

[Northwest Passage 100th Anniversary](#)

Beaming down on historic channel makes mountains of seafloor data

by John Trone and Al Martin

In 1903, explorer Roald Amundsen not only launched the first successful effort to discover the Northwest Passage, he was among the first to gather sophisticated scientific data about the region.

Today, a hundred years later, the Coast Guard's polar icebreaker/research vessel HEALY is adding another first, providing scientists with their best view yet of the floor of this fabled waterway.

During its 2003 voyage commemorating the 100th anniversary of Amundsen's historic voyage, the HEALY will be the first to gather detailed bathymetric data about the sea floor in the Northwest Passage.

Few explorers in search of the Northwest Passage thought of scientific study. The challenging and hostile Arctic environment often meant that well intentioned scientific studies other than mapmaking were replaced by efforts to survive. Amundsen's voyage aboard the GJOA in 1903 was different, because Amundsen came with the express intent of making meticulous measurements of the north magnetic pole, in addition to finding a route through the Northwest Passage. Amundsen spent three winters in the Canadian Arctic taking measurements, and also scouting and mapping unknown facets of the local geography.

Whereas Amundsen had to collect critical data about oceanographic features and conditions with only his eyes



and maybe a line and weight, the HEALY utilizes several sophisticated pieces of equipment to gather data, including a Multiple Formed Beam Echo Sounder (the Seabeam 2100 or "multibeam"), an Acoustic Doppler Current Profiler (ADCP), two different sub-bottom profilers (the Knudsen 320 and the Ocean Data Equipment Bathy 2000), xctd probes, and an in-line thermosalinograph. This equipment coordinates with ship's navigational and positional data systems to provide accurate track and station information to the collected data.

One might think that in the 100 years since Amundsen, we would

Dave Monahan with a multibeam swath of the Northwest Passage

have accumulated thorough and complete data about the world's oceans. While we may have learned a good deal about the oceans, in reality there is still a vast amount we don't know. According to Dave Monahan, a professor at the University of New Brunswick and scientist with the Canadian Hydrographic Service, we know more about the topography of the moon than we do about the seafloor.

Monahan and HEALY Chief Scientist Dale Chayes of Columbia University's Lamont Doherty Earth Observatory are in charge of gathering bathymetric data during HEALY's transit of the Northwest Passage. Experts in swath bathymetry and seafloor morphology, their "multibeam" generates a picture of the seafloor underneath the HEALY revealing sea floor relief, slope and depth contours.

Monahan is already intrigued by some of the patterns he's seeing from data collected on HEALY, and is looking forward to 2004, when a Canadian icebreaking vessel will generate a second set of multibeam data during its transit of the Northwest Passage.

Built into the HEALY's hull, where it is protected from damage from icebreaking activity, the Seabeam system generates up to 121 12 kHz beams per second, each 1 to 5 degrees wide, from transmitting units arrayed laterally across the hull. The number of transmitters allows the system to sweep the seafloor, rather than just a single line. The width of each swath is typically 1- 1.5 nm across, but this varies with depth, the swath being narrower in shallow water and wider in deep water. The "multibeam" software also displays a pictorial representation of bottom topography in real time.

Compiling a detailed map of the seafloor will help scientists and mariners alike. Scientists will be able to relate topside land features to those underwater, gain new understanding of processes that shape the sea floor, and determine bottom type. Information about seafloor topography and bottom type may be useful delineating areas appropriate to fishing or protection. Bathymetric information may also help mariners avoid navigational hazards.

Amundsen began his voyage to the Northwest Passage in 1903 in the spirit of scientific discovery. A hundred years later, HEALY continues that tradition of innovative science and discovery, uncovering the seafloor in the Northwest Passage.



HEALY travels through the ice near Banks Island, Northwest Passage