Pandemic Preparedness Action Plan

Home Academic Resources

Christina School District Families;

As the global outbreak of the Coronavirus (COVID-19) continues to evolve, the Christina School District, working with other districts in Delaware, as well as the Division of Public Health, is taking steps to prepare for the possibility of transmission to our community. As part of the Christina School District’s Pandemic Preparedness Action Plan we are providing the following academic resources in the event of an extended school closure.

The attached resources are meant to provide students with an opportunity to practice previously learned skills while schools are closed. These resources are also available on our website www.christinak12.org for downloading and printing. We ask that your child practice their skills by working on these resources daily. Students should complete the packet to the best of their ability. Students should work at their own pace and can receive support from family members. If students reach a point of frustration, please stop and move on. We also encourage our students to read daily for a minimum of 30 minutes per day. Completion of these activities will help maintain your child’s academic progress until school reopens. Please stay tuned to the Christina School District website for the most recent news and announcements regarding potential school closures.

Grade Level 9 10 11 12
Science & Social Studies
The Rise of Oxygen in the Earth's Atmosphere
by American Museum of Natural History
This article is provided courtesy of the American Museum of Natural History.

On a chilly October afternoon, Grant Young and Jay Kaufman stand along a busy roadside in northern Ontario, poring over their favorite Earth-history book. Young, a professor of geology at the University of Western Ontario, and Kaufman, a geoscientist from the University of Maryland, are among the leading scientists trying to attach firm dates to the rise of oxygen in Earth's early atmosphere - an event that, when it occurred more than 2 billion years ago, dramatically altered the planet's development.

The book they are reading is an ancient geological masterpiece: the Huronian Supergroup, a massive formation of rock laid down gradually between about 2.5 billion and 2.2 billion years ago, precisely the period when oxygen began to accumulate in the atmosphere.

The Huronian Supergroup is 10 or 11 kilometers (six or seven miles) thick and extends well below ground. From atop a nearby outcrop, a viewer can survey the landscape for miles around. At the moment, however, Kaufman and Young are at road level, examining a segment of the outcrop that was exposed back when the highway was built. Individual layers of ancient sediment form horizontal stripes on the rock. From a few steps back, the rock wall looks like a cross-section of a giant, stone encyclopedia.

"When we look at a sequence of rocks, it's like the pages of a book," Young says. "The page at the bottom is the oldest and the page at the top is the youngest. We read history by starting at the bottom layer and working our way up. The Huronian Supergroup is particularly exciting and interesting because, by chance, these rocks were laid down at a period when the atmosphere underwent a transition from containing no free oxygen to containing at least some free oxygen."

It may seem at first like an odd strategy: studying rocks in order to understand the atmosphere. It's one thing to examine fossils, the solid remains of ancient, solid creatures. But what can rocks reveal about something as formless as air, much less air that existed billions of years ago? How does one study the ancient atmosphere when no samples of it are left to collect?

Fortunately, the geological record contains a history of more than just rock. The atmosphere, then as now, constantly interacts with Earth's crust. As exposed rock weathers, its composition is altered by compounds in the air. This alteration is apparent even billions of years later and reveals important details about the atmosphere at the time. By studying a shoeprint in the mud, a police detective can determine not only the kind of shoe that made it, but also critical details about its wearer: size, weight, gender, even age, and whether or not he or she walked with a limp. The ancient atmosphere left an equally telling signature in the rock record. By flipping backward through pages of rock, a geologist can begin to form a picture of that atmosphere and how it changed through time.
"I've often wished that I had a time machine to go back and collect a sample of ancient atmosphere or an ancient bit of seawater," says Kaufman. "But we can't. All we can do is collect rocks that were formed under those waters and under that atmosphere."

Oxygen is a highly reactive element; it readily combines with other elements to form new compounds. As these compounds form, they become part of the geological record, leaving behind a trail of molecular "crumbs" that point to oxygen's whereabouts through history. One clue to the nature of the ancient atmosphere comes from rock formation known as "redbeds," the oldest of which date back about 2.2 billion years. Redbeds are sediments that were deposited on floodplains by water exposed to the atmosphere. They contain a mineral called hematite, a compound of iron and what must have been atmospheric oxygen. After 2.2 billion years ago, redbeds become increasingly common in the geological record.

"It's a very simple kind of test," says Young, who has studied redbeds extensively over the course of his career. "But it does give us at least a first-order idea as to whether there was free oxygen and whether there wasn't."

In recent years Kaufman's colleague James Farquhar, a geochemist at the University of Maryland, devised an even more precise method of dating the rise of oxygen. He collected rocks from the Huronian Supergroup and other deposits around the world, ground them to powder in the laboratory, and studied them for traces, not of oxygen, but of an entirely different element: sulfur. Sulfur compounds are emitted in vast quantities by volcanoes, which were especially active during Earth's youth. Like other airborne compounds, they undergo reactions in the atmosphere and eventually end up deposited in the geological record.

As it happens, there are four different kinds, or isotopes, of sulfur. By far the most common - about 95 percent of all atmospheric sulfur - is sulfur-32, or sulfur with an atomic weight of 32. The other isotopes are sulfur-34 (4.2 percent), sulfur-33 (0.75 percent), and sulfur-36 (0.02 percent). The relative proportion of these four isotopes has tended to remain steady over time. But Farquhar and his colleagues found that in rocks older than about 2.4 billion years, the proportion of sulfur-33 varied widely, whereas rocks younger than about 2.1 billion years showed no significant variation. What accounted for the variation, and for the change?

The answer, Farquhar and Kaufman believe, was oxygen. Early in the planet's history, before enough free oxygen had accumulated to form a protective layer of ozone (O3), Earth's atmosphere was scorched by intense ultraviolet radiation from the Sun. The UV radiation may have reacted with the atmosphere to produce some compounds with a high sulfur-33 to sulfur-32 ratio and other compounds with a low sulfur-33 to sulfur-32 ratio. Later, with the rise of oxygen and the formation of an ozone layer which blocked incoming UV radiation, that photochemical reaction stopped, and the ratio of sulfur-33 to sulfur-32 ceased to vary. Amazingly, these signatures of sulfur isotopes are recorded in the rocks. In old rocks, before the buildup of atmospheric oxygen, the ratio of sulfur-33 to sulfur-32 in rocks is variable; in young rocks it is constant and in the same ratio as today.
Farquhar's technique, though indirect, is remarkably exact: he has determined that free oxygen began to accumulate in the atmosphere about 2.45 billion years ago and was well established by 2.1 billion years ago. He also has been able, for the first time, to provide a rough measure of how much oxygen there was compared to today. "The sulfur research probably provides the strongest evidence for the buildup of oxygen in the atmosphere," Farquhar says. "The change from a large signature to a much smaller signature is a result of a large change in atmospheric oxygen content, from levels 100,000 times less than present to levels within about 100 times less than the present level."

"The most exciting thing to me about this research is that it quantifies amounts of oxygen in the atmosphere," Kaufman adds. "Before, we just had this qualitative sense of, well, it was low here, it must have risen here. But the signatures that we're seeing allow us to actually get at numbers - to get at the timing of this rise, so it's not just a fairytale. We can actually write some sentences on the pages of the book of atmospheric oxygen."
The Rise of Oxygen in the Earth's Atmosphere
by American Museum of Natural History (Adapted by ReadWorks)

It is a chilly afternoon in October. Two scientists named Grant Young and Jay Kaufman stand along a busy roadside in Canada. They are carefully studying an ancient rock formation. These two scientists both study geology, the science of the Earth and the rocks that make it up. They know that over 2 billion years ago, the amount of oxygen in Earth's atmosphere increased, which changed the way the Earth developed. Now they are trying to determine a more precise date of when that rise in oxygen happened.

For Young and Kaufman, studying the ancient rock formation is like studying a book of the history of the Earth. The rock formation is massive and is called the Huronian Supergroup. The formation is six or seven miles thick and extends below ground.

The sedimentary rock formation was created as wind and water left layers of sediment on the Earth's surface. Sediment is bits of sand, clay, minerals, and plants. These sedimentary rock layers form stripes on the rock. From a few steps back, the rock wall looks like a pile of pages from a giant, stone book.

"When we look at a sequence of rocks, it's like the pages of a book," Young says. "The page [or layer] at the bottom is the oldest and the page at the top is the youngest. We read history by starting at the bottom layer and working our way up."

This rock formation started to form 2.5 billion years ago. It took 3 million years for its rock layers to be laid down gradually.

Young says that this rock formation is especially interesting. This is because the layers of these rocks were laid down at a very important period in the history of Earth's atmosphere. They formed at the same time that oxygen gas began to accumulate, or build up, in the atmosphere. So scientists study these rocks in order to learn about that time period.

It may seem strange to study rocks in order to understand the atmosphere. What can rocks tell us about air that existed billions of years ago? How do you study the ancient atmosphere when you can't get a sample of it?

The layers of rock that these scientists study are called the geological record. Luckily, the geological record contains a history of more than just rock. It also contains a history of the things that came into contact with that rock. For example, the atmosphere constantly interacts with the rock that makes up the Earth. This causes the rock's composition to be changed by compounds in the air. The composition of the rock is what the rock is made up of. Changes in the rock's composition can actually be seen millions and billions of years later. And they reveal important details about the atmosphere at the time of the change. In a way, studying these rocks is similar to detective work.
studying the different layers of rock, a geologist can begin to understand more about the atmosphere and how it changed through time.

"I've often wished that I had a time machine to go back and collect a sample of ancient atmosphere or an ancient bit of seawater," says Kaufman. "But we can't. All we can do is collect rocks that were formed under those waters and under that atmosphere."

Oxygen is a highly reactive element. That means it combines easily with other elements to form different compounds. As these compounds form, they become part of the geological record and leave behind a trail of clues. These clues help scientists figure out whether there was oxygen in the air at different points in history. One clue about the ancient atmosphere comes from the formation of "redbeds."

Redbeds are sediments that were left on the ground by water that was exposed to the atmosphere. They contain a compound called hematite, which is made up of iron and oxygen. Scientists assume that the oxygen part of the compound must have come from the atmosphere. Around 2.2 billion years ago, redbeds became more and more common. This clue tells geologists that around 2.2 billion years ago, there must have been plenty of oxygen in the atmosphere in order to create that compound in these redbeds.

Looking for the presence of redbeds is one way scientists can get a basic idea about whether or not there was oxygen in the air at a certain point in time.

Recently, another scientist named James Farquhar used an even more exact method to figure out when oxygen began accumulating in the atmosphere. First, he collected rocks from rock formations around the world. Then, he ground them to powder. He studied them for traces of an element called sulfur. Compounds that contain sulfur are released in large quantities by volcanoes. Volcanoes were especially active in Earth's early years. Therefore, a lot of sulfur compounds were released into the air in those early years. These sulfur compounds interacted with the atmosphere. Eventually, they were deposited in rock layers and became part of the geological record.

Four different kinds, or isotopes, of sulfur can be found in the atmosphere. The most common is called sulfur-32, or sulfur with an atomic weight of 32. Almost all of the sulfur in the atmosphere is sulfur-32. The three other kinds of sulfur are called sulfur-33, sulfur-34, and sulfur-36. They make up just a small portion of the sulfur in the atmosphere.

The amount of each kind of sulfur in Earth's atmosphere is very important to Farquhar's study. The relative proportions of the four kinds of sulfur have remained steady for a very long time. This means that the amount of each kind of sulfur, compared to the amounts of each other kind of sulfur in the air, has stayed the same for a long time.

Since the sulfur in the atmosphere formed compounds that ended up in rock layers, scientists today can look at rocks to find out what kinds of sulfur were in the air in the past. Farquhar discovered that rocks younger than 2.1 billion years old have the same proportions of the four kinds of sulfur that we find in the atmosphere today. This means that those proportions have been the same for 2.1 billion years. But in rocks older than 2.4 billion years, the proportion of one of the kinds of sulfur, sulfur-33, can be very different depending on which rock is examined. This means that 2.4 billion years ago, the proportion of sulfur-33 must have changed a lot in the atmosphere. What caused the proportion of sulfur-33 to change so much in Earth's atmosphere? And what made the proportion of sulfur-33 stop
changing and become steady later on?

Scientists think that oxygen caused the proportion of sulfur-33 in our atmosphere to become steady. Early in our planet's history, the atmosphere received intense radiation from the Sun. This intense radiation may have reacted with the atmosphere to produce sulfur compounds with different proportions of sulfur-33. Some compounds had a high amount of sulfur-33 compared to sulfur-32, and others had a low amount of sulfur-33 compared to sulfur-32. Later, a great deal of oxygen accumulated in the atmosphere. This formed a layer in the atmosphere called the ozone layer. This layer blocked much of the Sun's most intense radiation. As a result, the reaction between the atmosphere and the Sun's radiation stopped. So the atmosphere no longer contained compounds with varying proportions of sulfur-33. The amount of sulfur-33 compared to sulfur-32 in different compounds in the air became constant, and has stayed the same ever since then. And all of this can be seen in the sulfur compounds in rocks.

This way of figuring out when the amount of oxygen in the atmosphere began to rise has remarkably exact results. Farquhar figured out that oxygen first began to accumulate in the atmosphere about 2.45 billion years ago. And he's learned that oxygen had a strong presence in the atmosphere beginning 2.1 billion years ago. He is also the first person to give an estimate of how much oxygen there was back then, compared to today. He found that there is about 100,000 times more oxygen in the atmosphere today than there was 2.45 billion years ago. "The sulfur research probably provides the strongest evidence for the buildup of oxygen in the atmosphere," Farquhar says. The changes in the sulfur compounds in the rocks prove that there was a change in oxygen levels in the atmosphere.

Before this research, scientists only had a general idea about the oxygen levels in the Earth's ancient atmosphere. Scientists just had an idea of when the oxygen levels were low or high, and when they must have gone up. But the sulfur proportions in the rocks provide information that allow scientists to find out when the oxygen levels changed, and by how much. Kaufman says that is the most exciting thing about the research. He is excited that the rise of oxygen is not just a fairytale. "We can actually write some sentences on the pages of the book of atmospheric oxygen," he says.
**accumulate**

**Advanced Definition**

transitive verb
1. to amass; collect.

> Now a millionaire, the tycoon began to accumulate many priceless paintings from Europe.

intransitive verb
1. to become greater; increase.

> Dust accumulated under all the furniture.

> Evidence of the harmful effects of the pesticide accumulated to the point where its use was banned by the government.

> Snow quickly accumulated on the roof.

> Water accumulated in the leaky basement.

**Spanish cognate**

*acumular*: The Spanish word *acumular* means accumulate.

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**These are some examples of how the word or forms of the word are used:**

1. A group of students dressed identically had *accumulated* at the corner and they were shivering in the cold air of dawn. He nodded to his classmates, all too tired to have a decent conversation.

2. Farquhar's technique, though indirect, is remarkably exact: he has determined that free oxygen began to *accumulate* in the atmosphere about 2.45 billion years ago and was well established by 2.1 billion years ago. He also has been able, for the first time, to provide a rough measure of how much oxygen there was compared to today.
composition

Definition
noun
1. the way the parts of something are put together.

*The scientists studied the composition of rocks from the moon.*

2. a piece of writing or music that has required thought and imagination to make.

*The teacher asked us to write a composition about the Bill of Rights.*

*His musical compositions are beautiful.*

Advanced Definition
noun
1. the act of composing.

2. the relation among the parts of something; order or structure.

3. a specific written or musical work.

4. the art or craft of producing such works.

*He is studying composition.*

5. a substance or material that is made from a combination of other substances or materials.

6. in printing, the setting of type.

7. a short piece written as a school assignment.

Spanish cognate

composición: The Spanish word *composición* means composition.

These are some examples of how the word or forms of the word are used:

1. Throughout his life, Ellington wrote lots of compositions. He wrote many film scores. He also wrote a lot of religious music. He is considered one of the greatest composers in jazz history.

2. Wolfie was a fast learner and surprised everyone in his family and in his town. Before he was even five years old, Mozart learned his first complete composition. He learned this song in
only 30 minutes!

3. On his way back down the cauldron wall, he chipped off a chunk of gleaming, newly hardened lava and carried it with him out of the caldera. Examining its composition back in Wyoming might offer another clue to when Nyiragongo will roar to life again.

4. Some fossil bones that are 60 or 70 million years old have a lot of their original chemical composition - they almost seem more like bone than rock. Other fossil bones could be "just" 10,000 years old, but they're so hard you could drive nails with them.

5. Modotti cropped the photograph so that the woman dominates the composition. She also took the picture from a low vantage point so that we look up at the woman, emphasizing her importance.

6. Sometimes only a small difference in chemical composition results in a very important alteration.

7. By examining the composition of each layer of sediment, we come to know more about what the atmosphere and other climatic conditions were like at different times of the earth's history.
proportion

Advanced Definition

noun
1. a part or fraction of a whole.

What proportion of the students require special assistance?

A large proportion of the forest will be cut down.

2. the comparative relationship between different things or quantities; ratio.

The proportion of men to women at the school is two to one.

3. the proper relationship between things or parts with respect to size or amount.

Make sure you add the ingredients in proportion.

4. harmony among parts or elements; symmetry; balance.

Her paintings demonstrate proportion of line and color.

5. (pl.) size; dimensions.

He designed a statue of enormous proportions.

transitive verb
1. to adjust with the intention of having sizes or parts in proper relation to each other.

The architect proportioned the rooms cleverly.

Spanish cognate

proporción: The Spanish word proporción means proportion.

These are some examples of how the word or forms of the word are used:

1. Although transatlantic slavers continued to deliver their cargoes to the great estuary, the proportion of Africans declined as the indigenous African American population increased.

2. In proportion as the structure of a government gives force to public opinion, it is essential that public opinion should be enlightened. As a very important source of strength and security, cherish public credit.
3. The taxes for paying that proportion shall be laid and levied by the authority and direction of the legislatures of the several states within the time agreed upon by the united states in congress assembled.

4. The building of the skyscraper represents an investment of $50,000,000 and all other figures are in proportion. More than 50,000 tons of steel, 10,000,000 bricks, and 200,000 cubic feet of stone will be used before the frame is completed.

5. Although the Voting Rights Act passed, state and local enforcement of the law was weak and it often was ignored outright, mainly in the South and in areas where the proportion of blacks in the population was high and their vote threatened the political status quo.

6. But in rocks older than 2.4 billion years, the proportion of one of the kinds of sulfur, sulfur-33, can be very different depending on which rock is examined. This means that 2.4 billion years ago, the proportion of sulfur-33 must have changed a lot in the atmosphere.
The Rise of Oxygen in the Earth's Atmosphere - Comprehension Questions

Name: ___________________________ Date: ______________

1. Why is the Huronian Supergroup rock formation particularly interesting to scientists?
   A. because it looks like a cross-section of a giant, stone encyclopedia
   B. because it formed during the period when oxygen began to accumulate in the atmosphere
   C. because it contains unusually large amounts of oxygen and sulfur
   D. because it dramatically altered the planet's development when it first formed

2. In this article the author explains what scientists are trying to find out. What are the scientists in the article trying to find out?
   A. how the proportions of different sulfur isotopes change in the geologic record
   B. when oxygen increased in Earth's early atmosphere
   C. when sulfur first appeared in Earth's early atmosphere
   D. how the ozone layer formed and the effects of its formation

3. Read these sentences from the article.

"I've often wished that I had a time machine to go back and collect a sample of ancient atmosphere or an ancient bit of seawater," says [Jay] Kaufman. "But we can't. All we can do is collect rocks that were formed under those waters and under that atmosphere."

Which conclusion does this statement support?
   A. Scientists are skeptical about their ability to determine when oxygen levels in the Earth's early atmosphere rose.
   B. Scientists are unable to study what the Earth was like millions of years ago because they do not have the materials needed to do so.
   C. Scientists study the atmosphere in order to learn what the Earth's seawater was like millions of years ago.
   D. Scientists study rock formations in order to learn what Earth's atmosphere was like millions of years ago.
4. Read these sentences from the article.

"Individual layers of ancient sediment form horizontal stripes on the rock. From a few steps back, the rock wall looks like a cross-section of a giant, stone encyclopedia."

Why might the author have included this description of the rock wall?

A. to explain why the author quotes scientists in the article
B. to demonstrate why the author explains two different methods used to date the rise of oxygen in the atmosphere
C. to show why the author presents information about different compounds in the article
D. to clarify why the author compares studying a rock formation to studying a book

5. What is the main idea of this article?

A. Scientists learn about sulfur by studying ancient rocks.
B. Scientists learn about the history of oxygen in Earth's atmosphere by studying rocks.
C. Scientists learn about redbeds by studying the history of Earth's atmosphere.
D. Scientists learn about the history of sulfur in Earth's atmosphere by studying oxygen.

6. The author asks these questions in the article.

"But what can rocks reveal about something as formless as air, much less air that existed billions of years ago? How does one study the ancient atmosphere when no samples of it are left to collect?"

Why might the author ask these questions? Consider both the questions themselves and their context in the article.

A. to get the reader thinking about something that will be explained later in the text
B. to force the reader to come up with ways to study the ancient atmosphere without collecting samples
C. to invite the reader to learn more about the questions scientists ask themselves
D. to suggest to the reader that it's impossible to learn about the ancient atmosphere using today's rocks
7. Read this sentence from the article.

"As exposed rock weathers, its composition is altered by compounds in the air."

Which of the following words could replace "its" without changing the meaning of the sentence?

A. the rock's
B. the weather's
C. the Earth's
D. the compounds'

8. In order to determine when oxygen levels increased in the Earth's atmosphere, which element did James Farquhar and his team search for in rocks?

9. Jay Kaufman said that while scientists cannot collect and study samples of the ancient atmosphere, they can "collect rocks that were formed... under that atmosphere." Why are scientists able to learn about the ancient atmosphere by studying the rocks that came into contact with the ancient atmosphere?

10. Explain what scientists might be able to learn about the seawater that existed millions of years ago by studying rocks that came into contact with seawater at that time in the past. Use evidence from the text to support your inference.
The Sounds of Baseball
by Michael Stahl

Human beings hear sounds constantly. Sounds are the result of vibrations. When an object vibrates, it sets off a chain reaction of events that might end up inside a person's ear. After a vibration of any kind, the molecules of the object knock into the molecules of air that surround it, or possibly the molecules of another object next to it. Air molecules bash into each other like millions of microscopic Ping-Pong balls, transporting the sound through what becomes a sound wave. Depending on how strong or soft the vibrations are, the sound's volume and tone will vary. Eventually, a human's ears hear the vibrations.

A person's ears pick up vibrations everywhere they go, but there might not be many places that offer as many different sounds coming from so many different sources as a baseball game.

While sitting in a seat at a game, one of the first sounds someone might hear would be that of a hot dog vendor. "Hot dogs here! Get your hot dogs here!" they might yell. The sound of their high-pitched voice begins in their voice boxes. Inside peoples' throats are wiry looking parts that vibrate when a person wants to make a sound and communicate their thoughts to others. The voice box vibrates and the beginnings of sound waves that shoot through the stadium's air are rooted there. The energy created by the vibrations sends the air molecules into unrest. In turn, this creates air pressure from all that wild movement of the molecules smashing into one another, that nobody can see, but they can certainly hear. Finally, those sound waves of vibrations make a connection inside a person's ear. The brain then recognizes the waves as a person's voice, offering a warm, yummy traditional baseball game treat. Once that happens, a person might almost have no choice but to yell back at the salesman using their own voice boxes, "I'll have a hot dog, please!"
Later in the game, if the home team has some men on base, what is known as a "rally" is beginning. The team that just about everyone is there to cheer on might be close to scoring some runs. Inside the stadium, there is an organ player, waiting for a chance to get the crowd riled up. The start of a rally is the perfect time for him or her to do just that.

One of the most popular and recognizable little tunes that an organ player might use to get all of the fans to cheer is the jingle that signals everyone to yell "Charge!" at its conclusion. Some quick, deep notes in a rhythm that gets faster and faster, and higher and higher are played. For a moment, the music stops completely, but comes right back with a high-pitched, racy tune, which everyone hears and just knows to shout "Charge!" at the end of. With any luck, the home team will do so and score a run or two.

The organ located somewhere inside the building is hooked up electronically to tremendous speakers that are usually built next to the scoreboard. Though they might be hard to see, behind the front of the speakers' covering are large circular parts called "cones." The cones receive pulses from the organ electrically that began when the organist hit the keys. The cones can transmit the sounds because they are able to vibrate in just the right way for the sound waves to be created accurately. The cones are different sizes so that they can properly send out different pitches, with the smaller ones vibrating quicker, making high tones, while the big cones create low sounds. The combination of just the right vibrations creates sound waves that enter the atmosphere and reach the ears of the fans, making them happy and ready to cheer.

One other favorite sound of many people at a baseball game is the crack of the bat when it hits a ball. Usually, fans recognize that sound as something good happening for their team: a base hit, or maybe even a home run. The pitcher throws his baseball towards home plate. The batter quickly decides if he should swing or not. If he does and times everything perfectly, he will place his bat in front of the ball, making a connection between the two. Because the ball was traveling in one direction and the bat forces it back the other way, rapid vibrations in both the bat and the ball occur when they smack into each other. Those vibrations quickly cause the air molecules to vibrate too and the sound waves are created. Microseconds later, the fans in the seats hear the hit, and use their vocal chords to start new vibrations of cheer!
molecule

Advanced Definition

noun
1. a single atom or several atoms bound together electromagnetically, forming the smallest particle that possesses all the characteristic physical and chemical properties of an element or compound.
2. a tiny piece or particle; bit.

Spanish cognate

molécula: The Spanish word molécula means molecule.

These are some examples of how the word or forms of the word are used:

1. As it encountered Earth's atmosphere, the meteor ran into increased resistance from air and dust molecules, which released some of its energy in the forms of heat and light.

2. Plastics are made of polymers-long chains of carbon molecules. Depending on how the chains are put together, a plastic will have different properties. Think of the difference between a polyester shirt and a polycarbonate bulletproof window. Both are plastic.

3. Glycogen is a molecule in your muscles that serves as your main source of energy during workouts. You refuel your supply of glycogen by eating carbohydrates. When you load up on carbs the day before a big game or an intense workout, you are topping off the glycogen held in your muscles.

4. Most neutrinos zoom through ice unimpeded and undetected. Occasionally, though, one bumps into an ice molecule. When that happens, a muon is created. A muon, like a neutrino, is an elementary particle-a particle that can't be broken down into smaller particles.

5. Other organic molecules like to cling to the surface of certain minerals. Life's earliest molecules might have been attracted to rocks and minerals on the ocean floor. Once they began meeting up on those surfaces in large numbers, they could have joined together to create bigger molecules and, eventually, the first living things on the planet.
transmit

Definition
verb
1. to send or carry from one person, place, or thing to another.

The television station refused to transmit the program.

They transmitted the message to their leader.

2. to pass on or spread a disease.

Some insects transmit diseases.

The doctors are afraid that the child's disease will be transmitted to others.

Advanced Definition
transitive verb
1. to send or convey from a source to a destination.

The message was transmitted by wire from London to Paris.

We need to transmit this information to our regional office.

2. to communicate or broadcast (news or other information).

This channel transmits the news continuously.

3. to pass on or spread (disease).

He transmitted the infection to his wife.

The disease can be transmitted by coughing.

4. to hand down genetically, as from parent to child.

The disease gene was transmitted to the offspring.

5. to pass, allow to pass, or cause to pass something: (light, motion, sound, force, or the like) through or along.

Water transmits sound effectively.
intransitive verb

1. to send a signal by electromagnetic waves.

_The campus radio station transmits from ten o'clock in the morning to nine o'clock in the evening._

**Spanish cognate**

transmitir: The Spanish word transmitir means transmit.

**These are some examples of how the word or forms of the word are used:**

1. Each leg has 11 plastic "bones" that form a mechanical linkage—an assembly of rigid rods and joints that *transmits* mechanical forces and movement from one place to another. As the crankshaft rotates, it moves a leg joint, which transmits motion via the other joints to the foot.

2. Both rods were made from metal, which Franklin theorized would conduct the electricity of the lightning. By moving from the first rod down the length of the wire, the lightning's energy could be safely *transmitted* into the ground, where it would no longer pose a threat to one's home or body.

3. For example, when Proust tasted his cookie, the sense receptors on his tongue sent a message to his brain telling it how the madeleine tasted. The messages are signals *transmitted* along nerve cells until they reach the brain. When the brain receives these signals, it processes them, and controls the body's reaction to them.

4. Modern technology can do some pretty incredible things. It's possible, with current technological capabilities, to *transmit* digital information over long distances using coding and decoding processes without losing the contents of the original information. The best part is we don't have to do anything besides send the message and wait for it to be received.

5. In Nigeria, there are 1.8 million orphans whose parents have died of AIDS, a disease *transmitted* by body fluids.

6. The genes that James added prevent flight muscles from forming in female mosquitoes. "Only the adult females feed on blood and therefore are responsible for transmitting diseases," he says. Unable to fly, the engineered females can't mate, bite, or spread dengue fever.

7. By definition, all waves *transmit* energy from one place to another. The energy of an underwater earthquake, in other words, is often transmitted to land in the form of a series of tsunamis. Like the surfers who ride them, waves carry energy forward.

8. Scientists program the tags to stay fastened to the shark for a certain amount of time and then pop off and float to the ocean's surface. Then the tags send the information they gathered to a satellite in space, which *transmits* the information to the scientists.
vibrate

Advanced Definition

intransitive verb
1. to move back and forth very rapidly and steadily; oscillate.

_The floor up here vibrates when the band practices downstairs._

_You can see how the guitar string vibrates._

2. to quiver, as sound; resonate or resound.

_Sound that vibrates quickly through the air has a higher pitch._

3. to be stirred with emotion or excitement; thrill; tingle.

_The audience vibrated as the great tenor took the stage._

transitive verb
1. to cause to move back and forth very rapidly and steadily.

_Sound waves vibrate the diaphragm in a microphone._

2. to cause to resound.

3. to cause to quiver.

Spanish cognate

_vibrar._ The Spanish word _vibrar_ means vibrate.

These are some examples of how the word or forms of the word are used:

1. New 3-D movies, such as Avatar and Toy Story 3, use polarized light to direct a separate image to each eye. Light is normally a collection of waves vibrating in many directions. When light is polarized, all the waves _vibrate_ in the same direction.

2. She imagined the device as a cross between a video game controller, a stereo, and a "grill"-a kind of mouth jewelry. The device worked by using a small motor to _vibrate_ the wearer's teeth—a process known as bone conduction, which, in this case, means the teeth and facial bones carry or "conduct" the sound.

3. Viers is also listening to one of the purest examples of how vibrating things produce sound, and how sound can make things _vibrate_. Let's take the whale hunt we discussed above and
slow it down. Whales make sounds by squeezing air between balloonlike sacks inside their heads. When the air passes by, it causes the sacks to squeeze together, or compress, causing vibrations.

4. Ocean waves are only one of many kinds of waves. Another common wave form is the sound wave. Sound waves travel through the air the way water waves travel through the ocean. Similar to water waves, sound waves are created by vibrating objects, which cause the air around them to vibrate as well. This vibrating air, in turn, causes the human eardrum to vibrate. The brain interprets this vibration as sound.

5. Receptors in the ear, called "auditory receptors" or "hair cells," are responsible for our hearing. Sound waves enter through our outer ear and cause the eardrum to vibrate. The three bones in our middle ear pass these vibrations on to the cochlea. The cochlea is a snail-shaped structure in the inner ear that is filled with a special fluid. When the vibrations move the hair cells (our receptors) on the cochlea, they send signals to the brain.
1. What are sounds the result of?
   A. air molecules
   B. ears
   C. voice boxes
   D. vibrations

2. What main examples are described in the text to illustrate how sounds are created?
   A. hot dog vendor shouting, the bat hitting the ball, the ball hitting the ground
   B. people speaking into microphones, the organ playing music, the bat hitting the ball
   C. hot dog vendor shouting, the organ playing music, the bat hitting the ball
   D. hot dog vendor shouting, the organ playing music, the fans clapping

3. After a sound is made there is a delay before a person is able to hear it. What evidence from the text supports this conclusion?
   A. Fans in the stadium hear the sound the bat makes when it hits the ball microseconds after impact.
   B. After a vibration of any kind, the molecules of the object knock into the molecules of air.
   C. Fans hear the hit of the bat and use their vocal cords to start new vibrations of cheer.
   D. Sound waves of vibrations make a connection inside a person's ear.

4. Which of the following occurs when a person's brain processes sound?
   A. The brain starts to send the molecules around it into unrest.
   B. The brain also determines whether it is a familiar sound or not.
   C. The brain sends the sound waves to the ear.
   D. The brain starts to vibrate.
5. What is this passage mainly about?
   A. the way air molecules bash into each other
   B. examples of sound being created at a baseball game and the science behind the sounds
   C. how sound waves of vibrations make a connection inside a person's ear
   D. baseball games, hot dog vendors, and organs

6. Read the following sentence: "After a vibration of any kind, the molecules of the object knock into the molecules of air that surround it, or possibly the molecules of another object next to it. Air molecules bash into each other like millions of microscopic Ping-Pong balls, transporting the sound through what becomes a sound wave."

   What does the word "bash" most nearly mean?
   A. get stuck
   B. melt
   C. to hit hard
   D. run away

7. Choose the answer that best completes the sentence below.

   __________ the hot dog vendor to yell out, his voice box vibrates first.
   A. And
   B. After
   C. Because
   D. In order for
8. Why does a baseball bat make a sound when it hits the ball at a baseball game? Support your answer with information from the text.

9. Explain how a hot dog vendor is able to yell out "hot dogs are here!" for others to hear at a baseball game.

10. Explain how sound waves are created and why they must be created for a person to hear sound. Use information from the text to support your answer.
Greek Society
By Mark Cartwright
From www.Ancient.Eu ● 2013

Mark Cartwright is a scholar of Greek philosophy and a frequent contributor to the Ancient History Encyclopedia. Ancient Greece (c. 8th to 5th centuries BC) was populated by a diverse number of social groups divided by age, gender, wealth, citizenship, and legal establishment of freedom. The following text explores these various social groups and paints a picture of what life was like in ancient Greek society. As you read, take notes on the similarities and differences in lifestyle between the different social classes and groups of people in ancient Greece.

Although the male citizen, with his full legal status, right to vote, hold public office, and own property, may well have dominated Greek Society, the social groups which made up the population of a typical Greek city-state or polis were remarkably diverse. Women, children, immigrants (both Greek and foreign), laborers, and slaves all had defined roles, but there was interaction (often illicit) between the classes and there was also some movement between social groups, particularly for second generation offspring and during times of stress such as wars.

Classes

Although the male citizen had by far the best position in Greek society, there were different classes within this group. The top of the social tree was the “best people,” the aristoi. Possessing more money than everyone else, this class could provide themselves with armor, weapons, and a horse when on military campaign. The aristocrats were often split into powerful family factions or clans who controlled all of the important political positions in the polis. Their wealth came from having property and even more importantly, the best land, i.e.: the most fertile and the closest to the protection offered by the city walls.

1. Dominate (verb): to have a commanding influence on; to exercise control over
2. Illicit (adjective): forbidden by law, rules, or custom
3. Offspring (noun): children
4. The aristoi were the noblemen of ancient Greece. Their name literally means “best,” not only in wealth and status but they were also considered the morally best.
5. A military campaign refers to a military’s strategies and plans for battle.
6. Aristocrat (noun): nobleman
A poorer, second class of citizens existed too. These were men who had land but perhaps less productive plots and situated further from the city, their property was less well-protected than the prime land nearer the city proper. The land might be so far away that the owners had to live on it rather than travel back and forth from the city. These citizens were called the periioikoi (dwellers-round-about) or even worse “dusty-feet” and they collected together for protection in small village communities, subordinate to the neighboring city. As city populations grew and inheritances became ever more divided amongst siblings, this secondary class grew significantly.

A third group were the middle, business class. Engaged in manufacturing, trade, and commerce, these were the nouveau riche. However, the aristoi jealously guarded their privileges and political monopoly by ensuring only landowners could rise into positions of real power. However, there was some movement between classes. Some could rise through accumulating wealth and influence; others could go down a class by becoming bankrupt (which could lead to a loss of citizenship or even being enslaved). Ill-health, losing out on an inheritance, political upheavals, or war could also result in the “best” getting their feet a little dusty.

Women

Female citizens had few rights in comparison to male citizens. Unable to vote, own land, or inherit, a woman's place was in the home and her purpose in life was the rearing of children. Contact with non-family males was discouraged and women occupied their time with indoor activities such as wool-work and weaving. Spartan women were treated somewhat differently than in other states, for example, they had to do physical training (nude) like men, were permitted to own land, and could drink wine.

Women citizens had to marrying as a virgin and marriage was usually organized by the father, who chose the husband and accepted from him a dowry. If a woman had no father, then her interests (marriage prospects and property management) were looked after by a guardian (kurios), perhaps an uncle or other male relative. Married at the typical age of thirteen or fourteen, love had little to do with the matching of husband and wife. Of course, love may have developed between the couple but the best that might be hoped for was philia—a general friendship/love sentiment, eros, the love of desire, was to be found elsewhere, at least for the male. Marriages could be ended on three grounds. The first and most common was repudiation by the husband (apopempsis or ekpempsis). No reason was necessary, only the return of the dowry was expected. The second termination cause was the wife leaving the family home (apoleipsis) and in this case the woman's new guardian was required to act as her legal representative. This was, however, a rare occurrence and the woman's reputation in society was damaged as a result. The third ground for termination was when the bride's father asked for his daughter back (aphaireisis), probably to offer her to another man with a more attractive dowry. This last option was only possible, however, if the wife had not had children. If a woman was left a widow, she was required to marry a close male relative in order to ensure property stayed within the family.

7. Fertile (adj): capable of producing crops
8. Also known as the perioeci, the periioikoi were freemen of Sparta, mainly farmers and merchants who often lacked full citizenship.
9. Subordinate (adj): lower in rank or position
10. The "new rich"
11. Monopoly (n): the exclusive possession or control of a trade or business
12. Upheaval (n): disorder; disturbance
13. Dowry (n): property or money brought by a bride to her husband on their marriage; a "bride price" is paid by the bridegroom to the bride's family/male guardian
14. It is also translated as "brotherly love."
15. Repudiation (n): rejection of a proposal or idea
Women, of course, were also present in the various other non-citizen classes. The group for which we have most information is that of sex-workers. Women were here divided into two categories. The first and perhaps most common was the brothel prostitute (pornē). The second, was the higher-class prostitute (hetaira). These latter women were educated in music and culture and often formed lasting relationships with married men. It was also this class of women that entertained men (in every sense) at the celebrated symposium.

**Children & Adolescents**

Children of citizens attended schools where the curriculum covered reading, writing, and mathematics. After these basics were mastered, studies turned to literature (for example, Homer), poetry, and music (especially the lyre). Athletics was also an essential element in a young person’s education. At Sparta, boys as young as seven were grouped together under the stewardship of an older youth to be toughened up with hard physical training. In Athens, young adult citizens (aged 18-20) had to perform civil and military service and their education continued with lessons in politics, rhetoric, and culture. Girls too were educated in a similar manner to boys but with a greater emphasis on dancing, gymnastics, and musical accomplishment, which could be shown off in musical competitions and at religious festivals and ceremonies. The ultimate goal of a girl’s education was to prepare her for her role in rearing a family.

**Laborers**

Greek society included a significantly larger proportion of laborers than slaves. These were semi-free workers, wholly dependent on their employer. The most famous example is the helot class of Sparta. These dependents were not the property of a particular citizen—they could not be sold as a slave could—and they often lived with their families. Generally, they formed arrangements with their employer such as giving a quantity of their produce to the farm owner and keeping the rest for themselves. Sometimes the quota required may have been high or low, and there may also have been some extra benefits to the serfs such as protection and safety in numbers. However, the serf-class or helots could never achieve any real security as they were given little or no legal status and harshly treated, even killed in regular purges (especially in Sparta), in order to instill a fear which would ensure continued subordination to the ruling class. In certain periods such as war, helots were required to serve in the armed forces and, fighting well, they could even earn an escape from their lot and join the intermediary social groups which existed below the level of full-citizen and included such individuals as children with parents of mixed status (e.g.: father-citizen, mother-helot).

16. Both words essentially mean “divorce” initiated by the husband.
17. Meaning the wife initiates the divorce
18. Meaning “a taking away”
19. A “courtesan” or “mistress”
20. Symposium (noun): a conference or meeting place for gatherings and discussions of particular subjects
21. Homer was the author of The Iliad and The Odyssey and is considered one of the greatest epic poets of ancient Greece.
22. The lyre is a stringed instrument shaped like a small harp used especially in ancient Greece.
23. Stewardship (noun): supervision or guardianship
24. Rhetoric (noun): the art of effective or persuasive speaking or writing
25. They were a class between slaves and citizens, often compared to serfs (people who worked land they did not own for a living and for protection).
26. Quota (noun): a fixed amount or number of items
27. Serf (noun): an agricultural laborer (see footnote 25)
28. Purge (noun): a quick or violent removal of a group of people
Slaves

[10] In Greek society, slaves were seen as a necessary and perfectly normal part of city-life. Acquired through war and conquest, kidnap and purchase, slaves were simply amongst life's losers. There were even intellectual arguments from philosophers like Aristotle, who propounded the belief that slaves were demonstrably inferior, a product of their environment and inherited characteristics. Greeks persuades themselves that it was they who had the best environment and characteristics and the purest blood line and were, therefore, born to rule.

It is impossible to say with accuracy how many slaves (doulos) there were in Greek society and what proportion of the population they made up. It is unlikely, due to the costs, that every single citizen had their own slave but some citizens undoubtedly owned many slaves. Accordingly, estimates of the slave population in the Greek world range from between 15 and 40% of the total population. However, a defense speech made in a court case in Athens by Lysias, and hints from others such as Demosthenes, strongly suggest that if every citizen did not have slaves then they certainly desired them, and to be a slave owner was considered a measure of social status. Slaves were not only owned by private individuals but also by the state, which used them in municipal projects such as mining or, as in the case of Athens, the police force.

The interactions between slaves and owners was similar to the slave-owner relationships at other points in history; there was a mix of contempt, distrust, and abuse from the owners and contempt, theft, and sabotage from the enslaved. Source material is always from the viewpoint of the slave owner but there are references in literature, particularly in Greek comedy, of friendship and loyalty in at least some owner-slave relationships. Whilst the flogging of slaves is commonly referred to in Greek plays, there were also treatises written extolling the benefits of kindness and incentives in slave management.

Slaves worked in all spheres and over 200 hundred occupations have been identified. These include working in the home, in agriculture, industry workshops (e.g.; making shields, food, clothes and perfumes), mines, transport, retail, banking, entertainment, in the armed forces as attendants to their owner or as baggage carriers, as rowers in naval vessels or even as fighters. Farms were generally small affairs with even the richest citizens tending to own several small farms rather than one large estate, therefore, slaves were not concentrated into large groups as in later ancient societies.

29. **Subordination (noun)**: the act of existing at a lower rank; servitude
30. Aristotle (384 BC - 322 BC) was a Greek philosopher, a student of Plato, and a tutor of Alexander the Great.
31. **Propound (verb)**: to put forward (an idea, theory, or point of view) for consideration by others
32. **Demonstrably (adverb)**: in a way that is clearly apparent or capable of being logically proved
33. Lysias (459 BC - 380 BC) was a speech writer and giver in ancient Greece, one of the ten great orators of the classical era.
34. Demosthenes (384 BC - 322 BC) was a statesman and orator (speech giver) of ancient Athens.
35. **Municipal (adjective)**: of or relating to a city or town or its governing body
36. **Contempt (noun)**: hatred; feeling that a person or thing is beneath consideration or deserving of scorn
37. **Flog (verb)**: to beat someone with a whip or stick
38. **Treatise (noun)**: a written work dealing formally and systematically with a subject
39. **Extol (verb)**: to praise enthusiastically
For slaves there was—at least for some—a glimmer of hope to one day achieve their freedom. There are instances when slaves, particularly those involved in manufacturing and industry, living separately from their owners and given a certain financial independence, could pay for their freedom with money they had saved. Also, slaves in the army were sometimes given their freedom by the state following their victorious exploits.⁴⁰

**Foreigners**

[15] Aside from slaves, most Greek poleis would have had a number of free foreigners (xenoi)⁴¹ who had chosen to re-locate from other areas of Greece, the Mediterranean, and the Near East, bringing with them skills such as pottery and metalworking. These foreigners usually had to register their residence and so became a recognized class (lower in status than the full-citizens) called the metics (metoikoi).⁴² In return for the benefits of “guest” citizenship they had to provide a local sponsor, pay local taxes, sometimes pay additional taxes, contribute to the costs of minor festivals, and even participate in military campaigns when necessary. Despite the suspicions and prejudices against foreign “barbarians” which often crop up in literary sources, there were cases when metoikoi did manage to become full citizens after a suitable display of loyalty and contribution to the good of the host state. They then received equal tax status and the right to own property and land. Their children too could also become citizens. However, some states, notably Sparta, at times actively discouraged immigration or periodically expelled xenoi. The relationship between foreigners and local citizens seems to have been a strained one, particularly in times of wars and economic hardship.

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⁴⁰ Exploit (noun): accomplishment
⁴¹ Meaning “foreign” or “stranger” from the Greek “xenos”
⁴² The term “metics” refers to a foreign resident of Athens, one who did not have full citizen rights.
Text-Dependent Questions

Directions: For the following questions, choose the best answer or respond in complete sentences.

1. PART A: Which of the following statements best describes the social structure of free male citizens in ancient Greece? [RI.2]
   A. Life for men in ancient Greece was divided into two categories: free and enslaved—class did not matter as much as this.
   B. There were three divisions of free men in ancient Greece: the nobles, the secondary landowning class, and the middle business class.
   C. There were four divisions of men in ancient Greece: the nobles, the secondary class, the middle class, and the foreigners.
   D. Class in ancient Greece for free men was determined by one's citizenship, business/trade, and whether they had the full right to vote.

2. PART B: How did this structure change over time in ancient Greece? [RI.3] [RI.1]
   A. It stayed relatively the same, but loss of money or a great increase in wealth provided some mobility.
   B. The middle class began to demand more and more of the aristocrat's rights and privileges, until the aristocrats eventually caved.
   C. The perioikoi started moving closer to the main cities, threatening the land held by the elite aristoic.
   D. The elite noble class eventually collapsed under the weight of debt it owed to the nouveau riche, or business class.

3. How did slaves in ancient Greece differ from models of slavery in later societies? [RI.3]
   A. Slaves in ancient Greece were considered people, not property.
   B. There were arguments that the best way to treat a slave was with kindness rather than violence.
   C. Slaves worked in various positions in society, spread out rather than concentrated in large, hard labor groups.
   D. Slaves were desired as a status symbol to indicate that one did not have to do work.

4. PART A: Which of the following captures how foreign residents, or xenoi, regarded their status or position in ancient Greek society? [RI.6]
   A. While some city-states discouraged immigration, most ancient Greek societies allowed foreign residents partial citizenship, the most that foreigners could hope to attain.
   B. The majority of foreign residents felt unsafe in ancient Greek society, as they were almost always expelled or killed if caught; this is because ancient Greeks considered themselves superior to many if not all other civilizations.
   C. While their rights were limited and their relationship with locals shaky, metics had the opportunity of social mobility and full citizenship status, for either themselves or their children.
   D. The xenoi saw themselves as advanced and providing new services to Greek society, as they often brought with them new skills, like pottery.
5. PART B: Which of the following quotes best supports the answer to Part A?  
   A. “Greeks persuaded themselves that it was they who had the best environment and characteristics and the purest blood line and were, therefore, born to rule.” (Paragraph 11)  
   B. “Aside from slaves, most Greek poleis would have had a number of free foreigners (xenoi) who had chosen to re-locate from other areas of Greece, the Mediterranean, and the Near East, bringing with them skills such as pottery and metalworking.” (Paragraph 16)  
   C. “Despite the suspicions and prejudices against foreign “barbarians” which often crop up in literary sources, there were cases when metoikoi did manage to become full citizens after a suitable display of loyalty and contribution to the good of the host state.” (Paragraph 16)  
   D. “However, some states, notably Sparta, at times actively discouraged immigration or periodically expelled xenoi.” (Paragraph 16)

6. In 3-5 complete sentences, summarize what life was typically like for a woman in ancient Greece. Cite evidence from the text to support your answer.
Discussion Questions

Directions: Brainstorm your answers to the following questions in the space provided. Be prepared to share your original ideas in a class discussion.

1. Ancient Greek culture is considered a foundation of modern Western civilization. In what ways, based on your reading, has ancient Greek society influenced us today? Discuss whether these influences are positive or negative. Cite evidence from this text, your own experience, and other literature, art, or history in your answer.

2. In the context of this passage, how did ancient Greece define the roles of men and women? What kinds of exceptions were allowed to these rules? How does contemporary society define these roles similarly or differently? Cite evidence from this text, your own experience, and other literature, art, or history in your answer.

3. In the context of this passage, what is fair? Is this an important factor in society, both modern and ancient? Compare what you learned of Greek society from this text to your knowledge of other ancient societies—was ancient Greece a more or less “fair” society? Cite evidence from this text, your own experience, and other literature, art, or history in your answer.

4. In the context of the passage, how easy was it for a citizen living in ancient Greece to change his or her class status? In your opinion, is socioeconomic status in contemporary society more fixed or more fluid than during ancient Greece?
Ancient Greece: The Birthplace of Western Individualism
By USHistory.org
2016

The ancient Greeks worshipped a variety of different gods and goddesses, many of whom remain part of modern-day popular culture. We can learn a lot about ancient Greek society by studying their myths and spiritual systems. This article explains the beliefs of the ancient Greeks, and what it reveals about their culture. As you read, take notes on the influence of Greek mythology in ancient Greece and modern Western culture.


Many of the fundamental elements of Western culture first arose more than 2,000 years ago in ancient Greece.

After conquering the Greeks, the ancient Romans' spread Greek ideas throughout their empire, which included much of Europe.

All Things Human

The glorification of the human form and of human accomplishment defined ancient Greek art, philosophy, literature, and religion. Even their gods were created in the image of humans. The Greek gods had human emotions, looked like humans, and behaved more like people than infallible gods.

[5] The Greeks' emphasis on the individual is one major cornerstone of Western Civilization. Indeed, the spirit of individualism as defined by the Greeks is still alive and well in modern American culture and society.

1. "Western" is a term commonly used to describe things, people, ideas, or ways of life that come from or are associated with the United States, Canada, and the countries of Western, Northern, and Southern Europe.
2. Ancient Rome was a civilization that began on the Italian Peninsula as early as the 8th century BC. Located along the Mediterranean Sea and centered on the city of Rome, it expanded to become one of the largest empires in the ancient world.
3. Infallible (adjective): incapable of being wrong or making a mistake
4. Cornerstone (noun): an important quality or feature on which a particular thing depends
5. Individualism is a social theory favoring freedom of action for individuals over collective or state control.
Gods, Goddesses, and Heroes

The ancient Greeks were polytheistic — that is, they worshipped many gods. Their major gods and goddesses lived at the top of Mount Olympus, the highest mountain in Greece, and myths described their lives and actions. In myths, gods often actively intervened in the day-to-day lives of humans, Greek religion did not have a standard set of morals; there were no Judaic Ten Commandments. Myths were used to help explain the unknown and sometimes teach a lesson.

For example, Zeus, the king of the gods, carried his favorite weapon, the thunderbolt. When it rained and there was thunder and lightning, the ancient Greeks believed that Zeus was venting his anger. Many stories about how the Greek gods behaved and interacted with humans are found in the works of Homer. He created two epic poems: the Iliad, which related the events of the Trojan War, and the Odyssey, which detailed the travels of the hero Odysseus. These two poems were passed down orally over many generations.

A Soap Opera from Hellas

The Greeks created gods in the image of humans; that is, their gods had many human qualities even though they were gods. The gods, heroes, and humans of Greek mythology were flawed. The gods were highly emotional and behaved inconsistently and sometimes immorally.

The gods constantly fought among themselves, behaved irrationally and unfairly, and were often jealous of each other. For example, Zeus, the king of the gods, was rarely faithful to his wife Hera. Hera plotted against Zeus and punished his mistresses.

In addition to Zeus and Hera, there were many other major and minor gods in the Greek religion. At her birth, Athena, the goddess of wisdom, sprang directly from the head of Zeus. Hermes, who had winged feet, was the messenger of the gods and could fly anywhere with great speed. Aphrodite, the goddess of love, was the most beautiful being in the universe. Her brother, Ares, the god of war, was sinister, mean, and disliked. Poseidon ruled the sea from his underwater kingdom, and Apollo rode his chariot across the sky, bringing the sun with him.

Hades was in charge of the dead in the underworld. Almost all people went to Hades after they died whether they were good or bad. To get there, the dead had to cross the river Styx. Charon was the name of the boatman who ferried the souls of the dead across the river Styx to Hades.

Typically, the gods punished those who were bad. For example, Tantalus, who killed his own son and served him to the gods for dinner, was sent to Hades and made forever thirsty and hungry. Although there was a pool of clear, fresh drinking water at his feet, whenever Tantalus bent down to drink, the pool would dry up and disappear.

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6. In Greek mythology, Mount Olympus was the home of the Twelve Olympian gods. It was also the setting of many mythological tales.
7. The Ten Commandments are a set of moral rules which the Bible describes as having been given to the Israelites by God at biblical Mount Sinai.
8. the author of the earliest known literature of Europe
9. a two-wheeled horse-drawn vehicle used in ancient warfare and racing
10. the boundary between the Earth and the Underworld in Greek mythology
Likewise, over his head hung the most delicious fruit. However, whenever Tantalus reached for them, a wind would blow them just out of his reach. The English word “tantalize” derives from the name Tantalus.

The list below features some of the most famous gods and goddess in Greek mythology and their important attributes:

- **Zeus**: King of the gods, Zeus killed his tyrant father Chronos; he is also the god of thunder
- **Hera**: The wife of Zeus and the goddess of fertility
- **Poseidon**: The god of the sea
- **Hades**: The god of the underworld
- **Hestia**: A little-known goddess, a sister of Zeus, and the goddess of the home and hearth
- **Chronos**: The leader of the Titans and the father of the Olympians, Chronos ate all of his children except for Zeus, who killed him
- **Demeter**: Goddess of the harvest and the mother of Persephone
- **Apollo**: God of the sun, music, and art; one of the most versatile gods
- **Artemis**: Goddess of the hunt, moon, and childbirth; the sister of Apollo
- **Aphrodite**: The goddess of love and the mother of Eros
- **Ares**: The god of War
- **Athena**: She sprang full-grown from Zeus's head; she is the Goddess of wisdom; the city of Athens is also named for her
- **Hephaestus**: The god of the forge; thrown from the top of Mount Olympus by Zeus, Hephaestus is also crippled; the husband of Aphrodite
- **Hermes**: The messenger god; wears a winged helmet and winged sandals
- **Persephone**: The daughter of Demeter; Persephone was kidnapped by Hades to be his bride, and because she ate three pomegranate seeds, she is forced to spend three months of the year in Hades (This period of time is known as winter)
- **Dionysus**: The god of wine and revelry; Dionysus had an enormous following throughout the Greek world
- **Eros**: The god of love; often depicted as a young child, Eros uses magical arrows to cause people to fall in love; known to the Romans as Cupid
Text-Dependent Questions

Directions: For the following questions, choose the best answer or respond in complete sentences.

1. PART A: Which of the following best states one of the central ideas of this article?
   A. The gods and goddesses of Greek mythology were created to teach humans to satisfy their individual needs.
   B. Greek mythology celebrated the greatness of individual human beings, using myths of humans defeating gods and goddesses.
   C. Greek mythology reflected how the world and human beings operated, teaching morality along the way.
   D. The gods and goddesses of Greek mythology are evil deities that commit horrific acts to teach humans to seek revenge when they are wronged.

2. PART B: Which TWO phrases from the text best support the answer to Part A?
   A. “The Greek gods had human emotions, looked like humans, and behaved more like people than infallible gods.” (Paragraph 4)
   B. “The Greeks’ emphasis on the individual is one major cornerstone of Western Civilization.” (Paragraph 5)
   C. “In myths, gods often actively intervened in the day-to-day lives of humans.” (Paragraph 6)
   D. “Hermes, who had winged feet, was the messenger of the gods and could fly anywhere with great speed.” (Paragraph 10)
   E. “Myths were used to help explain the unknown and sometimes teach a lesson.” (Paragraph 6)
   F. “Almost all people went to Hades after they died whether they were good or bad.” (Paragraph 11)

3. What connection does the author draw between ancient Greek mythology and modern Western society? Cite evidence from the text in your response.
4. Which of the following is most likely the author's purpose for including paragraphs 12 and 13 in the text?

A. to show how Greek mythology has influenced Western language
B. to highlight the most important moral lesson of Greek mythology
C. to demonstrate the violent and irrational behavior of Greek gods
D. to illustrate the human and superhuman traits in Greek mythology
Discussion Questions

Directions: Brainstorm your answers to the following questions in the space provided. Be prepared to share your original ideas in a class discussion.

1. What is your interpretation of the punishment of Tantalus, described in paragraphs 12-13? Do you think it indicates the presence of a cruel impulse among the ancient Greeks?

2. The author notes that Greek deities “behaved more like people than infallible gods” (Paragraph 4). What might this suggest about ancient Greek society?

3. Based on the text and your knowledge of historical events, how were the ancient Greeks similar to other polytheistic societies and cultural groups? How were they different?

4. The author notes that the ancient Greeks believed that many natural events of human life could be traced back to the gods; for example, they thought thunderstorms were the result of Zeus “venting his anger” (Paragraph 7). In the context of this article, who's in control: man or nature? Cite evidence from this text, your own experience, and other literature, art, or history in your answer.