Teacher's Guide for:

Spin Art

Note: All activities in this document should be performed with adult supervision. Likewise, common sense and care are essential to the conduct of any and all activities, whether described in this document or otherwise. Parents or guardians should supervise children. Rock-it Science assumes no responsibility for any injuries or damages arising from any activities.

Title Page of Video

(Numbers in the text are **time codes,** so you can refer back to the video.)

[01:00:04;01]

Spin Art
filmed June, 2009

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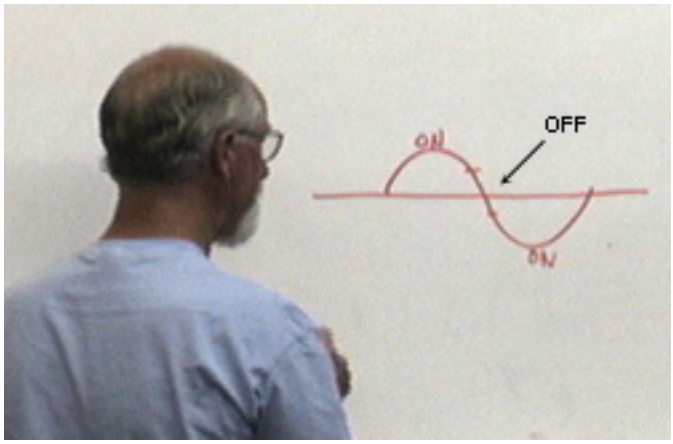
Introduction



The electricity goes through bumpy-wise.

[01:00:11;18] Look at those lights up there, and to our eyes, they look like they're on. But what would you say if I told you that they're going on and then off, and then on and then off, and then on and then off? They turn on a hundred and twenty times every second. And they turn off a hundred and twenty times every second. And you might be able to see it if you wiggle your fingers between them, your fingers look like they're kind of spaced out. That's because the electricity that goes through, goes through bumpy-wise. This is one bumpy *[draws sine curve]*. Sixty of those happen every second. And so the lights turn on here *[indicates top of curve]* and they turn on down here *[indicates bottom of curve]*. They turn off right about in there and there *[indicates crossing point at midline]* because they don't have enough electricity. So our eyes trick us. Did you know that tv's also turn on and off? Yeah, tv's flicker on and off. What if I told you that you flicker on and off? I don't know if people do that. It'd be way cool. Maybe ghosts do, because you can walk through a ghost. So a ghost must turn on and off.

[01:01:37;22] So we're going to try and trick your eyes today, and make something move fast enough so that you can't see it's there.

Story: *"Jack & Jill and the Tornado"*

[01:01:50;18] But first, we need a crazy story. Let's see, once upon a time Jack and Jill were raising chickens. Jack and Jill were raising chickens out in flatlands. And they had chickens in cardboard boxes, and there were lightbulbs in the boxes to keep the chickens warm. And there were little tiny baby chickens everywhere. Baby chickens are what color? Green - okay. There's a little baby chicken. Some of the chickens were big. Giant baby chickens. And Jack and Jill were trying to keep them all warm, because if they get cold and they don't have feathers, then they all die.

Jack & Jill's house and chicken box.

[01:03:03;01] Well, when they were getting all the chickens herded into their boxes and all the lights turned on, everything just right, along came a tornado. What color is a tornado. Grey? Okay, we're going to make the tornado red. Here came a red tornado. And the tornado missed all the chickens. But Jack and Jill were afraid of the tornado, ran into the house -- there's Jack's eyes, there's Jill's eyes, -- and the tornado hit their house, picked it up right into the air, and carried it around and around in circles until Jack and Jill were so dizzy they didn't know what to do. And Jack and Jill looked out the window of their house, and while it was spinning around and around they saw a bicycle fly by. And there was a witch on the bicycle, with a pointy hat. There was a cow that flew by. There. Do cows have antennas? This one does. There.

A tornado comes and picks up the house.

[Student] It looks like a deer.

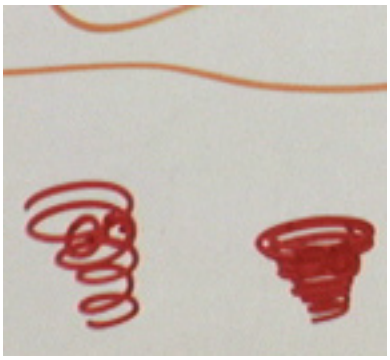
Well, you'd think it was a deer, but it's got an udder, so it's a cow.

The house, a cow, and a witch on a bicycle.

[01:04:20;11] And they went around and around and around, they got all banged around, and next thing you know, they were unconscious. When they came to, they weren't spinning anymore. And they could hear birds singing and all kinds of weird stuff going on. They looked out their window, and the storm was completely gone, the flatland was completely gone, the tornado and the cow and bicycle were completely gone, but the house was still there. And their house was all broken. Like that. A broken window like that.

The house landed and was all broken.

[01:05:09;29] And somebody outside was singing some sort of a silly song. And there were mountains in the distance. And they walked out the front door, and they heard these tiny little voices singing, "Ding dong, the witch is dead! The wicked witch!" And the voices were coming out of little tiny tornadoes, baby tornadoes. Singing baby tornadoes were all over the place. And they were singing this song, and Jack

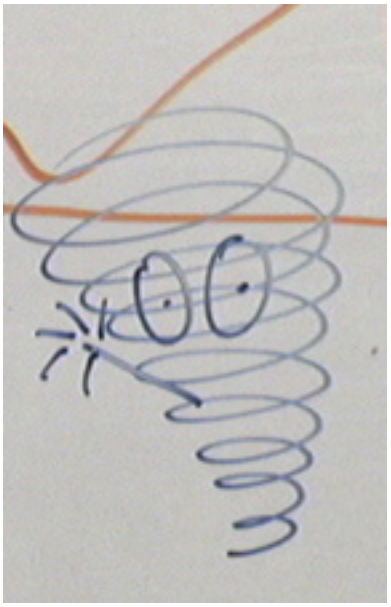


Singing baby tornadoes.

and Jill looked, and there were some ruby slippers under their house, and attached to the ruby slippers were some legs with black and white striped socks. And Jack and Jill said, "Oh, no, our house landed on somebody, that poor, poor somebody!"

Feet with ruby slippers under the house.

[01:06:13;23] And then along came a slightly bigger tornado like that, and it had a magic wand. And this one came over to Jack and Jill, blinked and said, "Jack and Jill, how did you get here?" And Jack and Jill said, "I don't know. We were in our house, a tornado came, and next thing you know we're here." And the tornado said, "Who killed my sister?" And Jack and Jill said, "Uhhhh, must have been us. We're sorry!" And the tornado said, "It's okay, okay. She was evil, so you did good." And Jack and Jill said, "All right, yeah, evil -- we killed the evil thing!"



Tornado with a magic wand.

[01:07:01;14] And then she said, "But those are magic slippers. You've got to kick the magic slippers off of the dead feet." And Jill said, "Eeww, gross!" And Jack said, "I'll go get them." So Jack went over and he took the slippers off. As soon as he took them off, they went badoompf! -- and stuck to his own feet. Now Jack had ruby slippers on his feet. And he thought, "Oh, man, I can't walk around in these. I'll look silly. People will make fun of me." And the witch said, "Well, go take them off." So Jack tried to take them off, but they were stuck tight to his feet and he couldn't get them off. From then on, whenever Jack tried to move, he danced when he moved. And Jill said, "Yay, Jack, you're a dancer."

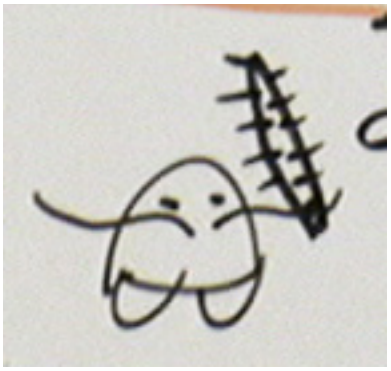
Bad witch Fredrica.

[01:07:43;02] Now, there was another evil witch in that place. Her name was Fredrica. Evil Mister Fred's sister. And she didn't wear a sombrero, let's give her a pointy hat. But she had a mustache. And she'd have to wear a dress because she's his sister. There. Okay, this is Fredrica. She was also sister to the good witchy thing there. She hears that her sister was killed by Jack and Jill. She said, "Ohhhhh, those rotten Jack and Jill. I'll show them. I'll get them some way, I'll get them for sure!"

[01:08:25;26] And so Fredrica had minions just like Evil Mister Fred's minions, but they don't get baseball bats. What should they use in this territory? Cactuses. They could use pieces of cactus.

[Student] What is cactus?

Cactus is a green thing that grows in the desert that has little spikes on it. So they've got pieces of cactus, like that. And she said, "Go out there and hit Jack and Jill." And the minions said, "Oh, boy, we can do this."



Minion with cactus.

[01:09:02;03] So they ran out there to get Jack and Jill. But when they did, the little tornado guys went and got all around them and spun the guys around til they were so dizzy they didn't know where they were going. They were going "Oooohaaah!" They were hitting each other, and they went back and hit Fredrica. So now she's got a bunch of little spikes sticking out of her. And she went, "Ooh! Ah! Ooh! Ah!" and ran away. And then she went back to her castle. And she sat in her castle tower pulling out the thorns, and she said, "I've got to get those two."

[01:09:36;16] And she looked into her crystal ball, and she could see everything Jack and Jill were doing. And she saw that Jack and Jill were having a good time. And she said, "Oh, crystal ball, crystal ball, what should we do to make life miserable for Jack and Jill?" And the crystal ball said, "Jack and Jill have only one way to escape from this territory. They have to follow the yellow brick road." And the crystal ball said, "If they can't follow the yellow brick road, they will never be able to leave, and you'll have the chance to do whatever you want to them." And then Fredrica said, "Well, okay, but I can't pick up the yellow brick road. It's big, it's huge, it would take forever." And the crystal ball said, "Ah, ha, ha. Leave that to me."

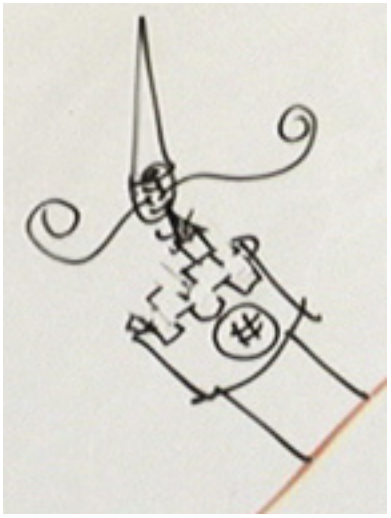
[01:10:44;19] And the crystal ball put a spell on all the little tornadoey things so that they zoomed left and they zoomed right, and they zoomed here and they zoomed there. Wherever they zoomed, they sucked in all the colors of everything that was there. Pretty soon the orange mountains turned black. The yellow brick road turned grey. All the bushes turned grey. All the trees became grey. Nothing had any color any more. Not even Fredrica. And Jack's ruby slippers turned black. And Jack and Jill couldn't find their way out of Oz. (They call this place Oz.)

[01:11:29;10] If you were Jack and Jill, what would you do?

Imagination and Brainstorming Time

[Students make suggestions] (THERE ARE NO WRONG ANSWERS! Whatever they say, you should reply: "That's a good idea," "They might do that," etc. After brainstorming, proceed with the experiments, then finish the story.)

[01:13:01;04] Well, we'll make this "To be coninued . . ."



Fredrica in her castle.

The yellow brick road.

The little tornadoes sucked out all the colors and made everything grey.

Experiment: *"Make Spin Art"*

Items needed for Setup:

- Boards extending the length of the table in an "I" configuration so that all students can reach it.
- 1/4" Copper Tubing attached to the boards
- 24" insulated Connecting Wires, connecting the boards in series with Alligator Clips
- 100-amp Power Supply
- 30-amp Fuse

Boards with copper tubing attached, connected with wires, attached to power supply.

Items needed for Students:

- Round plastic tub
- Large foam disk (just large enough to fit into plastic tub) with motor in center and a 4" square of plastic on top of motor (pre-assembled)
- Two sets of alligator clips with connecting wires
- Resistor (1 ohm, 40 watts)
- 4" Square piece of paper
- Masking Tape
- Colored marking pens

100-amp Power Supply

Alligator clips connect boards.

Fuse, and plugging it in.

[01:13:28;27] Okay, this is like a battery *[indicates power supply],* except it doesn't ever run down, which is really nice. And it's connected to these copper guys *[indicates copper tubing on boards]*. Then it goes through these green and yellow guys *[indicates wires going between boards]* that go to those copper guys, and then it goes down and connects to those copper guys *[indicates copper tubing on board at opposite end of table],* and then comes back here and sits at the end of the road and twiddles its fingers because it has nowhere to go. It's very sad because of that.

[01:14:09;14] Whenever you're hooking batteries to things, if they're a powerful battery -- it's only five volts, but it's a fairly powerful one -- you put a fuse on it. In your car you have fuses that pop out like that *[holds up fuse]*. And if something happens where, say, a robot comes in here and touches both of those together, the fuse goes bchh! and protects the battery. Five volts can't do anything to you, can't get through your skin. You could eat it. You can put your fingers on it, and

it won't do anything to you. There's five volts in there now *[indicates boards with copper tubing]*. You can feel these and see that they don't do anything.

[01:15:15;06] And you say, "I don't believe there's five volts in there." So we've got some old Christmas lights. We'll see if they're still any good *[touches wires to copper tubing -- bulb lights up]*. You see there's five volts there. And made it through there *[touches wires to another section]*. The five volts goes the whole way around.

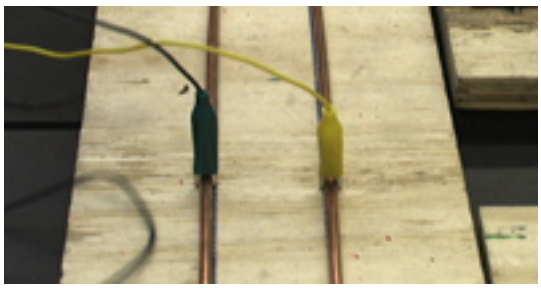
[01:15:49;10] Now, we want to see if there's enough power to spin -- you see there's a motor on the back of this? *[holds up large foam disk with motor in center]* The motor goes all the way through. And we want to see if there's enough power to spin our motor. *[Touches wires from motor to copper tubing]* So it can spin. So what we want to do is put something on here and make it spin. And we're going to put it in a tub. Here's a tub that holds it pretty good *[sets foam disk into tub]*. And we want this piece of paper to stick on it *[holds up square piece of paper, then places it on disk]*, and I usually just use some masking tape. You need two pieces of tape, one on one corner, and one on the other corner. You put it on your square thing and fold over the edges. And then rather than holding the wires with your fingers, we'll give you alligators.

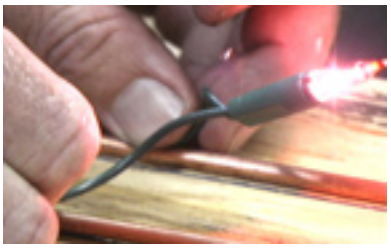
[Short gap in videotape]

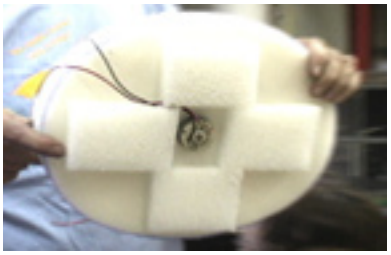
[01:18:14;07] Put one alligator on the hippopotamus with no head. You're going to put an alligator on the feet, one front foot of the hippotamus, which is really a resistor. When you're using it, your hippopotamus resistor will get very hot. If you touch it, you'll do the ooh-ah-ooh-ah dance. It doesn't matter where you hook it onto the copper. And you hook the other wire with the other alligator -- you see the alligators have a mouth and you squeeze his head and his mouth opens and closes -- you hook him to the other one. And when you get eveything out of the way, your piece of paper will spin.

[Passes out plastic tubs, foam disks, alligator clips, resistors, paper, tape, and markers.]

[Gap in videotape]


Alligator clips attached to copper tubing.


Testing the wires with a Christmas light.


Motor mounted on underside of foam disk.


Top of foam disk with 4" plastic square mounted on motor.


Foam disk just fits in plastic tub.

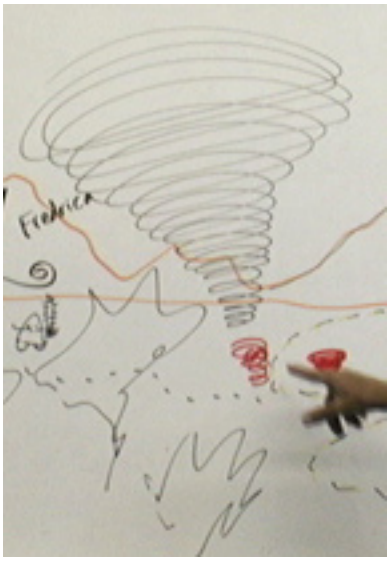

Attach paper with masking tape.


Resistor with alligator clip attached.

End of Story

** DO NOT * present this part of the lesson until after you have done the experiments!*

[01:34:43;19] The little tornado guys started sucking up all the colors, and everything was black and white, even the yellow brick road. So Jack and Jill didn't know how to escape from the place. So Jill said, "We've go to do something. We've got to stop those tornado guys." Jack said, "I'll stop them!" A little tornado guy was zooming by, and Jack ran out there and tried to grab him. Next thing you know, Jack is spinning around in circles like crazy. And Jill said, "Oh, nice going, Jack. Look at you running around in circles." Jack said, "Help, I'm getting dizzy! I'm going to throw up!" And Jill ran the other way.



The little tornado keeps sucking in Jill's hair, and it grows into a big tornado, sucking up all the little ones.

[01:35:25;06] And then Jill said, "Oh, let me try this." So she made a lasso out of her hair. And one of the little guys was zooming by, and she went whoom! -- and lassoed him. Well, her hair grows infinitely fast, and the thing started sucking up her hair, and it got bigger, and bigger, and bigger, and bigger! And pretty soon it was huge, full of Jill hair. And it was so big that it was just wandering around sucking all the little tiny tornadoes up. And as it did, it became like flashing colors everywhere inside of itself.

[01:36:09;12] So imagine that flashing colors by itself. And then it flew over toward Fredrica's castle, and it sucked up Fredrica and her castle. And as soon as it sucked up the crystal ball, it exploded. And all the colors went back to where they were supposed to be, and the tornado disintgrated, and we never saw Fredrica again. Everybody lived happily ever after, except Fredrica.

End of Lesson