# BIOLOGY / PHYSICAL SCIENCE

**Activity:** Molecular Genetics of Color Mutations in Rock Pocket Mice

**Topic:** Evolution, Genetics

**Resource Type:** Activities

**Description:**

In these activities, students transcribe and translate portions of the rock pocket mouse Mc1r gene to further explore the genetic variations responsible for different coat colors as described in the short film Making of the Fittest: Natural Selection and Adaptation.

By comparing DNA sequences, students identify the locations and types of mutations responsible for the coat-color change described in the film. Students will form a hypothesis to explain how a change in amino acid sequence affects the functionality of the MC1R protein, and how that change might directly affect the coat color of the rock pocket mouse populations. Please note this week's activity covers the same content as last week, but also includes concepts of protein structure, protein domains, and how the mutation location can affect phenotypic expression.

**Week 5 Directions:**

1) Read the introduction in the "Activity Handout" for this activity.
2) Watch the film *The Making of the Fittest: Natural Selection and Adaptation*.
3) Complete the Activity Handout below.

**Activity Handout:** https://www.biointeractive.org/sites/default/files/Mouse-Molecular-Genetics-Student-Activity-2.pdf

**Video Link**: https://www.hhmi.org/biointeractive/making-fittest-natural-selection-and-adaptation

**Key Terms:** adaptation, amino acid, trait, variation

FREIRE SCHOOLS

# CHEMISTRY

**Activity**: Build a Molecule

**Topic**: Atoms, molecules, molecular formula

**Resource Type**: Interactive Media

**Description**:
Starting from atoms, see how many molecules you can build. Collect your molecules and see them in 3D!

**Week 5 Directions:**

1. Download the sim: https://phet.colorado.edu/en/simulation/legacy/build-a-molecule
2. Explore all of the controls in both tabs of the sim for 5 minutes.
3. Answer the questions below.

*Please note you must have Java installed on your computer.*

**Activity Questions**

1. Build all the molecules in the collection "Your Molecules: Collection 1".

2. Choose one of the molecules from your collection and draw it. Include the molecule's name and the number of atoms it is made of.

3. Consider the following:
   A **coefficient** is a large number in front of the molecular formula.
   2 $H_2O$ means there is more than one molecule and multiples of atoms.
   In this case, **2 water molecules** with **4 hydrogen atoms** and **2 oxygen atom**s.

4. Click on the "Collect Multiple" tab at the top of the screen.
   a. Choose collection 1 or 2 and build the entire "collection" with your partner.
   b. Be on the lookout for the smiley face symbol—it means you have the collection completed.

5. Consider which atoms you would need to build **$2CO_2$** molecules in collection 1.
   a. What is the **name of the molecule** when 2- oxygen atoms bond with 1- carbon atom?
   b. If you have $2CO_2$ molecules, how many **different types of atoms** are there?
   c. Fill in the chart to help you organize the type of atom(s) and the number present in the 2 molecules of CO2.

| **Name of atom** in molecule | Number of atoms present |
|---|---|
| | |
| | |
| | |

6. In the "Larger Molecules" section, find the kit you will need to build a **$SiH_4$** molecule. **What is the name of this molecule?**

# ENVIRONMENTAL SCIENCE

**Activity:** Tracking Lion Recovery in Gorongosa National Park

**Topic:** Human Population & Impacts, Conservation

**Resource Type:** Videos

**Description:**

This video describes how scientists in Gorongosa National Park are using GPS satellite collars and motion-sensitive cameras to gather data about the recovery of the park's lion population.

Gorongosa National Park was once famous for its lion population, attracting tourists from all over the world. But during Mozambique's struggle for independence and subsequent civil war, the park's iconic wildlife was slaughtered. In 2008, a massive ecosystem restoration project began. Today, many animals are bouncing back in large numbers, but it's unclear whether the lions are also making a strong recovery.

Ecologist Paola Bouley heads the Gorongosa Lion Project, an effort to document the lions' response to the park's restoration and identify any factors that may limit their recovery. Working with Mozambican scientists Celina Dias and Domingas Alexio, Bouley is using GPS satellite collars and trail cameras to identify new lions and gather data about their behavior. These tools are also proving invaluable in protecting lions against poachers.

The accompanying "Student Worksheet" incorporates concepts and information from the video.

**Week 5 Directions:**

1) Watch the Video.
2) Complete the *Student Worksheet*.

**Activity Handout:** https://www.biointeractive.org/sites/default/files/TrackingLions-StudentWS-SW.pdf
**Video Link:** http://www.hhmi.org/biointeractive/tracking-lion-recovery-gorongosa-national-park

**Key Terms:**

Africa, camera, GPS, poaching, restoration, scientific methodology, scientific process, technology

FREIRE SCHOOLS

# PHYSICS

**Activity:** Density

**Topic:** Density, Mass, Volume

**Resource Type:** Interactive Media

**Description:**
Why do objects like wood float in water? Does it depend on size? Create a custom object to explore the effects of mass and volume on density. Can you discover the relationship? Use the scale to measure the mass of an object, then hold the object under water to measure its volume. Can you identify all the mystery objects?

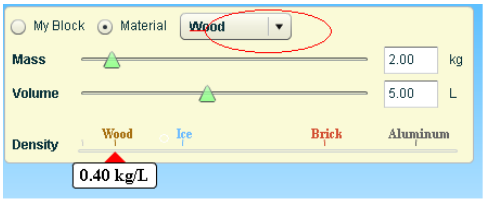
**Week 5 Directions:**

1. Interact with the sim: https://phet.colorado.edu/en/simulation/legacy/battery-resistor-circuit
2. Answer the questions below.

*Please be sure you have installed Java on your computer.*

**Questions:**
*Note: "Sink" means "stays on the bottom."*

1. Click on the "Run Now" button. Experiment with choosing a material.




2. Put the materials in the correct boxes:

| Material | S=sinker F=Floater | Density given |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

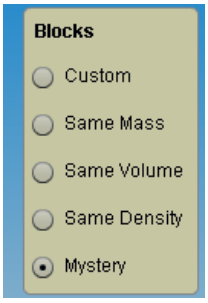
3. Try to get aluminum to **float**. Can you change the mass of the aluminum block without changing the volume of the aluminum block?

4. What do you notice about the **density triangle** at the bottom of the box? Why do you think this does or does not move?

5. How does the density of aluminum (2.70 kg/L) help explain what you see?
**Frame:** The aluminum will _____ in the water because the density of the aluminum is _____kg/L____ and the density of water is _____kg/L_. We have learned that _____.

6. Density: _____ over _____ equals _____.

7. In the "Blocks" box, click on **"Mystery".** Test the boxes in the water—just drag and drop!




When you have determined which ones sink and float, fill in the data table for each box.

| Sample | Starting volume of water (A) | volume of water and block (B) | Volume of block alone (difference B-A) | Mass (kg) | Density (kg/L) | What is it most likely made of? (hint: use **Show Table** for help) |
|---|---|---|---|---|---|---|
| A | 100-L | | | | | |
| B | 100-L | | | | | |
| C | 100-L | | | | | |
| D | 100-L | | | | | |
| E | 100-L | | | | | |

8. Look closely at green box C and red box D. List three observations you made while comparing the two boxes.

9. I am going to build a boat. My partner says I cannot put a refrigerator and a television in my boat because that would make it too heavy and the boat might sink. Then we would be swimming with the sharks!

   What would you advise me to tell my friend? Is she right or wrong? Be sure to give some evidence based on what you learned from the **boxes** or other places in this activity.