



Teacher's Guide for:  
**Laser Sound Waves**

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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Laser Sound Waves  
A Rock-it Science Lesson  
Filmed July, 2009

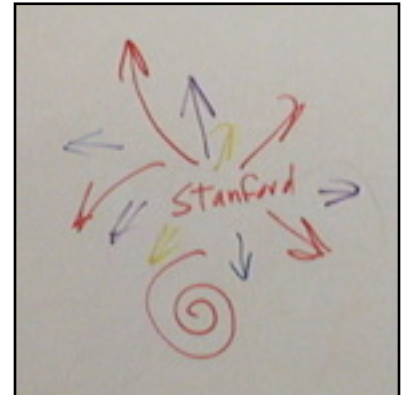
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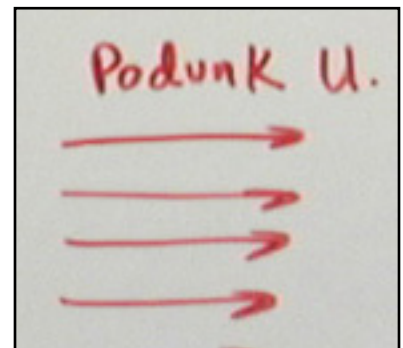
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## Intro Quick Recap:

- There are two marching bands. One of them wears all different colors and moves around in all different directions. The other band marches in perfect unison, all in the same direction.
- These represent two things that deal with light. Ask students what they might be.
- The first band represents visible light. The second represents laser light.
- Demonstrate a low-intensity laser pen, showing how the light doesn't spread out.
- Explain how to use the laser pens safely -- don't shine them in your own or anyone else's eyes.
- If you yell loudly, your voice makes vibrations.
- To demonstrate, use a long flexible spring. Student holds one end still, while the teacher holds the other end and rotates the spring like a jump rope to create a waveform. Different speeds of rotation create different numbers of peaks and valleys in the wave, corresponding to different colors of light or different sounds.
- Today you're going to try to see your voice.



The Stanford Band goes in all different directions.



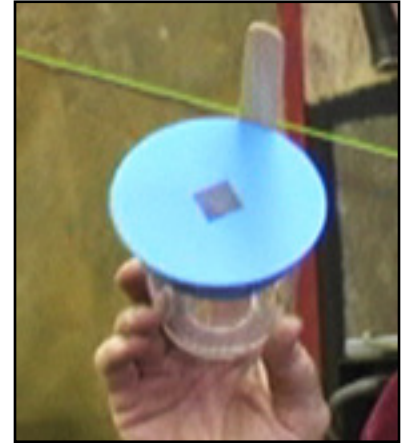
The Podunk Band marches in perfect unison.



Student stands on table holding spring while instructor rotates it at various speeds.

## Experiment Quick Recap:

- Teacher demonstrates how to build the device before students build theirs.
- Show students a clear plastic cup with a one-inch hole in the bottom. Demonstrate how to stretch a cut-off balloon over the mouth of the cup to make a drum.
- Glue a craft stick to the side of the cup. Attach a plastic swivel clamp to the end of the craft stick, using glue to keep it in place.
- Attach a half-inch self-stick mirror onto the center of the balloon.
- Take a laser pen with wires and alligator clips attached to it, and insert it into the swivel clamp. Wrap electrical tape around the pen so that the tape presses on the "on" button, keeping it turned on. Attach the other ends of the wires to a 6-volt battery.
- Adjust the pen so the beam bounces off the mirror in the center of the balloon. Use additional tape if needed to keep it in place.
- Hold the cup so the laser beam bounces off the mirror and hits a wall. Hold the bottom of the cup near your mouth and make sounds so that the laser image on the wall forms patterns. Turn off the lights to make it more visible.
- Pass out supplies to students and have them build their cup device.
- Turn down the lights and let students wander around the room, pointing their laser beams at the walls while they talk and yell into the cups.
- Optional: Turn on a fog machine to make the beams more visible.
- At end of lesson, have students take the tape off the devices and return the laser pens, batteries, and alligator clips to the teacher. Students keep the rest of the apparatus.



Square mirror in center of balloon.



Laser pen inserted in clamp.



When you shout into the hole in the cup, the laser makes an image on the wall.

## Equipment List: "Laser Sound Waves"

### Items needed for Instructor:

- Long flexible spring
- Fog Machine
- Power strips for glue guns
- Vinyl table cover

### Items needed for Students:

#### Consumables (per student):

- 16 oz Plastic Cup with 1" round hole in bottom
- 11" Balloon, with neck cut off
- 1" Square Self Adhesive Mirror
- Craft Stick
- Plastic Swivel Clamp
- 1" wide Electrical Tape (about 4" long)
- Glue Stick

#### Other (per student):

- Small Laser Pen
- 6-volt Battery
- Two Insulated Cables with Alligator Clips
- Hot Glue Gun



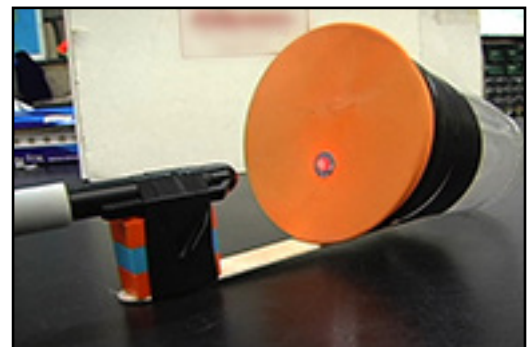
The Slinky Spring

### Prep Work:

- Burn hole in bottom of plastic cups
- Cut the neck off balloons
- Attach alligator cables to laser pens
- NOTE: The swivel clip used in the video was donated to us, and is not readily available. So we've added an alternate construction, which is explained in the final video segment, "Alternate Construction."
- Also see the Prep video for this lesson for instructions on trimming the balloons and burning the hole in the bottom of the plastic cups.

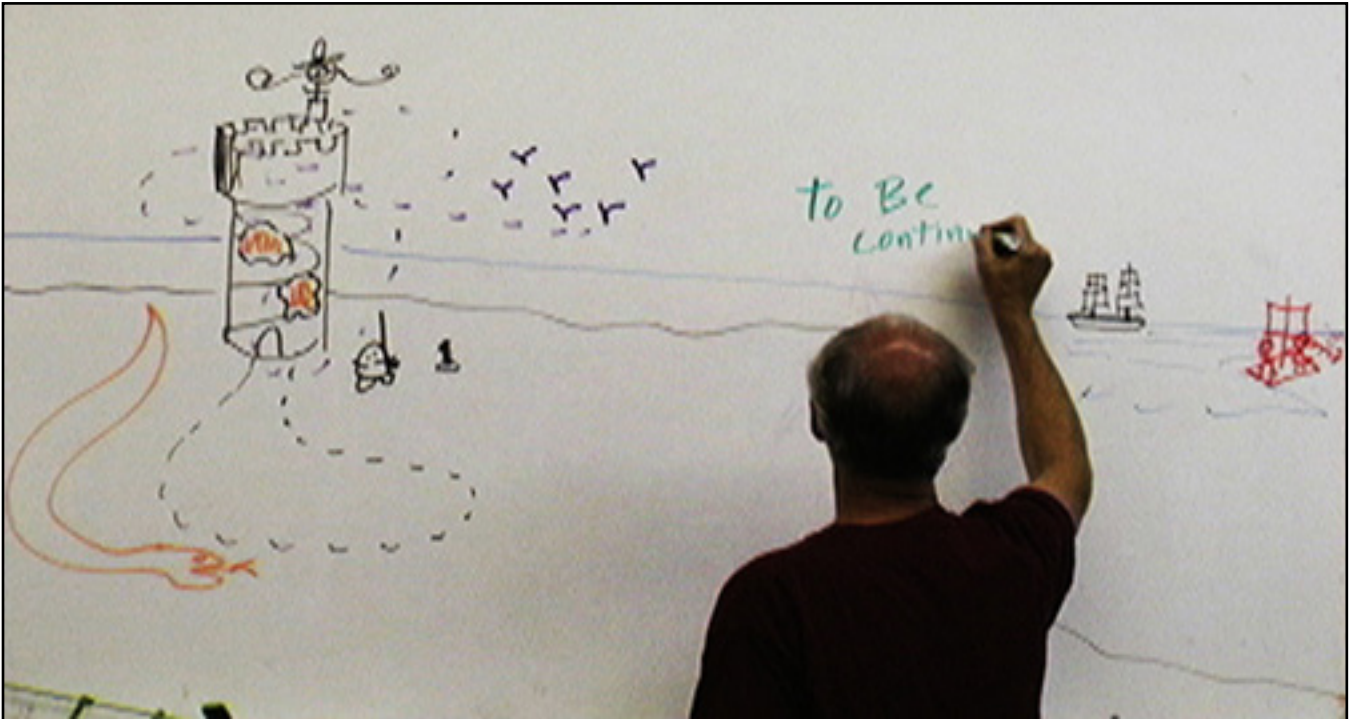


Laser Pen and Mirror apparatus.



Alternate construction, using three Lego bricks instead of the swivel clip. Apply the mirror AFTER the pen is in place. Electrical tape can also be used to hold the balloon on the cup more securely.

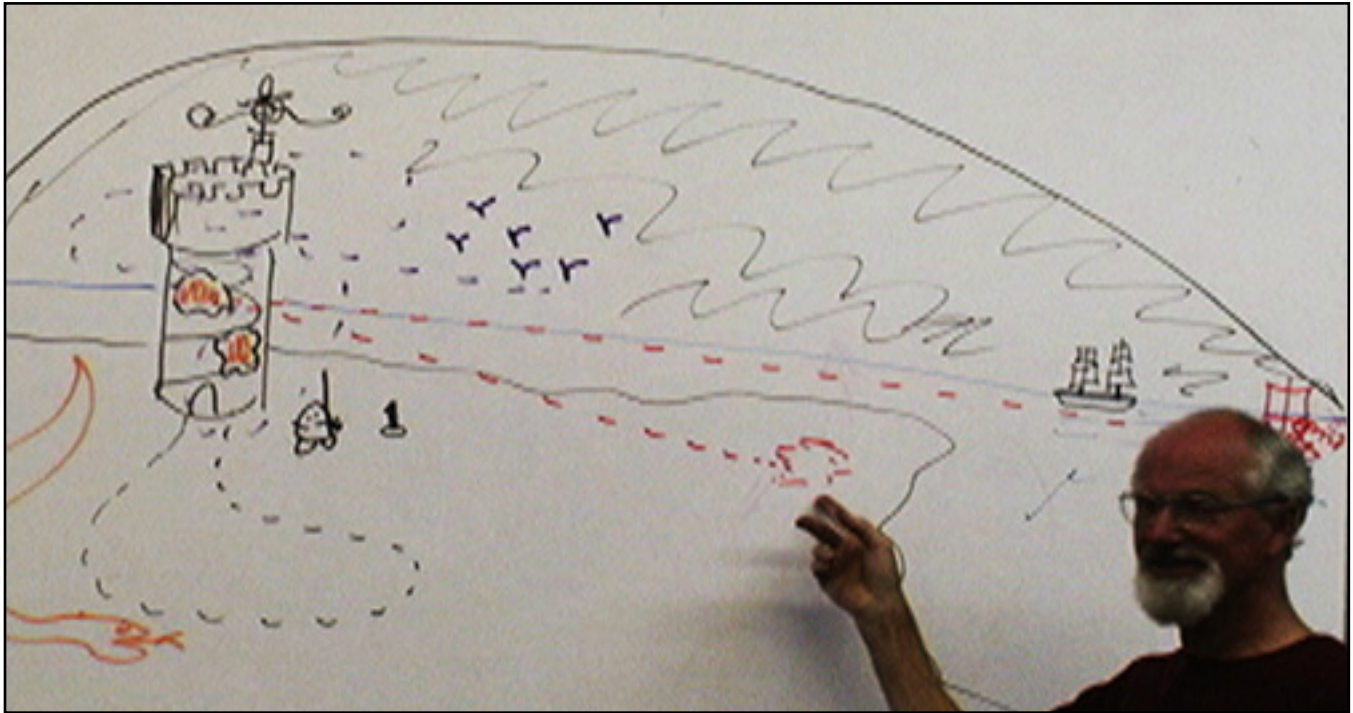
## Story Recap: "Evil Mister Fred's Snakeskin Windows"



### Part 1:

- Evil Mister Fred wants to take over the world. He's called a meeting in his castle with other evil people and creatures to make plans.
- The others didn't like the darkness inside the castle and wanted some windows.
- Evil Mister Fred told his minions to make some windows. They wore down their baseball bats trying to make windows, but they couldn't break through the rock.
- Evil Mister Fred called the Acme Store of Everything and ordered a thousand baseball bats. But the shipment hadn't arrived yet, so delivery was going to be delayed.
- Evil Mister Fred gave his minions hammers, told them not to hit each other, and they were able to make some holes in the castle.
- Then it was too cold, so Evil Mister Fred told the minions to find something to cover the windows.
- The minions found a large snake skin, and Evil Mister Fred cut pieces out of it and places them over the window openings. That allowed some light to come in and kept it warm.
- As Evil Mister Fred started making his evil plans with the other people, a bird was flying around. Evil Mister Fred tried to hit it, and the bird got mad. So it hid in a corner and listened to everything they said.
- Jack and Jill were living on a raft in the ocean. The bird came and warned them. The plan had something to do with a ship full of baseball bats that was on its way.

## Story Recap (cont.)



### Ending:

- Jack and Jill are trying to find out Evil Mister Fred's plan. Jill ordered a whole bunch of darkness that covered everything, and Jack ordered a laser.
- Jack started shining the laser all around in the darkness. When he shone it at the castle, it bounced off the snakeskin windows.
- Evil Mister Fred and the others were talking inside. When the laser beam reflected off the windows, it made wiggles on the ground. By looking at the wiggles, Jill could see what they were saying.
- She realized he was waiting for a ship full of baseball bats out in the bay to arrive so he could have his minions hit everybody over the head.
- Jack and Jill knew the ship was in the bay, but they couldn't see it in the dark. They shone the laser beam on the ship and wiggled it back and forth.
- The ship captain thought the laser beam was a signal from Evil Mister Fred to throw the baseball bats overboard. The minions were supposed to row out and grab them as they floated in the water. So the captain threw all the bats into the ocean and sailed off.
- Jack and Jill went out on their raft, gathered up all the baseball bats, and took them home.
- Evil Mister Fred couldn't take over the world, and the other guys got really mad and started beating him up.

## Transcript: Introduction

Okay, suppose you have two marching bands. One of them is from Stanford, and they're wearing all different colors, and they're trying to march across the field, but they're going every different direction. So one guy goes that way, and a guy goes that way, and this one's going around in circles, another one goes up there. So this is the Stanford Band. And let's make them be all different colors. So they're zooming around, various colors. Have you ever seen the Stanford Band? Yeah, they're funny. They just go crazy.

And then let's suppose there's some other band, and they're all dressed in red. And they march in straight lines, and they march all the way in step, all at the same distance from each other. This is Podunk University.

Those represent two things that deal with light. What do you think one of them might be? *[Students offer suggestions.]*

What color is this? *[Indicates Podunk]* What colors do you see there? *[Indicates Stanford]*

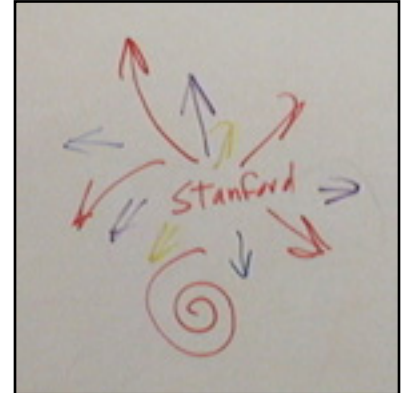
This one represents a laser beam *[indicates Podunk]*. A laser beam has all the same color, they all march perfectly together in lines, and they're all in step with each other. Regular old white light is a mixture of a whole bunch of different colors, and it shoots off all over the place.

Today we're going to be using laser beams. You've all seen laser pens before, and it's kind of neat that the dots stay small. When you shine a regular flashlight, the dot gets bigger and bigger. So if all the marchers are marching perfectly in step with each other, they don't bang into each other, and they can stay in a nice tight formation. If they're all different frequencies, the energies interact with each other and they spread out all over the place.

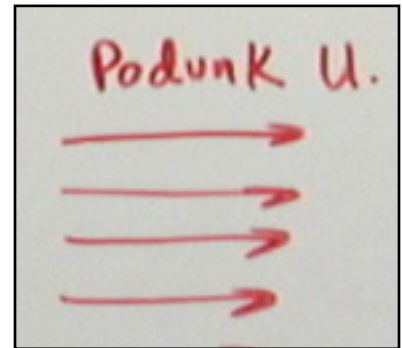
There are some hazards: You don't want to stare directly into the laser beam or shine it into your eye. When I was buying some of these at the store, the guy said, "Oh, these are harmless. They won't do anything to you. Yeah, see?" And he shined it in his eye. And I said, "Whoa, didn't that hurt?" He said, "Well, I do see this green dot. Everywhere I look there's a green dot." So you don't want to stare into it and get green dots.

So, you can shine it at your skin, and it doesn't do anything to you. You can shine it at your body and stuff, but you don't want to shine it directly into your eyes. If it goes flashy-flashy across your face, that doesn't do anything to you. You just have to look into it for a few seconds to do any harm.

Also, the other thing you need to know is, if you yell loud, your voice makes vibrations. Remember when we had that spring out? Did I show you the spring that moves all over the place? No? No slinky spring? Let's see if we can find the slinky spring.



The Stanford Band goes in all different directions.



The Podunk Band marches in perfect unison.

*[Gets slinky spring]* Light drives scientists crazy. Some of the time it flows around like it's waves, some of the time it flows around like it's machine gun bullets.

I need a volunteer from the audience. *[Selects a student]* Ah, there's a volunteer. Stand on the table, volunteer. *[Student stands on table; instructor hands one end of the spring to student]* Hang onto this with both hands, and hang on tight, so if I pull on it I can't get it out of your hands. Okay? You stay there. *[Instructor moves to other end of table]* You can face me. Turn around so you face me. And you're just going to hold your end tight. *[To other students]* You've got to watch out -- if he lets go you don't want to get smacked in the face.

I'm going to wiggle it and then we'll see what it does. If we're doing jumprope, I'll just move my end. You keep your end steady. *[Rotates spring like a jumprope]* This will be a jumprope, and one person could jump on it, and it represents red light. Red light is a big lazy wave. What's the next color down on the rainbow? *[Stops rotating]*

Orange. Orange has more energy than red does. *[Rotates spring faster]* So orange might look like that, making two jumproppers in the same space. They have to jump faster, though, because there's more energy. What's the next color down from orange? *[Stops rotating]*



Student stands on table holding spring while instructor rotates it at various speeds.



Yellow. Okay. *[Rotates faster]* Now we have three jumpers, but boy, they'd better be quick, otherwise the rope's going to smack them. If the light is really bright, there'd be a big wave. If the light is dim, it's a small wave. Okay, what's the next one down from yellow? *[Stops rotating]*

Green. *[Rotates faster]* What's the next one down from green? *[Stops rotating]*

Blue. Here's blue. *[Rotates faster]* That's about as many as my arm can do. And the more steps you go down, the more waves you get in the same space.

White light is a mixture of all the colors. So it's a big wave mixed with little waves *[Rotates spring in various ways]*, all running around really fast. The laser waves are like this, a single line *[Straightens out spring, then rotates it quickly]*. The laser waves are all exactly one frequency, all working perfectly. *[Stops rotating]* Okay, now you can let go.

Sound waves are a lot like light waves. The low frequencies are great big waves; the high frequencies are little waves. Now, we're going to try and see your voice today.

How can you see your voice? Ahhhhhh. Can you see my voice? *[Whistles]* Can you see my whistle? No. We're going to make it so you can see it. But first, let's see, we need some kind of a weird story.

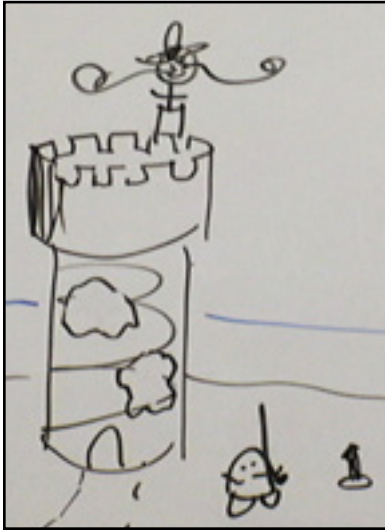
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## Story: "Evil Mister Fred's Snakeskin Windows"

Let's suppose that Evil Mister Fred is going to take over the entire earth. And he's making plans to take over the earth. So he's called together everybody who's going to help him in his castle. And the people and the creatures that came to his castle didn't like it in there because it's so dark. And they said, "You've got to make some windows." So Evil Mister Fred told his minions to put some windows in the castle.

And the minions only have one tool that they can use, and that's their baseball bats. So the minions went out there and started banging on the castle. Some were inside standing on the ladders and stairs that went up. And they kept banging, banging, banging. But the castle's made out of rock, and all they did was wear down their baseball bats. And they were really going at it, they were having a great time. They don't usually get to bang on the castle. And they wore all their baseball bats down to little nubs. There was like a handle and a little nub on it. And they couldn't break through the rock. And they said, "Evil Mister Fred, we need more baseball bats. We've run out."

And he went down into the dungeon to look for more baseball bats, but there were none down there. So he said, "Oh, man, we've got to get more baseball bats." So he called the Acme Store of Everything and said, "I need another thousand baseball bats." And they said, "Well, I'm really sorry, but the shipment hasn't arrived yet. It'll be here any day now." And Evil Mister Fred said, "Arrrrgh!"



Holes in the castle

So he did something he doesn't ordinarily do. He gave his minions hammers. And the minions said, "Oh, boy, boss -- hammers! We love hammers!" And they were going to go hammer each other, and he said, "Now, now, you don't hammer each other. You make windows in my castle."

So the minions said, "Oh, man." And they started hammering on the castle, and sure enough, they broke some holes into it. They weren't very good holes, but they made some holes in the castle. And Evil Mister Fred had to actually keep an eye on them so that they didn't knock the whole castle down.

So he said, "Okay, now we're ready. We can have our meeting on how to take over the world." But then everybody said, "Ohhhh, it's cold in here! You've got to cover up the windows." He said, "Well, I just made the windows. Now you're telling me to cover up the windows?" They said, "Yeah, cover them up with something we can see through."

So Evil Mister Fred said, "Minions, go find something to cover the windows with so we can see through them." So the minions went off and, unlike them, they actually came back shortly with something. It was the skin of a snake. It's a big, big snake.



Snakeskin.

You ever seen a snake skin lying around with no snake in it? Yeah. They shed their skins every once in a while. The minions brought back a shedded snake skin. And Evil Mister Fred said, "Wow! How'd you do that?" And the minions said, "Why, we're smart, boss. We just did it." He said, "Boy, oh, boy!" And he took some scissors and he cut it all up, and he put the snake skin over the broken open areas. And now Evil Mister Fred had windows in his castle. He was really happy to have that. And he started making his plans with everybody else, all kinds of weird people and animals and creatures, about how they're going to take over the world.



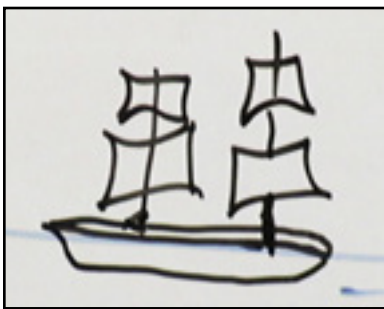
Purple birds.

And when he was doing this, there was a purple bird flying around. Maybe a bunch of purple birds flying around. Like that. They're polka-dotted, by the way. And they were flying around his castle, through the front door, out the top, driving everybody crazy. And Evil Mister Fred was trying to hit them with stuff. But they were pretty fast

purple birds. And one of the purple birds almost got hit -- just missed -- and he got really mad. He went and hid in the corner and he listened to everything Evil Mister Fred said.

Then he came back to Jack and Jill. Let's put Jack and Jill somewhere. They should be living off on a raft in the ocean. There. They've got a sheet for wind power. The purple bird came to Jack and Jill, and it said, "Evil Mister Fred is going to take over the world! It's going to be terrible. He's got weapons, he's got armies. You've got to do something."

And Jack and Jill said, "Oh, when is he going to do it? And how is he going to do it?" The purple bird said, "I don't know." So Jack and Jill had to find out.

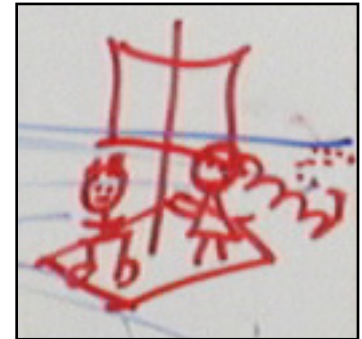


Ship carrying baseball bats.

Now, Evil Mister Fred, when he's making his plans, needed more baseball bats. And they weren't arriving yet, they were coming on a ship. Now we have a whole ship full of baseball bats. And Jack and Jill need to find out when this ship's going to come in, they've got to stop the baseball bats, they've got to find out what his plan is, and how to stop his whole plan. Now if you were Jack and Jill, how would you discover what Evil Mister Fred is going to do?



Snakeskin windows.



Jack &amp; Jill's raft.

## 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.)

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

## Experiment: "Laser Sound Waves"

We have an experiment to do. It involves a cup that somebody broke. It's got a hole in the bottom, and if you put your Coca-Cola in there, it's going to fall out. [First, you'll put your mouth on the end of the cup] with the hole in it and make your voice loud. Then turn over the cup and make your voice probably not as loud.



Plastic cup with 1" hole in bottom.



It takes two pairs of hands to stretch the balloon.

Then we're going to make your cup into a drum-like thing. To make it into a drum-like thing, you set it on the table. You put your two sets of fingers into it [the balloon] so you can stretch it. And then you pick someone else and have them put their fingers sideways and have them stretch it. And then we bring it over the cup and set it down, and you've got a drum. [Places his mouth over the hole and goes "Ohhhhhh".] You've got a drum that does weird things.

Then your drum needs to have a stick stuck to it. Yeah, it's the stick-stuck trick. So we want the stick so it's out toward the balloon. It doesn't fit very well there, but you're going to stick one there.

So it's like a tongue sticking out of the balloon. We'll put some glue on it. In this case, you'll probably want to use a lot of glue. That's a lot of glue. And you stick the stick in the glue and gush it down a little bit. Now you've got a stick that's not quite stuck because the glue is still hot.



Use lots of hot glue to attach the stick.

Then your drum needs . . . . Oh, look, here's a whole cup of sticky mirrors. There's a sticky mirror. Now, we can stick the mirror anywhere we want, but we're going to stick it on the balloon. The hard part is getting the back off of the sticky stuff. And if you've got fingernails you can probably do it. If you don't have fingernails, you can use your teeth. If your teeth don't work, you can use your toes. If your toes don't work, you can use your nose. If you ever get the paper off, then you stick the sticky thing on the middle of the balloon. Then it's a good idea to clean it off, get all the fingerprints off.



Square mirror in center of balloon.

Now, you've got a stick, a cup, a balloon, and a mirror all together. What could we possibly do with this? We could put a clamp on it. Here's a clamp. This is a cool clamp because it's got this weird thing that swivels. So we're going to clamp the clamp on the stick with the swivelly thing kind of upwards. And the clamp will stay there by itself, but it's better if you glue it on. So we can stick some glue in the grooves around it. Now we have a clamp, and a stick, and a balloon, and a mirror, and a cup with a hole in it. What good is that?

[Student] A laser.

Okay, we'll put a laser on it. We'll put a laser in the swivel thing and bounce it off the mirror. Hmm. Let's see what happens when we do that. What I'm going to do to make it so the laser pen sticks better is I'm going to put a rubber band on the plastic clamp . . . and hope it stays on. Now we've got a rubber band kind of wrapped around the ends any way you feel like.

And we'll take a laser pen, and we stick it in there and hope it stays. If it doesn't stay good, we'll put some tape on it. And we have some alligators on our laser pen.

[Student] What are we going to do with the alligators?

You're going to hook them up to a battery and see if your laser pen lights up or not. There's a button on the laser pen, and if you push the button it'll light up.

So now we've got a laser pen that's lit up. Can you see it on the balloon? Now I've got the rubber band stuck in the swiveler. Now we can bounce the laser beam off the mirror onto a wall.

Now if I talk into it -- hellooooooo. Let's turn off the light. Hel-looooooo. *[Laser beam makes patterns on the wall as the voice varies in pitch and volume.]* There's a certain frequency that you use with your voice that gets big. Ahhhhhhhhh.



Alligator clips attach to battery.

So that's what you're going to try and make. Good luck. If you're not done in three years, we'll send you home all starved and dead.

[Student] Do you need the battery to change the sound waves?

You need the battery to make the laser work. The battery's only there to make the laser work. There are no batteries in the laser because it's not a good laser.

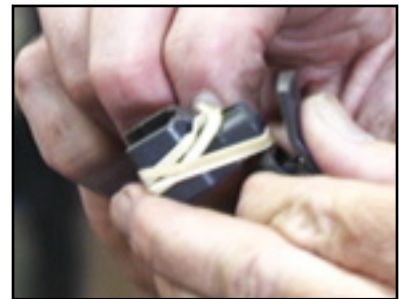
So, we'll give each of you a cup, and a balloon. The cups will break if you scrunch them, or if you stand on them, or sit on them, or smash them on your neighbor. Don't stand on or scrunch them or smash them



Attach swivel clamp to craft stick.



Add hot glue to keep the clamp on.



Wrap rubber band around clamp.



Laser pen inserted in clamp.

against your neighbor. *[Instructors pass out cups and balloons.]* Have your neighbor help with your balloon -- it takes two to do it. *[Students attach balloons to their cups.]*

*[Instructors set power strips on table and pass out glue guns and craft sticks.]* Plug it in. Now everybody count to a million. When you get to a million, your glue gun will be warmed up. Oh, you want to try and put the mirror on while you're waiting for your glue gun? *[Passes out mirrors.]* See if you can get the backing off your mirror and stick it on your balloon. Right in the middle. You need all the glue you can squeeze out of the glue gun when you do your stick. If you're just dabbing it on a little ant-size piece at a time, that's not enough.



When you shout into the hole in the cup, the laser makes an image on the wall.

*[Instructors pass out the rest of the supplies and students assemble their fixtures.]*

The rubber band is not that great of a solution to this problem, so we're going to try electrical tape. We'll give you about a foot of tape, and we'll see what happens with that amount. And you can stick your laser in, and wrap it around so that the laser doesn't fall out. Oh, it's stretchy tape, so when you wrap your tape on, stretch it. And when we come around to the button part . . . I know what we're going to do. We'll give you the battery first, check yours to make sure it works, don't shine it in anybody's eyes. Then you're going to tape the button down on your laser so that it'll stay on without you holding it, and then we'll tape the laser onto the cup. That'll work. It'll probably just stay by friction then.

We'll give you a laser and a battery. You have a battery and a laser, and the laser has two wires. And you'll say, "Mister Mac, where do the wires go?" And I'll say, "On the springy things." And you'll say, "But, does it matter which thing goes where?" And I'll say, "Yeah." Then you'll say, "Well, which one goes where?" And I'll say, "You've got to figure it out." So you put them on and push the button on your laser. *[Demonstrates.]* That works. If it doesn't work, you switch them around. Now I'm going to switch them around, and it doesn't work. So then I'm going to switch them around again. Will it work this time? Yep, there, it works.

Some of the buttons are sensitive, like this button, if you push it lightly it turns on. If you push it harder, it turns off. You push it lightly it turns on. If you push it harder it turns off. Isn't that weird?

So, when you have your laser on your battery, you're going to take a piece of tape that we'll give you and wrap it around the button. And



Wrap electrical tape around laser to hold button in "on" position.

wrap it either tight or loose so that the laser stays turned on. If it turns off, you can either make it tighter or looser. Mine turned on, so I'll wrap it around a couple of times. Now I have an "On" laser. Then I can stick my On laser into my fixture and tape it in place. *[Demonstrates.]*

So, you'll get batteries first, lasers second, tape third. You'll probably only need three or four inches to tape the button down.

*[Instructors pass out supplies and students assemble lasers. Then the lights are dimmed, then turned off completely so students can see the laser images change as their voices change. After a short time, instructor turns on the fog machine to make the laser beams visible in the fog.]*

*[When the lights come back on, students are instructed to disassemble the laser apparatus (audio quality in this part of the video is poor)].*



Stage fog makes lasers visible.

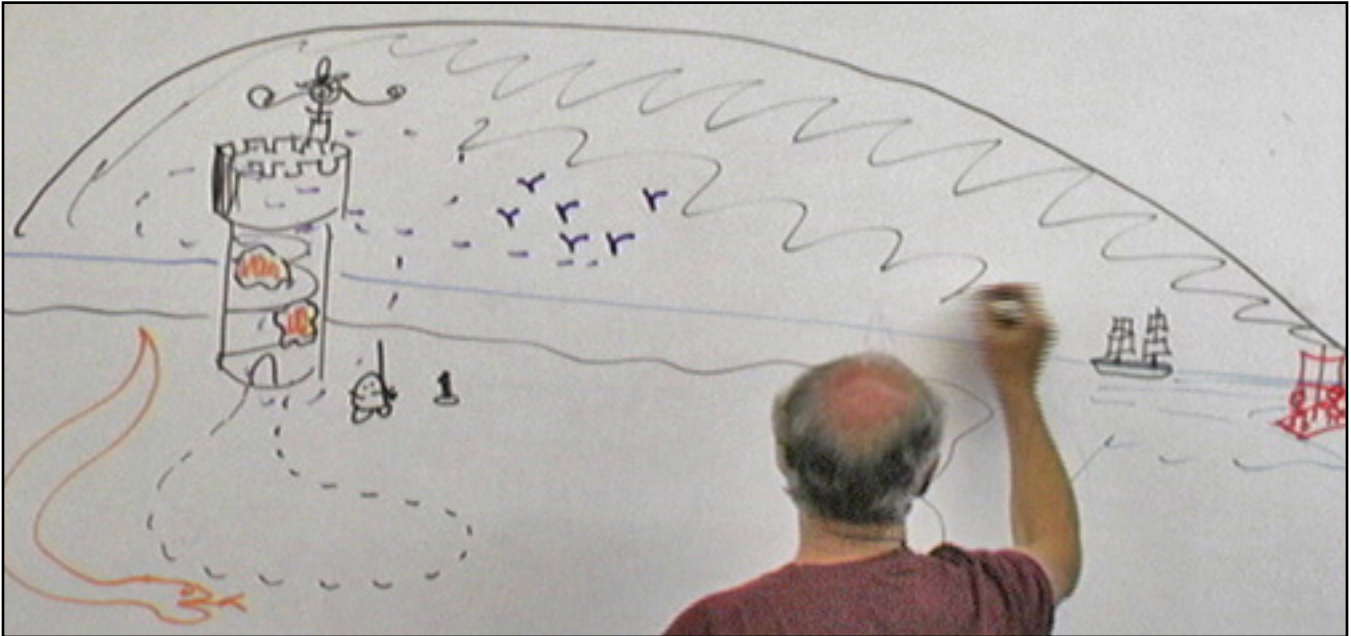
Take your lasers off of your cup and peel the tape off. *[Lasers, batteries, and alligator clips are returned to the instructor, and students keep the rest of the apparatus.]*

Okay, now we need to finish the story.

## End of Story

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

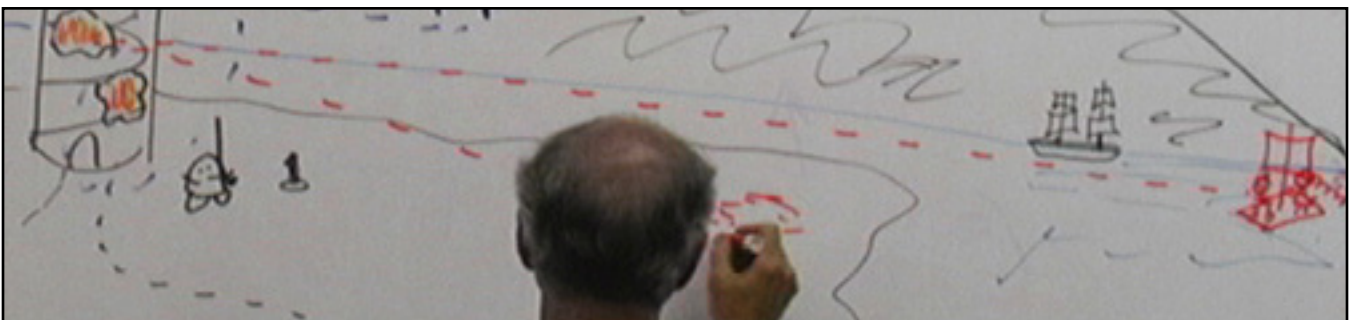
So Jack and Jill are trying to find out Evil Mister Fred's plan. And they called the Acme Store of Everything and they ordered some darkness. The Acme Store of Everything delivered a whole bunch of darkness. It covered up the whole place, as far as they could see. And now it's really dark. And Jack said to Jill, "Why did you order darkness? Now we can't see a thing." And Jill said, "Well, why don't you order something?"



Darkness covered everything.

Jack said, "Okay, I want a laser. I like lasers." So Jack ordered a laser, and he's shining it around all over in the darkness. Jill said, "That's cool. Shine it at Evil Mister Fred's castle." So Jack shone his laser right at Evil Mister Fred's castle, and it bounced off the snakeskin windows.

And Evil Mister Fred was talking about all his war plans inside. And the laser beam bounced off and ended up coming back, and it made wiggles on the ground. And Jill said, "Whoa, the window's vibrating! I wonder why." And then she looked and she watched and she listened, and she said, "I can barely hear what they're saying, but I can see what they're saying from the wiggles on the ground." And she



The laser beams from the raft bounced off the snakeskin windows and made wiggles on the ground.



and Jack looked at the wiggles and they said, "Oh, he's talking about coming with baseball bats and hitting everybody over the head. And there's a ship with baseball bats out in the bay, and as soon as he gets them, he's going to attack the whole world."

And Jack and Jill looked around, and they couldn't see the ship in the darkness. So Jack shined his laser beam on the ship and wiggled it back and forth really fast. And he saw the ship out there in the darkness, and he said, "That must be it -- the baseball bat ship!" And the captain of the ship saw the laser beam shining at him from the shore. And he says, "Ah, that's the signal! We're supposed to take all the baseball bats and throw them overboard." Evil Mister Fred was going to have his minions row out and grab them as they were floating around in the ocean. So he took all the baseball bats and threw them into the ocean and sailed off.

And now, Evil Mister Fred, of course, doesn't know this. Jack and Jill saw them do that and they said, "What are those guys doing?" So they took their raft out there and they gathered all the baseball bats, and they took them back home with them. And Evil Mister Fred couldn't invade the world. He got really mad, and all the guys that were with him were saying, "What kind of plan do you have here? You've got no weapons." And they started beating up on Evil Mister Fred because he didn't know how to plan a war. And they all lived happily ever after, except Evil Mister Fred.

### *End of Lesson*

*If you have questions about this lesson, please ask them through the [online Teacher Support Forum](#) on our web site.*

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