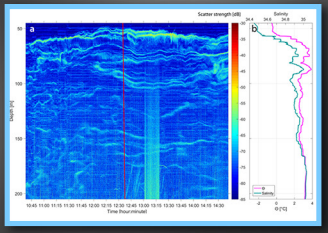
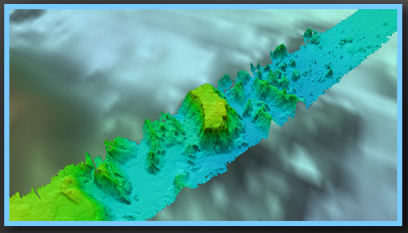
Office of Naval Research
Science & Technology

Distinguished Lecture Series

OCEAN MAPPING:
We've come a long way – but still have far to go





Presented by:

Larry Mayer

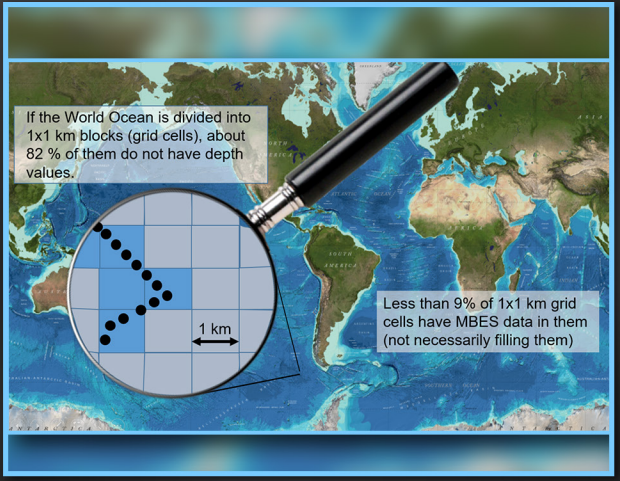
Professor and Director, School of Marine Science and Ocean Engineering, and Director, Center for Coastal and Ocean Mapping, University of New Hampshire

JUNE 12

2018

11 a.m.

IN THE JUNKER CENTER



Office of Naval Research
875 N. Randolph St., Arlington, Virginia
Bobby Junker Executive Conference Center, 14th Floor

OCEAN MAPPING:
We've come a long way—but still have far to go

Our ability to map the sea floor and ocean volume has changed radically over the past century. For thousands of years, a weight at the end of a rope (or wire)—a lead line—provided the only means to measure depth. By the end of the Second World War, single-beam echo sounders had been perfected to the extent that they became common on oceanographic and other vessels, providing more rapid but laterally averaged measurements of seafloor depths. Towards the end of the 20th century, two great advances were made in sea floor mapping—the development of techniques to use satellite altimetry to predict seafloor bathymetry and the evolution of multibeam sonar technology from classified military applications to the academic and commercial communities. Satellite altimetry-derived bathymetry provides an unprecedented view of sea floor topography and tremendous insight into tectonic-scale processes but is limited in achievable resolution. Multibeam sonars offer the potential of extremely high-resolution (a function of array size, beam footprint and water depth), but are typically deployed from manned surface vessels that cover a limited amount of sea floor at a relatively high daily cost. To date, multibeam sonar data is available for less than 10 percent of the world's sea floor. New technologies like autonomous mapping barges, large-scale multibeam sonar-equipped saildrones or sparse arrays, combined with a growing international effort to see the entire sea floor mapped, offer hope that someday we may have a complete map of the sea floor. In parallel with advances in sea floor mapping, we have also seen exciting new advances in the ability of multibeam and other sonars to image the water column. Spurred by efforts to trace the deep-sea oil plume during Deepwater Horizon, the 3D imaging of natural and man-made gas plumes is now common, with current work focusing on the acoustic determination of flux rates. We have also demonstrated the ability of broadband sonars to image, over large areas with remarkable detail, ocean structure, including fine-scale thermohaline steps, internal waves and the depth of the mixed layer.

ABOUT
LARRY MAYER

Larry Mayer is a professor and director of the School of Marine Science and Ocean Engineering and The Center for Coastal and Ocean Mapping at the University of New Hampshire. He received a Ph.D. from the Scripps Institution of Oceanography in marine geophysics in 1979. After being selected as an astronaut candidate finalist for NASA's first class of mission specialists, Larry went on to a post-doc at the School of Oceanography at the University of Rhode Island, where he worked on the early development of the Chirp Sonar. In 2000, Larry became the founding director of the Center for Coastal and Ocean Mapping at the University of New Hampshire. Larry has participated in more than 90 cruises (over 75 months at sea!) during the last 35 years, and has been chief or co-chief scientist of numerous expeditions—including two legs of the Ocean Drilling Program and nine mapping expeditions in the ice-covered regions of the high Arctic. He is the recipient of the Keen Medal for Marine Geology and an honorary doctorate from the University of Stockholm. He was a member of the President's Panel on Ocean Exploration and chaired National Academy of Science studies on national needs for coastal mapping and charting and the impact of the Deepwater Horizon Spill on ecosystem services in the Gulf of Mexico. He was the co-chair of the NOAA's Ocean Exploration Advisory Working Group, the vice-chair of the Consortium of Ocean Leadership's Board of Trustees, and is currently the chair of the National Academies of Science's Oceans Studies Board, a member of the State Department's Extended Continental Shelf Task Force and the Navy's SCICEX Advisory Committee. In 2016, Larry was appointed by President Obama to the Arctic Research Commission, in 2017 he was elected to the Hydrographic Society of America Hall of Fame, and in 2018 he was elected to the National Academy of Engineering. Larry's present research deals with sonar imaging and remote characterization of the seafloor as well as advanced applications of 3D visualization to ocean mapping problems and applications of mapping to Law of the Sea issues, particularly in the Arctic.