

**GRADE:** Adaptable to all levels  
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**MA:** Science Education  
For the Wyland Foundation

## “Penguin Eggs”

### **OBJECTIVE:**

Students will understand the cause and effect of melting glaciers. Students will understand how the Carbon Cycle, Greenhouse Gases, and Global Warming are all related to Ocean Warming and Glacial Melting. Students will learn that Penguins need ice to raise their families on and that the continent of Antarctica is mainly made of ice.

### **PURPOSE:**

To educate students on the causes and effects of melting glaciers and how to create the perfect penguin egg that will not roll or break on ice.

### **VOCABULARY:**

Global Warming, Greenhouse Gases, Sea-Level Rise, Ocean Warming, Glacial Melting, Carbon Cycle, Antarctica, Penguins, Chick

**TIME NEEDED:** 2 – 2.5 hours (30-45 minute class prep and background research)  
3 - 30 minute lab - work days (final day is for testing eggs)

### **GRADE LEVEL:**

### **TEACHER PREP AND BACKGROUND RESEARCH:**

1. Watch the following video prior to showing the class.  
[https://www.youtube.com/watch?v=k71g\\_GojFQ0](https://www.youtube.com/watch?v=k71g_GojFQ0)
2. \*For further information on the Penguins of Antarctica, please visit:  
<https://www.youtube.com/watch?v=y2gbMbzpaUk>

### **CLASS PREP AND BACKGROUND RESEARCH:**

- 1) In a class setting or in small groups, have students view the video, “Penguins of the Antarctic - Nature Documentary” (50 min) at the following YouTube link (allow time for student’s reactions as well as questions afterwards.)  
<https://www.youtube.com/watch?v=y2gbMbzpaUk>  
\*Alternate/optional idea: Read with the class the children’s book, “Penguin Chick” by Betty Tatham, and allow time for students questions throughout. At the end, create flashcards of each type of penguin featured in the book and where they can be found in the world (which continent). Have students print pictures of these penguins and place in a central part of the room to showcase the different features of Penguins.

2) Ask students what they think about the life of penguins, especially of a Penguin Chick? Have students discuss their answer first with a classmate, limiting the discussion to one minute per student, and switching to allow the other a chance to speak as well for one minute.

1. Have students then write a comment about the video on a sticky note and post in a central spot within the classroom where Teacher can read off to class and discuss comments. (Allow time for students to ask questions, and to discuss possible misconceptions regarding Antarctica and Penguins without correcting.)

2. Read the Introduction section below together as a class and pay particular attention to the vocab terms “Global Warming”, “Greenhouse Gases”, and “Ocean Warming”, “Sea-Level Rise”, and “Glacial Melting”. View the YouTube link showing the Carbon Cycle animation, pausing if necessary to discuss any questions.  
<https://www.youtube.com/watch?v=dDBU0lg-HYE>

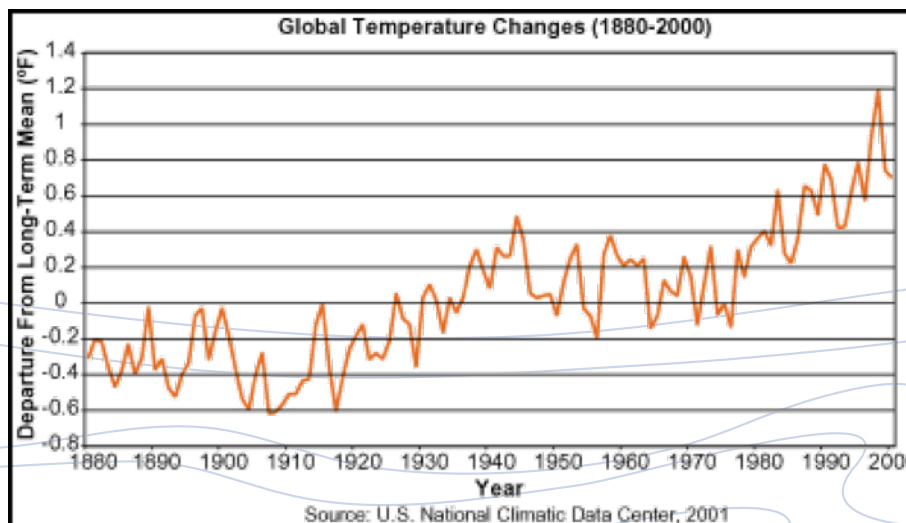
3. Finally, have students use their IPADS or a globe to locate Antarctica on a world map and compare it’s size with other “frozen areas” of our planet that may have been discussed in the Introduction section about Glaciers. Then, discuss with the class the threats Penguins face from global warming? Why is it so important for the whole world to work together on the problem of global warming? How does it affect the climate in Antarctica?

## INTRODUCTION:

Scientists have proven that climate changes do occur naturally. However, many human activities release pollution and gases into the atmosphere through the burning of fossil fuels. These “greenhouse” gases can mix within the earth’s atmosphere and can act like a “blanket” around the earth, trapping heat. This trapping of heat can cause what scientists call, “The Greenhouse Effect.”

Life on earth needs to be warm to survive from the cold of outer space. Our atmosphere traps the sun’s rays and keeps the earth’s average global temperature at 57 degrees F.

In the past 100 years, the earth’s temperature has risen one degree, resulting in the melting of glacial ice and sea levels to rise. The following graph was created by the U.S. National Climatic Data Centre and shows this rising trend in temperature.



## Let's Look at Some of the Most Common Greenhouse Gases:

Most "Greenhouse Gases" are natural and include water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Human activities can add to these naturally occurring gases:

- Carbon dioxide comes from fossil fuels (oil, natural gas, and coal), and wood products when they are burned.
- Methane gas emissions come from the decomposition of organic wastes in landfills, and from the raising of livestock (cow burps ).
- Nitrous oxide comes from agricultural, industrial, and combustion activities involving solid waste and fossil fuels.
- Some other harmful greenhouse gases created by humans are HFC's (hydro fluorocarbons), PFC's (per fluorocarbons), and SF6 (sulfur hexafluoride), released again from industrial processes.

Each gas receives a "Global Warming Potential" rating or GWP value, which is written in units representing how many millions of metric tons of carbon equivalents they carry. Every greenhouse gas absorbs heat differently. The most heat-absorbent gases are HFCs and PFCs, followed by Nitrous Oxide and Methane, which can hold over 21 times more heat per molecule than carbon dioxide. Due to carbon's unique ability to bond well with other elements, both metals and non-metals, on the periodic table, it is extremely important to understand the Carbon Cycle and where carbon is when not released into the atmosphere, such as oceans, forests, and fossil fuels. Please view the following link as a class:

<https://www.youtube.com/watch?v=dDBU0Ig-HYE>

Despite the burning of forests and fossil fuels, which release billions of metric tons of carbon into the earth's atmosphere each year, the good news is that soil, plants and ocean waters are acting as "carbon sinks", using and storing some of this carbon dioxide. However, global warming continues to threaten many environments around the world.

Recently, an ice core from Antarctica showed that over the last 740,000 years, there were eight previous ice ages and eight warmer glacial periods. Most of these ice ages froze and melted on a 40,000-100,000 year cycle. What is obvious is that human activities have contributed to the warming trend of our current cycle. Most global warming "inter-glacial" lasted about 10,000 years. In other words, it took that many years for the glaciers to warm.

The Taylor Glacier in Antarctica

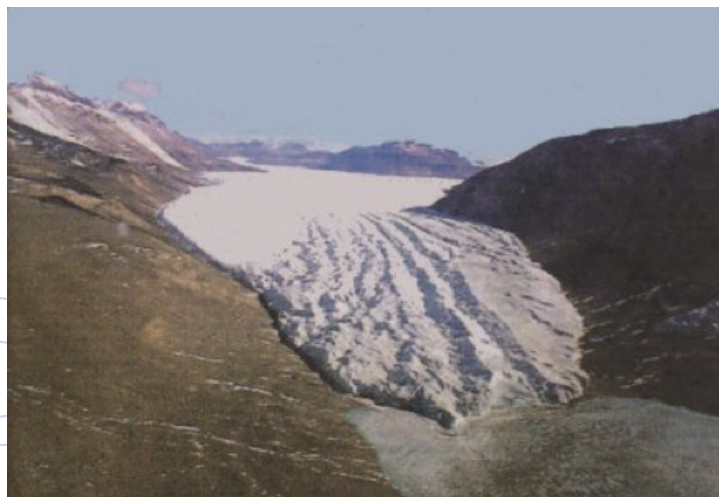


Photo: British Antarctic Survey/Professor Robert Carter



The South American Andes are crusted with many glaciers with one of the grandest being the Upsala Glacier in Argentina. The above picture represents this glacier as it appeared in 1928.



The Upsala Glacier (2004). The ice is retreating at least 55 meters per year. Today, local guides place marks on the mountain walls to show where the glacier used to reach.

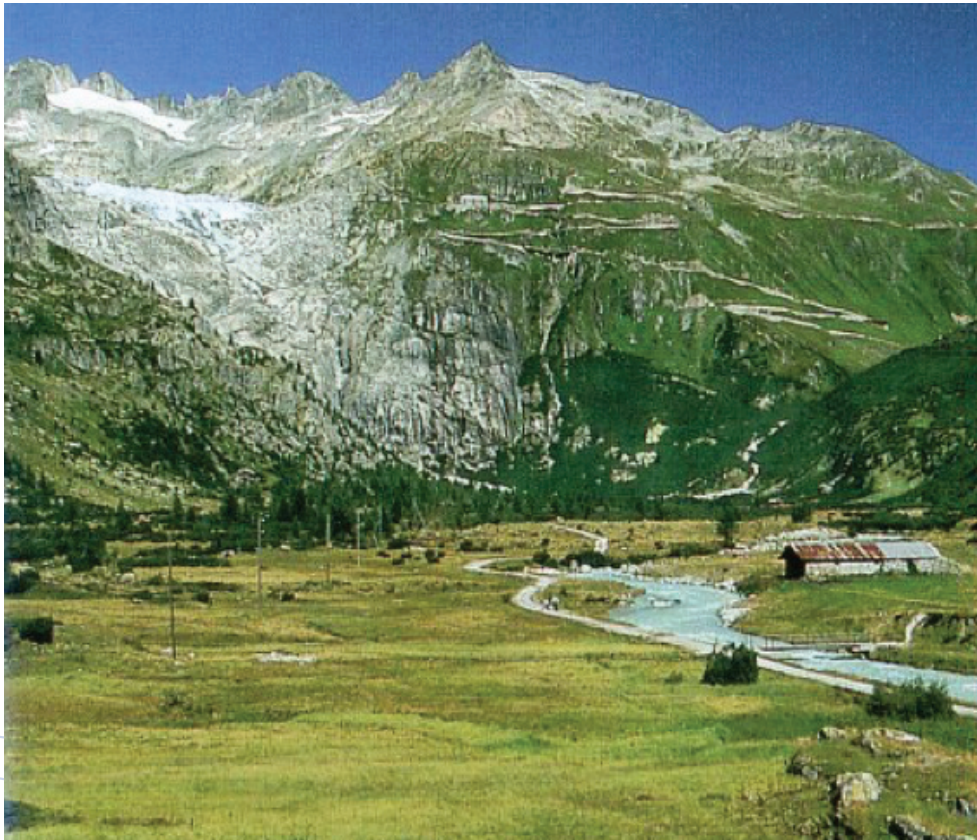
In the Arctic region, the Greenland ice cap is 3 km high and solid but covers a large portion of the North Atlantic Ocean, which is three kilometers deep as well and liquid. If this ice melts, this could result in widespread coastal flooding due to higher sea levels. year. Today, local guides place marks on the mountain walls to show where the glacier used to reach.



Greenland's "melting zone" has increased to higher elevations as well, which can cause melt water to drip down through cracks in the glaciers. This could allow for the glacier to slide faster over the rocks below and eventually to the sea. This can result in the North Atlantic and Arctic Ocean waters becoming increasingly fresher, and less salty. This melting of glaciers and ice caps, along with warming of the earth's oceans, is causing sea levels to rise four to ten inches in some places. It is agreed that if Greenland melts, sea levels could rise by six meters. This water would cover many of the small island nations in the Pacific Ocean, the state of Florida, the Mississippi Delta area, Manhattan, in New York, and Bangladesh, India. These coasts are all reliant on a stable climate if they wish to exist.



The Rhone Glacier in Gletsch, Switzerland, (1849).



150 years later, the Rhone Glacier in Gletsch, Switzerland, is a much smaller patch halfway up the mountains.

NAME: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

## “CHOCOLATE PENGUIN EGG -ROLLS”

### LAB ACTIVITY:

**MATERIALS (PER PAIR):** 1 oval party balloon (small), 1 round party balloon (small), 1 tray covered with wax paper, 1 plastic spoon or stirring stick, 1 cup melted chocolate (1-2 large Hershey Milk Chocolate Bars), access to a Freezer, access to a microwave, sharpie, 2-4 liters of tap water, one large tray 8” X 11” or Tupperware container or larger.

**HYPOTHESIS:** If we test two different egg shapes on ice, then we predict that the round eggs will \_\_\_\_\_ (roll or stay in one spot) and that the oval egg will \_\_\_\_\_ (roll or stay in one spot). (Circle one answer per blank above)

### PROCEDURE:

1. TEACHER: Place milk chocolate bars in a small microwave safe bowl and microwave for one – two minutes, until melted. Stir using a stirring stick or spoon until smooth and creamy. Allow the chocolate to cool for 5 minutes before beginning step 4 below (balloons may pop due to hot chocolate).
2. Have students pair up into groups of two or three (ideally two).
3. Allow students to pick out one small round party balloon and one small oval party balloon and blow them up to essentially the same size. Label each with the group’s name, using a sharpie.
4. Have students obtain one bowl of melted chocolate and dip each balloon halfway into their chocolate, coating the larger bottom half and place each balloon on a wax-covered tray, using a drop of chocolate place on the wax paper first to serve as a holding base for their “chocolate egg”. Allow to dry overnight.
5. Repeat step 1-4 however many times necessary for each group in the class.

### DAY 2:

6. Repeat Steps 1-4 for the other half of each chocolate covered balloon, so that the final balloon is covered entirely by chocolate. Allow to dry overnight.

7. TEACHER: Freeze 2-4 liters of water in a long tray or Tupperware container.

### DAY 3:

8. Congratulations! Your egg is ready! Be careful, as Mommy and Daddy Penguins have to be, as your egg can roll away and break if it falls onto a hard surface.

9. Place the frozen tray of tap water in a central part of the classroom. It is ok if it begins to melt; this will mimic current glacial melting conditions in Antarctica. Have students bring their eggs one pair at a time to conduct their “egg-rolling” test. Draw names from a hat perhaps to decide which group will go first, second and so on. Use the Data Table #1 below to record observations.

10. Place egg at one end of the ice and release. Observe if it rolls, stays in place, rolls left or right or if it rolls straight. Record number of rolls in Data Table #1.

11. After you conduct your trials, your teacher can decide if you may eat your Chocolate Penguin Egg-Rolls!

<b>EGG-ROLL TRIALS</b>	<b>ROUND EGG</b> Number of Rolls:	<b>ROUND EGG</b> Observations: (stayed in place, rolled in a straight line, rolled left or right)	<b>OVAL EGG</b> Number of Rolls:	<b>OVAL EGG</b> Observations: (stayed in place, rolled in a straight line, rolled left or right)
<b>GROUP #1 -</b> Name				
<b>GROUP #2 -</b> Name				
<b>GROUP #3 -</b> Name				
<b>GROUP #4 -</b> Name				
<b>GROUP #5 -</b> Name				
<b>GROUP #6 -</b> Name				
<b>GROUP #7 -</b> Name				
<b>GROUP #8 -</b> Name				
<b>GROUP #9 -</b> Name				
<b>GROUP #10 -</b> Name				
<b>GROUP # -</b> Name				

## INTERPRETING DATA:

### ROUND EGG:

- 1) How did your round egg roll? Did it stay in place, roll in a straight line, or did it roll to the left or right? Why do you think it did this?
- 2) How do you think the egg would react if the ice were frozen completely and not melting? Would this change your results in any way? Why or why not?



**OVAL EGG:**

- 3) How did your oval egg roll? Did it stay in place, roll in a straight line, or did it roll to the left or right? Why do you think it did this?
- 4) How do you think the egg would react if the ice were frozen completely and not melting? Would this change your results in any way? Why or why not?

**ANALYSIS:**

- 5) What importance does shape in the safety and success of a penguin egg hatching?
- 6) What role does temperature play in the safety and success of a penguin egg hatching?
- 7) What do you think would happen if most of the ice in Antarctica were melted? How would this impact the success of a Penguin hatching?

**VOCABULARY REVIEW:**

- 8) What does the word “glacial melting” mean to you? What does this word have to do with today’s Lab activity in terms of penguins and their eggs?
- 9) After performing this lab, is there such a phenomenon as Global Warming? Looking at the globe, where are some glaciers and where is the warmer air coming from that is causing glaciers to melt?
- 10) What continents and their climates are most affected by glacial melting?
- 11) What solutions could human’s come up with that would help control or limit glacial melting?

**SUMMARY CONCLUSION:**

Please write a 3-5 sentence paragraph using at least 5 of the words from the word bank below. Try to describe what happened during this lab according to your data and what you learned from your data.

**WORD BANK:**

Global Warming, Greenhouse Gases, Sea-Level Rise, Ocean Warming, Glacial Melting, Carbon Cycle, Antarctica, Penguins, Chick

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