



Teacher's Guide for:  
**Helium Balloons**

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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Helium Balloons  
A Rock-it Science Lesson  
Filmed July, 2009

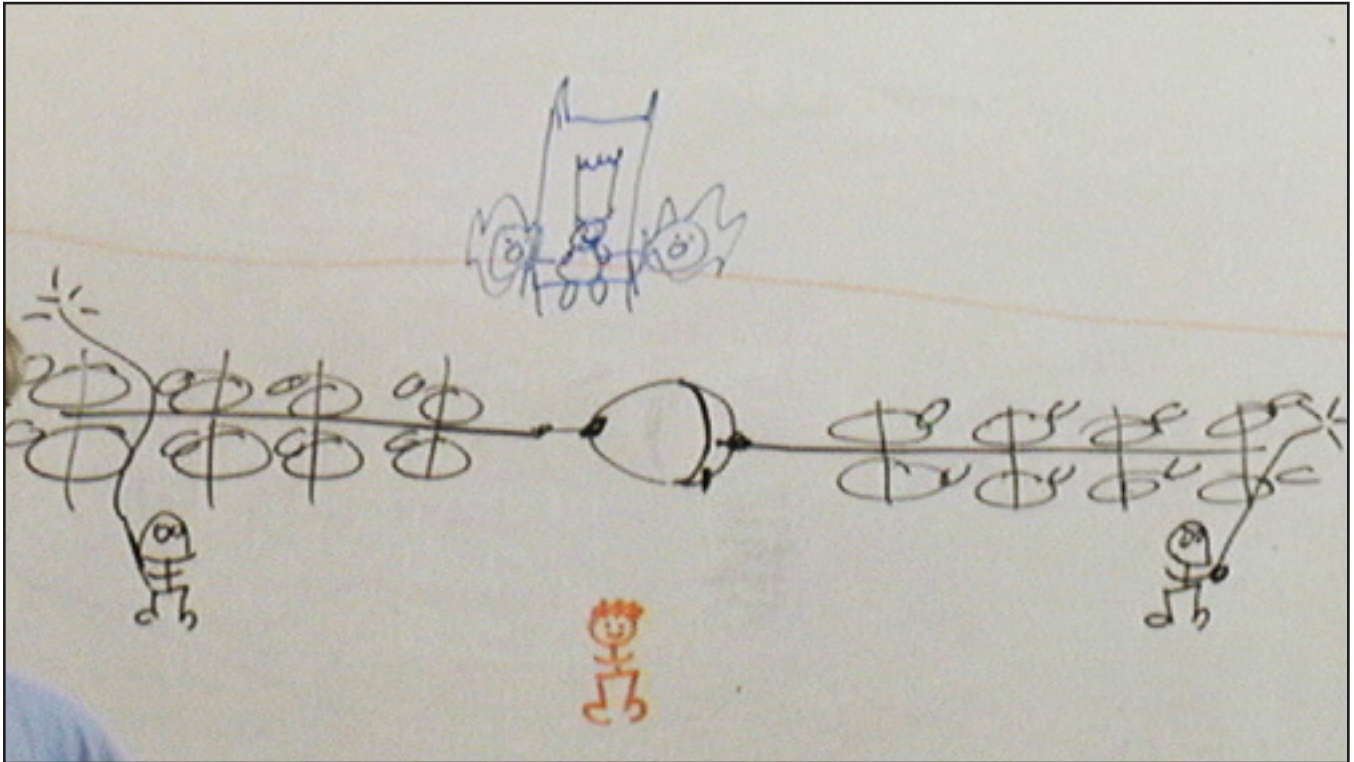
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## Intro Quick Recap: "Vacuum Strength"



- A king offered a lot of money to whoever could come up with the best experiment.
- Bernie said he could hold back two teams of horses, with nothing.
- He took two halves of a bowl, put them together, pumped out the air with a reverse bicycle pump, and tied ropes onto them. Then he tied the other ends of the ropes to two teams of horses pulling in opposite directions.
- The horses couldn't pull the bowls apart.
- Then Bernie had the king open the valve on the bowl so the air could escape, and then the horses could take off.
- The guy's real name was Bernoulli. He not only discovered that a vacuum could hold two things together, but he also discovered that wind creates suction.
- Today's experiment is to find out if wind creates suction.

## Experiment Recap: "Helium Balloons"

- Use a leaf blower to make a ball stay up in the air and move around; first a fairly heavy rubber ball, then a beachball.
- Note how you can tip the leaf blower at an angle and the ball still hovers.
- The wind sucks the ball upwards when it passes over it. Arrange hula hoops around the room ahead of time, clamped to shelves, etc., so they stand vertically.
- Give each student a balloon filled with helium, a ziplock bag, a piece of duct tape, a plastic drinking straw, and a sheet of paper.
- Tape the ziplock bag to the bottom of the balloon with duct tape.
- Students can draw a face or design on the balloon with permanent markers, so they know who it belongs to.
- Tear the paper into small pieces and put it in the ziplock bag.
- Add or remove pieces of paper until the balloon neither rises nor falls, but just floats. If the student can't get it exact, it's better to have it fall slightly.
- Students use straws to blow air above, below, in front of, or behind the balloon to make it move through the hula hoops. Not allowed to blow directly at the balloon.
- When two balloons meet, try to make them bump heads.



## ***Equipment List: "Helium Balloons"***

### **Items needed for Instructor:**

- Balls: 1 rubber 8", 1 beachball
- Leaf Blower
- Helium Tank
- Hula Hoops, about 8-10
- Clamps for mounting hula hoops onto shelving, about 8-10
- Long pole with sticky duct tape on the end for retrieving balloons
- Scissors

### **Items needed for Students:**

#### **Consumables (per student):**

- Balloon, 11", filled with helium
- Zip Lock Bag, 1-qt, light-weight
- Tape, Duct, about 4" long
- Paper, White, 1 sheet
- Straw, Plastic

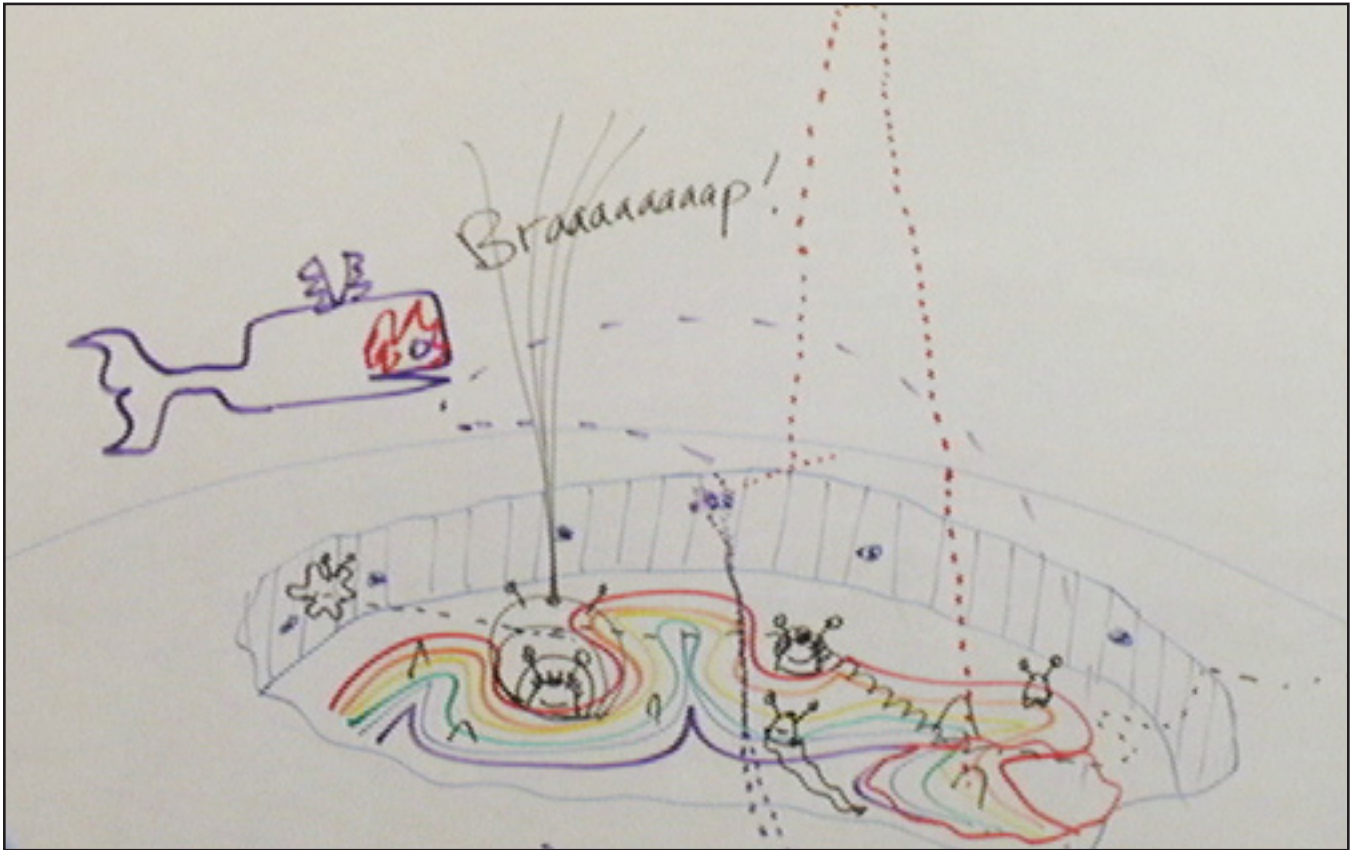
#### **Other:**

- Markers, Permanent, Colored

### **Prep Work:**

- Fill Helium Tank
- Arrange hula hoops around the room

## Story Recap: "Jack & Jill on the Slug Planet"

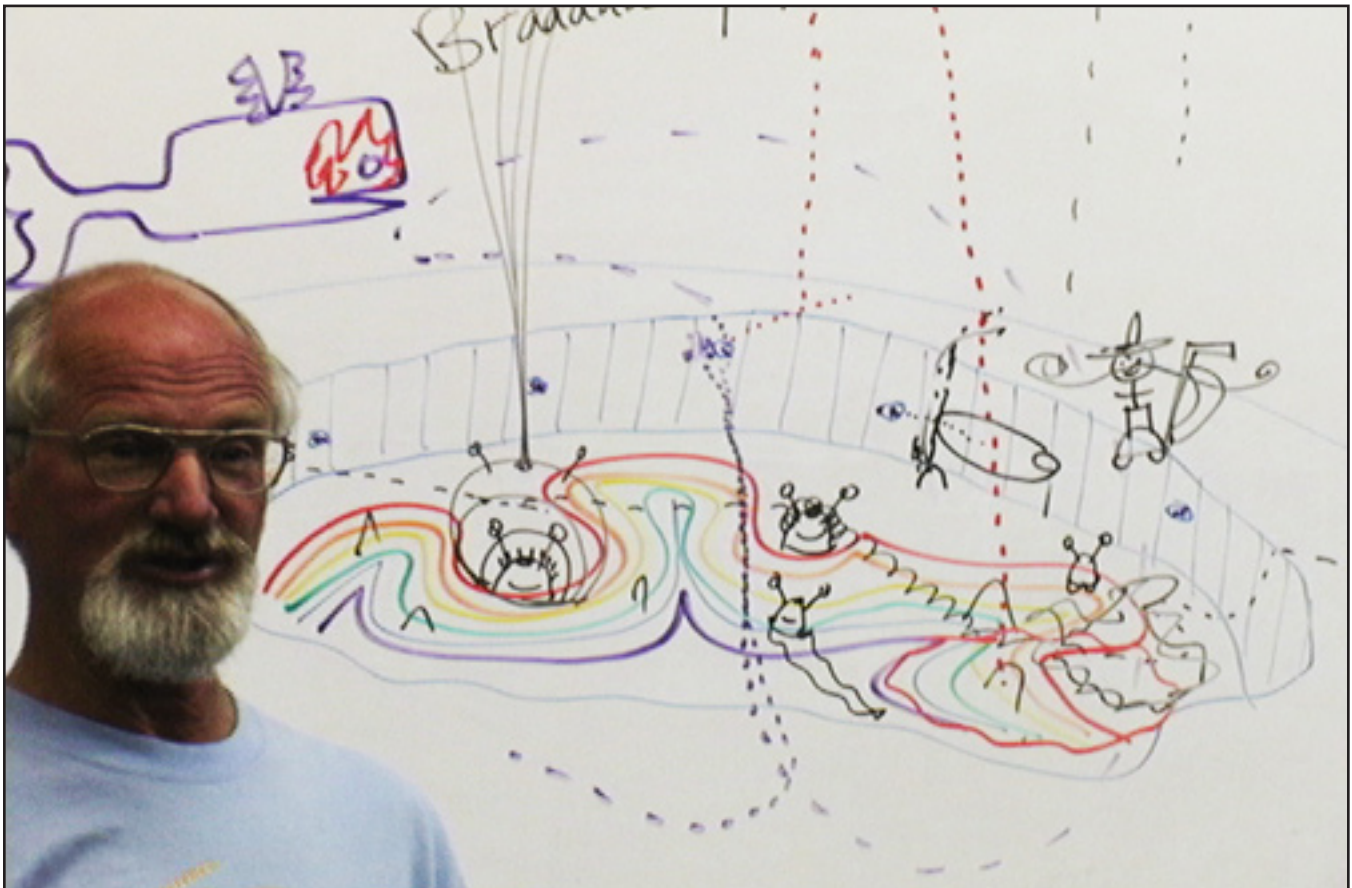


### Part 1:

- There's a planet made out of ice that has a deep canyon with caves in the walls.
- At the bottom of the canyon there was dirt of many different colors.
- The creatures living there looked like slugs and were called geysers and girlsers. Jack & Jill were there in the form of slug creatures.
- As they slimed over the colored dirt, each color had a different taste.
- An older slug warned them not to eat the yellow dirt, so Jack decided to eat lots of it.
- It made Jack get stretched out really big, like a balloon, until he let out an enormous burp and returned to his normal size. Then Jill started doing the same thing.
- She burped over Jack's head, and he rose up and went splat against the canyon wall.
- A herd of flying whales approached, planning to live in the ice caves and have baby whales.
- It's hard for the whales to fly into the small cave openings, and the first one kept missing.
- One of the slug creatures kept making fun of the whale, until it flew straight up and then dive-bombed the slug, flattening him like a pancake.
- When the slug creatures eat the rocks in the canyon, they create heat, making the canyon warm enough for the whales to live there and have whale babies. But if the whales kill too many of the

## Story Quick Recap (cont.)

- slugs, the ice will come in, and there'll be no more whale babies. So Jack and Jill want to find a way to help the whales land.
- Evil Mister Fred disguised his minions as slugs. They tried to make the whales mad so they'd smooch the slugs and make it too cold, so there'd be no more whale babies.



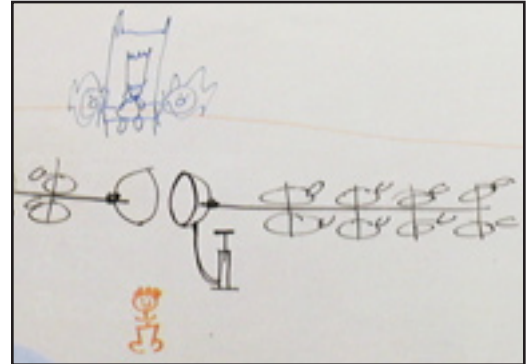
### Ending:

- Jack was still making giant burps while the whales tried to fly into the caves.
- Jack burped at a minion and knocked it against the wall. Then he burped again, trying to make it fly straight up out of the canyon.
- A whale was flying over at the time, trying to enter a cave, and as the minion flew upward past it, the whale got sucked forward and went right into the cave.
- Jill noticed this and started guiding the whales into the caves with her burps.
- Jack was still blowing minions around as Evil Mister Fred flew over to try to stop Jill.
- He flew right over a minion who had been taunting a whale, just as the whale started to dive-bomb the minion.
- Evil Mister Fred got squashed flat by the whale.

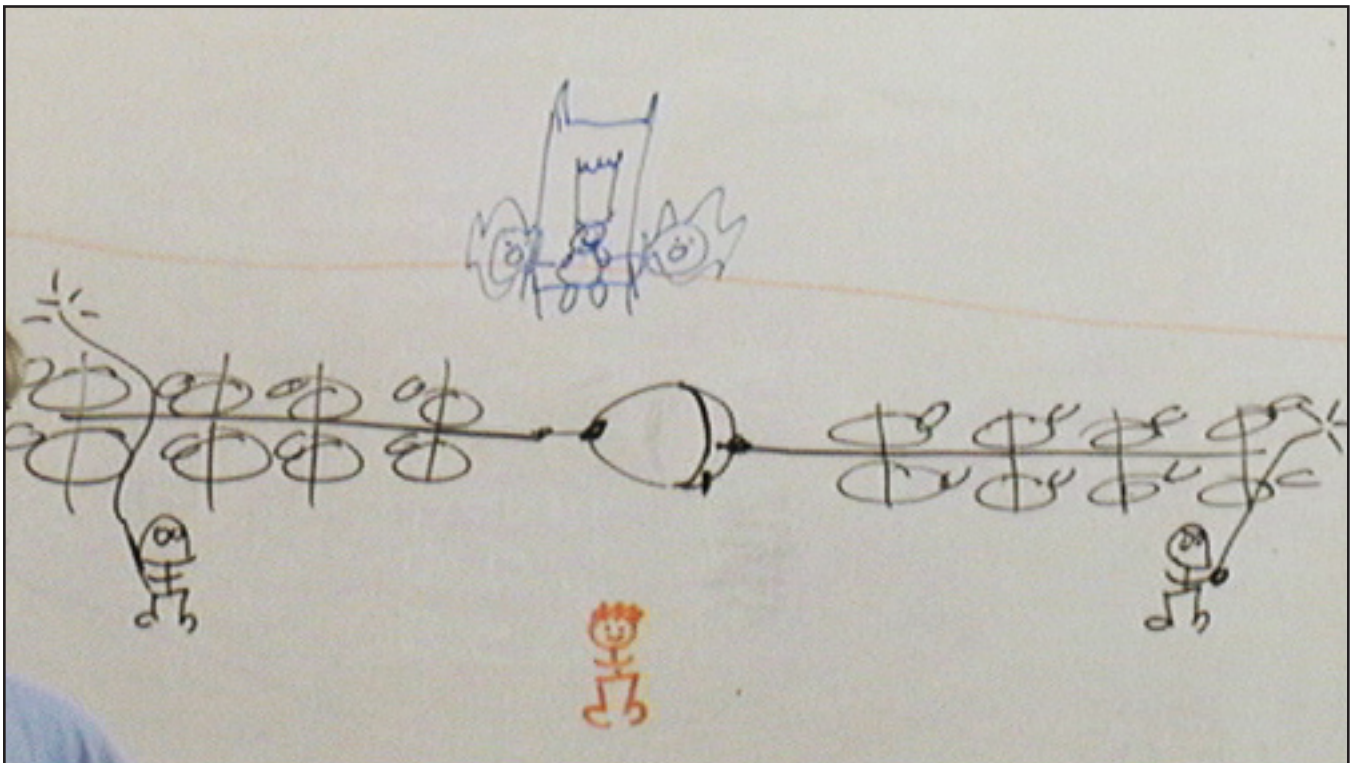
## Transcript: Intro: "Vacuum Strength"

One time, the king said, "Hey, if anybody can come up with a really cool experiment, I'll give you a whole chest full of money." And Bernie didn't have a lot of money. He said, "Yeah, I want to do this!" So he's looking around for a good experiment, and as he came down the road he found sixteen horses. So he tied them together -- these are horses. He put eight horses pointing this way, and eight horses pointing the other way, like that. That's a lot of horses. And he hooked all these horses together with sticks and ropes.

And in the middle, he put a bowl on that rope. And he put a bowl on this rope, like that, tied it on there. Just big old empty bowls. And then he got a bicycle pump, and he made it backwards, so that it would suck instead of blow. And he hooked it up to one of the bowls. And he put bubble gum around all the edges. And he said, "Hey, king! I have this great thing. I can hold all these horses back so that they can't pull, with nothing." And the king said, "What?" And he said, "I can keep all these horses stuck together, with nothing." And the king said, "No, you can't." And Bernie said, "Yes, I can." The king said, "No, you can't." Bernie said, "Yes, I can." And the king said, "Prove it! And if you're right, I'll give you a whole bunch of gold. If you're wrong, we'll cut your head off." And Bernie says, "Oh boy, this better work."



Two bowls and a Bicycle Pump



Once the Air was pumped out of the Bowls, the Horses couldn't pull them apart.

So they called all the king's horses and all the king's men together, and everybody came to watch the show. They wanted to see Bernie get his head chopped off. And we'll put the king out there, and put a crown on him. There's the king. Oh yeah, he should sit in a chair, with a lion on each side to protect him.

So Bernie showed the king the two bowls, that there was nothing inside. Then he had some people hold the bowls close to each other so they're just touching. Then he started pumping his reverse bicycle pump. As he did, the pump was sucking out the air between the bowls. And the bowls stuck together really well. When the bowls were nice and stuck, then Bernie disconnected his pump and said, "There you go! Two bowls, nothing in between." And the king said, "Well, that's kind of weird. They're staying stuck together." And Bernie called the horse drivers. These are guys who wear masks over their heads. And they have whips. They can crack these whips. And one guy was on one side, and one guy was on the other side. Bernie said, "Ready, get set, go!"

And the horse drivers cracked their whips, and they yelled at the horses, and the horses were pawing at the ground, and they were digging holes in the ground, and they couldn't pull the two bowls apart. And the king said, "Wow! There must be some trick to that. He's got some trick up his sleeve." And while the horses were pulling, Bernie had the king come out and open the little valve on the side and let air back in. So now it's going *[makes sucking noise]*. And pretty soon -- pop! -- the bowls popped apart and the horses took off. And the king said, "Wow! He really did make them hold back all those horses, with nothing!"

And this guy's real name is Bernoulli, and he came up with all kinds of smart things. One thing he came up with, not only this, a vacuum's suction holds two things together nice and tight. He discovered that wind creates suction. And people said, "Bernie, you're crazy. Wind does not suck." He says, "Yes, it does!" And today, we're going to find out if wind creates suction or not. But first, we need a crazy story.

## Story: "Jack & Jill on the Slug Planet"

Once upon a time, there was a planet that was made out of ice. A huge planet, and it was all smooth, smooth ice. You could go ice skating anywhere on this planet, except for one place. There was a place on the planet where there was a huge hole in the ground. And the hole had steep walls that went straight down, like that. And there were caves in the walls. Caves here, and caves here, here a cave, there a cave, everywhere a cave, cave. And in the bottom of the hole, if you were to stand on the edge and look down, it was kind of neat because the dirt down there was colored. There was some red dirt, and there was some orange dirt, and there was some yellow dirt, and there was some green dirt, and there was some blue dirt, and some purple dirt.

And there were creatures living down there. Let's put some creatures down there. The creatures looked kind of like slugs, except they were punky, like that. They had a hole in the top



Ice canyon with caves & colored dirt



Jack and Jill as Slug Creatures



of their head, they had a couple of eyes, and a mouth, like that. And the creatures were called geysers if they were guys, or girlsers if they were girls. There's a bunch of them. And wherever they walked around, they left a trail of slime behind them. One of the creatures had short hair, and one of the creatures had curly hair. [Student: *Is that Jill?*] Yep, that's Jill. Jack and Jill got turned into geysers and girlsers. And they'd never been that way before, and they were sliming around out there. They said, "Wow, this is really weird. I've got these cool eyes I can turn in every direction and see things all over the place. I've got a mouth I can talk with, and I can slime." And as Jack was sliming over the red stuff, he said, "Jill, I just slimed over some red stuff, and I can taste in my mouth cherry flavor!" And Jill said, "Whoa, that's weird." And she slimed over the red, and she could taste cherry flavor, too. And they slimed over the orange stuff, and it tasted like oranges, and the yellow was like lemon, and the green was like lime, the blue would be blueberries. What would the purple be? Grapes, okay. The purple was grape.



Old Slug with long beard.

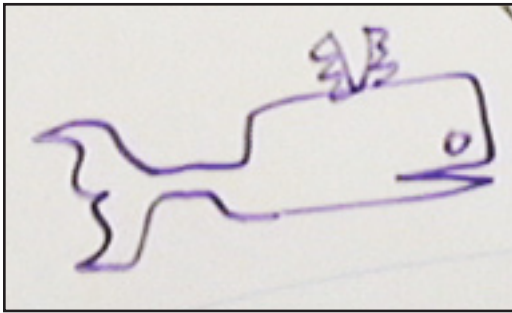
While they were sliming around out there, one of the old guys saw them and said, "Hey, you're newcomers." Jack and Jill said, "Yep, just got here." And the oldcomer had a beard. And he said, "Well, just be careful you don't slime over too much of that lemon flavored yellow stuff. It's bad." Jack and Jill said, "Oh, what'll happen?" He said, "Aw, just don't do it. Trust me. Don't do it." Jack said, "All right!" So Jack stayed on the yellow line, and he slimed, and slimed, and slimed, and slimed, and slimed, and Jack started to grow bigger and bigger. And he says, "Hey, this is great! Look at me, I'm getting big!"

He got bigger, and bigger, and bigger, like that. And Jill said, "Jack, you're getting bigger, but I think you're just stretching. It looks to me like you're going to explode!" And Jack said, "Uh oh!" And he kept sliming on the yellow stuff anyway. Next thing you know, Jack let out the world's biggest burp -- braaap! Huge, high-stream, high-velocity burp -- Braaaaaaaap! Like that. And Jill said, "Aw, that's gross! Ohhh! I want to do it."

So Jill started sliming the yellow stuff, too. And she got all big and big and big and big. Instead of doing her burp straight up, you know what she did? She leaned over and pointed it at Jack. And her burp went right over Jack's head, and Jack got picked up right off the ground, thrown across the valley, and splat -- here's a Jack splat, like that. And Jack hit the wall -- splat! And then he slowly went eeeeeee -- slid down the wall and landed on the ground. Pretty soon Jack put himself all back together again, and Jack and Jill were having burp fights. And the old guy was saying, "Why, them kids, they don't know nothing. Look at them, creating a big mess and a lot of noise."



Jack got really big, then burped.



Flying whale

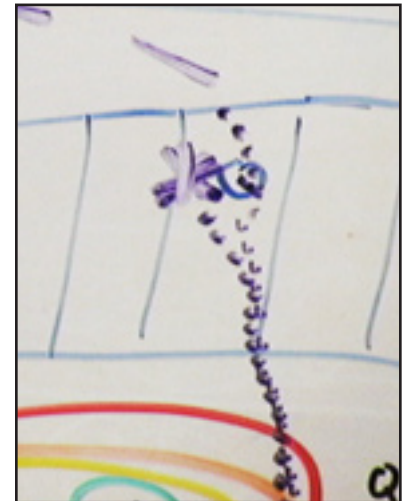
Well, while they were doing that, one of the other guys out there said, "Hey, they're coming!" And Jack and Jill stopped burping, and they said, "Who's coming?" And they said, "Everybody come look! They're coming!" And they were all looking, and over the horizon was whole bunch of little tiny things flying towards them. And Jack and Jill said, "Hm, wonder what those are?" And as they got closer and closer, they got bigger, and bigger, and bigger. When they were right overhead, they could see what those things were. Flying whales. And they had wings, like that. Great big whale, tiny

little wings. And they were flying around going, brrrrrrrr, like hummingbird wings, and they were moving pretty slowly.

And everybody down there said, "Oh, they're here, they're coming!" The whales come every year, and they go live in these caves. And then after a few months, out pop a whole bunch of little baby whales. And they said, "Woo-hoo! This is going to be so cool! Wait until the baby whales come out. They fly all over the place and bump into things. It's really fun to watch." And Jack and Jill said, "Wow, I like that!" And the old guy said to them, "Now, you just watch out. Don't you say anything bad to those whales while they're trying to go into their caves, because they're not very good about flying into them." Jack and Jill said, "Oh, yeah."

And one of the whales started off. He flew across the valley this way, made a pass across the top of the canyon, was heading for that cave, his wings were going as fast as he could, and he was trying to adjust this way and that, and he came in too high, and hit the ice and went pshew, pshew, pshew, pshew, and skidded across the ice.

Now, while this was happening, one of the little guys down there said, "Nice going, twinkletoes!" And the whale didn't like that. The whale was scooting off the other direction. Then the whale came back and made another shot at it. He came across the valley, a little slower this time, was aiming as carefully as he could, and bam! -- ran his head right smack into the wall. And the guy says, "Hey, where'd you get your driver's license? Ha, ha, ha!" And the whale's face turned really red, and the whale got mad. But the whale came around again, made another shot at it, and this time it looked like it was going to make it perfectly into the hole, and just barely missed the side and went boink, boink, boink, boink, boink, boink, like that, bouncing off. And the little guy said, "Hey, you look like some kind of a pogo stick, a whale pogo stick! Ha, ha, ha!"



The whale missed the cave and bumped into the canyon wall.

And the whale didn't say anything. Instead of flying around, the whale flew straight up. And the old guy says, "Uh oh! Follow me." Everybody started following the old guy, except for the dumb guy that was making the comments. The dumb guy was saying, "You can't do anything right! Stupid whale! See, chicken whale's flying away." The whale flew way, way up high, and then turned over, and started coming down -- faster, and faster, and faster, like a high-speed locomotive. And the whale came down and



The Whale flew up, then came down.

went splat, right on top of the little guy. And the little guy spread out like a giant pancake. And the old guy says, "Oooh, that's gotta hurt! That's gotta hurt really bad! It'll be months before he can get himself back together again."

Now, these creatures living down here are eating all these rocks. They create the heat that keeps the canyon warm enough so the whales can go live there and have whale babies. If the whales kill too many of the little guys or smooch them too much, it'll get cold. Then the ice will come in, and there'll be no more whale babies. And Jack and Jill hear about this, and they say, "Uh oh. We'd better do something to help those whales land."

Now, Evil Mister Fred happened to be in the territory. And Evil Mister Fred took some of his minions, threw them down into the canyon, and disguised them as geysers and galsers. He taped little eyes to their heads. He was telling them, "Hey, guys, go out there and start yelling at those whales and get them really mad. And try to get some of those other little guys to yell at them and get them really

mad!" Now, if you were Jack and Jill, and you see what's going on, what would you do?



Disguised Minion

## 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 . . .

## Demo: Balls and Leaf Blower

You've all probably seen a ball hover before. I can turn on the air and we can make the ball hover. Okay, that was a fairly heavy ball. Did you notice that I could tip it way out and it still hovered? Let's try a real light ball. A beach ball. People always wondered why you could do that. You know, the wind is blowing -- why doesn't it just blow away? And they discovered that wind sucks. So if you get a whole lot of wind going over the ball, it tends to suck it upwards, and it stays where the wind is. If it starts to go down below the high-level wind, the wind just sucks it back up again. You can move it this way, and you can move it that way, and move it all around. But you're going to try this out yourself to see if you can make something move around with suction created by wind.



## Experiment: Helium Balloons

You need something that is a little bit lighter than that ball, because we don't want to have you all running around with leaf blowers. *[Blows up a balloon.]* We want to make it so this is like the whale in the story, and it floats without going up or down. So it needs to have a little bit of weight added to it. We have some bags here and we can put a bag on the balloon. *[Student: How is it going to fit?]* I don't know, it doesn't fit in there, does it? No, it's too big for the bag. Maybe we'll tape the bag on the balloon's nose. *[Gets some cellophane tape.]* We'll probably give you masking tape because it's stickier than this stuff. *[Tapes ziplock bag onto balloon.]* Will the balloon hold up the bag? Ooh, wow, that bag is just about right.

We're going to add some paper to our bag. I'm going to give you guys a little bit lighter bag so it doesn't end up being right, right away. You're going to get some paper and tear it up into little pieces. You tear the paper up into tiny pieces, and you can put some pieces in your bag and see how many it takes. Now it should fall down. We'll probably have to take most of these out. And you put in however many pieces it takes to make your bag so it just barely goes down, because it's better to go down than up. Okay, that's pretty good.



Add or remove Paper so Balloon hovers.

Now, we want this thing to be able to move around, so we're going to give you a straw. And the idea is to make your thing move wherever you want it to go with a straw. You don't get to poke it, though. You

have to blow on it. But you're not going to blow it the easy way.

The easy way to blow it is to blow right at it, and it goes away from you. You're going to do it the hard way. If you want it to go up, you're going to blow right over the top of its head. If you want it to go down, you're going



When you blow across the top of the Balloon, it gets sucked upwards.

to blow kind of below it, and it'll go down. If you want it to go frontwards, you blow in front of it. If you want it to go backwards, you blow behind it.

Now, it needs to have someplace to go, so we're going to have some caves for you to blow it in. They're pretty shallow caves, though. They happen to look a lot like hula hoops. These are caves. And the caves are going to be taped all over the place. Suppose your balloon is floating out here, and you want it to go through that cave. You can't move the cave, because that would be too easy. You have to move the balloon. So you're going to blow on it and blow it through the hoops. And you can see there's a hoop over



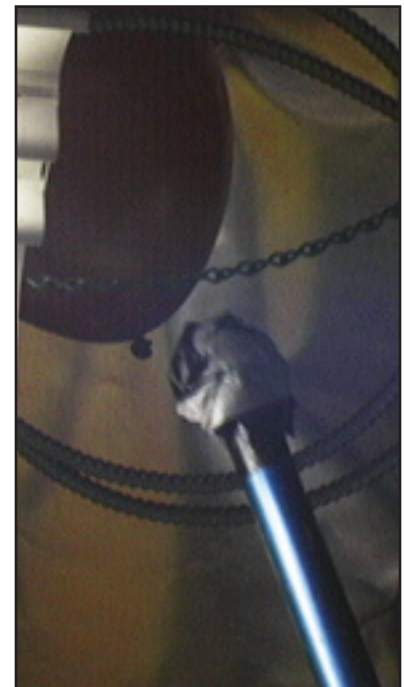
Hula hoop "caves" clamped to shelves and furniture.

there and he's already set up. We're going to try and get a whole bunch of hoops going.

When your balloon comes to another balloon, your balloons have to bump heads. When your balloon gets near another balloon, they have to say hello by bumping heads. So in order to make them bump heads, you have to figure that part out. There's a lot of people here, there's going to be lots of balloons, so there's a way to make them bump heads that's very easy. *[Student: Can we use a Sharpie and draw a face on the balloon?]* Uh, I wonder if it'll pop. Let's try one and see. *[Draws face on a balloon.]* Yes, you can draw on them. It looks like it's okay.

Now, it never fails, we hand you a balloon, you say, "Oh boy, I got my balloon!" And you go to get your bag, and your bag has tape on it, you go to put the tape on the balloon, and you accidentally let go of the balloon. *[Lets go of balloon and it rises toward the ceiling.]* Oh, no. What now? There's the balloon, stuck way up there. Well, we have a balloon catcher, so we can get balloons down from there. *[Uses a long pole with exposed duct tape on the end.]* But you have to wait until somebody

gets it down for you, so while you're waiting, everybody else is having fun and you're having no fun. So while we're starting to inflate balloons, we'll give you a ziplock bag, some masking tape, and some paper to tear up. So you can sit there and tear up the paper. If you want your balloon someplace, you can put it under the table because it'll stay there under the table. So first we'll give you some paper. Make it into lots of small pieces, and then put all the pieces in your bag.



Log Pole with exposed Duct Tape to retrieve Balloons.

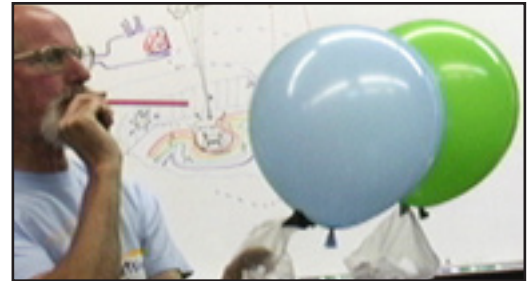


Guiding the Balloon through the Hoop.

If you have a bag full of torn-up paper, you can line up here. You need the whole sheet of paper in your bag. *[Inflates balloons, gives one to each student, attaching their bag to it with a piece of duct tape. Students add or remove paper as needed to make the balloon float without rising or sinking, then try to get them through the hoops.]* Try rubbing it on your head and see if it will follow you around. Try walking backwards with it in front of you, and then let go of it. It will follow you that way, too.

*[After students have finished experimenting and return to their seats.]* Suppose you have two balloons and they're floating

close to each other, and you want them to hit each other. You could blow this way, and it might run into that one. Or you could blow that way, and it might run into this one. What would happen if you blew right between them? So here they are. *[Blows between the balloons with a straw.]* If you get right between them, they bump.



Blowing between two Balloons.

What happens if you blow between the balloon and a wall? It goes bumpity, bumpity, bumpity, bumpity. That's how you can prove that air sucks.



Making the Balloon bump along the wall.

## End of Story

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

Evil Mister Fred sent his minions out to cause trouble. They were going to tell all those little guys to make fun of the whales, so the whales would come down and go splat and splat them. And Jack and Jill said, "Whoa, that could be a disaster. We've got to find a better way to do this." And Jack wasn't really paying attention. He was eating more of that lemon flavored glop and getting really really big, because he wanted to make some burps. And Jack was burping at one of the minions. The minion's in his disguise, and Jack would get all filled up and go brrrrrrppp, and the minion would go bang! against the wall. And he thought this was a fun game.

Well, while Jack was doing that, one of the whales was coming in for a landing right above Jack. And the whale was right about here, and Jack was down here. He was going to burp upwards because there was a minion right next to the wall, and he was going to blow him clear up out of the canyon. And as Jack blew, the minion shot out of the canyon, the whale got sucked forward, and went right perfectly into the cave. And Jack paid no attention to this. It didn't occur to him that he'd helped the whale. He just thought the whale was good at flying.

But Jill saw it, and she said, "Whoa! This is great! If we blow in just the right spots, we can guide the whales into their caves and they'll be safe." So Jill started eating a bunch of lemon

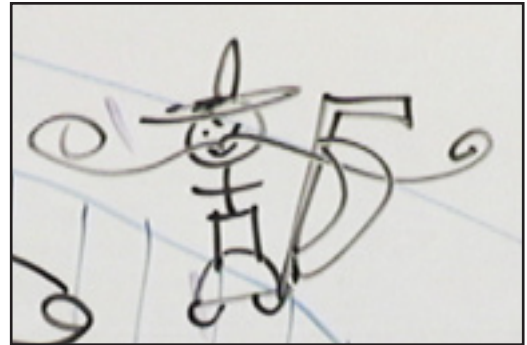


Jack burping in front of the Whale.

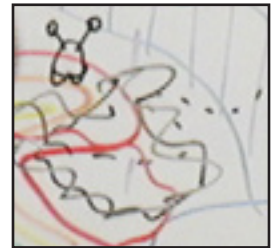
rock. And she'd go position herself to help the whales land. Meantime, Jack was busy blowing minions around.

As he was doing this, Evil Mister Fred saw what Jill was doing and hopped onto his flying vacuum cleaner to see if he could stop her. And he didn't notice what Jack was doing too much. And one of his minions was making fun of the whales, saying, "Hey, whale, you can't fly! Ha, ha, ha! Betcha can't get me -- nyah, nyah, nyah, nyah, nyah!" Like that. And the whale shot way up into the air and was going to come down. Jack was shooting the minion, and the minion went right by Evil Mister Fred.

Evil Mister Fred didn't see the whale at all. And the whale came down and hit Evil Mister Fred and splatted him out all over the ground. And the rest of the whales were able to land. And they all lived happily ever after, except Evil Mister Fred.



Evil Mister Fred going after Jill.



Evil Mister Fred went splat.

### *End of Lesson*

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