



An Ever-Advancing Nation

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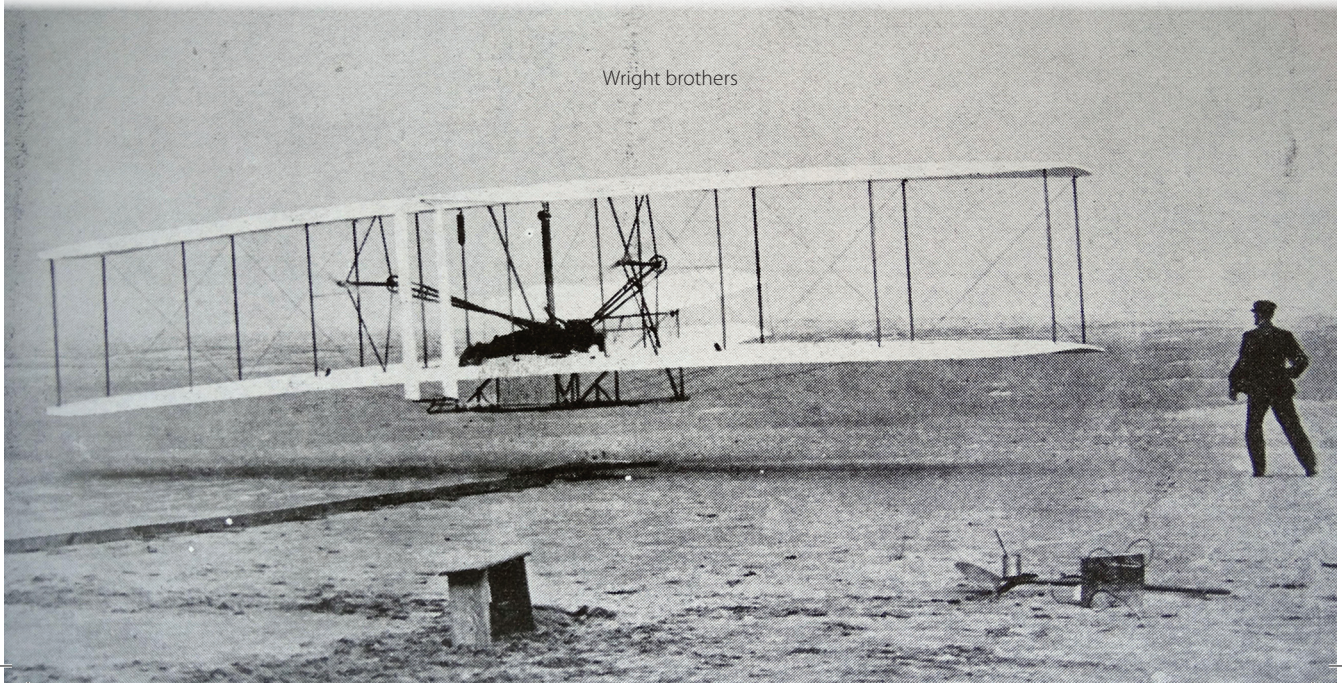
Curiosity rover



Mae Jemison



Wright brothers



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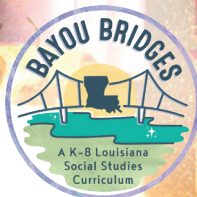
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Reader



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Chapter 1

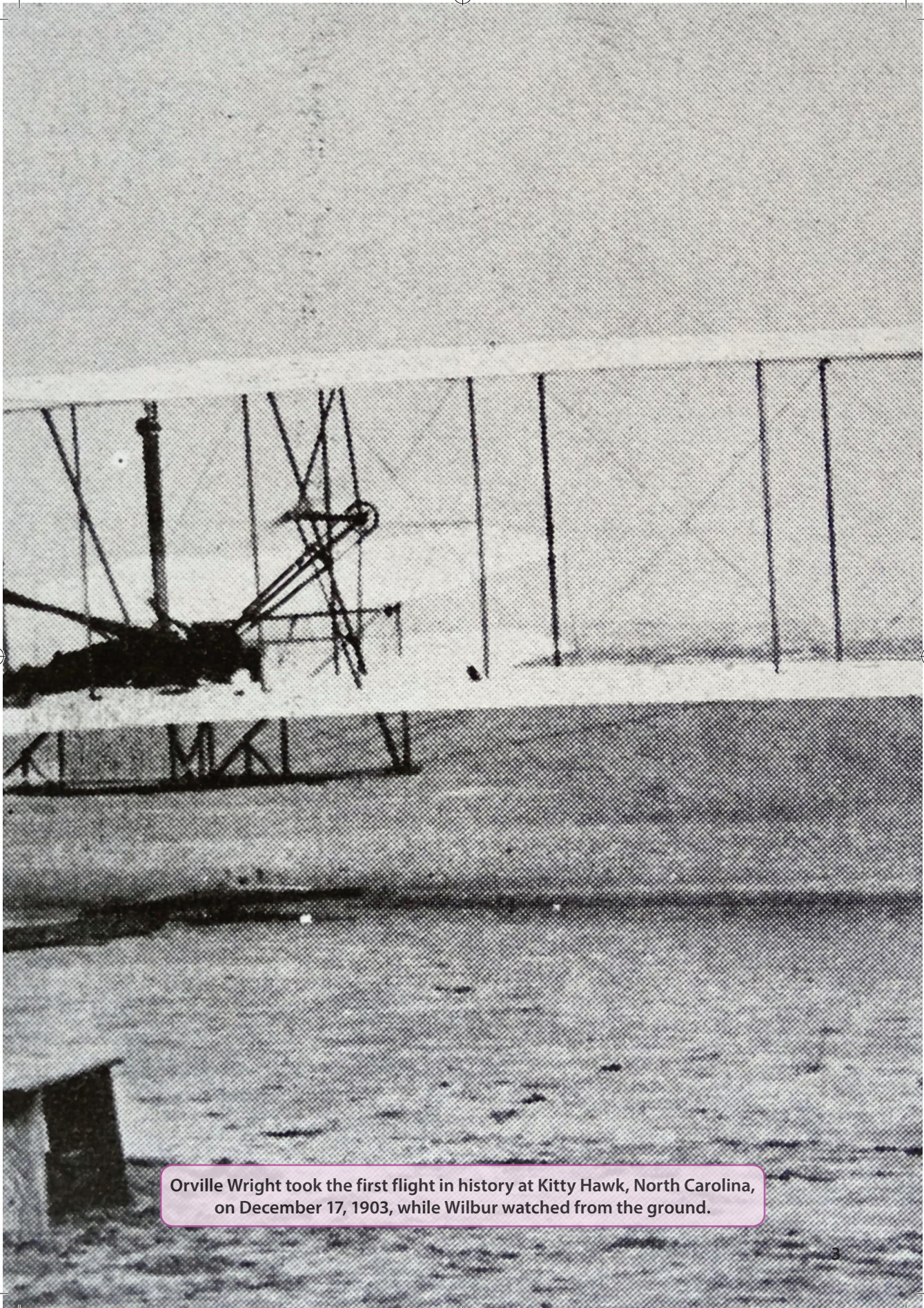
The Space Race

The First Flight Imagine you have traveled back in time. It is December 17, 1903. Wilbur Wright sets up a camera on a beach in Kitty Hawk, North Carolina. He's not trying to take a pretty photograph of the ocean or a sunrise. Instead, he's trying to make history. As the aircraft he and his brother built flies off the ground, he does just that.

The Framing Question

How did the Space Race impact the United States?

Orville and Wilbur Wright began experimenting with flight in 1899. They faced many obstacles but worked through them together. For example, when they could not find the kind of engine they needed for their aircraft, they made one themselves. With each failed attempt at leaving the ground, the Wright brothers gathered more knowledge. Together, the brothers took flight more than one thousand times.



Orville Wright took the first flight in history at Kitty Hawk, North Carolina, on December 17, 1903, while Wilbur watched from the ground.

Flight Evolves

After the first flight, **aviation** improved quickly. The first airlines opened for business less than twenty years after Orville Wright first took to the sky. The British Air Transport and Travel company flew a journalist from London to Paris on August 25, 1919.

Aircraft began to be widely used as a military tool during World War I. But these early planes were still too heavy to fly long distances. They were often used to fly over small areas to gather information for the military. Then, on April 6, 1924, the first planes to circle the globe took off. Eight Army pilots flying four airplanes left Seattle, Washington. Only one of the airplanes made the complete journey. The pilots made seventy-four stops. The trip around the world took 175 days.

In these early days, pilots and passengers often sat in open cockpits. Airplanes had **propeller**-driven engines. Flying was loud and uncomfortable. It was also expensive. In 1958, the jet engine changed air travel. Jets were bigger and faster. More Americans began traveling by air than by train. New airlines opened to meet the demand for air flight.

The Space Race

About fifty years after the first flight at Kitty Hawk, people set their sights higher. The goal was no longer leaving the ground. It was leaving the **atmosphere**.

Vocabulary

aviation, n. the operation of aircraft

propeller, n. a device with blades that rotate to make an airplane move forward

In the 1950s, the United States became involved in a Cold War with the Soviet Union. During the Cold War, the United States and the Soviet Union did not attack each other directly. Instead, it was a political and economic **rivalry**. Part of this rivalry was the Space Race. Both the Soviets and the Americans wanted to be the first to explore space.

The Soviet Union won the first part of the race. In October of 1957, a Soviet **satellite** was launched into space. It was called *Sputnik*. This was the first human-made object in Earth's orbit. The Soviets had kept their progress very quiet. *Sputnik* came as a surprise to Americans. It meant the competition heated up.

The United States launched a satellite in 1958. It was called *Explorer 1*. In the same year, President Dwight D. Eisenhower created the National Aeronautics and Space Administration (NASA). This was a part of the government dedicated to exploring space. When the first seven NASA astronauts were introduced to Americans, they were seen as heroes.

In May of 1961, astronaut Alan Shepard became the first American in space. However, the Soviet Union had again beaten America. It had sent an

Vocabulary

rivalry, n.
competition

satellite, n. an object or vehicle intended to orbit Earth, the moon, or another celestial body



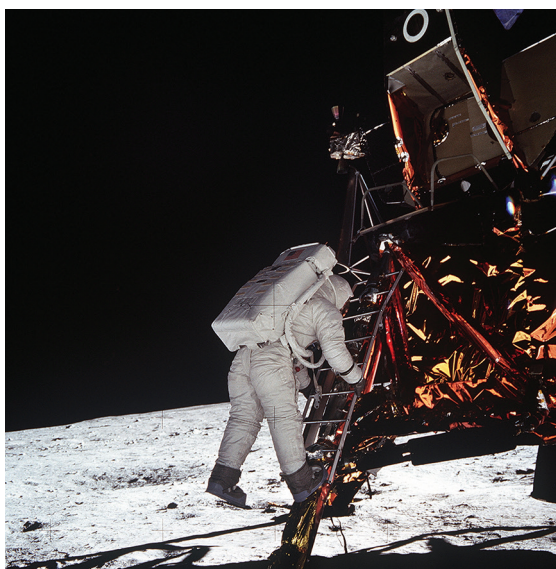
Astronaut John Glenn and President John F. Kennedy inspect the Project Mercury capsule *Friendship 7* in February of 1962.

astronaut into Earth's orbit in the previous month. Shortly after Shepard's trip, President John F. Kennedy made a bold claim. He said the United States would land a person on the moon before the end of the 1960s. NASA began working hard to figure out a way to get to the moon. In 1968, *Apollo 8* became the first crewed space flight to orbit the moon. Americans were getting close to fulfilling Kennedy's promise.

On July 16, 1969, Americans Neil Armstrong, Edwin "Buzz" Aldrin, and Michael Collins left Earth aboard the *Apollo 11*. They were part of the first attempt to land on the moon. They were successful. On July 20, Armstrong became the first person to walk on the moon. These historic steps won the Space Race for the United States.

During early NASA missions, most of the actual spacecraft did not survive the journey. Only a small module carrying the astronauts returned to Earth.

6



Neil Armstrong took this picture of Edwin "Buzz" Aldrin about to become the second person to walk on the moon.



There were a total of 135 space shuttle missions—including the last one, on July 21, 2011.

Beginning in 1981, NASA began launching space shuttles. Shuttles launched like rockets and carried astronauts and their equipment to space. Each shuttle had parts that could be reused in future flights. They were designed to withstand the harsh conditions of space. However, shuttles were not meant to travel far from Earth, unlike the earlier missions which aimed to go to the moon.

Exploring the Solar System

Before an American ever made it to the moon, NASA had its eyes on other parts of the solar system. Between 1962 and 1973, NASA built ten spacecraft. These machines were created to fly by neighboring planets. The first spacecraft to get close to other planets were small robotic explorers called the *Mariners*. There were no people aboard. *Mariner 4* launched in July of 1965. The spacecraft took an eight-month trip to Mars. It flew by Mars but did not land. It collected the first detailed photographs of another planet. *Mariner 4* surprised engineers at NASA. It survived about two years longer than its planned eight-month trip. During this time, it continued to send information back to NASA about our solar system.

Mars Rover Missions

Since the days of the *Mariners*, NASA has used **rovers** to land on Mars. Rovers can take pictures and travel across rocky surfaces. Rovers also perform experiments. They look for signs that Mars can support life, such as water. *Sojourner*, a Mars rover, was launched in December of 1996. Exactly seven months later, it became the first

Vocabulary

rover, n. a vehicle used for exploring the surface of the moon or another planet

rover to land on Mars. Cameras on *Sojourner* took photographs of rounded pebbles. This was evidence that there was once water on Mars.

There have been five rovers on Mars since 1997. Rovers called *Spirit* and *Opportunity*

were the most recent. They were launched in 2004. They also lasted longer than expected. They were built to explore Mars for ninety days. *Opportunity* lasted for over ten years! In 2018, a dust storm cut off its communication with Earth.



The NASA rover *Curiosity* took this self-portrait while collecting rock samples on Mars.

Women at NASA

Katherine Johnson was a mathematician who worked at NASA. She is best known for her work on the *Friendship 7* mission in 1962. NASA was preparing to put the first U.S. astronaut into space. Computers had been programmed with **equations** that would control John Glenn's spacecraft. But the astronauts were nervous about relying only on computers. Glenn asked Johnson to run the numbers by hand to double-check them. Glenn was the first American to orbit Earth. This was a major turning point in the Space Race.

Vocabulary

equation, n. a statement showing how the values of two mathematical expressions are equal



Katherine Johnson worked to ensure the launch and flight of the *Friendship 7* mission was a success.

Sally Ride became the first American woman in space in 1983. She was also the youngest American to go to space. She worked as a flight engineer during the *Challenger* mission. She launched two communication satellites. She also operated the shuttle's robotic arm and conducted experiments.



Sally Ride

The idea of space travel immediately captivated Americans in the mid-twentieth century. This interest continued for decades. Because of television, much of the Space Race of the 1950s and 1960s was closely followed. NASA's first astronauts became American heroes. Their arrival in space was a source of great national pride.

Mae Jemison was an astronaut and engineer at NASA. She worked from Earth on her first mission in 1989. Her job was mission specialist. In 1992, she became the first African American woman in space when she flew onboard the space shuttle *Endeavour*. Jemison and her team orbited Earth 127 times before returning. Since Sally Ride's trip to space, seventy-two women have been there. There have also been many other women, like Johnson, who have helped from the ground.



Mae Jemison

PRIMARY SOURCE: EXCERPT FROM PRESIDENT KENNEDY'S ADDRESS ON THE SPACE EFFORT (1962)

On September 12, 1962, President John F. Kennedy told an audience at Rice University in Houston, Texas, that Americans would put a man on the moon before the end of the decade. Just a year before, a Russian astronaut had become the first human to orbit Earth.

We choose to go to the moon. We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win. . . .

Source: Kennedy, President John F. "Address at Rice University on the Space Effort (Sept. 12, 1962)."

Chapter 2

The Digital Age

The First Telephone Call

“Mr. Watson, come here. I want to see you.” With this sentence, communication changed forever. It was 1876. Inventor Alexander Graham Bell had placed the first telephone call to his assistant, Thomas Watson. Just like the Wright brothers, Bell experimented many times before he was successful. Bell introduced the world to the telephone at the 1876 World’s Fair in Philadelphia. This technology let two people who were in different places speak to each other. Over time, telephones would become an essential part of our daily lives, changing personal and business communications.

The Framing Question

How have digital technologies affected Americans?



Because of Alexander Graham Bell, the telephone transformed global communication.

Radio

Twenty years after Bell's telephone came another **innovation**. Guglielmo Marconi created a radio communication system.

Radio waves travel through the air. Unlike the telephone, the radio did not need wires. Marconi built on the work of other scientists and mathematicians. He finally reached his goal of sending broadcasts at a lab he built in his parents' house in 1894. Marconi started his experiments by sending wireless Morse code messages to someone about a half mile away. Eventually Marconi sent a radio message across the Atlantic Ocean. Radio changed the way that the world communicated. Once radios became widespread and affordable, they became a way for families to receive news and entertainment in their own homes.

Vocabulary

innovation, n. a new idea or product

Television

Another major communication breakthrough was the television. Philo Taylor Farnsworth demonstrated his electronic television system in San Francisco in 1927. The television changed

communication and how Americans receive the news. You have read about the moon landing. Because of television, Americans were able to watch Neil Armstrong take his historic steps on the moon. When this technology was new, few



TVs for sale in the 1960s

families had their own television. By the 1990s, almost every single household in the country had at least one TV. Television offers both information and entertainment and has shaped American life. Today, the Internet makes it possible to watch TV anytime, anywhere, on portable devices like smartphones.

Microwaves

In 1945, another new technology came along. Unlike the others that you have read about, it was invented by mistake. Percy Spencer was an engineer at a company that made weapons for the military. One day, Spencer was working next to a magnetron, a tool that gave off radio waves.

He felt an odd sensation and noticed that a candy bar in his pocket had melted. Spencer then began testing how the machine could heat food instead of melting it. He soon got a **patent** for his new invention. In the



Early microwave ovens were large and heavy, like this one from the 1970s.

Vocabulary

patent, n. a license from the government that gives a person the exclusive right to make, use, or sell an invention

1970s, food companies began to make frozen meals specifically for microwaves. These meals made it easy for busy families to prepare a meal quickly. By 1997, ninety percent of homes had a microwave oven. Over thirty million microwaves are sold around the world each year.

Early Computers and the Digital Age

Communication changed again with the invention of **digital** technology, such as computers. When World War II began, it brought with it the need for machines that could solve complicated math problems. Before computers, people in the military were doing math with simple calculators. Solving complex math problems took a long time. The war made the invention of a digital computing machine urgent. The first computers were huge, the size of a large room, and could only be used by trained experts. They decreased the time it took to solve problems from weeks to hours.

Vocabulary

digital, adj. describes electronic technology that generates, processes, and stores information

As digital technology advanced, computers became smaller and easier to use. The first personal home computers became available in the late 1970s. The memory and speed of the machines improved with each passing year. At the same time, computer companies competed to make the smallest, fastest, most affordable model. The spread of computers led to a digital age. Living in a digital age means that many things are done by computer. We also have large amounts of information easily available.



It has been estimated that, currently, two billion people worldwide own computers.

Smartphones and the Internet

Think about the last time you were riding in a car and traveling to a new place. How did the driver know how to get there? How did they know where to stop for food? Odds are a smartphone was used to look up directions before traveling.

Smartphones were invented in 1993. They work a little like miniature computers. Smartphones let their users access the

Vocabulary

application, n. a computer program that performs a particular task

Internet and run programs, not just make and receive calls. The abilities of smartphones, along with their **applications**, have replaced many people's paper-based organizational tools, such as calendars and address books.

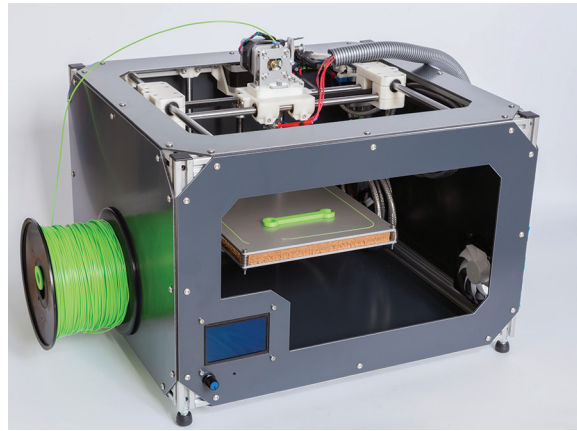
They have also replaced most landline telephones like the one invented by Alexander Graham Bell.

Smartphones allow people to complete tasks such as paying a bill or buying tickets to an event using a device that fits in a person's hand. Smartphones have also changed the way people communicate. Now, two people or a group can communicate through instant text messages. Smartphones can be very useful tools because they are connected to the Internet.



Today, computers, like this smartphone, fit in the palm of our hands.

The Internet was officially developed in 1983. Again, it was the military that was on the cutting edge of the new technology. At first, the Internet was just a way for different computers all over the world to “speak” to each other using a digital language. With the Internet, people all over the world can share the same information.



The Internet can be used to help people make things. Digital files for 3D printers can be created, shared on the Internet, then downloaded by other users all over the world. These files can be turned into physical objects with a 3D printer.

The Internet caused many changes. It has made communication faster. You can quickly send an email instead of writing and sending a letter through the mail. It has also sped up how quickly you can get information. For example, you can look up information on your smartphone or tablet instead of going to the library. The Internet also changed businesses. Some businesses have become completely Internet-based. People buy what they want online and have it shipped to their home.

Smart Decisions

While technology is constantly improving, it is often expensive. If you want to buy something, it is important to make good financial decisions. This means having a **budget**, saving money, and being sensible about what you spend.

Vocabulary

budget, n. an amount of money available for spending based on a plan for how it will be spent

It's important to make good decisions about social media too. Social media is a big part of the digital age. It is a way of sharing text and photographs with others in **virtual** communities. Popular social media sites include Instagram and Facebook. Social media connects people and can improve our lives. For example, family members who live on opposite sides of the country can see pictures and videos of each other and instantly reply. But social media can also be distracting and even harmful. Today and in the future, living in a digital age means being aware of what is positive and what isn't. Governments, companies, and individuals all play a role in working out how to balance the good and the bad.

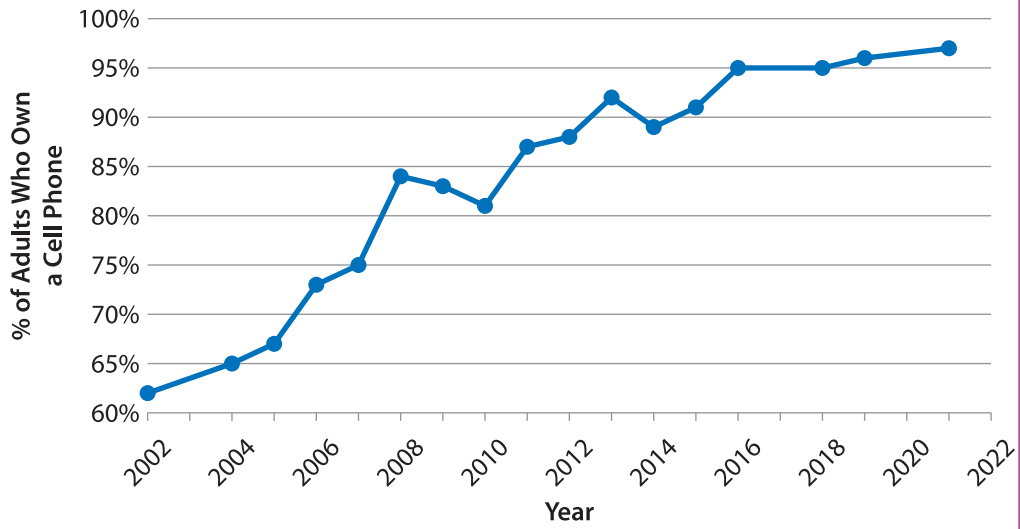
Vocabulary

virtual, adj. existing on a computer or online



In 2004, MySpace was the first social media site to reach a million active users. It was quickly followed by the launch of other social media applications like Twitter, Facebook, and TikTok.

PRIMARY SOURCE: GRAPH OF MOBILE PHONE OWNERSHIP IN THE UNITED STATES, 2002–21



Source: Pew Research Center.

Glossary

A

application, n. a computer program that performs a particular task (17)

atmosphere, n. the air surrounding Earth (4)

aviation, n. the operation of aircraft (4)

B

budget, n. an amount of money available for spending based on a plan for how it will be spent (18)

D

digital, adj. describes electronic technology that generates, processes, and stores information (16)

E

equation, n. a statement showing how the values of two mathematical expressions are equal (8)

I

innovation, n. a new idea or product (14)

P

patent, n. a license from the government that gives a person the exclusive right to make, use, or sell an invention (15)

propeller, n. a device with blades that rotate to make an airplane move forward (4)

R

rivalry, n. competition (5)

rover, n. a vehicle used for exploring the surface of the moon or another planet (7)

S

satellite, n. an object or vehicle intended to orbit Earth, the moon, or another celestial body (5)

V

virtual, adj. existing on a computer or online (19)





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