HAROLD J GAY
LECTURE SERIES

PDEs and Fractals

Douglas N. Arnold

Institute for Mathematics and its Applications
University of Minnesota

The Geometrical Basis of Numerical Stability

Monday, 4:00 pm
February 26, 2007
Bartlett Center

ABSTRACT The accuracy of a numerical solution to a partial differential equation depends on the consistency and stability of the discretization method. While consistency is usually elementary to establish, stability of numerical methods can be subtle, and for some key PDE problems the development of stable methods is extremely challenging. After illustrating the situation through simple but surprising examples, we will describe a powerful new approach—the finite element exterior calculus—to the design and understanding of discretizations for a variety of elliptic PDE problems. This approach achieves stability by developing discretizations that are compatible with the geometrical and topological structures, such as de Rham cohomology and Hodge decompositions, which underlie well-posedness of the PDE problem being solved.

Geometry with its applications has been at the heart of the development of partial differential equations and boundary value problems since the very beginning. In physics, biology, economics, and other applied fields, a variety of new problems are now emerging that display unusual geometrical, analytical and scaling features, possibly of fractal type. The objective of these lectures is to acquire the view of outstanding mathematicians on the subject of differential equations and fractals, and their developments and applications, in a broad perspective encompassing both classical highlights and contemporary trends.

Sponsored by WPI and hosted by the Department of Mathematics
Coffee and tea available one half hour before lecture time
Participation of faculty and students is most welcome

www.wpi.edu/+Math/News/lectureseries.html