COMMUN. MATH. SCI.
Vol. 13, No. 3, pp. I–II
© 2015 International Press

PREFACE

George Papanicolaou was born on January 23rd, 1943 in Athens, Greece. He received his PhD in Mathematics from the Courant Institute at New York University in 1969, and spent the first part of his career there as Assistant Professor (1969-1973), Associate Professor (1973-1976) and Professor (1976-1993). He was the Director of the Division of Wave Propagation and Applied Mathematics at Courant from 1979 till 1993. He moved to Stanford University in 1993, and has held the Robert Grimmett Professor of Mathematics chair since 1997.

George was a visiting member at many institutions including INRIA, France (1975-1976), the Institute for Advanced Studies, Princeton (1990-1992), Tel Aviv University (2002), Caltech (2003-2004), Institute for Advanced Study at Hong Kong University of Science and Technology (2008) and the Institut des Hautes Etudes Scientifiques, France (2010). He was a Sloan Fellow (1974-1976), a John Simon Guggenheim Fellow (1983-1984), a plenary speaker at the International Congress of Mathematicians (1998), the International Congress of Industrial and Applied Mathematics (2003), the German Mathematical Union (2004) and numerous international conferences. In 2000 he became a member of the U.S. National Academy of Sciences and a fellow of the American Academy of Arts and Sciences. He holds an Honorary Doctor of Science at the University of Athens since 1987, an Honoris Causa Doctorate from the University Paris-Diderot in 2011, and is the recipient of the SIAM von Neumann Prize (2006), the William Benter Prize in Applied Mathematics (2010), and the Josiah Willard Gibbs Lectureship of the American Mathematical Society (2011).

With his deep and far reaching scientific contributions, George has been very influential in the evolution of the field of Applied Mathematics over the last forty five years. He is internationally renowned for his research on probabilistic theory and modeling across a wide spectrum of areas including fluid dynamics, optics, material science, imaging, communications and mathematical finance. George realized early on the importance of multi-scale complexity of media arising in these fields and developed a stochastic framework that leads to rigorous mathematical treatment of a variety of important phenomena. His research demonstrates his view of Applied Mathematics, where quantitative modeling, analysis, computations and the interpretation of results go hand in hand in order to have an impact on real problems.

In general terms, much of George's work starts with a characterization of randomness that is specific to a medium or system, derives rigorously its significant predictable

effects on physical processes such as wave motion, diffusion or behavior of financial markets, and then uses the theory as well as numerics to study relevant questions for applications. The theory of homogenization is a great example of how sophisticated mathematical analysis can contribute to concrete applications in the study of composite materials. Among others, his collaboration with Raghu Varadhan at the Courant Institute or with Alain Bensoussan and Jacques-Louis Lions of the French school, has led to seminal and now classical publications in this large and still growing field. George has invested a good part of his research career in the multiscale analysis of stochastic equations which describe wave propagation in random media. Among others, his paper *Frequency content of randomly scattered signals* with Mark Asch, Werner Kohler, Marie Postel and Ben White, SIAM Review, 33, (1991), has played a crucial role in the research of a new generation of applied mathematicians. Many results that stemmed from this paper have been collected in his book *Wave Propagation and Time Reversal in Randomly Layered Media* with Jean-Pierre Fouque, Josselin Garnier, and Knut Solna, Springer, 2007. During the last fifteen years, George has been leading the way in the development of a new imaging methodology in random media. Imaging algorithms like Coherent Interferometry (CINT) obtained in collaboration with Liliana Borcea and Chrysoula Tsogka, and correlation based imaging with Josselin Garnier, have been introduced and have been put in a clear mathematical framework, and a new resolution theory has emerged including the important concept of statistical stability. In parallel, George and his collaborators have developed over the last ten years an original multi-time-scale approach for pricing and hedging financial instruments in the context of stochastic volatility. These results are collected in his recent book *Multiscale Stochastic Volatility for Equity, Interest Rate, and Credit Derivatives* with Jean-Pierre Fouque, Ronnie Sircar and Knut Solna, Cambridge University Press, 2011. Currently, George is also interested in problems of propagation of uncertainty and systemic risk.

George has been the mentor and role model for a large number of PhD students and postdoctoral fellows. He has organized remarkable programs such as the five year Mathematical Geophysics Summer Schools (1998-2002) that brought together scientists from a variety of disciplines and marked the beginning of the recent developments in imaging in random media. He has also lectured in numerous Summer Schools and Workshops that have attracted many young scientists to his vibrant area of research. George's enthusiasm and love of Mathematics is infectious, and his generosity as a teacher, adviser, mentor and colleague is remarkable. We dedicate this special issue to him, with our profound gratitude.

Liliana Borcea
Jean-Pierre Fouque
Shi Jin
Lenya Ryzhik
Jack Xin