september 6, 2019

making cel cartoons

a guide for josh cloud

by

ingo r.

START HERE!

and

FOR JOSH (sequence)

Here is your guide! You should know that this is a straight-ahead guide, i.e. I did not do full drafts beforehand - it's written word by word, slightly out of order and broken up into chunks whose names do not always accurately reflect their package contents. Wherever you see a white out mark, words crossed out or paper taped over other sentences, you can know that these are the only parts of this writing that have been edited. Due to the time restraints I was under while writing this, I

felt that allowing the guide to take this form(at) - namely, looseleaf paper clipped packets color coded with the title matching page numbers - would be wise. Even though this format was a rushed decision, I feel that it ended up being a more close mirror of the feel of following a cel pipeline than the format i had originally planned which was a step by step, ordered process from paper drawing to cel drawing to painted cel and back-ground. But starting to write I realized that since I was xeroxing the line onto my transparencies, I really didn't need to retread the step of actually drawing or animating for cels - since by printing the line the only things that matter are 1. preparing your files properly and 2. really making sure not to overdo it when it comes to how many individual drawings you are trying to print and paint. Aside from that, the animation itself can be done using literally any existing or un existing "digital" process* (read: a process

*Annapurna Kumar's work has some amazing examples of this i think

which results in a video file or image sequence) you can think of. This means CG, stop motion, clay, sand, shadow puppets and live action are all fair game as long as you prep the files (which in my case meant making them high-contrast monochrome using levels or threshold with photoshop actions) for your printer. I also realized that I did not follow sequence when I worked in this pipeline — i.e. I was constantly switching the type of task i was doing because the appearance of new materials would suggest the type of task they would wish me to do with them: Cels printed? time to paint. Files prepped? time to print. Drawings done? Better scan. Scans finished? Prep files.

Since you are working with sequences, not drawings, you will sometimes end up with multiple stacks of materials in different parts of the process —

meaning you get to choose what type of work you get to do at a certain point in the process. This is the most fun and head-clearing healthy part of doing cels and is a result of itself, i.e. choosing to move away from all-digital in the first place. But be warned! This type of "pipeline harmony" only comes about if you start by switching tasks in the first place. Meaning if you try and do all of one step at once you will inevitably fall into the trap of also doing all of the rest of the tasks in big chunks as well. The trap I fell into was leaving all the shooting, compositing and editing until the end - even after successfully getting my tasks mixed-up during the full-image production part of the process: drawing, scanning, printing, punching, painting and even a little leftover scriptwriting all at the same time, shuffled up into a sort of self-organizing routine/machine which i performed daily. All this to say that the non-and-sequential order of this type of pipeline is not only what makes it preferable

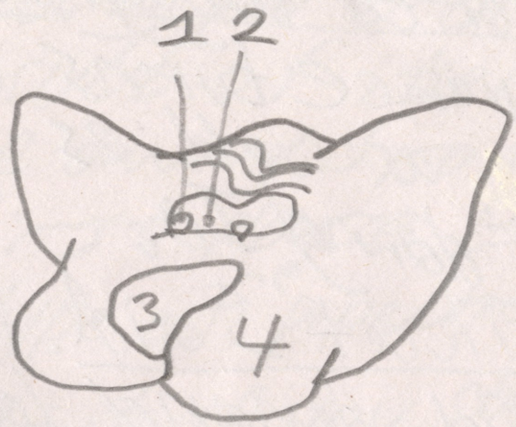
to us sensually, but it also is a source of efficiency and speed: the non-ordered way of creating an ordered sequence turns out to be the faster, as well as more pleasant way of doing so.

That Said. There are a few parts which demand to be done in sequence or at least have one sequence which is optimized for that task. The main one being the pattern of painting one color at a time of your cels. The alternative, painting all colors of each cel to completion, is less effective for 2 reasons: 1- your paints dry out much faster and 2- the sheer time saved from not picking up a new cup of paint every frame adds up!

Another optimized pattern is to paint the small details first and paint right over what you've already painted on the next pass. I talked about this method in the PAINT section - but this is a pattern that will basically reveal itself from the

shape of the drawing you've already done. So for example the optimal sequence of painting for this drawing [redacted]

might be



because since you're painting on the back side of the cel you can just sweep right over the already painted sections.

And remember that in practice, this 1,2,3,4 order means [redacted] each color is to be painted in every cel in which it appears, in a sequence. So -

pupils	1	1	1	1
eye whites	2	2	2	2
nose	3	3	3	3
full face	4	4	4	4

is the optimal sequence in this case.

And to you specifically Josh - While reading these packets you will certainly come across aspects of the pipeline you are already familiar with and it will seem like i am giving you the most banal basic info about this process. This is not because I think you personally don't already know this info, but because I didn't want to write a cel animation guide if it was only useful to someone already at cartoon school. That said, the guide is 100% for you, Josh, specifically - in that it is for you to both use and share with those in your life who may find themselves interested in the cel animation process. Most of the info is based on what I know of your cel process and tailored towards that - but it will often be placed within context of more basic, "how cartoons work" style presentation. This is why I hope, if you find these guides to be useful, you will

either make a copy or share the scans you make of this with the person who says to you "How do you do that?" or "I'd like to learn". My only regret in making this is that I once again became a victim of sequence, waiting until the very end of the process to write the how-to for the process. So that you, if you feel like it, can more easily document the eccentricities of your cel process, I've left you with some formatted news-print so that you or any other cel-maker can make your own instructional interchangeable packets, for yourself or others, to add onto the ones I've left with you here. Again, I do not expect you or anyone to add to these guides - I do feel however that the guide would benefit from some padding out and a collaborative element. Also you dont need to use that paper if you dont like newsprint lol.

This guide is YOURS to write on, deface, burn, bury, rip, throw in the LA river - the ONLY THING i ask is that before doing all of that you supply me with a 360 dpi color scan sent to ingoraschka@alum.calarts.edu

Thanks! ♡

The cels themselves

Today, cels manufactured specifically for animation are way overpriced, so the thing to use are called Transparencies, which are generally made for teachers to use beneath over head projectors.
These are 10x cheaper, more durable and more convenient to use than animation cels. They are usually made to 8.5"x11" standard making storing and registering them easier. You can use a regular hole punch and round pegbar with them.
But the best thing about them is that all transparencies made today are made to be used with home printers.
This means that you can animate for cels in virtually any medium you want.
That said, its worth planning for how much ink and transparency your process will use.
Historically, xerox printing onto cels has been used to print

line drawings, each a frame of a longer animation sequence, onto cels. These individual drawings, now on transparent celluloid rectangles, were passed to the ink and paint department (by this time the Print and paint dept, since the xerox machine took care of 'drawing' the line). The paint department then painted in the back of each cel, one by one, all day.

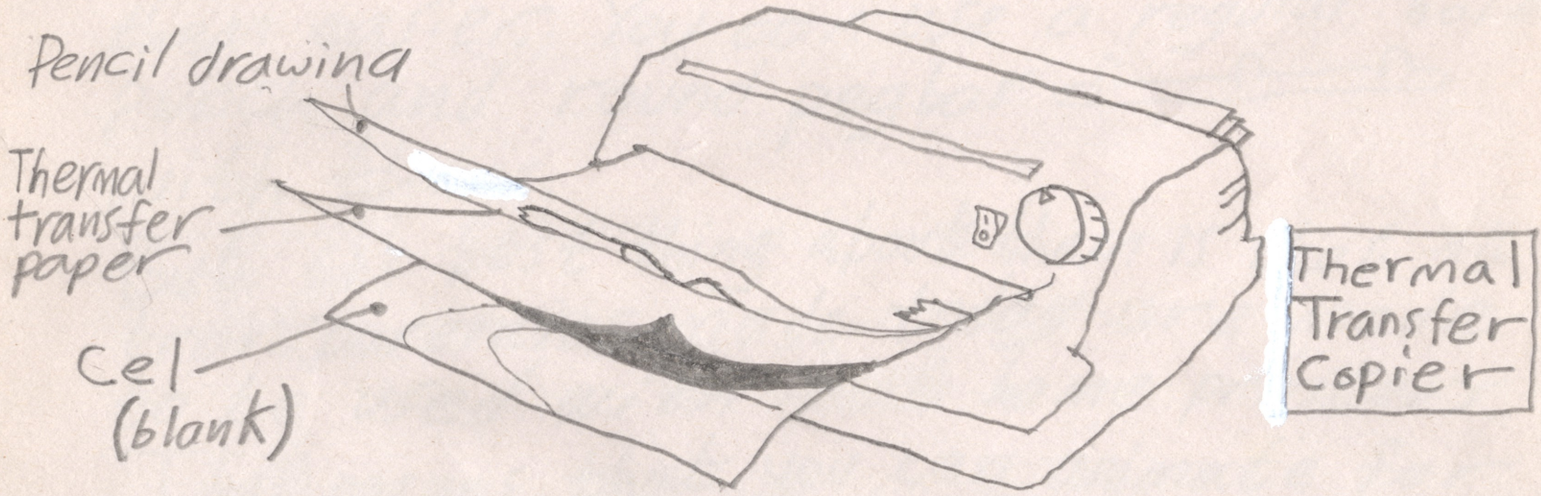
Today, you can actually print full color images onto transparencies. If you do this though you will want to test it and make sure your ink spending doesnt eat up your budget. Printers dispense ink very efficiently but the ink they use is expensive and the printer itself can give you tons of grief.

Painting, if not necessarily faster (although it can be), is definitely more reliable and consistent when planning out - for example - how much time your pipeline takes, as well as your budget - since printers can surprise you with their cost. (for ink, repairs, and who knows what else.)

Everyone who has ever used the xerox method of cel painting has destroyed a printer, yes, even when using transparencies meant specifically for that purpose. Usually what happens is the acetate (plastic) overheats and melts into the mechanism inside the printer. This can happen when your printer is too high end, or on the wrong setting, or just built for a different purpose. Because of this i stress the importance of 1. reading the printer manual, googling or otherwise learning about the specific model of machine (and cels) youre using, and 2. experimenting, testing, and physically using your printer a lot to see what it's capable of. Following these methods, you cant go wrong - and can preferably keep the # of destroyed printers nice and low.

There used to be a type of printer perfect for a cel pipeline, which there is a video of on YouTube of a woman using to prepare cels for Sailor Moon. This type of printer is called a Thermal Transfer Copier which only has one set of rollers and fits on a desk. A worker would take a pencil drawing from an animation sequence and register it to a

cel. Inbetween the drawing and the blank transparency, she would put a sheet of black thermal transfer paper, a type of paper coated in dry ink. When the sandwich of drawing-thermal paper-cel was then passed through the thermal copier, any part of the drawing page that had graphite on it would cause the ink on the transfer paper to peel off and stick to the cel underneath it. The rest of the ink would remain fixed to the transfer paper, which was discarded.

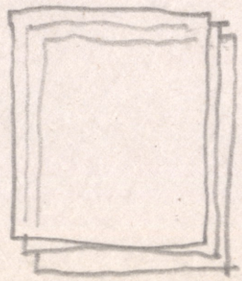


Today this type of printing is used by label makers and receipt roll printers (i think). Thermal copiers like that one are still made for tattoo artists to print their drawings onto temporary tattoo paper, to later transfer onto someone's skin as a guide for the

real thing. The printers themselves are not too pricey but i havent found a transfer paper cheap enough to be worth it. Since this process eats up one sheet of transfer per cel, it more than doubles your cel budget already, and thats just the inking step.

Its too bad, because a printer that lets you register your drawing directly to your cel by hand is ideal. Most printers register the image by themselves, using rollers and lots of internal mechanisms. This lets you batch print many cels at once but leaves your cels prone to overheating or jamming the machine. If you are using a large batch printer, its usually better to use the feed tray on the side (if it has one) rather than the large paper drawers underneath.

Final note: the best brand of transparency for printers is as well as the cheapest to buy in general is <u>Precision Imaging Products.</u> Staples, Apollo etc are way too staticy and will break your printer unless you can somehow discharge them.



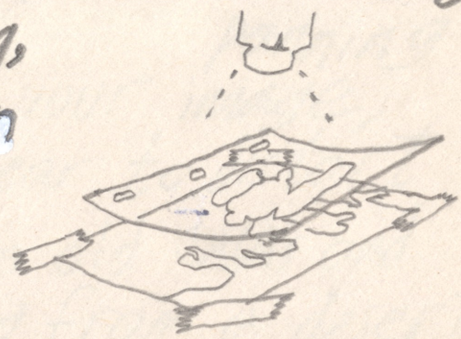
TRANSPARENCY

Cels are not 0% opacity. In fact most of the time they're not really even transparent. Cels and transparencies have 4 attributes which made them useful in the industrial pipeline. (Four attributes of many — obviously this is not the only way to describe cels.)

The first useful attribute is that they are rectangular. Since almost everything humans make uses some kind of rectangle as a register, this makes storing, aligning, and registering (sticking) your assets to one another very easy. It's my opinion though that rectangles can be a source of stress in a pipeline so I'd recommend not letting your process rely too heavily on rectangular registers unless that's what you're comfortable with. (more on this in "RECTANGLES" section.)

The second nice thing is that cels are transparent, meaning they allow light to pass through them. This means that whatever is on the other side of the cel can be visible through it. It also means that in certain conditions the cel will

appear to be more or less invisible. By drawing on a cel and then placing that cel over another drawing, the parts of the cel that are drawn on will cover up the drawing under neath. "Duh", right...

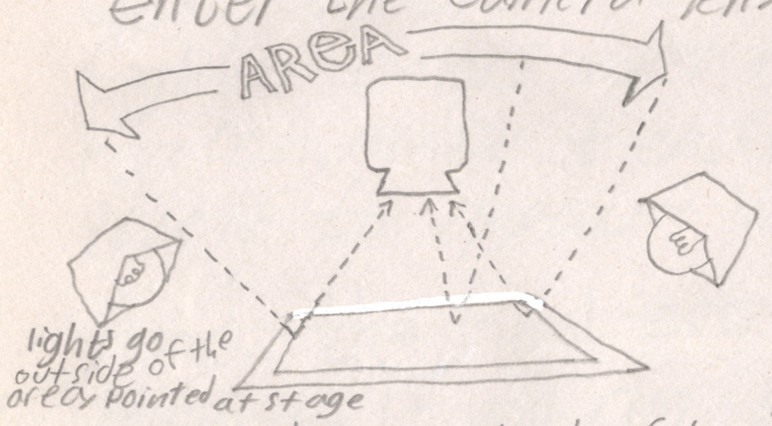


The third attribute is that cels are opaque. Or at least that they have opacity. At Hanna-Barbera, where limited or planned animation was developed and refined, characters or shots would often be composed of 5-6 cel layers. That many layers starts to tint each layer under neath. HB solved that by having gradated paint jars to compensate for the loss of color intensity with each additional cel layer.

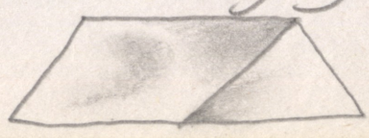
(Just so you know, I didnt do this. You can always just mess with color in AE or smth.) Tinted cels were also used in the past - you can take for example a Lighting Gel, Rubylith or some other tinted transparent material and cut out a positive mask to fit your scene. It will show the image beneath it but tint it a darker color; this used to be one way shadows were done in industial pipelines. (The other way was to double-expose the film in-camera, which you can write into an XSHEET as an instruction for the cameraperson).

The fourth thing (which pertained not as much to cels but more to glass and plexi) is that they are refractive. By panning a pane of warped glass across your image, any layers under neath will appear to distort and change. This was used a lot in old OVAs and anime to show heat waves rising from a desert, for example.

One last attribute which I left out is that cels and transparencies reflect light almost as well as they let it through. This is probably the most important thing to keep in mind if you want to use cels for their transparency. If you are pointing a camera down at your cels at a perpendicular angle, and your cels are flat, there will be a certain range or area outside of the camera's FOV where light can come from, bounce off the cel and enter the camera lens. You can easily find this area and fill it with black material or cloth to prevent reflections (or you can put something interesting in that area... a technique I'd like to try sometime).



Theres also some kind of lens filter you can use so the camera lens itself doesn't reflect, ask Fran Krause if you are interested in trying that.



A couple last things about transparency: Cels, having both transparency and opacity, cast shadows. They cast shadows both of themselves and of the ink and paint they support. You can use this if you want but if you want no shadow you can take a piece of acetate (preferably larger than your cels) and lay it over top, then brush the whole stack down with a makeup brush (for blush) — which you're going to need anyway to get specks of dust and stuff off of your cels (unless you want to keep those)

You can also <u>register</u> a cel shadow distance by placing blank cels between a cel and the image beneath it. This way you get the same amount of shadow each frame when you replace the cel.

Last note on reflectivity — the darker the color underneath a flat cel, the more light will be reflected by the cel and the more visible the reflected image will be. Lighter colors underneath the cel, for whatever reason, make it easier to get the cel itself to appear 'invisible.'

And: the final-est of final notes on transparency. If you run your cels through a printer (see section: The Cels Themselves) in your pipeline, the printer will print each transparency

with an encoded matrix of tiny yellow dots that are almost invisible on paper, but can be seen easily on printed cels, especially in a stack. This is called a Machine Identification Code (MIC). It's a way of identifying what make and model of printer was used to make the image. This was developed in the 80s by Xerox, and was used in consumer models without public knowlege until 2004 when it was used to incriminate counterfeiters.

This may not be pertinent to your pipeline as the code is functionally invisible. But it does speak, in a kind of silly way, to something i believe - which is that in ~~almost~~ all animation pipelines, the materials you work with are themselves already encoded. My film has an MIC in each frame. Which means - lets be honest, not necessarily functionally but theoretically (and literally), the materials I chose place me in some hypothetical legal framework. Either way it doesnt matter because platforming your work does that anyway, and so does the use of proprietary soft-and-hardware. And so does being alive.

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rectangles

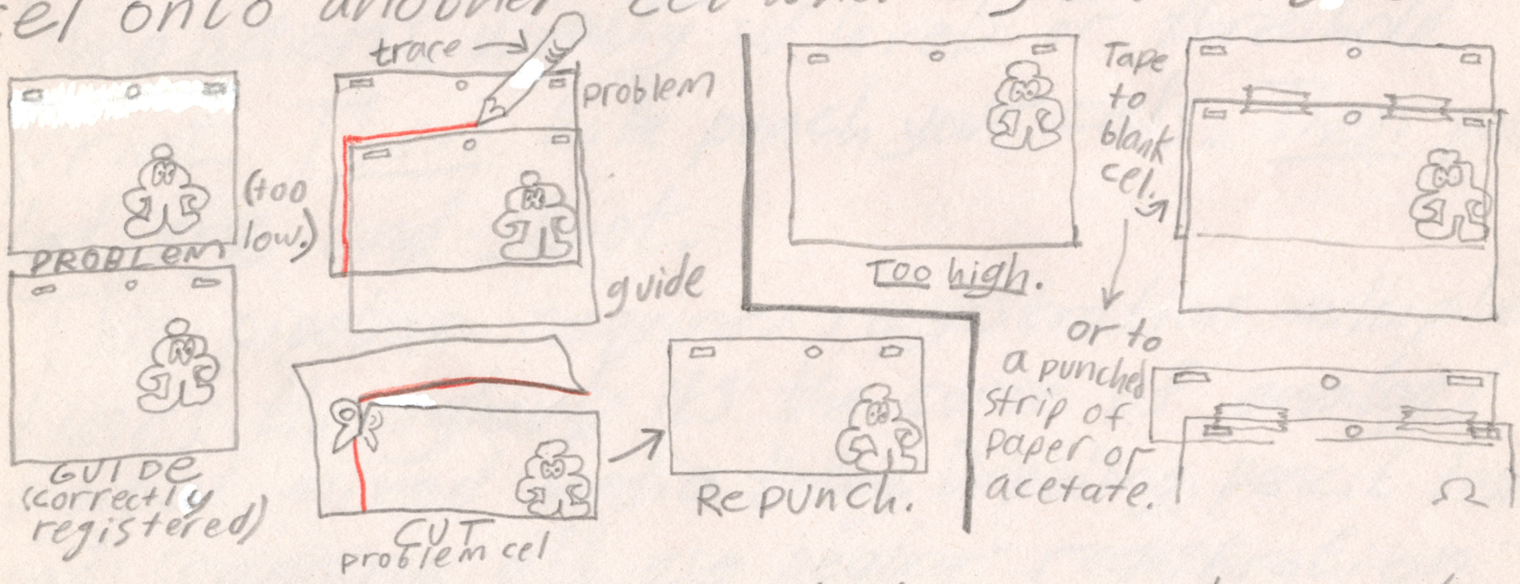
Rectangles are the shapes to which we register our assets for sequence. Registration is when assets are temporarily stuck to one another for the purpose of creating a new asset. Interior registration is when assets are registered inside of a shape, so that the border of that shape seemingly excludes anything outside of that shape from participating in the asset.

The cel animation pipeline I used went like this: Make the drawings on paper. Scan each drawing. Prepare each drawing for printing using photoshop actions, usually w/ levels or threshold. Print. Then hole punch your cels. Then paint, let dry, and shoot.

This pipeline requires registration multiple times throughout: it's the curse of analog/digital mixed media today. Drawing, pencil testing and scanning all use pegbar registration. From there, it becomes rectangular registration, i.e. all the images are the same size; they are registered to one another by virtue of having the same resolution. Printing: rectangular registration. The machine aligns the image

based on the rectangular shape of the cel. Punching, then, is creating pegbar registration from rectangular registration, a somewhat redundant step that's unfortunately necessary unless you want to be using rectangular registration during the shooting step which might be a pain.

All these re-registrations can add up and sometimes images can fall out of register. If this happens, dont worry it's an easy fix. If you are using top pegs and your image is too low on the page, line it up with another cel to find where it should be in relation to that cel. Then trace the edges of the guide cel onto the problem cel. Then cut away the excess and re punch. If it's too high on the page, just tape the cel onto another cel where you want it.



You might notice that cutout replacement animation solves the problem of rectangular registration because you only have to register once. Why don't we just do that instead? Simple answer: cel animation is way, way faster.

PAINT

Real cel paint is called cel vinyl, or vinyl paint - it bonds with the cel so that it doesn't flake. You can use pretty much any paint as long as it's viscous and opaque enough to suit your process.

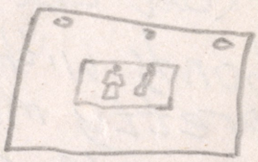
Cel painting isn't so much painting as it is depositing paint onto a cel - your brush shouldn't really touch the cel, - it's really more like dripping goop than painting. You need to put a ton of paint on each cel for the color to look flat on the other side. As a result of this they can take 24-48 hours to dry (seriously).

The fastest way to paint (that I know of) - "fill tool"-style - is to lay all your cels out on a big table and do one color at a time for every cel in the sequence, then repeat until all cels are fully colored.

When storing your cels, place a blank page between each cel. You can use your original drawings for this, but they might get paint on them.

Again, you can use any paint for this - just experiment to find what works re viscosity, opacity and price. I used screenprinting ink because it was cheap and easy to get but many types of paint have been used for this. I think Warner Bros even used gouache, which is how they washed their cels for re-use. Just remember there is no cel animation pipeline! ☺

TURN PAGE OVER

Forgot to mention — the smaller your image, the faster the painting step will be. You can <u>massively</u> speed up your pipeline by printing a smaller image. 2012 is about the size of index cards — the cels look like this: 

Which brings me to another thing — you want to make sure your printed cels are <u>size registered</u> to the background. What i did is draw the background while animating, then wait until <u>after</u> the cels are printed to paint it. You can print out the background with them and use it as trace reference for your final painted BG which goes under the camera.

ONE LAST THING — when painting the rounds of color, start with the smallest details up to the largest, i.e. facial features like eye whites up to bigger things like clothes. With each pass you can paint over what's already painted, so that when you finish and flip over the cel it will be seamless.

CEL ANIMATION FOR A PIXEL REGISTER

The focal point of a cel animation pipeline tends to be the part where cels are registered to a frame, i.e a picture is taken and [redacted] stored in a list of images.

This part in the process is very mysterious because the work itself (going through folders, stacking cels etc) is very monotonous and mind-numbing. You are essentially following instructions you have spent months writing for yourself.

But its also the exciting part of the pipeline, sort of the "part you've all been waiting for!" when you get to see your animation finally move, after spending so much time preparing each frame.

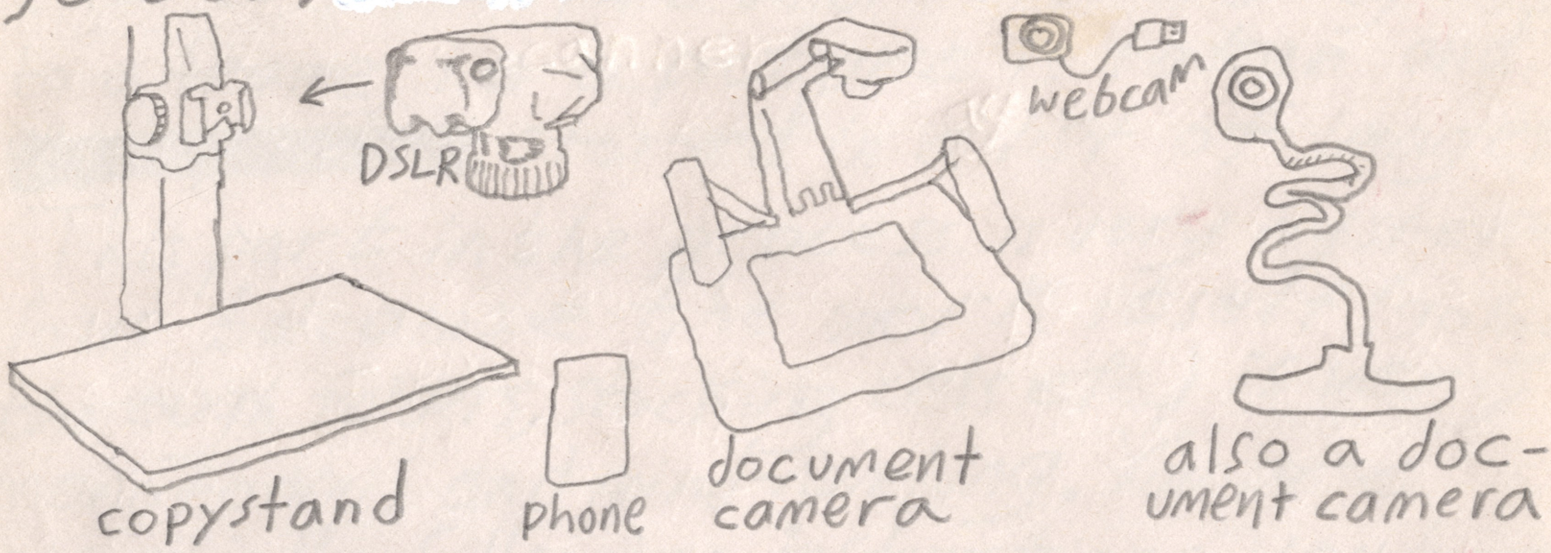
In 2019 there are many ways to store images of your cels in a list.

You can do it the way it was done for 100 years and use an authentic film camera. You can photograph them with a digital camera. You can use your phone. You can scan.

The fastest way today is probably to use a downward facing digital camera (a "digital downshooter"). Functionally you get the same result as a scanner – a digital image – or more precisely a pixel array or pixel register.

The difference is that a camera registers all pixels at once, and a scanner captures one column of pixels at a time, brightly lighting each column so that the resulting image is flat and evenly lit. Scanning is much slower but getting a flat image from a digital downshooter means evenly lighting the whole image at once, and keeping that lighting fixed for however long it takes to photograph cel compositions. This can be tricky and potentially expensive since it's generally easiest to get flat lighting with brighter bulbs. In a school setting they usually have facilities set up for this but for home cel enthusiasts – you can build a downshooter yourself, or find either a copystand, which is basically a downshooting rig for DSLRs, or a

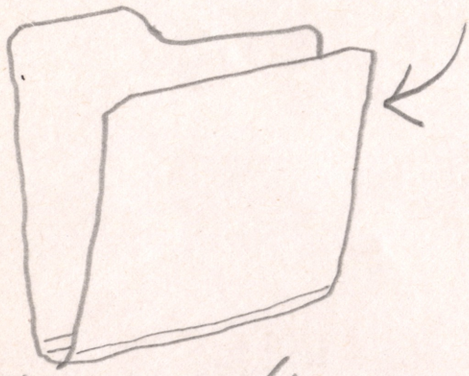
digital document camera, or document scanner, which is like an all-in-one where the camera and lights are built in to the downshooter frame. Digital cameras/DSLRs mounted on copystands are usually better quality, or at least higher resolution, than document cameras, which are more marketed towards teachers to use for overhead projection.



And youre going to want to put your down shooter in as dark a room as possible if you want control over your lighting. An alternative might be going out at noon every day and shooting for an hour. The sun in LA gives some pretty flat lighting.

STORAGE

Cel animation requires a <u>lot</u> of <u>these</u>:



My organization method was to have two of these folders per shot, one for the drawings and one for the printed transparencies. But for the drawings I sometimes fudged it and would keep them in one big stack with post-its inbetween each shot, which works fine.

If you are keeping your drawings in folders, you can mark each folder after scanning (i would just write "SCANNED" in marker).

Keeping painted cels is a little trickier - if you have a hanging file organizer that may help bc the paint won't be smashed under the weight of all those cels as happens when they are stored horizontally. Also putting a blank page btw each cel prevents cels from painting each other in storage. Using your original drawings for this is a good idea - check PAINT subsection where i describe this as well.