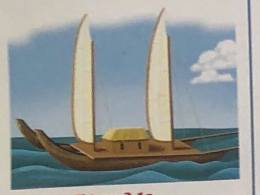


Figure 2-1a

Phillip Nicholson

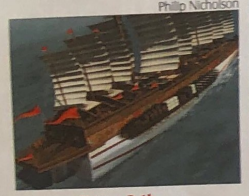


Figure 2-1b

US Naval Historical Center

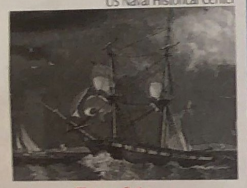


Figure 2-1c

Courtesy of Harbor Branch Oceanographic

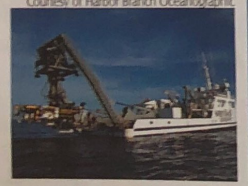


Figure 2-1d

Four stages of historical oceanography.
We can divide the history of oceanography into four stages: ancient uses and explorations, the Middle Ages, European voyages of discovery, and the birth and growth of modern sciences.

Today the United States is the longest standing democratic republic to ever exist. The successes and failures of this government offer tremendous lessons in political science and the nature of government. However, the establishment of this republic offers another important perspective.

Following the Constitutional Convention in Philadelphia in 1787, Alexander Hamilton, John Jay, and James Madison published 85 essays known today as the Federalist Papers. The purpose of these essays was to defend the proposed new Constitution for the United States of America and to encourage the states to ratify it. Throughout the 85 Federalist Papers, Hamilton, Jay, and Madison frequently cite prior failures of government and institutions as far back as ancient Greece. Their works show the many counterbalances written in to the US Constitution to cancel out these weaknesses.

The Federalist Papers show that in laying out the US Constitution, Hamilton, Jay, Madison, and the other members of the Constitutional Convention looked to history for lessons about what had succeeded and failed in government. For example, they examined the dismal track records of the early Greek democracies. Based on their failures, the convention determined that the US would not be a democracy. History showed them that a representative government elected by the people—a democratic republic—best preserves liberty.

The success of the United States republic demonstrates that history is not irrelevant. It's not simply names and dates that matter, but the lessons learned. In any field, whether politics or science, we avoid repeating errors by looking at history. Likewise, we repeat and build on success. The foundation of wisdom is history.

The History of Oceanography—Why Study It?

What are three reasons to learn the history of oceanography?

What are four main stages in the history of oceanography?

To learn to drive a car, you don't need to learn the history of cars. You can drive safely without knowing what a Model-T is or what the first sports car was. So, do you *need* to learn the history of oceanography to learn and apply modern marine sciences? To be honest, in many ways, no. Yet, unlike learning to drive a car, if you study oceanography without studying its past, you lose important dimensions that help you as a scientist.

Like oceanography, history is a branch of knowledge. History is the branch that records and explains past events. In the history of a science, those events and explanations are more than curiosities. They form the basis for science as it exists today. You need to learn the history of oceanography for at least three reasons:

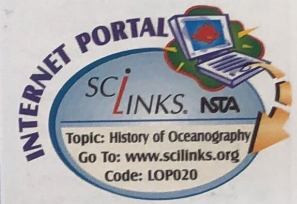
1. The history of oceanography isn't isolated from, but connected to, the world's overall history. In commerce, warfare, resources, and weather, the oceans have shaped humanity's past. Understanding the history of oceanography is part of understanding how the oceans have shaped human society and how they may shape the future.
2. Oceanography's past helps you understand why and how people apply marine sciences today. Based on the latest information, a scientist may challenge modern theories, procedures, or practices—this is how science progresses. But, it's difficult to objectively challenge the status quo without understanding its origin.
3. A good reason to study the history of oceanography is that it's interesting. It's not just a boring list of dates and famous fish nerds. Oceanography sometimes grew out of humanity's desire to explore and discover, sometimes out of naval combat and power struggles, and sometimes out of pure curiosity. As you're about to see, contributors to this science have ranged from the most powerful people on earth to those whose names history didn't record. Oceanography's history is about *people*, not just oceans and test tubes.

We can divide the history of oceanography into four stages: ancient uses and explorations, the Middle Ages, European voyages of discovery, and the birth and growth of modern marine sciences. As you'll see, each of these periods marks distinct changes in how we interact with and study the oceans.

STUDY QUESTIONS

Find the answers as you read.

1. What are three reasons to learn the history of oceanography?
2. What are four main stages in the history of oceanography?



STUDY QUESTIONS

Find the answers as you read.

1. What were the three primary reasons for early civilization to interact with the ocean?
2. When was the first recorded sea voyage, and by what civilization?
3. What did the Phoenicians contribute to ocean exploration?
4. What was the significance of early Polynesian seafaring?
5. How did ancient explorers navigate near shore and in the open ocean?
6. What major ocean discovery is credited to the Greek Pytheas?
7. What two major contributions are credited to the Greek Eratosthenes?
8. What were the significances of the maps of Herodotus, Strabo, and Ptolemy?
9. What is the purpose of the latitude and longitude mapping system?
10. What is a *parallel*? What is another name for the 0° parallel?
11. What is a *meridian*? Through what city does the 0° meridian run?

Figure 2-2

Egyptian seagoing vessel.

The earliest recorded sea voyage appears to have taken place about 3200 B.C. under the auspices of the Egyptian Pharaoh Snefru. Around 2750 B.C. the Egyptian Hannu led the first recorded sea voyage of exploration to the limits of their known world, the southern edge of the Arabian Peninsula and the Red Sea. These early vessels often used a single sail and oars for propulsion.

Ancient Uses and Explorations (5000 B.C.–800 A.D.)

Prehistory and the Rise of Seafaring

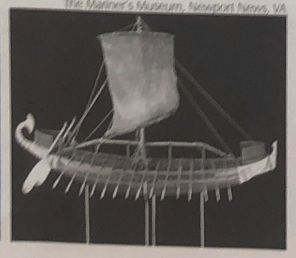
What were the three primary reasons for early civilization to interact with the ocean?

When was the first recorded sea voyage, and by what civilization?

History doesn't record exactly who the first people were to explore the oceans, nor when. But, archaeologists date Native American primitive fishhooks and spears to approximately 5000 B.C. It's clear that the first reason early civilization interacted with the oceans was to obtain food. As societies grew, trade between cities and cultures grew, adding two new reasons: to discover new lands and as a means of trade. Although these were economic rather than scientific pursuits, these three motivations led to the invention of ships and seafaring.

When was the first sea voyage in a ship? No one is really sure. The earliest historical reference to a voyage in a ship is the story of Noah and the Ark, which is dated approximately 4000 B.C. by many of the scholars of the Bible. Although several cultures have similar stories about a worldwide flood and a large boat full of animals, the existence of the Ark is widely debated. In any case, escaping a flood is not really a sea voyage in the true sense of the term.

The earliest recorded sea voyage therefore appears to have taken place about 3200 B.C. under the auspices of the Egyptian Pharaoh Snefru. The Egyptian records say that he brought 40 ships to Egypt from Phoenicia, suggesting that seafaring had been commonplace for some time. Other Egyptian hieroglyphics (the symbols used in ancient Egyptian writing) record an expedition to the southern edge of the Arabian Peninsula and the Red Sea. This trip in about 2750 B.C. appears to be the first recorded sea voyage of exploration. The earliest seafaring craft known dates to about 2585-2560 B.C., around the time the Egyptians built



The Mariner's Museum, Newport News, VA

the Great Pyramids. The Egyptians entombed an entire ship in the Pyramid of Khufu (Cheops), surrounding it with hieroglyphics and paintings. This reed boat used a single sail and oars for propulsion.

Figure 2-3

Location of Egypt and Phoenicia.

The ancient Phoenicians and Egyptians used sea voyages for trade and explorations.

Ancient Phoenician Explorations and Discoveries

What did the Phoenicians contribute to ocean exploration?

The ancient Phoenicians were among the most important early Western seafarers. Professor George Bass and archaeologists who studied what is probably the oldest underwater shipwreck known believe it was about 9 meters (30 feet) long and built in approximately 1200 B.C. Found off the coast of Turkey, evidence suggests the vessel was used by a Syrian merchant trader who specialized in metal. Archaeologists think this Syrian culture was the forerunner of the Phoenician culture. In this sense, Phoenician seafaring probably predates the rise of Phoenicia itself.

Considering the broad area and strong influence of Phoenician seafaring and trade, today little is known about their explorations. Phoenicia was on the North African Mediterranean coast, where Libya is today. Motivated by trade, the Phoenicians traveled (for their day) incredible distances. They contributed to ocean exploration by establishing the first trade routes throughout the Mediterranean and as far north as Great Britain.

Archaeologists theorize that the Phoenicians sailed both along the shore and in open ocean. Coastal sailors traveled only by day

THE NORTH STAR AND NAVIGATION

You may have heard that the North Star is significant in seafaring and navigation. The reason is that this star (called *Polaris* by astronomers) is almost directly over the Earth's axis at the North Pole. At night, all the other stars appear to move across the sky as the Earth turns. Due to the Earth's orbit around the sun, the timing and location of constellations also vary in their appearance with the seasons.

The North Star, however, doesn't appear to move much because it's nearly in line with the Earth's axis. This makes it a nearly steady point in the sky, which is why it became one of the first references for nighttime seafaring. It remained a primary navigation reference until the introduction of electronic navigation in the latter half of the 20th century.

Figure 2-4

within sight of land, stopping at villages or other landfalls at night. Open-ocean Phoenician sailors ventured farther from shore, but stayed within sight of land and sometimes traveled at night. They steered by observing the constellations and the North Star. In the ancient world, the North Star was called the Phoenician Star. This is one of the earliest historical references to using the North Star for navigation.

UNDERWATER ARCHAEOLOGY

Very few drawings of ancient ships have survived, and those that have lack construction details. Yet today we have a good idea of what Greek and Phoenician ships looked like, how builders put them together, the types of cargo they carried, and other details. Furthermore, every sunken ship is a time capsule for the era in which it sank. Much of what we know about ancient cultures comes from what we've found in old shipwrecks. This is possible thanks to the science of underwater archaeology.

Archaeology is the scientific study of fossils, antiquities, and artifacts relating to past human cultures and activities. By necessity it is a methodical science that records every detail of an ancient find before moving and preserving it. This is important because archaeologists learn as much (sometimes more) from the relationships of objects to each other as from the objects themselves.

Underwater archaeology applies the same science to human fossils, antiquities, and artifacts found under water. This typically means ancient shipwrecks, sunken cities, and other archaeological sites under water. Marine archaeology is sometimes known as archaeological oceanography. Scientists commonly use both terms.

Institute of Nautical Archaeology

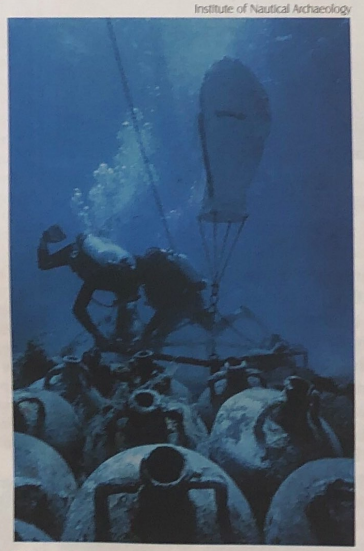


Figure 2-5

Underwater archaeology.

Much of what we know about ancient cultures comes from what we've found in old shipwrecks. This is possible thanks to the science of underwater archaeology.

As you may imagine, underwater archaeology can be quite demanding. Scientists must meet archaeology's exacting requirements in an extreme environment. This means they must do so using scuba diving, submersibles, or ROVs (Remotely Operated Vehicle), or a combination of these. Archaeologists must not only do this under water, but they must determine the best scientific methods to apply to each wreck—no two are exactly the same.

Early in the 20th century, hard-hat divers simply grabbed artifacts, which is salvage—not archaeology. This unscientific approach did not effectively study the finds and did more damage than good by causing the loss of significant potential information. In the late 1950s and early 1960s, Peter Throckmorton and George Bass conducted the first detailed, legitimate underwater archaeology on ancient wrecks in the Mediterranean. By the end of the 1960s, underwater archaeology had become an established and accepted archaeological discipline.

Ancient Polynesian Explorations and Discoveries

What was the significance of early Polynesian seafaring?

Imagine you're on Hawaii. You cut down a tree, hollow it out, add a sail, load in some food and water, and then set out on the ocean headed for Tahiti, more than 3,200 kilometers (2,000 miles) away. It will take weeks, you have no navigation tools except your eyes, ears, and nose, and you're not sure what the weather will be. By modern standards, to even attempt this would seem absurd and foolhardy.

Yet, based on the findings of archaeologists and anthropologists, between 2000 and 500 B.C.—while European cultures were sailing within sight of shore—Polynesian seafarers in the South Pacific were doing exactly this. They routinely crossed thousands of kilometers of open ocean in canoes crafted with stone, bone, and coral tools.

It's theorized that Polynesians built these canoes from tree trunks or planks sewn together with fiber rope. They sealed cracks and seams with tree sap. For open-ocean stability, they either attached an outrigger for shorter voyages, or, for longer trips, they lashed together two canoes with crossbeams and a deck. These crafts had sails. The Polynesians paddled them when there was no wind.

Figure 2-6

Polynesian vessels.

It's theorized that Polynesians built canoes from tree trunks or planks sewn together with fiber rope. They sealed cracks and seams with tree sap. For open-ocean stability, they either attached an outrigger for shorter voyages, or, for longer trips, they lashed together two canoes with crossbeams and a deck. These crafts had sails. The Polynesians paddled them when there was no wind.

Incredibly, these crafts were seaworthy enough to voyage the distance from Hawaii to Tahiti—more than 3,200 kilometers (2,000 miles). Although they didn't carry as much as the ships used by European explorers and traders, the Polynesian ships were faster.