

# Dinosaur Days



## A Study of Creation, Dinosaurs, & Fossils

### Ancient Science Guide A Science Program for 2nd-6th Grade WinterPromise

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# Ancient Science Dinosaur Days

## Science for 2nd to 6th Grade

### **How to Use This Program**

Welcome to Ancient Science! This year, you'll be learning all about the beginnings of our world, the amazing creatures called dinosaurs that once roamed around the earth long ago, and the simple science concepts that early man mastered and used. Here are the key components of this program.

### **Resource List**

- Science Books:       Dinosaurs Marvels of Creation  
                              Dinosaurs for Kids  
                              The Fossil Book
- Featured Resource:   Dinosaur Days of Long Ago Notebook
- Optional Resources:  Inside Noah's Ark: Why It Worked  
                              Dinosaur Activity Book



### **How to Use the Science Books:**

The science books are scheduled for you each week. A student can read these independently, if they are working on their own, or they can be read aloud and discussed with other students or a parent. These cover the major topics your student will study this year, including the days of Creation, early man and his machines, dinosaurs, fossils, and paleontology.

The notebook is a key resource for your year. Its 360+ pages offer material on topics included in the books, and other topics not covered elsewhere. It provides interactive pages for students to practice and show what they've learned, but also gives them a lot of new information on simple machines, drawing dinosaurs, and much more! *Answer key is in this guide.*

### **Enriching Your Study:**

This program also studies the after effects of the Noah's flood. Some families may wish to add this title to their program to enrich their study of the ark and the flood. Buying information is below. This resource is used in week 30 and 31. If you wish to add it to your study, purchase it prior to the scheduled weeks.

Inside Noah's Ark

by Laura Welch

ISBN# 978-0890519325

### **Using This Program with a Younger Student:**

As this is a program written for a range of ages, you may find that some worksheets in the Student Notebook are difficult for your youngest students to complete. You can change the requirements of a given worksheet, have them draw instead of write, or even complete some orally. Finally, some parents may want to add this resource to add a little lighthearted fun:

Dinosaur Activity Book

by Earl and Bonita Snellenberger

ISBN# 978-0890515150



# Dinosaur Days

## Weekly Science Topics

### IN THE BEGINNING . . . THE DAYS OF CREATION

- Week 1: The Creation of Light & Sky
- Week 2: The Creation of Water & Land
- Week 3: The Creation of Plants
- Week 4: The Creation of Bodies in Space
- Week 5: The Creation of Water Animals & Birds
- Week 6: The Creation of People & Time

### SIMPLE MACHINES OF ANCIENT MAN

- Week 7: Simple Machines & Forces
- Week 8: Levers
- Week 9: Inclined Planes
- Week 10: Wheels and Axles
- Week 11: Screws
- Week 12: Wedges
- Week 13: Pulleys



### DAYS OF DINOSAURS

- Week 14: The World of Dinosaurs
- Week 15: The Creation of Dinosaurs
- Week 16: Dinosaur Basics
- Week 17: Duck-Billed Dinosaurs
- Week 18: Dome-Headed Dinosaurs
- Week 19: Swanky Ceratopsians
- Week 20: Stegosaurs with Style
- Week 21: Ankylosaurs with Armor
- Week 22: Super-Sized Sauropods
- Week 23: Raptors & Fin-Backed Dinosaurs
- Week 24: Carnosaurs
- Week 25: Terrible Tyrannosauroids

### DINOSAURS INSIDE & OUT

- Week 26: Born a Dinosaur
- Week 27: Dinosaur Biology
- Week 28: Dinosaur Anatomy
- Week 29: The Lives of Dinosaurs

### THE FLOOD CHANGES EVERYTHING

- Week 30: The Flood Begins
- Week 31: Fossils & the Flood

### FOSSILS & PALEONTOLOGY

- Week 32: Buried in the Rocks
- Week 33: The End of Dinosaurs
- Week 34: Evolutionary Problems
- Week 35: Dinosaur Discoveries
- Week 36: A Real Fossil Hunt





# Ancient Science - Week 1

## The Creation of Light and Sky

### The First & Second Days of Creation

ONE-DAY SCHEDULE - Complete All  
 TWO-DAY SCHEDULE - Divide as Shown

DAY 1	DAY 2
<p><b>READ &amp; COMPLETE:</b></p> <p><u>Dinosaur Days of Long Ago Notebook</u>            Creation Day 1 - Light            Read Pages 6-7</p>	<p><b>READ &amp; COMPLETE:</b></p> <p><u>Dinosaur Days of Long Ago Notebook</u>            Creation Day 2 - Sky            Read Page 10</p>
<p><b>DINOSAUR DAYS NOTEBOOK:</b></p> <p><u>Dinosaur Days of Long Ago Notebook</u>            Complete "See How Light Behaves" - Page 8</p>	<p><b>DINOSAUR DAYS NOTEBOOK:</b></p> <p><u>Dinosaur Days of Long Ago Notebook</u>            Complete "Watch the Sky" - Page 11</p>
<p><b>ACTIVITY OR EXPERIMENT:</b></p> <p><u>Activity - Dinosaur Days Notebook</u>            Make a Rainbow - Page 9</p>	<p><b>ACTIVITY OR EXPERIMENT:</b></p> <p><u>Activity - Dinosaur Days Notebook</u>            Sky Color - Page 12</p> <p><u>Activity - Dinosaur Days Notebook</u>            Catching Air with a Copter - Page 13</p>
<p><b>NOTES</b></p>	
<p>Your student will begin their "Dinosaur Days of Long Ago Notebook" today. They should be able to complete many of the worksheets independently, unless they are at the youngest end of our recommended age group. Activities will require parental guidance.</p>	



# Ancient Science - Week 2

## The Creation of Water and Land

### The Third Day of Creation

ONE-DAY SCHEDULE - Complete All  
 TWO-DAY SCHEDULE - Divide as Shown

DAY 1	DAY 2
<p align="center"><b>READ &amp; COMPLETE:</b></p> <p><u>Dinosaur Days of Long Ago Notebook</u>            Creation Day 3 - Water            Read Pages 14-15</p>	<p align="center"><b>READ &amp; COMPLETE:</b></p> <p><u>Dinosaur Days of Long Ago Notebook</u>            Creation Day 3 - Land            Read Pages 18-19</p>
<p align="center"><b>DINOSAUR DAYS NOTEBOOK:</b></p> <p><u>Dinosaur Days of Long Ago Notebook</u>            Complete "How Do You Use Water" - Page 15            Complete "The Water Cycle" - Page 16</p>	<p align="center"><b>DINOSAUR DAYS NOTEBOOK:</b></p> <p><u>Dinosaur Days of Long Ago Notebook</u>            Complete "Wash Down a Mountain" - Page 20</p>
<p align="center"><b>ACTIVITY OR EXPERIMENT:</b></p> <p><u>Activity - Dinosaur Days Notebook</u>            Make a Mini-Water Cycle - Page 17</p>	<p align="center"><b>ACTIVITY OR EXPERIMENT:</b></p> <p><u>Activity - Dinosaur Days Notebook</u>            Candy Rock Cycle - Page 21</p>
<p><b>NOTES</b></p>	
Empty space for notes	



# Dinosaur Days of Long Ago

Student  
Notebook



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**Ebook Version:** This resource is designed to be printed double-sided. A section in the back should be printed in color.

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# Dinosaur Days of Long Ago



*Or speak to the earth, and it shall teach thee:  
and the fishes of the sea shall declare unto thee.*

*Who knoweth not in all these that  
the hand of the LORD hath wrought this?*

*Job 12:8,9*

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# Dinosaur Days of Long Ago

## Creation Day 1 - Light



*"<sup>1</sup>In the beginning, God created the heaven and the earth. <sup>2</sup>And the earth was without form, and void; and darkness was upon the face of the deep. And the Spirit of God moved upon the face of the waters. <sup>3</sup>And God said, Let there be light: and there was light. <sup>4</sup>And God saw the light, that it was good: and God divided the light from the darkness. <sup>5</sup>And God called the light Day, and the darkness he called Night. And the evening and the morning were the first day."*

Genesis 1: 1-5, KJV

When God created the heaven and the earth, the first thing he created was light. What is light? Light is a form of energy that travels like a wave through space. Light can be seen by the human eye. It allows us to see what is in our world. Light is easy to observe in our world. The sun gives off light. So does fire. Light bulbs have been designed to provide light. Chemicals in living things produce light as bioluminescence, as you see in fireflies on a summer night.

Light travels faster than anything else scientists have ever observed. It travels about 186,282 miles every second! Amazing! Scientists of the past like Galileo tried to accurately measure how fast light traveled, but the true answer was not discovered until modern times.

The human eye is specially designed to use light to see. Light first enters the eye through the cornea, and passes through fluid behind the cornea, and on through the pupil and lens. The light passes through another area of fluid, then reaches the retina, on the back of your eye. Your eye works by focusing light onto cells on your retina that receive light. Your retina has two types of cells that are ready to receive and process light. Rod cells react to the intensity of light and are responsible for seeing in black and white. Cone cells aren't as sensitive to intensity of light, but are sensitive to other properties of light that help you see color and detect fine detail, the kind you use when you read or sew.

We can observe the effects of light interacting with our world every day. These effects are called optical phenomena (happenings or results). One of the ways light interacts with our world is with color. Light, which appears white, is actually made up of different colors that can be split apart to form a rainbow or directed through a prism, sending the color bands in different directions.

There are different colors of light, because light waves have different wavelengths. Violet light has the shortest wavelength of all the colors, while red light has the longest wavelength. The differences in wavelengths make a rainbow possible. How?



### **DID YOU KNOW?**

The enzyme luciferase that causes fireflies to produce light has been used by researchers to determine which cells are active!

When sunlight hits a drop of water in the atmosphere, some of the light refracts, or bends, into the drop, reflects from the water drop's inner surface, then refracts back out of the drop. The two refractions separate the light into separate colors. If you've ever seen a rainbow, you've seen the result of light waves being divided and sent in different directions! The light separates into color bands you can see in the sky, and -- a rainbow appears!

***(Skip to last paragraph for younger students.)***

When you see the blue sky, a red sunrise, or pink sunset, these are optical phenomena, too. The sky appears blue because the special properties of blue light allow it to scatter well in the atmosphere. When you look at an orange sunset, you are looking at light that is less scattered, so red and yellow light creates the appearance of an orange sunset. The scattering of light happens when light meets air molecules.



In 300 B.C.,  
the Greek  
mathematician  
Euclid described  
the laws of  
reflection and  
studied them  
mathematically.

Mirages are another type of optical phenomena. Mirages happen when light rays are bent because of variations in heat. The rippling effect of different heat levels bends light rays and makes distant objects look strange. The faraway objects can look bent out of shape and distorted. They can even trick you into believing you see water.

Light and optical phenomena affect how things work, things such as mirrors, lenses, microscopes and telescopes -- even lasers. It has taken scientists a long time to figure out that light has properties that make it behave as if it moves in a wave, and properties that make it behave as if it moves in individual particles. The properties that make light move like a wave would appear, if you could see it, to look like a ripple on the surface of water that moves outward in a circle. On the other hand, the properties that make light move as if in individual particles would be more like seeing a marching band moving together along a street.

Light is one of the forms of energy whose power and limits God created. He also created other forms of energy. Scientists through the ages have identified many forms of energy, and are still identifying more! The most common other forms of energy are these: electric, chemical, thermal, nuclear, magnetic, sound, and mechanical. There are other forms of energy as well. When God created the world, he created and defined these forms of energy. He set in place universal laws that determined how they behaved and limited their power.

Light allows us to see and experience what God created, revealing who God is through what He created. It is no wonder, then, that Jesus said He was the Light of the World. Jesus allows us to see and experience God and His truth. Just as light makes a cave wall visible that is usually in darkness, so Jesus gives us the ability to "see" who God is, and understand His character. Jesus is the Light of the World, just as He said.





# Dinosaur Days of Long Ago See How Light Behaves!

If you were in Chicago, Illinois, in the waiting room of Union Station in 1943, you could have stepped into the light patches in which these police officers are standing.



This picture shows some of the behaviors of light. See if you can observe these same behaviors with the help of a flashlight.

1. Light travels in a straight line until it is stopped by something, just as the sunlight above is traveling through the window in straight lines until it reaches the floor.
2. You can see that the light hitting the floor at an angle spreads the light over a large area. Light hitting the floor from straight on would spread the light over a smaller area. With a parent, talk about what you discovered about light.



## **DID YOU KNOW?**

Union Station is more than nine city blocks in size, but it is largely below ground, underneath Chicago streets and skyscrapers!

# Dinosaur Days of Long Ago Make a Rainbow



How do rainbows work? Let's find out!

## What You Need:

- A glass of water filled about three quarters full
- White paper
- A sunny day



## What To Do:

Before you begin, think about the color of the sunlight. What color is it?

Take the glass of water and paper to a room where the sun is shining in. It's best to work near a window, where sunlight is streaming in.

Without spilling the water, hold the glass above the paper, allowing the sunlight to pass through it. The sunlight will pass through the glass of water and refracts (bends) the light, and forms a rainbow of colors on your sheet of paper.

Hold the glass of water at different heights or angles to see if you can get it to create a different effect.

What colors do you see? Write them here: \_\_\_\_\_

\_\_\_\_\_

## What is Going On?

You normally see a rainbow as an arc of color in the sky. But rainbows can form where water and light meet, such as in a water fountain or the mist of a waterfall or at a water park. Rainbows form in the sky when sunlight refracts or bends as it passes through raindrops, just as a rainbow formed when the sun when through your glass. As you saw, the sunlight refracts, and is separated into the colors red, orange, yellow, green, blue, indigo, and violet. All these colors are part of the light. We just don't see the colors until the water helps separate them into a rainbow of colors!

## What Did You Learn?

Write what you learned from this experiment. \_\_\_\_\_

\_\_\_\_\_



# Dinosaur Days of Long Ago

## Creation Day 2 - Sky



*“<sup>6</sup>And God said, Let there be a firmament in the midst of the waters, and let it divide the waters from the waters.<sup>7</sup>And God made the firmament, and divided the waters which were under the firmament from the waters which were above the firmament: and it was so.<sup>8</sup>And God called the firmament Heaven. And the evening and the morning were the second day.”*

*Genesis 1: 6-8, KJV*

After God created light on the first day of the Creation week, he created the sky. Without the atmosphere, life on Earth could not exist. When God created the sky, he created a layer of gases that surround planet Earth. Gravity keeps these gases in place. The atmosphere absorbs ultraviolet solar radiation, an important protection of life on Earth.

The atmosphere also keeps the surface of Earth warmer than it would be without the atmosphere. Heat from the Earth's surface is radiated back toward earth by the gases in Earth's atmosphere, keeping more heat around the Earth, and allowing less to escape into space. Finally, the atmosphere keeps the Earth from experiencing huge temperature extremes between day and night, since warmth is kept near Earth even when the sun's rays aren't reaching one side of the Earth at night.

The atmosphere keeps air needed for the survival of plants, people, and animals near the earth. Air is made up of about 78% nitrogen, 21% oxygen, .09% argon, .04% carbon dioxide, and small amounts of other gases. Air, which is absolutely necessary for life on earth, is not found anywhere else people have explored in our universe. It is only known to be found in Earth's atmosphere!







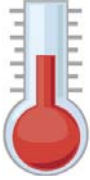
Our atmosphere helps to circulate air around the Earth. Together with ocean circulation, this is how heat is distributed fairly evenly around the Earth. This circulation remains the same because it is determined by how quickly the Earth rotates, and the difference in how much sunlight reaches the equator as compared to how much reaches the North and South poles.

The atmosphere plays a key role in understanding weather, and meteorologists study the atmosphere to learn what factors play a role in weather patterns. Geologists study the atmosphere, too, since erosion and shaping of landforms happens because of rain, snow, and wind, all of which originate in the atmosphere. Biologists who concern themselves with living things on earth study the atmosphere, too, since every living thing depends on air in the atmosphere, and the heat the atmosphere protects. Pretty cool, huh?

# Dinosaur Days of Long Ago Watch the Sky



Let's watch the sky to see what weather you have this week. In the graph below, mark down any you see in the sky each day. Try to go outside about the same time every day to record what you see. Put an "X" in the kind of weather you see in the sky, and in the bottom, bigger box, write down notes about the weather and how hot or cold it is.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
 <b>Sunny</b>							
 <b>Clouds</b>							
 <b>Cloudy</b>							
 <b>Rain</b>							
 <b>Stormy</b>							
 <b>Snow</b>							
 <b>Other Notes</b>							





# Dinosaur Days of Long Ago Sky Color

The sun is white, but a clean sky is blue. This is because molecules of air scatter the blue colors of sunlight more effectively than they scatter the green and red colors. So, the sky appears blue. But weather, air pollution, and other natural events can make the sky appear different shades of blue, or even different colors, like brown, gray, or greenish.

How well do you pay attention to the sky? Take time each day this week to look at the color of the sky, and write about why it may be that color. Here is some information about the color of the sky that will help explain why its color changes. You can use this information to help you think about why the sky is the color it is each day.

## All About Sky Colors:

A **deep blue sky** is a clean sky, and can occur when a cold front brings in clean air from the north, or when clean air from the ocean blows in over land.

A **medium blue sky** might mean there is plenty of water vapor in the sky, or may indicate there is a little pollution from coal, chemicals, or other sources.

A **pale or milky white sky** shows there is likely a lot of air pollution, often sulfur from coal-burning power plants. This happens more frequently in the summer when air isn't moving around and the pollution gets a chance to accumulate. (In winter, a white sky happens when it snows, too!)

A **gray or dark gray sky** can be caused by smoke or an oncoming storm.

A **brown or brownish-orange sky** over the horizon can be caused by pollution from cars.

A **hazy brown sky** can be caused by a major volcanic eruption, and can last for a long time.

A **greenish sky** can be a sign of tornado weather, and is a good sign you should take cover!

## As You Look at the Sky, Ask Yourself:

What is the color of the sky near the horizon?

What about the color of the sky well above the horizon?

What is the sky color straight over your head?



Use the colors above to describe the sky color you see each day this week.

Remember to include information on what you think the cause of the color might be.

DAYS	Color of the Sky	Why Do You Think the Sky is This Color?
Day 1		
Day 2		
Day 3		
Day 4		
Day 5		

# Dinosaur Days of Long Ago Catching Air



To see air in the atmosphere at work, make a paper helicopter from this pattern.

## What You Need:

- A copy of the copter pattern (in the back of this resource)
- Pencil
- Scissors
- Paper clips
- Markers
- Newspaper
- Cereal bowl

## What To Do:

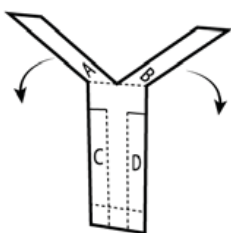
- Print out the helicopter pattern, and cut along the solid lines. Do not cut along the dotted lines. These are used only for folding.
- Then, fold piece A toward you, and B away from you, as in Picture 1.
- Fold C and D over each other so they overlap as in Picture 2.
- Fold the bottom up and put a paper clip on it, as shown in Picture 3.
- Hold the helicopter by the paper clip and throw it into the air like a baseball, as hard and far as you can, or climb on a chair and drop it. It will spin to the floor. You can also drop it outside from an upstairs window if a parent allows you to.
- If you'd like, you can color your copter. When it falls, the colors will blur together!

## What is Going On?

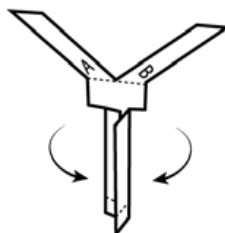
When the copter falls, air pushes up against the blades at the top, bending them upward just a little. When air pushes upward on the slanted blade, some of that thrust actually pushes sideways, becoming a horizontal thrust (Picture 4). You may wonder why the copter doesn't just move sideways, then. The two blades at the top are each getting a push, but in opposite directions. This creates two opposing thrusts, and makes the copter spin!

## Taking It Further:

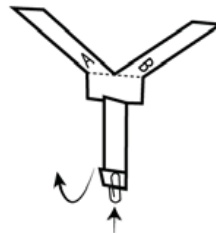
You can have fun with a sibling or friend by making several copters. Then, draw a 1-foot circle on an open piece of newspaper. Put the cereal bowl in the middle of the circle. The circle is the target area, and the bowl is the bull's-eye. Take turns standing on a chair above the edge of the newspaper, and drop your copters. Give 2 points if a copter lands inside the circle, and 3 points if it lands in the bulls-eye, with only 1 point given if it falls on the newspaper. See who has the most points after each person drops their copter 5 times.



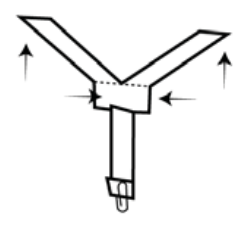
Picture 1



Picture 2



Picture 3



Picture 4

# Dinosaur Days of Long Ago

## Creation Day 3 - Water



*“<sup>9</sup>And God said, Let the waters under the heaven be gathered together unto one place, and let the dry land appear: and it was so. <sup>10</sup>And God called the dry land Earth; and the gathering together of the waters called he Seas: and God saw that it was good. <sup>11</sup>And God said, Let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after his kind, whose seed is in itself, upon the earth: and it was so. <sup>12</sup>And the earth brought forth grass, and herb yielding seed after his kind, and the tree yielding fruit, whose seed was in itself, after his kind: and God saw that it was good. <sup>13</sup>And the evening and the morning were the third day.”*

Genesis 1: 9-13, KJV

On the third day of Creation, God gathered the waters of the earth so that there were areas of dry land. The Bible does not absolutely tell us when God created water, though it had to be on or before the first day of Creation, since water is mentioned on the first day. No matter when God created water, it is necessary to life on earth, and is an amazing chemical compound!

A water molecule contains one oxygen and two hydrogen atoms, so it is often called H<sub>2</sub>O. Water stays in liquid form at temperatures above 32° Fahrenheit and below its boiling point, which is usually 212° Fahrenheit, but can vary if the air pressure is unusually high or low. In temperatures below 32°, water forms into a solid we know as ice. When water is heated above its boiling point, it changes forms, escaping into the air as water vapor, or steam. Clouds are an example of water vapor, while snow is an example of water in its solid, icy form.

Water covers more than two-thirds of the Earth's surface, and is vital to all forms of life. Oceans are home to 96.5% of Earth's water. The rest of the water is found in glaciers, polar ice caps, ground water, in bodies of fresh water, and in clouds and precipitation. Only 2.5% of all of Earth's water is fresh water, and 98.8% of that amount is found in ice and groundwater. That means people have to use water wisely as more and more people on the planet need to use the fresh water available to us all.

Water on Earth continually recycles itself, first evaporating into the air, forming clouds and condensing, falling to the ground as rain or snow, and running off the land into rivers and lakes, and oceans. This cycle continuously happens, watering plants around the world, keeping our lakes full of water, and affecting weather around the world every day.

Humans depend on water in so many ways! Water is essential for us to break down and use the food we eat. Plants could grow without water, since water is



a key part of photosynthesis. Water supports all the life in every sea, ocean, lake, pond, river, stream, and puddle around the world. These same bodies of water are used for transportation of goods around the globe along rivers, canals, and ocean shipping lanes. Much of the food you eat and the things you buy from stores has been shipped across or along at least one body of water!

Water is used by scientists and in industry to dissolve chemical compounds, it is used by firefighters to fight fires, and by almost everyone to wash themselves and keep their clothes and homes clean, too. Water vapor is used to heat homes and drive engines and generators. It helps people grow, process, and cook our food, and lets us enjoy water sports such as boating, tubing, swimming, surfing, and diving. People also use water in its solid, icy form to have fun, going ice skating, or playing hockey, or trying out skiing, sledding, or snowboarding. Imagine what life would be like without water!

## Dinosaur Days of Long Ago How Do You Use Water?



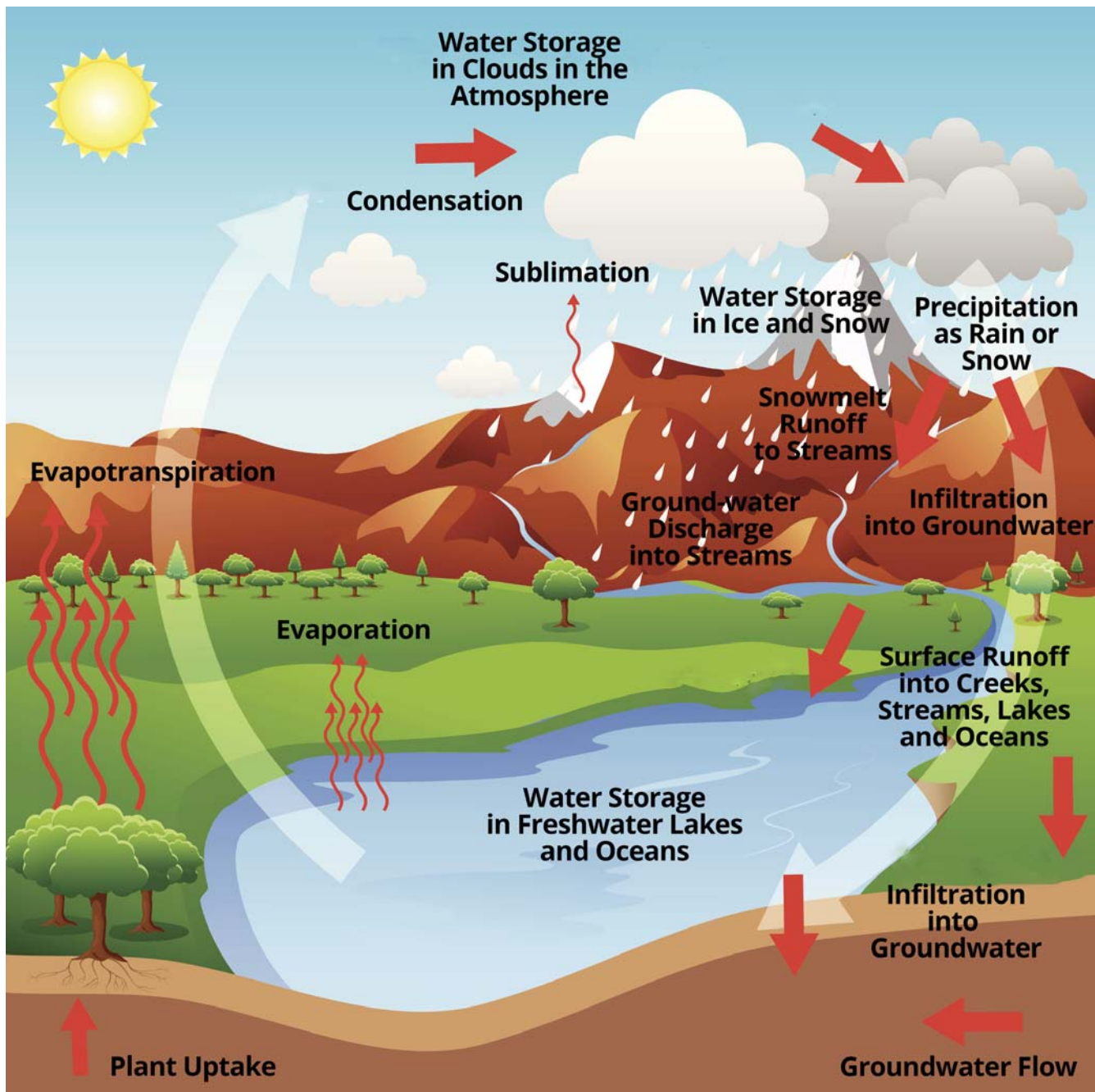
Below, list as many ways as you can that you use and depend on water. You can look back at the reading to remind you of some of them. Fill in as many blanks as you can.

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# Dinosaur Days of Long Ago The Water Cycle

You've already learned about the water cycle. Take a look at this illustration, which shows how the water cycle works. With a parent, talk through the cycle.



# Dinosaur Days of Long Ago Mini-Water Cycle



To see air in the atmosphere at work, make a paper helicopter from this pattern.

## What You Need:

- A large metal or plastic bowl
- A sheet of clear plastic wrap
- A dry ceramic mug (coffee mug)
- A long piece of string or large rubber band
- Water
- A sunny day

## What To Do:

- Fill the bowl with water until it is about 1/4 of the way full.
- Put the bowl in a sunny place outside, and place the mug in the center of it, without getting any water in it.
- Cover the top of the bowl tightly with the plastic wrap, tying the string around it to hold the plastic wrap in place.
- Watch the bowl to see what happens.

## What is Going On?

You should see a mist form on the underside of the plastic wrap that will begin to drip. If you'd like to speed up the drops actually falling, just move your bowl into the shade without splashing it. When the water warms up, some of it forms steam and rises into the air at the top of the bowl. Then it comes in contact with the plastic wrap and starts to accumulate and cool down. This causes the water to condense into drops of water that will then fall again down into the bowl.

## Taking It Further:

Explain below how this is like Earth's water cycle.



# Dinosaur Days of Long Ago

## Creation Day 3 - Land

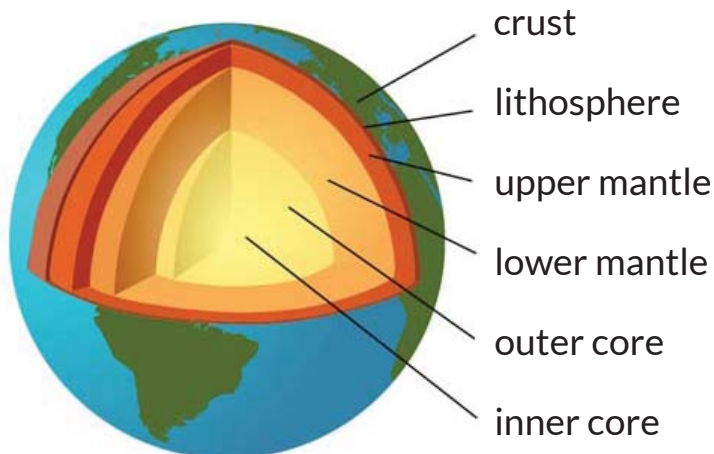


*“<sup>9</sup>And God said, Let the waters under the heaven be gathered together unto one place, and let the dry land appear: and it was so. <sup>10</sup>And God called the dry land Earth; and the gathering together of the waters called he Seas: and God saw that it was good. <sup>11</sup>And God said, Let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after his kind, whose seed is in itself, upon the earth: and it was so. <sup>12</sup>And the earth brought forth grass, and herb yielding seed after his kind, and the tree yielding fruit, whose seed was in itself, after his kind: and God saw that it was good. <sup>13</sup>And the evening and the morning were the third day.”*

Genesis 1: 9-13, KJV

When God gathered the waters on Earth together, dry land appeared. The study of this “dry land” is a science we call geology. Geologists study the land on Earth, the rocks that make up the dry land, and how these rocks and the Earth’s landscape changes over time. The land on Earth gives insight into Earth’s past, though scientists do not always agree on how to interpret what can be observed in rock formations. Though interpreting the past may be difficult, Earth’s land has helped geologist learn more about how to predict and give advanced warnings about natural disasters like earthquakes, and finding solutions to environmental problems.

The earth itself is made up of several layers. The earth’s crust is made up of igneous, metamorphic, and sedimentary rocks. The lithosphere includes both the crust and the top of the upper mantle, which serves together as a hard outer shell for the Earth. The mantle is pretty much solid, and surrounds a hot core. The mantle is divided into two layers. The upper mantle is where earthquake activity begins, sending waves of energy up toward the crust. The lower mantle is quieter.



The outer core is very hot, and is made up of iron and nickel. The Earth's magnetic field is believed to be created in this layer. This magnetic field keeps the solar wind from striking Earth's atmosphere with enough force to carry away the atmosphere. The inner core is solid, and is about as hot as the sun!

The study of the land God created includes a lot of study on rock. There are three major types of rock: igneous, sedimentary, and metamorphic. Igneous rock is magma or lava from the earth's mantle that cools and becomes solid. Sedimentary rock is rock that has been deposited on the earth's surface in bodies of water. Minerals or small particles of materials from plants or animals settle and build up, forming sedimentary rocks. Metamorphic rocks have had a change in their form because of heat or pressure, or both. The heat causes physical or chemical change to the rock. Igneous rocks and sedimentary rocks can be changed by heat to become metamorphic rocks. Even rocks that are already metamorphic can make this change.

Earth's rocks are continually being changed because of the effects of wind, water, heat, and pressure on them. Wind and water erode rock away, carrying it away in particles or pebbles. Heat melts rock, and pressure can combine with heat to change rocks. The rock cycle shows how the three types of rock and magma from the earth's center act with the help of heat and pressure, wind and water.

Magma from the Earth's inside occasionally erupts up through the Earth's crust. When it does, it hardens into an igneous rock. Igneous rock can then be weathered and eroded by wind or water, which carries it away. These particles are then deposited, and, with time can harden again into layers of sedimentary rock. The igneous rock could also be changed into a metamorphic rock by heat and pressure. If it does turn into sedimentary rock, it could change again into metamorphic rock with heat and pressure also. Metamorphic rocks can also be eroded away to become sedimentary rocks. Then, too, all three types of rock can be remelted to create magma once again, which can harden into an igneous rock. So you see, rocks and weather forces keep breaking down, then making more rocks, of one of these three kinds.

Geologists spend a lot of time keeping watch on how rocks form hills, cliffs, mountains, and volcanoes, while studying the weathering forces that carve out pieces of hills, wear away cliffs, and create canyons and ravines in mountains. Since the rock cycle is working everywhere on Earth all the time -- it's a big job!





# Dinosaur Days of Long Ago Wash Down a Mountain

Erosion shapes the Earth every day. Water carries away rocks and washes away sand. Wind blows dirt off cliffs or sand off dunes. Rivers and streams wash mud downriver and tumble rocks and pebbles, breaking them into ever smaller pieces, making new dirt and sand. Let's see how erosion works to shape the land!

## What You Need:

- Pitcher filled with water
- Cookie sheet with a raised edge
- Dry sand
- Dry soil
- Ice cube

## What To Do:

- Make two piles, one out of sand and one of soil on the cookie sheet.
- Blow on the soil gently and watch what happens. Did some of the soil blow away?
- Now take the pitcher of water and raise it just above the sand. Gently pour the water on top of the sand pile, and see what happens. Raise the pitcher and pour the water from higher up to create more force. What happens when you pour from each height?
- Frozen water also can cause erosion. Take the ice cube and rub it back and forth over some of the dirt or soil that is still dry. Turn the ice cube over. What do you see?

## What is Going On?

When you blow on the soil, like the wind, some of it is carried away. Wind blows loose soil and sand. In time, wind can move mountains of dirt or sand dunes.

When you pour water on the dirt, the water picks up the soil and carries it downhill. In nature, this sand or dirt ends up in a river or a lake, or even in an ocean. Water erosion wears down entire hillsides or riverbanks. Ocean waves can wear away at rock cliffs. If enough water or rain falls on the earth, large parts of hillsides or mountains fall down, and collapse. Did your sand mountain collapse?

Like the ice cube, glaciers pick up and carry along soil and rocks. These rub on the earth as the glacier slowly moves across the land.



# Dinosaur Days of Long Ago Candy Rock Cycle



Why not take a look at the rock cycle for yourself? This is a great way to learn more, because there's chocolate involved!



## What You Need:

- A cutting board
- A plastic baggie
- A handful of candy-coated chocolate pieces
- Aluminum foil
- Warm and hot water
- A hammer
- A bowl
- A fork

## What To Do:

- Put more than half your candy-coated chocolate pieces in a baggie. Put the baggie on the cutting board, and have an adult hit them with a hammer until at least half of what is in the baggie is in small chunks or tiny shavings, but there are still some larger chunks.
- Gather up the smallest pieces and shavings, leaving behind the larger chunks. Press them onto a piece of aluminum foil in layers. Press down hard to see how **sedimentary rocks** are formed.
- Next, take the larger chunks of what you hammered and some shavings and smaller chunks, and combine it with a few of the other chocolate pieces that weren't broken. Make a small cup out of aluminum foil and put the mixture in it. Fill the bowl with medium hot water, and float the aluminum cup in it. The chocolate should start to melt. With the fork, remove the foil from the water when the chocolate is soft and wait for it to cool. The mixture changed when heat was added; this is just what happens to **metamorphic rock**.
- Next place some of the sedimentary chocolate and some of the metamorphic chocolate along with some new chocolate pieces in another aluminum cup. Float this mixture in very hot water in the bowl. Watch and wait while the water heats the foil and melts the chocolate. Wait until it becomes a smooth liquid. With the fork, remove the foil from the water and wait for it to cool. This melted and cooled chocolate is similar to **igneous rock**.

## What is Going On?

As you see, rocks are worn away or subjected to heat and pressure. These make changes to the rocks. Rocks are always going through the rock cycle, changing forms again and again!