



Warming Waters

Background:

Water covers over 70% of our planet and is essential for human life. All of this water is responsible for over half of the world's oxygen, absorbs 50 times more carbon dioxide than our atmosphere, and regulates our climate: according to the National Oceanic and Atmospheric Administration (NOAA, where Dr. Tracy Fanara works as a scientist managing our ocean models) the ocean transports heat from the equator to the poles, regulating our climate and weather patterns.

Since the beginning of the Industrial Revolution (1760-1820-ish) humans have burned incredible amounts of fossil fuels, releasing heat trapping chemicals, called greenhouse gases, into the atmosphere. A greenhouse gas is a gas that absorbs and emits radiant energy within the thermal infrared range, the primary gases being water vapor, carbon dioxide, methane, nitrous oxide, and ozone. According to National Geographic, although most of the heat still escapes into space, the small amount which is confined, is enough to increase temperatures on earth, and 90% of that increase is absorbed into our oceans.

Part 1

The United States Geologic Survey (USGS) defines specific heat by the amount of heat needed to raise the temperature of 1 gram of a substance 1 degree Celsius (°C). Water has a high specific heat, commonly called “heat capacity”, so it takes more energy to increase the temperature of water compared to other substances. This is why water can be used in your car's radiator as a coolant. The USGS also explains that the high heat capacity of water also helps regulate the rate at which air changes temperature, which is why the temperature change between seasons is gradual rather than sudden, especially near the oceans. The ocean has had a temperature increase of a little more than one degree Fahrenheit, on average, over the past century.

Let's check out heat capacity!

Lab 1:

Materials:

- 2 balloons
- a heat source and an adult
- safety glasses
- water

Step 1:



- Blow up one balloon and fill the other with water
- Put your safety glasses on

Question 1: What is your hypothesis?

Step 2:

- Hold the balloon with air (or secure it with a clip) while an adult applies a heat source

Question 2: What happened?

Step 3:

- Hold the water balloon and have an adult apply a heat source

Question 3: What happened?

Question 4: Why did the balloon respond differently in these two scenarios?

Part II

We get hurricanes from the energy of the sun and the rotation of the earth. As warm, humid air rises it is replaced by cooler air. The cooler air will then warm and start to rise. If there is enough warm water, the cycle will continue and the storm clouds and wind speeds will grow causing a hurricane to form. This increase in ocean waters causes an increase in the intensity of hurricanes, contributes to sea level rise (as warm water expands and glaciers melt), and it is harmful to marine life (due to physiology and chemical changes associated with increasing temperatures).

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The warming of the ocean is speeding up. The top part of the ocean is warming up, according to National Geographic, about 24 percent faster than it did a few decades ago, and that rate is likely to increase in the future.

Lab 2

Materials:

- Ice
- 2 pans
- Hot water
- A big clear container or empty aquarium (optional)
- A fog machine or hose with hand pump



- Fog juice (or make your own in a one liter bottle or other container: mixing distilled water and vegetable glycerine. The total glycerine concentration should be between 15 to 30 percent (1/2 cup glycerine and 2 cups distilled water), shake for 10 seconds. Now you are ready to put your mixture into a fog machine or into a heat safe pot over a heat source).
- Safety goggles

Step 1

Put on your safety goggles

If you are making your own fog juice, follow these steps: <https://sciencing.com/make-fogmachine-fluid-6168233.html>

Step 2

Have an adult heat 3 cups of water (up to 100° F) and pour into one of the pans

Pour 3 cups of ice into the other pan

Step 3

Place the pans of ice and hot water side by side.

Set up fog machine or hose next to the pan with ice



Step 3

Turn Fog Machine on and note what happens

Questions:

What happened when the fog passed over the ice?

What happened when the fog passed over the hot water?

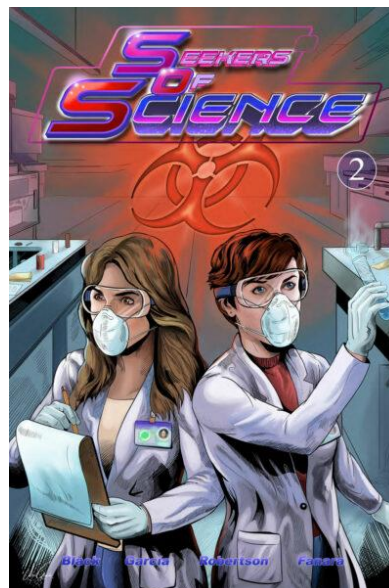
What will happen if the water temperature is increased?



“Seekers of Science”

Seekers Of Science (S.O.S.) is a comic that is about using real-life science in real-life situations to try and save the world. It stars two real-life scientists, Dr. Tracy Fanara and Tamara Robertson, as they use their skills and those of other scientists around the world to help stop the problems that are put in front of them.

Each issue or arc focuses on a different part of the world of science. From handling pollution to the science of making medicine and so much more. It’s our hope that those who read this comic will be inspired by it and want to learn more about what science and more have to offer the world. As well as showing that ANYONE can be part of the STEM (Science, Technology, Engineering, and Mathematics) fields. And it’s so diverse, that you can find something that speaks to you and your personality. **FREE ISSUES**



Each attendee of the USA Science Festival will be the recipient of “Seekers of Science” Issue 1 and 2 digitally for FREE by going to:

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