

Alumni Profile: John K. Hall, PhD '70

After completing a doctorate in marine geophysics at Lamont, John K. Hall immigrated to Jerusalem with his Israeli wife and spent 35 years at the Geological Survey of Israel before retiring in 2005. A self-described “five times over Mayflower Yankee,” Hall has devoted much of his career to mapping the bodies of water in and around the Middle East. In 2000, Hall purchased his own private multi-beam (swath) sonar, which he has used to map the bathymetry of the Mediterranean and the northernmost Gulf of Elat. As vice-chairman of the International Bathymetric Chart of the Mediterranean project, Hall has been a longtime vocal proponent of assembling a 0.1° grid of the Mediterranean and Black Seas.

Hall's instrumental role in obtaining seismic and bathymetric data from these areas, as well as the Red, Dead, Caspian, and Black Seas, Lake Baikal, and the Sea of Galilee (the “puddles” as Hall jokingly refers to them), stems from a spirit of curiosity, determination, and adventure that has similarly marked his latest endeavor: the mapping of the inaccessible Alpha Ridge, located in the central Arctic Ocean.

If the destination is not entirely new for him (Hall conducted his thesis research on Fletcher's Ice Island), his mode of transport certainly is. To reach this nearly impenetrable part of the Arctic, Hall has purchased and equipped a hovercraft, the R/H *Sabvabaa*. As a graduate student, Hall speculated that the Alpha Ridge (which rivals the Himalayas in size) was a fossil spreading ridge—a region once active due to mantle convection. Subsequent findings by others have shown this to be incorrect, but the ridge, which could conceivably reveal the origin of the Arctic's main Amerasia Basin, remains a mystery.

Over the years, another Lamont alumnus, Yngve Kristoffersen (PhD '77), would review Hall's early published seismic records of this area. Something in the data puzzled Kristoffersen, so in 2004 he invited Hall to the University of Bergen to discuss the records. The seismic evidence showed a severely disturbed area some 200 by 600 kilometers, suggesting an intriguing scenario: the possibility that an asteroid hit the Alpha Ridge several million years ago. Hall and Kristoffersen have decided to return to the region to test this hypothesis further. In the process, they also plan to deploy autonomous drifting seismic reflection buoys, along with echo-sounding buoys developed under the Seafloor Soundings in Polar and Remote Regions project.

“To get into an area inaccessible to icebreakers—or reachable by plane only in spring—is pure chutzpah.”



Will Fessenden Jr.



The R/H *Sabvabaa*

“The task is to figure out the real message in the data—a dream challenge for any scientist. So far, we have mostly met shaking heads, which just makes it more fun,” Kristoffersen explained.

Hall and Kristoffersen have outfitted the *Sabvabaa* (the name, in Inupiaq, means “flows swiftly over it”) with the latest technological instruments. The hovercraft, with a 2,200 kg payload, boasts an electromagnetic device for underway ice thickness measurements, a CTD winch that measures the water's salinity and temperature to depths of 500 meters, a light-weight corer, a rock dredge and winch with 3,000 meters of Kevlar rope, a 20 in³ airgun and six-channel streamer, a CHIRP sub-bottom profiler and 12kHz echo sounder, GPS navigation, satellite, marine and aircraft communications, FLIR (infrared) thermal imaging, small computers, and a rooftop solar panel. The team will rely on icebreakers to deposit caches of diesel fuel to keep the hovercraft operational. The craft can travel more than 500 nautical miles with full payload without refueling. Its base for these expeditions is Longyearbyen, Svalbard, at 78°N.

The *Sabvabaa* is highly mobile and economical. While the American icebreaker *Healy* costs \$9,000 an hour, the hovercraft can operate for more than a week on that amount. Over the summers of 2008 and 2009, the *Sabvabaa* completed nine weeklong trips onto the permanent icepack as part of the Norwegian International Polar Year project “Classroom on the Ice,” which paired researchers with high school students. These shorter trips have left Hall and Kristoffersen very optimistic that the hovercraft will be able to tackle the Alpha Ridge. So far, the craft has traveled 6,500 nautical miles on Arctic missions.

Hall's return to his Arctic roots began during a year's sabbatical in 2003 as a Visiting Scholar

at the University of New Hampshire's Center for Coastal and Ocean Mapping (CCOM), headed by multibeam guru Larry Mayer. While there, Hall participated in two of Mayer's cruises aboard the *Healy*, generating maps in support of a future U.S. submission under the United Nations' Law of the Sea. With the Arctic ice cover shrinking, interest in acquiring exploitable marine areas is peaking. (A May 2009 *National Geographic* article entitled “Arctic Landgrab” depicts this international activity and illustrates the areas mapped by CCOM.)

By the time this piece goes to print, Hall will have completed his fourth (and Mayer's fifth) *Healy* cruise, a joint seismic operation with the Canadian icebreaker *Louis S. St-Laurent*. These cruises, to areas Hall traversed on the drifting ice station more than four decades ago, have fortified his belief that the hovercraft, operating without time and financial constraints, offers the best chance to get “boots on the ground.” The *Sabvabaa*, with a crew of two or three, has much of the capability that Lamont's *Vema* had in the 1960s.

When he is not at sea, Hall is on the editorial advisory board of the journal *Hydro International*. He has also coauthored two books—one on the Russian swath mapping of the eastern Mediterranean and another on the geology of the Levant. This past summer, Hall was inducted into the Norwegian Academy of Sciences and Polar Research. Hall views his proactive swath mapping and hovercraft purchase as having been made possible by his grandfather's successful career as head of the American Chicle Company.

In his nominal retirement, Hall can look back on a long (if far from finished) career. To a great extent Hall credits his years at Lamont for shaping the course of his research. “We did an awful lot of pioneering then, and I believe that I have faithfully continued in this tradition.”