Dynamic Earth: Heat Flow

A Museum of Science Traveling Program
Description

Dynamic Earth: Heat Flow is a 60-minute presentation about thermodynamics in the context of Earth Science. It is designed to build on NGSS-based curricula.
Needs

We bring all materials and equipment, including a camera, video projector, and screen. Access to 110-volt electricity is required.
Space Requirements

The program can be presented in assembly-suitable spaces like gyms, multipurpose rooms, cafeterias, and auditoriums.
Goals: Liquid Nitrogen

Liquid nitrogen is used to explore Thermal Energy and how it affects matter.
Goals: Heat

Heat is a movement of Thermal Energy, and we’ll dissect our planet to find out how that energy is transferred both within and without the Earth.
Goals: Conduction

Thermal Energy flows out of Earth’s hot core into the Mantle since they’re in direct contact, just like how energy can flow into ice to make it melt.
Goals: Convection

The effects of temperature on the density and motion of fluids is demonstrated both with GASES...
Goals: Convection

... and with LIQUIDS! And we discuss how this causes major changes in Earth’s crust like Plate Tectonics.
Goals: Radiative Heating

Explore how the crust receives energy from the Sun and find out if a piece of paper could even absorb enough light energy to incinerate!
Additional Content

In addition to these core goals, other concepts are taught with a variety of additional demonstrations.
At the end of the program, Oxygen gas is distilled through Liquid Nitrogen until it condenses…
Finale

... and we test its chemical properties to see just how good this component of rocket fuel would be at getting us to other parts of the Solar System!
Program Details

• Can only be booked for school groups during the school year.

• Can only be booked for grade(s) studying program content:
  – In Massachusetts, optimal for 7th or 8th grade
  – Varies in other New England states based on individual district adaptations of NGSS
Program Details

• Capacity is up to eight classes (200 students) of a single grade per session.
• Up to two consecutive sessions can be taught per day.
NGSS Connections

- **6.MS-PS1-7.** Use a particulate model of matter to explain that density is the amount of matter (mass) in a given volume. Apply proportional reasoning to describe, calculate, and compare relative densities of different materials.

- **6.MS-PS4-2.** Use diagrams and other models to show that both light rays and mechanical waves are reflected, absorbed, or transmitted through various materials.

- **7.MS-PS3-5.** Present evidence to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

- **7.MS-PS3-6.** Use a model to explain how thermal energy is transferred out of hotter regions or objects and into colder ones by convection, conduction, and radiation.
NGSS Connections

- **8.MS-ESS2-1.** Use a model to illustrate that energy from Earth’s interior drives convection that cycles Earth’s crust, leading to melting, crystallization, weathering, and deformation of large rock formations, including generation of ocean sea floor at ridges, submergence of ocean sea floor at trenches, mountain building, and active volcanic chains.

- **8.MS-PS1-1.** Develop a model to describe that (a) atoms combine in a multitude of ways to produce pure substances which make up all of the living and nonliving things that we encounter, (b) atoms form molecules and compounds that range in size from two to thousands of atoms, and (c) mixtures are composed of different proportions of pure substances.

- **8.MS-PS1-4.** Develop a model that describes and predicts changes in particle motion, relative spatial arrangement, temperature, and state of a pure substance when thermal energy is added or removed.
NGSS Scientific and Engineering Practices

• Asking questions and defining problems.
• Planning and carrying out investigations.
• Developing and using models.
• Constructing explanations and designing solutions.
### 2019 – 2020 Prices

<table>
<thead>
<tr>
<th>Sessions per Day</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Session</td>
<td>$575</td>
</tr>
<tr>
<td>2 Sessions</td>
<td>$950</td>
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</tbody>
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No mileage fees charged in New England in 2019-20 School Year.
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For information/reservations:
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