**From Basement Storage to Online Access: Processing and Digitizing the *Mathematical Association of America* General Mathematics Film Production Elements**

*Transcript, Part 2 of 2*

This next section is where we get into the expensive equipment, as we go through the process of digitizing the films and putting them online. But first, let's take a step back and talk about why we digitize film, and even if we should digitize film, starting with the difference between film and video, as what we're doing when we digitize film is transforming it into video.

I always say that if film and video were set up on a date, they wouldn't have much to talk about.

The matchmaker would be like, Film you are going to *love* video! You two have so much in common! You both love movies! And sure, they are both analog moving image formats, but beyond that...film is translucent, while video is opaque. We can look at a film reel and see the actual images, tell if it has sound or not, find the date it was manufactured. While looking at a video reel doesn't tell us much. It's organized data on magnetic tape, giving instructions to a machine to beam out scan lines that give the impression of a picture. Film is a picture. If you magnified film you would see light shining through beautiful crystals of color suspended in gelatin. With video you would see a wall of rust. And there are also differences in the images created by each. Film is a set of single, simple pictures, while video uses interlacing, running two alternating fields of scan lines for each image, to conserve bandwidth. The speeds are also different. Sound film universally moves at 24 frames per second while analog video in America was about 30 frames per second, and video abroad about 25. An image on a film is permanent, save vinegar syndrome, while video was sold in part because it could be recorded over, as Dr. Who fans know. On the flip side, video isn't prone to color fading like film, but when it's image does degrade, it does not go gracefully. And video, like all magnetic tape, is an impermanent medium that should be refreshed every decade, while film on the right stock, in proper storage conditions can last for more than a half a century.

So film archivists and advocates have been pushing back on the idea that video can replace or be a surrogate to film since the ’60s, and they have always been right. But just now, as theater chains transition to digital, they are losing ground. And what about digital video, compared to film? It may be contained on spinning hard drives or magnetic back-up tape, but it is still opaque, needs a machine to be read, and is easy to delete. Digital video files also have the possibility of corrupting over time, and this problem is compounded with compression, too complex to get into here, but another layer between you and your video files. While film is one of the most mature media formats, with over 100 years of steady use and refinement, digital video is the least mature of digital media formats, because it was too large for most computers to deal with--they didn't have a fast enough throughput to handle all the data, and not enough storage to be able to keep it. It is just now becoming possible to store digital video in an uncompressed form that actually gets close to the resolution and dynamic range of film.

And let's talk about that quality: 16mm film like what we're working with here has roughly the same potential resolution as 1080p HD video, and 35mm film is

exponentially beyond that, with potential resolution of more than 4K, but to really be doing anything like digital preservation, as Jeff Kreines, the Kinetta Scan inventor has noted, we really need to be scanning at double the potential resolution, because film grain is not laid out on a grid.

Compare that to the life of digital audio, which made a simple move from PCM signals on a tape to PCM WAV files that are bit-for-bit copies of the earlier tapes with an added header, to our current standard of 24-bit/96 kHZ Broadcast WAV files, which include the same but at higher quality with a little more info in the header, or digitized photos, which have used uncompressed TIFF format for the last ten years.

Archival digital video, especially tapeless, has not really been a thing until recently, when storage costs have gotten low enough, and computers have gotten fast enough, which leaves us with years of proprietary compression schemes to navigate, and especially for film advocates, an untrustworthy history for the permanence of files.

In my opinion, uncompressed is an answer. As opposed to compression, file encoding for uncompressed is much more straightforward, doesn't require a complex codec to be read, and actually captures the full-quality of the original, without educated computer guesses about the image and its color. So if you re-save a file, as we'll always eventually need to do for migration, no information is lost, unlike a jpeg, where resaving becomes a guess of a guess. The file size is not trivial, though. When we used DV compression for video, our files were 13GB an hour, while our uncompressed files are closer to 120GB. But once archives have gone uncompressed, as with audio and photos, we've tended to stick with it, And storage costs continue to decline.
Still, you should know that there is no archival digital video format standard yet, but I diligently check FADGI, hoping but not waiting...

So hopefully you can see why film preservationists have a right to be concerned about preserving film on digital video. And you should know that the current consensus among moving image archivists is that film is best preserved on film. This is unlike magnetic media, which should be transferred as soon as possible, with things getting dire and expensive after 2025. The problem with making prints of film is that it's quite expensive. Last time I checked it was at least $1,000 per reel, which marginalizes films not already part of a canon, and doesn't necessarily increase access. If I were just now putting together our digitization program, film would not be my top priority for equipment.

But here we are. If you can wait, maybe you should. More equipment and standards are coming. The problem is that vinegar syndrome is irreversible, and films that are playable now may not be in ten years. (05:00) If I were starting over, with unlimited money, I would survey all my films, stabilize their storage and add silica to slow vinegar syndrome, then send any films with moderate or worse vinegar syndrome to a vendor with a sprocketless scanner, letting the rest of the films wait until standards, equipment, and storage costs are more settled.

All this is to say that what we are doing here is digitizing for access, not preservation. But the copies we make here are of a high enough quality to be broadcast and used in documentary films, and that's a big deal, because more than half of my A/V researchers are looking for footage for documentaries, which also help the films be discovered and advocated for. And that's what we're doing here. Giving our films a chance to be seen and discovered through digitization, and finding what could be

worthy of the gold standard of film on film preservation, at the same risk of damage as running film through a projector, which is not trivial.

With that, let's talk about the machine we use here, as the machine defines the digitizations we make, and the decisions we make in deciding what elements to digitize. Here at the Briscoe we have the MovieStuff Sniper16 HD, which retailed for $10,000. That price might shock you, but this is actually a low-end machine. The next step up is BlackMagic's upcoming Cintel at $30,000, which has sprockets and tops out at UHD quality. After that we step into the realm of digital preservation, with the MWA film scanners, distributed in the US by flashscan8.us. They don't publish prices, but seem to be in the $55-250,000 range, with three models including the flashscanHD, which can handle both film and any film audio format you throw at it, I believe the only machine from any of these manufacturers capable of that. And finally the Kinetta Scanner, which retails at $179,000. It's easy to balk at prices like this, but keep in mind that the most expensive component of digitization is the (wo)manpower, and only having to digitize a single time is cheaper in the long run.

You're also getting a higher level of service with these machines. I've had some tough times with Moviestuff customer service, and their perspective is not long-term, evidenced by keeping their manuals online-only, and recently discontinuing repair of machines less than three years old. And BlackMagic is known for disruptive prices but uncommunicative customer service.

The owners of Kinetta and Flashscan are highly reputable, with Jeff Kreines, the inventor of Kinetta Scan regularly publishing papers on film digitization. Obviously with a penchant for promotion, but still quality contributions. And Ted Langdell of flashscan8.us being the long-standing secretary for the Quad Videotape Group, documenting the workflows and equipment for the most endangered A/V format: 2-inch quadruplex tape.

But the Moviestuff is what we have, and it's hard to argue with the cost/benefit ratio of these machines. It's an ingenious design, repurposing a Bell and Howell projector, then adding a platform to hold that and a camera. And instead of projecting the film it's backlighting it, and shooting that image with a camera. The crux of the machine is the Cinecap Velocity program that emulates mouse clicks for every frame of film. With the Sniper, this is truly where the magic happens. Rather than trying to use a still camera and snap a picture every frame, which would break most cameras in a few reels, it uses a video camera for continuous motion, but only keeps the frames where the film is in the gate. To do this, it emulates a mouse-click for each frame, telling the software, which was originally made for stop-motion animation, to keep the image from each click. This allows the film to be processed at any frame speed, decoupled from the rate of transfer.

What I love about this machine is that it's inexpensive, records sound, and gives us HD progressive scan files (or does it?). What I don't like is that it has sprockets, and has issues with sound, both in cutting off parts of audio during synchronization, and recording only in mono, no matter the source material, and being stuck at 16-bit rather than 24.

I also don't like that the whole system is dependent on proprietary software from a separate developer who seems like he could disappear at any time, and the software doesn't do basic things like show audio levels or report dropped frames during capture,

and requires a custom built PC for support, with parts that are now out of production and still don't work perfectly, as we'll see during capture.

The machine also requires a fair amount of skill to use, as the focus, framing, and lighting all require hand adjustment for decent results. Also, since we've gotten the HD upgrade, I haven't been able to get the backlight low enough to capture film without blowing out the highlights. After we bought this, MovieStuff made a new line called the RetroScan, which lowers the price to $4,500 and loses the sprockets, but also loses the ability to capture sound.

So we know the machine's positives and negatives, let's see how it affects our choices on what to digitize. With a sprocket machine, it's most compatible with a finished print, as those are likely to have some damage and probably aren't one-of-a-kind items, and as you'll see, prints are a lot less hassle to facilitate access for, just digitize, process, and you're all set. For these films we didn't have prints, so we want to get as much of the information transferred in the fewest steps, to avoid potential damage to the films and keep our project within the budget.

Let's start with sound elements. We have full coat mag stock reels of the entire soundtrack, and negative optical sound reels. As I've covered, this machine can't play full-coat mag stock film, and if we could get it digitized the sync isn't great, so we won't use that. Luckily our machine seems to play back negative optical sound (10:00) film the same as positive, so that's our best choice for sound.

Now, for picture elements, we have the internegative, which was the item the print was made from, and the interpositive, which is one generation previous. Here's a quandry: the earlier the generation, the more quality we're getting, but also the more intention we lose from the creator. It was pretty common for color changes to have been made from the interpositive to internegative. However, our decision is made by our equipment. The Sniper can technically process color negative film, but it doesn't turn out great, and requires a lot of post-processing to make it look close to natural. For that reason, with our specific machine, we end up re-interpreting the creator's color intention more than just going with the interpositive. So the best choice for our circumstances is the interpositive.

For sound, we'll select our optical reels, and for picture our interpositive, and we're not selecting our full-coat mag stock or internegative reels. And since we've digitized everything, let's see if we made the right decisions. Not bad at all.

Those videos were captured in DV quality- standard definition composites that we made before we got our HD upgrade. In those line drawings especially, you can see how sad it is to put film through the video interlacing process. Just for comparison, here's what it looks like now, with the HD progressive capture. Much better (but looking closely, is that progressive scan, or just the finer resolution?).

So here's what I need to do with the Sniper before capturing a film: I'm using the first interpositive reel here, and I'm going to take it from the can, put it on a split reel, then put that onto the supply side of the Sniper. And I've got my film wind on the outer right, as opposed to the outer left, with the glossy side on the outside, and the emulsion side on the inside, and if this film had a soundtrack, I would need that on the edge facing away from me, but this reel is image-only, with sprockets on both edges. Now I just need to thread it through the projector and get it to the take-up reel on the left.

So now we thread the film through the path. Every projector is different but similar. We're going under the first set of rollers, then up over the first set of sprockets, under the second roller, then over the next roller, which I call the claw. I'm going to leave some extra slack for the latham loop here, I never want this tight. Unlike audio tape transports, which are about keeping the tape flat against the playback head, and play with continuous motion, motion pictures use the latham loop, which keeps slack around the gate where the image is projected, or in our case, captured from. So while everything outside that loop has constant tension, the section of the film playing back is almost suspended in the air, and if you haven't noticed, actually stopping for just a moment with each frame to help create the illusion of motion. The latham loop is even more important for the Sniper, since if we lose our loop the film tightens on the rollers, which causes the projector to shut down to protect damage to the film, but the film is damaged in the process, and the digitization is either stopped or interrupted.

So that's why I add some extra loop, and we can actually see what that damage looks like. You'll notice that right before it shuts off, the film is pulling down against the rollers, and the film is being pulled against the sprockets, causing tears in the film. This would not happen with a sprocketless scanner. And this looks terrible, because it is, but also keep in mind that this is 1/12th of a second.

Continuing with the film path, next I'll wind the film under the bottom roller, then through the middle of this pair of rollers, past the optical sound reader, then under the next three rollers, over the sprockets, over the final roller, and onto the take-up reel, where I'll feed the film into a slot, and keep my finger on it until I turn it one time, to get the film to hold against itself, and then give it another spin or two. (15:00)

Then for the video camera, I need to set the framing, focus, and brightness. This is not unskilled labor! And you'll see that a lot of choices are being made here. Let me show you an example of how much variance you can get. [Example] This was an actual turned in digitization from before I started at the Briscoe, made by someone who had experience with film. But they didn't have experience with this machine. So they went way too bright, and lost detail, and for the focus I have no idea what they were doing.

**Focus**

To set my focus, framing, and brightness, [The correct order is framing, focus, then brightness] I'm always going to advance the film past the leader and countdown to the actual program material. Then I find a good scene, and put the projector in play mode, which is where you can see the film path most clearly, with all the rollers clamping the film down on to the sprockets, the optical reader light turning on, and the gate clamping down onto the film which allows for accurate focus. And when you're pulling focus on the film, as I learned from Afsheen Nomai of the Texas Archive of the Moving Image, you want to focus to the grain of the film. You don't know if the original camera person had everything in focus, and you can make things hard on yourself and stray from creator intention trying to focus an image that isn't. The mental model is that we're not trying to get the subjects on the screen in focus. We're trying to get the film in focus, and if you stick to the grain, you can't go wrong. So I'm just picking a spot, getting it focused, then jogging the focus wheel back and forth to make sure I've got it. Now I'm picking another spot and making sure both of those are coming into focus at the same time. There's a point when you can see it's at it's sharpest, and

that's the place to be, And I want to make sure all the edges are staying focused...and I think that's it.

**Framing**

The basic part is making sure that we don't have the top of the frame too high or low, which will cause a split in the image. (20:00) We'll use these fine-tuning adjustments on the base for height, and I'm going to error on getting a flatter line at the top. Now the more complex part, using the zoom of our HD camera we can change how much of our film we're covering. This might seem like an easy choice, and I may be on the record as saying "we want everything" all the time, but with framing there is some give and take to framing the entire film as opposed to the image area. The give is that you can get more of the physicality of the film, and with the famous Zapruder film, which was 8mm, there was actually some new information along the side of the film. The take is that you're losing resolution the further you zoom out.

For these films, and every other 16mm film I've seen in our collections, there is no extra information on the sprocket side, and since we're capturing the sound from our optical reader, and our resolution is already a little lower than I'd like, I feel OK about just capturing the traditional picture area. But even this brings some interpretation. The full frame is not necessarily what the cameraperson was seeing, and you'll even see that there may have been dust around the gate, which was not intended to be seen. So what to do? For me, I've decided to error on capturing the full picture area. I'm not comfortable with cropping the image and making interpretations about what was supposed to be seen, and it's always possible for someone to make a derivative with a cropped image down the line, but if the image is cropped during digitization, it's gone.

**Brightness**

Moviestuff encourages users to use their auto-brightness feature, and capture film without monitoring, but that's a terrible idea for archives. Luckily they also give us a knob for manually adjusting brightness, though since our HD upgrade, it hasn't been able to get as low as I'd like. What I'm hoping to see is grain in the highlights also known as the whitest spaces of the film. If that detail is blown-out, or too bright to be seen, then it's gone forever. At the same time there's a balance, if the film is too dark, detail is lost in the shadows, or darkest parts of the film. As Jeff Kreines, the inventor of Kinetta Scan says, "the goal in scanning is to capture all of the dynamic range present in the film -- not to create a pretty or even appealing image." From: "Digitalisierung von Schmalfilm in HD... a response" This is a good thing for us, because color grading requires an amazing amount of talent, and is beyond our scope as archivists. And If we make quality captures, they should be a good starting point for potential color grading in the future.

Once we have all these set, I try not to change them during digitization, but there are cases where the film jumps in the frame, or the lighting changes drastically, and live adjustments have to be made. I should say that focus almost always stays the same.

**Digitization**

So now I'm going to rewind the film all the way past the original leader, because again, we want to digitize everything on this reel.

And let's digitize!

So we're going to name the capture with a unique identifier if we have it, or I use box number and rough title if not. Luckily we have one for this one. I'm going to use "e," which is a convention to state that it's a collection and the identifier name. And then math, and then I would have an underscore here, but it won't let me add one. For now, I'll put in "01204." And then to start all I need to do is press start on this and then right after turn on the motor switch to begin the capture. And here we go! And we're off.

You'll notice that I always start the recording on the computer just before I turn on the analog item. You always want to capture everything the analog item has so you error on the side of the digital recording everything. I just saw a punch hole. Now see that, that's the part we could have framed to and we would have been wrong. You see that line on the bottom. The leader does not always match the film. And once again, this focus frame, not quite right compared to the actual film. It's a little bit lower. (25:00) Now looking at the monitors, you might notice some strange waves in the picture. This is pulldown, and comes from the speed difference between the original film and the video camera recording it. And there are two sets of clicks you're hearing: on the left channel is the optical sound reader trying to read the sprockets of the silent film, and on the right channel is the mouse click emulation. I also use this sound to tell if the capture program has dropped frames, since it has no error reporting. And while I'm capturing I'm usually taking timed notes or working on metadata for the film, but more than anything I'm watching to make sure that nothing goes wrong, especially with the framing and brightness. And at the end of the reel, we will let it digitize all the way to the end of the film, until the tail literally passes the gate, then we stop the digitization, stop the machine, and check our file.

And that leaves us with a RAW file, which has everything, including the pulldown motion. I'll select and process it as HD at 24 frames per second. So now the Cinecap program will pull the mouse-clicked frames, and give us a processed video file that plays back at the speed we told it, but where did I get that specific speed from? For sound film like this it's easy, 24 fps, standardized since 1930. But for silent film, there is more variety and interpretation happening. Most films made after sound was standardized for motion pictures are 18fps, but if a photographer normally shot sound film, like Houston photographer Bob Bailey, their silent films tend to be 24fps.

Here's an example of doing it wrong, from a film collection we have from the LCRA that was put on VHS by a transfer house in the '90s. If I had to guess, the transfer house thought that since it was old black and white film, it should look old-timey like the hand cranked comedies of the 20s and earlier. And with a wave of the hand, something shot majestically could end up looking silly.

Again, anything you don't know about the significant properties of your source format is at risk during transfer. During digitization or any migration, It is easy to lose what you don't know you have.

The way you get the speed right is looking at people jumping, rivers flowing--physics--to see if things look natural. If you have experimental films, all bets are off, But for the film we just digitized, and this entire collection, it's easy. I'm processing to 24P which is a true 24 frames per second to match the film, rather than video's usual 23.97 equivalent.

Two other things are happening when Cinecap processes the raw file. The image is cropped to just the section in the yellow lines that I framed to, and the sound is synchronized to the picture. Both of these are a little problematic. The cropping leaves black bars on the sides in the file, rather than just changing the aspect ratio and keeping the framed section. It's disappointing because it eats up storage for no purpose, and I'd prefer to have an option to keep the sprocket holes and sound track rather than just black space More seriously, the Moviestuff adds some glitches to the audio during synchronization. So what was smooth and continuous during capture is now broken up, with small sections of audio missing to conform to the speed of the film.

So the raw capture has been processed and we now have a second file, which is what goes into our digital media repository: a motion JPEG wrapped as a MOV, at between 60 and 80GB per hour, compressed by the software, unfortunately. And in most cases I am getting rid of the RAW capture file.

But there are some eggs being broken here. The audio is no longer continuous, the speed is no longer reversible, and the image is cropped to the section I've framed to. But unless I have problems during capture, or feel unsure about the framerate, I just can't justify the cost of storing two HD (30:00) copies of the same film at 80 GB each per hour.

And I also haven't been able to re-process RAW files made on the old version of Cinecap with the new, so I don't have faith that the raw files will be useful into the future.

What I am starting to do is pull the audio from the RAW file, at less than a gigabyte per hour, and save that in case somebody using a clip in a documentary wants to resynchronize that without the Moviestuff processing glitches. Way out of the scope of traditional research, but production can never really be separated from A/V archives.

And when I said "problems during capture" what do I mean? I'm talking about those rare cases where the projector loses loop or shuts down and it's not feasible to go back and re-capture the entire film. The processed file won't clearly show the problems during capture, since it syncs by frame, and frames aren't moving when the projector stops. Kind of a pain to do, but we're an archive, and authenticity matters.

**Authenticity**

And let’s talk about authenticity. With magnetic media it's generally agreed that the digital objects we create will outlast the original media, so that has informed our policy for all A/V at the Briscoe, which I think is a good thing. When we present a digital object, unless the metadata clarifies differently, what we're saying is that this is a single pass of digitization, from the beginning of the source media to the end. And to be clear, sometimes we trim the ends of files when we've recorded after playback has stopped, and in rare cases, we trim the beginning of a file when we start recording too soon, but the thing we never ever do is trim the middle of the file, because that would effect authenticity. In the audio world, there is no project that has had more scrutiny or money spent on recovery than the missing 18 minutes of the Richard Nixon tapes. With digital files, things are even more treacherous, because instead of leaving an obvious blank space in the middle of a recording, or a splice to show changes were potentially made, a section of digital media could simply be trimmed out, undetectable by most people. So when you're creating digital objects for A/V, don't be a Nixon. There should

be nothing missing from the middle of your files, and full transparency for any problems that come up during digitization.

By the same token, don't combine files without telling the researcher. As tempting as it is to splice both sides of an audio cassette into one file or present a single video for an interview that spans 3 VHS tapes, it muddies context, and blurs the constraints of the original media which informed choices made by the creator.

Still, there are rare cases at the Briscoe where we make an exception and combine files for clarity. We call these composites, and use them for capture problems from the same analog item. So if a film breaks or glitches as happened earlier, we either continue on and keep the raw file, or go back to the beginning and recapture the entire reel as we did earlier, deleting the first file completely. Or, if that's not possible, we use a composite file, keeping the first digital object and creating a second digitization for the rest of the film. Then combining those into a third digital object, the composite, and all three files are kept in our Digital Media Repository, with notes on the problems encountered during capture, and the ability to trace back the composite to its source files. We also use composites for combining production elements like these into an easily watchable video.

But let's get out of the abstract, and back to our film reel. Our last step is to wind this film back onto it's core. So we'll place the reel on the left side of the winder, with it's core and split reel on the right. And you'll notice I'm winding a little faster than usual, and I'm giving it more tension, because I want that momentum to give a tight, uniform wind. Then when I'm finished, I'll add some hold-down tape to keep it that way, and then write that unique identifier we used for the file name on the the leader that I've added—never on the original film—using a paint marker, nothing that smells of solvents.

I'm not adding a title or anything interpretive, because I don't want to leave confusion about creator notes versus my own, and all that stuff will be in our metadata record, which will be mapped to our identifier, and the identifier will also be printed on the film can's label, so even if the film somehow gets separated from the can, it can find its way home. We're now done with the original film, and it will be barcoded and sent to our offsite Library Storage Facility.

**Assembly**

And now we have all the production elements digitized, and that's great, but is it useful? You tell me. Is this meaningful? For most researchers I would say "not yet." Let's assemble these into a composite digital object for access. This is where our careful digitization of the original leader will pay off. We can use those same synchronization punch holes and sync marks in our video editing program to line up the picture and sound reels in our editing program just like the films would have been lined up on a ganger to make a print. I'm working in Adobe Premier, but most video editing programs should work. Usually this just works (35:00), but there are cases where there are no synchronization marks and I have to do it by hand. Again, I disclose this and we're saying clearly that we assembled this. And the originals and their digital derivatives are all saved in other places. [sound clip] Alright, we don't want to do this again, so I'm going to save as close to the original file specs as possible and then I'm going to save a

lower quality MP4 access file for online streaming. And I'm also going to take screenshots for the master metadata record and streaming access site.

And so far I'm not saving the Adobe working files I make when assembling, because I have no faith they will be playable in the future, but let me know if I should reconsider.

**Access**

You'll notice I'm not burning a DVD. Here's why: they require re-compression to fit video, take a lot of computer processing time, degrade the image, and give a false sense of preservation. This is a lot of time and effort for something that isn't a preservation-quality item. In a test I did with a worker paid $11 an hour, I found burning DVDs, with fully-optimized conditions of batch processing the compression overnight, to come out to $3.59 per disk, in addition to the cost of the media, which itself is more expensive than hard drive storage. And it's time and effort that doesn't contribute to the description of the item, and needs to be refreshed every few years. I would rather put that money toward improving our digital infrastructure. What we do now is provide streaming access online for any items with no restrictions, and then bring restricted video files on-demand to our Reading Room Portal computer.

**Online Access**

And let's talk about streaming access at the Briscoe. We're using a Rich Media system called Glifos, which has a good amount of users in South and Central America, and Austin, Texas, but hasn't really taken hold anywhere else in the United States. Which is a shame, because their timed text system works really well for us.

And what is timed text? Timed text could be subtitles, closed captions, a synchronized transcript, named markers in a broadcast WAV file, a creator's edit decision list, chapters in a DVD, or a simple table of contents for a video, simply saying: at this time, this event is happening. Timed text, to me, is a very functional way to describe time-based media. We use two main types of timed text in Glifos, transcripts, and tables of contents. We've found transcripts take about six to eight times the length of the original media item to make, so we don't make those in most cases, but if they do exist in a digital form, it only takes us about one and a half times the length of the media to synchronize them. Tables of contents or TOCs also take us about one and a half times the length of the original media, but even less if we take timed notes during capture, so everything we put online has a TOC. Some more detailed than others.

And Glifos has flagship pages with a lot more features, like interactive maps and timelines, pictures attached to media, and multiple digital objects on a page, but we don't use that stuff—it just adds complications—and would make us more dependent on Glifos, and we're not investing into that system, or perfect pages, we're investing in our A/V description.

Right now, there is an amazing amount of development for archival tools, and I think carefully choosing and scoping what you need from them, and defining your functional requirements are among the most crucial decisions you make. More than anything, we don't want to put anything into any system that we can't easily get back out.

That's what I like more than anything about Glifos. Even though it's not open-source, the code for the timed-text is straightforward XML, and it's absurdly close to the W3C timed text markup language standard, so with a simple batch export and XML transform we feel confident that our timed text will persist into whatever the next system is.

Let's make some timed text. We've got a page created for our "Kakeya Problem" composite, and our access copy video is uploaded to the streaming server. We're going to add a table of contents for the video. So as opposed to a transcript, which captures all the words in the professor's lecture, what we're looking for is the structure of the video: on-screen titles, topic changes, graphics and animations—any time things change we want to give a heads up to the researcher, so that they can quickly scan through the video to find what they're looking for. If you think of the video as a box, what we're trying to do is describe the folders. My rule of thumb is I try to make sure I document any changes within three to five minutes, but if it isn't there, I don't write it.

These lecture films are a little harder to describe than most things I do, as I majored in English literature and then information studies in part to avoid math of this caliber, but let's take a look. [video clip] (40:00) This is not a set in stone description—we're just giving the structure of the media and providing access, but welcoming new information, corrections, and identifications of people and places.

You should note, too, that I'm displaying the films in the two separate parts it came in, with leader included. This is not only for authenticity for the researcher, but also to keep this timed text that we're investing our resources in persistently useful. If I was to trim the leader off then combine the two reels into one video, our timed index would no longer relate to the master file, making our work kind of useless beyond Glifos. I don't mean to harp, but with time-based media, time matters.

So from this process I'll end up with a good understanding of the item, and I'll fill in the Dublin Core description field from that. The description field is, to my shame, one of those catch-all fields that I use to capture everything that doesn't fit into our standardized schema. To parse this in the future, I at least have a format for this section.

1. Content description, in order of relevance for researchers. I include keywords, events and prominent people that appear or are mentioned in the video. I'm also going to save a short keyword version of this to add to the Finding Aid
2. Notes on the analog source: This is the place for all the writing on the leader and can that we've been adding to our spreadsheet. I actually have a batch command that transforms my spreadsheet fields into sentence form.
3. Explanation of problems encountered during digitization or preservation issues with source material. This is for authenticity and to note for researchers why things may look glitchy.

And finally,

4. Description of adjustments made to the file, as in the case of adjusting the color on an internegative, or explaining a composite file. Again, this is for authenticity.

Then I'll fill out the rest of the fields based on what I've learned and pulling from the spreadsheet I made when I was surveying the films, save and exit the page, and we now have an accessible streaming video.

For description, we have one more place for metadata, our Digital Media Repository, or DMR, which is actually the master record. I save this for last because of how much the Glifos indexing process enriches the metadata. So we'll transfer all the Glifos fields, then fill out a few more that are unique to the DMR, for management of the Digital Object.

And now our metadata and access copy is safe, but what do we do with the master files? We've been really lucky in the last year to start making the Texas Advanced Computing Center our home for digital storage. It's not yet a full-fledged Trusted Digital Repository, but the files are automatically mirrored to two geographically disparate locations. And the storage cost is the best we've found.

Now for our final step, we want to tie our digital objects in with our finding aid, so we're adding an <altformavail> tag for the composite version to the series. I use the convention "digitized as" followed by the identifier, then a link to the DMR record. And since this has video on Glifos, a "Click for video" option will populate on the DMR record page, which the user can click to go right to the Glifos page. Then we'll do the same for the identifiers of the production elements in the content list, and finally loop back and add our shortened description for the composite film at the series level. And once the finding aid is live, the films are available for researchers, whether in our reading room, or anywhere with an internet connection.

**Conclusion**

And that, in excruciating detail, is how we process, digitize and describe film at the Dolph Briscoe Center for American History up to now. And hopefully I've left you with some insight into the factors that shaped our process so you can shape yours.

If you have any corrections or questions, my email address is justin[PLEASE]kovar[DONTSPAM]@utexas.edu and I'm @Kovarsound on social media. Thanks for watching!