those standards and adapt them to the different timing needs of the artworks that use non-standard playback timings, for example.

So is that a new standard or is that just clarifying a standard for a specific set of media objects?

Clarifying isn't probably the right word, "updating" is. Off the top of my head, the quick answer is that standards like MFX will be able to be adapted for the vast majority of non-'ordinary' works that need to be digitized for preservation. There will have to be some work done on the standards that allow signaling into or out of a device that has the recording on it. This is because they aren't ordinary audio or video signals. If you have time-based media where the relationship between the audio and video or even the mechanical device doing something at the same time, a Rube Goldberg type of device, if those are the relationships, you have to find some way to control those physical devices along with the off the shelf audio visual devices at the same time. Those are the standards that will need to be set. Those command and control signals and timing relationships will need to have standards set to enable equipment and software to be created to consistently reproduce the work.

How about storage? Are the storage needs different? What aspects of that model or work and what needs more specificity? I wonder if you could speak a little bit to what you think about how artwork components that are digital form need to be housed differently or the same.

Let me start off with a question for you, what do you think would be different?

This isn't my interview [laughs]. I think a lot of the things I am focusing on right now are security and integrity checks that are the same process but possibly more frequent. Additionally, the archival packages for artworks include more robust technical documentation. Otherwise, the entire base of the storage infrastructure and larger organizational policies are the same.

Smithsonian Institution Time-Based and Digital Art Working Group: Interview Project

You've pretty much hit the nail on the head. One of the things we've realized, especially designing our archives. Do you know the difference between an archive and a repository?

Between the use of the terms digital archive and repository, I would say that they have different organizational policies and access points when discussing long term storage, retention, access, and the use of the content.

You need the big picture definition. The archive is for the content that isn't intended to be touched, it is intended to be preserved. One of the realities is, if you are touching it constantly you greatly increase the chances of damage. It doesn't mean that the content in the archive isn't being used; it means that you make copies of it for use but leave the archive copy alone. In other words you have an offline component and an online component. Offline meaning that normal, everyday people who are trying to use the content in the archives aren't accessing that content on those tapes or drives as part of their day-to-day work. That's what you don't want to do because use equals potential damage to the recording. What you do want to do is you want to make copies of the files that people are using and put those in an online environment (say servers with hard disk storage) where if those files get damaged you haven't damaged the original. Archival materials aren't meant to be touched except on the very oddest of occasions when they either need to be validated, migrated, or accessed for some reason. In other words, only if the online copy was damaged and you need to get another copy of it to be able to use it again. Do you see what I mean?

So you could essentially have both a repository and an archive?

All repositories are archives, not all archives are repositories. Here's the difference. Repositories are where you have day-to-day business accessible data. That's where your retention requirements are different. Archive retention requirements are years, decades, even centuries (as in the Library of Congress' case). Repository requirements are whatever the business requirement is. If it's IRS tax-related data that's seven years. If it's commercial business data that's 15-20 years. If it's internal documents it is whatever the deadline or sunset date is. If you come back to them in five years and say I don't need these anymore, erase them.

Repositories are more actively used. They are the business operations data of any institution. An archive is a part of the repository but its rule set is different. It's more like 'don't touch me unless you absolutely need me'. An archive is part of the repository but the online part of the archive, the files that are actually used day-to-day, are copied out of the central archives so the originals aren't damaged and the working copies are the ones that are worked from. Repositories are the day-to-day work environment, storage for the work environment, to do whatever it is your institution needs to do. Your archive is your master

copy of all of the content that has been migrated and preserved, and it is not meant to be touched unless on the very oddest of occasions.

What do you think about time-based art components in repositories?

If it's a file, if all you're doing is preserving the file, data systems today don't care. It's data. As long as you set your parameters correctly - you have cryptographic hash checksums to make sure your fixity is good and you check your fixity from time to time - your data has been preserved with a high degree of confidence. In designing what goes in to your archives, that's where things get more interesting, because whether the technology is technology like our day to day technology here or it is technology in specific implementations for specialized artworks, what you really have to do is to be able to maintain the accessibility and the usability of the digital content. In other words, you saved this file that has whatever information is inside of it. If you pull it back and you start using it, you need the documentation to know how to use it. If you don't have a device that knows how to use the content you have to build the device that knows how. The only way to do that is to include the documentation on whatever the standards, interfaces, physical equipment, etc. is needed to read and use that data. That also has to go into the archive along with the migrated content itself. Documentation of how to use that content is the other half of the equation. That has to go in the archives too.

Part of what we've done in our audiovisual archive, we've done two different things. We have included, or intend to because some of our technical standards aren't up to the point where we can do it reliably, we plan to include all of the information that tell us what a particular work is. For example, it's a television program, it was produced by NBC Studios, who the producer, director, and other people that own the footage are, copyright information. All of that data needs to be included with the original migrated work itself. Our master cataloging database here (the MBRS division) is called MAVIS. We intend to put our MAVIS record, an XML copy of the MAVIS record for each work into the MXF file along with the work. We are not there yet but that is where we are aiming.

What is the state of MXF?

The MXF standard is there. The folks that are writing the software for MXF are about three-quarters of the way there. They can't do it with all of the types of metadata that is out there. All of the descriptive data is metadata when it comes to how you described metadata verses data in an archive file. We are working with SMPTE and AMWA (the Advanced Media Workflow Association) to allow curatorial metadata, not just technical metadata but curatorial metadata, to be included in the files reliably so people can use that content. It's going to take a while to work out the details, but we will get there.

So these archival packages of supporting materials for the file, would you say you are able to standardize that type of package?

That's actually what we are working on right now. I am on a committee called the "Archival eXchange Format" (AXF, SMPTE standard 2034). The goal of the AXF committee is to do exactly that, to define that archive object. That's what the standard calls it, an "archive object". For an AXF Archive Object, the intent is that it is basically a bit-bucket. It doesn't care how many files are inside, it doesn't care what kind of files are inside. They could be media files or they could not be media files, it really doesn't matter. It allows you to group sets of digital content together in a single standardized way that you can migrate from storage medium type to storage medium type and you don't have to change the AXF object itself when you do the transition. If your archive is on a bunch of spinning disks on hard drives and you write an AXF object to it, you should be able to take it off and put in on LTO 5 tape and not have the content or the structure of the AFX object itself change. Right now, the structure of files themselves has to be changed when migrating from one storage system to another. The formatting of how the data is written on each of these media has to change when you migrate between the media. Part of the time delay in migrating the collection from one type of media to another type of media is the processing time and also the different ways that vendors do those implementations. The metadata is not standardized, if there is metadata at all. The goal is to have standardized metadata fields that describe what is in the object and what the payload is as well as intent, time code, and others. They are not media files; they are archive files that allow you to store media files inside of them if it is media files you want to store.

Does it work like a ZIP? Is it considered its own file?

It is, but ZIP files have a file size limit based on how they're coded. AXF is designed to not have a file size limit. If you have an Exabyte-size archive you could have a Terabyte size file. Right now you can't have that.

Do you think that AXF would work for artworks? Why?

Yes. As long as it's data, AXF doesn't care what is inside the Archive Object. What you would put in there is if you have a media file of the media content of that particular artwork. Then you've got the technical documentation of how to build the machinery to reproduce the content of that file. You've got curatorial metadata about who owns the rights to this. What the artist's name was, when they were born, when they died, all of that stuff you can put in this archive object and you'd have it all together.

This is a bunch of interesting worlds you are traversing here. What kind of training made this possible?

The stuff that I described to you at the beginning of the interview basically made it possible. Part of it is, for whatever reason, there are basic technical concepts that I and a number of people like me, we just get it. We understand the technology and the concepts; not everybody does. We understand the relationship between the ephemeral, the bits and bytes you can't actually touch with your fingers and how you take those bits and bytes and turn them into something physical that you see, hear, touch, or feel. We understand those relationships. From my perspective, my training, what led to this was first of all the work I did at Discovery and the Advanced Television Test Center is what introduced me to the concept of file based media. The ATTC was one of the key places where file-based media were defined and tested, and I was there practically from the beginning of file-based media as a concept and that's pretty much where it started. Things like MPEG-2 and MPEG-4 and the relative positives and negatives in compressed essence coding and the limitation of the technology, I understand how computers work. I understand how stuff that is audio and video, but is not a computer. I understand the difference between the two. Part of that is I've got a talent for it. Part of that is I've had the right training.

But additionally, on top of your technical knowledge and training, you are also quite fluent in archival language and in the needs of fine artworks specifically. How did you combine all of that? Does that come from learning on the job?

It comes from a combination of on-the-job and not-on-the-job stuff that kind of sticks to my brain. For whatever reason I've got a decent photographic memory for things technical. Whatever that thing is in my brain that makes that information stick and the training I've had that allows me to use that information in some way that's useful. It's both. I have an interest in things like the technology history. Things like how technology works and how it's changed over time. Part of it is my non-work-related interests. Although strictly speaking, my work and my play are practically the same thing. I get paid to do what I enjoy doing anyway.

In terms of standards that address the needs of artworks, what's left to do?

Well there is plenty left to do just in getting our standard audiovisual stuff to where it needs to be. We've probably got another five or ten years to get the file formats, the metadata standards, automated processing, and automated quality control, and the last big pieces we have left to implement is... we have a good idea how archive migration is going to happen from one storage media to another storage media. We know how we think it's going to happen but now we actually have to do it. Whenever we do a major migration, the plan is not only will we do the fixity check to make sure the stuff coming off the storage media is ok. If we need to update metadata fields, we will update them at the major migration time. If we want to change something about any essences or add content to a

work, that stuff would get updated at that point in time. We mapped out what we think that's going to look like but we haven't actually done it yet.

Any last thoughts?

The key thing is for time-based media that is not traditionally audiovisual content. It's going to be a combination of standards that exist and standards that need to be updated or written. That is going to be the challenge of how do we do that and also teaching people what kind of metadata that needs to be collected to put things in perspective. In other words: what kinds of technical documentation needs to be kept for specialized artworks? We are going to have to do the first couple of artworks that are funky implementations of existing technology. We need to do some of those to see what the actual problems are for implementations. You can theorize all you want but you can't know for sure until you actually do it to see what problems will arise.

How do you feel about emulation as a possible strategy for some works?

Well if we are going to play any of these videogames from the 70s that's the only way we are going to do it.

So it is a viable solution for some works?

Yes, absolutely. If you want to recreate the experience of someone playing Asteroids from 1978 the tactile response, how do you do that but do that with current systems that can't run the software from the 1970's on the original machines. Those machines either don't exist anymore or don't work anymore. One of the realities of integrated circuits is they don't age well. The only way we are going to be able to have a prayer of reproducing a lot of these experiences whether it is videogames or immersive realities that have some hardware or software component, the only way we will be able to do over the long term is through emulation. Again, that's one of those things where we will have to take a look at how we get there from here. What standards exist to allow us to do it and what standards need to be set. Then we have to ask for those standards to be set or work with others to set them ourselves.

We've been collecting videogames, we just don't know what to do with them yet; some of the work has been going on at the University of Illinois, and they have done a lot of seminal work and we are keeping an eye on that. Why reinvent wheels that someone else is working on? At some point we will have to be bringing what those folks have found out and documented here and we are going to have to say, "Okay, we actually have to do something with our content." How do we do that? Part of it is, is there some content we won't be able to do because the cartridges don't exist or don't work anymore. Or for some unknown reason, the Copyright Office didn't make them submit their cartridges they just required

the first and last page of the code. We can't go back to the original manufactures or original code writers, those are lost to history. We can't reproduce those since there is nothing to reproduce: just tantalizing evidence of the work's existence. That's too bad. We are probably going to have a fair number of those. From 2013 starting now, the Copyright Office- this is what we need you to require for best edition submission for copyright. We will have to ask for the code that would allow us to run things in emulation.

You mentioned University of Illinois, are there any other resources you'd want us to know about?

Yes there are but off the top of my head I don't remember where they are. The best person to ask would be Carl Fleischhauer or Leslie Johnston who worked at OSI here in the Library because that was actually several of the NDIIPP (the National Digital Infrastructure Implementation and Preservation Program) projects and how to preserve videogames and time-based media, etc. That would be the place to start. NDIIPP was specifically designed to help folks start asking the right questions about file-based systems and answering those questions when it comes to all sorts of digital based content regardless of if it's audiovisual. It's a very good starting point because even if they didn't finish the work, they at least started down the road and gave the next generation of people who work on the challenge a good starting point.