

# Unit 1: The History of Marine Science

## **Ancient Civilizations and Beyond!**

Unit Essential Question: What scientific disciplines, historic figures, and events have contributed to the development of modern marine science?

# Understanding the interdisciplinary nature of marine science.

- **Lesson Essential Question:**

- How are the various physical and biological sciences involved in the study of marine science?

- **What do you need to know?**

- What is marine science?

- How is physical science connected to marine science?

- How is biology connected to marine science?

# What is Marine Science?

- Marine science is the study of the ocean, its life forms, and how the ocean interacts with other Earth systems.

# What is Marine Science?

- There are four main branches of science that contribute to the study of marine science:
  1. Biology = the study of life
  2. Geology = the study of Earth
  3. Chemistry = the study of the compositions and characteristics of natural things
  4. Physics = the study of how natural things interact with one another
- Geology, Chemistry, and Physics are considered physical sciences!

# Important terms:

- Abiotic = nonliving things
- Biotic = living things
- Ecology = the study of how living things interact with their environment
  - Ecology is the study of how abiotic and biotic things interact.

# History of Marine Science

- **Lesson Essential Questions:**

1. How did ancient civilizations contribute to the advancement of marine science?
2. Who was James Cook and how did his voyages contribute to marine science?
3. Why is the Challenger Expedition still considered one of the most important to marine science?

# History of Marine Science

- **What do you need to know?**
  - Why do we need to study the history of marine science?
  - What ancient civilizations were involved in early ocean exploration?
  - What voyages did James Cook make and when?
  - What was the Challenger Expedition?

# Why study the history of marine science?

- History forms the basis of science as it exists today.
- It allows us to see how the oceans have shaped human society and how it may affect the future.
- You cannot question something unless you fully understand it.
- It is interesting, early exploration was born out of a desire to discover and gain power.

# 5 Stages of Marine Science History

1. The Ancients: Early seafaring people
2. The Middle Ages: Vikings and Chinese
3. The European Voyages: Around the Horn of Africa
4. The Birth of Marine Science: James Cook and the Challenger
5. 20<sup>th</sup> Century Marine Science: Submersibles

# The Ancients (5000 BC – 800 AD)

- Motivated by food and trade.
- Important people of the time were the Egyptians, Polynesians, Phoenicians, and Aristotle.
- New technology included ships, sails, and the idea of latitude and longitude.
- Egyptians made the earliest sea voyage. Phoenicians established trade routes through the Mediterranean. Polynesians made the earliest long distance open sea voyage. Greeks invented latitude and longitude.

# The Middle Ages (800 -1400)

- Motivated by food, trade, and warfare.
- Important people were Leif Eriksson a Viking and Admiral Zheng from China.
- New technology included advances in ship design, the compass, rudders, and watertight compartments.
- Vikings landed and settled on North America. Chinese developed the compass, rudders, and watertight compartments.

# European Voyages (1400-1700)

- Motivated by trade, mapping, colonization, and conquest.
- Important people were Vasco de Gama, Columbus, Magellan, and Sir Francis Drake.
- New technology was the magnetic compass and the quadrant used to measure latitude and longitude.
- Columbus sails to the Caribbean, thinks it is Asia. Magellan circumnavigates the world. Drake makes second voyage around the world bringing back vast amounts of treasure.

# Birth of Marine Science (1700-1900)

- Motivated by colonization, conquest, and science.
- Important people were James Cook, Charles Wilkes, Matthew Maury, and Charles Darwin.
- New technology was the chronometer.
- Cook made first voyage dedicated to science. Wilkes locates Antarctica. Maury maps the global surface winds and currents. Darwin proposes theory of natural selection. Challenger expedition devoted to marine science.

# 20<sup>th</sup> Century (1900-1999)

- Motivated by trade, warfare, science, and research.
- Important people were Jacques Cousteau, William Beebe, and Jack Corliss.
- New technology was steam engines, iron ships, research equipment, submarines, SCUBA, ROV, AUV, satellites, GPS.
- Meteor expedition maps Atlantic seafloor. Atlantis is the first ship designed for ocean study. Challenger II locates the deepest part of the ocean. Alvin observes hydrothermal sea vent communities.

# Concept 3: Modern research vessels, institutions, and technologies used in marine science.

- LEQ's:
  1. What types of research vessels and submersibles are used in modern marine science?
  2. What are the major marine research laboratories and where are they located?
  3. How do modern technological advances contribute to our study of marine science?

# Evolution of ships

- In the 1900's ships went from being made of wood and powered by wind to being made of iron and powered by steam.
- Next came diesel engines, electric motors, and lead-acid batteries.
  - These batteries were what made submarines possible.

# 3 important research vessels

- Meteor: A German research vessel (ship) that crossed the Atlantic ocean 14 times in 2 years.
  - Made maps of the sea floor.
- Atlantis: A US research vessel that was designed and built specifically for ocean research.
  - Confirmed the existence of the Mid-Atlantic Ridge.
- Challenger II: Used echo-sounding to map the Atlantic, Pacific, and Indian Oceans.
  - Located the deepest part of the ocean, the Marianas Trench.

# 3 Basic types of submersibles

- Submersibles are any ship that can travel completely underwater (submerged).
  1. Bathysphere: a steel ball with a window.
    - Attached to a ship, only up and down motion.
  2. Bathyscaphe: a steel ball with a window attached to a floating platform.
    - Able to move vertically with some horizontal motion.
    - Deepest diving submersible
  3. Deep-Diving Submersible: two to three person vessels that dive vertically and have excellent horizontal motion.
    - Do not have to remain attached to another vessel.

# Important Submersibles

- Alvin is owned by the US navy and operates out of Woods Hole Oceanographic Institute.
  - Alvin can dive 14,764 feet
  - Alvin has made over 150 dives per year
  - Dr. Ballard used Alvin to help him discover Titanic
- SeaLink Submersibles are owned and operated by Harbor Branch Oceanographic Institute in Florida.
  - Can dive to 3,000 feet
  - Has panoramic (180 + degrees) visibility

# ROV's

- ROV's (remote operated vehicles) are essentially small unmanned submersibles with propellers, a video camera, and an umbilical (cable) to the surface.
  - ROV's are controlled by an operator on the surface who watches the video images.
  - They can be as small as a lawnmower or larger than a car.
  - Some have robotic arms, claws, and other tools.

# AUV's

- AUV's (autonomous underwater vehicle) are untethered robotic devices that are controlled and piloted by an onboard computer.
  - They are launched from the surface and can move in 3 dimensions.
  - Some move by a motor while others glide on temperature differences in the water. Either way they travel on preprogrammed paths.
  - AUV's are used to collect data from the ocean water.

# Modern Marine Research Laboratories

- Woods Hole Oceanographic Institute
  - Located in Massachusetts.
  - Has been in operation for almost 100 years.
  - They are “dedicated to research and education to advance understanding of the ocean and its interaction with the Earth system, and to communicating this understanding for the benefit of society.”

# Modern Marine Research Laboratories

- Woods Hole Oceanographic Institute
  - Currently researching ocean and climate, coastal science, hazards to the ocean, ocean chemistry, ocean circulation, ocean life, ocean resources and policy, polar research, pollution, seafloor and below, tools and technology, and undersea archaeology.