FROST SCIENCE

Celebrating American Innovation

Project Overview

In honor of the semiquincentenial, we are highlighting 250 American scientists, innovators, and engineers in the fields of marine science, paleontology and natural history, astronomy, and flight through the following:

- **Poster exhibit**
- **Passport**
- Resource guide
- Lesson plans for grades 6-12
- Planetarium show (3-5 minutes)

Celebrating American Innovation

Poster Specs

- ★Total number of posters: 25 (24x36)
- ★Total sq. ft.: Approximately 3,440 (sizes vary)

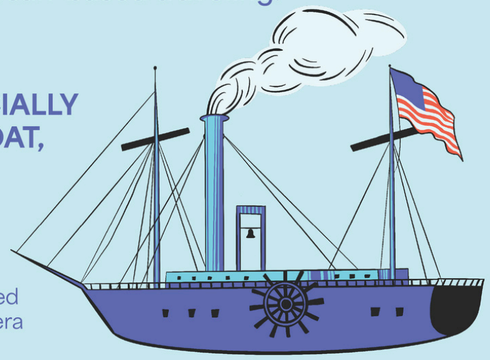
Celebrating American Innovation

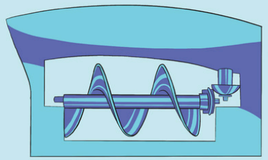
Powered Vessels

American innovation has paved the path of efficient and powerful ocean-based traveling.

1807 - FIRST COMMERCIALLY SUCCESSFUL STEAMBOAT, ROBERT FULTON

Robert Fulton designed and invented the first commercially successful steamboat. Although this steamboat would only traveled a short distance, it launched the era of powered watercraft.





1843 - FIRST PRACTICAL SCREW PROPELLER, JOHN ERICSSON

John Ericsson, a Swedish American inventor and mechanical engineer, developed one of the first practical screw propellers and oversaw the construction of the U.S. Navy's first screw-propelled ship, launched in 1843. The adoption of the screw propeller marked a major advance in naval engineering. This technology is still used as the primary form of high-speed marine propulsion today.

CONNECTING CULTURES:
Ancient Polynesian Navigation

People have been sailing the ocean for thousands of years, using wind and currents to reach lands near and far.

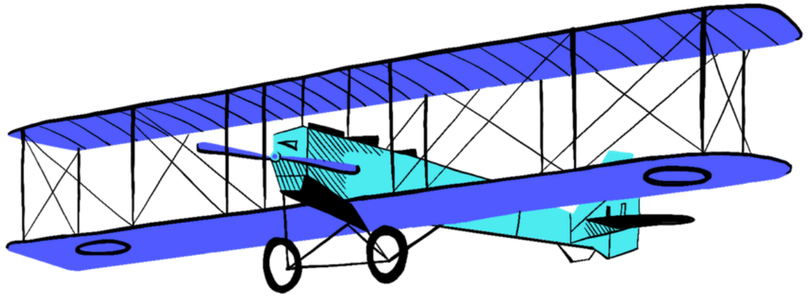
The ancient Polynesians navigated the vast Pacific Ocean using the stars and signs from the ocean and sky in canoes made of wood. These traditional wayfinding methods have mostly disappeared with the emergence of Western technology, though they are still used by navigators in Pacific Islands nations.

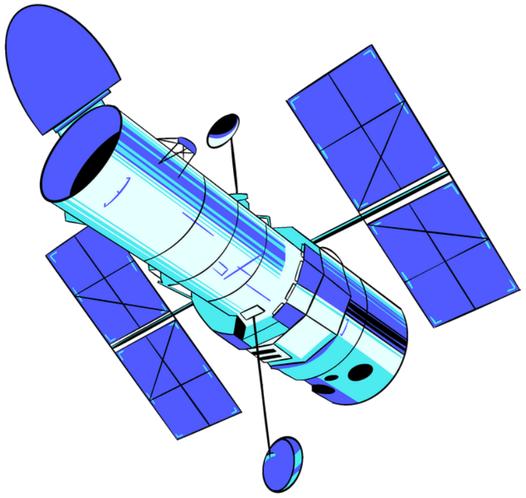
Sample Poster

AMERICA 250

Celebrating American Innovation

Sample Illustrations





Celebrating American Innovation

Disciplines and Themes

FROST SCIENCE

Celebrating American Innovation

Introduction Poster

AMERICA 250

Celebrating American Innovation

Marine Science

Breaking the Surface and Connecting Cultures

From early navigation, mapping, and seafaring technologies to modern tools like Scuba, submersibles, and remotely operated vehicles, American innovation has pushed the boundaries of ocean exploration. These technologies can be traced to foundational exploration methods developed by cultures around the world. Here, we highlight the connections between American innovation and the rich, global history of ocean exploration.

Sections/Themes

- Powered Vessels
- Mapping Oceans
- Exploring the Deep
- Ocean Stewardship and Protection

5 posters
Approx. 220 sq. ft.

Celebrating American Innovation

Marine Science

Breaking the Surface and Connecting Cultures

From early navigation, mapping, and seafaring technologies to modern tools like Scuba, submersibles, and remotely operated vehicles, American innovation has pushed the boundaries of ocean exploration.

These technologies can be traced to foundational exploration methods developed by cultures around the world. Here, we highlight the connections between American innovation and the rich, global history of ocean exploration.

Celebrating American Innovation Discover the American spirit of creativity and discovery by exploring 250 American scientists, engineers, and innovations.

Scan to view the resource guide

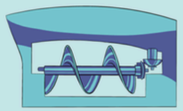
Powered Vessels

American innovation has paved the path for efficient and powerful ocean-based traveling.

1807

First Commercially Successful Steamboat: **Robert Fulton**

Robert Fulton designed and invented the first commercially successful steamboat. Although this steamboat would only travel a short distance, it launched the era of powered watercraft.



1843

First Practical Screw Propeller: **John Ericsson**

John Ericsson developed one of the first practical screw propellers and oversaw the construction of the U.S. Navy's first screw-propelled ship. The adoption of the screw propeller marked a major advance in naval engineering. This technology is still used as the primary form of high-speed marine propulsion today.

EXPLORE MORE!

How can mechanical engineers and marine scientists work together?

CONNECTING CULTURES
Ancient Polynesian Navigation

People have been sailing the ocean for thousands of years, using wind and currents to reach lands near and far.

The ancient Polynesians navigated the vast Pacific Ocean using the stars, ocean, and sky. These traditional wayfinding methods have mostly disappeared with the emergence of Western technology, though they are still used by navigators in Pacific Islands nations.

Mapping the Oceans

American ingenuity has led to efficient and accurate ocean navigation and mapping.

EXPLORE MORE!

What's a cartographer and why are they important for understanding the world around us?

1845

First Map of the Gulf Stream: **Alexander Dallas Bache**

Alexander Dallas Bache served as the second superintendent of the United States Coast Survey. In 1845, he issued detailed surveys of the Gulf Stream, building upon the work of his great-grandfather, Benjamin Franklin. The survey's findings advanced the understanding of America's coastal waters and helped contribute to the identification of the continental shelf break and the continental slope.

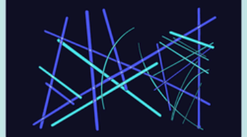
1952

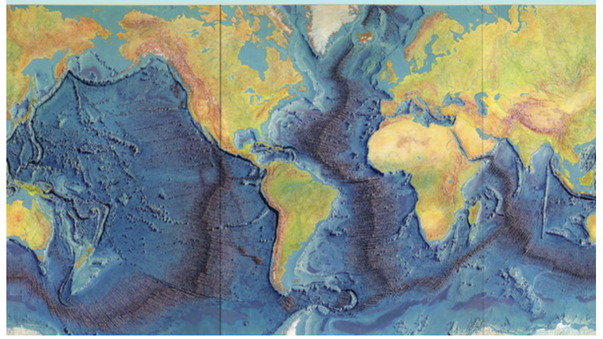
First Scientific Map of the Atlantic Ocean: **Marie Tharp**

Marie Tharp produced the first scientific map of the Atlantic Ocean floor in partnership with geologist Bruce Heezen. In 1952, Tharp used sounding profiles from the research ship Atlantis to map the Mid-Atlantic Ridge, a monumental discovery that ultimately helped scientists accept the theories of plate tectonics and continental drift.

CONNECTING CULTURES
Mapping the World

In many seafaring cultures, navigation was a learned art passed down through generations by storytelling instead of physical maps. For example, the Micronesian people from the Marshall Islands created stick charts that mapped surrounding islands and currents, but they were not generally used to navigate. Instead, it is believed that these charts were used for teaching.





Exploring the Deep

Scientific understanding of the deep ocean is supported by the discoveries of American scientists who identified marine life and phenomena at extreme depths.

1867

Discovery of Life in the Deep Sea: **Louis François de Pourtalès**

Louis François de Pourtalès' dredging operations conducted through the United States Coast Survey led to the discovery of life at depths greater than 3,000 feet.

1930

Invented Deep Sea Bathysphere: **Frederick Otis Barton Jr.**

Frederick Otis Barton Jr. invented two deep sea submersibles, the Bathysphere and Benthoscope. In 1934, the Bathysphere descended to a depth of 3,028 feet; In 1949, the Benthoscope, which could withstand more pressure, descended 4,500 feet below the ocean's surface.

1960

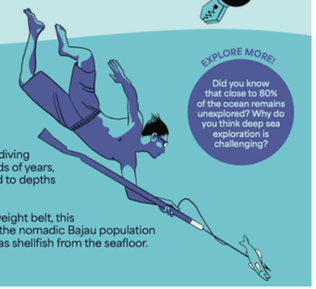
Evolution of Sonar Technologies: **Harold Eugene "Doc" Edgerton, Ph.D.**

Dr. Harold Eugene "Doc" Edgerton made strides in developing sonar technologies, such as the "thumper" and "boomer." These innovations enabled scientists to identify the presence and shape of objects and geological structures on the ocean floor.

1979

Her Deepness: **Sylvia Earle, Ph.D.**

The potential for untethered deep sea exploration and research was revealed by Dr. Sylvia Earle's record-breaking dive to 1,250 feet. During the more than two-hour dive, Earle successfully walked on the seafloor wearing only an atmospheric diving suit known as JIM.



EXPLORE MORE!

Did you know that close to 80% of the ocean remains unexplored? Why do you think deep sea exploration is challenging?

CONNECTING CULTURES
Free Diving

Awareness of ocean depths has existed for centuries, exemplified by the practice of free diving among early cultures. For potentially thousands of years, the Bajau people of Southeast Asia have dived to depths exceeding 230 feet.

Equipped with only a traditional mask and a weight belt, this extraordinary deep-diving ability has allowed the nomadic Bajau population to survive off the ocean, gathering food such as shellfish from the seafloor.

Marine Science

Ocean Stewardship & Protection

Modern marine protection efforts are shaped in part by American-influenced science.

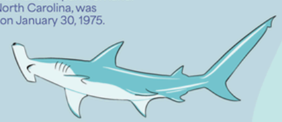
EXPLORE MORE!

What does being an ocean champion look like to you?

1975

Emerging Marine Protected Areas (MPAs)

MPAs, which include parks, sanctuaries, and reserves, are designated areas of the ocean managed for conservation. These protected areas emerged as a fisheries management tool to limit the size and number of fish fishers were allowed to catch. The goals of MPAs have since expanded to include consideration for the entire ecosystem—much like national parks on land. The USS Monitor, southeast of Cape Hatteras, North Carolina, was designated the first National Marine Sanctuary on January 30, 1975.



2007

Protecting Smalltooth Sawfish: **Dean Grubbs, Ph.D.**

Dr. Dean Grubbs, a researcher at Florida State University, has studied the migration of the endangered smalltooth sawfish since 2007. Grubbs's research focuses on protecting smalltooth sawfish by designating critical habitat in the United States and the Bahamas and reducing sawfish bycatch.

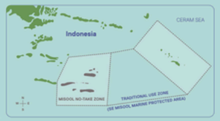
2018

Protecting Great Hammerhead Sharks: **Catherine Macdonald, Ph.D.**

Dr. Catherine Macdonald is a marine biologist and the Director of the Shark Research and Conservation Program at the University of Miami's Rosenstiel School of Marine, Atmospheric, and Earth Science. In 2018, she documented the first-known great hammerhead nursery on the east coast of the United States, a break-through that continues to provide vital guidance for protecting this critically endangered species.

CONNECTING CULTURES

How Indigenous Peoples Around the World Protect Marine Life



Long before modern marine conservation movements existed, Indigenous communities practiced ocean stewardship through generations of close observation and deep relationships with coastal and marine ecosystems.

Sasi is an Indigenous practice used in parts of Indonesia to manage resources by designating specific time periods during which people are allowed to hunt and fish certain animals. For example, the Misool Marine Reserve has been preserving the 400-year-old Sasi practice by allowing the hunting of giant green turban snails for one week every year.

Astronomy

Earthbound Observations to Interstellar Exploration

American space exploration began with observing the cosmos from Earth. Tools such as radio astronomy observatories, telescopes, and planetariums have allowed us to learn about the universe safely from the ground. American ingenuity has also driven major advances in how we explore space by taking humankind to the Moon and the International Space Station, sending rovers to far away planets, and even taking photos of black holes. Here, we explore the individuals who contributed to space exploration, with emphasis on innovative tools used from Earth and beyond.

Sections/Themes

- Observing the universe from Earth
- Leaving Earth
- Public engagement with science

6 posters
64 sq. ft.

Celebrating American Innovation

Astronomy

Earthbound Observations to Interstellar Exploration

American space exploration began with observing the cosmos from Earth. Tools such as radio astronomy observatories, telescopes, and planetariums have allowed us to learn about the universe safely from the ground. American ingenuity has also driven major scientific advances by taking humans into space, sending rovers to far away planets, and even imaging black holes.

Here, we explore the individuals who contributed to space exploration, with emphasis on innovative tools used from Earth and beyond.

Celebrating American Innovation

Discover the American spirit of creativity and discovery by exploring 250 American scientists, engineers, and innovations.

Scan to view the resource guide

Observing the Universe from Earth

Through careful observation and the use of mathematical tools, early astronomers made discoveries that revealed the structure and scale of space.

1847

America's First Female Astronomer: Maria Mitchell

Maria Mitchell discovered and named a comet– originally called C/1847 T1, later known as "Miss Mitchell's Comet"–by spotting a small blurry object in the sky that did not appear in her charts. She became a professor of astronomy and helped found the Association for the Advancement of Women. She inspired women to believe that they could accomplish the same things as their male counterparts.

1912

New Discoveries in Understanding Stars: Henrietta Swan Leavitt

Henrietta Swan Leavitt discovered that the luminosity (brightness) and pulsation periods of a Cepheid star–a type of star that brightens and dims on a predictable rhythm–was directly related to its distance from Earth. This realization shaped the future of astronomy by changing how scientists measure the distance of celestial objects.

1922

The Harvard System for Classifying Stars: Annie Jump Cannon, Ph.D.

Dr. Annie Jump Cannon developed and applied the Harvard system for classifying stars which is still used today. She manually classified over 350,000 stars using their spectra and focusing on temperature, helping to shape the future of astronomy and how scientists measure objects in the universe. Cannon became the first woman to be awarded the Henry Draper Medal from the National Academy of Sciences.

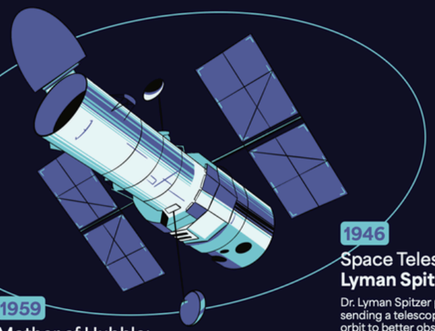
1924

Understanding our Universe: Edwin Hubble, Ph.D.

Dr. Edwin Hubble discovered that galaxies exist beyond the Milky Way and that the universe is constantly expanding, completely changing our understanding of space. He also coined Hubble's Law, which states that the further a galaxy is from Earth, the redder its light appears.

Building the Tools of Space Science

The limitations of Earth-bound methods of space exploration inspired the design of new tools and technologies to collect clearer, more precise data from outside our atmosphere. These tools included advanced telescopes and other instruments built specifically for space.



1959

Mother of Hubble: Nancy Grace Roman, Ph.D.

Dr. Nancy Grace Roman, NASA's first Chief of Astronomy, spearheaded the concept of the Hubble telescope. She established the entire framework for space-based observatories and pushed for the installation of new devices on space telescopes for better image quality.

1946

Space Telescopes: Lyman Spitzer, Ph.D.

Dr. Lyman Spitzer proposed sending a telescope into Earth's orbit to better observe space. He hypothesized that light would be able to reach a telescope in space more easily than it can reach the ground due to the distorting effect of Earth's atmosphere. His vision was realized with the launch of the Hubble Space Telescope in 1990.

1958

Invisible Forces in Space: James A. Van Allen, Ph.D.

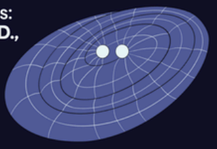
Dr. James A. Van Allen discovered belts of radiation surrounding Earth and other planets in our Solar System, revealing that space is shaped by invisible forces.

Building the Tools of Space Science *(Continued)*

1984

Understanding Extreme Cosmic Events: Kip S. Thorne, Ph.D., Rainier Weiss, Ph.D., and Barry Barish, Ph.D.

Dr. Kip S. Thorne, Dr. Rainier Weiss, and Dr. Barry Barish contributed to the development of the Laser Interferometer Gravitational-Wave Observatory (LIGO), an observatory that detects gravitational waves. In 2015, LIGO scientists directly observed gravitational waves for the first time.



1993

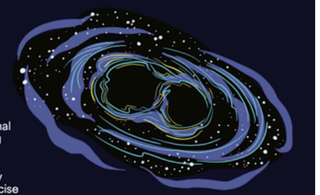
First Latina in Space: Ellen Ochoa, Ph.D.

Dr. Ellen Ochoa is a Mexican American engineer, former astronaut, and former director of the Johnson Space Center. Ochoa co-invented three optical devices: a system that inspects objects, a system that identifies and can "recognize" objects, and a system that minimizes distortion in the images taken of an object. Ochoa became the first Latina to go to space when she served on a nine-day mission aboard the Space Shuttle Discovery.

2015

Merging Blackholes: Nergis Mavalvala, Ph.D.

Dr. Nergis Mavalvala's major scientific contributions focused on enhancing gravitational wave detection. Most of Mavalvala's pioneering work was on quantum states of light, which significantly improved the sensitivity of Laser Interferometer Gravitational-Wave Observatory (LIGO) detectors. Her research led to more precise measurements and a higher rate of discoveries, including the first direct detection of gravitational waves from the merging of two black holes.



Astronomy

Leaving Earth

America is known for many "firsts" in the story of human space exploration. These historic events were made possible by the individuals who contributed to ground- breaking discoveries and innovations.

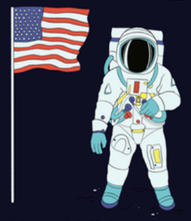
EXPLORE MORE!

How do you think our view of space changes when we leave Earth?

1961

First American in Space: **Alan Bartlett Shepard Jr.**

Alan Bartlett Shepherd Jr. became the first American to travel into space aboard the *Freedom 7* Mercury capsule in 1961. His suborbital flight marked a critical step in human spaceflight. Shepard later became the commander for *Apollo 14*, which put the U.S. back on the Moon.



1969

First Man on the Moon: **Neil Armstrong**

Neil Armstrong was a naval aviator before becoming an aeronautical research pilot for NASA's High-Speed Flight Station, now known as the Armstrong Flight Research Center. In 1966, Armstrong commanded his first mission, *Gemini 8*, and in 1969, he commanded the *Apollo 11* lunar landing mission. On July 20, 1969, Armstrong became the first man on the moon.

1992

Breaking Barriers: **Mae Carol Jemison, Ph.D.**

Dr. Mae Carol Jemison was a medical doctor and Peace Corps officer who, in the wake of the *Challenger* tragedy, applied to become an astronaut candidate. She was one of 15 out of 2,000 applicants chosen for NASA Astronaut Group 12. In 1992, she was assigned to the STS-47 crew as a mission specialist. She became the first African-American woman in space when she flew on the Space Shuttle *Endeavour*.

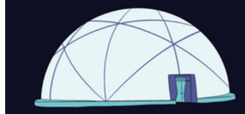
1970

Innovating Technologies: **Judith Love Cohen**

Judith Love Cohen is known for her critical work on NASA's Abort Guidance System for the Apollo program, which was vital in the safe return of the *Apollo 13* astronauts. Beyond Apollo, her innovations included guidance systems for the Minuteman missile, ground systems for the Hubble Space Telescope, and later, children's books inspiring girls in STEM. Cohen is also the mother of actor Jack Black.

Sharing Science with the Public

Great science communicators effortlessly bridge the gap between scientific innovation and the public. These charismatic individuals have brought awareness, understanding, and curiosity about the cosmos to America and beyond.



KEEP LOOKING UP!

1976

Pioneering Astronomy Education: **Jack Horkheimer**

Jack Horkheimer was a pioneering astronomy educator and the longtime director of the Miami Space Transit Planetarium (now the Frost Planetarium). Through his planetarium programs and TV series, *Star Hustlers*, later renamed to *Star Gazers*, he made observing the universe accessible and engaging for millions of people. His legacy lives on in the programs shown at the Frost Planetarium.

1980

Translating Science through Entertainment: **Carl Sagan, Ph.D.**

Through his television series, *Cosmos*, Dr. Carl Sagan translated complex space science into stories that helped millions connect emotionally to the universe. Sagan also proposed that NASA take a photograph of the Earth from over 3.5 billion miles away, resulting in the famous photograph titled *Pale Blue Dot* from the *Voyager 1* Space Probe.

1997

Science Communication Continues: **Neil deGrasse Tyson, Ph.D.**

Dr. Neil deGrasse Tyson's early research primarily focused on stellar evolution and galactic structure. He founded the Department of Astrophysics at the American Museum of Natural History. While Tyson has published dozens of scientific papers, he is most known for being a science communicator, phrasing seemingly indigestible content in a way that almost anyone can understand.

EXPLORE MORE!

Share your favorite thing about space with a friend or family member.

2020

Diversity in STEM: **Diana Trujillo**

Diana Trujillo is a Colombian-American aerospace engineer who served as Flight Director at NASA's Jet Propulsion Laboratory and the Robotic Arm System lead for the Mars *Perseverance* mission. Trujillo worked full-time to fund her English lessons at Miami Dade College.

Aeronautics & Flight

What it Takes to be Airborne

How did we become airborne, and how did flight change the way we experience the world? From the laws of physics to bold inventions and creative problem-solving, humanity's path to flight transformed how we travel, communicate, and connect. Driven in part by the ingenuity and engineering feats of American scientists, this journey led to a more global and connected society.

Sections/Themes

- Understanding motion and forces
- Engineering the sky
- Making flight a global system

5 posters
168 sq. ft.

Celebrating American Innovation

Aeronautics & Fight

What it Takes to be Airborne

How did we become airborne, and what feats of physics did we achieve along the way? Bold inventions and creative problem solving–rooted in physics and engineering–have transformed how we travel, communicate, and connect.

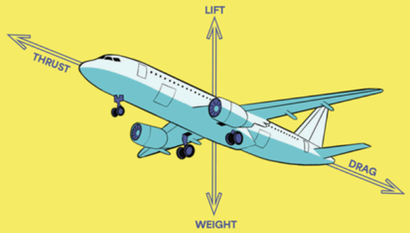
Celebrating American Innovation

Discover the American spirit of creativity and discovery by exploring 250 American scientists, engineers, and innovations.

Scan to view the resource guide

Understanding Motion and Forces

Long before powered airplanes, Americans experimented with balloons, kites, and gliders, showing that human flight was possible. Scientific understanding of motion and forces transformed these early attempts into controlled, powered flight. For years American scientists and engineers worked to understand how forces such as lift, drag, and air resistance act on flying objects.



1894

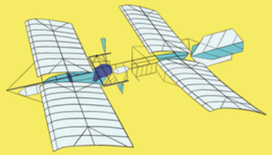
Engineering the Plane: **Octave Chanute**

Octave Chanute analyzed and documented flying machine experiments in the late 19th century. He designed and repeatedly tested a biwing glider, which travelled over 300 feet though the air.

1896

Exploring the Foundations of Physics: **Samuel Langley**

Samuel Langley conducted early experiments to study propulsion and aerodynamic lift. He designed and tested a series of flying models, powered by lightweight steam engines. The Langley Aerodrome No. 5 flew about 3,000 feet over the Potomac River!



Understanding Motion and Forces *(Continued)*

1903

The First Airplane: **Wilbur and Orville Wright**

The Wright brothers helped launch the aviation age on December 17, 1903 when Orville piloted their aircraft 120 feet through the air in 12 seconds. Together, they proved that sustained flight was possible by inventing, building, and flying the world's first successful airplane.

1906

Advancing Flight: **Charles Wesley Peters**

Charles Wesley Peters was the first African American man to design, build, and fly an airplane. He flew for the first time at 17 years old in a glider that he designed and built himself, traveling the length of a football field. Later, he attached an air-cooled automobile engine to his motorized airplane to create a plane capable of flying for up to 12 minutes at a time.

1953

Flight Grounded in Science: **Mary W. Jackson and Christine Darden, Ph.D.**

Mary Jackson and Dr. Christine Darden advanced aerodynamic research using wind tunnels and mathematical analysis to study airflow, boundary layers, and the forces acting on aircrafts at high and supersonic speeds. Together, these engineers transformed the science of flight from experimentation into a discipline grounded in data and physics, while simultaneously paving the way for women in STEM.

Engineering to Take to the Sky

As the thought of humans touching the heavens became more than just a theory, engineers helped transform flight into practical technology.

1911

Innovations to Propel Us Forward: **Glenn Hammond Curtiss**

Glenn Hammond Curtiss transformed flight from a fragile experiment into a practical technology. His innovations with engines and seaplanes expanded aviation's speed, range, and real-world applications. He developed a powerful and lightweight engine for the Aerial Experiment Association, leading him to become one of America's aviation pioneers.

1932

Connecting Continents: **Amelia Earhart**

Amelia Earhart, one of the most famous American pilots, was the first woman to complete a solo transatlantic flight. Her record-breaking flights challenged both physical limits and social expectations.

1935

Flying for Everyone: **Donald Wills Douglas Sr.**

Donald Wills Douglas Sr. was an engineer whose contributions made air travel safe and dependable through the development of the commercial aircraft. In addition to producing many civil and military aircrafts, he designed and produced the first airplanes to circumnavigate the Earth as well as the first commercial passenger plane.

Aeronautics & Fight

Human Health

Collaboration in Healthcare

In healthcare, human connection matters at every level: from the relationship between patients and doctors to the collaborative work behind new treatments, medical equipment, and discoveries. Across American history, scientists working together have developed vaccines, improved blood transfusions and transplants, and transformed lives.

Sections/Themes

- Patient–Provider Partnerships
- Peer Connection & Mutual Support
- Community Voice & Experience

4 posters
120 sq. ft.

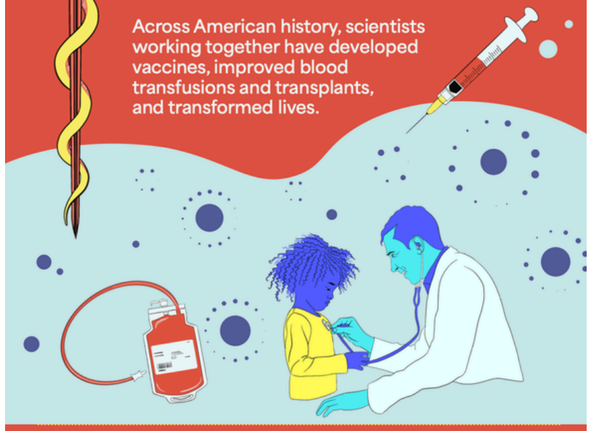
Celebrating American Innovation

Human Health

Human Connection in Healthcare

In healthcare, human connection matters at every level: from the relationship between patients and doctors to the collaborative work behind new treatments, medical equipment, and discoveries.

Across American history, scientists working together have developed vaccines, improved blood transfusions and transplants, and transformed lives.



Celebrating American Innovation

Discover the American spirit of creativity and discovery by exploring 250 American scientists, engineers, and innovations.

Scan to view the resource guide

Patient-Provider Partnerships

Trust in healthcare professionals has shaped American innovation and discovery. The history of medicine in America is marked by unique innovations, discoveries, and groundbreaking medical milestones rooted in patient-provider trust.

1891

The Father of Cancer Immunotherapy: **William Bradley Coley, M.D.**

Dr. William Bradley Coley believed that the immune system was able to shrink or destroy some types of cancer. To test his theory, he injected Streptococcus bacteria into a cancer patient for the first time. While a few died, many patients had their tumors shrink or disappear. To make the procedure safer, Coley extracted toxins from several bacteria and used these toxins to produce the same immune response. He is now considered the "Father of Immunotherapy" for this groundbreaking work.

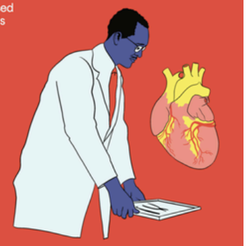
EXPLORE MORE!

Arteries, like the aorta, are blood vessels. Why do you think an artery surgery is considered an open heart surgery?

1893

The First Open Heart Surgery: **Daniel Hale Williams, M.D.**

Dr. Daniel Hale Williams rushed a man named James Cornish into emergency surgery without X-rays or surgical prep after he was stabbed in the chest. Williams successfully repaired his damaged arteries, completing the first open heart surgery. Williams was the founder of the first Black-owned and interracial hospital in America, located in Chicago, Illinois.



2025

First Transcontinental Robotic Telesurgery: **Vipul Patel, M.D.**

Dr. Vipul Patel successfully performed a prostatectomy (surgery to take out part or all of the prostate gland) on a patient. What made this surgery so special? Patel was in Florida, and his patient was 7,000 miles away in Africa, making this the first FDA-approved transcontinental surgery. Because of the collaboration across continental lines, Patel was able to lead a global effort to make healthcare more accessible.

Peer Connection and Mutual Support

Curiosity leads to innovation—and curiosity can be amplified by talking to your friends. American ingenuity in healthcare has long been sparked by friendship and peer collaboration, and society has greatly benefited from this.

1784

Bifocal Glasses: **Benjamin Franklin, D. Hon**

Benjamin Franklin struggled with deteriorating vision due to old age and was tired of switching glasses every time he needed to see something near or far. So, Franklin asked his optician to split the lenses of his two pairs of spectacles in half and combined them, creating bifocals! Franklin sent a letter to his friend George Wheatley sharing his invention and how it could help improve people's vision.

1916

Blood Preservation for Transfusions: **Francis Peyton Rous, M.D., and Joseph Turner**

Dr. Francis Rous and Joseph Turner worked together to develop the Rous-Turner solution, a blood preservative made from citrate and glucose. They developed a chemical solution to preserve and store blood for longer periods of time, leading to the first blood banks, which were used during World War I. Their teamwork, research, and discovery helped make blood transfusable at a moment's notice, saving countless lives, and laying the foundationfor modern blood banks.

EXPLORE MORE!

Why are mRNA vaccines more effective than traditional vaccines?

2005

mRNA Vaccines: **Katalin "Kati" Karikó, Ph.D. and Drew Weissman, Ph.D.**

Dr. Katalin Karikó and Dr. Drew Weissman worked together to make one of the biggest breakthroughs in vaccine development in history. They discovered that mRNA could be modified in a laboratory and be used to produce antibodies for diseases. The pair also found ways to make mRNA last longer after being injected into the body. This modification helped produce more antibodies, making mRNA vaccines even more effective. This discovery became the foundation for the COVID-19 vaccine.

Community Voice and Experiences

American healthcare innovations have been fostered by relationships between community members and professionals who work together to make healthcare more accessible and affordable. These passionate individuals know that improving healthcare for all means a healthier America.

1986

Laser Cataract Surgery: **Patricia Era Bath, M.D.**

Dr. Patricia Era Bath co-founded the American Institute for the Prevention of Blindness, which provides resources focused on vision development and vaccines for children around the world. She also invented the Laserphaco Probe, which uses lasers to destroy cataracts. Bath is responsible for preventing and reversing blindness for thousands of people around the world.

1984

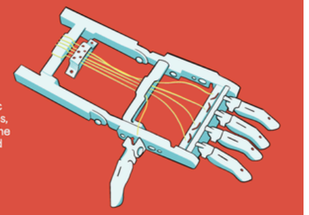
Identified HIV/AIDS as a Retrovirus: **William Alan Haseltine, Ph.D.**

Dr. William Alan Haseltine proposed that AIDS was caused by human immunodeficiency virus (HIV) and not transmitted through casual contact with infected individuals. During the beginning of the AIDS epidemic, he sequenced the HIV genome and helped develop one of the first AIDS treatments. Haseltine now lives in Miami, Florida and serves on the Board of Trustees at Frost Science.

2013

Robohand: **Ivan Owen**

Richard Van As lost several of his fingers in an accident and could not afford a prosthetic hand. Ivan Owen, an artist in the United States, posted a video of a 3D printed puppet hand he had created online. Owen and Van As worked together through emails and video calls to develop an affordable prosthetic hand that improved the accessibility of prosthetics for people around the world.



Paleontology

The Puzzle of Earth’s Past

From uncovering new fossils to developing technologies that deepen our understanding of the past, the story of natural history is one of exploration and collaboration across centuries. American innovation has helped identify new frontiers in natural history, paving the way for new ways of seeing, studying, and rediscovering our planet’s past.

Sections/Themes

- Breaking Ground on Discovery
- Imagining Earth’s past
- How emerging technologies can help us understand past discoveries

4 posters
112 sq. ft.

Celebrating American Innovation

Paleontology

The Puzzle of Earth's Past

From uncovering new fossils to developing technologies that deepen our understanding of the past, the story of natural history is one of exploration and collaboration across centuries. American innovation has helped identify new frontiers in natural history, paving the way for new ways of seeing, studying, and rediscovering our planet's past.

EXPLORE MORE!

What can fossils tell us about what the Earth looked like millions of years ago?

Celebrating American Innovation

Discover the American spirit of creativity and discovery by exploring 250 American scientists, engineers, and innovations.

Scan to view the resource guide

An American Journey to New Frontiers

The study of paleontology began in the early 19th century with the work of pioneers in comparative anatomy, debates about extinction theories, and fossil hunting expeditions.

Thanks to early American paleontologists, explorers, geologists, natural historians, zoologists, anatomists, and more, America emerged as a leader in the paleontological field.

1804

Established America as a New Frontier: **Thomas Jefferson**

It wasn't until Founding Father Thomas Jefferson took an interest in the field that paleontology truly boomed in America. It gradually became a globally respected scientific study of Earth's past. Jefferson even asked Lewis and Clark to search for living mammoths on their expedition to the American West, eventually confirming their extinct status. Through his expeditions and collaborative studies with Charles Willson Peale, Jefferson established paleontology as a scientific field in the United States.

1869

Proved Existence of Large Mammals in North America: **Dr. Joseph Leidy**

Dr. Joseph Leidy was a distinguished and versatile scientist known as the founder of American vertebrate paleontology. Leidy made extensive studies of fossil deposits in western states, proving the prehistoric presence of the lion, tiger, camel, and rhinoceros in the western U.S. He published On the Extinct Mammalia of Dakota and Nebraska, later described as the most important paleontological work produced in the U.S.

1879

The Bone Wars: **Edward Drinker Cope and Othneil Charles Marsh**

The Bone Wars, a competition for fossil discovery, transformed Othneil Charles Marsh and Edward Drinker Cope from respected friends to relentless rivals. Cope helped increase attention to paleontological exploration and collections in America. He discovered over a thousand species of extinct vertebrates in the U.S. Marsh organized and led several expeditions to the American West in search of new fossils. His competitive tendencies with Cope also caused him to make scientific mistakes.

Imagining Earth's Past

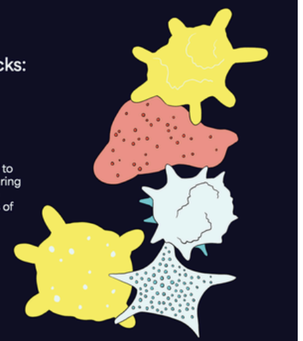
In the 20th century, American paleontology evolved from a discipline focused largely on fossil collection and classification into a more integrative science centered on understanding how all the pieces fit together. Spectacular specimens were still being unearthed but researchers were increasingly revisiting old discoveries, looking at them with new tools and theories.

Advancements in geology refined stratigraphic dating while biochemistry introduced radiocarbon dating, allowing scientists to more accurately place fossils in evolutionary contexts.

1905

Novel Methods for Dating Rocks: **Ester Applin, Alva Elliso, and Hedwig Kniker**

Esther Applin, Alava Ellisor, and Hedwig Kniker published a 1925 paper on forams, a type of single-celled organism. The paper shared their discovery that foram microfossils could be used to determine the age of rock samples collected during oil exploration. Their discovery made it easier to search for fossil fuels and to determine the ages of fossils found in layers of sedimentary rock.



1949

Radiocarbon Dating: **Willard Libby, Ph.D.**

Dr. Willard Libby was a physical chemist who revolutionized the paleontological field when he developed radiocarbon dating. Unlike uranium-lead dating, which is used to determine the age of rocks around fossils, radiocarbon dating is used to determine the age of organic materials.

EXPLORE MORE!

What is the closest living relative to dinosaurs?

Using Emerging Technologies To Understand Past Discoveries

Coming into the late 20th century, the field of paleontology was once again transformed thanks to a combination of theoretical and technological advances from the 1980s to the present day. These cross-disciplinary breakthroughs bridged past and present, enabling scientists to decode secrets hidden for millions of years.

1986

Classifying Dinosaurs: **Jacques Gauthier, Ph.D.**

Dr. Jacques Gauthier made cladistics the standard for dinosaur classification, grouping dinosaurs based on the number of physical characteristics they share. Using cladistics became the standard approach in paleontology for determining how closely two organisms are related.

1990

The Mathematician of Shapes: **F. James Rohlf, Ph.D.**

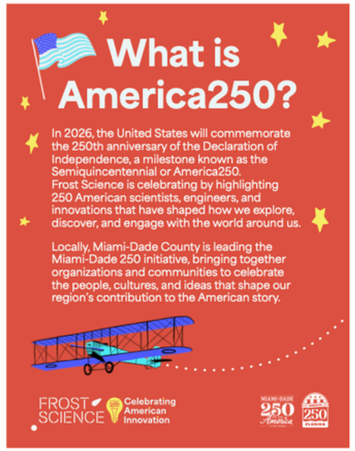
Dr. F. James Rohlf created the "TPS" software suite that helped make paleontological measurements more efficient. His research interests were in morphometrics, or the quantitative analysis of an organism's size and shape.

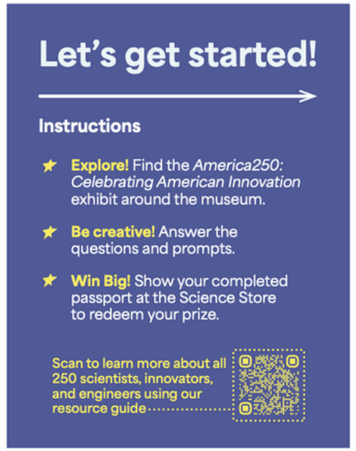
1990

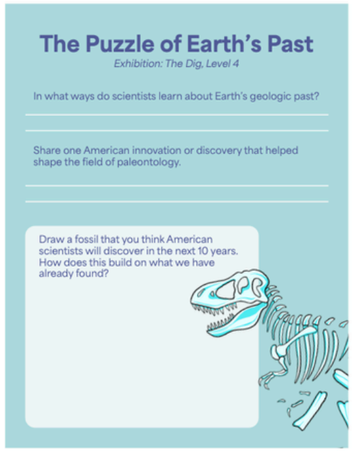
Tribal Paleontology: **Benjamin M. Eagle**

Benjamin M. Eagle is a fossil preparator and tribal representative who helped establish the Standing Rock Sioux Tribe as the first in the U.S. to enact its own formal paleontology code (Title 38). This asserts tribal ownership over fossils found on reservation land and creates a legal framework to prevent looting and unauthorized commercialization.

Optional: Provide opportunitiys for visitors to engage further with this interactive passport







Available to be edited to align with your institution. Printing costs not included.

Logstistics

FROST SCIENCE

Celebrating American Innovation

How to Credit Frost Science

We will provide an introduction poster which provides and overview of the exhibit and credits Frost Science.

Option 1:
Place the introduction poster at least once alongside poster exhibit.

Option 2:
Include the below copy at least once alongside the poster exhibit.

★ *This exhibit was curated and designed by the Phillip and Patricia Frost Museum of Science in Miami, Florida. Learn more at frostscience.org/america250.*

Celebrating American Innovation

Packages Available

Option 1: Posters as-is

All posters as is along with additional assets. This includes:

- 1 Introduction poster (24x36)
- 24 content posters (24x36)
- Suite of logos and illustrations

Option 2: Graphics and Assets to Build-your-own

All poster exhibit assets for teams to use however. Organizations may resize or edit assets as needed. This includes the .ai working files of the poster assets.

Celebrating American Innovation