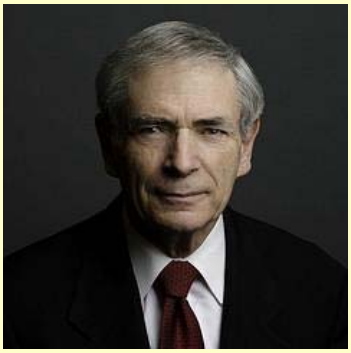
2016 MICHALIK LECTURE



J. Tinsley Oden is Associate Vice President for Research, Cockrell Family Regents' Chair in Engineering No. 2, Peter O'Donnell Jr. Centennial Chair in Computing Systems, and the founding Director of the Institute for Computational Engineering and Sciences at The University of Texas at Austin. His research is on the mathematical theory and implementation of numerical methods applied to problems in linear and nonlinear solid and fluid mechanics. Dr. Oden has authored over 600 scientific publications and has authored or edited 56 books. He is a recipient of numerous awards, including a member of the U.S. National Academy of Engineering, a Fellow of the American Academy of Arts and Sciences, an Honorary Member of the American Society of Mechanical Engineers, the Theodore von Karman Medal, the John von Neumann medal, and the Newton/Gauss Congress Medal.

4:00 P.M.
Friday,
September 23, 2016

Ballroom,
O'Hara Student Center

Free and Open to the Public

UNIVERSITY OF PITTSBURGH
The DIETRICH School of Arts & Sciences

The University of Pittsburgh Department of Mathematics

Presents

The Edmund R. Michalik Distinguished Lecture in the Mathematical Sciences

J. Tinsley Oden

Institute for Computational Engineering and Sciences
The University of Texas Austin

Foundations of Predictive Computational Science: Selection and Validation of Models of Complex Systems in the Presence of Uncertainty

Interest in a subject some call predictive computational science has emerged in recent years, mainly because of dramatic advances in computers and computational science. These advances have pushed computer modeling from a qualitative endeavor to a quantitative science in which specific predictions are sought as a basis for important, sometimes life and death, decisions: climate change, predictive medicine, design of new materials, drug design, manufacturing processes, and many other subjects. What has fueled concerns about computer predictions, and led to the study of predictive computational science, is their reliability. What factors determine the reliability of computer predictions, particularly in the presence of inevitable uncertainties? How can one quantify the uncertainty in computer predictions when every phase of the prediction process faces often confounding uncertainties: in observational data, in model selection, in model parameters, and in targeted quantities of interest?

This lecture presents an introduction to mathematical, statistical, and philosophical issues underlying computer predictions in the presence of uncertainties. It is argued that a Bayesian approach provides the most logical setting for addressing these issues, complimented with tools from information theory. We describe OPAL-the Occam Plausibility Algorithm, as an adaptive approach to model selection and validation. The process of selection, calibration, validation, and implementation of models of tumor growth and effects of cancer treatments is described as a canonical example of an application of principles of predictive science.

Reception Immediately Following the Lecture

This public lecture is part of an annual series in honor of Professor Edmund R. Michalik, established through a gift from the Michalik family.

For further information, email: **math@pitt.edu**
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