Ecology and Astronomy

The Homeschool Curriculum Company
How is a desert different than a tropical rain forest?

How is a coniferous forest different than the tundra?

Temperature, moisture, light, plants, and animals are a few of the ways these biomes differ from each other. A biome is a complex community of plants and animals in a geographical area with a specific climate.
Generally speaking, scientists agree that there are seven major biomes.

A grassland is a region with large areas of grasses, herbs, and flowers. Can you imagine grass that grows up to 11 feet tall? This tall grass is called Big Bluestem Grass. There are over 9000 species of grasses in the world! Grasslands could also be called prairies or pampas. Few trees are found in grasslands.

In the United States, grasslands are divided into 3 types: tall grass, mixed grass, and short grass.

And what is all this grass for? Grass is for grazing! Because grasslands present vast expanses of plants for grazing animals to eat, grasslands are home to some of the earth’s largest animals.
Scientists call the frozen cold ecosystems found near the northern most part of the Earth the tundra. These locations are known for their long cold winters, and their short cool summers.

The word "tundra" comes from the Finnish word "tunturia", which means "a barren land". Where is Finland? Finland is one of the most northern countries on Earth. The barren land of the tundra is frozen up to 3 feet deep for part of the year.

Not many kinds of plants can survive on the tundra. Only low growing plants like moss, lichen, and heath are found there.

The cold climate of the tundra brings plenty of snow, which provides good cover for animals with white fur. Can you name some animals with white fur that live on the tundra?

Actually, 48 species of mammals live there. Do you know what a mammal is?

In this region, spring and fall are very short, while summer and winter are longer. The average temperature is -18 degrees, but it can fall to -94 degrees!
Deserts are biomes which receive very little precipitation per year. In a desert, less than 250 mm or 10 inches of rain falls per year. Though most people think of deserts as being "hot", the largest desert in the world is actually in Antarctica! Deserts that are located in cold areas are called "polar" deserts.

Can you guess where the largest "non-polar" desert is? It is the Sahara Desert in Africa. Its length spans from the Atlantic Ocean on the west to the Red Sea on the east. Its width goes from the Mediterranean Sea on the north and continues south for 1200 miles into the middle of Africa.
Because deserts have very little precipitation, very few plants and animals live there. Can you name one plant and one animal that live in the desert? Hint: they store water!

Scrublands are areas that surround deserts and grasslands. They receive more rainfall than deserts and grasslands, but not enough to support tall trees. The plants in scrublands are typically shrubs and short trees.

You may encounter a variety of animals in the scrublands - rabbits, moles, box turtles, skunks, skinks, bobcats, and weasels!

A Skink
Now we need to talk about your teeth! What do your teeth have to do with biomes?

The teeth you have as a child - baby teeth - can also be called “deciduous teeth”. “Deciduous” means “falling off or out upon maturity”. Your baby teeth "fall away" when your mature teeth are ready to come in. Deciduous can also pertain to the antlers on a deer.

A forest where most of the trees lose their foliage at the end of the growing season is called a deciduous forest.

The trees in a deciduous forest lose their leaves on a yearly basis. Deciduous forests are found in North America, Europe, and Eastern Asia.
Coniferous forests are made up primarily of cone bearing trees. A cone bearing tree produces a needle and a cone instead of a leaf. Can you find a coniferous tree near you? Trees like spruce, pine, hemlock, and fir are coniferous trees. The coniferous biome tends to be cool and moist, with long, snowy winters and warm, humid summers.

The Earth's coniferous forests are mostly found in the northern hemisphere across North America, Europe, and Asia. Coniferous forests are usually found north of deciduous forests and grasslands, but south of the tundra.

Common mammals include elk, moose, and wolves.
The last type of forest is the tropical rain forest. A tropical rain forest gets lots of rain! Rainfall can range from 50 to 260 inches per year! That is over 20 feet of rain!

Huge trees and thousands of different types of plants and animals live in the rain forest. A rain forest has more kinds of trees than any other forest, and many of these trees grow straight up with no branches until very high above the rain forest floor.

Because tropical rain forests are typically located close to the equator, they have warm temperatures throughout the year.

The largest tropical rain forest in the world is located in South America. It is called the Amazon, and the great Amazon River runs through it.
In the beginning, God created a perfect environment, a special place in which to place man.

Read Genesis 2:4-20.

In Genesis 2:15, where did God "put the man"?

According to Genesis 2:9, do you think there was abundant food in the garden? According to Genesis 2:6 and Genesis 2:10, do you think there was plenty of water in the garden?

How many trees are described in Genesis 2:9?

According to Genesis 2:17, were Adam and Eve allowed to eat from the tree of knowledge of good and evil? What would happen if they did?

Could Adam and Eve have eaten from the Tree of Life?

According to Genesis 2:19-20, do you think Adam was afraid of any of the animals?
Read Genesis 3:1-6. Does it appear that Eve was afraid of the serpent?

Do you think that Eve was surprised that the serpent spoke?

When Eve ate from this tree, whom did she believe - God or the serpent?

After they sinned, were Adam and Eve allowed to eat from the tree of life? See Genesis 3:22-24.

Adam and Eve had decided to test the validity of God's word with the validity of the serpent's word. They rejected the gift of "revelation", and instead of believing God, they chose to "test" God's word. Adam and Eve did receive instant knowledge of good and evil, but all of humanity has paid a heavy price.

According to Matthew 20:28, who eventually paid the price for this sin? What was the price He had to pay?
Consumers

A consumer is one who consumes. To consume means to eat or drink or use up. In the scientific field of ecology, we can study what animals eat and then put the animals into groups according to what they eat.
Some animals eat only plants, such as grass, bushes, algae, fruits, and vegetables. These plant-eating animals are called herbivores. Do you remember some of the large herbivores that graze in the grasslands?

There are also very small herbivores. For example, mice are herbivores; they eat berries and seeds.
Another type of animal only eats other animals. They are called carnivores.

"Carni-" is a Latin term for "flesh or meat", and "vorare" is a Latin term meaning "to devour". So carnivores only eat flesh or meat. Carnivores do not eat plants.

Some of the largest carnivores are the southern elephant seal, the polar bear, and the Siberian tiger.

The Latin word for "all" is "omni". It is easy to understand that an omnivore is a consumer that eats all! An omnivore eats plants and animals. A bear is an example of an omnivore. It will eat berries or mushrooms or deer or fish!
One special subgroup of herbivores is called a "ruminant". Sheep, deer, cattle, giraffes, and camels are all ruminants.

Ruminants have four chambers or parts to their stomachs. They chew grass or leaves and swallow. The chewed food will sit in the first chamber to soften and then the animal will "regurgitate" it back up to their mouth where they will "chew the cud."

What are you? An herbivore, a carnivore, or an omnivore?
Previously we looked at the Garden of Eden where Adam and Eve were tempted.

Jesus was also tempted. Do you know where Jesus was tempted?

According to Mark 1:13, were there animals around when Jesus was being tempted? Do you think these animals were herbivores, carnivores, or omnivores?

Read Matthew 4:1 Who led Jesus? Who tempted Jesus?

Did Adam and Eve have plenty of food when they were tempted? Do you think Adam and Eve ate from the forbidden tree because they were hungry?

According to Matthew 4:2, was Jesus hungry? How many days had Jesus been without food?

In Genesis 3:1, what question did the serpent ask Eve?

Now let's look at how Jesus handled temptation. Read Matthew 4:4, 4:7, and 4:10. What words did Jesus use to fight temptation?
The Food Chain

In the last lesson, you read about the different types of consumers. In this lesson, you will see that consumers are one link in the food chain.

There are three links to the food chain. Plants take energy from the sun and nutrients from the soil and atmosphere. With this energy and nutrients, the plants produce their own food. Plants are producers, the first link in the food chain. They make their own food and do not depend on any other living substance for their nutrition. Examples of producers are fruits, vegetables, algae, seaweed, and phytoplankton.

Which do you like the most, fruit, vegetables, or seaweed?
When an animal comes along and gobbles up the plant, we see the second link in the food chain, the consumer.

A consumer cannot make its own food, but must eat (consume) it. Remember, consumers can eat plants, meat, or a combination of both.

Do you remember what each of those consumers is called? Consumers use a portion of the food for sustenance, and then discard the waste material.

A decomposer is the last link in the food chain. Decomposers use organic waste, as well as dead plant and animal remains. Decomposers break down the organic waste and tissue from plants and animals, returning the nutrients back to the soil.

Now that the nutrients have returned to the soil, producers can use them with sunlight to produce food and the cycle begins again.

Vultures, mushrooms, and worms are just a few examples of decomposers.
Did you know that worms are mentioned in the Bible?

If you open your Bible in the middle, you will probably land somewhere in the book of Psalms. The Jewish people called the book of Psalms "the hallal book" which means "Book of Praises." The Hebrew word for psalms, "mizmer", means songs. Many of these psalms may have been sung with musical accompaniment.

Psalm 22, a very famous Psalm, was written by David almost one thousand years before Christ. The passage gives a prophetic detail of the suffering of our Lord. Jesus quoted part of this Psalm as He hung on the cross.

Jesus quoted verse 1 on the cross. When He did, He essentially identified himself with the worm in verse 6. This worm referenced in Psalm 22 is no ordinary worm. It is a specific type of worm - the scarlet worm.

The Hebrew word translated "worm" in this passage is "tolath".

Let's look at how the word "tolath" is used in other verses to get some insight.

In Exodus 25:4, the Hebrew says, "and blue, and purple, and "tolath".

In Isaiah 1:18, the Hebrew says, "though they be red like "tolath".

As you can see, "tolath" was also translated as "red" or "crimson". The scarlet worm was the source of a fluid from which the people of ancient times made their scarlet dyes.
When the mother worm of this species is ready to give birth to her baby worms, she will implant her body in a tree somewhere, or on a post or stick of wood, so firmly that she can never leave again.

When the young are brought forth, the mother's body provides protection and sustenance for them until they can leave and fend for themselves.

The mother then dies.

As she dies, the scarlet fluid in her body emerges to stain her body, the bodies of her progeny, and the wood of the tree where the offspring were given life by their dying mother.

Like the scarlet worm, Christ's blood and death have brought new life to many sons and daughters.
Natural Cycles

A cycle is a series of events that are regularly repeated in the same order. The word "cycle" comes from the Latin word "cyclus" meaning circle. When you draw a circle with a pencil, the end of the circle brings you back to the beginning of the circle. So it is with a cycle. When you get to the end, you are back at the beginning!
The water cycle describes the continuous movement of water below, on, and above the earth. As the water moves through this cycle, it can occur in any of these forms: liquid water, water vapor, or ice.

The water in oceans, lakes, and ponds receives heat from the sun. This heat causes some of the water to turn from liquid into gas, rise into the sky, and collect in clouds. When liquid water turns to water vapor, the process is called evaporation.

As the water in the clouds cools again, it is turned back into a liquid. When water vapor turns back into liquid, the process is called condensation.

The water will then fall from the clouds in the form of rain, snow, or ice. This called precipitation. After it falls from the sky, it collects in bodies of water and the cycle begins again!
Nitrogen is the most abundant element in our atmosphere, comprising 78%. Although it is extremely important for plant life, nitrogen is a gas and cannot be used by plants in this state. It needs to be changed into another form before it can be useful to plants. The path that nitrogen takes through nature is called the "nitrogen cycle."

You are probably familiar with one way that nitrogen is converted to a usable form! If you need a hint, think of what you see during a thunder storm. If you thought of lightning, then you have figured out one way nitrogen is converted.

Do you know what the study of lightning is called? Fuminology! Maybe the next time someone asks what you want to be when you grow up, you can say a "fuminologist"!

Though lightning is "big and bold", most of the work of the nitrogen cycle is done by something that you can't even see! Specialized bacteria also change nitrogen into a form that can be used by plants and animals. Other bacteria do just the reverse - change the nitrogen back into a gas.
Living things are made of carbon. Carbon is also found in our atmosphere. When plants perform photosynthesis, they take carbon from the atmosphere and water from the ground and turn it into sugar, oxygen, and water vapor. The sugar is their food. What do we call an organism that can produce its own food?

When a living creature eats a plant, the carbon from the plant is transferred to the living creature. What types of consumers eat plants? When a living creature breathes, they breathe in oxygen and then breathe out carbon dioxide.

When an animal dies, all the carbon, oxygen, water, and other elements return to the soil. We refer to the cycling of carbon and oxygen together as the carbon oxygen cycle.
What book of the Bible do you think addresses many of the cycles, systems, and processes of nature?

Tough question! If you guessed the book of Job, you are correct.

Let's take a look:

Job 36:27-28
Job 37:9-10
Job 38:22-23
Job 38:29-30

And how would YOU answer this question? Job 38:35

Wow, with all the science in this book, it is easy to forget what was going on in Job's life! Read Job 1:1-22.

From the passage you read in Job 1, did it seem like Job was suffering because of something he did wrong? The book of Job deals with the topic of "undeserved suffering".

Do you think that many people have gone through "undeserved suffering"?
Do you think God cares about our suffering?

It seems that Job was not told exactly why he was suffering. God may explain suffering sometimes, but this is an example of a time when God did not explain. But God was not silent. What was God's response to Job's suffering?

In the midst of Job's suffering, God spoke about creation. He comforted Job by calling attention to His creative power. The belief in God's omnipotence and omniscience can steady our trust in Him. The Creator and Judge of all the earth will certainly do right.
Coping with Change

When God made animals, He knew that their environment would not always remain the same year after year. Changes in the environment can happen naturally, like a volcanic explosion or season change, or be caused by man, like pollution or population increase. God foreknew this and enabled animals to react to these changes.
An adaptation is a change within an animal that occurs due to a change in their environment. Some adaptations occur quite rapidly, while others occur gradually. Adaptation may occur because of natural selection where the animals with certain characteristics are better able than others to survive.

Hibernation is associated with a "winter sleep." During this period, the animal will "sleep" and become very difficult to awaken. The body functions of the animal will also slow.

Some hibernating animals are very familiar to us: raccoons, groundhogs, mice, skunks, chipmunks, hamsters, bats, and bears! Other animals that hibernate are frogs, toads, turtles, snakes, snails, and shrimp!

Many people immediately think of a bear when hibernation is mentioned. Did you know that a black bear can stop eating, drinking, urinating, or defecating for months???
The bear will eat as much as it can in the autumn, typically putting on 30 or so pounds. Then it will gather leaves, twigs, and other plants to make a den. When the bear enters the den, it rolls itself into a tight ball and puts its back to the entrance of the den.

A bear's heart rate is normally between 40-50 beats per minute. However, during hibernation, it will drop to only 8 beats per minute. Even though a bear drinks no water during this time period, scientists have found that during hibernation a bear still has a perfect amount of water in its body.

A bat also hibernates. A bat's heart rate will go from over 1000 beats per minute to only 25 beats per minute during hibernation. And some bats only breathe once every two hours while hibernating!
Not to be out done, the box turtle doesn't need to breathe at all during hibernation! Its skin absorbs the oxygen it needs!

Migration is the final way in which an animal can react to changes in an environment. Birds, bees, flies, and fish are examples of animals that migrate.

One of the most magnificent migrating examples is that of the monarch butterfly. A monarch butterfly cannot tolerate the cold temperatures of North America in the winter. Beginning in October, the butterflies will travel over 2500 miles to a warmer climate. Amazingly, a family of monarchs may go to the very same tree for several generations!
We have discussed how animals react to environmental change. What is the most famous "environmental change" in the Bible?

If you answered the flood, then you are correct. We will begin looking at this monumental alteration in Genesis 6. According to Genesis 6:14-16, how big was the ark? The ark was taller than a three-story building and about one and a half football fields long.

How many animals do you think could be on the ark? The ark had the capacity equivalent to 522 railroad cars.

Do you know how many sheep can fit in one railroad car? 240! That means the ark could have carried over 125,000 sheep!

According to 2 Peter 2:5, how many people went on the ark? How do you think 8 people cared for that many animals?

Not only did these 8 people have to feed the animals, but they also had to manage the waste somehow! And what about water for the animals to drink?
This is where we see that the mysterious and remarkable factor of hibernation may have been involved.

In Genesis 6:20, how did the animals come to the ark?

Do we see another change in animals after the flood according to Genesis 9:2-5?

Do you think the ability to "hibernate" might have been first imparted prior to the flood?

Is it feasible that all three methods that animals use to cope with environmental change - adaptation, migration, and hibernation - were first imparted by God during the time of the flood?

Quite possibly, the first migration was the animals' journey to the ark, the first hibernation was the time aboard the ark, and the first adaptation was the animals' adjustment to a new environment!
Have you ever seen garbage on the side of the road or in a park? Have you ever breathed in smoky air that made you cough? These are just a few examples of pollution. Pollution is the introduction of harmful contaminants into an environment.

Can you guess what noise pollution is? Noise pollution is excessive or irritating noise, most usually caused by things such as airplanes, railroads, machines, and even music.

Many people don't realize that excessive noise can actually bring about changes in humans and in animals. If you don't believe it, go turn up your music and see how long it takes someone to ask you to turn it down or off!
Air pollution occurs when chemicals or particles get into our atmosphere. Our atmosphere is a complex gaseous system, and needs to maintain the appropriate balance of the elements. When this balance is affected by pollution, it can be harmful to plants, animals, and people.

Water pollution is the pollution of lakes, rivers, oceans and other bodies of water. Most living things need water to live. Fish and birds can be especially impacted by water pollution. This can have a negative effect on the surrounding environment.
Land pollution is another kind of pollution and is usually caused by domestic waste or trash. We should never throw trash anywhere but in a garbage can or bag. Not only does it look bad, but it can be harmful to the soil and organisms nearby.

Many industrial and power plants take water from a nearby river or lake and use it as a coolant. This raises the temperature of the water. Because the water's temperature has been changed, it has an effect on the plant and animal life of the lake or river when it is returned. When the temperature of a body of water is changed it is called thermal pollution.

Radioactive pollution is caused by the disposal of radioactive waste in a manner that is damaging to the environment. This can happen at a nuclear power plant. Radioactive waste can be very destructive, even in small amounts. Great care should be taken to prevent this kind of pollution.
Could a person's mind or spirit also become "polluted"?

Read Romans 12:1-2.

What are we to offer to God according to this passage?

In the Old Testament, what happened to a "sacrifice"? Did it live or die? As you can see from this passage, we are to offer ourselves as what kind of sacrifice? The word "offer" in this verse implies a joyous and spontaneous act, similar to the way someone would give a birthday gift!

There are 2 commands in Romans 12:2. One is negative and one is positive. What verb is in the negative command?

Conformed actually means "molded" or "stamped" according to a pattern. The verse tells us what pattern we will be "molded" or "stamped" into if we do not pay attention - the pattern of this world. "World" in this verse does not mean the earth. It means the "same type of thinking as this age".

What is the positive command in this same verse?
You are changed by the renewing of your mind. This passage teaches that your mind is actually the vehicle for "change." We have to make continual and intentional choices about what we let our minds dwell on.

It is very easy to see, hear, and learn the "pattern of this world". It is all around us! What are ways you see, hear, and learn the pattern of this world without even trying?

However, it does take effort to renew your mind. You will have to make conscious choices about what you personally choose to see, hear, and learn.

You also have to expose your mind to the truth of God through His Word. But this effort will be rewarded with transformation.

We have mentioned several times that the Old Testament was written in Hebrew. Do you know what language the New Testament was written in?

The Greek word for "be ye transformed" is "metamorphouste". It is the same word that is used to describe Jesus at the Transfiguration. Read Matthew 17:1-2.
The same word that is used to describe how Jesus marvelously changed is the same word describing how we are to be changed.

Look back at Romans 12:2.

The last part of the verse implies that God has a good, pleasing, and perfect plan for you!

You do not have to look for or discover God's will for you. As you present your body and renew your mind, God's plan comes to you.
The majority of the stars you see at night are giant stars. These stars can be 5 to 25 times the size of our sun. A dwarf star is a relatively small, low mass star that emits an average or even below average amount of light. Our sun is a yellow dwarf star.

A variable star is a star that changes appearance when viewed from the earth.
A nova is a star that may have been dormant and then re-ignites for a certain period of time. Nova comes from the Latin word for "new star". This is because the star may not have been visible and then suddenly becomes the brightest star in the sky.

A neutron star is a very small star - about 12 miles across - that weighs a lot! A teaspoon of the matter that makes up a neutron star would weigh a billion tons!
Stars range in color from red to blue based on the surface temperature. The coolest stars are red. Next comes orange, then yellow, then white. The hottest star is actually blue. From this, you can see that our sun is somewhere in the middle.

When there is an enormous assembling of stars, it is called a galaxy. Do you know the name of the galaxy in which Earth is found?

Our galaxy alone contains over 100 billion stars! And just how many galaxies are there? It is estimated that there are over 100 billion galaxies!

The amount of energy that is in our galaxy is truly amazing. The sun alone gives off more energy in one second than one billion major cities could produce in a year.

The energy and vast expanse of the universe is almost beyond comprehension.
Do you know any famous stars mentioned in the Bible? Read Matthew 2:1-2.

There have been several explanations for this celestial event: a supernova, an amassing of planets, a comet, or even the conjunction of 2 planets!

Whatever it was, it had to be significant enough to prompt the wise men to actually travel to follow it. Now look at Matthew 2:3-4.

Does the Bible say that Herod saw the star? Does the Bible say that the chief priests or scribes saw the star? Do you find it interesting that the star would prompt the wise men to travel, yet there is no mention that Herod or the chief priests or the scribes saw the star?

Read verse 9 of that same chapter.

No star that we know could "naturally" stand over a place on the earth. Because the earth is continually rotating, the stars appear to rise in the east and set in the west.
Obviously, the birth of Christ was a supernatural event, so there is no reason why the star could not have been a supernatural event also! Possibly, it was specially designed and created for this unique purpose at this unique time.

Also from Matthew 2:7-10, does it seem that the star disappeared and then reappeared again after the magi met with Herod?

Did they know the Messiah would be born in Bethlehem?

Do you think it is possible the star appeared directly over the place where Jesus was born? Do you think a star could have been supernaturally close to the earth at this time to appear to be directly over the place where Christ was born?
Remember how many stars there are? In Genesis 15:5 God spoke to Abraham. "He took him outside and said, "Look up at the sky and count the stars-if indeed you can count them."

God made billions and billions of stars, and He gave our solar system 1 special one.
The sun is the largest object in our solar system, and is the closest star to our earth, yet it is still 93 million miles from the earth. The sun is 109 times larger than the earth. It is the size of 10 Jupiters.

Because the sun is made up of gases, it has no solid surface. Our star is 94% hydrogen, and almost all the rest is helium. Even though the sun is a big ball of gas, it still has structure.

The core of the sun is the center of the sun, and is the sun's hottest part. The radiative zone is the zone that circles the core of the sun. The convective zone is the outermost ring of the sun.

The spots on the sun that appear slightly darker in color are called sunspots and are cooler.

The sun periodically releases amounts of gas and plasma. These releases are known as solar flares.
The layer of the sun that we can see from the earth is the photosphere. The corona of the sun is the part around the atmosphere that you see during a solar eclipse.

An eclipse involves 3 things: the sun, the moon, and the earth. A solar eclipse happens when the moon passes between the earth and the sun, blocking all or part of the sun.

When do you think a "solar" eclipse would occur - during the night or during the day?

There is another type of eclipse - a lunar eclipse. A lunar eclipse happens at night, and has to be during a full moon. The earth will pass between the moon and the sun and the shadow of the earth will block part of the moon.

We have more lunar eclipses than solar eclipses. You can look at a lunar eclipse with no eyewear, but you should protect your eyes when looking at a solar eclipse.
Genesis 1:19 gives us a pattern that is repeated during the creation account: "there was evening and there was morning."

Do you remember in what language the Old Testament was written? The Hebrew word for evening is "ereb". The Hebrew word for morning is "boqer".

The phrase "evening and morning" is repeated throughout the Genesis creation account. How many times do you see this phrase repeated in Genesis 1?

Why do you think God repeats certain things in the Bible?

How many hours typically make up an evening and a morning? During the creation account, God set forth "lights" as a way of quantifying advancing days and years.

Let's finish Genesis 1:19 together. "And the evening and the morning _________________________.

The "fourth day" is what is called an "ordinal" number. It is not a "cardinal" number.
Cardinal numbers tell how many items - one, two, three, four.

Ordinal numbers tell in what order - first, second, third, fourth.

Do you know the first five books of the Old Testament?

These books are also called the Torah. In the Torah alone, we find ordinal numbered days over 100 times. In every instance, the interpretation of this is a 24-hour period.
Our solar system is made of the sun, 8 planets that orbit the sun, moons, asteroids, comets and other celestial bodies.

Do you think other planets have a moon like we do?

Do you think other planets could have more than one moon?

Our 8 planets have a total of 140 moons!
The 4 closest planets to the sun are Mercury, Venus, Earth, and Mars. They all have a very solid, rock-like surface.

Mercury is the smallest planet and is closest to the sun. You can sometimes see Mercury in the late evening, or the early morning. Mercury has great ranges in temperature, from 800 degrees Fahrenheit in the day to -300 degrees Fahrenheit in the night.

Not only is temperature very different on Mercury, but so is time. Mercury rotates very slowly, so one day on Mercury would take over 58 days on earth! However, Mercury can complete one orbit around the sun in only 88 days. That means a year on Mercury is only a little longer than a day on Mercury! Another way to look at it is this: a Mercury year is only 1 ½ Mercury days. Wow, it would be hard to figure out our ages on Mercury!
Venus is the brightest planet in the solar system. Besides the moon, Venus is the brightest natural object in our sky. When Venus is west of the sun, it can be seen in the morning and is known as the Morning Star. When Venus is east of the sun, it can be seen in the evening and is known as the Evening Star.

Mars is the fourth planet from the sun, and the second smallest planet in the solar system. It is sometimes called the "red planet" because the iron oxide on its surface gives it a reddish appearance.

It is possible that you have even seen or touched this same iron oxide that is prevalent on Mars. Can you guess what it is?

Iron oxide is commonly known as "rust"!
The 4 planets farthest from the sun are Jupiter, Saturn, Neptune, and Uranus. These planets are sometimes called the gas giants.

Jupiter is the largest planet in our solar system. Jupiter is so big, that you could fit 1300 earths inside Jupiter. Jupiter also has a very strong magnetic field. If you were to look at Jupiter through a telescope, you would see a giant red spot. This red spot is actually a storm that has been raging since the 17th century.

Do you know what Saturn is famous for? Saturn is famous for its rings! These rings are made of ice crystals, some as small as dust particles and others as large as your house!

Neptune has the strongest winds of any planet, with gusts reaching over 1200 miles per hour. The strongest winds on the earth are only 250 miles per hour. Typical hurricanes on Earth have winds ranging from 74 mph to 95 mph.
Uranus takes 84 of our Earth years to orbit the sun. At this rate, if you lived at one pole of Uranus, how long would you have daylight and how long would you have darkness?
Read 2 Peter 3:8.

In our own solar system, we can see how "days" and "years" could mean different amounts of time.

Here on earth, at different times in the history of man, days and years have been calculated by different means.

The calendar of the Old Testament was actually a "lunar" calendar. This means time and seasons were based on the different phases of the moon. A "lunar" calendar is in contrast to a "solar" calendar, which is based on the sun.

For examples, see Psalm 81:3 and Isaiah 66:23.

What calendar do you think was used by the Egyptians, who held the Hebrews as slaves during Moses' time? Not only did the Egyptians use a solar calendar, but they also worshiped the sun!

Knowing this, what do you think about the plague described in Exodus 10:21-29?
The calendar used in the United States is a solar calendar called a Gregorian calendar. It is named after Pope Gregory XIII who reigned over the Catholic Church in the 1500's.

The days of the week are named after the sun, moon, and the five known planets at the time: Mars, Mercury, Jupiter, Venus, and Saturn.

Likewise the names of the months have Roman origins. Can you guess from where the name July came? How about August? Do you know any famous Romans who had similar names?

A Hebrew in the Old Testament would simply call the days and months by their ordinal number: first day, first month, second day, second month, etc.
It takes the moon about 29.54 days to complete one orbit around the earth. As the moon circles the earth, different parts of the moon are lit by the sun. Since we can only see the part of the moon facing the sun, it appears to change shape. These are called phases of the moon.

When the moon is lined up between the earth and the sun, you might think there is no moon at all! This is because the lit part of the moon is facing the sun. The "dark side" of the moon is facing the earth. This is called a new moon.
As the moon moves away from the sun, you will start to see a small section of the moon. As the part of the moon we see grows in size, we say that it is waxing. The first small section that you can see as the moon starts to “grow” is called a waxing crescent. This is typically visible in the west, after sunset, one to two days after the new moon. The crescent is sometimes called a young moon.

As the moon waxes, it will get to a point where we can see a half circle. This will happen about one week after the new moon. Because the moon is one quarter through its orbit, the phase is called a quarter moon. To be even more descriptive, it is called a first quarter moon. The first quarter moon will rise at noon and will be high overhead during sunset and actually set at midnight.

As the moon continues to wax, more than half of the moon will be visible. This is called a waxing gibbous moon.
Then finally, you will see a full moon.

Now the moon is going to appear like it is getting smaller - we call this "waning." This happens because the lit part of the moon is turning away from the earth. The phase directly after a full moon is called a waning gibbous moon.

About one week after the full moon, you will see a third quarter moon.

And finally you will see a waning crescent moon.
Look outside today or tonight and try to find the moon. Can you identify the phase?
Read Gen 1:14-19.

According to verse 19, on what day were the sun, moon, and stars created?

Genesis 1:15 tells us the sun and the moon give light to the earth. The sun gives light by burning gases and emitting photons of light to the earth.

Do you know how the moon "gives" light? The moon gives light by reflecting these same photons.

Genesis 1:14 tells us the main functions of the "lights".

KJV: “...to divide the day from the night; and let them be for __________, and for __________, and for __________, and __________.”  
(signs, seasons, days, years)

The "lights" were a visual way to quantify advancing days and years. Without these "lights", it would be very hard to communicate or calculate any kind of time.

It is not surprising that calendars are figured based on the "lights" that God created.
Let's look at Genesis 1:19 again: "And the evening and the morning were the fourth day."

If you look at the pattern throughout the creation account in Genesis 1, which is always listed first - the evening or the morning? Do you find this unusual?

What time does a new day start for us now? Midnight now marks the start of a new day. However, midnight is not accompanied by any astronomical event. In other words, people who lived before there were clocks would have not have been able to see a visible sign in the sky to designate midnight.

In Jewish time, a new day began when a star was visible in the evening sky.

And, as odd as it may seem to us, in the Old Testament, it was the moon that governed the calendar, not the sun. The moon established the first day of the month, and important festivals were held on certain days of the month.
A pattern is repeated in Genesis - there was evening, and there was morning. The evening came before the morning.


Malachi 4:2 predicts for us who will bring the Light in the New Testament:

"But unto you that fear my name shall the Sun of Righteousness arise with healing in his wings."
Space Rocks

Besides the sun, planets, and moons, there are other things orbiting through our solar system. Comets, asteroids, and meteoroids travel through space orbiting the sun. But what are the differences between them?

Comets are made of ice, dust, and small rocky particles. "Comet" comes from the Greek word meaning "hair of the head." A comet looks like it has hair because it has a tail of dust particles. The tail of a comet always points away from the sun.
The most well known comet is Halley's Comet. Halley's Comet can be seen from the Earth about every 75 years. It was visible from Earth in 1986, and is expected to be visible again in 2016.

Asteroids are rocks floating in space. These can be the size of a pebble - or they can be over 500 miles across! Between the planets of Mars and Jupiter, a great number of asteroids are in orbit. This is widely known as an asteroid belt.

A meteoroid is a small part of an asteroid or a comet. If a meteoroid, comet, or asteroid makes it into the earth's atmosphere, it begins to burn up due to the speed at which it contacts the air. When a meteoroid enters the earth's atmosphere, it is called a meteor. We often call these meteors "shooting stars".
If the meteor makes it all the way through the atmosphere without burning up completely, and it lands on the Earth's surface, it is called a meteorite.

Hoba: The world's largest meteorite
Read Genesis 1:15-16.

Which do you think is given more importance, the sun and moon, or the other stars?

Do you think most stars are bigger than the earth?

Do you think many stars are bigger than even the sun?

Which do you think is more complex - a star or the earth?

A star is mostly hydrogen and helium - essentially quite "simple". However, the earth is quite complex, for it is uniquely and perfectly designed to support life.

Complexity and organization are more meaningful measures of significance than mere size!

According to 1 Corinthians 15:41, are any two stars alike?

Because no two stars are alike, there is unending variety in the stars and in the galaxies.
Did you know that the Bible names several of the stars and their constellations?

Read the following verses:

Job 9:7-9

Job 38:31-32
What is known as the "space race" began in 1957 with the launch of the Soviet satellite Sputnik 1. The United States formed NASA, the National Aeronautics and Space Administration, with the goal of putting a human in orbit around the earth before the Soviets could achieve it.

Project Mercury was officially introduced by President Eisenhower and publicly announced on December 17, 1958.

What family and friends do you have that were alive in 1958?

Rocket Garden - Cape Canaveral
Project Mercury involved building, testing, and flying several different kinds of spacecraft. There were 20 different spacecraft developed during the Mercury space mission. Some were never flown, some were destroyed during unmanned flights, and one even sank in the ocean!

The first seven astronauts were selected and were called the "Mercury Seven." Of these seven, Alan Shepherd would be the first American in space, and John Glenn would be the first American to orbit the earth.

The next step - the moon!

The Gemini space mission was to develop a spacecraft to travel to the moon and back. The spacecraft developed for this mission held two men, side by side. Gemini is a Latin word for "twins". There were 10 manned Gemini space flights, with a total of 16 astronauts.
Now that a spacecraft had been developed to travel to the moon and back, the next step was to land a man on the moon. This was the goal of the Apollo Space Mission.

Unfortunately, the Apollo Space Mission started with a tragedy. In 1967 three astronauts were killed in Apollo 1 during a pre launch cabin fire.

Eventually, Buzz Aldrin, Neil Armstrong, and Michael Collins would travel in Apollo 11 and land their lunar module on the moon in 1969.
The Space Shuttle Program was NASA's launched vehicle program from 1981 to 2011.

If you look at a Space Shuttle vehicle, you will notice something that wasn't on the other space vehicles - wings! Those wings would help the shuttle land on a runway much like a glider.

Here are some names of the Space Shuttle vehicles: Columbia, Challenger, Discovery, Atlantis, and Endeavor. Altogether, there were 135 missions flown.

Among other things, these missions aided in the construction of the International Space Station, repairs to the Hubble Space Telescope, and many, many science experiments!
There were 2 tragic accidents with this program. The Space Shuttle Challenger was lost 73 seconds after liftoff. The crew of seven was killed in this accident.

Additionally, the Space Shuttle Columbia was lost 16 minutes before it landed on February 1, 2003. All seven members of the crew were killed.
One of the most magnificent Psalms about God's creation is Psalm 19. Read Psalm 19:1-6.

According to verse 1, what do the heavens do?

The Hebrew root for "declare" is "caphar", which actually means "recounting".

According to this passage, what are the skies/firmament doing?

The Hebrew root sheweth (proclaim in NIV) is "nagad", which has the implication of stating the obvious.

Basically, the essence of this passage is that creation obviously, conspicuously, and clearly shows the glory of God - and man would have to willfully suppress the way that creation speaks of God's glory.

According to verse 2, do you think that every day and night you could learn something new about the excellence of God?
Look again at verses 3 and 4.

According to this passage, has every person who has ever lived heard God's glory and his handiwork?

Psalm 19 declares that the heavenly world is indeed delivering a message to people, regardless of where they live or what language they speak. This testimony is an inescapable message for all who live on earth because it is being announced day and night from the sky over every person's head.

This Psalm speaks of "two witnesses" to God's glory. We have already discussed the first witness in verses 1 - 6: creation.

The second witness is described beginning in verse 7 - the "word" of God. Read verses 7-14.

Nature and creation can reveal the glory of God, but they cannot reveal the will of God. God's word reveals God's will.

What words describe the "word of God" (law, statutes, etc.) in verses 7-9?
Creation reveals the glory of God, while God's word reveals the will of God.

According to verse 11, what will you receive if you keep God's word?

“The heavens declare the glory of God; and the firmament sheweth his handywork.”

Psalm 19:1

God bless, Mia