



Teacher's Guide for:  
**Bouncy & Stretchy Glue**

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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Bouncy & Stretchy Glue  
A Rock-it Science Lesson  
Filmed June, 2009

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## Intro Quick Recap

*Note: This intro is NOT on the video.*

- Glue contains billions and billions of little guys swimming around in it, and they don't like to get close to each other.
- These little guys are called polyvinyl alcohol molecules. This isn't the kind of alcohol that you drink, or that doctors use to sterilize things.
- To make the little guys stop fighting with each other, you can add a love potion called sodium tetraborate decahydrate -- 20 Mule Team Borax Laundry Booster.
- When you add it to glue, the polyvinyl alcohol molecules attach to each other and make a completely new chemical.

## Experiment Quick Recap: Bouncy & Stretchy Glue

- Mix water into Elmer's Glue and mix it thoroughly. The best glue is Elmer's, because it has the right chemicals, including polyvinyl alcohol.
- Rather than taking the water out, we add to it a glue Love Potion: sodium tetraborate decahydrate, also known as Borax soap.
- If you pour glue on the table and then pour some of the Borax solution onto it, it thickens and becomes easier to clean up. You can use a popsicle stick to help scrape it together.
- Then you can squish it back and forth in your fingers until it turns into rubber. You can tell when it becomes rubber because it bounces and stretches.
- Give each student a small plastic souffle cup and put 1 tbsp of the glue & water mixture in it.
- Add 1 tsp of the Borax solution.
- Students mix it around in the cup with their fingers, then pour it out on the table and continue squishing it around until it becomes rubber.
- Once they get rid of all the water, students can color their rubber with water-soluble colored markers.
- If they keep it in a ziplock bag, it will last for weeks. If they leave it in the sun, it will dry up and become like a rock.



Add water to Elmer's Glue.



Combining the glue and Borax mixtures creates slime.

## Equipment List: "Bouncy & Stretchy Glue"

### Items needed for Teacher:

- Borax Laundry Booster, 1/2 cup
- Water, hot, 1 pint
- Elmer's Glue, 8 oz. (other brands don't work as well)
- Water, 8 oz.
- Craft Stick
- Measuring spoons: 1 Tablespoon and 1 Teaspoon
- Plastic bottle, 1 liter, for Borax & water mixture
- Cup, clear plastic, 16-oz., for glue & water mixture

### Items needed for Students:

#### Consumables (per student):

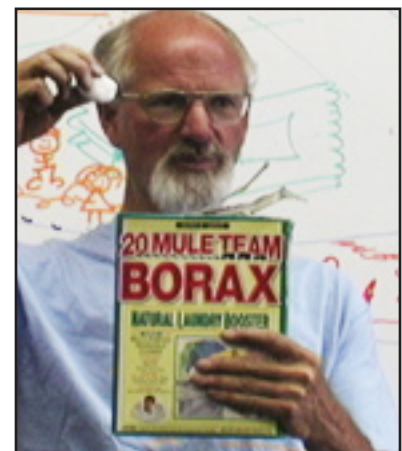
- Plastic souffle cup, 2-oz
- Elmer's Glue solution, 1 Tablespoon
- Borax solution, 1 Teaspoon
- Zip-lock bags, 1-qt. size

#### Other:

- Water-soluble colored marking pens

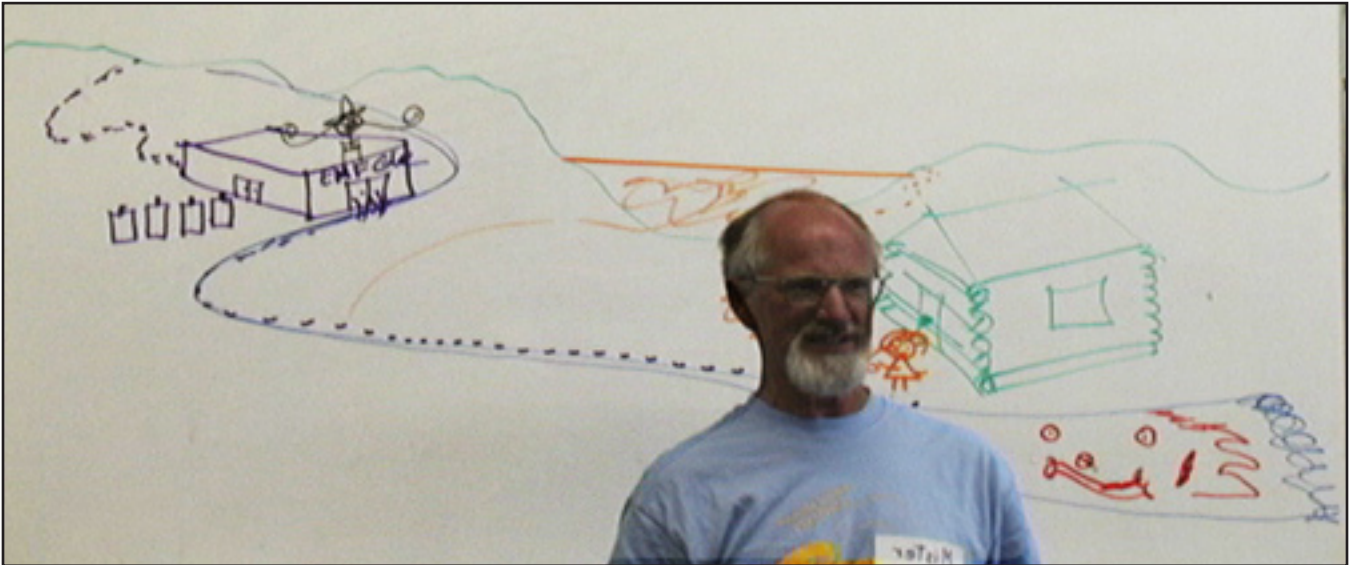
### Prep Work:

- Dissolve 1/2 cup of Borax Laundry Booster into 1 pint of Hot Water well in advance of the class, so the undissolved Borax has time to settle to the bottom of the bottle.
- Mix 8 oz. of Elmer's Glue (other brands don't work as well) with 8 oz. of Water (it will be thin and runny). This is done during the lesson intro.



Borax Laundry Booster

## Story Quick Recap: "Jack & Jill and the Glue Factory"



### Part 1:

- Jack and Jill built a log cabin out in the woods near a river. They piled rocks in the river to make a place to go swimming.
- Next morning they went down to the water and found stuff floating in it -- eyeballs, ears, legs, and a bunch of guts.
- Jack and Jill jumped in and started playing with the gross stuff. They got sick from it.
- After they got better again, they walked upstream to find out where the stuff was coming from, and they discovered that Evil Mister Fred had built a glue factory.
- He brought animals in the back door, dumped animal parts out the front door into the river, and sent bottles of glue out the side door.
- Jack and Jill told Evil Mister Fred that it was against the law to throw animal parts in the river, but he didn't care. He said the local policeman was his brother, his uncle worked at the Environmental Protection Agency, and his cousins were on the Supreme Court.
- Jack and Jill walked away. Jack was so angry he started to throw rocks and kick dirt. There was a desert nearby, and he grabbed a bunch of dirt from the desert and threw it in the river. And he grabbed a bunch of glue and threw that in the river, too.

## Story Quick Recap (cont.)



### Ending:

- Evil Mister Fred told Jack and Jill the water was fine. He jumped into the water above his factory and was swimming around and even drinking it.
- Jack got a bunch of glue and poured it into the water above Evil Mister Fred.
- As the glue came down, it got onto Evil Mister Fred.
- Jack got some dirt from the desert (which happens to be sodium tetraborate decahydrate -- the glue love potion) and threw it in the water.
- When Evil Mister Fred got covered in the glue and the dirt, he got all gobbled up in it.
- As he went down the river, he got all caught up in the eyeballs, ears, intestines, and stuff.
- He became a rubbery piece of junk. People came and thought he was garbage, so they put him in a garbage truck and hauled him away.

## Transcript: Introduction *(Note: This intro is NOT on the video)*

Here is a bottle of white glue. It has little guys swimming around inside that hate each other. If one gets too close to another he'll say, "Get away from me! You're too close! Stay back!"

The whole bottle is filled with billions and billions of these little guys. Chemists call them polyvinyl alcohol molecules. This is not like the alcohol that you use to drink... that's called ethyl alcohol, and it's not like the alcohol that doctors use to sterilize things, that's called isopropyl alcohol.

Now, it turns out that there is a way to make them stop fighting with each other. There is a common chemical that we can add to help them out... kind of like a glue love potion. You can buy it in grocery stores and I like to call it sodium tetraborate decahydrate! But the store people call it 20 Mule Team Borax Laundry Booster.

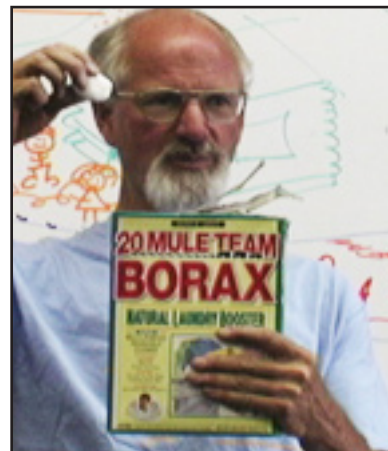
When you add it to white glue, all of a sudden the little guys say, "My buddy!" and hug each other. When the polyvinyl alcohol molecules attach to each other, they make a completely new chemical that we'll use today in our experiment.

## Story: "Evil Mister Fred's Glue Factory"

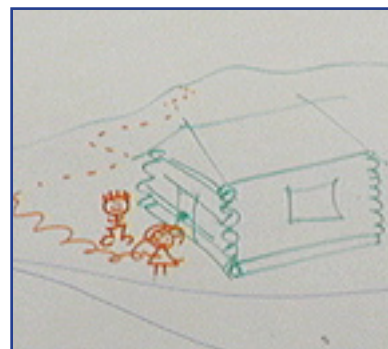
Well, we're going to take some of this glue and goof around with it and see what it will do for us. But first we need a fairly quick crazy story.

Once upon a time, Jack and Jill bought a cabin out in the woods. A cabin is made out of logs (laying on top of each other). And they had logs this way, and they put a roof on it. They put a window in it, and a door. And they were up in the hills, and there was a river coming from the hills by their cabin. And they piled rocks in the river, and they made a place where they could go swimming. And this was a perfect spot for Jack and Jill. And Jack and Jill loved it here. There was Bambi the deer, Thumper the rabbit, there were bluebirds, and every morning they had good food for breakfast, and then they went playing. And they thought, "It couldn't get any better than this! We can do anything we want. We can go hiking, we can go swimming, we can climb trees. I love this place."

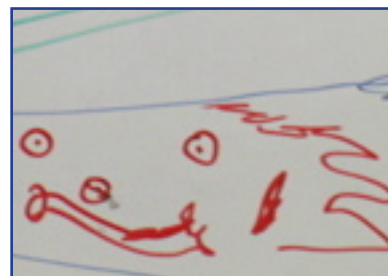
Well, the next morning they got up and they jumped in the water, and there was a bunch of eyeballs floating in the water. And there were some ears floating in the water, and a few legs, and a bunch of guts. And Jack said, "Oh, that's gross!" And he jumped in. He started playing with the pieces of stuff, making ropes out of the guts, juggling the eyeballs, he put the ears on his head, and Jill said, "Oh, Jack! You shouldn't do that. You're going to get sick. . . I want to do it, too!" So she jumped in. And they got all sick, but when they got well again, they said, "We



Borax Laundry Booster



Jack & Jill's cabin by the river.



Eyeballs and guts in the river.

better find out where all this junk is coming from. Somebody is polluting our river."

So when they were completely well, they walked upstream and they discovered that the Evil Mister Fred had built his own place upstream. Curse him! And Evil Mister Fred was making glue. And in the back door came all kinds of animals. Whatever kind of evil animals or good animals Evil Mister Fred could capture, he had them go in the back door. Out the front door came animal parts that he threw into the river, and out of the side door came bottles of glue. They call it animal hide glue. And he sold the glue to people who made all sorts of things.

And Jack and Jill said, "Evil Mister Fred, it's okay to make glue, but it's not okay to throw animal parts in the river." And Evil Mister Fred said, "Says who?" And Jack and Jill said, "Says the law!" And Evil Mister Fred said, "Well, what are you going to do about it?" And Jack and Jill said, "We're going to call the police." And Evil Mister Fred said, "Well, you just do that. In fact, here's the phone number of the local policeman. He's my brother." And Jack and Jill said, "Your brother? Are you kidding?" And Evil Mister Fred said, "Yeah. Why do you think I built this place here?" And Jack and Jill went, "Arrgghh." And they said, "Then we're going to call the Environmental Protection Agency." And Evil Mister Fred said, "Yeah, my uncle!" And Jack and Jill said, "Then we're going to call the Supreme Court!" And Evil Mister Fred said, "My cousins!" And Jack and Jill said, "Arrgghh."

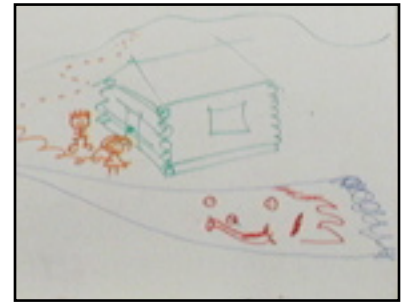
And they walked away and Jack was so mad he didn't know what to do. He said, "Awww," and he was starting to throw rocks and kick dirt. And there was a desert back there, and he went and ran over to the desert, grabbed a whole bunch of dirt, and threw it in the river. And then Jill said, "Jack, why are you throwing dirt in the river? It's just making it worse." Jack said, "Because I'm mad!" And then he went and grabbed a bunch of glue and he threw that in the river. And Jill said, "Now you're really making a mess." And Jack said, "Arrgghh!"

If you were Jack and Jill, wanting to stop Evil Mister Fred from doing these terrible things, what would you do?

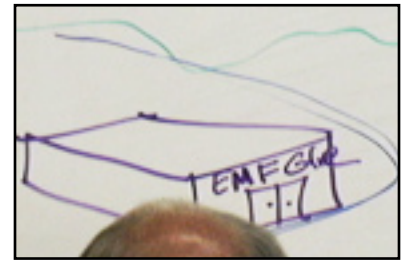
### Imagination and Brainstorming Time

[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.)

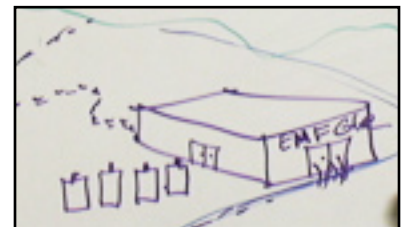
We'll leave this To Be Continued . . .



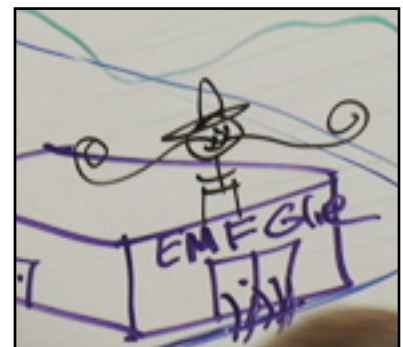
The cabin and polluted river.



Evil Mister Fred's factory.



Animals come in the back door, glue comes out the side door, and leftover animal parts are dumped into the river.

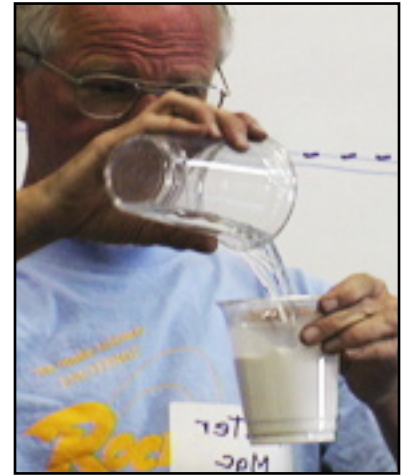


Evil Mister Fred isn't afraid of the law.

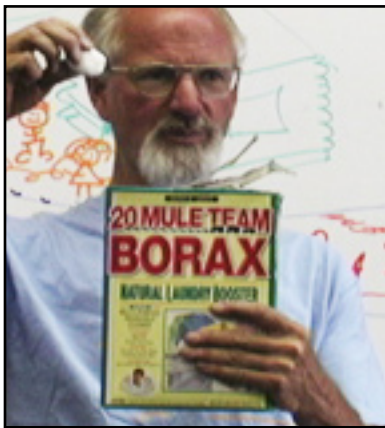
## Experiment: *Bouncy & Stretchy Glue*

Here we have the glue we were talking about, and water. Plain old Elmer's Glue. We mix the water into the glue and stir it all up. Once it's thoroughly mixed -- of course you can do this at home. The best glue we've found isn't ordinary el cheapo white glue. The best glue is Elmer's Glue, because it has the right chemicals. The glue has a chemical in it called polyvinyl alcohol -- PVA. That you don't drink. There's lots and lots of kinds of alcohol.

Now, we're going to add to this -- rather than trying to take the water out, which takes forever and doesn't work that great -- we're going to add to it glue love potion. Love Potion Number Nine. It's something that you probably have around your house, or at least it's at your grocery store. And when I tell you the name of it, you'll say, "Oh, yeah, I eat that all the time!" Are you ready? Sodium tetraborate decahydrate.



Add water to Elmer's Glue and stir thoroughly.



Borax Laundry Booster

And sodium tetraborate decahydrate is called Borax soap. You put it in your washing machine to help get your clothes cleaner. It ties up all the minerals in your water. It's a white powder. If you put sodium tetraborate decahydrate in your water, some of it dissolves. Not very much of it dissolves. When it dissolves, it leaves some white stuff at the bottom, and a little bit of cloudy stuff at the top.

If you pour some of this [glue] on the table and say, "Oh, no, Mom, I made a big mess," and you try to clean it up with your fingers, now you've got a big mess on your fingers. So then you say, "Oh, now what?" But you put the love potion in there [pours some of the Borax solution onto the puddle of glue mixture]. It

makes the molecules of the polyvinyl alcohol stick to each other, and it turns into slime. And it becomes easier to clean up. If you have a popsicle stick . . . [scrapes up the mixture with the side of the craft stick]. This is really good if you have dirty hands.



Combining the glue and Borax mixtures creates slime.

And you can gush it out of your fingers. You pretend like it's guts. They love guts. You keep squishing it and squishing it so it gushes out between your fingers, and after awhile it starts to change. After awhile it turns into rubber. This is called vinyl-type rubber. And you can tell it's rubber because it bounces. Plus, it stretches.



Gush it out through your fingers.

Okay, so you guys are going to make some. My lovely assistant will give you each a cup with stuff in it. After Jen gives you the cup and Greg gives you the goo, I'll come by and pour in some of the love po-





Students get 1 tbsp glue mixture and 1 tsp of Borax mixture.



After the mixture turns to rubber, students can color it with water-soluble markers.

tion. You stir it with your fingers and see what happens.

Okay, stir it all up good. After it gets to be all gunky, then you take it out and play pat-ticake with it. Try and get all of it out of your cup. And then gush it all around really good.



Stirring mixture with fingers.

Dump it out on the table. Get rid of all the water that's in it.

When you get a marker, draw on them. You can turn it into boogers if you use yellow and green.

If you put it in a bag, it'll last for weeks and weeks. If you leave it out in the sun, it'll dry up and become like a rock. We'll give you the bags.

## End of Story

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

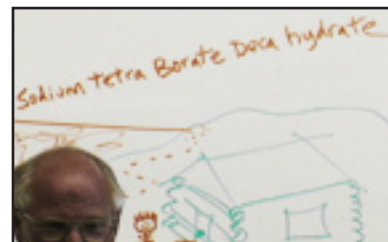
Evil Mister Fred was killing poor innocent animals, making glue out of them, and throwing the leftover body parts into the river and polluting the whole river, and Jack and Jill didn't like that. And they discovered that Evil Mister Fred's relatives were all the people in charge of the laws. And they said, "What are we going to do?" Jack was so mad, he was throwing dirt in the water and glue in the water, and all kinds of stuff.

And Evil Mister Fred said, "I don't see what you're complaining about. The water is fine. And Evil Mister Fred jumped into the river above his place, he was swimming all around saying, "See, it's perfectly good water. You can even drink it." And Jack said, "Cool!" So he got a whole bunch of glue, ran around the building, and poured it into the water above Evil Mister Fred. And the glue started coming down, and now Evil Mister Fred is getting in his own glue. And Jack ran over to the desert, got some of the dirt from the desert, which happens to be sodium tetraborate decahydrate. That was the love potion you added to your glue.

And when it met with Evil Mister Fred swimming in the water in the glue, Evil Mister Fred got completely gobbled up in gluey stuff. And the more he struggled, the more gobbled up it became. And Evil Mister Fred got mad, and he started trying to run down the river, and as he went down the river, he got all caught up in the eyeballs and the ears and the hoofs and the intestines. Pretty soon Evil Mister Fred was a giant rubbery piece of junk. And people came and they said, "Oh, look -- garbage." And they picked it up out of the river and put it in a garbage truck. And everybody lived happily ever after except Evil Mister Fred.

## End of Lesson

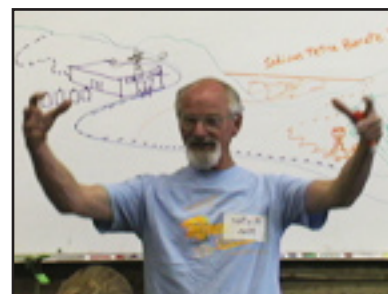
[If you have questions about this lesson, please ask them through the online Discussion Forum on our web site.](#)



Jack's dirt from the desert was Sodium Tetra Borate Deca Hydrate.



Evil Mister Fred got all gobbled up in the gluey stuff.



People picked up the Evil Mister Fred garbage and put it in the garbage truck.