

Ocean 11

History of Navigation

Ancient Navigation

The first seafarers kept in sight of land in order to follow the coast and line up landmarks in order to find former fishing grounds. Sounding, using a lead line helped. Early navigation also depended on the stars. In fact, records from 600 BC showed that navigation was done this way.

Another "trick" used by early sailors like the Norsemen, or Vikings, was to follow seabirds in flight. If their beaks were empty, the birds were heading out to sea in search of food. Otherwise, the birds were heading toward land. Sometimes, seabirds kept caged on deck were released in order to show the way toward land.

Another method used by the Polynesians in the islands of the Pacific, was to observe the patterns of the waves and actually construct maps of shells and twigs.

A modern Micronesian stick chart.



Knots or shells tied at the junctions between bamboo sticks represent islands. Straight strips represent patterns of regular waves; bent strips depict waves curving around the islands.



The Polynesian Triangle

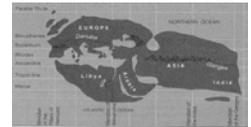
Ancestors of the Polynesians spread from Southeast Asia or Indonesia to New Guinea and the Philippines by about 20,000 years ago.

The mid-Pacific islands have been colonized for about 2,500 years.

The explosive dispersion that led to the settlement of Hawaii occurred about 450 to 600 AD.

The Greek Pythagoreans realized the earth was spherical by the 6th century BC.

The World : Third century BC



Eratosthenes drew latitude and longitude lines through important places, rather than spacing them at regular intervals, as we do today.

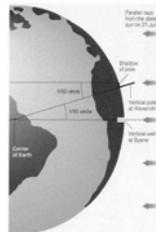
Eratosthenes was the first to calculate the circumference of the earth in 230 BC.

From travelers returning from Syene (Aswan) Eratosthenes learned, that at noon on the longest day of the year (June 21), the sun shone directly onto the waters of a deep, vertical well.

In Alexandria, he noticed that a vertical pole cast a slight shadow on that day. Since the earth is a great distance from the sun, he assumed the difference was due to the earth's curvature, since the rays would be essentially parallel.

He measured the shadow angle and found it to be 7.2 degrees or 1/50th of a circle, since a circle is 360 degrees. According to reports from caravan traders, he estimated the distance between the two locations at about 785 kilometres.

He calculated its circumference by multiplying the distance between the two cities by 50. His calculation of 39,250 kilometres was 92% accurate.



In 200 AD the Greek, Ptolemy, created the first world atlas, which included mainly the area around the Mediterranean Sea. This was, of course, the world as the Greeks knew it.

By the 10th century, the Italian merchants supplied detailed direction distances, depths and coastal descriptions.

By the 13th century, sea charts drawn to scale and with bearings, were produced.

The Chinese Contribution

To move goods from place to place in the open seas the Song Dynasty (A.D. 960-1280) developed the mariner's compass. Originally, the compass had been developed for divination purposes, a sort of magnetic spoon going back as early as the Han Dynasty 1,000 years before.



Although the compass was invented thousands of years ago by the Chinese, it wasn't used by sailors until much later, due to the fears of "black magic". Sailors are a superstitious group.

Accompanying the invention of the compass were other inventions, such as the development of new types of locks along the canals.

The Chinese previously had invented the sternpost rudder, actually in the Han Dynasty, but the sternpost rudder was very important for controlling a vessel.

They had also invented sails that could move. In earlier times, in the Mediterranean, sails were fixed. They had to wait for the wind to change in order to be able to move. But, the Chinese invented sails that could be trimmed, so that they could travel, regardless of which way the wind was blowing.

They also developed the structure of the ship's hold, dividing it into different watertight compartments. The result was that if one chamber in the hull sprang a leak, then it wouldn't damage the rest of the cargo.



Because giant squids can attain a length of fifty feet or more, they have earned their reputation as "sea monsters". A ten-armed cephalopod, the squid, like the octopus, is a mollusc that has shed its outer shell during the course of evolution.



Track of the Magellan expedition — the first voyage around the world. Magellan himself, did not survive the trip. Only 18 out of 270 sailors managed to return after three years at sea.

The trade winds have always been important to mariners. In the Indian Ocean, the northeast monsoon took traders to Africa in the cool, dry winters. They followed the southwest monsoon back in the hot, wet summer.

In the Middle Ages, sailors relied on the astrolabe, a disk of metal that was suspended by a small ring. This was used to measure the height of the sun above the horizon.

The sextant was invented in 1731. Using tables, it would take several hours to figure out longitude.



Captain Nemo takes a sun shot aboard the Nautilus of Jules Verne's imagination. There are remarkable similarities between Captain Nemo's Nautilus and that of Commander Anderson. The length of the real Nautilus is 200 feet compared with 300 feet for Nemo's submersible; diameter of 28 feet (real Nautilus) compared with 26 feet. Each ship was equipped with an engine — screw, and Nemo's Nautilus was powered by electricity generated from sea water, which enabled it to remain submerged for long periods.

Video: Using the Sextant



Video: Latitude and Longitude

53 minutes



The chronometer, a very accurate timepiece, provided assistance for calculating position.



2-day chronometer
British c. 1900



8-day chronometer
British c. 1820



Lately, the GPS (global positioning system) with assistance from satellites, provides accurate information about the location of vessels.

HMS Challenger



1872: The cruise of *HMS Challenger* marks the beginning of Oceanography. The cruise took 3 1/4 years. An additional nineteen years and \$200,000 were required to publish all the scientific results.



HMS Challenger's track from December 1872 to May 1876.

In general, the significance of the Challenger Expedition involved:

- (1) establishing the composition of sea water
- (2) demonstrating that animals exist at the greatest depth of water sampled (5500 metres)
- (3) mapping ocean sediments
- (4) temperature measurements, which indirectly indicated the Mid-Atlantic Ridge
- (5) collecting a vast accumulation of temperature, salinity and specific gravity values from all over the world.

The visit of *HMS Challenger* off the coast of Halifax from May 9 to 19 in 1873, stirred much interest with one visitor to the ship coming from as far away as Boston.

The Curator of the Provincial Museum was so enthusiastic that he was presented with a series of samples, which are still at the Nova Scotia Museum.

Bedford Institute of Oceanography



Dartmouth, Nova Scotia

The Bedford Institute of Oceanography, Canada's largest centre for ocean research, is located in Dartmouth, Nova Scotia.

Opened on October 25th, 1962, it has grown to rank among the most respected research institutions in the world.

Over 300 scientists, engineers, and hydrographers in many specialized fields study the ocean off Canada's east coast. BIO scientific teams investigate the physical and chemical properties of the ocean, the life within it, and the geology of the sea-floor, as well as the interactions between the atmosphere, the oceans, and the continents.

In recent years, the Bedford Institute of Oceanography has been very active in world research on the oceans, using ships.

In 1969, the *C.S.S. Hudson* carried out a cruise of the Atlantic under the direction of Dr. B. R. Pelletier.

The cruise carried out geophysical, geological and oceanographic surveys along two tracks crossing the Atlantic to the Azores and Spain.

The object of the cruise was to further our knowledge of the history of the Atlantic margin of our continent.

The geographical limitations of suspected oil producing sedimentary basins off our coasts and continental drift as it applies to the geology of the Atlantic were also studied.