Northeastern University
College of Engineering

Weekly STEM Newsletter - Week 36 (APRIL 19 - APRIL 26, 2021)

Physical Geography

Introduction

Earth Day is this week! Planet Earth provides us with water to drink, food to eat, a sun to keep us warm, and oxygen to breathe. Earth Day is about learning more about the planet that does so much for us and making sure we are taking the necessary steps in order to protect it. We will be talking about physical geography to learn more about the processes and features that make the Earth the way it is.

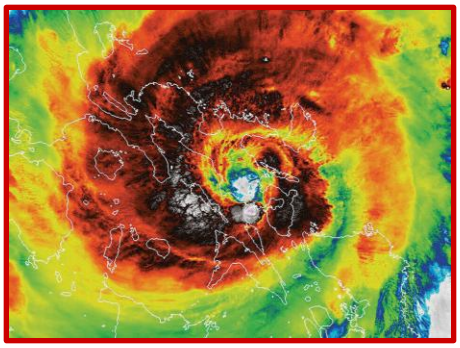
The study of processes and patterns that occur in the natural environment is known as **Physical Geography**. It is studying the atmosphere, mountains, oceans, habitats, plate tectonics, and much more. We use the term "physical geography" here because there is another branch of geography known as "human geography". Human geography is more focused on the cultural and built environment (Check out last week's newsletter on Human Geography). This newsletter will focus on Physical Geography including the many subcategories of it. One subcategory of Physical Geography focuses on the spread of animals and plants across the planet as species tend to vary depending on biome, elevation, latitude, etc. This is known as **Biogeography**. **Climatology** is another branch of Physical Geography that concentrates on studying weather patterns and the atmosphere and their effects on the climate. **Meteorology** is a similar discipline that focuses instead on weather and weather forecasting. There are many other subcategories such as **Coastal Geography**, the study of erosion and the environment at coasts; **Geomorphology**, the study of terrain, landforms, and the processes involved in the changing and formation of them; **Glaciology**, the formation and movement of ice sheets and glaciers; **Hydrology**, the study of water cycles and the movement of water across Earth's surfaces; **Lithology**, the study of the composition of rocks; and **Oceanography**, the study of oceans and seas. The last subcategory we will discuss is known as **Environmental Geography**, which looks at the effects that humans have on the environment and the interactions between

the two. Environmental Geography requires an understanding of climatology, hydrology, biogeography, geology, and geomorphology (other subcategories of Physical Geography). Many of these subcategories link to Human Geography in fact, as many of them are impacted by our actions, culture, and population.

Northeastern Connections

Faculty Connection

Northeastern University's Office of Sustainability focuses on advancing the



greening of their campuses through sustainability projects and policies. Some notable achievements include the construction of LEED-certified (Leadership in Energy and Environmental Design) buildings, the switch from fluorescent to LED lights, and the adoption of compostable cutlery in dining halls.

Carbon footprints are the generation of greenhouse gases as a result of actions from eating meat to flying a plane. High levels of these gases, like methane and carbon dioxide, are one of the reasons for climate change and global warming. One of Northeastern's key promises stems from their 2010 Climate Action Plan where they seek to reduce the Metric Tons of Carbon Equivalent (MTCE) emissions by 80% from 2005 to 2050. Since then, Northeastern has seen a 39% MTCE/gsf reduction since 2005 and is on track to achieve its goal by 2050. In an effort to reduce these emissions, Northeastern has "procured carbon-free, renewable energy credits from offsite wind energy generation facilities", making them carbon neutral. Carbon neutrality refers to a balance between a source's production of carbon dioxide and their efforts of carbon emission removal.

As of Spring 2021, Northeastern University seeks to continue its sustainability efforts through student, faculty, and community insight, with a more formal proposal coming Fall 2021.

Plastic single-use containers and cutlery are known to be cheap and easy to produce but also very harmful to our environment. Plastic waste can contaminate our water supply, poison our marine life, and sit in landfills for centuries. As a result, researchers have spent years trying to find alternatives to plastic that compare in affordability but excel in environmental benefit.

Northeastern University Mechanical and Industrial Engineering assistant professor, Hongli (Julie) Zhu, has developed a compostable option from sugarcane and bamboo with her team. Their solution using sugarcane byproduct ticks all the boxes: biodegradable, inexpensive, and also durable. Her team's creation "began breaking down after about 30 days and disintegrated almost completely after 60 days" when buried in dirt, taking out the need for any other specialized equipment.

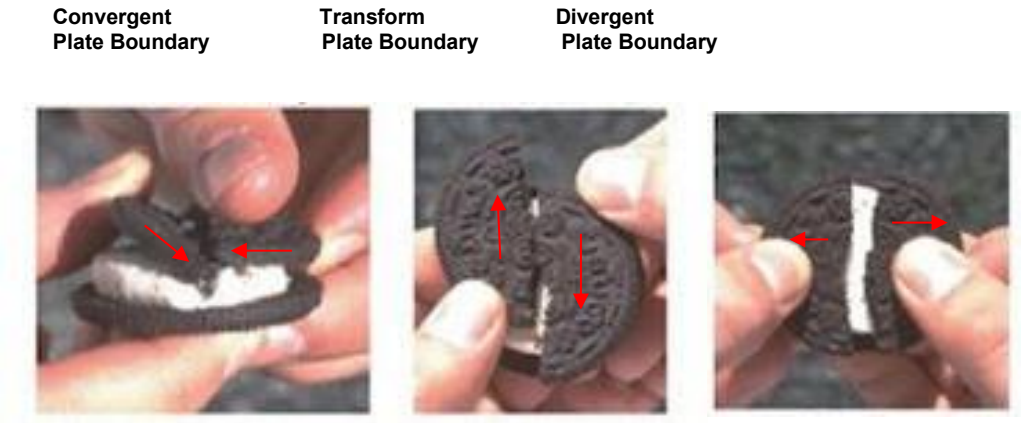
Student Connection

Northeastern's Husky Environmental Action Team (HEAT) is a student organization whose focus is to raise awareness to combat climate change and spread sustainability practices across campus. Working with other environmental clubs and organizations including NUComposting and Greentown Labs, HEAT discusses the prevalent environmental issues we currently face as well as sustainable actions to adopt into our everyday lives. One of their yearly campaigns is the Plastic-Free Week, where they encourage people to make the pledge and avoid buying any plastic goods. They also provide tips and guidance for going plastic-free in your everyday life!

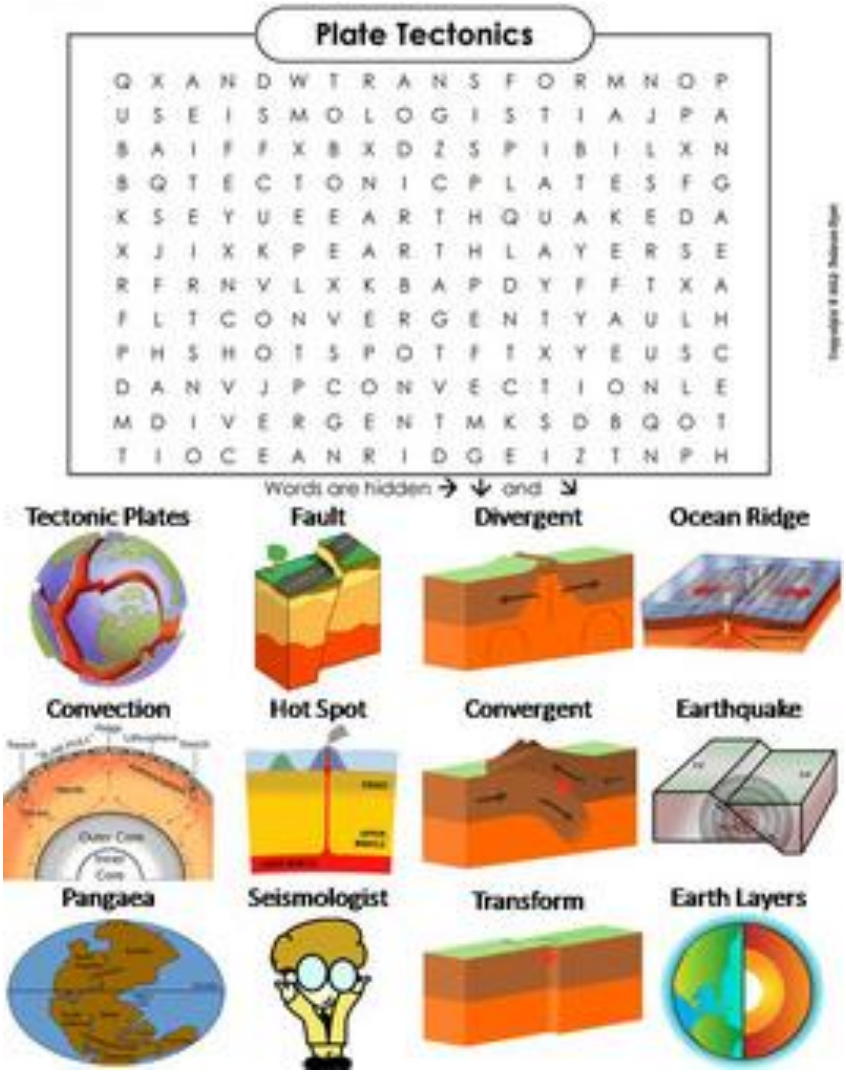
Do Now

This will be a fun, quick, and yummy activity! Grab a couple of Oreos to learn about plate tectonics and plate boundaries. Plate tectonics is the theory that our Earth is split into several plates that move and collide. Volcanoes, mountains, and earthquakes form and occur due to the movement of these plates. See the image below to learn more about the types and how

you should move the top of the Oreo. Observe what happens to the cookie and the creme filling.



Here's another activity you can do to learn about plate tectonics:



Activity

In honor of Earth Day, for this week's activity you will be doing your own recycling and reusing. The goal of this activity is to take old scrap paper and make your own paper that you can decorate. Recycling paper reduces greenhouse gas emissions, preserves resources (save the forests!), and saves energy and water. Recycling one ton of paper saves the energy equivalent to the energy needed to power an average home for six months and saves about 7,000 gallons of water. Every ton of recycled paper also saves about 17 trees. Recycling is one of the necessary means of preserving this planet.

Materials Needed:

- Scrap paper
- Scissors
- Blender
- Spoon

- Picture frame
- Window screening (any type of mesh material)
- Natural coloring (e.g. tea)

Steps:

- Make a sheet mold by cutting a piece of plastic needlepoint canvas to fit inside of the picture frame.
- Tear the scrap paper into pieces, and place it in a large bowl of warm water
- Soak the paper for at least 15 minutes.
- Place a handful or two of soaked paper along with 2 cups of water into a blender (If you'd like colorful paper, you can use tea or fruit juice instead of water).
- Optional: During this step, you may try adding a variety of plants, spices, or fragrances to change the texture and fragrance of your paper.
- Blend for about 20 seconds, or until the pulp has the texture of runny oatmeal.
- Place the sheet mold in a tray to avoid a mess, then pour half of the pulp into the sheet tray. Use the back of a spoon to spread the pulp evenly.
- Lift the mold a bit and tilt it to let the water drain off.
- Set one side of the mold on a dishtowel. Lift the frame of the mold, leaving the screen in place, and set it aside.
- Starting from the middle and working out to the edges, press firmly on the screen with a sponge to flatten the paper and draw out more of the water, then remove the screening.
- Pick up the dish towel holding the damp piece of finished paper, and let it dry. After a few hours, gently peel the sheet of paper from the towel, then set it on a drying rack to finish drying.
- Between making sheets, completely rinse the mold so there is no excess pulp leftover.

Discussion Questions:

- What are other ways you can help protect the environment?
- What would happen if no one recycled paper?
- How long do you think forests can sustain our paper consumption?
- What impact does recycling have on the physical geography of this planet?

Share Your Results

We'd love to know how the activity and/or the "do now" turned out! What worked and what didn't work? Please share with us something you learned and/or send us pictures! Email us at stem@northeastern.edu.

Related links/Extensions

- Marine and Environmental Sciences – Northeastern University College of Science
- Nearly Eight Million Tons of Plastic Is Missing from Our Oceans. Where Did It Go? – Northeastern University College of Science
- Environmental Science, BS < Northeastern University
- Office of Sustainability – Facilities
- A Sweet Solution to Plastic Pollution – Facilities
- NUHEAT: HEAT's Plastic-Free Week
- Environmental Science and Landscape Architecture, BS < Northeastern University
- Previous Sub-branches of Physical Geography