Applied Math Seminar

USNA Thursday Sept. 29, 12 noon, Room CH110

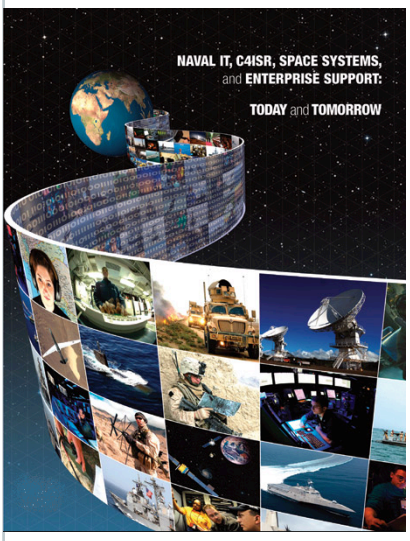
Speaker: Dr. James Wilson

USNA Class of 1965 and President of Jove Sciences Inc.

JOVE Sciences Inc.

Excellence in Oceanographic Sciences, Engineering and Professional Services

The Critical Role of Modern Mathematical Methods in Solving Real World Navy and Joint Forces Problems



Age of Information Overload

The Department of Defense has entered the "**Age of Information Overload"** and an era were there are fewer and fewer tactical warfighters to analyze an ever increasing amount of time critical data that must be assessed in near real time. The solution is automation of the tasks that the Naval operator can no longer perform manually, and the knowledge and application of modern mathematical methods is now essential and mandatory to accomplish DoD's missions.

This talk will first focus on numerous, very technical, mathematical based DoD problems that midshipmen will face immediately in the Fleet. In **ASW and USW** the submarine and surface threats have become acoustically very quiet and "EMCON Silent", and modeling shipping noise, wind noise, acoustic propagation, and other factors in the passive and active sonar equation accurately are now used with **Cloud Computers** in near real time to impact tactical decisions. The oceanography, bottom geology, and normal mode propagation in shallow water is an especially underdeveloped area, and are critical to **Special Forces Operations** in maritime denied areas. In Command Control Communications and Computers Intelligence, Surveillance and Reconnaissance **(C4ISR),** sensor and information (e.g., meta data) overload requires the use of trusted agents, such as Knowledge Based Inductive Learning (KBIL) along with multi sensor, multi INT real time data fusion to reduce the threat sensor to shooter time to prevent damage from WMD and other lethal weapons. An example of a ship track data fusion capability (called AquaQuIPS (AQ)) to detect "EMCON Silent" or dark contacts" is given to address this problem. Now a small RAM Dense computer and small Cloud Computer can be used by AQ at SPAWAR in San Diego to track all surface ships worldwide in real time. AQ data fuses Top Secret/SCI satellite sensors, tactical sensors (e.g. radar and AIS), and Unmanned Aerial System sensors (UAS), such as the MQ-9 Reaper and Triton, in real time.

Modern mathematical methods are..

also very important in a vast number of basic research areas that are too numerous to cover in one presentation. The presenter will select **Quantum Computing** as an example of basic research that shows great promise for future DoD applications. Most mathematicians that know the basics of Quantum Mechanics realize that we cannot fundamentally measure the spin of an electron or polarization of a photon with certainty, and it seems, at first, unlikely that a computer would benefit from using particles with uncertain properties to great advantage in computing. The presenter will show why **Quantum Computing** is on the verge of a breakthrough in DoD applications.

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