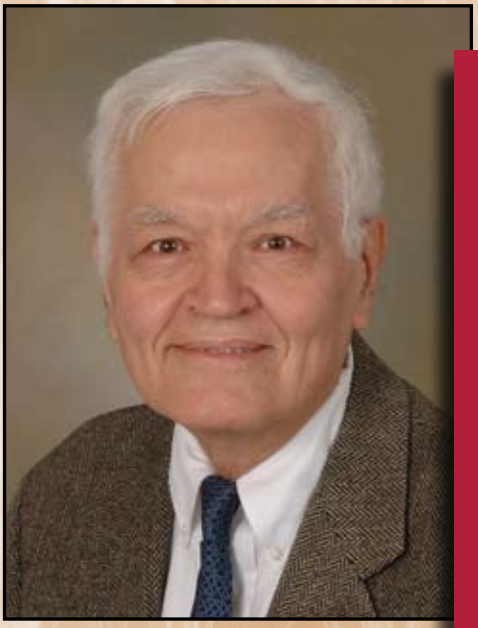
Center for Applied Mathematical Sciences Distinguished Lecture



Speaker:
James Glimm
SUNY at Stony Brook

James Glimm is the Distinguished Professor in the department of Applied Mathematics and Statistics at SUNY at Stony Brook. He received his BA in engineering and his PhD in mathematics from Columbia University. His research interests include quantum field theory, partial differential equations, scientific computing, numerical analysis, fluid dynamics and mathematical biology. He is a member of the National Academy of Sciences and the American Academy of Arts and Sciences. He was awarded the National Medal of Science in 2002. From 2007 to 2009 he served as President of the American Mathematical Society.

Mathematical and Numerical Principles for Turbulent Mixing

Abstract: Turbulent mixing is an important aspect of a number of practical problems, often combined with combustion or some other reaction. Due to the importance of this problem, considerable effort has been invested in verification (mathematical correctness of numerical solutions) and validation (correctness and applicability of the equations to be solved). A standard test problem of this class is Rayleigh-Taylor mixing, the problem of a heavy fluid over a light one, mixing under the acceleration force of gravity.

We present a clear solution to many of the mysteries associated with this problem, and we correct a number of common and widespread errors made in previous attempts to solve it. Due to the small values of physical viscosity and mass diffusion, these quantities are often approximated by zero. However their ratio, the Schmidt number, is then 0/0, i.e. indeterminant. Since the mixing rate depends on the Schmidt number, the mixing rate, so modeled, is also indeterminant.

We present a practical computational algorithm to resolve 0/0, to obtain mesh converged solutions which agree with experiments. In addition to the overall mixing rate, we return to the original motivation for this problem, and consider chemical reaction rates, which, in our approach are also convergent, without use of any model, other than the turbulence models used for viscosity and mass diffusion.

Monday, March 22, 2010
University of Southern California
Ethel Percy Andrus Gerontology Center
Leonard Davis Auditorium

Reception: 3:30 p.m. - 4:00 p.m.
Lecture: 4:00 p.m. - 5:00 p.m.

CAMS Director:
Susan Friedlander
susanfri@usc.edu

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