

## **A Nonlocal Vector Calculus with Application to Nonlocal Boundary Value Problems**

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Mathematics  
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**Date :** 24 July 2009 (Friday)  
**Time :** 3.30 pm – 4.30 pm  
**Venue:** SPMS-Executive Classroom 1, MAS-03-06  
School of Physical and Mathematical Sciences

We develop a calculus for nonlocal operators that mimic Gauss' theorem and the Green's identities of classical vector calculus. The operators we treat do not involve derivatives. We then apply the nonlocal calculus to define variational formulations of nonlocal "boundary" value problems that mimic the Dirichlet and Neumann problems for second-order scalar elliptic partial differential equations. For the nonlocal variational problems, we show how one can derive existence and uniqueness results and also how, under appropriate limits, they reduce to their classical analogs. Although we do not report on this in this talk, the results are easily extended to vector elliptic equations, and in particular, to the peridynamics model for materials.

### **Speaker Biography**

Prof. Max Gunzburger received his B.S (1966), M.S.(1967) and Ph.D.(1969) in New York University. He is currently a Francis Eppes Distinguished Professor of Mathematics at Florida State University and serves as the Chair of the Department of Scientific Computing. He was the 2008 winner of the SIAM W.T. and Idalia Reid Prize in Mathematics. Prof. Gunzburger served as the Editor-in-Chief of the SIAM Journal on Numerical Analysis from 2000-2007. He also served as the Chairman of the Board of Trustees of SIAM in 2003 and has held various positions at SIAM. His seminal research areas include flow control, finite element analysis, superconductivity and voronoi tessellations. He has also made great contributions in the areas of aerodynamics, materials, acoustics, climate change, groundwater, image processing and risk assessment.

Host: Prof. Wang Desheng, Division of Mathematical Sciences, School of Physical and Mathematical Sciences

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