

SUGGESTED REFERENCES

- **Satellite Atlas of the World**, NPA Satellite Mapping
- **Global Climate Change**, by Spray Sharon
- <http://www.nineplanets.org/earth.html>
General information, facts and figures, and statistical data about the Earth, plus helpful weblinks.
- <http://science.hq.nasa.gov/kids/earth.html>
Activities, games and puzzles designed for fun and learning about the planet on which we live.
- <http://en.wikipedia.org/wiki/Earth>
From Wikipedia, the free encyclopedia, comprehensive information about many aspects of our home planet.
- <http://pubs.usgs.gov/gip/dynamic/dynamic.html>
This Dynamic Earth, a US Geological Survey site, traces the story of the theory of plate tectonics, including detailed descriptions of plate motions and mantle plumes.
- <http://earth.google.com/>
A 3D interface to our planet. Dive into any place on Earth. Google Earth combines satellite imagery, maps and the power of Google Search to put the world's geographic information at your fingertips.
- <http://www.jpl.nasa.gov/earth/>
From NASA's Jet Propulsion Laboratory, news and features about Earth-observing satellites and the work they are carrying out. Access to hundreds of Earth Images and a selection of Earth wallpapers.
- <http://earthobservatory.nasa.gov/>
A collection of data and images, features, news and details of all current and planned Earth-observing missions, plus links to sections on the atmosphere, oceans, land, energy and life.
- <http://www.thetech.org/exhibits/online/satellite/>
From the San Jose Tech Museum, Lockheed Martin, a site about the many types of artificial satellites, how they work, their orbits and applications. Use an interactive program to build three different kinds of satellite.

NATIONAL SCIENCE EDUCATION STANDARDS

Grades 5-8:

Earth and Space Science

Structure of the Earth System
Earth in the Solar System

Science in Personal and Social Perspectives

Populations, Resources and Environments

Grades 9-12

Earth and Space Science

Energy in the Earth Systems
Origin and Evolution of the Earth System

Science in Personal and Social Perspectives

Natural and Human Induced Hazards

*Source: National Science Education Standards, 1996, National Academy Press

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SCIENCE SCREEN REPORT

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EARTH "Home Planet" & ORBIT "Earth From Space"



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SYNOPSIS

The Earth occupies a special place in our solar system; it is the right size, distance from the Sun and has a composition that makes it ideal to support life. This might not be readily apparent if you were just flying by the planet in a spaceship. From that view, you might see only vast oceans, huge weather systems and some seasonal changes.

Students don't have to imagine what the Earth looks like from space because we have a constellation of satellites monitoring the Earth. Students will see how these satellites help predict the weather, carry out global telecommunications and monitor how we are changing the planet. The technology that gives us the power to view the Earth from space is also showing us how we are damaging it, making it more difficult to support life.

CURRICULUM UNITS

- PHYSICAL SCIENCE
- PHYSICS
- INTEGRATED SCIENCE
- BIOLOGY
- ECOLOGY

RUNNING TIME

2 X 10:00

BACKGROUND

Two-thirds of Earth's surface is water - oceans that teem with life and where, most probably, life began. Sea creatures evolved limbs and lungs, and crawled ashore to colonize every landmass.

How is it that the Earth is capable of supporting life when other planets are so hostile? There are two primary reasons: The Earth is just the right "temperate" distance from the Sun, and it is neither too hot nor too cold, and has liquid water.

Earth is the largest inner planet, third from the Sun and the first with a moon. A thin crust overlays a hot mantle of partially melted and solid rock. Beneath is a liquid outer core surrounding a solid inner core of iron and nickel that slowly rotates and is thought to be the dynamo generating our magnetic field. The crust of the Earth is broken up into plates. The movement of these plates cause earthquakes, volcanoes and mountain-building to occur.

The orbit of the Earth around the Sun helps to produce our seasons. Scientists have observed that the Earth tilts on its axis about 23 degrees. This is not a constant angle, as the Earth wobbles slowly. The tilt may vary as much as 2.5 degrees. The part of the Earth that is farthest away from the Sun will have shorter days and cooler weather. When that same part is closer to the Sun, days will be longer and the weather warmer. The wobble of the Earth's tilt may influence colder or warmer periods in Earth's history.

The Sun also drives the Earth's weather patterns. Heating the water causes it to evaporate and rise. At higher elevations, the water in the air cools and condenses into clouds. The same phenomenon happens to the gases in the air. Hot air rises and cool air falls. Because the air is rising there are less molecules near the Earth and it causes the air pressure to fall. Falling air causes high pressure. Air at high pressure will always move towards low pressure. This causes the winds.

The Moon is a natural satellite, but the rest of the satellites orbiting the Earth are man-made. There are at least eight thousand in orbit as of 2001. These satellites allow us to carry out global telecommunications and bring us images from around the world. The global positioning satellite system (GPS) can track hikers in the woods, get people in their cars to their destinations and get ships into port.

Some satellites monitor our Earth's natural resources. They can aid farmers by spotting the breeding grounds of locusts and monitor regions that are at risk of drought.

Weather satellites can track wind speed and direction. They help meteorologists identify weather patterns and improve forecasting of major storms. They can even identify areas of intense lightning.

Volcanic eruptions can cause the loss of thousands of lives. Satellites are used to monitor volcanoes and help warn when they are about to erupt. The same satellites can be used to track other environmental disasters like forest fires and oil spills.

Increasingly, satellites are used to monitor changes in the Earth's environment. As concerns about global warming and deforestation increase, satellites are used by scientists for many reasons including: to see how much of the rainforests are being destroyed; whether or not the sea levels are rising; and the changing size of glaciers and other events tied to human activities.

ADVANCED ORGANIZERS

Prior to viewing this program, students should have some understanding of the following Benchmarks for Science Literacy, Oxford University Press which are excerpted and, in some cases, abbreviated below. Refer to the Benchmarks for more information.

Benchmark 4: The Physical Setting

Section B - Earth
Know by Grade 8

- The Earth is mostly rock. Three-fourths of its surface is covered by a relatively thin layer of water (some of it frozen), and the entire planet is surrounded by a relatively thin blanket of air. It is the only body in the solar system that appears able to support life.
- The cycling of water in and out of the atmosphere plays an important role in determining climatic patterns. Water evaporates from the surface of the Earth, rises and cools, condenses into rain or snow, and falls again to the surface.

Know by Grade 12

- Weather (in the short run) and climate (in the long run) involve the transfer of energy in and out of the atmosphere. Solar radiation heats the land masses, oceans, and air. Transfer of heat energy at the boundaries between the atmosphere, the land masses, and the oceans results in layers of different temperatures and densities in both the ocean and atmosphere. The action of gravitational force on regions of different densities causes them to rise or fall, and such circulation, influenced by the rotation of the Earth, produces winds and ocean currents.

Section C - Processes that shape the Earth

Know by Grade 8

- The interior of the Earth is hot. Heat flow and movement of material within the Earth cause earthquakes and volcanic eruptions and create mountains and ocean basins. Gas and dust from large volcanoes can change the atmosphere.
- Some changes in the Earth's surface are abrupt (such as earthquakes and volcanic eruptions) while other changes happen very slowly (such as uplift and wearing down of mountains). The Earth's surface is shaped in part by the motion of water and wind over very long times, which act to level mountain ranges.

Know by Grade 12

- The solid crust of the Earth, including both the continents and the ocean basins, consists of separate plates that ride on a denser, hot, gradually deformable layer of the Earth.

**Benchmarks can be found at www.project2061.org/tools/benchol/bolintro.htm*

CRITICAL THINKING EXERCISES

1. EXPLAIN the relationship between the Sun and global wind patterns.
2. EXPLAIN how changes in the tilt of the Earth can cause changes in our weather.
3. DISCUSS how satellites can be used to violate your right to privacy.
4. EXPLAIN how the global positioning satellite system works.
5. DESIGN a model to show how the Earth's plates interact with each other.
6. DESCRIBE how satellites are used to monitor changes in the environment.

VOCABULARY

Carbon monoxide

Continental drift

Evaporation

Fissure

Hurricane

Locust

Magnetic field

Salinity

Satellite

Tornado

CAREER POSSIBILITIES

- METEOROLOGIST
- GEOLOGIST
- ECOLOGIST
- MECHANICAL ENGINEER
- COMPUTER ENGINEER