
STEAM: Make a Paper Zoetrope with Jamie Hudson

Chapter 1 - Make a Paper Zoetrope

Overview

- Hi, I'm Jamie Hudson. I'm a PhD scientist who started an art company with his wife a couple of years ago and have since fallen in love with this idea of bringing science into art and bringing art into science. Using a Cricut cutter, I'm gonna show you how to make a zoetrope, which will use a simple 10-frame animation loop. Takes advantage of persistence of vision, which is the trick that takes still images, and by going very quickly, begins to make them look like motion. This is how television works and movies work. And this is where it began really, with the zoetrope. Let's get animated. (bright music)

Materials

- You'll need a couple sheets of poster board, a light grip mat, an unsharpened pencil and a pencil eraser, the Cricut Fine-Point Blade and Pen that come with the cutter, a couple of film strips you can print out from the PDF that'll help you draw your own animation, and you'll need a Cricut cutter, and a mobile device to access Design Space, and of course, don't forget to download your SVGs for the project.

Make a Paper Zoetrope

- To get started let's open Design Space. First, we'll start with a blank canvas and we'll go and we'll upload the design file for the zoetrope. So to upload go down on the bar on the left at the very bottom and click the Upload. Over on the left you'll see Image and underneath Upload Image, click on that. Browse to where you've downloaded your SVG file. Here it's called Zoetrope Posterboard, we'll open that up. You'll see the whole design laid out. Go down to the bottom right and click Save and that'll save that image. Go ahead and select that image and make sure it's highlighted and then say Insert Images on the bottom right. When you do that, all that stuff will come in. Now, all of these lines are just loosely associated, so if you were to say Make It right now, it would just put these lines kind of wherever it felt it needed to be. So to help break that out what we'll do is select all of them and say Attach. And that'll make sure all those lines go into the right spot. The other thing we're gonna do is that this project takes advantage of the Cricut draw and then cut feature. So it's actually gonna use the Cricut cutter to draw patterns, it's gonna draw this star that's getting squished and unsquished in the animation when you're done. And so what we'll do is we'll run through into the bottom of this file and we'll select all those red stars, there should be 10 of them. So we'll just grab all 10 of them. And instead of saying Cut, we're gonna go over to the line type in the top left on the top toolbar and change Cut into Draw. And so now what it'll do is it'll run around and it'll draw all of those and it'll cut all the rest. Now, when we say Make It it should draw that out separately, so it'll go through again with a pen, draw all those stars, and then it'll run around and cut it out, and then the zoetrope will fold together in kind of a neat paper craft way. We'll say Continue, that looks fine. It'll then connect to the maker using either Bluetooth or USB depending on how you have it set up. And then we'll say Browse All Materials. We're using poster board here. We'll just go into All Categories and we'll search for poster. At the bottom you'll see Poster Board, Done. And what it'll tell us to do is to load the 0.4 pen into clamp A on the Cricut. And we'll load the fine point blade into clamp B on the Cricut. So we'll just open that up, take the pen, push it down, you'll hear it

click, and then close the clamp. That helps hold it into place. And then we'll go into clamp B and we'll load our fine point blade and just set it down the bottom, reattach it. And then the Cricut is ready to go. Next, we'll need to set up our mat with the poster board on it. So to do that just grab your light grip mat, position the poster board just right in the middle of that square. That's a 12 inch by 12 inch piece, so put it into the 12 inch spots on the Cricut. Just give it a gentle press to help kind of hold it down. You don't want that mat moving sideways while it's being cut. And then it's ready to load into the Cricut. At this point you can do everything just from the Cricut machine itself. There's the Load button, these arrows that flash, if you click it, it'll load the material in. After a bit you'll see the Cricut light flash and that means it's ready to process. Hit it again and it should go through and draw. (machine whirring) And that star is an animation that should look like a normal five-sided star that's being squashed down and then it'll unsquash on a loop. So kind of like a GIF loop you might see on the internet. When the Cricut's done the Unload button will light and so simply click it and it'll unload your mat for you. Then you'll want to go through, what I like to do is take that mat and just kind of peel it back, and then just very carefully pull up the negative space, the part that you don't want, and pull it out. Negative space is pretty interesting in its own right. I think this zoetrope in particular makes kind of negative space. So I'm sure you can think of something clever to do with that. Make a hat maybe, I don't know. Then you'll want to go through and very carefully just pull that back and peel off the zoetrope. The way this works is it'll fold together like a box where each frame kind of indexes and clicks into the next frame. I'll show you how that works in a second. And then we'll make a zoetrope handle to help actually spin it. But first let's build the zoetrope. So we'll just very carefully pull that off and there we have our zoetrope body. And to actually build this start with any spot, fold it up, grab the neighboring one and you'll look, there's a little tab and it'll slide in through the slit in the previous one. And you'll see there's tiny little ears that are cut to fold over and help to hold that together. Now, you're just gonna wanna repeat that nine more times. Grab the one next to it, put it through the slot, go in there. Just kind of bend those little ears over again. Go to the next one, fold it over. Carefully bend it over. Go to the next one. The Cricut has a really neat feature where you can go through and do folding scoring cuts, but just for this, because I already had the fine point blade loaded, what I did was just use a simple score on the bottom, so that it's mostly cut through, but it's got a couple of tabs. So it just makes that folding real easy. It's a nice alternative to using the scoring blade. But the scoring blade makes a much better fold if you're doing kind of fancier boxes. All right, we're almost there, one more to do. And the very last one should just slide right in there. And just like that you've got the basis of your zoetrope. And what you'll see is you have a slot that's passing before your eyes that's looking back at an image that's being swept across your field of view. What your brain does is it's trying to figure out all the time, what is it that I'm looking at? And it's filling in all kinds of information. In fact, there's parts of your vision you can't even see, your brain just fills it in. So things you think you see, your brain just says, eh, this is probably what this looks like. And that's exactly how these types of things work is that they take advantage of your brain's trying to figure things out. And when it sees something move by and then change and then change, it goes, oh I see, I'm looking at a star this being squished and unsquished. And that's why you see it. So to actually make this spin you can put it on something that spins by itself or what we're gonna do is make a little handle and we're gonna use the Cricut cutter again to make a handle that we can hold onto and then we'll just spin a pencil and it should cause that zoetrope to spin. So to do that we'll clean off our Cricut mat. Take off all these little negative space bits. And eventually these Cricut mats will get kind of full of dust and hair and things like that, because they're basically a giant piece of tape that is being used to kind of tape

down very softly the thing. And if you do find that these get a little too unsticky after awhile you can go in and very gently with a bit of soap and water and it'll help kind of liberate some of this material off and then you can let it dry and it'll be good as almost new. It'll help you get a little bit more life out of your mats. But for this we'll go ahead and set the piece of poster board back on the mat. And then we'll go back over to Design Space, we'll load in the handle file, and we'll cut that handle. We'll load a new canvas. We'll go down to the bottom left, click that Upload icon again, we'll click Upload Image again. We'll browse back over to where we saved our SVGs and here we have one called Handle Posterboard. It's just telling me that it's a handle for the zoetrope. We'll say Save. We'll click on the thing we just loaded in there, highlight it, on the bottom right, click Insert Images, all that stuff comes together. And again, this is really important with these types of files is when you take all those different cuts and you want all those orientations to stay exactly where they are. We're not trying to make all these little things individually, we want it all to come out as one part. So we'll grab them all and we'll say Attach. And all those things, when you go over and say Make now you'll be able to make a tiny little box handle that will help us spin our zoetrope. So now we've got our handle loaded. Everything else will be very familiar. We'll say Continue. It'll connect to the maker. We'll grab the poster board that we had loaded previously. It's telling us now that we don't need that pen anymore. We may as well take it out. Pull it out and remember to the cap back on it, so that we don't let that go dry on us. And we don't need clamp A anymore. And then clamp B has already got our fine point blade in it. Everything else is what we did before. We'll load our mat using the Load button. And as soon as the Cricut light comes on and says everything looks good, we'll click it. And now it'll go and cut out that handle for us. (machine whirring) Our handle is done cutting. We can hit the Unload button again and we'll get the mat back to us. And now we've got a handle in the corner. We can pull off our negative space again, being careful. And there's enough of that poster board left that I would keep it and I'll bet you can make another handle down there or something else. So go ahead and hold on to that. And then it didn't quite release, but just real carefully go around, and you can use a X-Acto knife if you need to, and just break out that handle. We'll set that aside. And the handle, like the zoetrope itself, is just a little paper craft box that folds up. So I've got score lines, so you can just run around and fold those guys over. The top and bottom fold in. So this is just kind of like how a cereal box would fold up. And then we just tuck those guys in, fold over the top, and now we've got our box. Let me show you that again, just to see how that all goes together. That folds over. And then we've got these two little tabs right there that will fold over and pop right in if you do it, if I did it right it'll pop right into there. Oh, come on, don't make a liar of me. There it goes. So now we've got a little handle and it's a pretty simple device, but what that's meant to do is that you can hold onto it with your hand and you can run a pencil just through those two holes and what that does is it just acts like an axle. And when you put that pencil through the hexagonal cut that we made in our zoetrope that acts like a little gear. And so now it spins. And what I do is I use that eraser, put it onto the pencil, nice and simple, just so it doesn't fall off. And now I've got a way to hold on to it. I can just take the pencil at the bottom and spin it. And if you look in there what you'll see, if you hit just the right speed, you wanna get as much light as you can on those images, you'll see a star slowly get squashed and then come back out as a star again. And there you have a zoetrope. I think this is really neat, but if you wanna take it one extra level there's a PDF that has just these simple film strips that has basically little five-frame or half film strips in it. If you cut out two of those, tape it together in the back, what you have is a 10-frame film strip that you can fold along those little lines. And when you pull that whole thing around what you have is another little 10-frame film strip that'll plop right down into your zoetrope, just like that. And you

can draw your own animations that then you can go and watch spin around. So if you wanna do something like a bouncing ball or some other simple animation, that's how it works. Remember that you're animating on a loop. So as you go from frame one all the way through to frame 10 you'll immediately go back to frame one. So whatever you do, it would be nice if it kind of had that looping continuum. That's what we do when we do the star where it kind of squishes and it unsquishes. Let's do something simple, like a bouncing ball. Let's say we have a ball that'll start at the top of our frame here. And by the time we get halfway through, or five frames later, let's say we wanna have our ball flat, 'cause that's what balls do when they hit the ground, on the bottom of our frame. So our ball will go down, fall, squish, and then rise back up as it bounces. If you think about how a ball actually falls in the frame one it's here, two, three, four. So it goes down quite a bit more every time. We'll do our second frame there. Our third frame here. Oh no. Our fourth frame, let's say here. Let's see. And then we'll have our ball come down just touching the surface and then it'll go all flat on the bottom. And then basically what we'll do is we'll just reverse that back up. And as much as I can I'm gonna try and make this ball go back up. I'm sure you guys can do a much better job than I am doing right here, but this is a good start. So I'll say that frame and then right back up to there. Just to help hold that in the zoetrope I'll just use a little piece of tape in the back to make that into a loop. And then we'll put that into our zoetrope. So this is a 10-sided guy. It doesn't matter where that fits in, 'cause it's just a loop. But now, if we look back into our zoetrope if I did that right, and who knows, maybe I did, you will, in fact, see a ball bouncing up and down. That doesn't look too bad. And you're off to the movies. You can make your own zoetrope and your own animations.