

# Experiments With Oobleck

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**Objective:** To learn how pressure affects a non-Newtonian fluid.

**Grade Level:** 5-8

**Subject(s):** Science

**Prep Time:** 10-30 minutes

**Duration:** 45 minutes

**Materials Category:** Household

National Education Standards	
Science	2, 3a
Mathematics	
Technology (ISTE)	
Technology (ITEA)	
Geography	

## Materials:

- Water
- Two boxes of cornstarch
- Food coloring (optional)
- Plastic bags (one per student)
- Plastic cups (one per group)

## Related Links:

University of Arizona—Science Connection—Oobleck and Glurch

<http://student.biology.arizona.edu/sciconn/oobleck/oobleck.html>

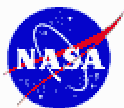
Boston College—Oobleck Lesson Plans

<http://www2.bc.edu/~johnsech/lessonplans.html>

## Supporting NASAexplores Article(s):

Magnetic Fluids: Sticking Around

[http://nasaexplores.com/show2\\_article.php?id=03-010](http://nasaexplores.com/show2_article.php?id=03-010)



# Experiments With Oobleck

Teacher Sheet(s)

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## Pre-lesson Instructions

- You can make Oobleck before the lesson begins, or you can have the students make it themselves. If you want to make it beforehand, put  $\frac{1}{2}$  quart of water and food coloring in a large bowl. Begin adding cornstarch and mixing. The mixture will get thicker, keep adding and stirring. You will know when you have created Oobleck—the mixture will be too hard to stir quickly!
- Dispose of Oobleck in the trash can. **DO NOT WASH OOBLECK DOWN THE DRAIN!**
- Let the students take the Oobleck home with them by putting it in a plastic bag.

## Background Information

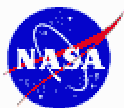
Oobleck is an interesting substance. When little pressure is applied, it flows like a liquid. A spoon or your finger can easily be pushed to the bottom of a cup of Oobleck if you do it slowly. When more pressure is applied, Oobleck begins to act like a solid. It will keep its shape and resist movement. Stirring Oobleck quickly is impossible. Since Oobleck doesn't follow the rules of most liquids, we call it a non-Newtonian fluid.

So, what makes Oobleck act like both a liquid and a solid? The mixture can be thought of as a suspension. The little grains of cornstarch do not dissolve in the water. They mix with the water, but they stay intact and solid. If you let the mixture stand for a while, the starch will settle to the bottom and a layer of clear water will form on top.

To further explain Oobleck's strange behavior, imagine each granule of cornstarch surrounded by water. The surface tension of the water keeps it in the spaces between the granules. The cushion of the water provides quite a bit of lubrication and allows the granules to move around. Rapid movements cause the water to be squeezed out from between the granules, and the friction between them increases rather dramatically.

## Guidelines

1. Read the NASAexplores 5-8 article, "Magnetic Fluids: Sticking Around."
2. Write the words "Liquid" and "Solid" on the board. Ask students to describe something that is liquid, and write describing words on the board. Repeat this with something that is solid.
3. Explain that the students are going to be doing experiments today with a substance that may fit into both of these categories.
4. Divide the class into pairs, and hand out the Student Sheets.



5. Go over the activities that the students will be doing, and be sure the class understands all directions.
6. If you have made the Oobleck in advance, give each pair a small cup of it. If the students are making the Oobleck, pass out the supplies.
7. Allow time for the class to complete the activities with the Oobleck.

### **Discussion / Wrap-up**

- Discuss how Oobleck has properties of both a liquid and a solid.
- Go over the work on the Student Sheets.
- Explain that Oobleck is a non-Newtonian fluid.

### **Extensions**

- Research to find other non-Newtonian fluids.
- Have the students design a vehicle that could travel across a “sea” of Oobleck.



# Experiments With Oobleck

## Student Sheet(s)

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### Materials

- ½ cup of cornstarch
- ¼ cup of water
- Food coloring (optional)
- Plastic cup
- Plastic bag

### Procedure

1. If your teacher has already made Oobleck for your class, get some of it in a small cup, and skip to Step 2. If your teacher has not made Oobleck, follow all directions below.
  - a. Place ¼ cup of water in the plastic cup. Begin slowly adding cornstarch and stirring constantly. When the mixture begins to get thick, keep adding and stirring.
  - b. When the mixture becomes too hard to stir quickly, you've made Oobleck.
2. The first part of your experiment with Oobleck involves observation. Play with the Oobleck. Pour a little in your hand, and see how it reacts when you push on it. Write your observations in your science journal.
3. Do the following tests on your sample of Oobleck, and write what happens in your science journal.
  - a. Slowly poke your finger into the Oobleck.
  - b. Quickly poke your finger into the Oobleck.
  - c. Pour Oobleck into a plastic bag  
(Does it pour? Does it take the shape of the bag?)
  - d. Roll the Oobleck into a ball.
  - e. Tap the Oobleck with a pencil.
  - f. Bounce the Oobleck (on your desk, not the floor).
4. Make your final observations, and answer the following question: Is Oobleck a solid or a liquid? Support your answer with information you gathered during your experiments.
5. Clean up your area. Wipe off any area the Oobleck may have touched. Place the Oobleck in a plastic bag to take home or throw in the trash.

