

PhD Dissertation
Department of Environmental Science and Policy
George Mason University

Candidate: Karen M. Kohanowich

Defense Date and Time: Tuesday, November 8, 2016 at 1:00 PM

Defense Location: George Mason University, David King Hall Rm 3006 (ESP Conference Room)

Title: From Cousteau to Cameron: A Quadrant Model for Undersea Marine Research Infrastructure Management

Dissertation Director: Dr. E.C.M. Parsons

Committee: Dr. Patrick Gillevet, Dr. Joseph Maxwell, Dr. Esther Peters

ABSTRACT

The oceans are of great importance to society, but their visual opacity, corrosive chemical composition and great pressure at depth make them one of the most challenging and hostile environments in which to conduct research. In addition to remotely sensed physical and chemical parameters, oceanographers require data that can only be gathered *in situ*, much like that required for biological and geological field work, to fully understand marine ecosystem status and interactions of the undersea environment. The systems that have been developed to conduct these tasks underwater, including human-occupied, robotic, and autonomous vehicles, often fall in the category of ‘mid-size infrastructure.’ This class of research equipment is typically beyond the ability of a single university or sponsor to support, but not costly enough to warrant the attention and rigor that is applied to more expensive systems, such as ships or satellites. In addition, although many ocean community efforts have assessed the scientific value of undersea marine research equipment, none have included behavioral or societal factors in these assessments.

This study introduces a quadrant model that provides the framework to consider the full range of technical, operational, functional, and societal influences on the sustainment of U.S. undersea marine research infrastructure. It tests the model using the case of U.S. human-occupied submersibles which, from Jacques Cousteau’s diving saucer *DENISE* to James Cameron’s *DEEPSEA CHALLENGER*, have experienced practically a full technological lifecycle within our lifetime, and have been subject to a wide range of program influences. Results include validation of the model for use in further study, demonstration of the importance of societal and behavioral factors on human-occupied research submersible sustainment, and insights into U.S. marine research infrastructure dynamics.