



Teacher's Guide for:  
**Magnetic Creatures**

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

[00:03] (These numbers are **time codes**, so you can refer back to the video.)

Magnetic Creatures  
A Rock-it Science Lesson  
Filmed June, 2009

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## Quick Recap

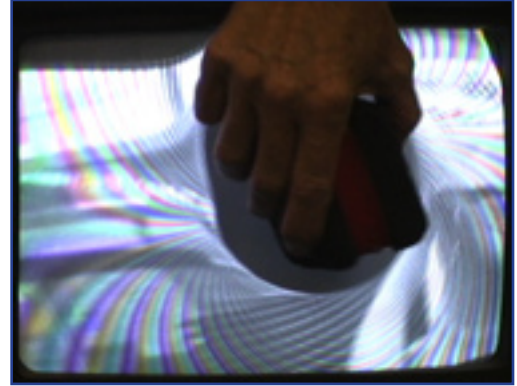
### Intro:



Teacher uses a very large magnet to show how various materials do or don't stick to it.



Teacher passes the same materials through a hard drive containing powerful magnets to demonstrate how some of them are slowed down, even though they don't stick to the large magnet.



Teacher passes a magnet in front of a tv screen to show how it distorts the image by upsetting the paths of the electrons.

### Experiment -- Magnetic Creatures:

- Each student receives two 1/2-inch disk magnets, then wander around and see how they behave and what they stick to.
- Draw a habitat for their creature on a paper plate.
- Make creature using a puff ball, foam pieces, google eyes, and pipe cleaners. Do not glue the creature to the plate.
- Glue a disk magnet to the bottom of the creature.
- Use the second magnet on the back of the plate to make the creature move.



## Equipment List: "Magnetic Creatures"

### Items needed for Teacher:

- Large Horseshoe Magnet on stand with steel ball on cord
- Strips of different magnetic and non-magnetic materials
- Stainless steel utensils
- Hard Drive containing neodymium magnets, on stand
- Color TV
- Video camera
- Video cables
- Large magnet (for TV)
- Vinyl Table Cover

### Items needed for Students:

#### Consumables (per student):

- 1/2" Round Magnets (2 per student)
- Glue Sticks
- 12" Smooth Strong Paper Plate
- Small Puff Balls (approx. 4 per student)
- Large Puff Balls (approx. 2 per student)
- Foam Tube Slices (approx. 2 per student)
- Doll Eyes (approx. 2 per student)
- Chenille Stems (approx. 1 per student)

#### Other (per student):

- Glue Guns & glue Sticks (1 per 2 students)
- Permanent Markers, Colored
- Scissors



Supplies for building creatures.

### Prep Work:

- Cut Foam Tubes into 1/8" slices
- Construct horseshoe magnet assembly
- Construct hard drive assembly



Large magnet on stand

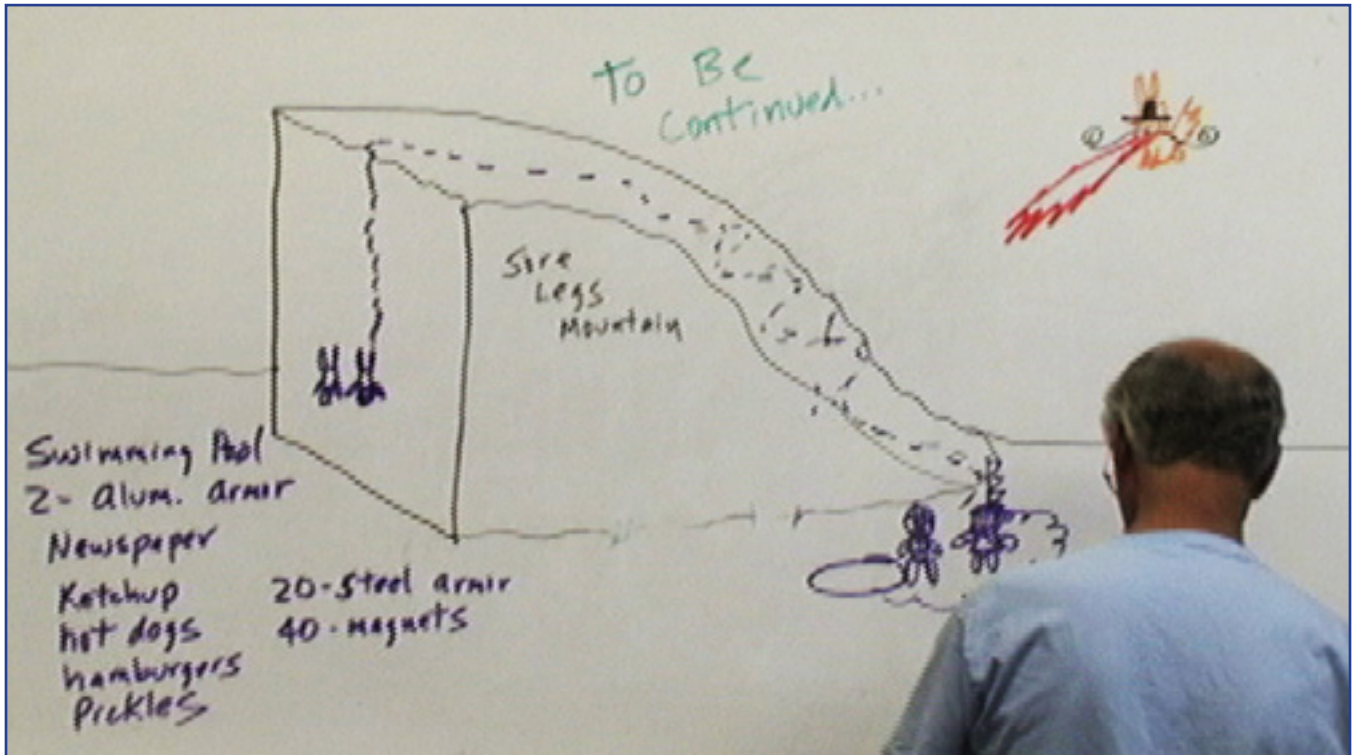


Hard drive on stand



Magnets inside hard drive.

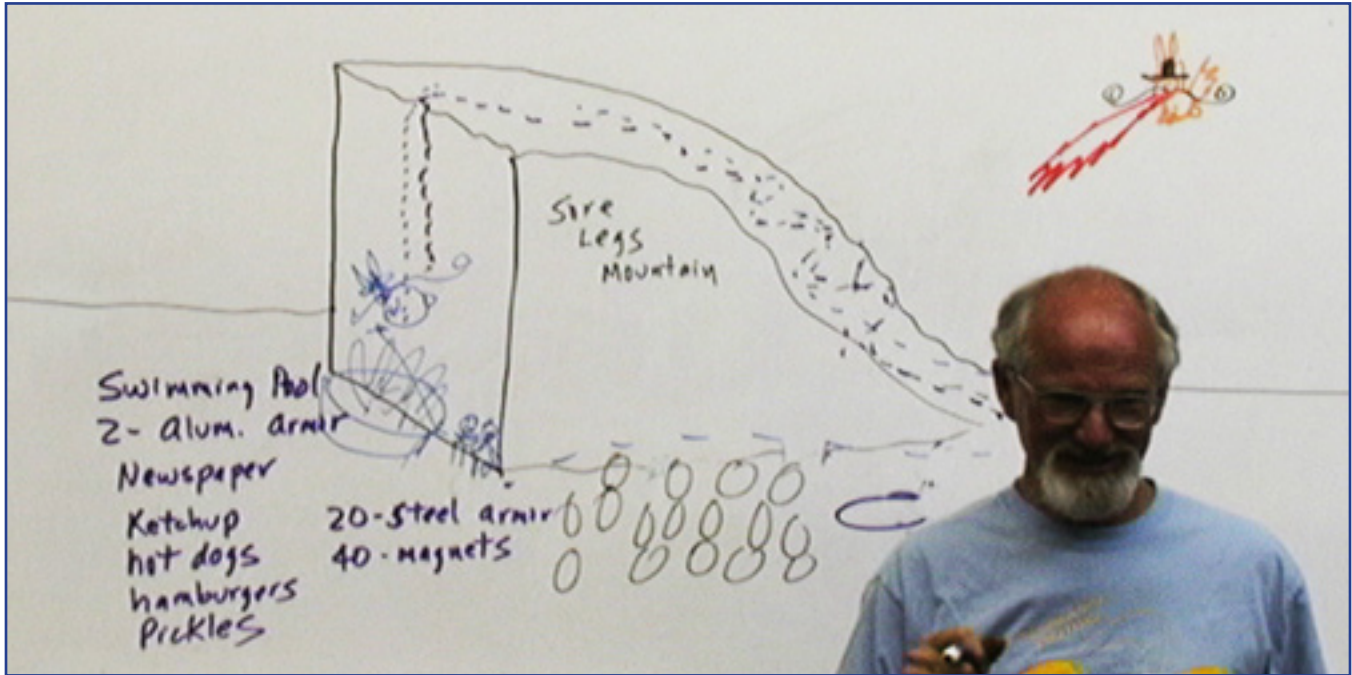
## Story Quick Recap



### Part 1:

- Jack & Jill's flying caterpillar crashes near Sore Legs Mountain.
- They land in a hole in the ground and pop out, unharmed.
- Small creatures live in the holes who can produce anything.
- A woman throws Jack and Jill in the hole, and they pop out wearing steel armor.
- The people there wear armor because they fear that a monster will eat them.
- An alarm sounds, and all the people jump into the hole and close the lid, leaving Jack and Jill on the surface.
- A fire-breathing bunny rabbit appears in the sky, with a mustache and a black hat.
- Jack and Jill run up the mountain to try to escape the bunny, which shoots jets of flame at them.
- Jack and Jill tumble over the edge of the cliff and the bunny flies off, thinking they're dead.
- Jack and Jill's armor makes them stick to the side of the cliff, which is magnetic.
- The people drag them up by Jill's hair, and Jack and Jill come up with a plan.
- They need 2 suits of aluminum armor, a swimming pool, 20 suits of steel armor, newspapers, 40 magnets from the mountain, some long sticks, hot dogs & hamburgers. The guys in the hole make it all.

## Story Quick Recap



### Ending:

- Jack & Jill fill the steel armor suits with newspapers.
- The guys underground put a magnet under the foot of each suit of armor and make them move around so it looks like people are inside.
- Jack and Jill put on the aluminum armor.
- When the bunny comes back, all the people hide underground, and Jack and Jill hide behind the base of the cliff.
- The bunny gobbles up the suits of steel armor.
- Jack and Jill run up the mountain and jump off the cliff, and the bunny follows.
- The bunny gets stuck to the side of the cliff because of the armor in his stomach.
- Jack and Jill land in the swimming pool.
- They all have a picnic and use the bunny's fiery breath to cook their hot dogs on long sticks.

## Transcript: Introduction



Big Magnet with a steel ball.

[00:11] This is a giant nut. It's a nut. It's a special kind of a nut. It's not a walnut, and not a peanut, it's a mag-nut. Yes. And there's something trying to stick to it. What metal do you think this ball is made out of?

[Student: Copper.] Could be copper. What else could it be made of?

[Student: Metal.] Metal. What kind of metal? [Student: Maybe gold.]

Maybe gold, could be gold. [Student: Iron.] Could be iron. [Student:

Cobalt.] Could be cobalt. [Student: Iron.] Iron. We're going to find out.

This is a very strong magnet. I'm going to pull the ball away and see how far I have to pull it before it falls down. It's still being held up by the magnet . . . still being held . . . still being held . . . [ball falls]. It's a very powerful magnet. So if there's any chance that something is going to stick, it'll stick to this magnet.



Brass doesn't stick to the magnet.

[Teacher holds up samples of various materials and places each one against the magnet. Students call out Yes or No when asked whether each one will stick to it.] First, will cardboard stick? [Students: No!]

You're right. Will wood stick? [Students: No!] You're right. Will copper

stick? [Students: Yes! No!] No. Will brass stick? [Students: Yes! No!]

They make trumpets out of brass. They make trombones out of brass.

They make french horns out of brass. [Students: Yes!] But they don't

make english horns out of brass. [Brass doesn't stick.] Awww. Will aluminum

stick? [Students: Yes!] Okay, here goes aluminum. Will it stick,

will it stick, will it stick? [Teacher brings aluminum hard against the

magnet, then easily pulls it away.] No, I tricked you. Aluminum doesn't

stick.



Some stainless steel spoons stick.

Will stainless steel stick? [Students: Yes! No!] Here it goes -- no. How-

ever, there are some types of stainless steel that stick. [Teacher places

various stainless steel items on the magnet -- a spatula, several spoons.

Some spoons stick, some don't.] Some of the utensils around your house will stick and some won't. So that was kind of a trick question.

One more left. Bicycles are made out of this stuff. It's steel. It's 99.6%

iron. [Students: Yes!] [The iron sticks. Teacher then places some of the

stainless steel spoons against the steel while it's sticking to the magnet,

and they stick to the steel.]



Stainless steel sticks to the magnet.

Okay, now we're going to use these same pieces of metal. So you remember that iron is the only one we had here that sticks. But [one student] said cobalt. Cobalt is a metal that sticks. And if you go to Canada and you get some dimes, dimes will stick, too.



White magnets inside hard drive.

*[Teacher brings out a hard drive with neodymium magnets visible inside.] Here are four white magnets that are really strong inside of a box. You see the white magnets in there? Now, if we put our spatula inside [inserts handle of stainless steel spatula into box], it gets stuck. [Pulls spatula out.]*



Aluminum bar drops through slowly.

Let's take our wood and drop it into the slot. *[Places a puff ball under the slot.]* Here is a little bunny rabbit. Hello, bunny. *[Wood drops through the slot and lands on the puff ball.]* Here's cardboard. Here goes. *[Cardboard also drops through.]* Here's our stainless steel. *[It drops straight through.]* Here's our aluminum. Did the magnet stick to aluminum? *[Students: No!]* Are you ready? *[Aluminum drops very slowly through slot and lands gently on the puff ball.]* Here's copper. Did it stick to the magnet? *[Students: No!]* Here goes. *[Copper drops through a little faster than the aluminum.]* Here goes iron. Did iron stick to the magnet? *[Students: Yes!]* *[Iron gets stuck in slot and doesn't drop.]* And here's brass. Did brass stick to the magnet? *[Students: No!]* *[Brass drops through a little faster than copper.]*

So these three went slow. The slowest one was aluminum, the next slowest was copper, and the next slowest was brass. There's something that goes on when you put metal like this through a very powerful magnet.

There's little things inside the metal called electrons. And the electrons, when they go by the magnet that's in there, they go "Ahhh!" and they run in circles, like that. And as they run in circles, they create a magnet inside this metal that fights against that one *[indicates the hard drive]*. And it goes slow. The more electrons, the slower it goes. Lots of electrons in aluminum, not so many in brass.

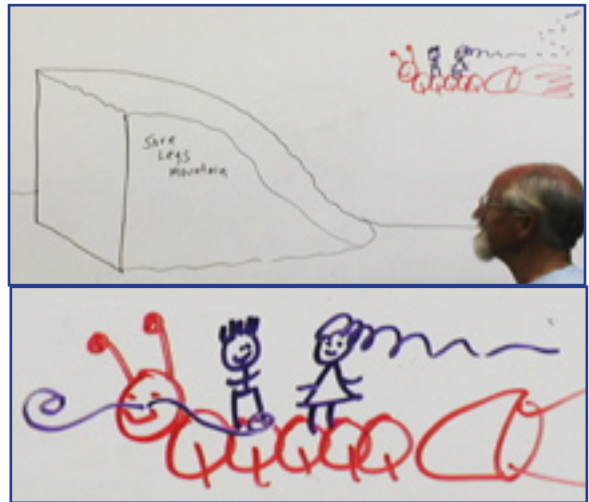


The magnet disrupts the tv image.

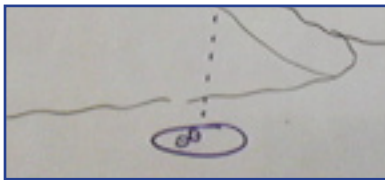
*[Teacher hooks up a video camera to an old television monitor and brings a large magnet close to the screen and moves it around. This creates interference patterns on the screen, like concentric lines of force around the magnet. It also disrupts the colors.]* There's electrons in the tv that are shooting forward, and the magnet makes the electrons go crazy like they did in the metal, so they don't form the picture that they're supposed to.

## Story: "The Fire-Breathing Bunny Rabbit"

[09:] Once upon a time, there was a cliff, a tall, tall cliff. It was on a mountain called Sore Legs Mountain. And Jack and Jill were headed for Sore Legs Mountain. They were just going to drive right by it by flying in the air. They were testing out a new kind of vehicle that they had just bought. It was a rocket-powered caterpillar. Jack's riding on the caterpillar, and Jill's riding on the caterpillar, and there's problems. The caterpillar wasn't made by a reputable rocket-powered caterpillar company. It was made by Evil Mister Fred, Incorporated. And the caterpillar is making all kinds of bad noises. And it's going crooked this way and that way. Next thing you know, the caterpillar's doing a death dive straight down. And it didn't hit the ground.



Jack & Jill on their Rocket-powered Caterpillar.



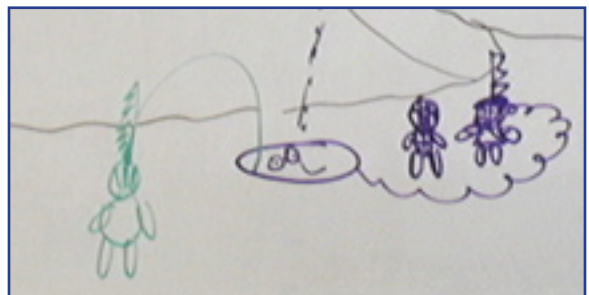
Little eyes in the hole.

There was a hole in the ground. And there were two eyes in the hole, and the eyes were watching all this, and just as it got there, the eyes moved out of the way. And the caterpillar went into the hole, and there was a whoomph! -- and smoke came out of the hole. And everybody thought, "Oh, no. The caterpillar must have died. And whoever was in it, too bad for them."

But just a few seconds later, out of the hole popped Jack and Jill. And they were perfectly fine. And Jack said, "Jill! I thought we just died. I was mangled, I was torn to bits, burned up, crashed, smushed, and totally destroyed." And Jill said, "Yeah, me, too! What happened?"

And then the caterpillar popped out of the whole -- foom! -- and flew away without Jack and Jill. And Jack and Jill said, "Whoa! What just happened?" And they ran over to the hole, and they looked down inside, and there were the eyes. And the eyes went blink, blink. And Jack and Jill said, "Hey, thanks, guys, that was really nice!" And Jack said, "Wow, can you do anything?" And the eyes went, blink, blink. And Jack said, "Can I have a pepperoni pizza with anchovies?" And poof! -- a pizza popped out of the hole in the ground. That was really good.

And then the next thing that happened was a green lady popped out of the hole. She was green because she was wearing a suit of armor that happened to be green armor. And she had a green feather sticking out of her hat. And she said, "Well, what are you two doing here? And how come you don't have any armor? You're in danger, did you know that?" And she grabbed Jack and Jill and threw them back down in the hole. Next thing you know, Jack and Jill popped back up out of the hole, and they were all encased in armor. And they went clank,



Lady in green armor and Jack & Jill in armor.

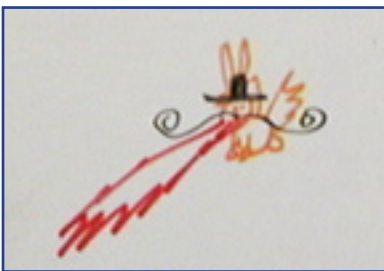


clank, clank, clank, wherever they walked. And they said, "Why do we need armor? It's heavy. It's hot. It's hard to walk around in this stuff."

And she said, "Oh, there's a terrible monster, a horrible monster that will just swallow you alive and dissolve you right out of your armor." And Jack and Jill said, "Oh, that's bad."

Pretty soon other people popped out of the holes in all different colors of armor. There were little babies in armor, and teenagers in armor. Little babies just sit in a ball like that, and they roll them around. And they were all protected. Then pretty soon they heard an alarm: Clang, clang, clang! And everybody jumped down into the hole, and a door closed over the hole, and they were all gone. And Jack and Jill said, "Oops! I think maybe we were supposed to jump down in the hole." But they didn't. They stood in their armor. And they said, "I hope there's no monsters coming." And they looked around here and there and they didn't see any monsters.

And then Jack said, "Look -- up in the sky! There's something coming." And Jill looked. Sure enough, there was something coming. A cute little bunny rabbit with wings was flying in the air. And Jack and Jill said, "Awww, how nice. A bunny rabbit." And then they noticed that the bunny rabbit had a mustache. What else could the bunny rabbit have? A hat. [*Students: Evil Mister Fred!*]



Fire-breathing flying  
Bunny Rabbit.

And the bunny started to zoom down towards Jack and Jill saying, "Oh boy, oh boy, oh boy!" And Jack and Jill went, "Uh-oh, this is bad." And they started to run away. Jack and Jill ran up the mountain, and they zigged and they zagged, and they tried to stay away from the bunny. But it turned out this was a fire-breathing bunny. And Jack and Jill were going "Ooh! Ahh! Ooh! Ahh!" because of the heat.

And as they were running towards the top, Jack was in front, Jill was behind. Jill turned around to see where the bunny was, and Jack stopped at the very edge. But Jill didn't see him stop. And she ran into Jack -- crash! -- and both of them fell over the edge -- "Ahhhhhhhhhhhh!" And there was a loud clang!, clang!, and the bunny said to himself, "Yesss! That's the end of Jack and Jill!" And he flew off.

And Jack said to himself, "I'm dead. I must be in heaven." And Jill said, "Jack, I can hear you. You're not dead." And Jack said, "Well, I feel dead. I can't move." And Jill said, "Well, me neither. I'm paralyzed." Then she said, "Wait a minute. I can wiggle my fingers inside my armor. I just can't move my armor." And Jack said, "What do we do? What's going on?" And Jill said, "I think this is a magnetic mountain. We're stuck to it." And Jack said, "Oh, great. We're going to die here, upside down, stuck to a magnetic mountain."

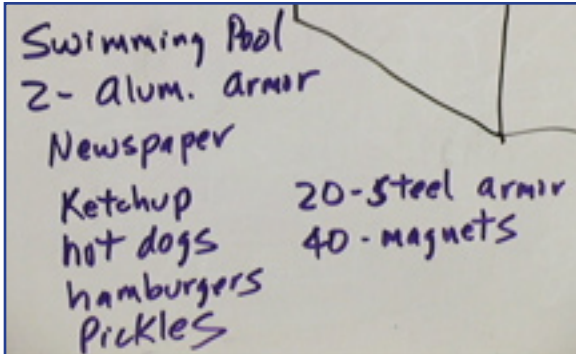


Jack & Jill stuck on the cliff.

About that time, the people came out of their hole. And they looked around and they said, "Oh, no! The two visitors. Where did they go?" And they followed Jill's hair, up Sore Legs Mountain, clear to the top, and they looked over the edge. And there was Jack and Jill, stuck to the cliff. And they said, "Oh, well,

just hang in there. We'll save you." So they grabbed Jill's hair and started to pull -- screech, screech, screech! [Student: What about Jack?] He got tangled up in her hair. So he came up here.

And Jack and Jill got to the top and they said, "Ooh, that Evil Mister Fred! That rotten Evil Mister Fred! I think we should show him what we're going to do to him." And Jill said, "Yeah! We've got a plan. We're going to do something. We're going to catch that Evil Mister Fred. But we need a couple of things. We need a swimming pool." And they said, "Okay. We'll give you a swimming pool." "We need two suits of armor made out of aluminum. We need a lot of newspapers." [Student: Food!] Somebody



Jack & Jill's plan needs these items.

said food. Let's give them some ketchup, hot dogs, hamburgers, pickles, and they need twenty suits of regular armor -- steel armor -- and they need forty big magnets that they can take from the cliff.

And Jack and Jill hollered down the hole and they said, "Can you guys do this?" And the little eyes went blink, blink. Next thing you know, all that stuff popped up out of the hole, ready for them to use. What do you think Jack and Jill are going to do with all that stuff?

## Imagination and Brainstorming Time

[18:40] *[When you get to the cliffhanger, ask the students, "If you were Jack and Jill, what would you do?" Then let them offer solutions for the problem. There are no wrong answers! The purpose of brainstorming is to stimulate their creative imagination, not to come up with the "correct" answer. The solutions don't need to be realistic; in fact, the more imaginative they are, the better. This will help them think more creatively during the experiment that follows.]*

*No one, not even the Teacher, is allowed to criticize anyone's idea. The Teacher gives only positive responses, or at least a non-judgmental acknowledgement such as, "That's an idea," or "They might do that," or simply repeat the student's idea. Don't ask for details or clarification; just accept the suggestion as the student presents it. Every student who has an idea is given a chance to share it, and those who don't are not required to. We don't want students to think they're going to be called on and put on the spot if they don't have an answer. For more suggestions about brainstorming, see "How to Present a Rock-it Science Lesson."]*

We'll leave this To Be Continued . . .

## Experiment: *Build a Magnetic Creature and its habitat*

[19:38] We have an experiment to do. First part of the experiment is, you're going to each get two magnets and you're going to try and make earrings out of them; you're going to try to roll them on the table so they roll perfectly straight, without going crooked; and you can test things around the room to see what they stick to and what they don't stick to. *[Teacher gives each student two half-inch disk magnets, and they wander around the room testing them for a few minutes. Meanwhile, the Teacher sets up the glue guns.]*



A sample creature habitat.

Okay, everybody come and sit down. You're going to get a paper plate. You're going to draw on the paper plate someplace for your creature to live. This creature lives in a volcano and drinks hot lava. This one eats dead octopuses. And this one gets chased around by giant snakes in the sky -- venomous, poisonous snakes.

We're going to make a creature out of fuzz balls, google eyes, pipe cleaners, and foamy pieces. When your creature is done, you're going to make him move around on the plate. *[Teacher puts one magnet on the front of the plate and holds a second magnet on the back of the plate, dragging it around to make the magnet on the front move.]* So if you glue your creature -- let's suppose I'm not very creative, so I make a creature out of a pipe cleaner. Yep, there's my entire creature *[sticks pipe cleaner to front magnet and makes it move around]*. Does it have aluminum wiring in it? *[Student: Metal.]* What kind of metal. *[Student: Steel.]* You're right!

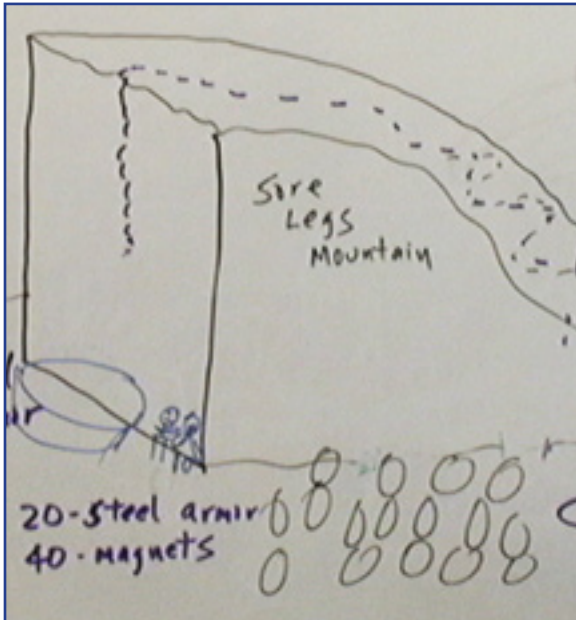


A magnetic creature in its habitat.

*[Teacher passes out plates and supplies, and students color their plates, build their creatures, and make them move around. The video shows only a few minutes of the experiment, but students will spend the remainder of the class working on it, except for the last five minutes, when the Teacher finishes the Crazy Story.]*

## End of Story

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



Twenty suits of armor, a swimming pool, and Jack & Jill hiding at the foot of the cliff.

[25:12] So Jack and Jill had a plan. They were going to stop that Evil Mister Fred. They weren't going to let him get any further than he had. And they got into their two aluminum suits of armor. So Jack and Jill were hiding by the edge of the cliff in aluminum armor. And they put the swimming pool right next to it. There's the swimming pool. And then they had the other suits of armor all full of newspapers. And they gave the little guys under the ground the forty magnets, and the little guys stuck a magnet to the feet of all the suits of armor above them. And they could move the magnets around, and the suits of armor would move up above them on the ground. So it looked like there was people in them. And Jack and Jill said, "I think we're ready. Everybody go down and hide."

So everybody went down into the ground. And the suits of armor were moving around like there was people in them. And they waited. And Evil Mister Fred came flying by, and he said, "I don't believe my eyes! There they are.

They don't know I'm here. Yes! I'm going to swoop down and swallow 'em up one by one." So he did. He went zzzooooop, gomp, gomp, gomp, gomp, gomp, gomp! And before you could say, "Jack be nimble, Jack be swift," he ate all twenty suits of armor, thinking there was people inside.

Now he's all chubbed out with suits of armor. And Jack and Jill ran out from behind the cliff and they said, "Ha, ha, ha, Evil Mister Fred! You can't eat me!" And Evil Mister Fred said, "There's always room for two more." And he started chasing Jack and Jill.



The bunny rabbit got stuck on the side of the cliff.

And Jack and Jill ran up Sore Legs Mountain just like before. And Evil Mister Fred said, "This time I'm not letting 'em get away. This time I'm really going to get 'em!" And they fell over the edge -- ahhhhhhhh! And Evil Mister Fred went over right behind them, going Yaaaahhh! And when Evil Mister Fred got to the magnetic part -- Clangggggg! Evil Mister Fred was stuck to the cliff. And Jack and Jill fell in the pool with a big splash. And they got out of the pool, and Evil Mister Fred was hanging right there, with his mustache and his hat, and he said, "You let me free! What's hanging onto me? I gotta get off here! Arrrrghhh!" And Jack and Jill said, "You're stuck."

And then they went over to the hole, and they said, "Everybody come out! It's time for a picnic. Bring your

hot dogs and your hamburgers and all your food. And long sticks!” And so they brought them all out. And then they’d put a hot dog on the end of a long stick and hold it by Evil Mister Fred and say, “Tickle, tickle, tickle!” And Evil Mister Fred would get mad and go, “Whooom!” and cook their hot dogs with his flames from his mouth. And they all lived happily ever after, except Evil Mister Fred.

[28:37] *End of Lesson*

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

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