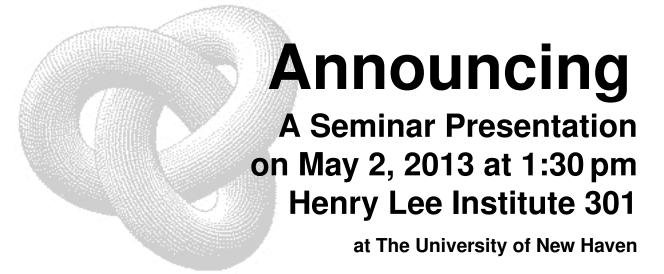
# **Lectures on Pure and Applied Math**



### Dr. Kenric Nelson

Principal Investigator, Advanced Tracking & Debris Mitigation Systems Architecture, Design & Integration Raytheon Integrated Defense Systems

## **Title: Information Theory for Complex Systems**

### **Abstract:**

Complex systems are characterized by nonlinear dynamics which create a mixture of ordered and disordered states. Linear systems can be modeled by separating the ordered and disorder states and because of the law of large numbers, the Gaussian distribution is a very good model of the disordered noise. In contrast nonlinear mixing between the deterministic and stochastic components of a system, shifts the character of the noise to distributions with slower than exponential decay. Pioneers such as Alfréd Rényi and Constantino Tsallis have demonstrated that a generalized entropy function can describe the wide-spread presence of these 'power-law' or 'heavy-tail' distributions in natural systems. Recasting their approach in terms of the degree of Nonlinear Statistic Coupling provides a mathematically symmetric and physically intuitive perspective on information theory for complex systems. Innovations arising from this approach include improved performance metrics for decision systems and new approaches to information fusion.

#### **Further Information**

Refreshments are served from 1:20 pm until 1:30 pm.