Teacher's Guide for:

Static Electricity

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.*

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Title Page of Video

Static Electricity
A Rock-it Science Lesson
Filmed June, 2009

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Intro Quick Recap:

Lesson Intro/Demos: Electrons & Static Electricity

- What happens when you slide down a plastic slide? Static.
- Rub a balloon on hair to show how the static makes it puff up.
- Explain how a Van de Graaf generator works, with the belt moving and electrons jumping on at the bottom and off at the top.
- Show how you can make dry ice fog disappear by pointing at it. (NOTE: The fog is optional for this lesson. See the lesson entitled "Fog and Static Electricity" for a more complete description of this effect and how to set it up.)
- Have someone stand on the stepstool and put their hand on top of the Van de Graaf ball, holding an aluminum pie tin. See their hair puff up.
- Three Rules of Electrons: 1) They hate each other; 2) They have ESP; 3) They have sticky feet.
- Show how a stack of aluminum pie tins will fly off the top of the Van de Graaf.
- Stick a thumbtack or T-pin on the ball with the point upward.
- Let students feel the spark from the Van de Graaf, and let them feel the "air" that seems to come off the pin.
- Have a student at the Van de Graaf point to a second student, and have the second student point at a third one. Then have the third student touch the second one's finger, which gives the second student a small shock.
- Demonstrate large Van de Graaf. Show how sparks can be long or short, and how the color changes. (The large Van de Graaf generator was specially built by Mr. Mac. and is not necessary for the lesson.)

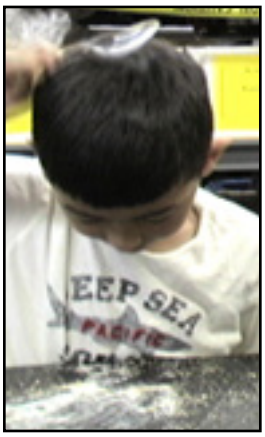
Making Dry Ice Fog Disappear

Aluminum Pans Fly

Feeling the Sparks

Three-way Spark Transfer

Experiment Quick Recap: *"Using Static Electricity"*



Experiment: Use Static Electricity to Separate Salt & Pepper

- Each student gets a small pile of vermiculite and a small pile of salt on top of it.
- Students mix the ingredients together thoroughly.
- Students have to separate them into two piles.
- After awhile, students are given plastic spoons and a balloon to use.

Equipment List: "Static Electricity"

Items needed for Instructor:

- Small Van de Graaf
- Clear Plastic Square Tub
- Aluminum Foil
- Insulated cable with alligator clips
- Dry Ice (small amount)
- Water
- Balloon (size not important)
- Stepstool
- 6" Aluminum Pie Tins (about 10-15)
- Thumbtack with metal base
- Scotch Tape
- Mirror (large enough to see one's hair puffed out)
- Giant Van De Graaf generator (special Rock-it Science item)
- Fiberglas Pole for giant Van De Graaf
- Dustpan & Brush (to clean off table)

Prep Work:

- Check weather (high humidity not good for Van de Graaf generator)
- Clean Mirror
- Buy small amount of Dry Ice (or schedule this lesson on same day as Dry Ice Lesson, and use leftover dry ice)

Van de Graaf generator and Aluminum Pie Tins

Items needed for Students:

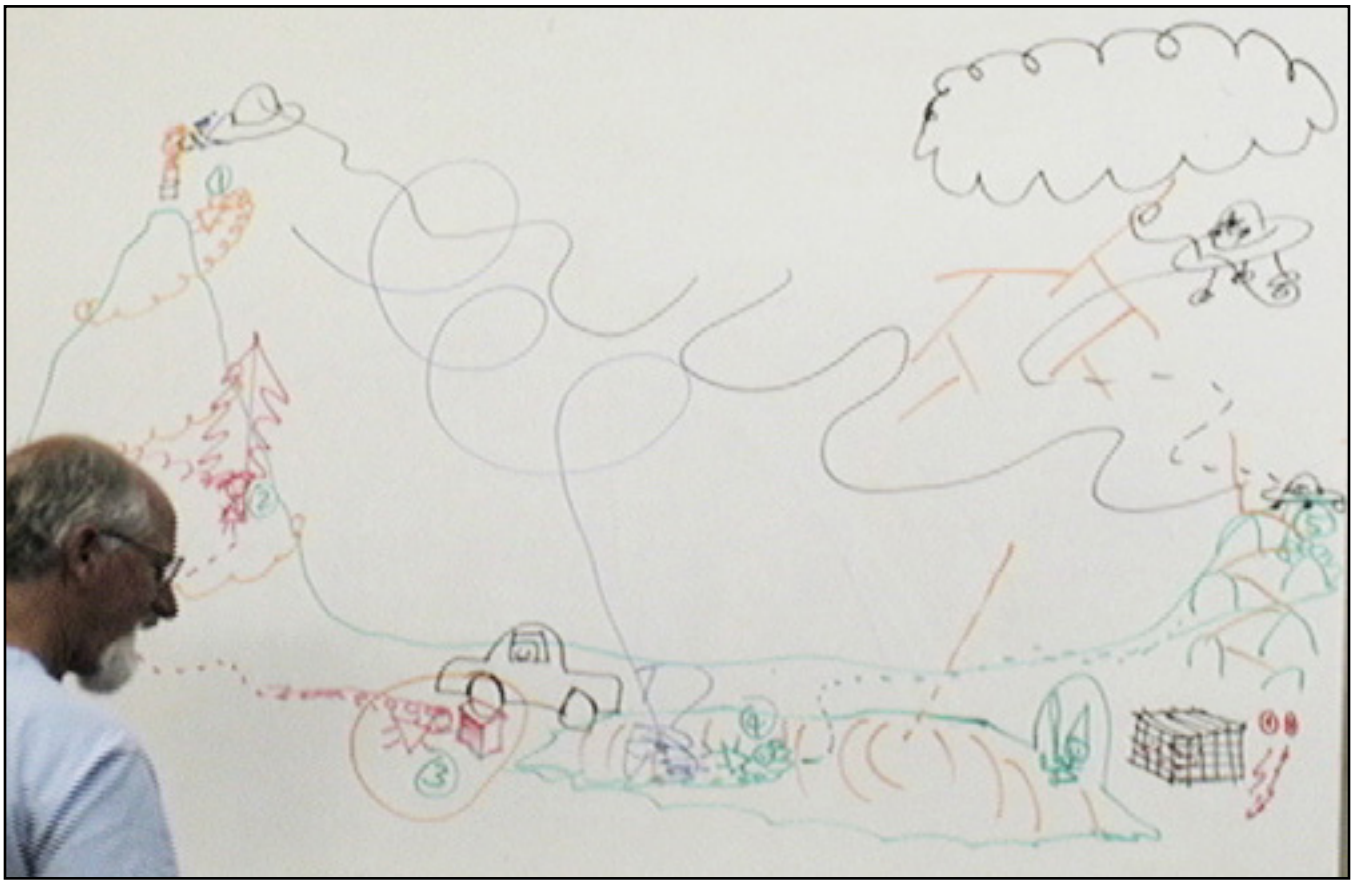
Consumables (per student):

- Vermiculite (about 1 tsp.)
- Salt (about 1 tsp.)
- Plastic Spoon

Other:

- None

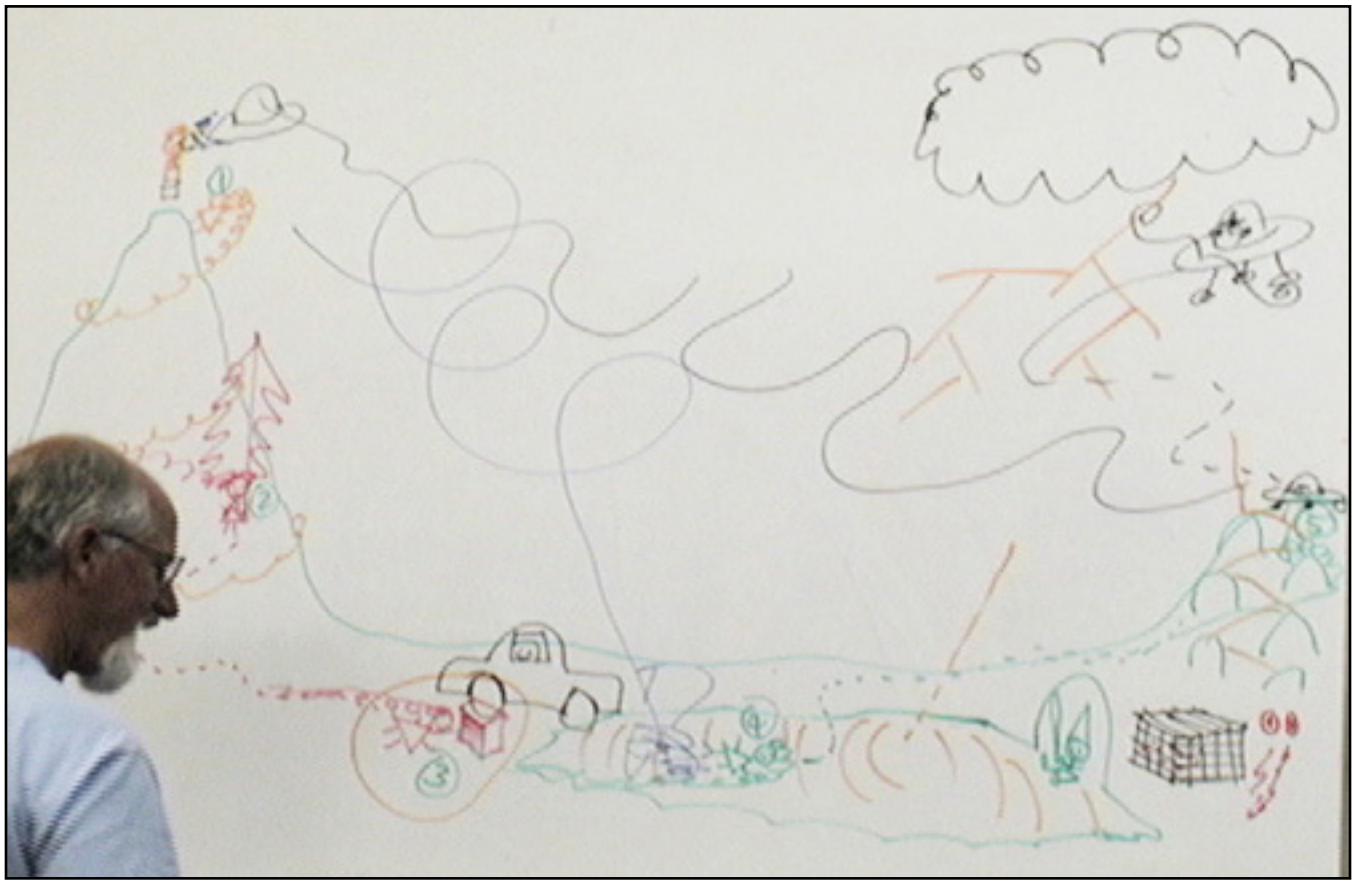
Story Recap: "*Jack and Jill and the Lightning Storm*"



Part 1:

- Jack & Jill climbed up a hill and a storm started coming.
- Jack wouldn't leave, but Jill started down the hill and hugged a tree.
- Then Jill went to the bottom of the hill and read comics so fast her hair caught fire.
- She jumped into a slimy pond near Fredericka's cave.
- Then she ran up another hill and hid behind a rock.
- Ask students which place is safest (on the flat land), and why the others are more dangerous.
- Jack wanted to take a picture of a lightning bolt striking him, so he wouldn't leave the hill.
- Evil Mister Fred was flying around in his spaceship and got out to try to sneak up on Jill.
- Jill got into the ship, flew over to Jack, and grabbed him with a tractor beam, and crashed the ship in the slimy water.
- Fredericka captured them, locked them in a cage, and was going to feed them to her dragon.
- Jack & Jill persuaded her to let them go if they could solve a problem: separate a pile of salt & pepper.

Story Recap (cont.): "*Jack and Jill and the Lightning Storm*"



Ending (same image, no additional drawings):

- Jack started jumping around and banging the table in frustration, and the salt and pepper spilled into the slimy water.
- The salt got dissolved in the water, and the pepper floated to the top.
- Jack threw some of the pepper into the dragon's face, and he sneezed just as Fredericka was opening the cage.
- Jack & Jill ducked, but Evil Mister Fred had just poked his head into the cave, looking for Jill.
- Both Fredericka and Evil Mister Fred got hit with the dragon fire.

Transcript: Introduction/Demos


Van de Graaf Generator

Have you ever slid down a plastic slide before? Did your hair ever do anything weird after sliding down a plastic slide? Yeah, your hair can stick out by static. Whenever any two things rub together, it doesn't matter what they are, they make some static electricity, as long as the two things are different from each other. So if you rub your hand on your head, you can make some static on yourself, but you usually don't even feel it. If you rub a balloon on your head, you've probably seen that before. Let's get a balloon. *[Blows up a balloon.]* Let's see, I need a volunteer's hair. Oh, look, she's got good hair. *[Rubs balloon on student's hair, then pulls the balloon upward to show how the hair lifts up toward it.]* And look at that. The static electricity as it works.

Now, when you go down a slide, you get charge built up on you, and the slide being plastic doesn't let it go anywhere. Plastic is a good insulator. So as you're sliding down, you get more and more and more charged up. If you have your friend stand at the bottom with their hand out, then you can touch their hand and they'll feel a spark as you go by. Some things make more static than others. If you slide down with your dog, dog hair against the slide makes lots of static, and the person down at the bottom will get a big zap. If you slide down wearing like, zip-lock-bag pants, plastic pants, you won't get hardly any static at all.

And today we have ways to make static in machines called Van de Graaf generators. They have something like a slide inside. There's a rubber band that goes around and around and around and around. And then there's a pulley at the top made out of one kind of plastic and a pulley at the bottom made out of another kind. Between the two of them, they make all kinds of static charge. This one takes electrons, which is electricity made out of itty-bitty little things called electrons. And the electrons like to jump on the rubber band at the bottom, because the pulley underneath is positively charged, and the electrons want to go there. They think this is a picnic area. And they go zzzzzhhhh-boom! -- stick on the rubber band. Then the rubber band carries them to the top. When they get to the top, they discover to their horror that there's another pulley there with the same charge as them. And they go, "Aaaaahhhh!" and they jump off onto the ball.


Use an Insulated Stepstool

So we're going to use some of those electrons today. This electron pump will pump them up to the top, and we'll goof around with them and see what they do. We've got some fog here *[indicates dry ice fog in a plastic container],* there's one experiment you can do where, if you stand on something that's insulated and let the electric charge go into you . . . I'll turn


Making Dry Ice Fog Disappear

this on *[turns on Van de Graaf]*. This one makes little sparks *[holds hand next to ball to show sparks jumping toward his hand]*. Can you see the little sparks? *[Student: Plus, it hurts.]* Oh, yeah, they're extremely painful. I'm in agony. If I put my hand on the ball, the electrons go through my arm, through my body, down through my feet into the floor. If I stand on something that's plastic *[stands on plastic stepstool],* the electrons go into me and I start to get charged up. Is anything happening to me yet? *[Students: Your hair!]* Now, if I point my finger at the fog -- do you see the fog move? The electrons go and they try to hit the aluminum foil which is close by, and it knocks down the fog. And there's dry ice in there that's busy making fog, so I'm killing it almost as fast as it's making it, with my finger. So if you're at the airport and they say, "Oh, no, planes can't take off because there's fog on the runway," you run around, rub balloons on your head as fast as you can, point your fingers into the air, and kill all the fog for them so that the airplanes can take off. *[Student: Your hair is still sticking up!]* Is it still sticking up?

[Instructor calls up his assistant.] Let's see what happens if Jen . . . *[assistant stands on stepstool, with hand on Van de Graaf]*. Okay, just put your hand right on there. Don't press too hard. *[Her hair starts to stand on end.]* Oh, look at that -- that's perfect! It's working good. Now, just do this. *[Assistant shakes her head to make her hair stand up even more.]* Look at that. She's got the perfect hair. Now, take your hand off the ball and see if your hair stays puffed. *[She removes her hand from the ball. Instructor points one finger at her hair.]* Ooh, now watch this. *[Her hair becomes attracted to his finger.]* Now touch my finger. *[She does so and gets a big shock.]* Okay, now you can step down because you're all discharged.


Assistant's Hair Stands Up

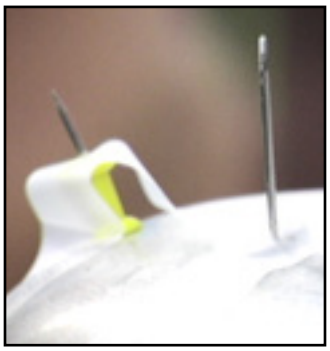
Sometimes we can see the electrons. If I turn off the light, you can see the electrons as they jump to my knuckle *[holds fist next to ball]*. Most of the time you can't see them. These are little tiny lightning bolts. *[Student: And they hurt. It's like pinching your knuckle with your fingers.]* Or like jabbing your fingernail into your knuckle. Sometimes they make other things happen. *[Turns lights back on.]*

Electrons follow three basic rules. Rule Number One is: They hate each other. If you put two electrons in the same place, they look at each other and go, "Aaaaahhhhh!" and run in opposite directions. Rule Number Two is: They have extrasensory perception. They alway know where the other electrons are. So if one electron is here, and the other electron goes and hides right behind *[this student's]* head, this guy can't see that guy, but he knows he's there with his extrasensory perception. And if the one behind his head tries to sneak out, sneak around behind me, this guy says, "Ah, you can't sneak up behind me. I know you're there," and will run away. The Third Rule of electrons is: They have sticky feet.

When you get into college and the professor says, "Well, does anybody here know anything about electrons?" you stand right up and you say, "Yes! The Rule Number One is: They hate each other. Rule Number Two is: They have ESP. And Rule Number Three is: They have sticky feet." And your professor will say, "What is wrong with that guy?"


Aluminum Pans Fly

But that's how they act. We can kind of prove it. We'll put our tub out of the way. *[Holds up aluminum pie tin.]* Suppose this is your new car. Your dad paid a hundred thousand dollars for your new car. He brings it in and you say, "That's not much of a car, dad. Looks like an aluminum pie pan to me." And dad says, "Ah, but it's a special pie pan. You can sit on it and ride away." And you say, "Dad, you're a sad case. Your brain has gone crazy." And he says, "No, no, no, my brain hasn't gone crazy." Let's just use a whole bunch of cars. We'll put them on here *[puts a stack of pie tins on top of the ball, keeping one hand on top to hold them in place]*. Now they're going to be all covered with electrons. Now I'm going to let them go and see if they do anything. *[Takes hand away and pie tins fly off the stack one by one.]* Good car! If you were riding in that car, you could be flying right through the air. Now, do you suppose it will work if I do it upside down? Let's see. *[Places stack of pie tins on top of ball in reverse position, then releases them.]* Here goes. *[Pie tins fly off just as before.]*


Tacks taped onto Ball

Now, here's a thumbtack. A thumbtack is kind of like a lightning rod. In the old days they set lightning rods on houses, and the idea was to keep the lightning from hitting your house, or at least burning it down. It's supposed to leak off the electricity so your house doesn't burn down. If you take this lightning rod and some scotch tape, we can tape it to this ball. Now we've got a sticky thumbtack. *[Sticks thumbtack onto ball, with point sticking up.]* Now we have a thumbtack sitting on the ball, and there's still some charge out here because it's the plastic coming back. *[Holds palm above tack.]* There should be charge leaking off of this. We might need a better pin for that. Let's leave that one there. Ah, here's a better pin. That one has a plastic base which makes it not work as well. *[Takes a T-pin and tapes it to the ball.]* This one has a metal base. There. Now our Van de Graaf generator has antennas. *[Puts his hand above the new pin.]* And it just barely sparks.


Feeling the Sparks

Now, if you want to see what electrons feel like, you can come up here and you can put your finger or your knuckle by the ball one at a time and feel a little tiny spark. Or you can put it by the end of the needle, and it feels weird. The electrons will be zapping into your skin. The palm of your hand is best, just

Student see his Hair in the Mirror.

Three-Way Charge Transfer

above the needle. Don't slam it down on the needle, because you'll bleed. If you want to try this, line up right here. *[Students take turns putting their hands next to the ball.]* When you come by, try to get a little zap there. And then put your hand like this and see if you can feel anything. *[Student: I feel air!]* Yeah, that's what it feels like -- cold air.

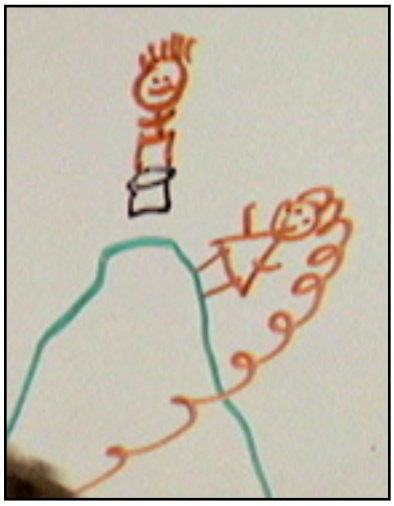
Now, is there anybody out there who would like to have their hair puffed up? If you want hair puffed up, stand on this thing *[insulated stepstool]* and then . . . *[hands student a pie tin to hold upside down on top of the ball]*. It works better if you hold it like that. And then just put it on top of the ball, and we'll see if it's charging up right now. Oh, it's starting to. We'll dry it off a little bit. *[Turns on hair dryer and directs it toward the rubber belt. Student's hair starts to stand up.] [Students take turns getting their hair to stand on end while the Instructor holds a hand mirror so they can see it.]*

[While one student is getting his hair puffed, Instructor calls another student to stand nearby.] [To the first student:] Point your finger right at him. You feel anything? *[Second student: Something weird.]* Something weird, right. Now point your finger over at *[third student]*. *[Student on stool points at second student, and second student points at third student. Instructor tells third student to touch second student's finger. Second student gets a shock.]*

[Instructor moves all students to one side of the table, away from the large Van de Graaf generator.] During this experiment, if you're sitting in a chair you need to stay seated in a chair. You need to stay where you are. This one is the same as the other one, but this one lets us see what lightning looks like. And we can study lightning by watching its shape and seeing how it moves and what it does. *[Turns off lights and uses long pole to pull lightning bolts from ball.]* And you can watch it change color. Sometimes it's like violet, sometimes it's like blue. You can try to make it longer. And you can make it shorter. See how blue it is when it's short? Almost white. *[Student: Is that metal?]* No, it's a fibreglass pole. If you look carefully, you might see some little tiny lightning bolts coming up off the little ball. Let's see if we can get the little ones to form. If you look carefully also at the flourescent lamps, they flicker every time you go zap. If you get too far away, it just sits there and hisses. It's still making electrons, but they're shooting out all over the room. And even when you get far away, you come back up, and it still doesn't jump that far. *[Turns on lights, turns off Van de Graaf, and continues to bring pole close to ball until no more sparks are created.]* There -- all charge is gone.

Big Van de Graaf

Story: *"Jack and Jill and the Lightning Storm"*


Jack & Jill with a Pail of Root Beer

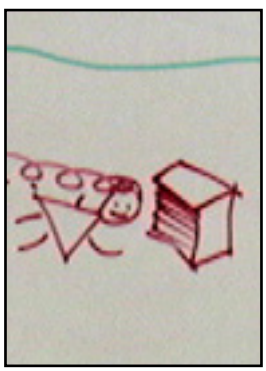
Once upon a time, Jack and Jill went up the hill to fetch a pail of root beer. Yep, there's a hill. And there was root beer hovering over the top of the hill, in a bucket. And they were all tired out, they'd been hiking all day, and they really wanted some root beer. And they got up there and discovered that somebody had gotten there first and drank all the root beer. So Jack got on top of the root beer bucket and was trying to balance himself up there. He's going "whoooaaahh" like this on the root beer. And then Jill was saying, "Whoa, that looks like fun. I want to do that, too." But Jack wouldn't let her get onto the root beer. And she says, "Awww, that's not very nice."


A Storm Approaching

While they were arguing, Jill happened to notice off in the distance that there were some clouds coming. And she said, "Uh, oh, there's clouds. Looks like a storm coming. We'd better watch out." And Jack said, "No, we're okay up here. I like it up here." And then there was a flash of lightning, like that. And Jill started counting Mississippis. She said, "One Mississippi, two Mississippi, three Mississippi, four Mississippi, five Mississippi -- " KA-BOOM!!! And there was the thunder that shook everything. And Jack said, "Jill, why are you counting Mississippis? I don't even see any Mississippis." And Jill said, "Ah, I do it for a reason." And Jack said, "What?" Do you know what Jill's reason was? What do you think? Yeah! If you count five Mississippis for the first flash, and if you hear another flash at ten Mississippis, that means the storm's moving away from you. And every Mississippi is about one second. It takes five Mississippis to make one mile. So she said, "Hey, Jack! That lightning is one mile away. We're in danger. We've got to go. We've got to run away and hide or we might get hit by lightning." And Jack said, "No, I'm cool. I'm all right here. I like it here."

So Jill ran down the mountain and saw a redwood tree. And Jill hugged the redwood tree. And she said, "I'm safe here, I'm by this big redwood tree." And she would have stayed there, except there were red ants all over the tree. And the red ants got all over Jill, and they were biting her. And she went, "Ahhh, I don't like ants! Ohhh!" And she ran away, trying to shake off the ants. And she came down here and saw a whole pile of comic books. Jill loves comic books. And she said, "Oh, boy, comic books!" So she sat down and started to read the comic books. But Jill is a speed reader. She was reading the comic books so fast that her brain got really hot and her hair caught on fire. And she said, "Oh, no!" Her hair was on fire, and she saw, luckily, a slimy green pond there. And she jumped into the pond and put out her hair. Now she's covered with slime, and her hair is no longer burning. She didn't


Jill and Redwood


Jill reading Comics

notice, but there was a cave near the end of the pond. And in the cave was a little green lady with a pointy hat. Her name was Fredericka. And Fredericka had a baseball bat. And Fredericka looked and saw Jill and she said, "Oh, boy, food!"

Jill in the Slimy Green Pond and Fredericka in her Cave

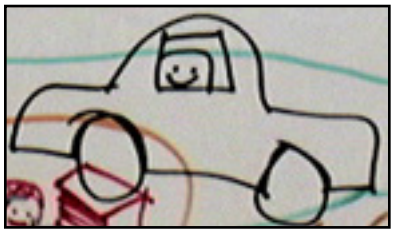
And Fredericka was going to run out there and go get Jill and drag her inside. But Jill just got out of the water and ran away up onto the hillside, where there were some big rocks. And she hid behind the rocks. There's Jill's eyes, hiding behind the rocks, and her curly hair.

Jill behind the Rocks

Now, Jill's been in a bunch of different spots. She was up here on top of the mountain. She was hugging a tree down there. She was reading comic books down there. She was sitting in a pond over here. And she's behind some rocks over here. Five places. And the lightning has been moving across the valley this way and that way. Sometimes it's over closer to Jack, sometimes it's over closer to Jill. If you were Jill, which place would you like to stay that's the least likely that you would get hit by lightning? Should she stay on top of the mountain? *[Students: No.]* No? Should she hug the redwood tree? *[Students: No.]* Should she stay reading her comic books? *[Students: No.]* Should she stay in the water? *[Students: No.]* Should she stay up on the rocks? *[Students: Yes. No.]* Ahh.

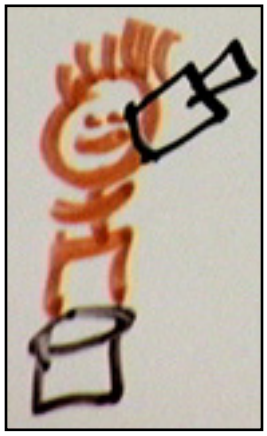
Well, people have studied this. A friend of mine is a ranger, works out at Grand Canyon National Park. And, unfortunately, he was hit by lightning once. And he knows about lightning because you kind of get careful once you've been hit by it. He didn't die, but it burned little holes in him wherever he had metal on him. You know how on jeans they have little rivets on them? He had a belt buckle on, and he had glasses on, he had car keys in his pocket. And on his shoes there were little metal round things. Wherever there was metal on him, it burned a hole down deep into his skin, which took weeks to heal up. But he revived again and eventually was okay. And he did some research and he said, "The worst place is up on top of a mountain. Lightning likes to hit up on top of mountains." Bad place also is near a tree, especially if the tree is by itself out in the field. If there's a tree out there and you're hugging the tree, lightning will hit the tree -- kazzzzzhhhh! and the tree might even explode. The water in the tree turns to steam, and the steam goes ka-blam, and the tree blows up. If you're hugging it, you get electrocuted. If you're in the water, if you're on the surface and the lightning hits anywhere on the surface . . . Lightning likes to spread out, you remember electrons hate each other? And it spreads out, and you'd get electrocuted. But if you're underwater with the fishes, unless the lightning hits directly above you, you won't get electrocuted, which is a pretty cool thing. Otherwise, all the fish would die when the lightning hit a lake. If you're up among the rocks -- he discovered this, too -- there was a whole herd of sheep on

a rocky hillside. And the lightning hit one of these rocks. And then it jumped kerching, kerching, kerching, from sheep to sheep to sheep, and it killed about fifty sheep with one lightning bolt. So that's now a real good place to be. Turns out the best place is down here on the flat land, on the ground, hopefully with not much metal on you. And even though you're sitting there with nothing around you, and there's lightning going pzzsshew, pzzsshew, pzzsshew, and you think, "Oh, no, the lightning can see me! It's going to get me!" That's the best place, out in the wilderness.



Inside a Metal Car is a Safe Place

If a Volkswagen car, or any car actually, shows up and it's made out of metal, get in the car. Metal cars are fantastic. Inside of a car is really good, as long as you don't roll down the window and stick your head out to watch the lightning. Because the lightning hits the car and goes all around it and jumps to the ground, and you're safe inside the car.

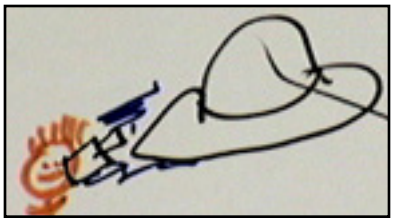


Jack and Camera

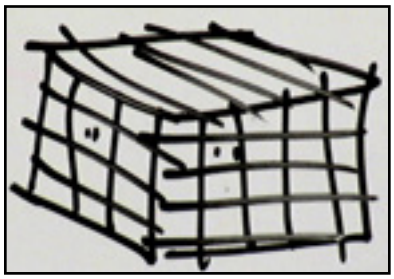
So Jill is now up on this hillside, lightning's hitting over here, so it'll be all right for awhile. And she sees Jack is still standing there on top of the bucket. And she says, "Jack, get down! You're going to die!" And Jack said, "No! I'm going to become famous." And he pulled a camera out of his backpack. And he says, "I'm going to take a picture of that lightning bolt just as it goes into my forehead. And I'll be famous. It'll be the best picture of lightning anybody's ever taken." And Jill said, "You're going to die!"

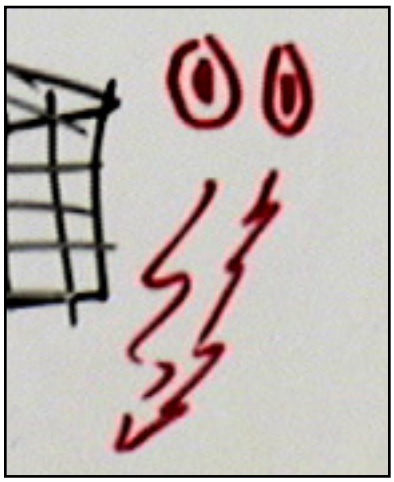
Well, while Jack and Jill were arguing, Evil Mister Fred, who was flying around in his spaceship, happened to be nearby. And he saw Jill hiding behind a rock. And he says, "Oh, ho, ho! I'm going to sneak up on Jill, and I'm going to grab her, and I'm going to tie a rope around her, attach it to my spaceship, and fly away. And maybe I'll catch Jack, too." So Evil Mister Fred came down, landed his spaceship, and tried to sneak up on Jill. While he was doing that, Jill was desperate. She had to rescue Jack some way. So she got up and she was running around, trying to find out how to get back to Jack. And lo and behold, she saw Evil Mister Fred's spaceship. And no Evil Mister Fred. So she got inside, and there were all these controls, sticks and buttons and dials and all sorts of things. She says, "I don't know how to fly it. What am I going to do?" So she started pushing buttons. Push, push, push, push, push. And she played with the sticks -- rmm, rmm, rmm -- and the thing took off. It was hovering in the air. She says, "Wow, I'm good!" Then she flew it -- kind of crooked, because she wasn't good at flying -- and managed to get it right over by Jack. She said, "Jack, get on, grab hold!" And Jack said, "No! Get out of my way!" And Jill saw a button that said, "Tractor Beam." She said, "I wonder what that does. Does it throw out tractors?" She didn't know. So she pushed the Tractor Beam, and a blue ray of light shot out and hit Jack -- bzzzzzhhh! And it made Jack stick to the thing like a magnet -- klonggg -- by his head. And Jill started to fly away with Jack. Still she wasn't that good at the controls, and she was going, "Whoooa, whooa, whooa!" And smush! It crashed into the slimy green water.

Evil Mister Fred's Spaceship



Jack Caught in the Tractor Beam


Jack & Jill in Fredericka's Cage


Fredericka's Fire-breathing Dragon

And here was the green lady. And she says, "Oh boy, oh boy, oh boy, there's people there!" And she ran out with her baseball bat, grabbed Jack and went klonk!, grabbed Jill and went klonk!, and took them into her cave. Inside of her cave there was a steel cage. And the water in the cave was about two feet deep, and it was all slimy and smelly in there. And Jack and Jill were put in the cage and the door was locked. There's Jack's eyes. There's Jill's eyes. When Jack and Jill woke up again, they looked around and said, "Ohh, it stinks in here!" And the green lady said, "Ha, ha, ha! I've invited you for dinner. And Jack and Jill said, "We don't want dinner." She said, "No, no, no, no. You're the dinner." And Jack and Jill said, "What -- us? We wouldn't taste good." And the green lady said, "Don't worry. I'm not going to eat you." And Jack and Jill said, "Oh, phew! That's a relief!"

Then they happened to look at the back of the cave, and there were two big red eyes. Jill said to Jack, "Uh, Jack, there's two big red eyes back there." And Jack said, "Oh, no, what is it?" And a little bit of flame shot out -- ssssssshhhhh! And Jill said, "Uh, fire-breathing dragon, maybe?" And Jack said, "Oh, this is not good. This is bad. This is really bad." And Jack and Jill said to the green lady, "Please, please, let us out, let us out, let us out!" And the green lady said, "Okay." And then she said, "Wait a minute! Who said that?" And Jack and Jill said, "You said that." And the green lady said, "I did?" And Jack and Jill said, "We definitely heard you say, 'Okay,' you would let us out." And she said, "Oh, man, that's bad!" Well, the last teeniest bit of goodness that was in her little toe had sneaked up and climbed into her brain, and she agreed to let them out. And then she said, "Oh, no, I can't let you out. My dragon's hungry. I've got to feed it. Okay, I've got an idea. I'll let you out if you solve the problem." And Jack and Jill said, "Okay, what's the problem? We'll solve it." And she said, "Uh, oh. I'd better make up a real hard problem." So she looked around in her cave, and she found a table. And she put the table in the cave with Jack and Jill. And then she poured on top of the table a hundred pounds of salt. And then she poured onto the table a hundred pounds of pepper, and said, "There you go. Mix it all together." So Jack and Jill went goosh, goosh, goosh, goosh, and mixed all the salt and pepper together. And she said, "Now, all you have to do is put it back, a pile of salt and a pile of pepper, just like it was." And Jack and Jill said, "What? That's impossible. That would take us a hundred years." And she said, "Yeah. If you're not done by midnight, off with your heads!" Now, 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.)

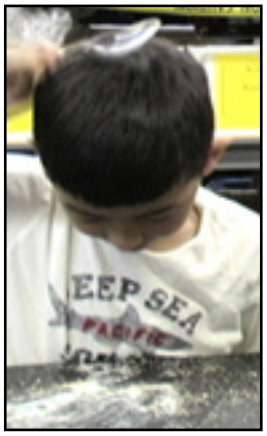
We'll leave this "To be Continued . . ."

Experiment: "*Using Static Electricity*"

And we'll do an experiment. I used to use real pepper for this experiment, and you know what would happen? Somebody would have the pepper in their hand, and they'd go ah-ah-ah-ah-phooo! and blow it in other people's faces. And they'd go, "Ahhh, pepper in my eyes! I hate that!" So we have fake pepper that doesn't make you sneeze. It's called vermiculite. And I'm going to give you a pile of fake pepper, and then we're going to pour some salt on it. And then when you get your salt on top of your pepper, mix it up just like Jack and Jill did. *[Instructor passes out salt and vermiculite to each student.]* Now mix it all together really good, and then try to unmix it. Oh, please don't blow on it, because salt can still get in people's eyes. *[Instructor passes out plastic spoons.]* It is helpful if you use your head on this experiment.

Vermiculite and Salt

[After awhile, an Instructor rubs one of the spoons on a student's head and uses it to attrack some grains of vermiculite. Then she does the same with a balloon. The students then start rubbing their spoons on their heads and using the static to pickup the vermiculite.] With a balloon, the salt can sometimes jump, too, but that's mostly pepper. If you brush it off somewhere else, then you'll have one pile of pepper and one pile of salt.



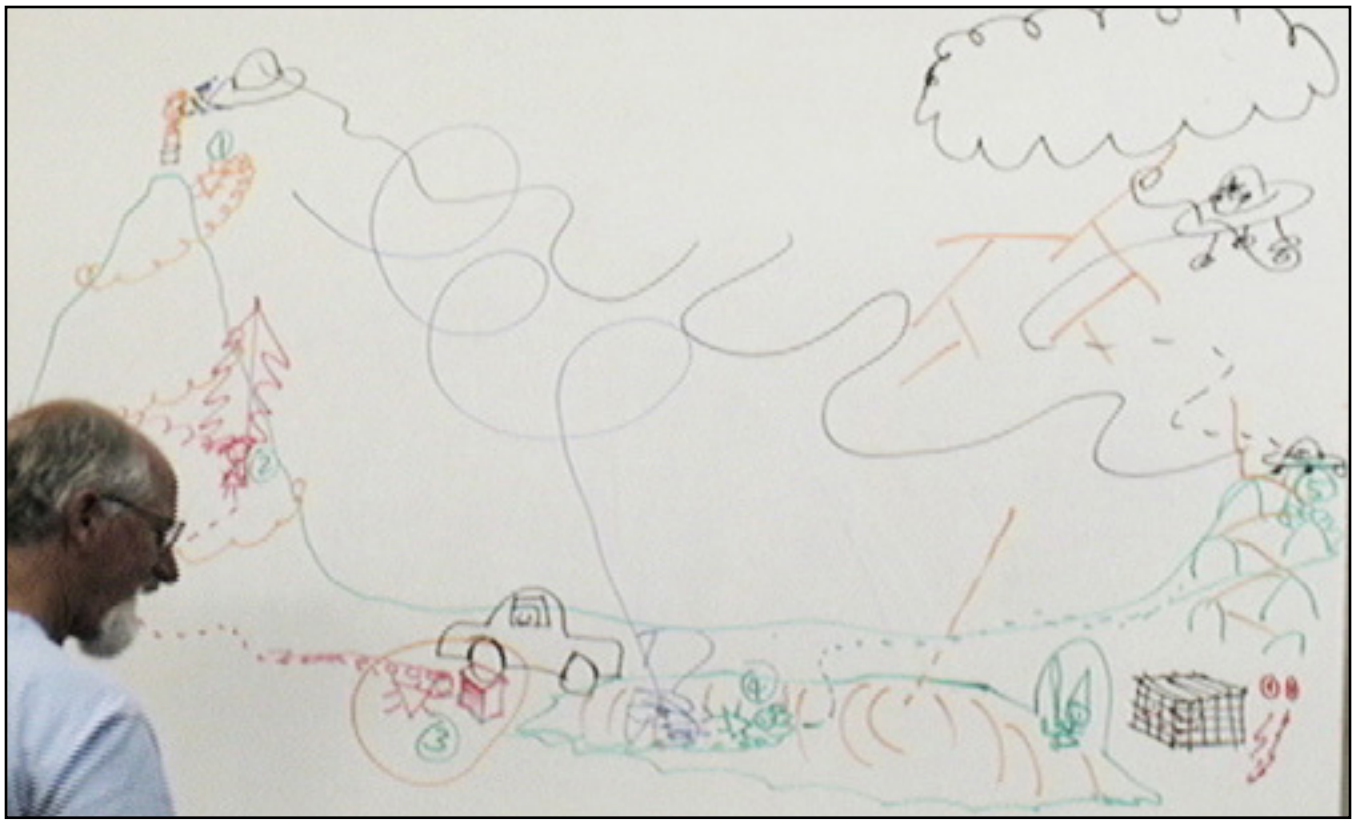
Making Static

The Charged Spoon picks up Vermiculite

The Charged Balloon picks it up, too.

End of Story

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



Okay, we need to create an ending for the story. Jack and Jill were in the cave, and the green lady was going to feed them to the dragon in the back. And Jack said, "No! Please, not that!" And he jumped up and down, pounding his fists on the table, and Jack broke the table. Crash! And all the salt and all the pepper went zboosh! into the green water. And Jack said, "Oops!" And Jill said, "Oh, no, what are we going to do?" And Jack said, "Aaaaahhhh!" and went splash, splash, splash, splash. And as he was splashing, the salt dissolved in the water, and the pepper floated to the top. And Jill said, "Oooh -- cool! You separated them." And Jack said, "Wow -- that's pretty good!" They said, "Hey, witchy lady, you've got to let us out!" And the witchy lady said, "Arrrghh!" And she was fishing around for the key. And Jack grabbed some of the peppery stuff that was floating on the surface and said, "I like this stuff." And he went whoosh! and threw it like that. And it landed on the face of the dragon. And just as she opened the door, the dragon was going, "Ah-- ahh-- ahhh-" and at that moment Evil Mister Fred poked his head around the corner to look inside to see what was going on. And the dragon went "Ka-chooo!!" Jack and Jill went boosh! under the water, the flames went right over their heads, and the green lady and Evil Mister Fred went poof! And everybody lived happily ever after, except Evil Mister Fred and the green lady.

End of Lesson

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