

## **Distinguished Lecture**

### **UNDERSTANDING THE PLANETARY LIFE SUPPORT SYSTEM: NEXT GENERATION SCIENCE IN THE OCEAN BASINS**

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**Abstract:** Driven by solar and internal geothermal energy, the complex processes interacting within the global ocean constitute the ‘flywheel’ of our planetary life-support system; it is the massive volume of the ocean that drives long-term weather and short-term climatic variations across the seas and onto the continents. Entirely new approaches to understanding the complexity, power, and vagaries of this ‘oceanic modulator’ are arising from the rapid implementation and use of submarine cabled networks that will provide unprecedented electrical power and bandwidth to thousands of increasingly sophisticated robot-sensor systems distributed throughout full-ocean environments. Partly triggered by the advent of a growing number of these cabled research systems, oceanographers are poised to benefit from a host of emergent technologies largely driven by investment from communities external to ocean sciences. Important developments include: robotics, biotechnology, cloud computing, in situ chemical and genomic sensors, extraction of novel biochemical materials, digital imaging, nanotechnology, serious gaming, new visualization technologies, computational simulations and data assimilation, seismo-acoustic tomography, and universal access to the Internet. Far more powerful than any one of these emerging technologies will be the convergence of the ensemble when applied to understanding the innate complexity of our planetary life support system – the global ocean. As these rapidly evolving capabilities are integrated into sophisticated, remote, interactive operations through out the ocean basins for decades, a new era of a pervasive human tele - presence throughout entire volumes of our, once ‘inaccessible’ global ocean will be realized. Such capabilities are required to meet the onset of immense environmental and societal challenges in the coming decades that can only be addressed through optimally informed international collaboration.