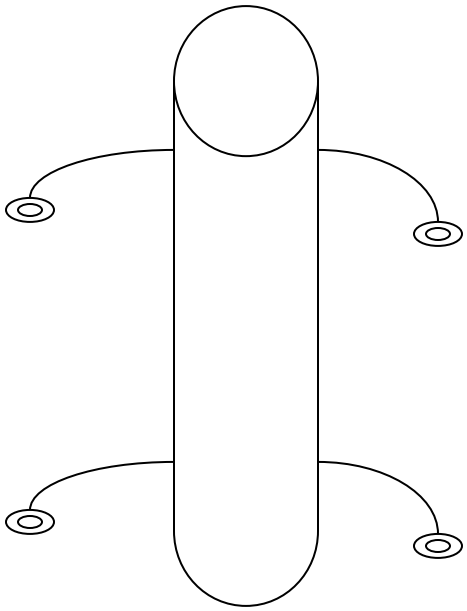
# The Mystery Tube



Purpose: The students will be able to…

- Compare observations and inferences
- Use a constructed model to test a hypothesis.

Nature of Science Standards Addressed:

**N.8.A.2** Students know how to critically evaluate information to distinguish between fact and opinion.

**N.12.A.5** Students know models and modeling can be used to identify and predict cause-effect relationships.

## Introduction

The Mystery Tube activity engages the students in the nature of science by exposing students to techniques and ways of thinking that parallel real scientific investigation. As the students interact with the tube, the wonder, "What is going on in there!" Any bead that you pull on will make the extended piece of rope retract into the tube. If rope number one is extended pull on rope two, three, or four to retract it. This process can be repeated as many times as you wish, to the amazement of the students. A materials list and steps for construction are included in the end of the activity.

Engagement, Exploration, & Explanation:

1. Start the activity by pulling two ropes back and forth, directly opposite one another. This would make the students think a single rope is being pulled back and forth.
2. Discuss that when scientists make observations about events they often make hypothesis about the cause of those events. They try to explain the underlying mechanism causing the event.
3. Ask the students to make a hypothesis about the connection of the ropes inside of the tube. **DO NOT OPEN THE TUBE.**
4. Pull one of the ropes not directly opposite the extended rope causing it to retract. Continue pulling those two ropes back and forth. This will cause many of the students to revise their original idea of how the ropes are connected inside of the tube.

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www.bsu.edu/web/fseec/pie/Lessons2/General%20Science/**Mystery**%20**Tube**.doc

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5. Explain that when scientists make new observations that contradict their original hypothesis, they must modify or totally change their original hypothesis.
6. Explain that scientists perform experiments or make more observations to test their new or modified hypothesis. This process of experimentation and hypothesis modification should continue until a hypothesis can explain all of the observed data.
7. Continue this interaction until students think they have a working hypothesis that explains all of the observations, about how the ropes are connected inside of the Mystery Tube.
8. Discuss how the ability to observe the underlying mechanisms responsible for certain events is impossible. In order to test their hypotheses about an underlying mechanism, scientist often make a model to simulate the mechanism in order to reproduce its effects. These models range from mathematical models to mechanical models.
9. Hand out cardboard toilet paper tubes, scissors, and string. Tell the students to test their hypothesis by making a mechanical model that mimics the behavior of the Mystery Tube.
10. Have student groups share their hypotheses and models with the rest of the class. Discuss how this portrays the interaction and collaboration of the scientific community. **Do not reveal how the ropes are actually connected!!**

Conclude with a discussion about the limited scope of science. Even when models have incredible predictive ability or can mimic observed behavior perfectly, scientists can never be absolutely sure they are accurately describing the underlying mechanisms responsible for the observed phenomena.

## Evaluation:

The following questions can be used for an informal concluding discussion, or they can be used as a part of a formal write-up.

1. Why do scientists use models?
2. Describe one example of a model that can help you learn about something that is too small to see.
3. Describe one example of a model that can help you learn about something very big.

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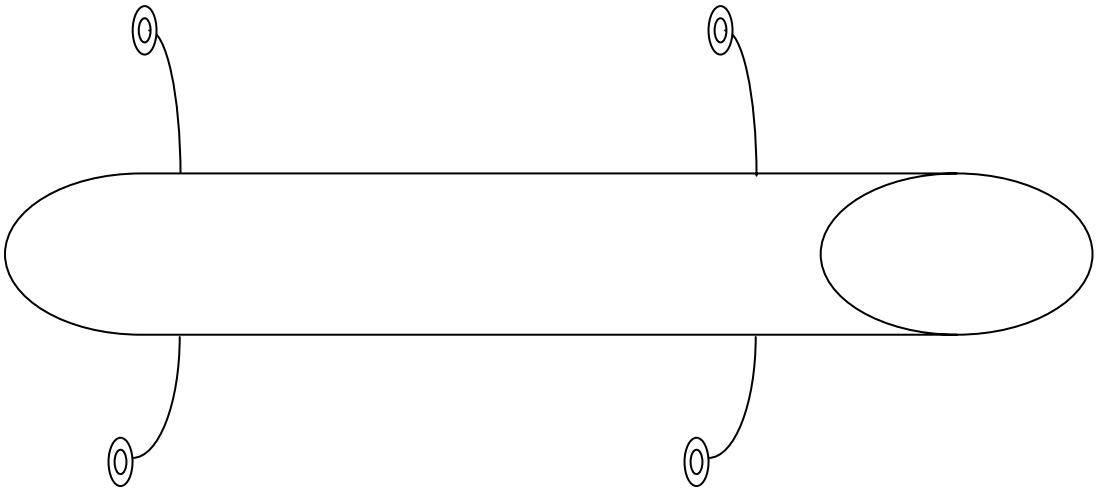
# The Mystery Tube

Use the diagram below to draw your initial prediction. Once to experiment with the tube, list observations and inference about the tube (DO NOT OPEN IT), then diagram your final conclusion.

**Initial Hypothesis/Sketch**



Date Table #1: Observations and Inferences of Tube #_____

| Observations | Inferences |
|---|---|
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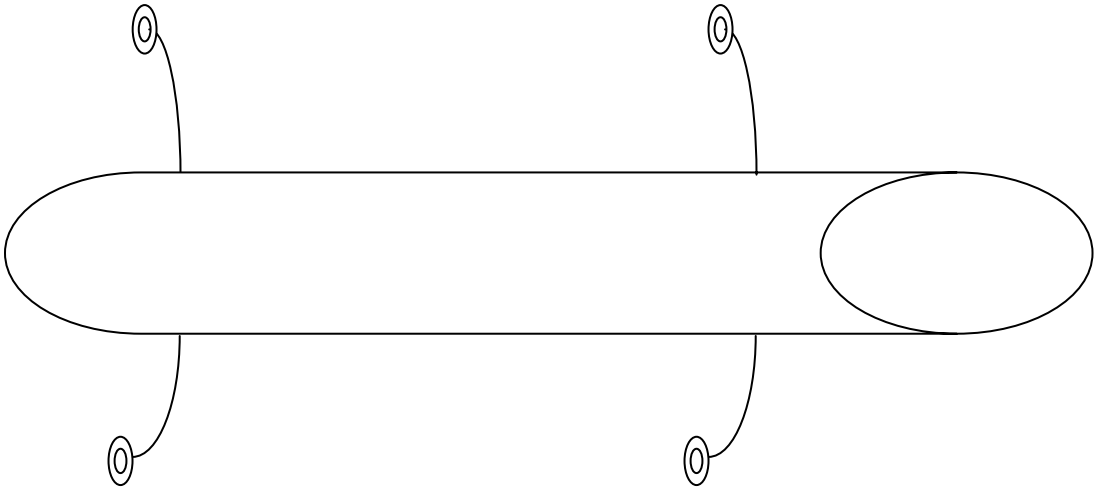
**Final Conclusion**



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