



Lunar CRater Observation and Sensing Satellite

Sea-Faring Navigators

Human beings reach out to space as explorers who have been navigating to destinations on Earth for thousands of years. Peoples of the Pacific Oceans, such as the Polynesians, stand out in pre-modern history as the discoverers of new lands by their methods of non-instrument navigation. They did so by careful observations of natural signs.

To tell direction, Polynesian explorers used the Sun when it was low on the horizon. They observed the appearance of its path on the water. They memorized where the wind was coming from at sunrise. When the Sun got too high to tell where it had risen, they steered by the direction of the swells generated by the wind. At sunset, they repeated the observations. When the Sun went down, they looked at the shape of the waves to determine if the wind changed or the swell pattern changed. At night, they used the stars.

When nightfall came under heavy clouds, they could not see the stars or the swells, but the swell pattern could be felt moving under the canoe. Skilled navigators could lie down inside the hull of a canoe and know the canoe's direction.

Polynesian non-instrument wayfinding uses the Sun as the main guide. Twice a day it gives a directional point to the traveler, rising in the east and setting in the west at exact points which change during the year. The navigator aligns the rising or setting Sun to marks on the railings of the canoe. The navigator uses stars in a similar way, keeping a star at a bearing that will head the canoe in the desired direction. The path of the star throughout the night, the rising and setting points, differ with the explorer's latitude. Two stars in the Southern Cross¹ always pointed south for the Polynesian wayfinders.

The Polynesians divided the phases of the Moon into three ten day periods. By observing where the Moon rose and set with respect to another celestial² body permitted the Moon to be used for navigation, even during the day. The navigators used the "Wandering Stars" or planets, which move among the fixed stars to navigate as well. They used ocean swells, which travel beyond the wind systems that generated them, and are more stable than waves. They used the wind at a constant bearing to the canoe to hold a course.

On coastal voyages, navigators steered by landmarks. They could line up a hill and a mountain to steer a straight line. Living seamarks, such as schools of porpoises, could determine a latitude point remembered from a previous voyage. Navigators used seamarks to find land, such as drifting land vegetation, clouds piled up over islands, island swell patterns, and seabirds.

Polynesian wayfinders, who discovered the Hawaiian Islands 1,300 years ago, were astronomers of their time who studied the motions of the heavens for navigation and were accomplished explorers. Students around the world in 2009, working on the LCROSS mission to the Moon, will join their ranks as explorers of the celestial bodies which guided their path.

1: Southern Cross - five stars in a kite-shaped or cross-shaped constellation between Centaurus and Musca.
2: Celestial - of or relating to the sky or the heavens: Planets are celestial bodies.



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