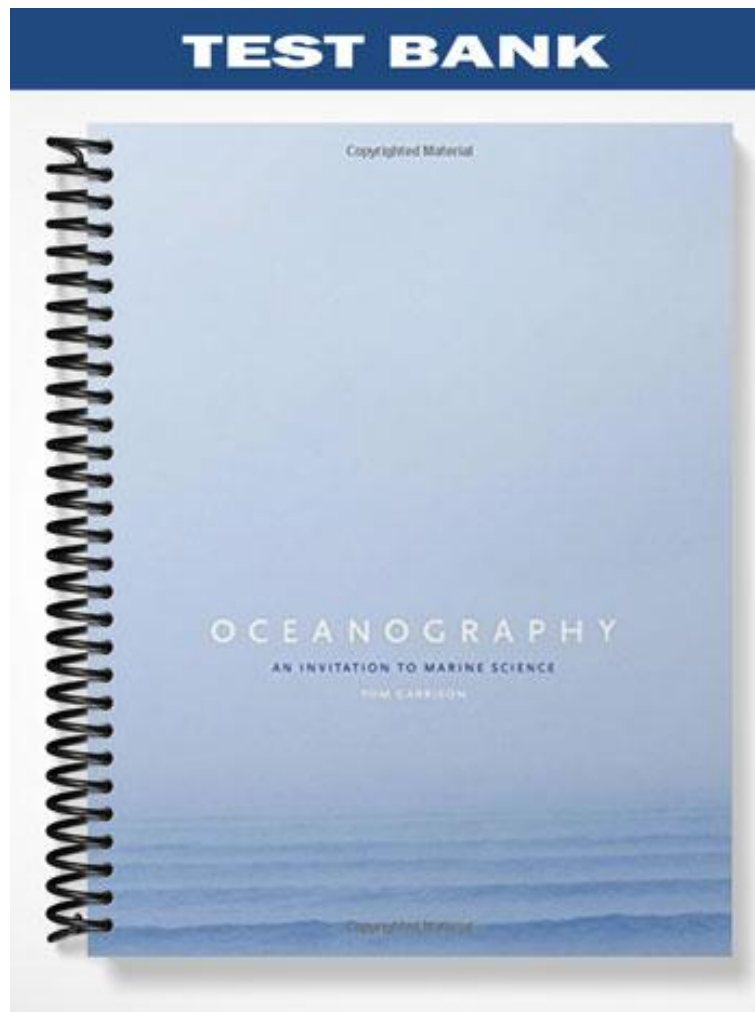


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OCEANOGRAPHY

AN INVITATION TO MARINE SCIENCE

TOM CARROLL

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Chapter 2--History

Student: _____

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- A. Expansion of trade
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- D. All of these choices

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32. Matthew Maury is considered to be the "father of oceanography" due to his life accomplishments pertaining to ocean and wind currents.

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44. Benjamin Franklin's information on the stream of currents in the North Atlantic led him to write *The Physical Geography of the Seas*.

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TRUE

46. Discuss the problems that occurred while trying to determine longitude. How was the longitude problem finally solved?

Answer should include:

- Longitude lines are imaginary grid lines that run pole to pole used, along with latitude measurements, to determine location coordinates. They measure the angle of a particular location in reference to the prime meridian. They are always north and south measurements.
- The biggest issue with longitude is that it cannot be determined using celestial markers as with latitude. After setting a particular location as zero, longitude can be calculated using time. The Earth is 360 degrees in circumference, and completes a full rotation every 24 hours. Thus, every 15 degrees is equivalent to one hour of time.
- After it was determined that longitude could be found using time, another problem arose. In the early 18th century, clocks were propelled by a pendulum to keep accurate time. These clocks were not able to keep accurate time as they used pendulums which were useless on a rolling ship.
- John Harrison created a clock in 1728 that was able to keep accurate time while at sea. He called it a *chronometer*. It used a spring escapement instead of a pendulum, and this made it a good solution to the previously inferior clocks at sea.
- John Harrison built four chronometers total. The last model he made was only five seconds slow, which was an astonishing accomplishment for that time period.
- Eventually, John Harrison's clocks were able to be reproduced. This allowed Harrison to finally collect reward money for his invention. Captain Cook took one of Harrison's replicated clocks on his last two expeditions.

Information can be found in the section *Voyaging Combined with Science to Advance Ocean Studies*.

47. What was the first expedition devoted entirely to marine science? What new equipment was used on this expedition to facilitate more research? What information was acquired?

Answer should include:

- The HMS *Challenger* expedition was the first voyage devoted to marine science. The idea for the expedition was conceived by Charles Wyville Thomson and his student John Murray. They were inspired by Charles Darwin's findings from the HMS *Beagle* expedition.
- The course that the *Challenger* voyaged was directed by a six-man team of scientists. This solely scientific expedition was different than previous hybrid expeditions that combined science with other voyage goals.
- The scientists used a steam powered winch that allowed them to obtain deep sea samples. On previous expeditions, deep sea samples were only able to be made by hand lowering meters of rope. This technology enabled the scientists to collect samples from waters as deep as 8,185 meters.
- The expedition made use of mechanical grabs and nets to collect specimens and water samples from the deep. Over the course of the trip, 151 trawls were conducted, and 77 water samples were collected.
- The information gathered on the *Challenger's* expedition was compiled into a fifty volume report. The scientists discovered 4,717 new specimens. Measurements were taken of the ocean's salinity, temperature, and water density. Ocean currents, meteorology, and sediment distribution were also recorded. They were even able to collect Manganese nodules with the use of the new equipment aboard the ship.

Information can be found in the section *The First Scientific Experiments Were Undertaken by Governments*.

48. What was the significance of the Library of Alexandria? How did it obtain information? What happened to the library? Include relevant dates and famous people associated with the library.

Answer should include:

- The Library of Alexandria was founded in the third century. It held the greatest collection of ancient writings at that time. Some say that it was a university of sorts because there was such an exchange of information.
- The library used laws to acquire original logs from ships that came into the harbor. The library copied the logs and returned the copies to the owners, while keeping the originals for the library. They collected information from land caravans in the same way.
- Traders quickly realized the competitive benefit of this information.
- The library existed for 600 years and had many librarians.
- Hypatia, the last librarian, was met with resistance from early Christians. They viewed this woman, a mathematician and a symbol of science, as a pagan. She was murdered in A.D. 415.
- The library itself was burned when Hypatia was killed. Over 700,000 scrolls were destroyed. The loss of knowledge was devastating to Europe.

Information can be found in the section *Understanding the Ocean Began with Voyaging for Trade and Exploration*.

49. Compare and contrast the United States Exploring Expedition and the HMS *Challenger* expedition. How was each of these expeditions pioneering in their own right?

Answer should include:

- The *Challenger* expedition was a purely science based voyage. It is reasonable to say that this voyage was influenced by its predecessors, but this ship was directed by scientists. The mission was to see if there was life below 549 meters.
- The *Challenger* had equipment that solved previous issues regarding sampling of the deep sea. This included a steam powered winch and a system of nets and grabs.
- The *Challenger* mission discovered 4,717 new species. At the end of the expedition, information, charts, and illustrations were compiled into a fifty volume report.
- The United States Exploring expedition was the first hybrid venture. Although science studied the ocean, it was primarily a naval voyage. The mission included showing the American flag, charting waters, observing, and, interestingly enough, disproving the theory that the Earth was hollow and could be entered into at the poles.
- The United States expedition explored the west coast of North America, and their findings were especially valuable when connected to the map of the Rocky Mountains.
- The United States expedition collected many specimens and artifacts that would later be housed in the Smithsonian. The voyage also collected enough information to generate a 19 volume report.
- Both expeditions had goals to pursue ocean science. This was not a common occurrence at their time. They collected samples and charted waters and their findings were immensely valuable to the world.

Information can be found in the section *The First Scientific Experiments Were Undertaken by Governments*.

50. How was Captain James Cook able to study science, navigation, and international relations? Include information on his various expeditions.

Answer should include:

- Captain Cook was considered the first marine scientist. He collected marine and terrestrial specimens in addition to samples from geological formations and the ocean floor.
- Captain Cook kept accurate and detailed records. His logbooks contained vast amount of information pertaining to his trips. The information was not exaggerated so the logbooks were very reliable. In addition to the information in his logbooks, Captain Cook made precise charts of the regions he traveled. These charts were even used in World War II.
- Captain Cook interpreted natural history, anthropology, and oceanography along his voyages.
- The HMS *Endeavour* sailed in 1768 to assert British presence in the South Seas. Captain Cook initiated contact and affable relations with native chiefs.
- During the HMS *Endeavour* scientific observations were conducted aboard as well. The movement of Venus across the sun was measured. This allowed earlier calculations of planetary orbits to be confirmed.
- Due to his leadership on the *Endeavour* voyage, Cook was given command of the HMS *Resolution* and *Adventure*. Captain Cook charted many new islands including Tonga and Easter Island. He also discovered new islands like New Caledonia and South Georgia.
- While leading the *Resolution* and *Adventure*, he became the first to circumnavigate the globe at high latitudes. He sailed at 71° South latitude.
- Captain Cook's final expeditions were aboard the HMS *Resolution* and *Discovery*. The goal of these particular expeditions was to find a northwest passage around Canada and Alaska or conversely a northeast passage above Siberia.
- Cook charted the west coast of North America.
- Captain Cook's discovered the Hawai'ian islands in the course of his last expedition. He initiated contact with the chief. Captain Cook returned to Hawaii on his return voyage after trying to find a northwest passage. Cook angered the Hawaiians somehow and they killed Cook along with others.

Information can be found in the section *Voyaging Combined with Science to Advance Ocean Studies*.