Teacher's Guide for:

Burning Things with Electricity and Oil Lamps

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.

NOTE: *This is the transcript of a lesson that was videotaped during an actual Rock-it Science class with real students, not actors. The students' brainstorming comments are included on the video but are not transcribed here because they're not part of the lesson presentation.*

Contents:

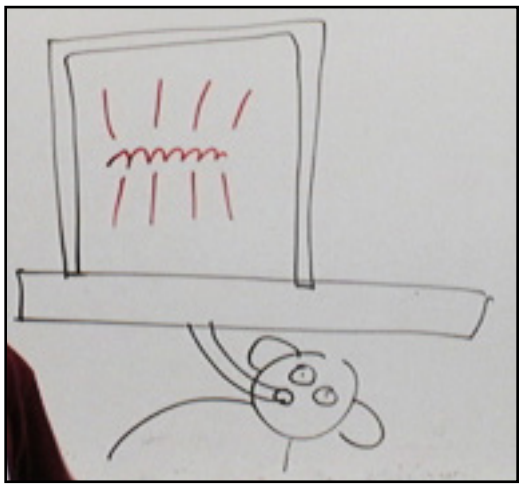
Title Page of Video

Burning Things with Electricity and Oil Lamps
A Rock-it Science Lesson
Filmed July, 2010

Rock-it Science
2110 Walsh Ave, Unit F
Santa Clara, CA 95050
www.rockitscience.org

Intro Quick Recap:

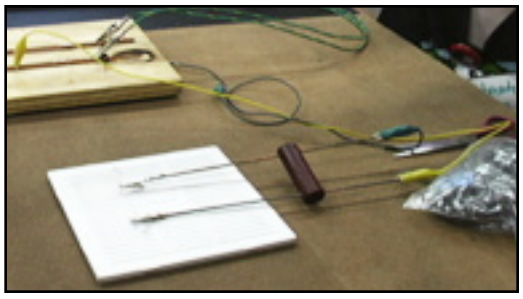
- A guy named Tommy used to like to experiment with electricity.
- When you put electricity through a wire, it glows, but it goes out right away.
- If you put it in a jar and have a gorilla suck out all the air, it will burn longer.
- Tommy tried four thousand times to find the best wire for glowing.
- This was Thomas Edison.



Gorilla sucking air out of the jar.

Experiment Quick Recap:

Experiment #1: Burning Things with Electricity



Apparatus for heating wires.

- Set up wooden planks with copper wires attached so students can hook up alligator clips to it at any point. A power supply is attached.
- Assure students that the electricity can't pass through their skin and hurt them.
- Students work in pairs. Use the tools from "Foam Cutters" without the batteries.
- Instructor demonstrates by stringing a piece of wire from a wire scrubbing pad between the alligator clips on the foam cutter tool. Connect it to the copper wires on the boards with a pair of wires containing alligator clips.
- Place the tool on a non-burnable ceramic tile.
- Turn on the power and see if the wire glows.
- Students get a piece of graphite fibre and do the same.
- Then they separate the wire to get a thinner piece and repeat the experiment.
- Instructor connects a small bunch of steel wool to the alligator clips and shows how it glows.
- Instructor then touches the alligator clips to a larger bunch of steel wool to show how it glows wherever the alligator clips touch it.

Steel wool glowing

Experiment Quick Recap:

Experiment #2: Oil Lamps

Roasting pan with small dish inside.

- Students work in pairs. Each pair gets an aluminum roasting pan, a very small, shallow aluminum dish, and a 3" piece of shoestring with wire threaded through it.
- Students bend shoestring into the shape of a snake so it will stand up in the little dish.
- Instructor squirts denatured alcohol into the aluminum dish and ignites the shoestring wick with a propane torch.
- Turn off lights to see it burn. Notice size of flame and how long it lasts. Turn lights back on.
- Give students a new wick, add lamp oil, and repeat experiment.
- Give students a third wick, add Canola oil, and repeat experiment.
- Canola oil is very similar to whale oil.
- Ask students to compare the results of the different oils -- size of flame, length of time it burned, whether it smoked.

Shoestring with wire inside.

Equipment List: "Burning Things with Electricity and Oil Lamps"

Items needed for Instructor *("Electricity"):*

- Boards extending the length of the table so that all students can reach the copper tubing attached to the power supply (see next page for detailed instructions).
- Wire holder apparatus (see Prep Work)
- Wire scrub pad
- Fine Steel Wool
- Two sets of alligator clips with connecting wires.
- Ceramic tile, non-burnable, about 8" x 8"
- Scissors
- Cup, plastic, 16-oz.

Items needed for Students *("Electricity"):*

Consumables (per 2 students):

- Graphite fibre, about 3 inches

Other:

- Wire holder apparatus
- Two sets of alligator clips with connecting wires.
- Ceramic tile, non-burnable, about 8" x 8"

Prep Work for *"Electricity":*

- Set up the boards and power supply before class begins (see page 5).
- Assemble wire holder apparatus as follows:
  - Use 2 wooden chopsticks
  - Cut aluminum tape the same length as chopsticks and wrap it around so the sticks are covered completely.
  - Attach an alligator clip to the top of each chopstick.
  - Attach the chopsticks to either side of a piece of foam about 2" wide. (The material used in the video for this was a manufacturing castoff that we had on hand. A piece of foam works just as well.)
  - Attach alligator clips with connecting wires to the bottom of each chopstick so the other end of the wire can be connected to the power supply.

Prep Work for *"Oil Lamps":*

- Insert 20-gauge wire through length of shoestring, about 9" per student.

Items needed for Instructor *("Oil Lamps"):*

- Propane Torch
- Pipette
- Scissors
- Cup, plastic, 16-oz.

Items needed for Students *("Oil Lamps"):*

Consumables (per 2 students):

- Dish, round, shallow aluminum foil, about 2" wide
- Shoestring with 20-gauge wire inserted, 3 pieces at 3"
- Denatured Alcohol, 2 ml.
- Lamp Oil, 2 ml.
- Canola Oil, 2 ml.

Other:

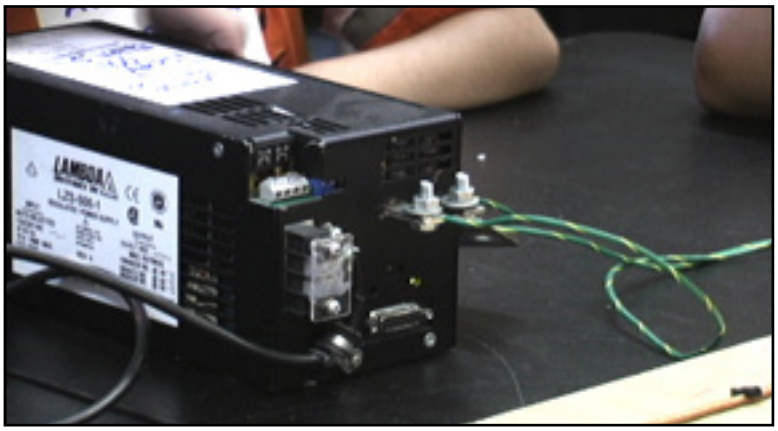
- Roasting Pan, Aluminum

Equipment List (cont.): Power for Electricity Experiment

Electrical power components:

- Boards extending the length of the table so that all
- students can reach the copper tubing.
- 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
- Extension cord

Boards with copper wires extending the length of the table, all connected to a power supply.



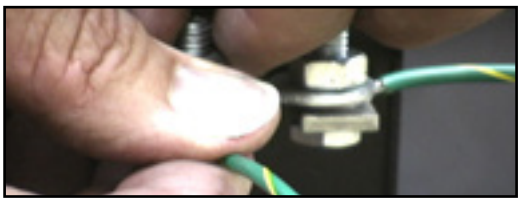
110-amp power supply.

Copper tubing attached to wood.

Connecting boards with alligator clips.

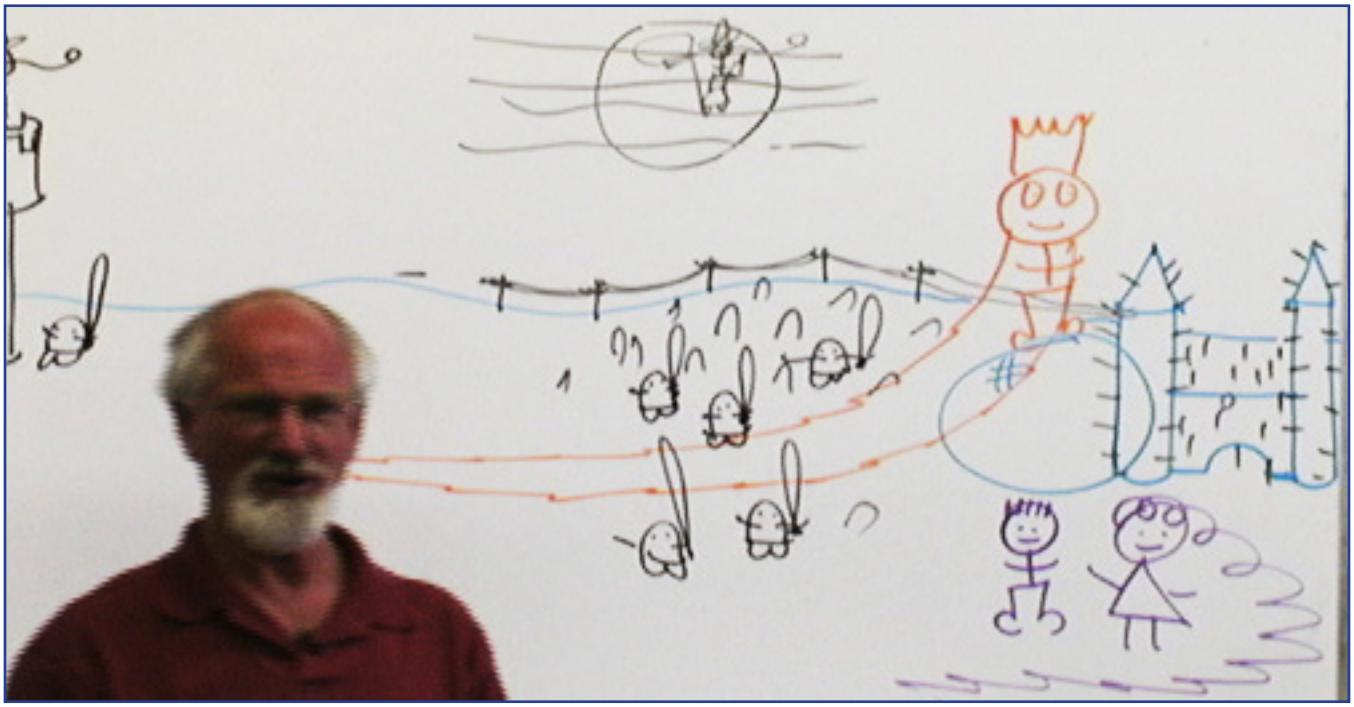
30-amp fuse.

Inserting fuse.



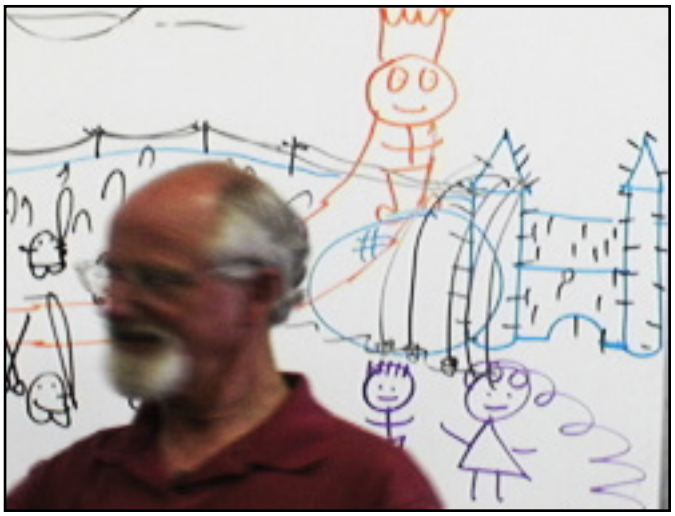
Attaching wires to power supply.

Story Recap: "*The Darkened Castle*"



Part 1:

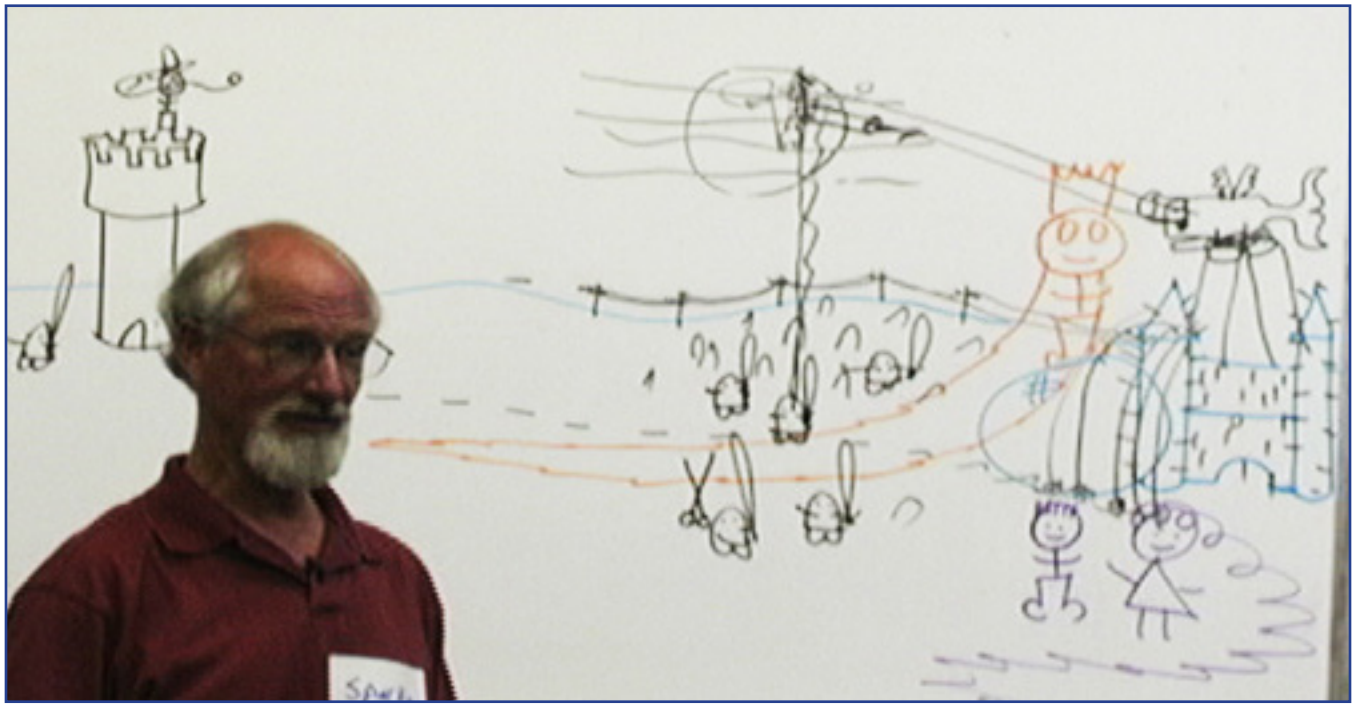
- The old King wants to find someone to be the new king after he dies.
- He asks Jack and Jill to help him. They decide to invite everyone and have a contest. But Evil Mister Fred isn't invited.
- The castle is full of people taking part in the contest.
- Evil Mister Fred sends his minions to create chaos and mayhem.
- He gives one minion a pair scissors to cut the power lines so the castle won't have lights. The minion gets toasted.
- The other minions go into the castle, break all the lightbulbs, and whack people with their baseball bats in the dark.



Part 2:

- They used Jill's hair to fix the lightbulbs.
- People thought the attack was part of the contest, so they threw the minions off the tower on their heads.
- Jill's hair caught fire, so they had to put it out, and they were in darkness again.
- All they had were shoestrings, little bowls, and a bunch of fat.

Story Recap (cont.)



Ending:

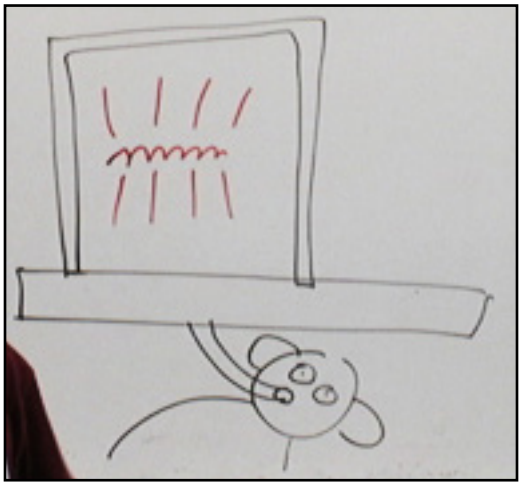
- Jack and Jill called the Acme Store of Everything and ordered a flying whale.
- The whale opened a drawer in his stomach and turned on floodlights to light the castle.
- Evil Mister Fred, on his vacuum cleaner, called the Acme Store of Everything and ordered a harpoon gun and aimed it at the whale.
- Evil Mister Fred was right in front of the moon, so Jack and Jill saw him and warned the whale.
- The whale shone a searchlight right into Evil Mister Fred's eyes, so he dropped the harpoon gun.
- It landed on a minion's head. The minion's baseball bat flew up and hit the button on the gun.
- The harpoon shot right through Evil Mister Fred's hat, which was glued to his head, and he got carried away and disappeared.

Transcript: Introduction

Okay, there was a guy, let's see -- his name was Tommy. Tommy liked to experiment with electricity. He liked to experiment with lots of other things, too, but electricity was one of his favorites. And he discovered that if you put electricity through a wire, the wire gets hot. And the more electricity you put through it, the hotter it gets. And you know what happens if you put too much through? *[Students offer answers.]* It could explode, but before it explodes, what does it do? It could catch on fire. It could get really hot. What happens when things get really hot? They melt. Do they do anything before they melt? They make smoke.

Glowing Wire

Well, he discovered that they'll glow. When he put electricity through some wires, the wire would glow with a nice bright red light. And he thought, "Wow, that ought to be useful for something." The problem was, when it glowed nice and bright, about a second later it melted. He said, "Oh, no. I don't want it to melt. But there must be some way to stop it from melting." And somebody else came up with the idea of putting it in a jar. If you put it in a jar, and then you have a really big gorilla suck all the air out of the jar -- here's a gorilla. He's down there, and he has a tube in his mouth, and he sucks all the air out of the jar until there's none left. And then when you have the wire glowing in there, the wire glows a lot longer. Then he discovered that a gorilla doesn't do a perfect job of sucking the air out of the jar, that you had to use something called a vacuum pump. And when you use a vacuum pump and suck almost all the air out of the jar, the wire can glow for hours and hours and hours. And he made one of the first practical lightbulbs by getting a good strong vacuum in there and choosing the right kind of wire. You know how may wires he tried? *[Students guess.]* He tried more than ten. He tried more than nine hundred ninety-nine. Less than ten thousand. More than one thousand. More than three thousand. Yeah, four thousand. He tried four thousand different kinds of wire before he decided that the very first one that he tried was the best. And his name, of course, was Thomas Edison. He made the first lightbulb.

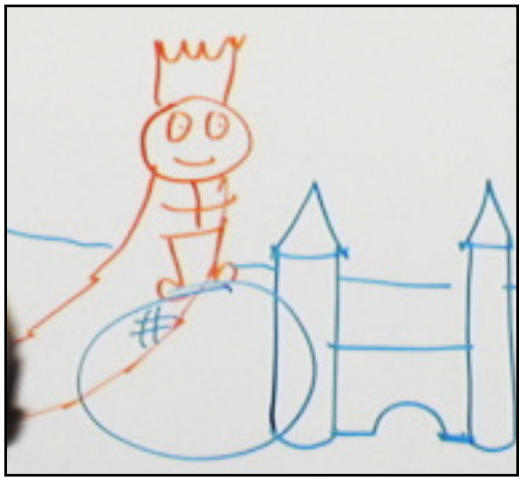


Gorilla sucking Air out of Glass Jar

Now, we want to reproduce some of his experiments today, but we're not going to suck all the air out of the room. We're just going to put electricity through some things and see what burns and what doesn't. But first, we need a crazy story.

Story: *"The Darkened Castle"*

Part 1:

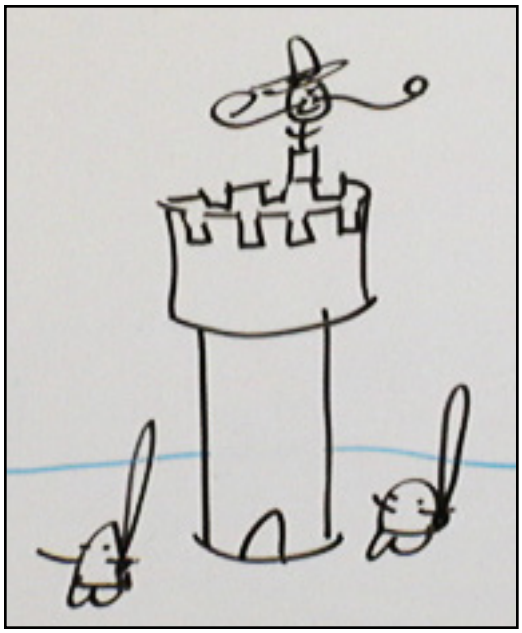


Old King with Beard standing on a Ball

Once upon a time, there was an old, old king. And he had a beard. There, he's an old guy. And he figured that sooner or later he's going to die, and they needed a new king in the territory. So he was going to have a king contest. He lived in a castle, and he said, "You know, if anybody gets to be king, they get to live in the castle. And they get to tell other people what to do. And they get to go fight wars and become famous." Let's see, our king was standing on top of a ball. And he said, "What's the best way to choose a new king? Should we choose somebody that can balance on top of a ball? Or should we choose someone that can cilmb a tree faster than other people? Or should we choose someone that can sing songs louder than everybody else?" He thought and he thought, and he didn't know exactly what to do.

Jack and Jill

So he called Jack and Jill and said, "Jack and Jill, how are we going to choose a new king?" And Jack and Jill said, "Well, I suppose it would have to be somebody that's very patient, and somebody that doesn't like to kill people, and somebody that's good at fighting and defending everybody if there is a battle. We're going to have to have a contest." And the king says, "Ooh, I love contests! We should invite everybody in the whole kingdom for our contest." And Jack and Jill said, "Yeah, that's great."

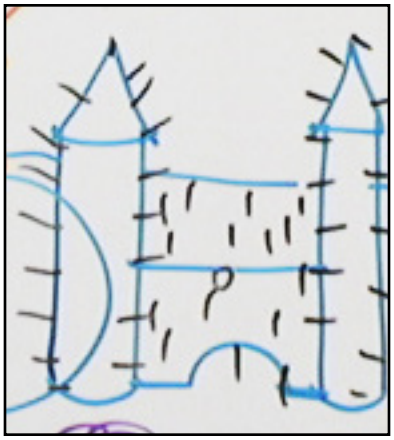


Evil Mister Fred and his Minions

Well, their kingdom also happened to include Evil Mister Fred and his own castle. And Jack and Jill sent out invitations to everybody in the kingdom, to come to the king's house. And they were going to have a contest to decide who was going to be the next king. And the first part of the contest was, they had to tell a good joke. And the joke had to be so good that it would make everybody laugh. And Evil Mister Fred said, "Hey, I hear they're going to look for a new king, and I'm just the guy. They should just select me as king and forget about all that other silly business." The minions said, "Yeah, boss, you should be king. Forget those other guys. We'll support you." And Evil Mister Fred said, "Well, thank you very much. Minions -- supporting me. What will come next?"

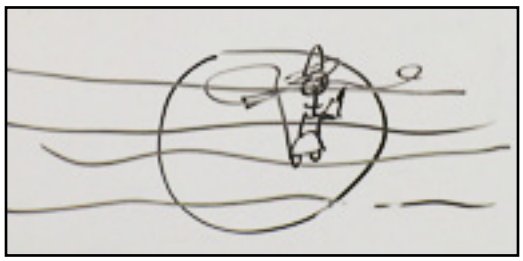
Well, Evil Mister Fred didn't get an invitation to the contest. Everybody else did, but not Evil Mister Fred. And he went "Arggghhh! Those guys left me out! I'm not happy about this." And they came far and wide, everybody with their books

and their brains and their ideas about how to run the kingdom, and they all went in for a great party, a celebration, and a test.


Castle full of People

So now the castle is full of people, people, people, people, people, people, people. There's people all over it, inside of it, there's people everywhere. Those are all people, like that. And Evil Mister Fred said, "I'll show them. I'm going to mess up their contest. I'm just going to ruin it completely, and when they figure out what happened, it'll be too late. I'll be king instead of them."

Well, the contest was slated to start at midnight. It was a full moon. And Evil Mister Fred was hovering up above on his vacuum cleaner. And he told his minions exactly what they needed to do to ruin the party. And Evil Mister Fred had his cell phone there so he could talk to them. And the minions are all down here saying, "Okay, we've got to do this for the boss. We've got to make sure we do everything right." He gave them all new baseball bats. *[Student: He should give them swords.]* Oh, they'd cut each other in pieces with swords. And then Evil Mister Fred has to spend all day duct taping them back together again. They could wear armor, but they clank around a lot, and they fall down because they're so short, and the armor just falls off. They could glue it on. Minions, minions, minions, all over the place.


Evil Mister Fred on Vacuum with Cell Phone


Minions and Power Lines

So everybody's in the castle. They're having their joke-telling contest. The minions are surrounding the castle on the outside. They've got their baseball bats at the ready, and at Evil Mister Fred's command, they're going to storm the castle, climb all over it, smash the windows, go inside, and create mayhem, chaos, and havoc. But first, Evil Mister Fred has told the minions to look for the power lines leading to the castle. He wants to turn off all the electricity so that they can't see inside. And the minions said, "Oh, easy! We'll just climb up those poles and cut those wires." And Evil Mister Fred said, "Yeah, you do that. Just climb up the poles and cut those wires." So he gave just one minion a pair of scissors. And the minion said, "All right, boss! I'm ready to go!" He climbed up the telephone pole and just put the scissors right on there. Kchunk! Next thing you know -- poofffff! -- you've got flaming minion. And the other minions went, "Whoa, did you see that? He burst into flames!" And now the minion's running all over the place, and Evil Mister Fred had to pour water on his head. He said, "Well, maybe that's a bad idea. Minions, instead of cutting the wires, when you get into the castle, use your baseball bats and smash all their lightbulbs so it's dark inside. And then we can do the mayhem and the chaos and everything else to make their life miserable."

Well, part of their plan worked. The minions actually did smash the windows, climb all over the castle, run around inside, and smash the lightbulbs. Now, Jack and Jill are in there, and they were saying, "Oh, no!" Other people were in there, too. The minions were swinging their baseball bats, whacking everybody, along with themselves. If you were Jack and Jill, and you're inside of a castle and there's all this chaos going on, and your contest is being ruined, what would you do?

Imagination and Brainstorming Time, Part 1

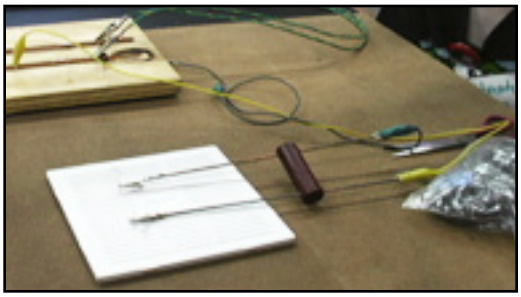
[Students make suggestions] (THERE ARE NO WRONG ANSWERS! Whatever they say, you should reply: "That's a good idea," "They might do that," etc. After brainstorming, proceed with the experiments, then finish the story.)

And we're going to leave this "To be continued . . ."

Experiment #1: Burning Things with Electricity

In our experiment, we need some electricity, and this black box makes just the perfect kind of electricity for us. The electricity is now on. If you touch the wires, will your hand explode? Oh, we should test it with Mister Mac first. *[Instructor puts his hand on the wires.]* Here we go. Aw, darn, my hand didn't explode. There's only five volts here, so it's like two flashlight batteries. It can't go through your skin. You're safe from that. *[Student: Could it give you a heart attack?]* Well, if you put it right on your heart, it might. But it can't get through your skin to get to your heart.

Power Supply with Wires mounted on Board



Scrub Pad Wire between Alligator Clips

To do the experiment, we're going to use something that looks like this and something like this. It's got alligator mouths at the top. If you squeeze its head, its mouth opens and closes. And this one does the same thing. We can put stuff between the two alligator heads, let the electricity go up this wire, through the part we put in there, and out that one. We'll test it. And we have some unburnable plates. We'll set a plate on the table and grab a couple of wires. And these guys also have alligators hidden inside. They call them alligator clips. We can stick one on one leg, and one on the other leg, and we can clip them onto here. Now, the electricity's available to go between these two, but I don't have anything in there yet. I'm going to test that a piece of wire on there and see what it does. For instance, here's a scrub pad. It's springy, wiry-looking scrub pad. And this kind of wire is so thin, you can cut it with scissors. We can clip it with one alligator, and we can clip it with the other alligator, and then we can let the electricity go through it and see what it does. Now, with that size of wire, it's getting real hot -- you might have seen it smoke. *[To assistant:]* Would you turn off the lights there, and then when I make it shorter . . . .

When you have a wire on here, you don't want to touch it because you might burn your finger. You can make it shorter. There, it's short. Now, you can turn the lights off. *[Wire glows and quickly burns out.]* And did you see that? You can switch the lights back on. So that was like a light bulb filament.

When you hook them together, you can just let them sit on the plate so you don't have any burning stuff fall on you. And then all you have to do is touch this to there and let the electricity go through and see if it does anything.

We're trying to burn stuff with electricity. So I'll be turning the power on and off. When you're ready, we'll turn it on and let them all try to burn up. Then we'll switch the power off and then turn if back on again. You're going to be working with a partner, so sit by someone you want to work with. Now, we're going to hand out these. Let's see, you guys are all set. *[To assistant:]* You can hand out the tiles. You guys can use those. You guys can put the alligators on. Choose fatter wires if given a choice. Some of the wires are really thin and short.

The first wire is being passed out. It looks like hair. You can put it between your alligators and see what it does.

Hook up your alligators to the copper tubing. Go ahead and do it now -- there's no power on. Has everybody got alligators hooked up? There, just leave it, just set it on there. Okay, when Edison did his experiments, he failed three thousand nine hundred and ninety-nine times. Do you think this is going to work or fail? We'll see. The power is now on. See if yours does anything.

Now take your piece of hairy stuff out and take it apart and use about half of it. Take the half and stick it back in. Okay, are you ready with half of it? Let's turn the lights off. We'll turn the power on. Power's coming on. Any glows yet? No glows yet. You can turn the lights back on. Anybody got fried wires? No? Now, Mister Edison might have said at this point, "Well, that didn't work." Maybe he'd keep dividing it in half, and dividing it in half. Eventually you can get this to glow a little bit, but it immediately burns up. So he might say, "Let's try a new idea."

What if he took a little bit of really, really thin wires. *[Instructor borrows one of the students' apparatus. A cup of water is placed on the table nearby.]* This is steel wool, comes from steel sheep. *[Instructor places a small piece of steel wool between alligator clips.]* You guys need to move back a ways. *[Nearby students push their chairs back from the table.]* Okay, turn the power on. Let's do it with the lights on first and see if I got the right amount.

Let's suppose Mister Edison decided to try steel wool. You see, the steel wool is kind of smokey. He'd say, "Well, that's close, but no cigar." Oh, we still have some of the others hooked up. We need to disconnect the others. *[Disconnects students' alligator clips from the copper wires.]* We want all the power to go through this one. So, he put some electricity through here -- go ahead and turn it on again -- and he saw that it smoked. And if he pushes it closer together, it glows! *[Steel wool glows brightly.]* Turn off the lights for a second. And he said, "Ooh, that's cool!" Lights on again. Turn off the power. So he says, "Well, if a little is good, more should be better, right?" *[Instructor puts a large piece of steel wool on the alligator clips.]* Okay, turn off the lights. Power on. So he's going to try a bigger chunk here. Ahhh! Wherever you put electricity through, the steel wool gets hot. And you can burn it. *[Instructor blows on the steel wool and it glows brighter.] [Student: You're adding oxygen.]* Yes, when you add oxygen it burns more. Okay, lights back on. Turn off the power. So these are the kinds of experiments Edison did.

Small piece of Steel Wool, and a larger piece.

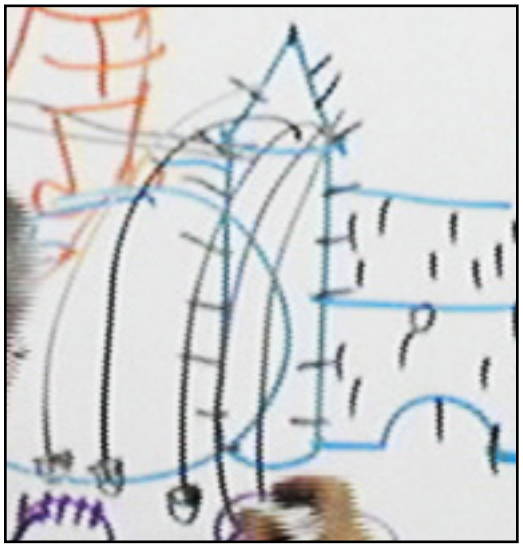
[Places the burning clump of steel wool in a cup of water to extinguish it.] Now we need to finish our story, and we have one more experiment that we're going to do quickly.

Story, Part 2

**** DO NOT * present this part of the lesson until after the Electricity experiments!***

So Evil Mister Fred got his minions to go inside the castle. They're climbing up the stairs, they're hanging from the chandeliers, they're throwing pots and pans at everybody in the castle. There's chaos everywhere. People are screaming and trying to get away. But then some of them say, "Maybe this is part of the test to be king. Maybe we should be very calm and regal and pretend like we're all kings and we're not afraid, and maybe then they'll choose us as king." So instead of screaming and yelling and throwing stuff, everybody stood around and said, "Everything's under control. Oh, I think we're just fine." And the minions were trying to hit their toes with their baseball bats, so they had to dance around while they're trying to act calm.

They Jack and Jill said, "We need light. We've got to have light." So they took some of Jill's hair and they put it where the lightbulbs were, and her hair started to light up. And everybody, once they saw the light and they saw all the minions, they said, "Remove those varmints! Throw them out!" So all the people gathered the minions and threw them off of the tower. So it's raining minions outside. These are minions being thrown off. Luckily, the minions landed on their heads and were not hurt too badly. And they all ran away screaming back to Evil Mister Fred's castle.



Minions landing on their heads

And Jack and Jill said, "Well, we survived that one." And then Jill's hair caught on fire -- poof! And everybody said, "Put out the fire." So they took champagne and soda pop, and they poured it on Jill's hair to put out the fire. But now it's dark again. And they say, "Uh, oh. It's dark. We've got no light bulbs, we've got electricity, but nothing to light up with it. We've got to do something because sure enough, that Evil Mister Fred is going to send his minions back to attack us." And they looked around, and they had shoe strings. And they had little bowls, and they had a bunch of fat. If you were Jack and Jill, what would you do to make light?

Imagination and Brainstorming Time, Part 2

[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.)

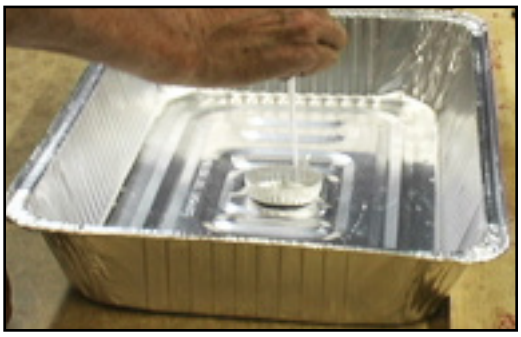
And we're going to leave this "To be continued . . ."

Experiment #2: Oil Lamps

For this experiment, you're going to work with the same partner you worked with last time. We're going to put a big aluminum tub between you, and in the tub we'll put a little tiny aluminum tub. And in the little tiny aluminum tub we're going to put some shoestring. And the shoestring has to be bent a certain way. Here we have special shoestring. This is trained shoestring. When I tell the shoestring to stay that way, now it's staying that way, *[holds the shoestring in different positions]* and it's staying that way, and it'll stay that way, and it'll stay that way. You can tell why, huh? You see that? Yeah, I shoved wire inside.


Shoestring Snake

When you get your shoestring, we're going to cut off pieces of it for you. And you get a piece that is about that long. When you get it, you want to bend it in some way so that it looks like a snake standing up, like that. And it'll fit inside the little bowl. And we're going to pour stuff in the little bowl. And we're going to immolate him.


Adding Alcohol to the Small Bowl

[To the assistant] So now you can pass out the big tubs and the little tubs. If there's enough big tubs, one for every two. *[Passes out pieces of shoestring.]* Here, make that into a standup snake. Make your snake stand up. Your snake needs to stand up in some way. As long as it stands up, it's good. Now we're going to drown your snake. We have alcohol. We're going to drown your snake. *[Uses pipette to put Denatured Alcohol into little tubs, then turns off lights and ignites the shoestring with propane torch.]* We want to see if alcohol is going to make a nice lamp to light up the room. I'm just going to bring a little bit of flame by and see if yours makes a good lamp. Is this enough light to read by? Don't blow on it, please. *[Student: My fire's going down.]* It's going down? Oh, no! *[All lamps burn out in a minute or so.]* Is your snake dead? Okay, lights back on.


Alcohol Flame in Small Bowl

Well, it kind of worked, but it didn't last very long. Let's try *[reads label]* "Genuine Candle and Lamp Oil -- Odorless, Smokeless. Warning: To prevent fire, do not use this near flames." Uh, it's lamp oil. What's up with that? Take out the old wicks and put them in the big tub off to the side. *[Assistants pass out new shoestrings.]* Okay, put your new wicks in the tubs. *[Pours lamp oil into a cup and uses a pipette to put the same amount as before into the little tubs.]* Are you ready? *[Turns off light and uses propane torch to light the wicks. Flames are much bigger than the alcohol flames.]* Remember, this is smokeless. This makes no smoke. *[Student: Yes, it does.]* What, are you trying to tell me the bottle wasn't telling the truth? Awww. Does that give more or less light than the other one? Oh, more. Well, now we have to see if it lasts as long as the last one did. It's a pretty big flame, huh? I don't think it's going to last very long. Wow, yours is gone. Oh, look, some of them are wearing out. Which one is lasting longer, the alcohol or the lamp oil? *[Students: Lamp oil.]* They're about the same. Lights on.

Lamp Oil Flames are bigger than the Alcohol Flames

Take that wick out. We're going to give you a new wick. Everybody ready? Okay, this time we're going to use Sunny Select Canola Oil. You use it to cook food. You think it'll burn? We'll find out. *[Puts canola oil into each little tub.]* Same amount as before, only this is really thick stuff, so it's harder to squeeze out. So we want to find out if this is going to burn to make light. Okay, lights out. *[Ignites wicks with propane torch. Flame is smaller than the one from lamp oil.]* Cooking oil -- will it work to see by? It does light. Okay, does it make enought light to see by? Does it smoke? Now, we want to see how long it burns. You know what they used to burn in the old days? Whales. They just put a whale in your cabin, light his tail on fire. No, actually, they took the fat from the whales and they burned the fat. This is pretty close to whale fat. They put a wick in it just like this. Is this lasting as long as the alcohol? Is it lasting as long as the lamp oil? *[Student: Way longer.]* I've burned it for about seven minutes. Don't blow on other people's! I don't want people leaning over the flame just trying to blow on somebody else's candle. Is it still lasting longer than the others? Is there any stuff left in the bottom? *[Students: Yes.]* It's getting close, huh? We'll turn on the lights to finish the story, and we'll just let those burn and see if they last. Don't be putting anything else into them.

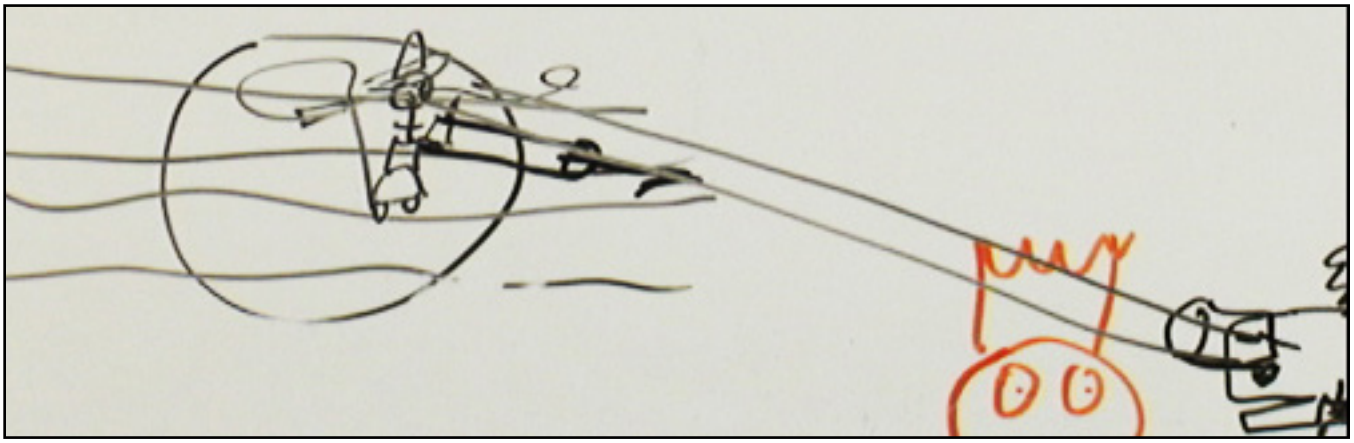
End of Story

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

Flying Whale
with Searchlights

So all the people were still in the old, old, old king's castle, trying to become king themselves. And Evil Mister Fred's first plan failed. Everybody grabbed the minions and threw them out of the castle tower and they landed on their heads and ran away. So Jack and Jill said, "We've got to have light in here!" So they called the Acme Store of Everything and they ordered a whale. A flying whale, like that. And the whale came flying by and said, "What do you need, folks?" And Jack and Jill said, "We need light. Quick!" And the whale said, "Okay." And the whale opened up a drawer on his stomach and put out huge searchlights so he could shine light down on the castle tower. And now it was really bright down there. And Jack and Jill said, "Yeah, you're the man! We've got lots of light. Now we can finish our contest."

So everybody was continuing to try to show off how good they were at becoming king. And Evil Mister Fred said, "Look at those guys over there. They got a flying whale with searchlights. That's not good." So he's up here with his vacuum cleaner, flying around, and he says, "I've got to get that whale out of here." So he called the Acme Store of Everything and ordered a harpoon gun. And he was going to harpoon the whale. Well, Evil Mister Fred, not being too bright, is right in front of the moon. And Jack and Jill looked up and saw that he had a harpoon gun. And they said, "Whale! Look out! Evil Mister Fred's got a harpoon!"



Whale shining Searchlight on Evil Mister Fred's Harpoon Gun

And the whale turned one of his searchlights right on Evil Mister Fred, which blinded him. If you've ever had a searchlight shine in your eyes, it's really bright. And Evil Mister Fred went, "Aaaaaaahhh!" And while he was screaming because of the bright lights, he accidentally dropped the harpoon gun and it landed on a minion's head. It went crash! And the minion went, "Aaaaaah!" And his baseball bat flung up and it hit the button on the harpoon gun. And the harpoon gun went pshewww! and shot the harpoon out. Where do you think it's going to go? *[Student: Evil Mister Fred!]* Yep.

Harpoon Shoots through
Evil Mister Fred's Hat

It stuck right through Evil Mister Fred's hat, which was glued to his head, because he doesn't like to lose it when he's flying around. And Evil Mister Fred got carried away along with the harpoon and his hat, clear up into the sky and just disappeared. And everybody lived happily ever after, except Evil Mister Fred.

End of Experiment #2:

Now, let's look here and see. Has anybody's gone out yet? This one is burning like it's not going to last too much longer. This one has gone out. This is still going -- it might be going for awhile. That one's burning well. So that's the end of the class. If you want to, you can blow on it and make it go out.

End of Lesson

If you have questions about this lesson, please ask them through the online Teacher Support Forum on our web site.