



## Winning Experiment Procedures from the NIH LAB Challenge

### Euglena, the Phototaxic Protozoa

**By:** Michael Espey

**From:** National Institute of Diabetes and Digestive and Kidney Diseases, NIH

**Suggested grade level:** elementary school

#### Background

The free living single cell protists *Euglena* are unique in their ability to obtain energy by mitochondrial respiration (food) or chloroplast photosynthesis (light). *Euglena* uses their eyespot to orient and direct themselves via flagellar motion toward light sources in a process termed phototaxis. *Euglena* are microscopic. To the human eye, *Euglena* swimming in water have the appearance of a greenish haze.

#### Objective

Students learn to appreciate the diversity of life and consider what constitutes a plant or animal. Students also learn about experimental design by using a control and test group.

#### Hypothesis

*Euglena* move in a directed manner toward a light source.

#### Duration

Total in-class time: about 15 minutes

Set-up time: 1 minute

Experiment's run time: 8 to 10 minutes

Take-down time: 1 minute

#### Materials

- *Euglena gracilis*
- A desk lamp with an incandescent light bulb
- Two glass jars with lids (for example, pickle jars)
- Two sheets of opaque paper (for example, black construction paper)
- Two pieces of tape
- A pair of scissors

Stock *Euglena gracilis* can be obtained from Carolina Biological Supply for \$16.00; ATCC also sells the organism frozen at a higher price.

#### Procedure

1. Divide *Euglena* equally into two separate jars containing normal tap water.
2. Fasten the lid loosely on each jar.
3. Wrap one jar completely in opaque paper (taped to fasten). This is the control jar.

3. Wrap the other jar completely in opaque paper (taped to fasten) except that that you've cut a numeral corresponding to the students' grade level (about 1 inch tall). For example, third graders would cut out the number 3.
4. Position both jars side-by-side a few inches from the lamp bulb.
5. Point the lamp at the cut-out portion of the test jar and corresponding covered portion of the control jar. Turn on the lamp.
6. Wait for 8 to 10 minutes.
7. Turn off the lamp.
8. Remove the paper from the control jar.
9. Remove the paper from the test jar.

### Results

No changes are evident in the control jar. In the test jar, *Euglena* have gathered on the glass next to the cut-out portion of the jar in the shape of the numeral.

### Conclusions

*Euglena* are phototactic, which means they have directed motility toward a light source. The control jar shows that in the absence of a gradient of light, these organisms are randomly distributed in solution.

During the experiment, teachers can draw a picture of *Euglena* and review the anatomy of key organelles (mitochondrial, chloroplast, eyespot, flagellum) and discuss their function. You can also discuss experimental design (test versus control conditions) and classification of life: plant, animal, etc. If the classroom has a microscope, students can directly observe the *Euglena*.

*This experiment is a classic. Cutting out the grade number is my variation, which always draws a big cheer when I have performed this experiment with grade school students!*

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