Technological Advancements

StudiesWeekly®

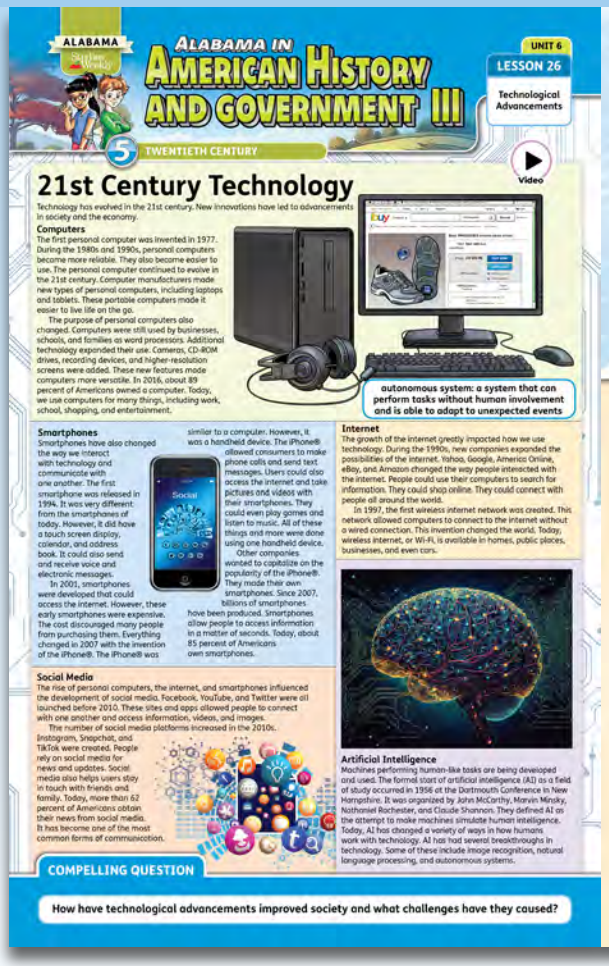
Compelling Question

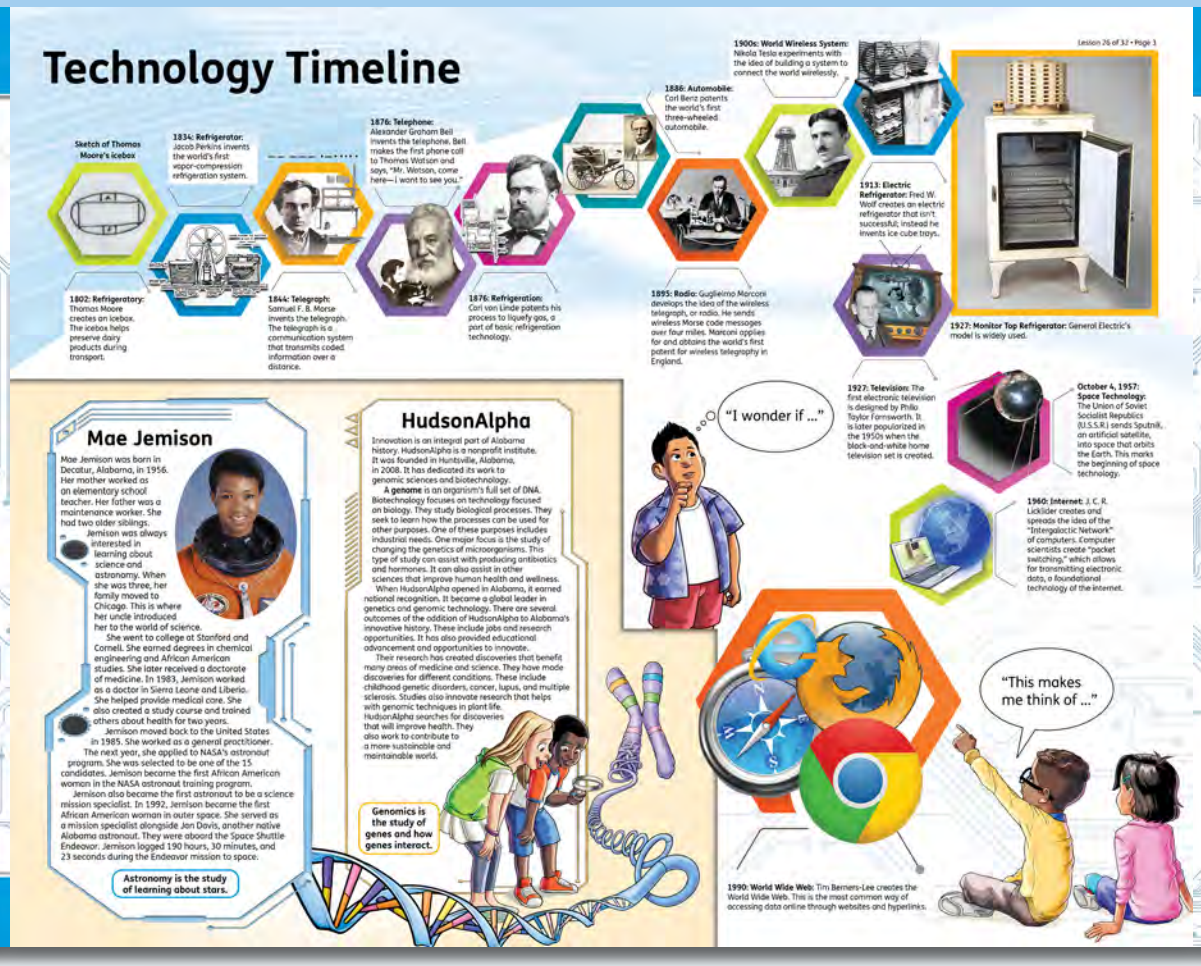
How has technological advancements improved society and what challenges has it caused?

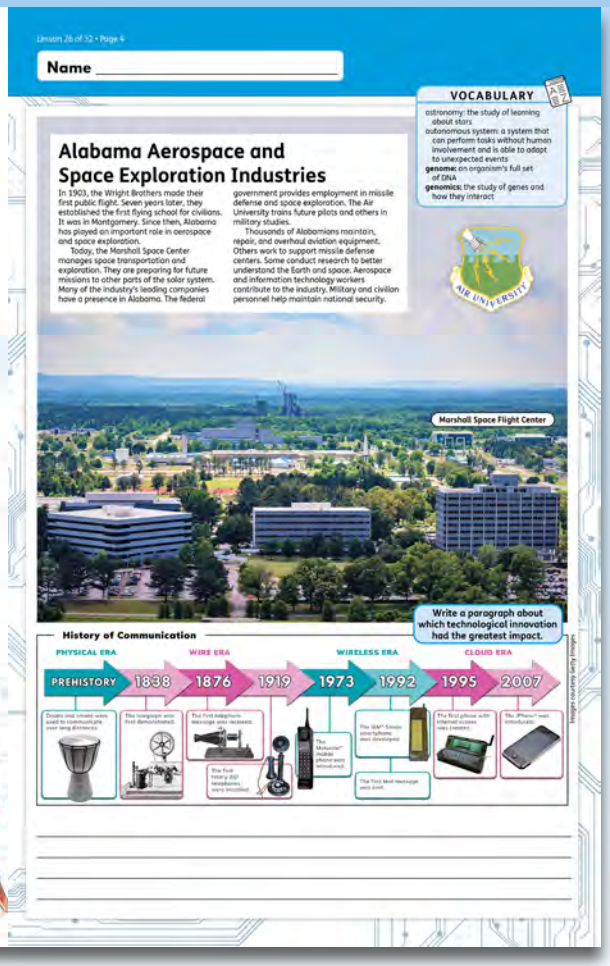
Vocabulary

- astronomy: the study of learning about stars
- autonomous system: a system that can perform tasks without human involvement and is able to adapt to unexpected events
- **genome:** an organism's full set of DNA
- **genomics:** the study of genes and how they interact

Picture Walk







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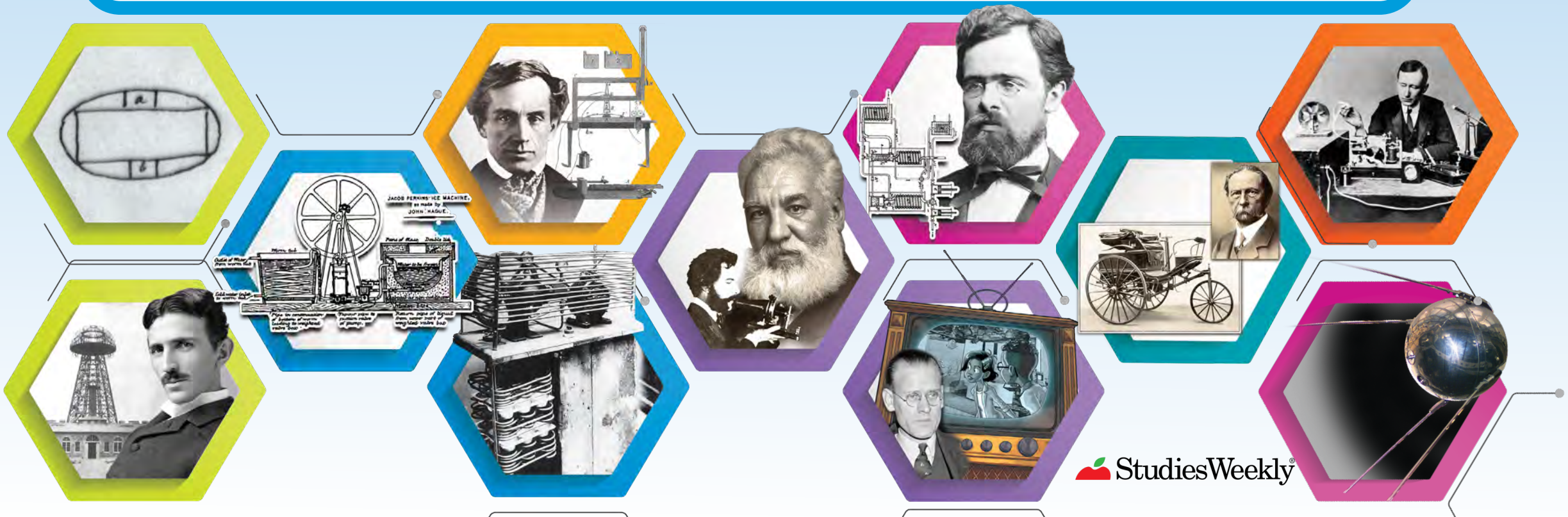
Think and Discuss

What do we use technology for?
How has technology changed over the years?



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Let's Number

1

21st Century Technology

Technology has evolved in the 21st century. New innovations have led to advancements in society and the economy.

Computers

The first personal computer was invented in 1977. During the 1980s and 1990s, personal computers became more reliable. They also became easier to use. The personal computer continued to evolve in the 21st century. Computer manufacturers made new types of personal computers, including laptops and tablets. These portable computers made it easier to live life on the go.

The purpose of personal computers also changed. Computers were still used by businesses, schools, and families as word processors. Additional technology expanded their use. Cameras, CD-ROM drives, recording devices, and higher-resolution screens were added. These new features made computers more versatile. In 2016, about 89 percent of Americans owned a computer. Today, we use computers for many things, including work, school, shopping, and entertainment.

autonomous system: a system that can perform tasks without human involvement and is able to adapt to unexpected events

2

Smartphones

Smartphones have also changed the way we interact with technology and communicate with one another. The first smartphone was released in 1994. It was very different from the smartphones of today. However, it did have a touch screen display, calendar, and address book. It could also send and receive voice and electronic messages.

In 2001, smartphones were developed that could access the internet. However, these early smartphones were expensive. The cost discouraged many people from purchasing them. Everything changed in 2007 with the invention of the iPhone®. The iPhone® was similar to a computer. However, it was a handheld device. The iPhone® allowed consumers to make phone calls and send text messages. Users could also access the internet and take pictures and videos with their smartphones. They could even play games and listen to music. All of these things and more were done using one handheld device.

Other companies wanted to capitalize on the popularity of the iPhone®. They made their own smartphones. Since 2007, billions of smartphones have been produced. Smartphones allow people to access information in a matter of seconds. Today, about 85 percent of Americans own smartphones.

3

Internet

The growth of the internet greatly impacted how we use technology. During the 1990s, new companies expanded the possibilities of the internet. Yahoo, Google, America Online, eBay, and Amazon changed the way people interacted with the internet. People could use their computers to search for information. They could shop online. They could connect with people all around the world.

In 1997, the first wireless internet network was created. This network allowed computers to connect to the internet without a wired connection. This invention changed the world. Today, wireless internet, or Wi-Fi, is available in homes, public places, businesses, and even cars.

4

Social Media

The rise of personal computers, the internet, and smartphones influenced the development of social media. Facebook, YouTube, and Twitter were all launched before 2010. These sites and apps allowed people to connect with one another and access information, videos, and images.

The number of social media platforms increased in the 2010s. Instagram, Snapchat, and TikTok were created. People rely on social media for news and updates. Social media also helps users stay in touch with friends and family. Today, more than 62 percent of Americans obtain their news from social media. It has become one of the most common forms of communication.

5

Artificial Intelligence

Machines performing human-like tasks are being developed and used. The formal start of artificial intelligence (AI) as a field of study occurred in 1956 at the Dartmouth Conference in New Hampshire. It was organized by John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon. They defined AI as the attempt to make machines simulate human intelligence. Today, AI has changed a variety of ways in how humans work with technology. AI has had several breakthroughs in technology. Some of these include image recognition, natural language processing, and autonomous systems.

Sketch It: Close Read

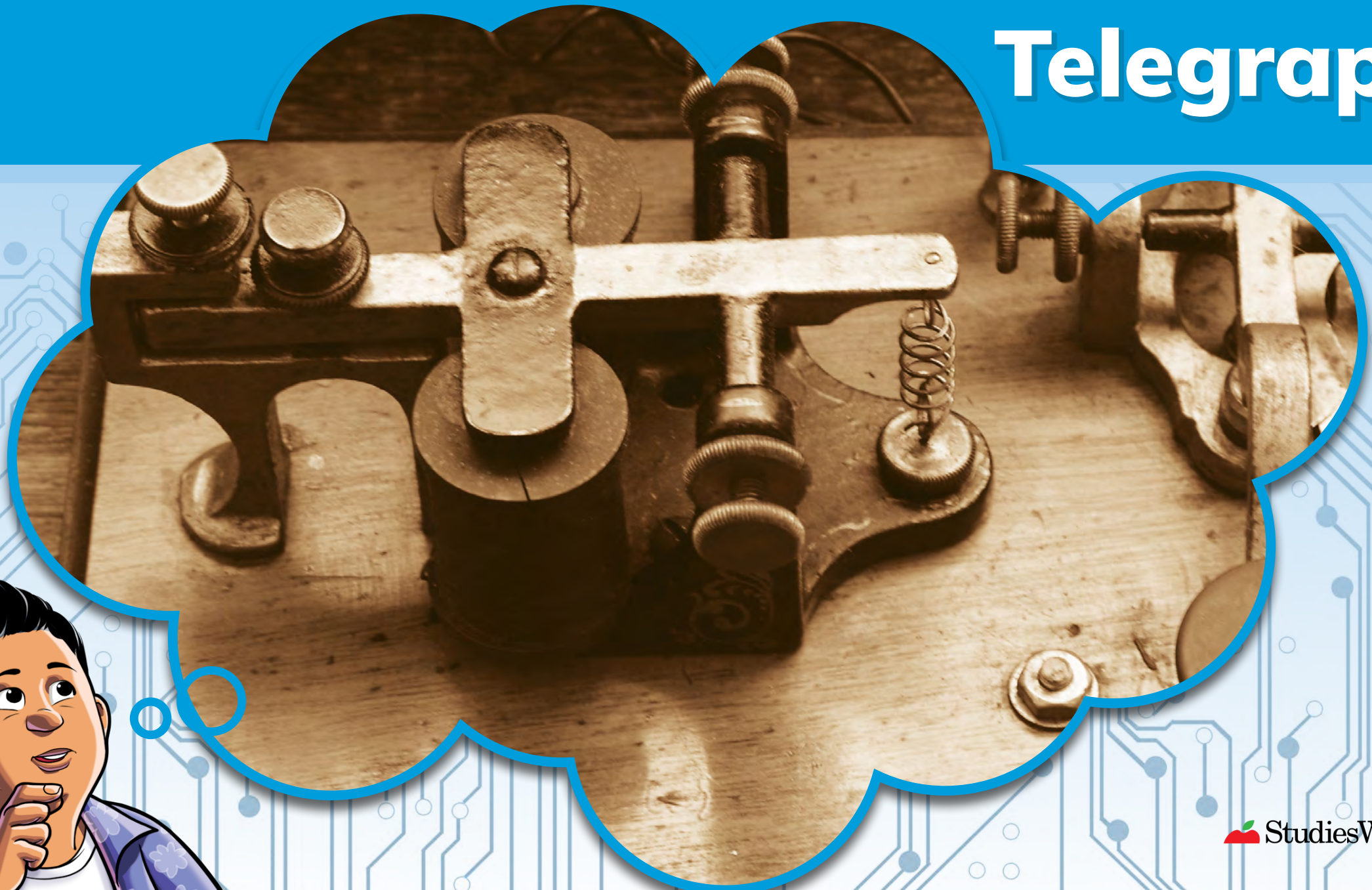
Step 1: Number your chunks of text.

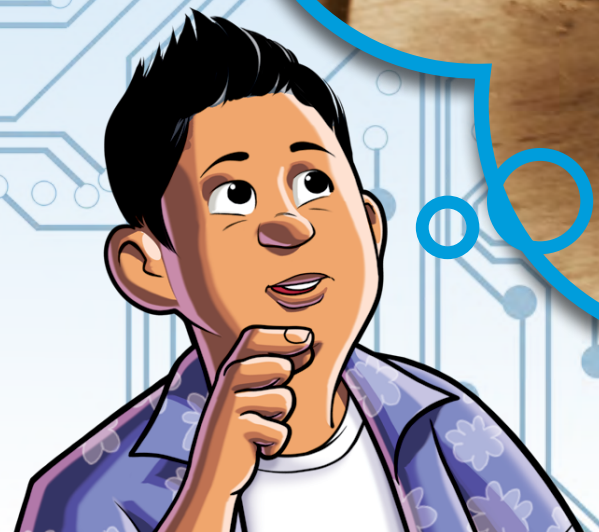
Step 2: Reread the article.

Step 3: Draw out your summaries for each chunk.

Step 4: Underline the evidence in the paragraph that supports your drawing.

Telegraph





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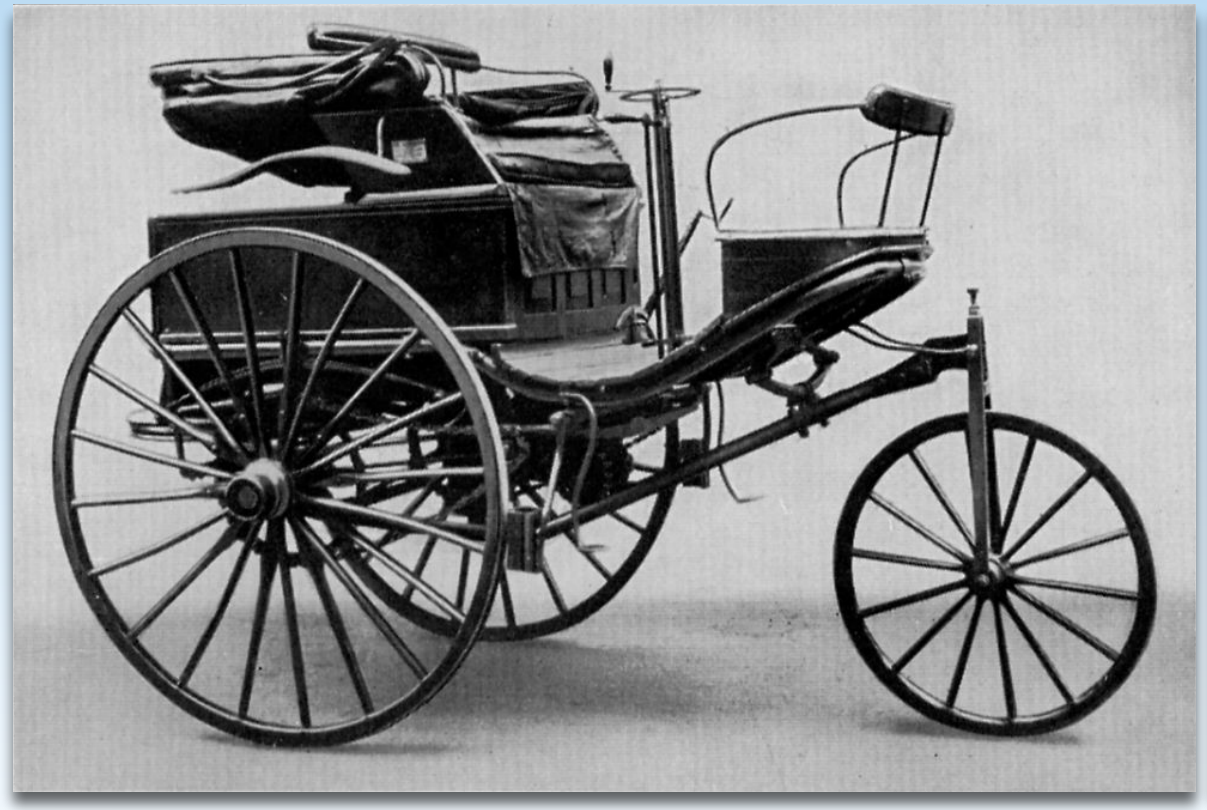
Different Types of Cars



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Let's Discuss

Compare the dates and analyze the time span of each innovation.

- How did innovations in technology have impacted people's lives?
- Think about the geography of Alabama. Have any of these inventions or innovations affected Alabama?
- What is something you wish you could invent? What problems would your invention solve? Could your invention be used globally? Would your invention help Alabama in any specific way?

Background Information

What do you remember about the space race?
Why did our country want to go to space?

Mae Jemison

Research

Name: _____ Date: _____

Mae Jemison Research

Directions: Answer the questions below in complete sentences. Use the article you read and other resources to research more about Mae Jemison.

1. When was Mae Jemison born?

2. What occupations did Mae's parents have?

3. How many siblings did Mae have?

4. What subject in school was Mae most interested in?

5. What did Mae study in college?

6. What is something that Mae was the first African American woman to do?

7. How many hours did Mae log aboard the Space Shuttle Endeavor?

8.Write a paragraph about something Mae did in her life after being the Science Mission Specialist for Space Shuttle Endeavor. Include at least three interesting facts about Mae's life after Endeavor. Write in complete sentences. Include an introductory sentence, three facts about Mae, and a concluding sentence.

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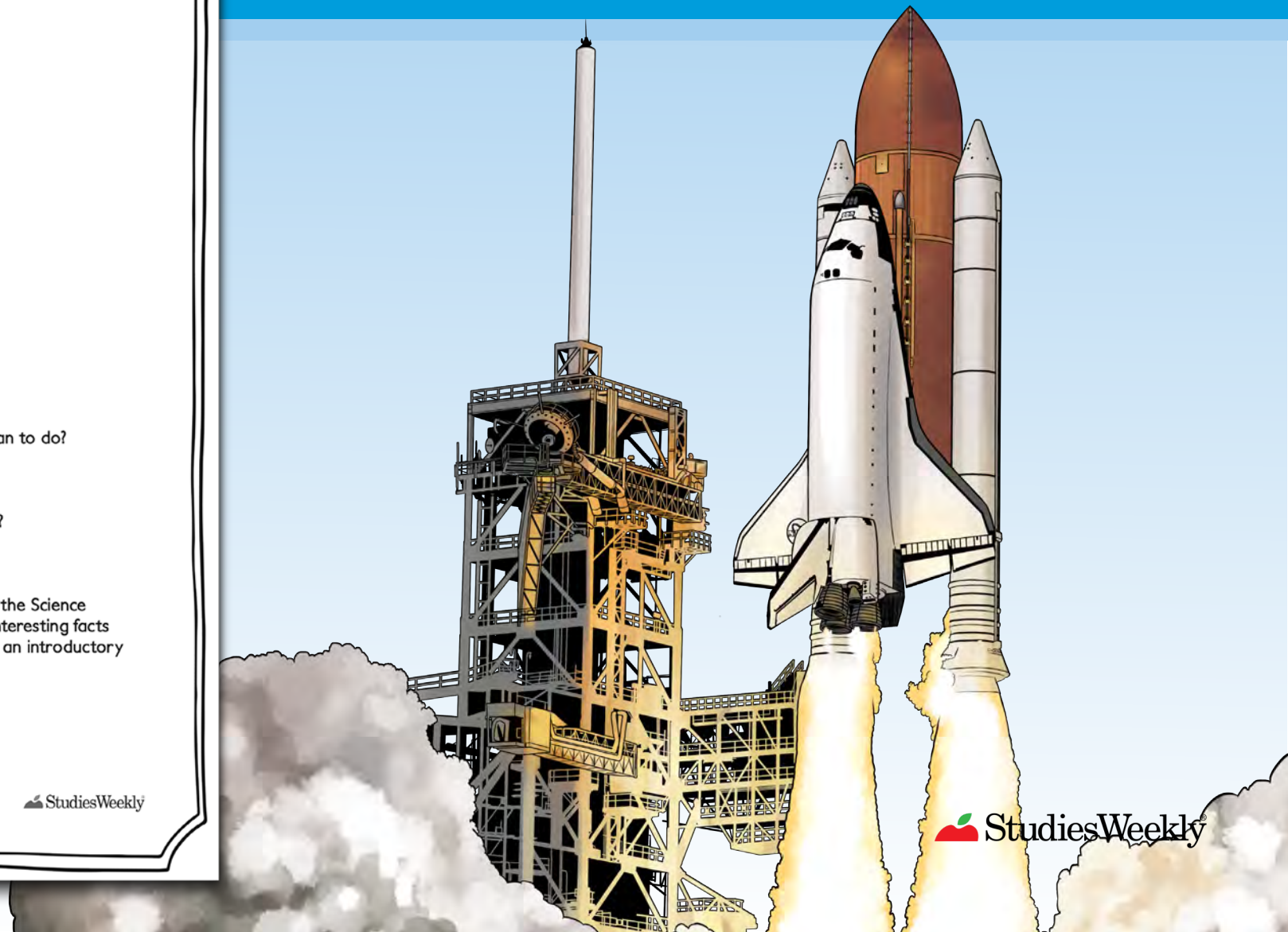

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Let's Review

Who was Mae Jemison?

Why was she important?

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Let's Read

HudsonAlpha

Innovation is an integral part of Alabama history. HudsonAlpha is a nonprofit institute. It was founded in Huntsville, Alabama, in 2008. It has dedicated its work to genomic sciences and biotechnology.

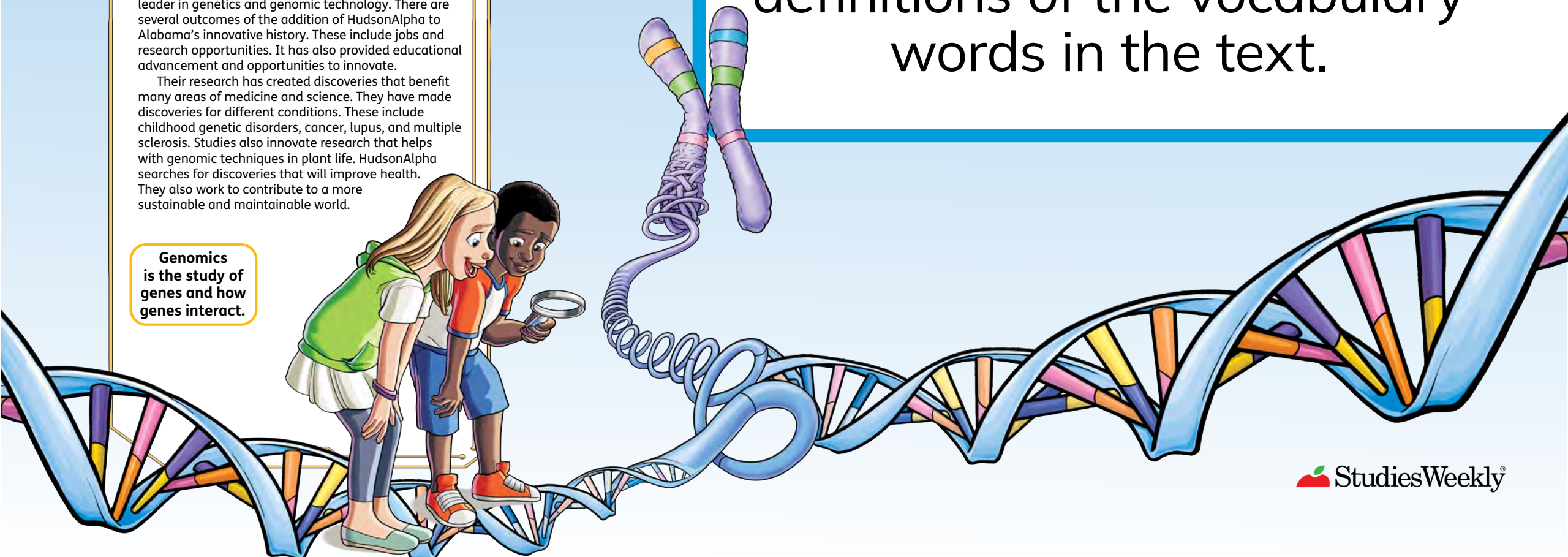
A genome is an organism's full set of DNA. Biotechnology focuses on technology focused on biology. They study biological processes. They seek to learn how the processes can be used for other purposes. One of these purposes includes industrial needs. One major focus is the study of changing the genetics of microorganisms. This type of study can assist with producing antibiotics and hormones. It can also assist in other sciences that improve human health and wellness.

When HudsonAlpha opened in Alabama, it earned national recognition. It became a global leader in genetics and genomic technology. There are several outcomes of the addition of HudsonAlpha to Alabama's innovative history. These include jobs and research opportunities. It has also provided educational advancement and opportunities to innovate.

Their research has created discoveries that benefit many areas of medicine and science. They have made discoveries for different conditions. These include childhood genetic disorders, cancer, lupus, and multiple sclerosis. Studies also innovate research that helps with genomic techniques in plant life. HudsonAlpha searches for discoveries that will improve health. They also work to contribute to a more sustainable and maintainable world.

Genomics is the study of genes and how genes interact.

Underline or highlight the definitions of the vocabulary words in the text.



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Deep Dive

Learn more about HudsonAlpha and be ready to present
Investigate the competitions that can be participated in
Describe how HudsonAlpha is funded
Explain the important contributors and scientists involved in the program

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Turn and Talk

Satellites and Spacecrafts

What do you see? What do you think we use this technology for?

Space Command Headquarters

Name: _____ Date: _____

Space Headquarters Moves

Directions: First, locate Colorado and Alabama on the map. Next, draw a line from the original location of the Space Command Headquarters to the new location. Then, use the article to answer the questions.

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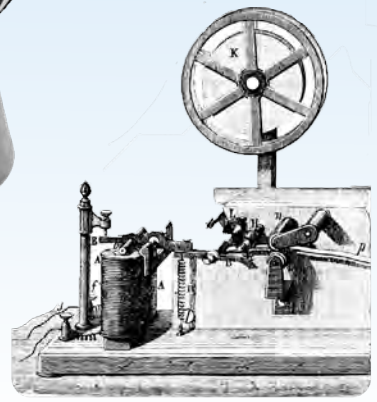
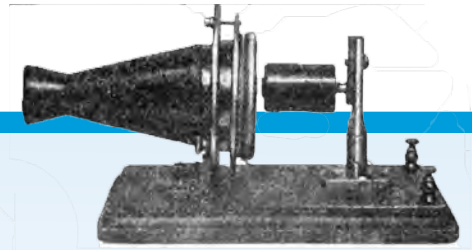
Let's Discuss

How has the way we communicate changed over time?
What might life be like for someone who lived in 1919 or 1973?
What might be the same or different?
Are there any patterns you see in the timeline?
How did events in the past affect what we experience today?

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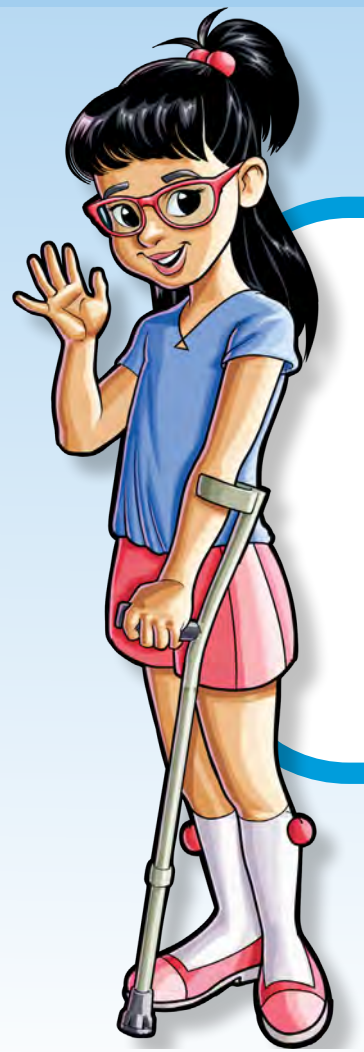
Exit Ticket



How has technological advancements improved society and what challenges has it caused?

Writing Rubric: How did you do?

Check the appropriate box to evaluate your work.

	4	3	2	1
I was on target for the assignment.				
I expanded on the ideas or shared with a partner.				
I did my best work.				
I turned my assignment in.				

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The Atomic Age

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Compelling Question

How did technology impact the world after World War II?

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Vocabulary

- **arsenal:** a place where weapons are made or stored
- arms race: competition to see which country could have the most destructive weapons
- **Cold War:** a war of mutual threats and suspicion and a competition between the Soviet Union and the United States to create and stockpile the most dangerous weapons
- fission: when atoms split apart and create more atoms in a chain reaction
- proliferate: to spread rapidly

Picture Walk

Turn and Talk

What do you see on the page?

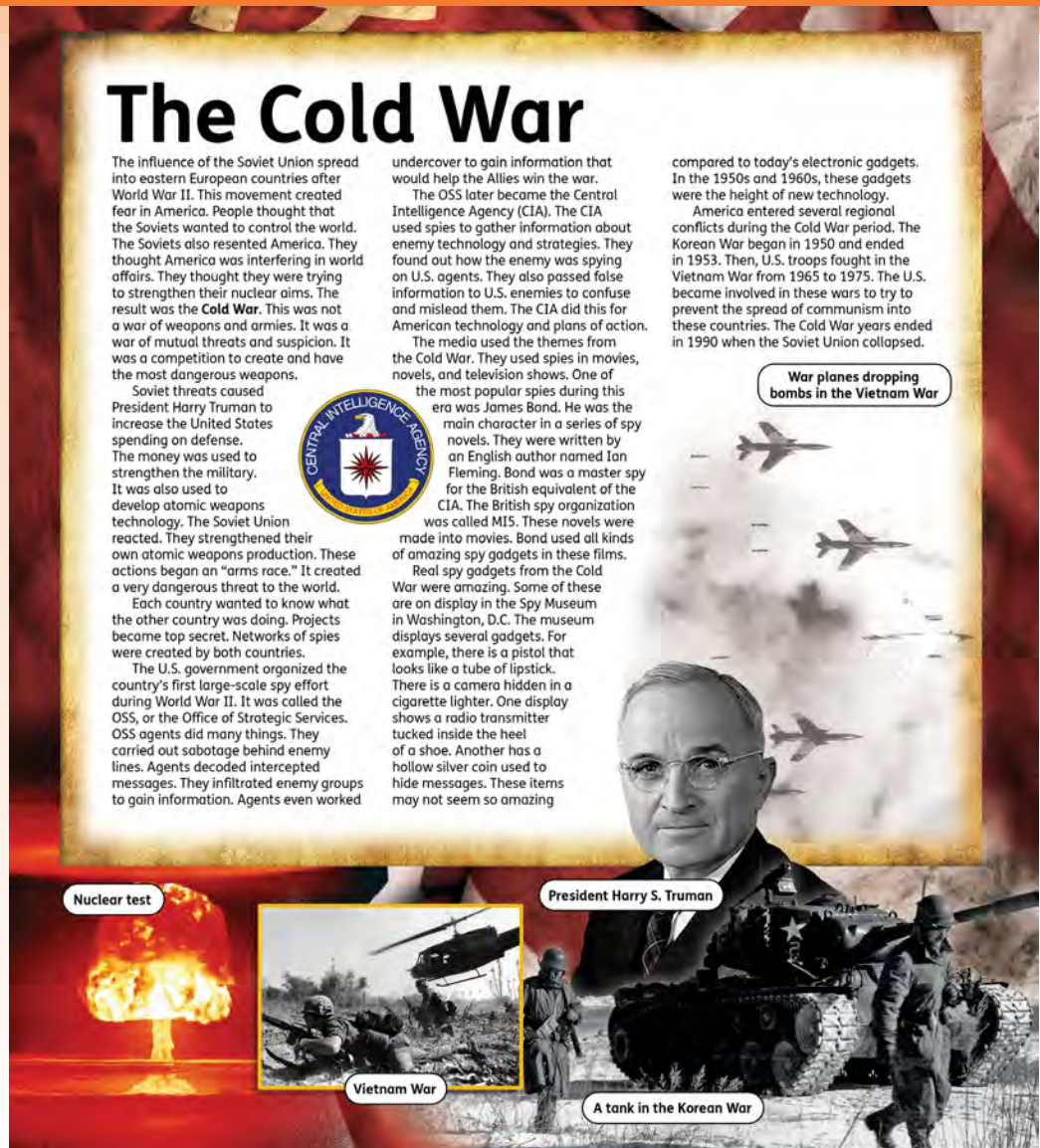
What do you think "Cold War" means, based on the images and captions?

Content Poster

Reread the article.

On your poster, include:

- countries involved
- their role in the arms race
- their spy network
- media references



Let's Discuss

What was the Cold War?

What are some advancements or changes that came out of the Cold War?

Pair Up and Share!

Nuclear Science

Scientists in the Atomic Age knew there was more to atomic energy than devastation in a bomb.

The United States worked to find peaceful uses for atomic energy. It started after the bombing in World War II. People hoped that this new power would do everything. They hoped it could be used to cure cancer, dig canals, and power automobiles. While most of these dreams haven't come true, some have.

The first big step in power came in 1951. Scientists figured out a way to control fission to boil water and create steam. The steam ran generators that created electricity. The invention was perfected. In 1954, construction began on the first commercial nuclear power plant. By the 1960s, nuclear power plants began creating electricity in the United States. It was also used to power ships and submarines.

Today, nuclear power plants are almost too expensive to build. They must be very safe. No nuclear waste can enter the atmosphere or water supply. The nuclear power industry has struggled. Other energy sources are cheaper to produce. These include coal, natural gas, and hydroelectricity.

Nuclear medicine is a new field of treatment for cancer and other diseases. Cancer patients can receive doses of atomic energy. The doses are effective in killing dangerous cancer cells. Atomic energy is also used to identify and diagnose various illnesses. X-rays are a form of radioactivity. They take pictures of the inside of the human body.

In 1946, the government started selling radioactive chemicals to research institutions. Scientists used the materials for a variety of reasons. They tracked insects' flight, sterilized food, and created medicine. The material was used in the study of metals, pharmacy drugs, and botany. Physics and genetics use the material. The chemicals were also used in chemistry and dozens of other areas of research.

First commercial nuclear power plant located in Calder Hall, United Kingdom

Hiroshima after the atomic bomb was dropped

The Atomic Age became an everyday part of American life. Electricity generated by nuclear power plants was sometimes advertised in fun ways. Little cartoon characters represented the atoms. School children were shown movies advertising the new world that nuclear science was bringing. Science fiction stories and books, movies, and even vocabulary words all began to show influence of the Atomic Age. The new science changed world politics, science, medicine, and war.

What is "radioactivity"? This word has to do with atoms that shoot off particles naturally. Radioactive materials eventually decay away over time. The more radioactivity in a material, the better the material can split neighboring atoms. Uranium and plutonium are very radioactive. They are preferred materials in atom bombs.

Communists are people who support communism, the main government and economic system in the Soviet Union.

Atomic War, a science fiction publication

Amazing Stories, a science fiction publication

Atomic Power Station in Shippingport, Pennsylvania, the first full-scale nuclear power generating station in the U.S.

Atomic bomb "Fat Man" on transport

What is your opinion about nuclear science?

Cold War

The Soviet Union tried to create the same atomic weapon as the United States. They sent spies to discover atomic secrets the United States had developed. It didn't take long for the Soviets to catch up once they learned the discovered secrets. In 1949, they exploded their first atomic bomb. Americans learned that Soviet spies were in secret places, taking pictures, and stealing top-secret plans. A hunt began for Communists. Some people were found who wanted to harm the United States and world peace. However, there were many innocent people who were falsely accused. Their reputations were ruined.

Atom Bombs

These new weapons were invented during World War II. They used uranium or plutonium atoms that are smashed together. The atoms split apart and create chai reactions. That splits more atoms. The process releases huge quantities of er Early atom bombs had the same expl power as 100,000 tons of dynamite.

Hydrogen Bombs

Another bomb that was invented use a different process. The hydrogen bon works when hydrogen atoms are forc to combine or fuse together. Super-ho temperatures are needed for this proc to work. The atom bomb could create those high temperatures. It became the "trigger" for the hydrogen bomb. Today's hydrogen bombs can destroy entire cities in one blinding flash.

Nuclear Weapons Treaties

Controlling nuclear weapons was very important. There were many nuclear weapons on both sides of the Cold War. The United States and the USSR could destroy each other several times over in a nuclear exchange. The United States and its allies agreed with the USSR and its allies not to build any more nuclear weapons than are necessary to defend either side. New treaties are being negotiated. They force both sides to destroy old or "first strike" weapons.

Fission is when atoms are splitting apart and creating more atoms in a chain reaction.

_____ v

One little pound of uranium could create enough explosive power to shoot 2,500 automobiles straight up into the air for 500 miles.

T-Chart

Positive	Negative
•	•
•	•
•	•
•	•

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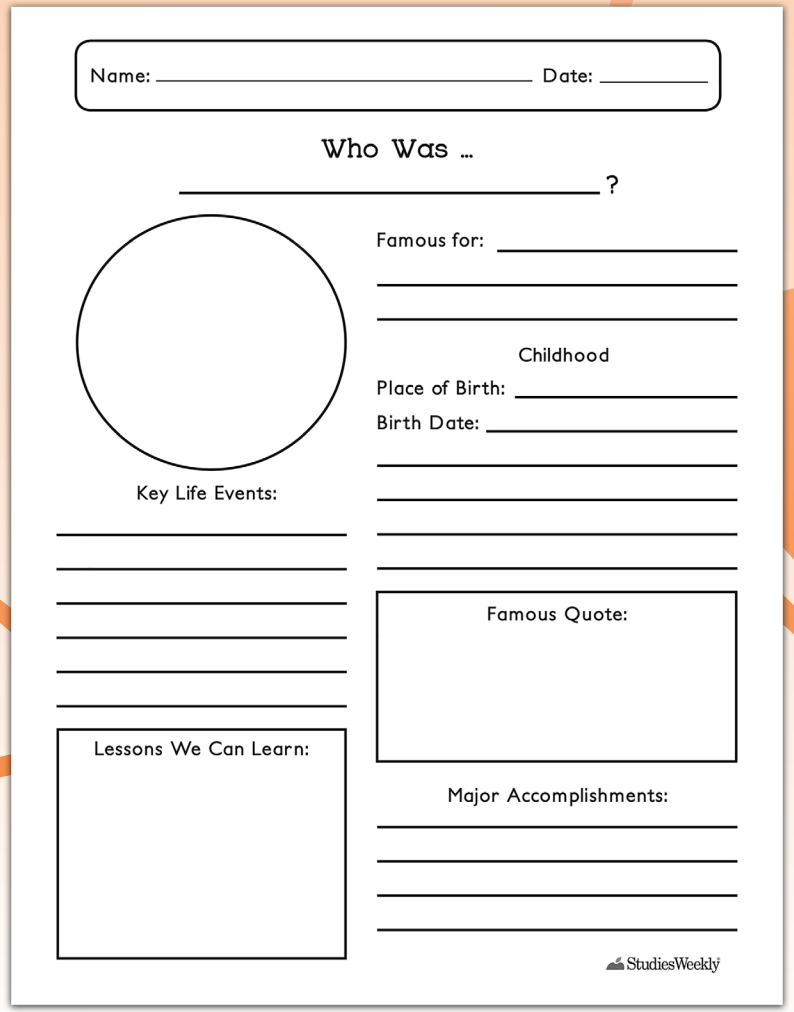
Robert Oppenheimer

Who Was?



Name: _____ Date: _____

Who Was …

_____ ?

Famous for: _____

Childhood

Place of Birth: _____

Birth Date: _____

Key Life Events:

Famous Quote:

Lessons We Can Learn:

Major Accomplishments:

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Discussion Time

What are some of the major accomplishments Oppenheimer had during his lifetime?

Nuclear Proliferation

Nuclear Proliferation

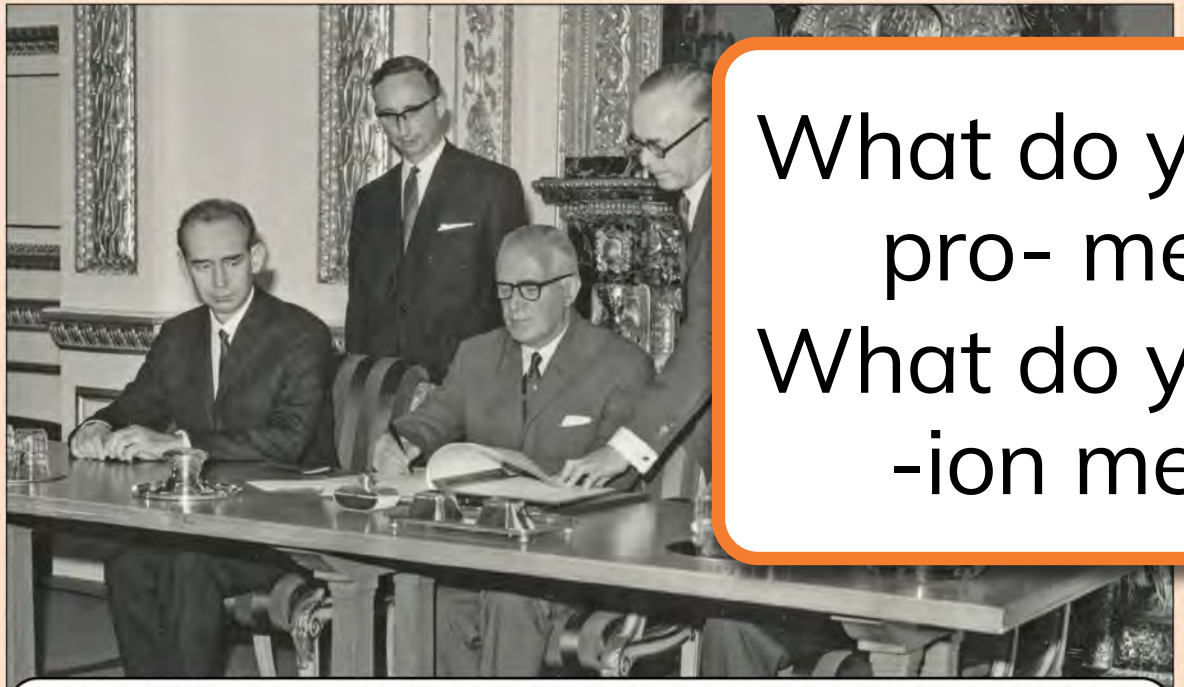
The word "proliferate" means to spread rapidly. After it was introduced, nuclear energy proliferated.

There began to be a proliferation of nuclear weapons in the world's most powerful nations. Less powerful nations were also trying to create the weapons. Nations thought that access to nuclear technology would mean more power. The weapons also meant the countries had more political control when dealings with other nations.

World leaders became concerned about the number of countries with nuclear weapons. In 1968, the United Nations created a treaty. It was the Nuclear Non-Proliferation Treaty. It became effective in 1970. The countries that signed the treaty committed to do three things:

1. to work to prevent the spread of nuclear weapons and weapons technology
2. to promote the peaceful uses of nuclear energy
3. to achieve total nuclear disarmament

The goal of the treaty was to eventually get rid of all nuclear weapons. Eventually, 191 countries signed the treaty.



Britain Foreign Secretary Michael Stewart signs the treaty on Non-Proliferation of Nuclear Weapons at Lancaster House in London while ambassadors from the Soviet Union (left) and the United States (right) observe, July 1, 1968.

In its official statement on the Nuclear Non-Proliferation Treaty: the U.S. State Department said:

It has enabled past progress on nuclear disarmament and facilitated the spread of peaceful nuclear technology for development across the globe.... The treaty has made the world safer and more prosperous for all States Party [signers], and it remains one of the most successful treaties ever negotiated.

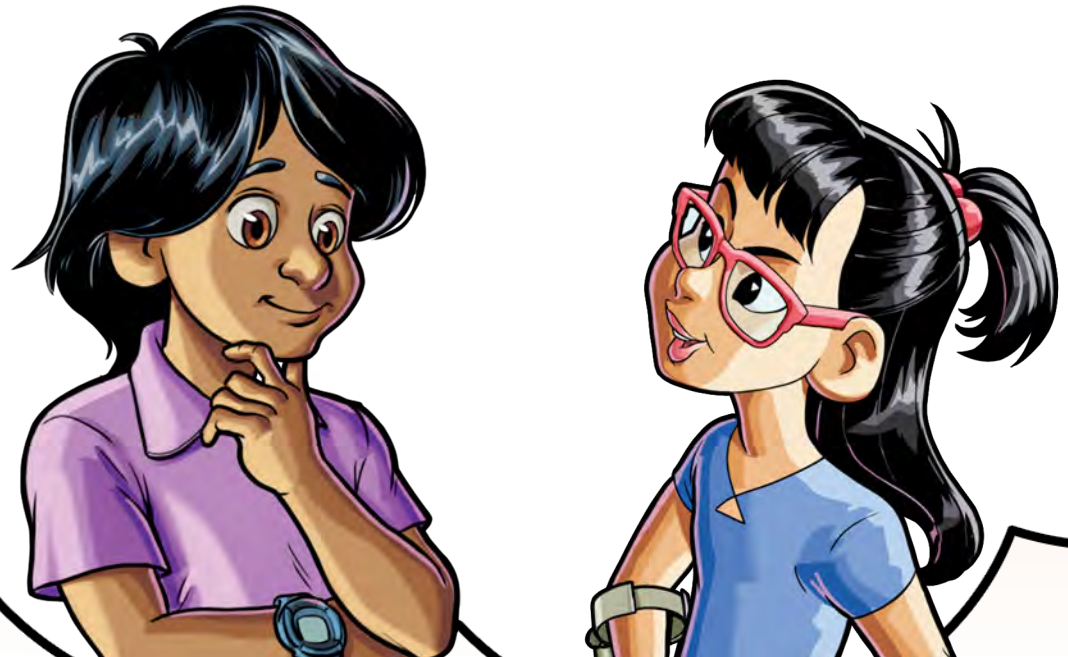
What do you think pro- means?

What do you think -ion means?

What do you think?

What do you think proliferation means?

Write your definition in the margins.



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Comprehension Questions

- What was the fear world leaders had with nuclear energy?
- Who created the Nuclear Non-Proliferation Treaty?
- What were the three items the treaty committed to?

Let's Review

Who was Robert Oppenheimer?

Review

-
-
-

Manhattan Project Map

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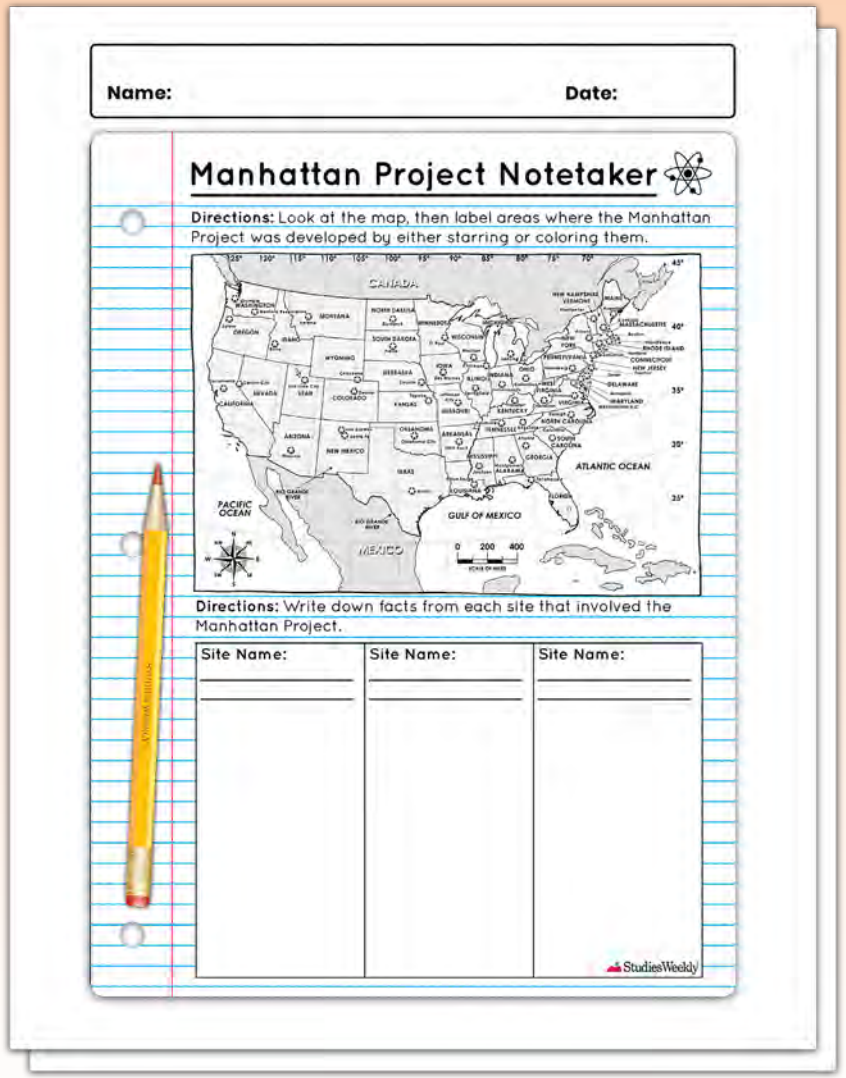
Manhattan Project Notetaker



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Let's Look

Redstone Arsenal

Redstone Arsenal was built in Huntsville, Alabama. It was built at the beginning of WWII. An **arsenal** is a place where weapons are made or stored. This arsenal was built to make chemical weapons. The plant stopped production for a while after World War II.

It didn't take long for the U.S. to realize its greatest threat. The Soviet Union was developing new weapons. The Korean War crisis also brought an urgent need for new weapons. These factors motivated the United States to further advance its weapons. German engineers and scientists were brought to the Redstone Arsenal. Here, they continued their work. They built the Redstone Rocket. A later model was called the Jupiter-C missile. It took the first U.S. satellite into space in 1958.

In the 1960s and 1970s, Redstone Arsenal was home to the U.S. Army Missile Command (MICOM). It had 19 major missile systems. These missiles were used in later conflicts. Today, Redstone Arsenal is home to the Army's missile testing and development program.

Saturn V Rocket

The Saturn V Rocket was used to launch astronauts to the moon.

The Marshall Space Flight Center

Alabama has a history with space exploration. In 1960, the National Aeronautics and Space Administration (NASA) program opened the Marshall Space Flight Center (MSFC). The center is located at the Redstone Arsenal in Huntsville, Alabama.

The establishment of the MSFC brought many people to Alabama. It brought scientists, engineers, and researchers to town. There was growing interest in the science field. To join the space race, more than 100 German-born scientists became U.S. citizens.

In 1961, the Mercury-Redstone mission sent Alan B. Shepard into space. The vehicle that carried him was tested at Marshall Space Flight Center. The center took the lead in the industry. Its scientists were then commissioned to build the Saturn V rocket. It was these rockets that helped the U.S. reach the moon in 1969.

Redstone technology helped make both the Saturn V rocket booster and lunar rover products possible. MSFC has also been a part of developing the International Space Station. It helped launch the Hubble Space Telescope. The center and the U.S. Space & Rocket Center keeps Huntsville as a leader in American rocket and space development.

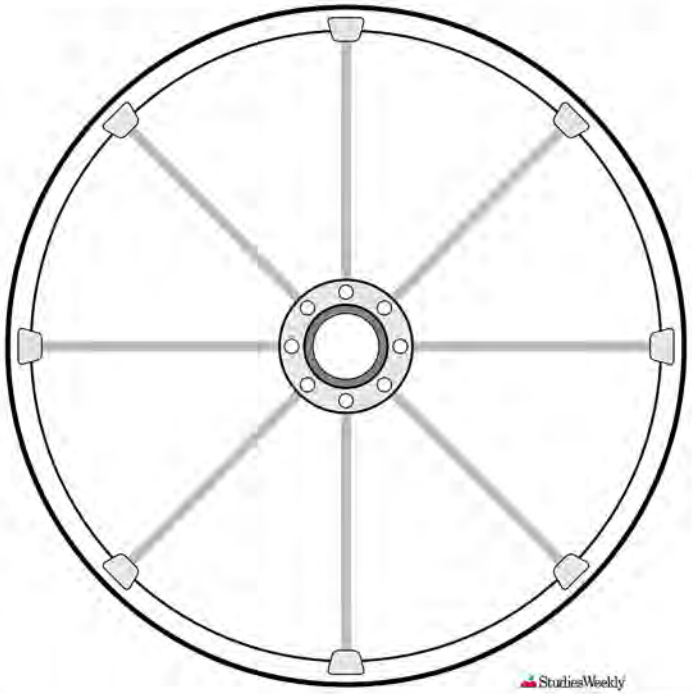
The impact of NASA and the people that came to Huntsville shaped the cultural and intellectual climate. Many entrepreneurs, scientists, researchers, and engineers were drawn to the area. They wanted to be a part of the space program. NASA decided to branch beyond rockets and space exploration in the 1970s and 80s. They worked to create additional training programs. Space Camp is one of those programs. The camp is for fourth–sixth grade students. Its goal is to encourage students to pursue careers in math, science, and technology.

Wagon Wheel

Name: **Date:**

Wagon Wheel

Place a thought/question/comment on your section, rotate it to the person to your left, reread or skim the article(s), and write a thought/question/comment in that section. Complete until all parts of the wheel are filled.



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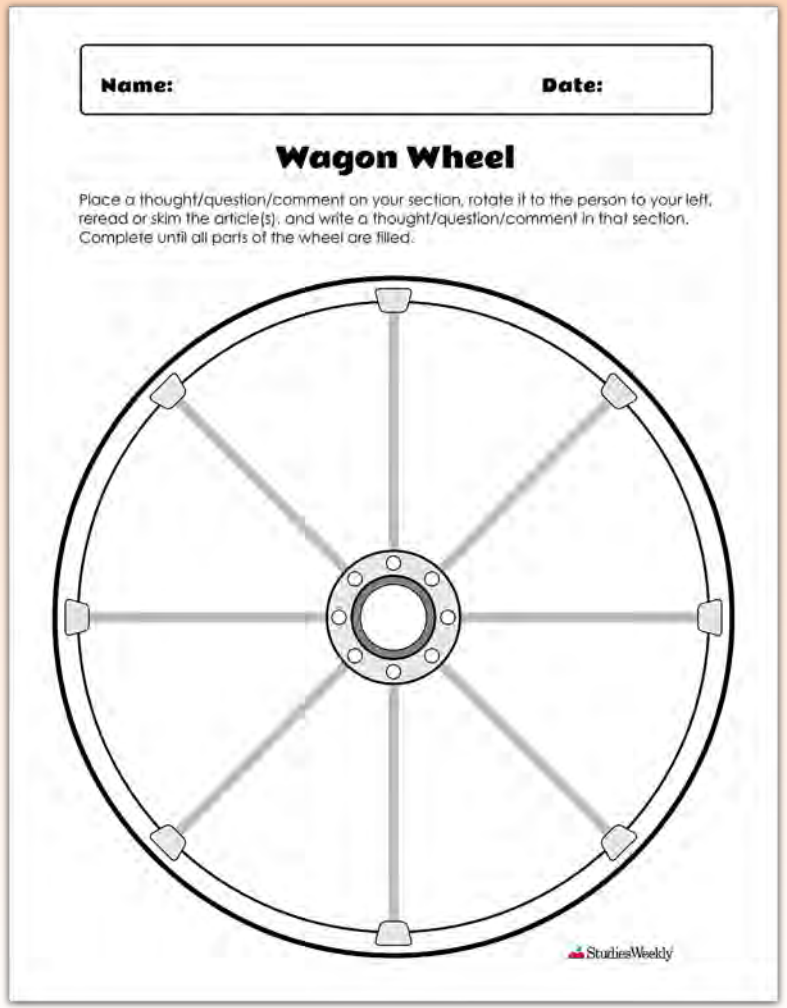
Wagon Wheel Directions


Name: Date:

Wagon Wheel

Place a thought/question/comment on your section, rotate it to the person to your left, reread or skim the article(s), and write a thought/question/comment in that section. Complete until all parts of the wheel are filled.

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You will go through this activity twice:

- First, place comments/ thoughts from the articles.
- Second, respond to spots and leave additional comments and thoughts from the articles.

In groups of four

Skim the article "**Redstone Arsenal.**"

Write a thought/question/comment on a section of the wagon wheel.

Once done, rotate it to the person to your **left**. This will be done twice.

Skim the article "**The Marshall Space Flight Center.**"

Write a thought/question/comment on a section of the wagon wheel.

Once done, rotate it to the person to your **left**. This will be done twice.

On the last two spots of the wagon wheel, write a thought/ question/comment reviewing what you just learned.

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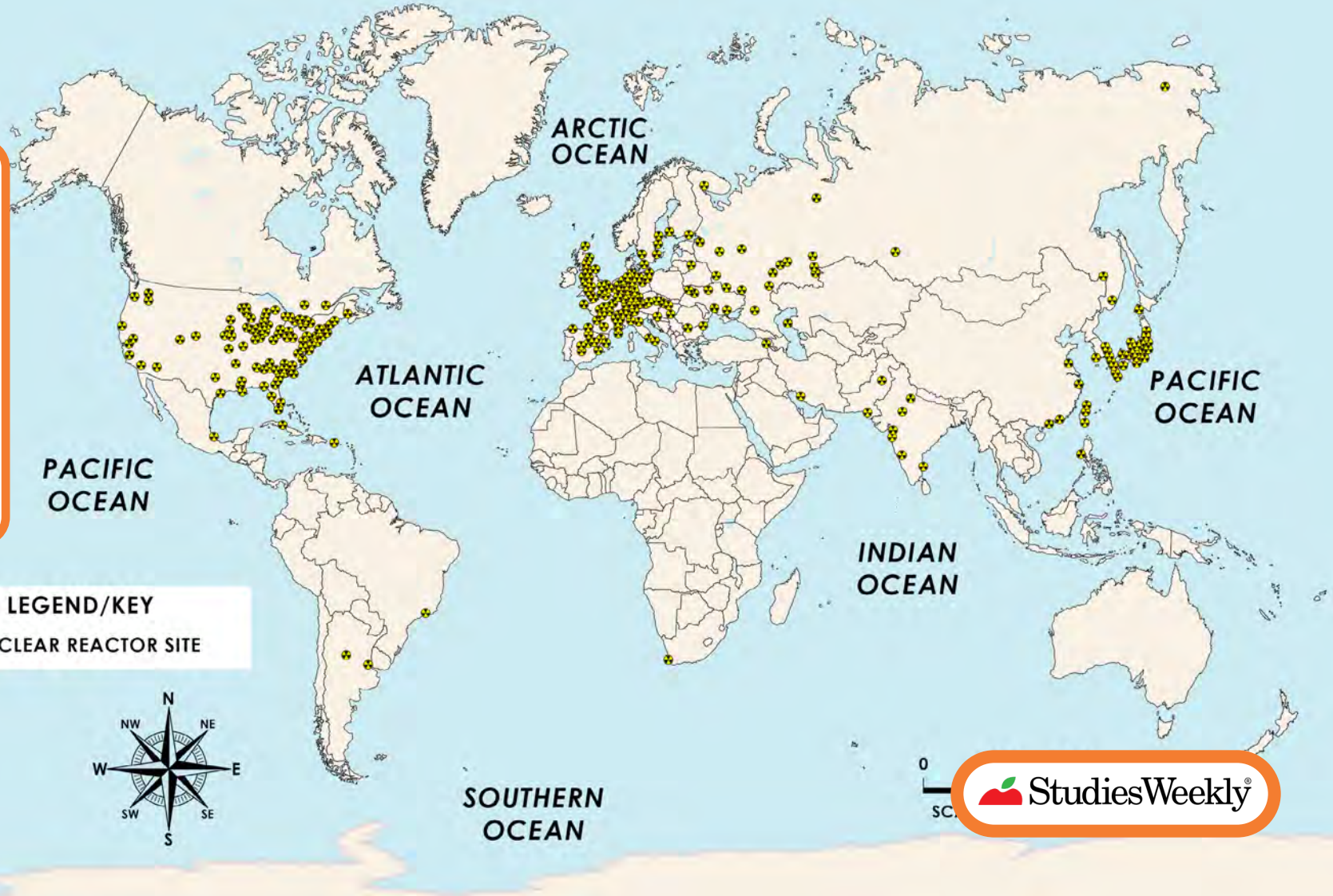
Recap!

How were these space centers important in the Atomic Age?

Nuclear Plants Map

What do you notice?
What surprised you?
Which country has the fewest power plants?
Why do you think this country has the fewest?
What might be some problems with nuclear power plants?



Exit Ticket

How did technology impact the world after World War II?

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Writing Rubric: How did you do?

Check the appropriate box to evaluate your work.

	4	3	2	1
I was on target for the assignment.				
I expanded on the ideas or shared with a partner.				
I did my best work.				
I turned my assignment in.				

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THE MAYA CIVILIZATION

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COMPELLING QUESTION

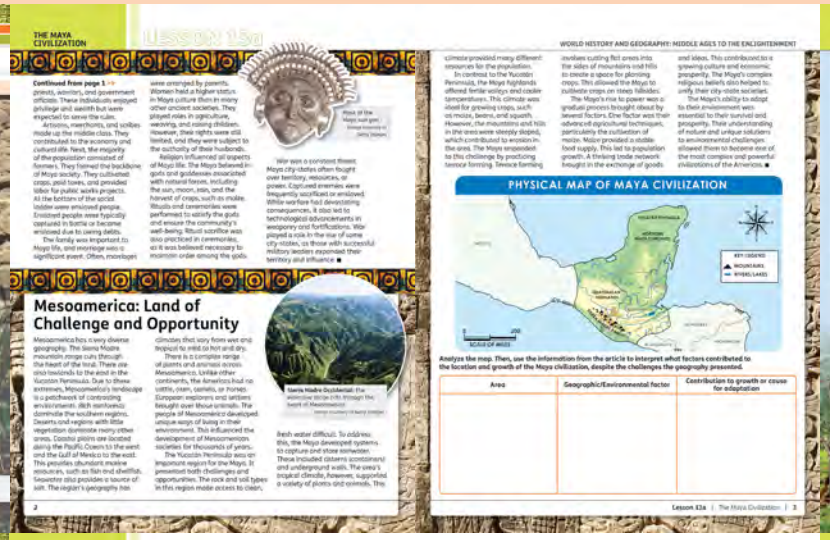
How did geography, technology, and religion shape the Maya civilization?

VOCABULARY

Directions: Find each of the bolded vocabulary words in the articles. Highlight the word and then write the word and its definition on a sheet of paper as you read them in the articles.

city-state	an independent city and its surrounding land, which has its own government
codices	Maya religious text that priests used to record important information
corbel arch	a type of arch created by overlapping stones or bricks in a stepwise fashion
erosion	the wearing away of land
halach uinic	the title given to the Maya leader
rebus writing	a type of writing using hieroglyphs or pictures instead of words
terrace farming	a method of farming that involves cutting flat areas into the sides of mountains and hills to create a space for planting crops

PICTURE WALK



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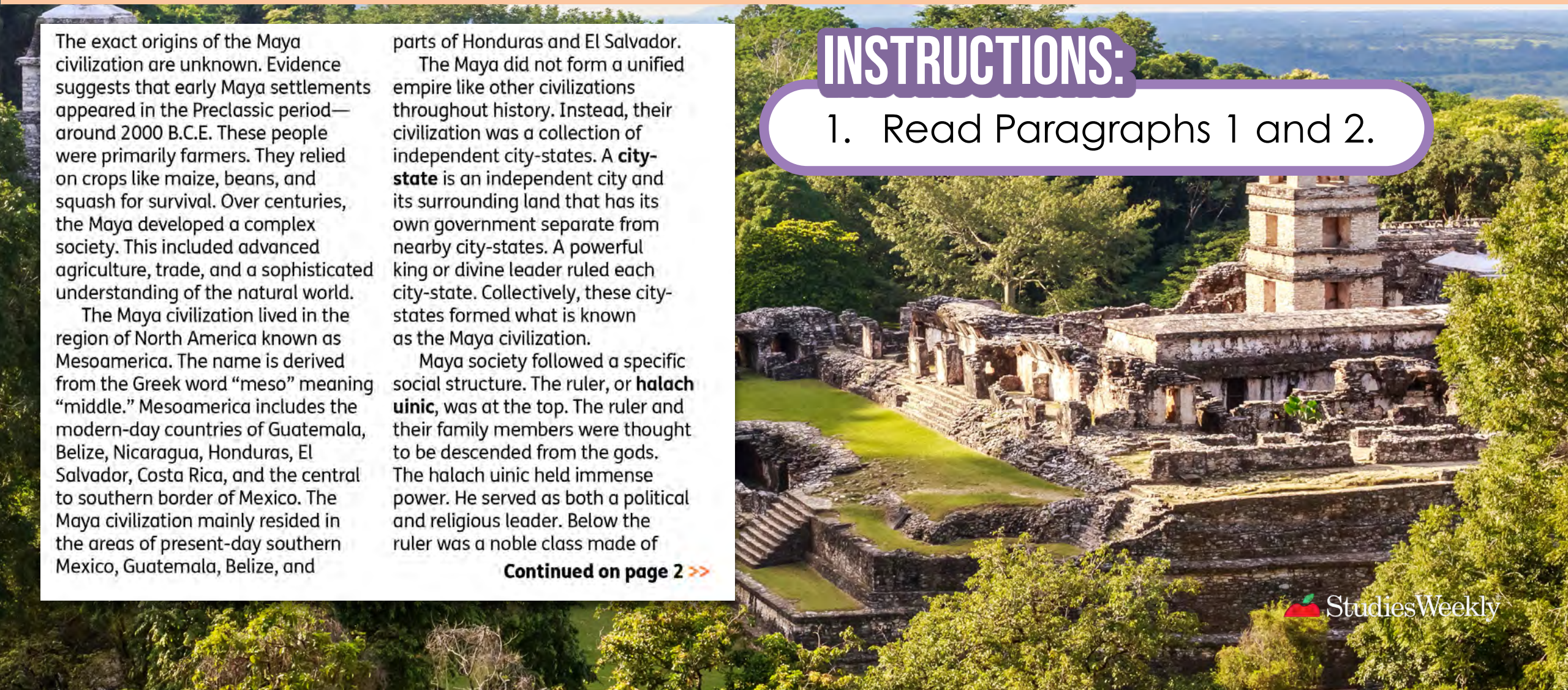
READ

THE MAYA PEOPLE



The exact origins of the Maya civilization are unknown. Evidence suggests that early Maya settlements appeared in the Preclassic period—around 2000 B.C.E. These people were primarily farmers. They relied on crops like maize, beans, and squash for survival. Over centuries, the Maya developed a complex society. This included advanced agriculture, trade, and a sophisticated understanding of the natural world.

The Maya civilization lived in the region of North America known as Mesoamerica. The name is derived from the Greek word "meso" meaning "middle." Mesoamerica includes the modern-day countries of Guatemala, Belize, Nicaragua, Honduras, El Salvador, Costa Rica, and the central to southern border of Mexico. The Maya civilization mainly resided in the areas of present-day southern Mexico, Guatemala, Belize, and parts of Honduras and El Salvador.

The Maya did not form a unified empire like other civilizations throughout history. Instead, their civilization was a collection of independent city-states. A **city-state** is an independent city and its surrounding land that has its own government separate from nearby city-states. A powerful king or divine leader ruled each city-state. Collectively, these city-states formed what is known as the Maya civilization.

Maya society followed a specific social structure. The ruler, or **halach uinic**, was at the top. The ruler and their family members were thought to be descended from the gods. The halach uinic held immense power. He served as both a political and religious leader. Below the ruler was a noble class made of

Continued on page 2 >>

INSTRUCTIONS:

1. Read Paragraphs 1 and 2.

GEOGRAPHIC LOCATION

GULF OF MEXICO

Maya Lowland

MEXICO

Maya Highland

BELIZE

HONDURAS

PACIFIC OCEAN

GUATEMALA

EL SALVADOR

N NW NE W E SW SE S

0 100 200 300

SCALE OF MILES

Where was the Maya civilization located relative to where you live today?

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SOCIAL STRUCTURE

Name: Date:

Maya Civilization: City-State Social Structure

Directions: Read the article "The Maya People" and fill out the social structure chart below. Then, answer the questions about the Maya people.

Maya Social Structure Chart

Maya civilization: a collection of independent city-states
Who ruled the city-states? What do you know about the ruler and their family members?
Who made up the noble class of the city-states? What do you know about these individuals?
Who made up the middle class of the city-states? What do you know about these individuals?
What do you know about the farmers of the city-states?
What do you know about the enslaved people of the city-states?

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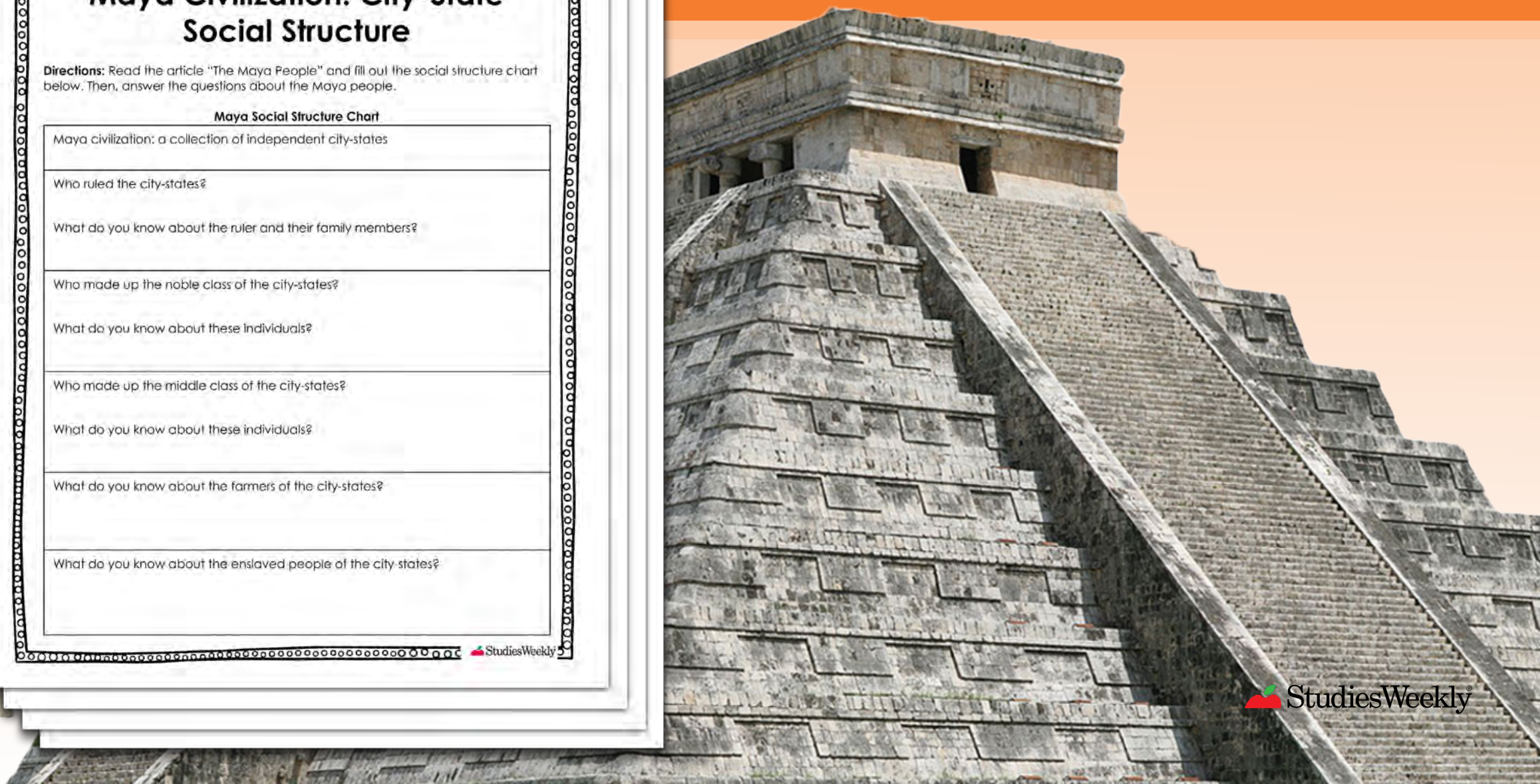

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LET'S DEBRIEF

What did you learn about the social structure of the Maya city-states?

How do you think the beliefs and religion of the Maya people shaped their culture?

LET'S REVIEW AND PREDICT

What do you remember about what we already learned about the Maya people?

What do you predict we will learn about the geography of the area where the Maya civilization formed?

SIERRA MADRE MOUNTAIN RANGE, BARRANCO DEL COBRE NATIONAL PARK

What do you notice about the image and the geography of the area?

MESOAMERICA: LAND OF CHALLENGE AND OPPORTUNITY

Mesoamerica: Land of Challenge and Opportunity

Mesoamerica has a very diverse geography. The Sierra Madre mountain range cuts through the heart of the land. There are also lowlands to the east in the Yucatán Peninsula. Due to these extremes, Mesoamerica's landscape is a patchwork of contrasting environments. Rich rainforests dominate the southern regions. Deserts and regions with little vegetation dominate many other areas. Coastal plains are located along the Pacific Ocean to the west and the Gulf of Mexico to the east. This provides abundant marine resources, such as fish and shellfish. Seawater also provides a source of salt. The region's geography has climates that vary from wet and tropical to mild to hot and dry.

There is a complex range of plants and animals across Mesoamerica. Unlike other continents, the Americas had no cattle, oxen, camels, or horses. European explorers and settlers brought over those animals. The people of Mesoamerica developed unique ways of living in their environment. This influenced the development of Mesoamerican societies for thousands of years.

The Yucatán Peninsula was an important region for the Maya. It presented both challenges and opportunities. The rock and soil types in this region made access to clean, fresh water difficult. To address this, the Maya developed systems to capture and store rainwater. These included cisterns (containers) and underground wells. The area's tropical climate, however, supported a variety of plants and animals. This climate provided many different resources for the population.

In contrast to the Yucatán Peninsula, the Maya highlands offered fertile valleys and cooler temperatures. This climate was ideal for growing crops, such as maize, beans, and squash. However, the mountains and hills in the area were steeply sloped, which contributed to erosion in the area. The Maya responded to this challenge by practicing terrace farming. Terrace farming involves cutting flat areas into the sides of mountains and hills to create a space for planting crops. This allowed the Maya to cultivate crops on steep hillsides.

The Maya's rise to power was a gradual process brought about by several factors. One factor was their advanced agricultural techniques, particularly the cultivation of maize. Maize provided a stable food supply. This led to population growth. A thriving trade network brought in the exchange of goods and ideas. This contributed to a growing culture and economic prosperity. The Maya's complex religious beliefs also helped to unify their city-state societies.

The Maya's ability to adapt to their environment was essential to their survival and prosperity. Their understanding of nature and unique solutions to environmental challenges allowed them to become one of the most complex and powerful civilizations of the Americas. ■

Sierra Madre Occidental: The extensive range cuts through the heart of Mesoamerica.

Image courtesy of Getty Images

Underline/highlight the different geographic features.

In the margins, write about the ways this feature impacted the Maya people.

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GROUP MEMBER ROLES

- **Group Leader:** organizes group activities, facilitates discussions, ensures all group members participate, keeps group on task, helps manage overall project, and acts as primary spokesperson for the group
- **Researcher:** helps access resources for research, assigns members of the group topics for research, gathers and organizes information, and summarizes findings for the group to consider when creating the map
- **Map Artist:** takes charge of the creative aspect of the map, including the design and layout; draws geographical features and assigns help to label them accuratel; and chooses colors and symbols to make the map visually appealing and easy to understand
- **Writer/Note Taker:** compiles and writes the descriptions that accompany each feature on the map, ensures that the language used is clear and informative, takes notes during group discussions and keeps track of ideas
- **Presenter:** practices and delivers the group's presentation to the class; clearly explains the map and the information in it; engages the audience during the presentation encouraging questions and interaction; and coordinates with the group to ensure that each member has a chance to speak about their assigned features

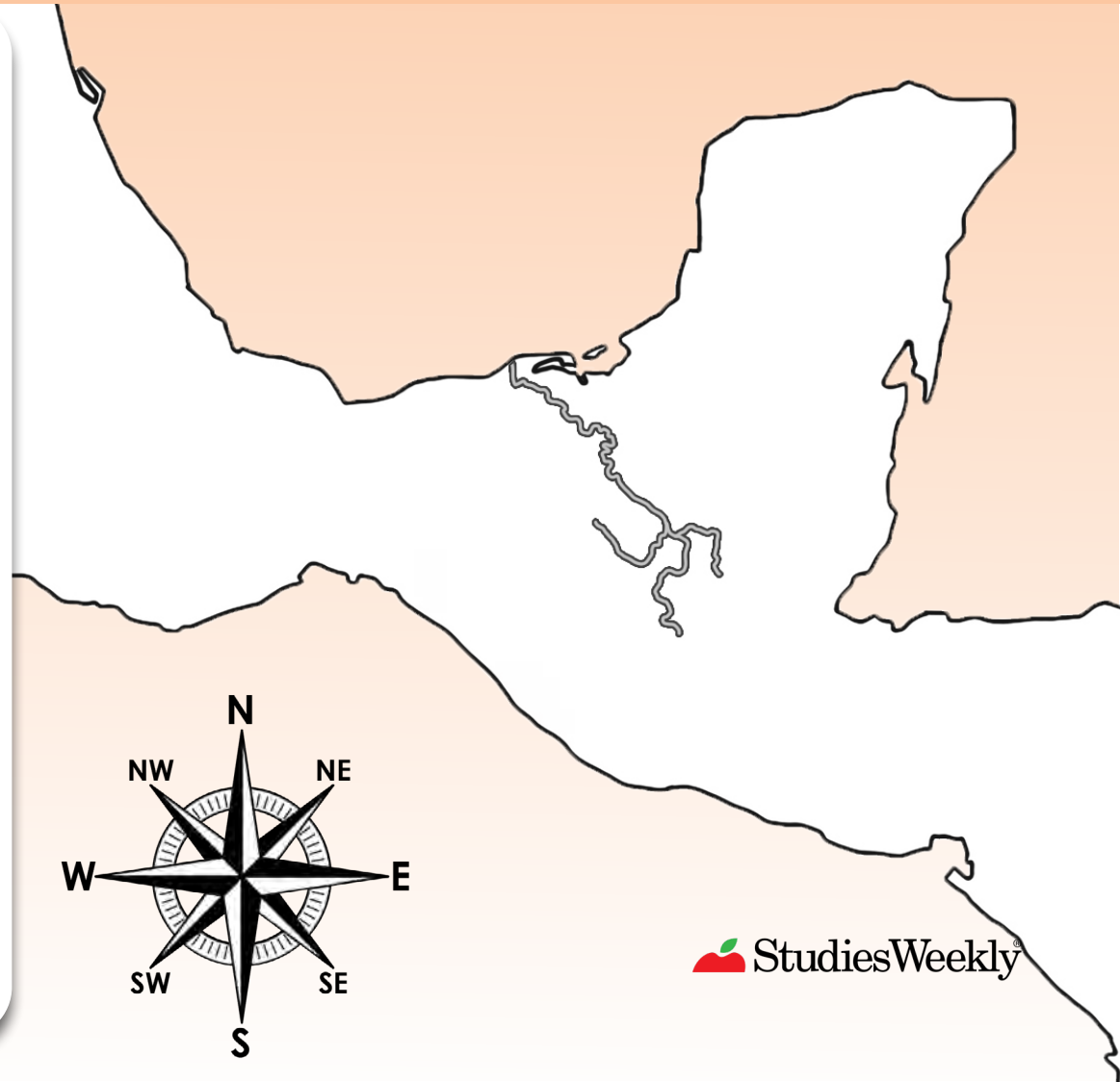
GROUP RESEARCH

Instructions: You will work together to create your own map of Mesoamerica. Gather information about the geography in Mesoamerica so you can create a realistic and accurate representation depicting the area at the time.

Outcome: You will present your map and findings to the class.

Resources to use in your research:

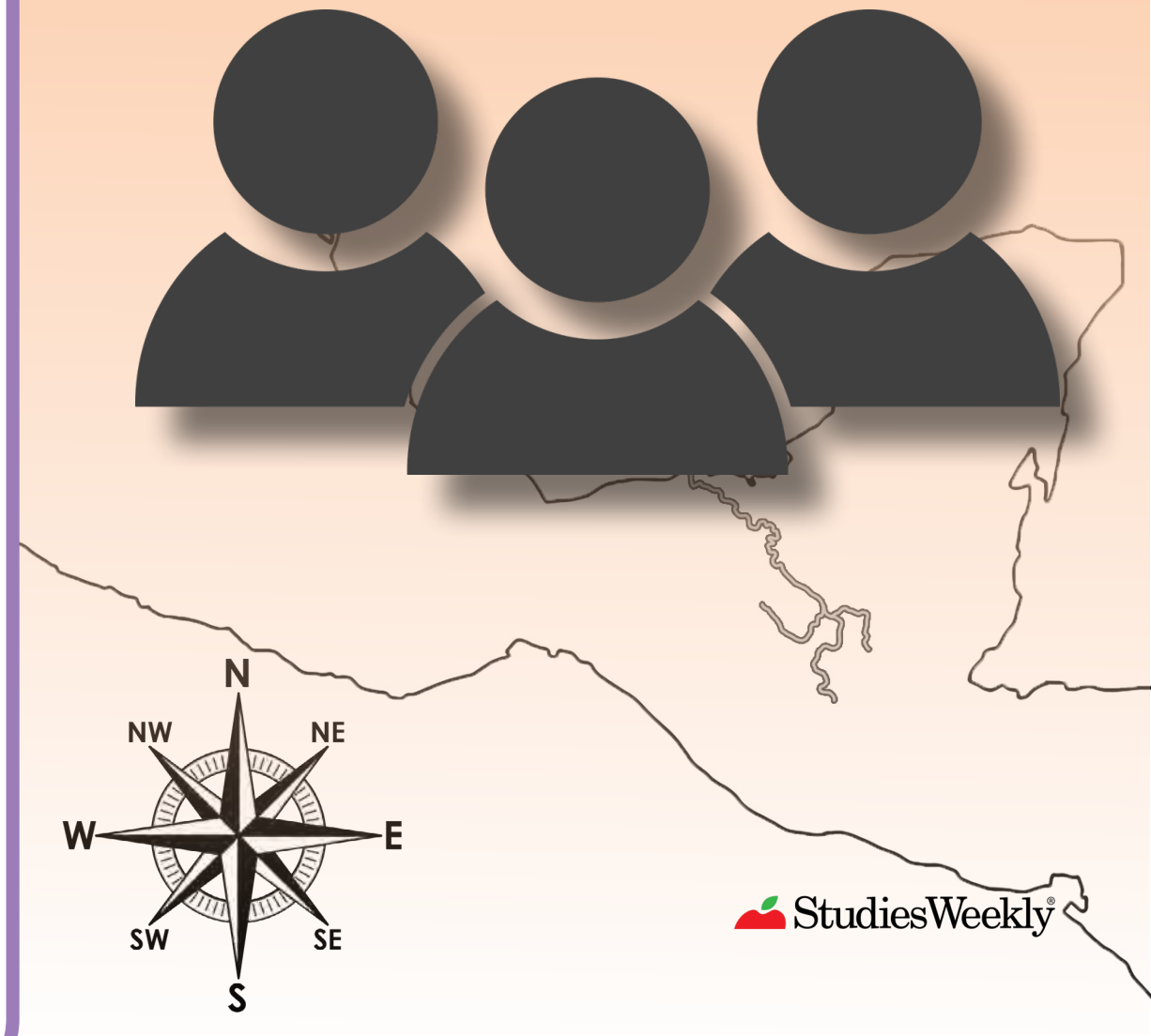
- the article
- atlas
- digital resources
- maps



MAP PLANNING

Discuss and plan how you will present each feature on your map:

- Placement of geographical features
- Use of colors and symbols
- Brief descriptions of each feature that explains how it influenced Maya society (e.g., "The Sierra Madre mountains provided a barrier that influenced trade routes and agriculture.")
- Map legend
- Map title



MAP CREATION

- **Draw and label geographical features clearly:**
  - Sierra Madre mountain Range
  - coastal plains
  - lowlands
  - highlands
  - Yucatán Peninsula
  - desert
  - fertile soil
  - climate
  - rain forest
  - lack of freshwater
  - steep mountains
  - cliffs
- **Use colors and symbols to differentiate between features (e.g., green for rainforests, brown for mountains, blue for coastlines, etc.)**
- **Include a legend.**
- **Include a title for the map.**
- **Add written descriptions beside the features, explaining their significance.**

PREPARE PRESENTATIONS

Work together to prepare a short two- to three-minute presentation explaining your map to the class.

Decide who will explain which features and discuss how these elements influenced the Maya civilization.

Each group should discuss:

- The geographical features you chose to highlight
- The influence of these features on climate, agriculture, and Maya culture
- Unique insights or fun facts you discovered in your research

OPTIONAL EXTENSION ACTIVITY

1. What did you learn about the geography of Mesoamerica and its impact on society?

2. How did the diverse landscapes contribute to the success of the Maya civilization?

3. What were the similarities and differences in the geographical challenges faced by the Maya compared to other civilizations?

EXIT OUT OF CLASS: STUDENT ARTICLE ACTIVITY

Analyze the map. Then, use the information from the article to interpret what factors contributed to the location and growth of the Maya civilization, despite the challenges the geography presented.

Area	Geographic/Environmental factor	Contribution to growth or cause for adaptation

LET'S REVIEW

What have you already learned about the Maya civilization so far?

What else are you curious about?

The Maya Economy

The trade and subsequent wealth of the Maya greatly contributed to the growth of their civilization. They were able to acquire wealth by trading goods, such as agricultural crops and salt. Each Mayan city was strategically placed to support trade with other Mesoamerican civilizations.

Salt was produced by boiling salt water found in the lowlands. Salt is a vital mineral for health and life. It helps balance the fluids in the body. It makes nerve connections function. In addition to salt's medical benefits, it also adds flavor to food and helps preserve it.

Another popular trading item was chocolate. Dried cacao beans are the main ingredient in chocolate. These beans were considered very valuable. Historical evidence suggests that common workers may have even been paid with cacao beans. Chocolate drinks served in clay bowls are believed to have been used as a trade item. Some historians think the decline of the Maya civilization might have resulted from a change in climate that affected the supply of cacao beans.

Maya leaders taxed their workers. They required them to pay portions of their harvested crops. These taxes were then used to pay the palace workers and trade for other necessary items. Many conquered tribes were enslaved and forced into work. Often, they also paid taxes to the ruler. Engaging in war was an important way to boost the Mayan economy. The more city-states an army could conquer, the more prisoners they could take. This led to more wealth from taxes that Maya leaders could gain. ■

How did the region's suitability for growing cacao impact the economy of the Maya civilization?

Cacao Bean: These valuable beans may have even been used as a type of currency.

Image courtesy of Getty Images

Cacao trees

Image courtesy of Getty Images

MAYA ECONOMY BUZZ WORDS

Circle these terms as you read the article "The Maya Economy" individually:

- trade
- crops
- salt
- chocolate
- cacao beans
- chocolate drinks
- war
- taxes

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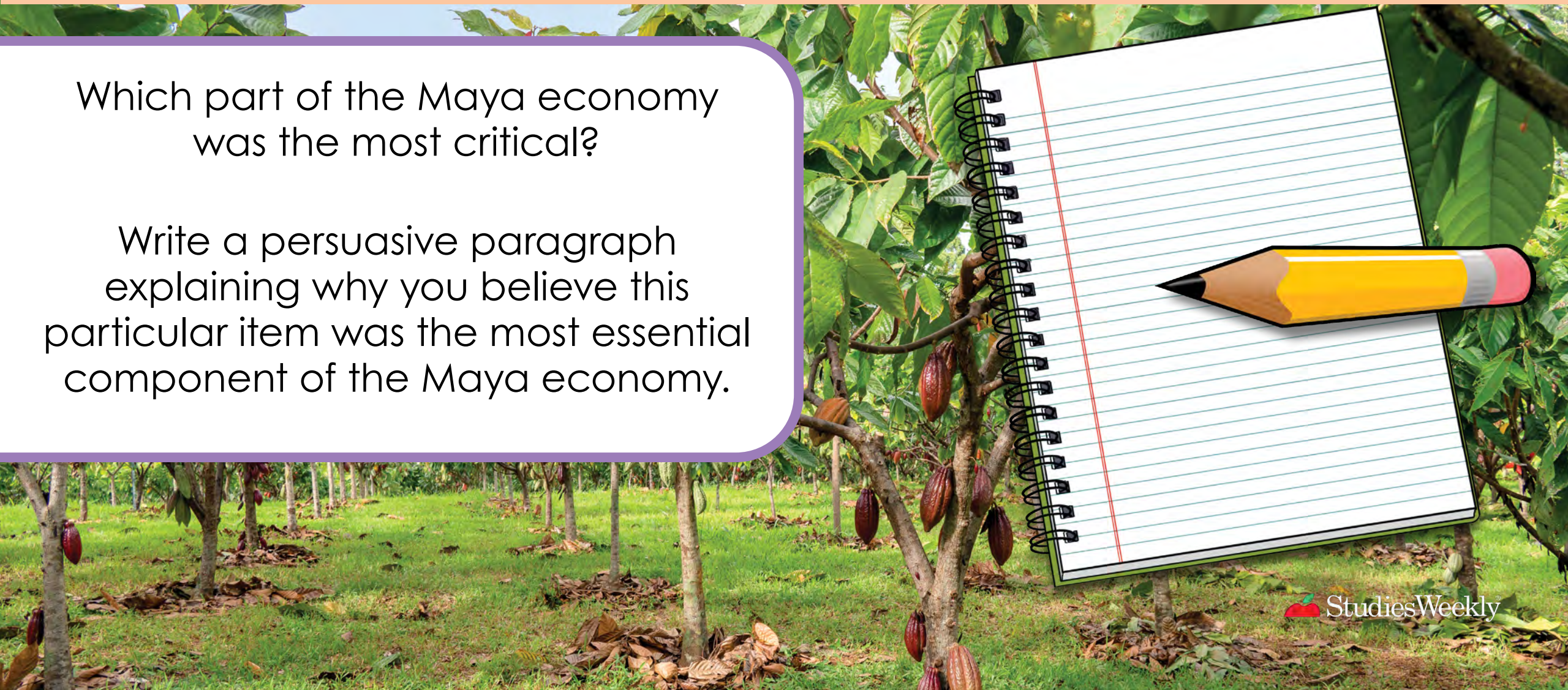
CRITICAL ECONOMY PARTS



Which part of the Maya economy was the most critical?

Write a persuasive paragraph explaining why you believe this particular item was the most essential component of the Maya economy.

CALLOUT BOX

Turn and Talk with a partner about this question:

How did the region's suitability for growing cacao impact the economy of the Maya civilization?

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CONNECTIONS

What is a significant achievement you have made in your life?

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SIGNIFICANT ACHIEVEMENTS OF THE MAYA

Significant Achievements of the Maya

The Maya were skilled in various artistic expressions and technological developments. Mayan artifacts offer a glimpse into their sophisticated society and beliefs.

Architecture

Maya architecture is an example of their significant engineering and artistic achievements. Maya city-states housed towering structures, including pyramids, temples, and palaces. These structures were often built on platforms. This raised them above other buildings. This created a sense of height that was used to inspire the people. Complex carvings and sculptures were placed on the exterior walls. These depicted Maya rulers, scenes from daily life, and figures from Maya myths. The Maya used special construction techniques to create spacious interiors. These included corbel arches and tall ceilings. A **corbel arch** is a type of arch created by overlapping stones or bricks in a stepwise fashion. The stones resemble an upside-down staircase. When these stones meet at the top, they form an arch-like structure. Corbel arches effectively supported the weight of roofs and upper stories in many buildings.

Corbel Arch: Mayan ruins in Copan, Honduras
Image courtesy of Getty Images

Language

Linguists believe there may have been dozens of different languages spoken throughout Mesoamerica. This variety of languages made communication difficult. The Maya people were pioneers of language. They are credited with having one of the only verified writing systems in the Americas before the arrival of Columbus. Their written language was a combination of hieroglyphs, or pictures, instead of words. This is called **rebus writing**. This form of writing is considered to be highly developed.

The Madrid Codex: A page from one of three surviving Mayan books, c. 900–1521 C.E.
Image courtesy of Getty Images

Maya Astronomy

The Maya were experts in the study of astronomy. In addition, the Maya's religious and cultural beliefs were closely linked to astronomy. Maya priests were responsible for studying the heavens and celestial objects. They recorded their observations. They also interpreted signs that they believed were from the gods. Much of what they

Continued on page 6 >>

VOCABULARY

codices: Maya religious text that priests used to record important information
corbel arch: a type of arch created by overlapping stones or bricks in a stepwise fashion
deforestation: the cutting down of forests
rebus writing: a type of writing using hieroglyphs or pictures instead of words

Continued from page 5 >>

observed was recorded in religious texts, called **codices**. There are very few Maya codices that have survived to the present. Those that have provide valuable information about the religious beliefs of the Maya and their study of astronomy.

Maya builders and engineers also observed the principles of astronomy. Temples, palaces, and ceremonial buildings were built so that important parts of the buildings were aligned to the cardinal directions. This was done as a sign of respect for the gods. On many Maya buildings, the placement of the doors was particularly important during the equinoxes, when the seasons changed from winter to spring and summer to fall. At precise times during the equinoxes, sunlight would shine on the interior of temples, palaces, and ceremonial buildings and light up important statues or art.

The Maya Calendar

The Maya also developed a very precise calendar based on astronomy. The Maya took a calendar developed by the Olmec people and improved it. The calendars they created could accurately track both short- and long-term cycles of time. This included the solar year and the lunar cycle. Maya calendars were used for both daily and religious events.

The regular calendar, or Haab, consisted of 365 days. In the Haab, there were 18 months of 20 days. When multiplied, this equals 360 days. The Maya added five days to the calendar to match the 365-

Maya calendar
Image courtesy of Getty Images

Observe the calendar's parts. Describe it as if you were explaining it to someone who can't see it. Try to make sense of it.

Where is it from? _____

What was it used for? List reasons you think so.

_____

_____

What does this tell you about the people who made and used it?

_____

_____

What does it tell you about technology at the time it was made?

_____

_____

Use it as historical evidence. What did you find out from this artifact that you might not learn anywhere else?

_____

_____

What other documents or historical evidence could you use to help you explain the calendar?

_____

_____

Look at the title, subtitles, and images with the article. What do you observe?

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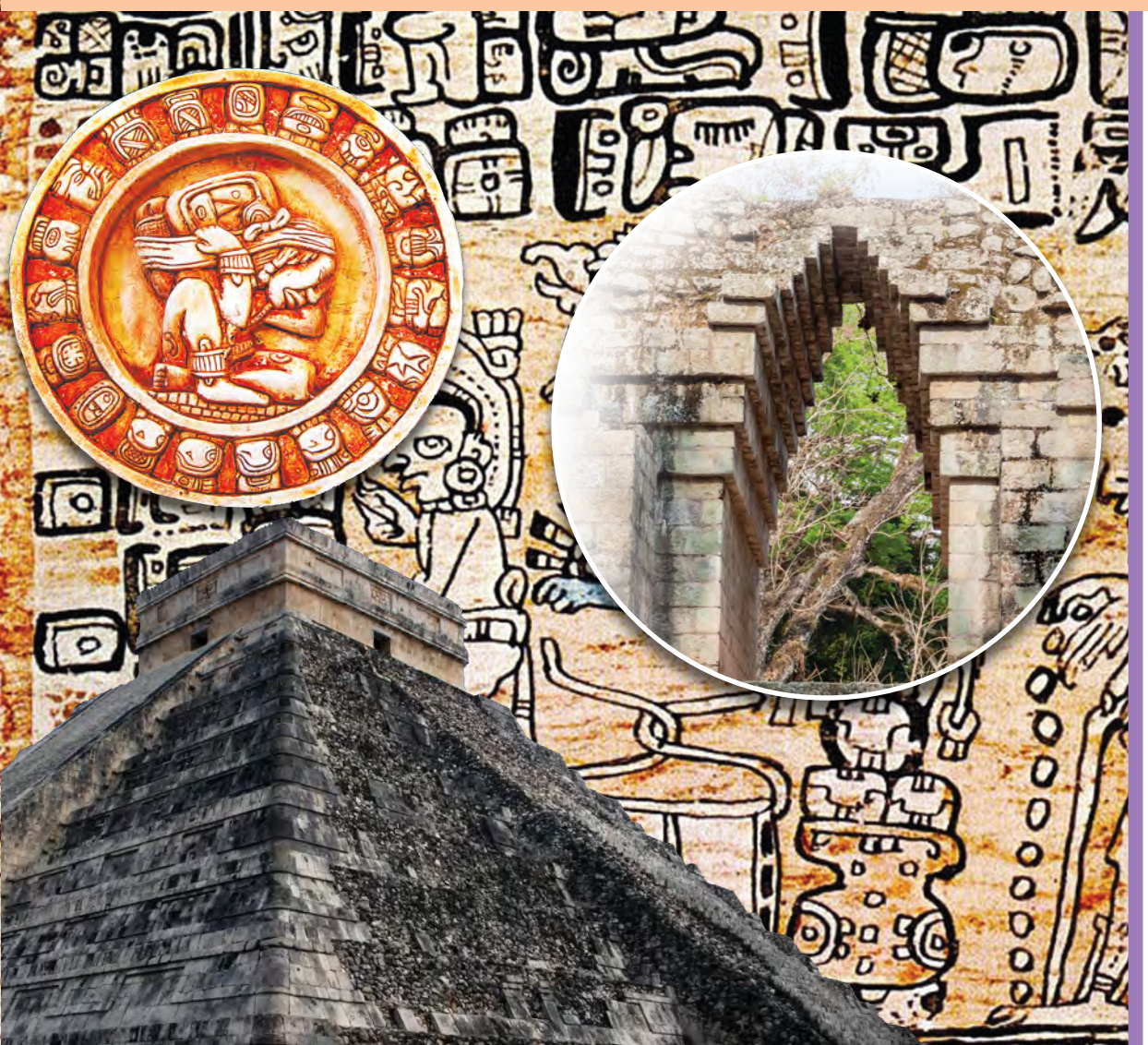
SIGNIFICANT ACHIEVEMENTS OF THE MAYA STATIONS



Stations:

1. Architecture
2. Language
3. The Maya Calendar
4. Art Culture of the Maya

At each station:

Highlight key information in your student text, then follow the instructions at the station.

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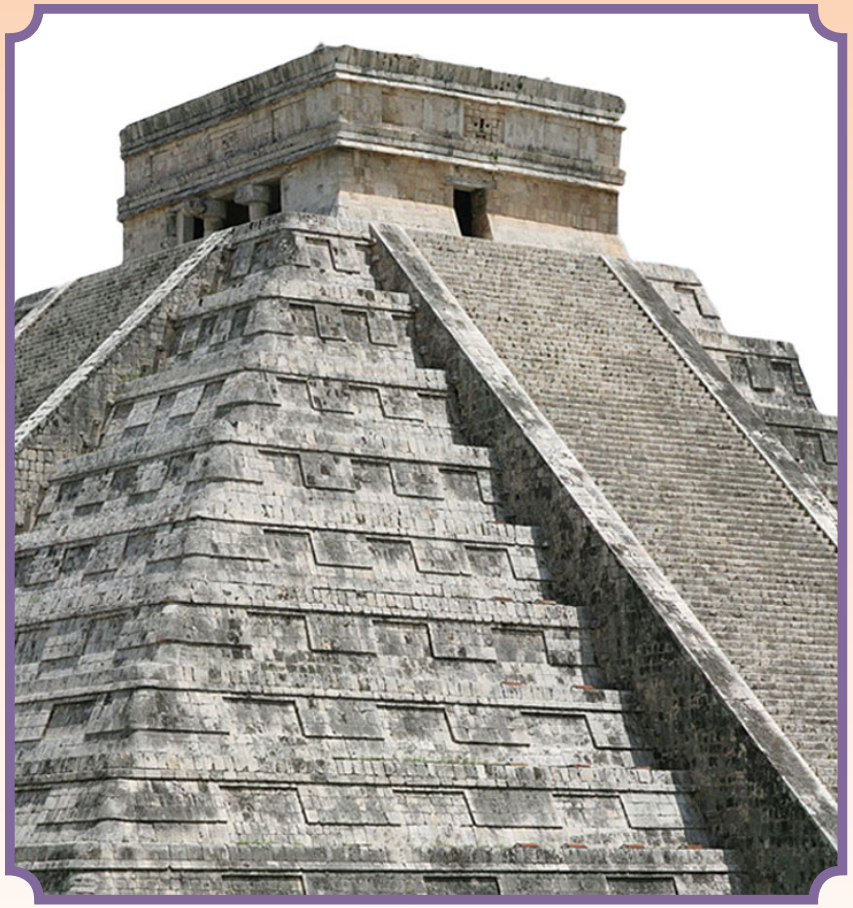
CLASS DISCUSSION



QUESTIONS:

1. Why did the Maya build their pyramids and temples on raised platforms?

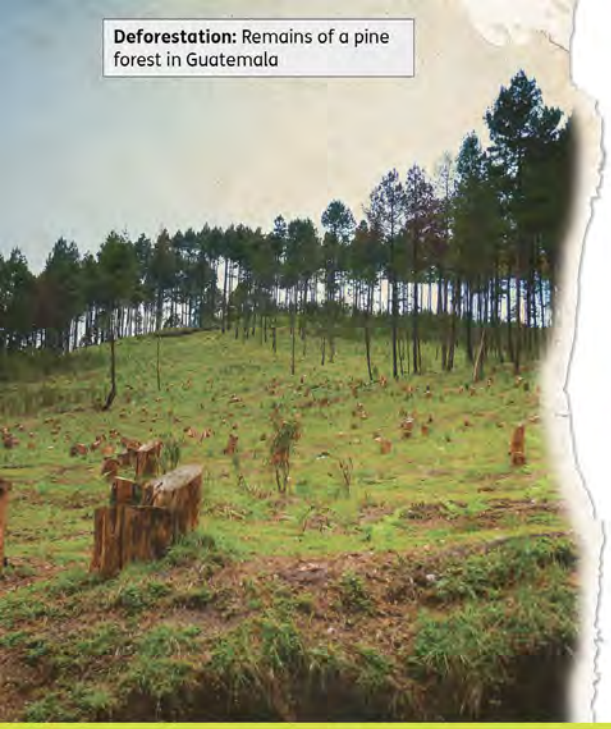
2. What challenge did the variety of languages in Mesoamerica create?

3. How did Maya buildings interact with sunlight during equinoxes?

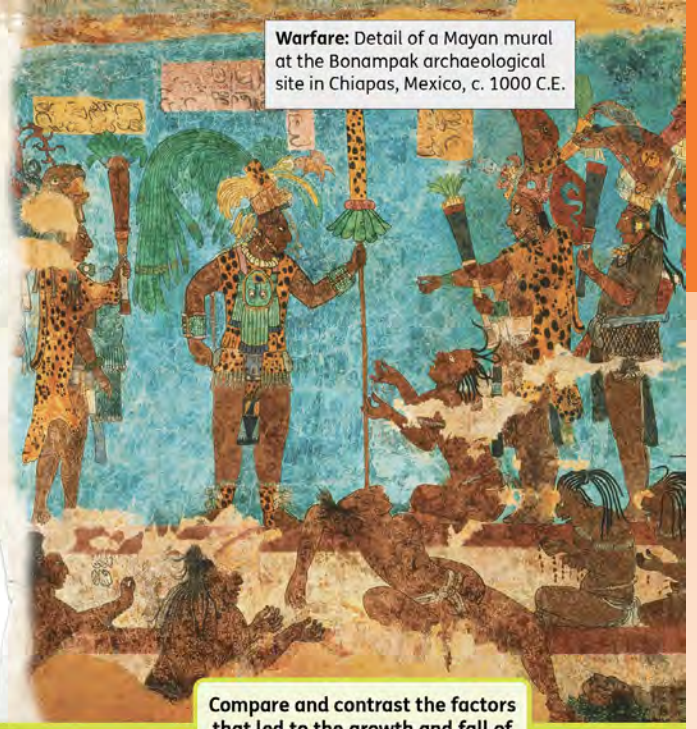
EXIT TICKET: ORAL ACCOUNT

Remember that the main way of passing down knowledge and stories from generation to generation for mayan people was through oral traditions. Poems, songs, and folktales were shared through storytelling. These stories preserved Maya cultural heritage and influenced the lives and values of future generations. Maya oral traditions not only explained religious beliefs, but also explained the natural world and the place of humans within it.

On your way out of class today, preserve your knowledge by giving an oral account of something you learned about the significant achievements of the Maya people.



Deforestation: Remains of a pine forest in Guatemala



Warfare: Detail of a Mayan mural at the Bonampak archaeological site in Chiapas, Mexico, c. 1000 C.E.

Compare and contrast the factors that led to the growth and fall of the Maya civilization.

The Fall of the Maya

The collapse of the Maya civilization remains one of history's greatest mysteries. It was a thriving society with advanced architecture, a complex calendar system, and a developed understanding of astronomy. Despite this, the Maya mysteriously abandoned their cities between the eighth and 10th centuries C.E.

There is no definitive answer to explain the decline of the Maya. Historians point to several possible factors. One theory is environmental issues. Maya agricultural techniques and deforestation may have caused these issues. **Deforestation** is the cutting down of forests. These practices may have damaged the land. Soil erosion and reduced nutrients would have resulted in decreased crop harvests. Periods of drought could have worsened the situation. Drought often resulted in famine. Without enough food, the population would have declined.

Overpopulation is another possibility. A growing population would lead to increased demand for resources. This would have put a further strain on the environment. The people at the top of the Mayan social pyramid controlled most wealth and resources. Having fewer resources would likely have led to social conflict.

Warfare between rival city-states may have also significantly affected the Maya's decline. Constant conflict drained resources and disrupted trade networks. Some historians point to this as a factor in weakening political structures and breaking the social order. This could have contributed to the overall decline of the Maya.

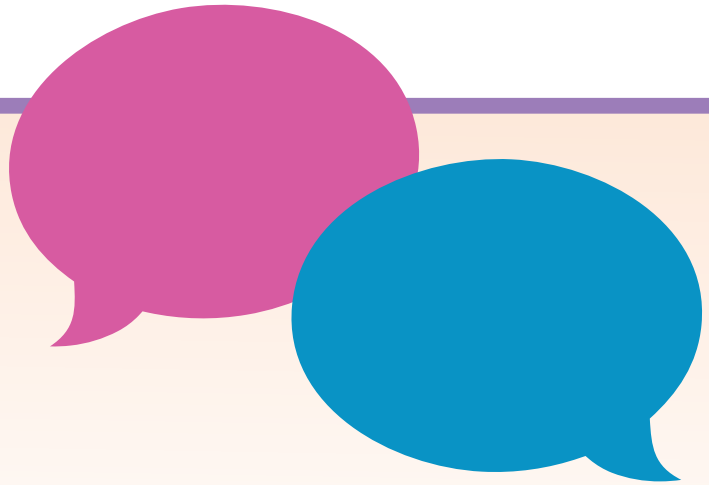
The Maya's belief system may have also contributed to their downfall. If people thought that the ruler's power came from the gods, environmental challenges could have caused people to question their leaders' authority. This would have led to even more instability.

The collapse of the Maya civilization was not a sudden event. It was a process that took much time across different regions of Mesoamerica. Some cities continued for centuries after the decline of the classic period of the Maya (250–900 C.E.). As a result, Mayan culture continued to evolve. There is no single known reason for why the Maya civilization collapsed. The whole story remains a subject of ongoing research and debate among historians. ■

WHAT DO YOU THINK?

Why does a civilization fall?

What happens when that civilization falls?



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LET'S DISCUSS

Compare and contrast the factors that led to the growth and fall of the Maya civilization.
Consider everything we have talked about so far.

PACAL THE GREAT

Ruler of Palenque: Pacal the Great

Pacal, also known as K'inich Janaab' Pakal I, ruled over the Mayan city of Palenque in southern Mexico from 615–683 C.E. He rose to power at a very young age. Historians believe he was as young as 12 when he became ruler. After the death of the previous ruler, there were no adult heirs available to take the throne. Pacal, despite his youth, was seen as the best option to assume the throne. Pacal's mother, Lady Sak K'uk', played a crucial role in his early reign. She guided him and helped to maintain order and stability in the kingdom. Pacal ruled for over 68 years. He left a lasting legacy on Palenque and the surrounding region.

Pacal was a skilled ruler and a strong military leader. He engaged in numerous military campaigns. He expanded Palenque's influence and secured its borders. His military successes strengthened Palenque's position within the Mayan world. Information about Pacal's military activities is known from hieroglyphic inscriptions and archaeological evidence.

Pacal was more than a military leader. He was also a patron of the arts and sciences. He supported advancements in astronomy, mathematics, and writing. A period of significant construction at Palenque happened under Pacal's rule. He ordered the building of impressive temples, palaces, and other structures. One of these was the iconic Temple of Inscriptions.

His most famous legacy is his elaborate tomb. It is located within the Temple of Inscriptions. The tomb was discovered by archaeologists in the 1950s. It contained Pacal's intricately carved sarcophagus and a jade mask. His tomb provided valuable insights into Mayan beliefs about the afterlife. Pacal's reign transformed Palenque into a major center of the Maya civilization. His leadership and support of the arts and sciences contributed to the flourishing of Maya culture during the Classic period. ■

Pacal's jade mask

Temple of Inscriptions

Image courtesy of Getty Images

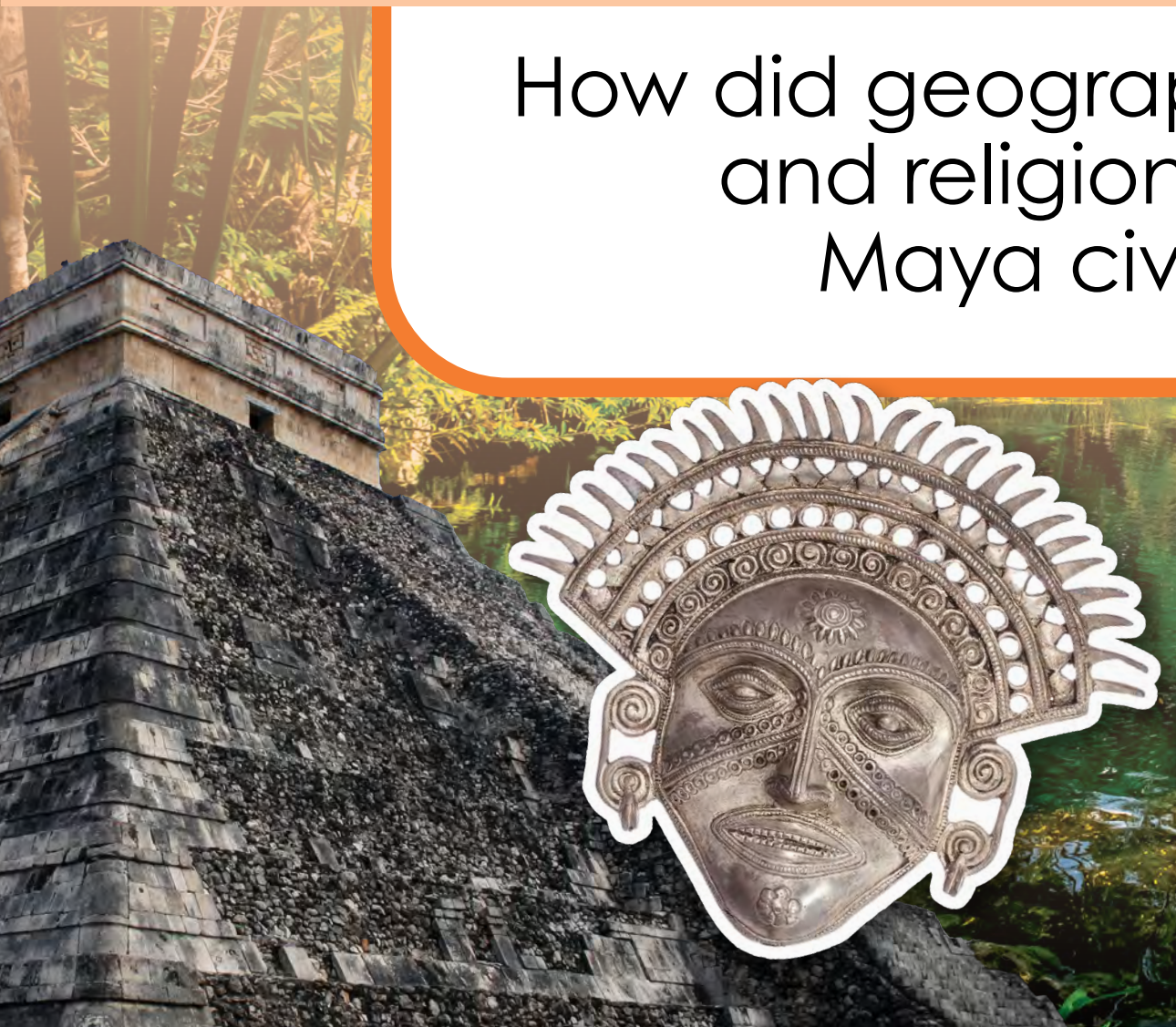
CREATIVE WRITING: A DAY IN THE LIFE OF A MAYA

Write a creative narrative from the perspective of a Maya individual during the period leading up to the civilization's collapse. Incorporate historical factors from the article into your narrative, such as food shortages, social unrest, or interactions between rival city-states.

- Paragraph 1: Introduce your character.
  - You can choose to be a farmer, leader, warrior, or merchant.
- Paragraph 2: Discuss how geography, technology, and religion shaped your civilization.
- Paragraph 3: Reflect on the challenges you face.
- Paragraph 4: Include an interaction with Pacal the Great, your character's opinion of him, and why your character believes this about him.
- Paragraph 5: Conclude with why you chose to leave the area. Use evidence from the article to support your character's decision.

EXIT TICKET

How did geography, technology, and religion shape the Maya civilization?



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WRITING RUBRIC: HOW DID YOU DO?

Check the appropriate box to evaluate your work.

	1	2	3	4
I was on target for the assignment.				
I expanded on the ideas or shared with a partner.				
I used correct spelling and punctuation.				
I turned my assignment in.				