



# THE SCIENCE OF “FRINGE”

## EXPLORING: STATIC ELECTRICITY

A SCIENCE OLYMPIAD THEMED LESSON PLAN  
EPISODE 321: The Last Sam Weiss

### Overview:

Students will learn about static electricity and how it is created and dissipated.

**Grade Level:** 9-12

### Episode Summary:

While Peter remains hospitalized in a coma, Olivia and Sam work together to find a hidden document that will lead to a ‘crowbar’ that can be used to pry open the force field preventing Peter from entering the doomsday machine. Meanwhile, more and more environmental anomalies are occurring, ranging from minor earthquakes to large bolts of lightning. Peter spontaneously wakes up and leaves the hospital unescorted, heading for ‘home’ in New York City. Once the secret of the crowbar is discovered, the team searches for Peter in order to enable him to finally activate the machine.

### Related Science Olympiad Event:

Experimental Design - Given a set of unknown objects, teams will design, conduct, analyze and write-up an experiment.

### Learning Objectives:

Students will understand the following:

- Static electricity is the buildup of electric charge on an object that is an electrical insulator.
- When two electrically dissimilar materials are in contact with each other, electrons may migrate from one to the other, resulting in a charge imbalance between the two.
- Static electricity can be prevented and dissipated by the use of an electrical conductor, such as a wire or humid air.

**FOX CODE**



**FOR SMARTPHONES**



### Episode Scenes of Relevance:

- Nate and his parents driving on the freeway (3:03 'hey dad' – 4:15 lightning strikes)
- Olivia and Sam getting the key from the museum (19:16 'the key' – 20:17 'bowling alley')

### Online Resources:

- Fringe "The Last Sam Weiss" full episode: <http://www.fox.com/watch/fringe>
- Science Olympiad Experimental Design event: [http://soinc.org/exper\\_design\\_c](http://soinc.org/exper_design_c)
- Science Made Simple: Static Electricity: <http://www.sciencemadesimple.com/static.html>
- PhET Static Electricity interactive simulation: <http://phet.colorado.edu/en/simulation/balloons>
- Physics First: Static Electricity resources: <http://www.compadre.org/precollege/static/unit.cfm?sb=9&course=2>

### Procedures:

1. Tell your students that they are going to learn about static electricity.
2. Have your students research static electricity in resources such as physics textbooks and websites and discuss what they have learned.
3. Have your class complete the following activity in small groups:
  - a. Materials: rolls of scotch tape, rulers, a smooth surface such as a table top
  - b. Adhere 2 pieces of tape at least 8 inches long to the smooth surface, not touching each other. Leave a small tab at the end of each piece to hold onto.
  - c. Quickly peel them off (but not so quickly that they curl up). Hold only onto the tab and ensure the tape doesn't touch anything else.
  - d. Bring the 2 hanging pieces of tape close to each other and watch them repel each other due to the static electricity on them.
  - e. Measure the distance between the ends of the tape as a quantitative indicator of how much static charge there is.
  - f. Discuss with your group possible ways to repeat this experiment with different variables to test the amount of static charge built up. Example variables include length of the tape, speed of removal of the tape, and which sides of the tape faces each other.
  - g. Conduct your experiment and record the results on a graph.
4. Discuss with the class the results of the activity. Be sure to address:
  - a. Why do the pieces of tape no longer repel each other once they touch something?
  - b. Do shorter or longer pieces of tape repel more?
  - c. How could they make the pieces of tape attract each other instead?

### Additional Discussion Suggestions:

- Static electricity can build up on other objects as well. For example, try rubbing a balloon against a wool sweater and then hold it near long hair. Why does the hair react that way even though it wasn't explicitly 'loaded' with static electricity?

# FRINGE



- Lightning is essentially a very large static electricity discharge. How does the static electricity that causes it form?
- A Van de Graaff generator is often used in science demonstrations to show the buildup of a large amount of static electricity on an object. How does the generator work?

## Extension to Other Subjects:

History: The invention of the Leyden jar is considered to be a critical event that allowed for many early experiments in electricity. Research what a Leyden jar is and how it was used to discover many of the fundamental principles of electricity.

Geography: Some areas are more prone to lightning storms than others. Research what causes this and what precautions local populations can take to reduce the risk of a lightning strike.

Art: Static electricity is often used in relation to painting to ensure an even coating of paint is applied. Research some of the techniques utilized by painters and why they are important.

## National Science Standards Alignment:

H.A.1 Abilities necessary to do scientific inquiry

- c. Use technology and mathematics to improve investigations and communications.
- d. Formulate and revise scientific explanations and models using logic and evidence.
- e. Recognize and analyze alternative explanations and models.
- f. Communicate and defend a scientific argument.