Selected Recent Publications of George Papanicolaou

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Research interests.
In the past I have been interested in waves and diffusion in inhomogeneous or random media and in the mathematical analysis of multi-scale phenomena that arise in their study. Applications come from electromagnetic wave propagation in the atmosphere, underwater sound, waves in the lithosphere, diffusion in porous media, etc. I have studied both linear and nonlinear waves and diffusion, in both direct and inverse problems. I am now working on assessing multiple scattering effects in imaging and communication systems, especially when time reversal arrays are used.

Another recent interest is financial mathematics, the use of asymptotics for stochastic equations in analyzing complex models of financial markets and in data analysis.

Over 200 published papers and four books, including the following more recent publications.

Books:
"Multiscale Stochastic Volatility for Equity, Interest-Rate and Credit Derivatives" by Jean-Pierre Fouque, George Papanicolaou , K. Ronnie Sircar and Knut Solna, Cambridge University Press, 2011.
"Wave Propagation and Time Reversal in Randomly Layered Media" by J.-P. Fouque, J. Garnier, G. Papanicolaou and K. Solna, Springer, 2007.
"Derivatives in Financial Markets with Stochastic Volatility" by Jean-Pierre Fouque, George Papanicolaou and K. Ronnie Sircar, Cambridge University Press, 2000.

Selected publications in the last ten years:
"Detection and imaging in strongly backscattering randomly layered media", (with R. Alonzo, L. Borcea and C. Tsogka). Inverse Problems, Volume 27 (2011) 025004, 43pp.
"Array imaging using intensity-only measurements", (with A. Chai, and M. Moscoso). Inverse Problems, Volume 27 (2011) 015005, 16pp.
"Resolution analysis for imaging with noise", (with Josselin Garnier). Inverse Problems, 26 (2010) 074001 (22pp).
"A universal filter for enhanced imaging with small arrays", (with Liliana Borcea, Thomas Callaghan and Josselin Garnier). Inverse Problems, vol 26 (2010) 015006, 29pp.
"Filtering random layering effects in imaging", (with Liliana Borcea, F. Gonzalez del Cueto and Chrysoula Tsogka). SIAM Journal on Multiscale Model. Simul. Vol 8 (2010) pp. 751-781.

"Fine scale uncertainty in parameter estimation for elliptic equations", (with J. Nolen). Inverse Problems, 25, (2009), 115021 (22pp).

"Passive Sensor Imaging Using Cross Correlations of Noisy Signals in a Scattering Medium", (with Josselin Garnier). SIAM J. Imaging Sci. Volume 2, Issue 2, pp. 396-437 (2009).

"Spatial focusing and intersymbol interference in multiple input single output time reversal communication systems", (with A. Kim, P. Kyritsi, P. Blomgren). IEEE J. Ocean Engineering, 33, (2008), 341-355.

"Edge illumination and imaging of extended reflectors", (with Liliana Borcea and Fernando Guevara Vasquez). SIAM Journal on Imaging Sciences, vol 1 (2008), pp. 75-114.

"Identification of Green's Functions Singularities by Cross Correlation of Noisy Signals", (with Claude Bardos and Josselin Garnier). Inverse Problems, vol 24 (2008), 015011 (26pp).

"Market Influence of Portfolio Optimizers", (with Suhas Nayak). Applied Mathematical Finance, 15, (2008), pp 21-40.

"A Framework for Adaptive Multiscale Methods for Elliptic Problems", (with J. Nolen and O. Pironneau). SIAM Journal on Multiscale Modeling and Simulation, 7, (2008), pp. 171-196.

"Optimal illumination and waveform design for imaging in random media", (with Liliana Borcea and Chrysoula Tsogka). Journal of the Acoustical Society of America, vol 122 (2007), pp. 3507-3518.

"Adaptive interferometric imaging in clutter and optimal illumination", (with Liliana Borcea and Chrysoula). Inverse Problems, vol 22 (2006), pp. 1405-1436.

"Coherent Interferometric Imaging", (with Liliana Borcea and Chrysoula Tsogka). Geophysics, vol 71 (2006), pp. S1165-S1175.

"Boundary layers for cellular flows at high Peclet numbers", (with Alexei Novikov and Lenya Ryzhik). Comm. Pure and Appl. Mathematics, Vol. LXIII, (2005), pp. 867-922.

"Maturity cycles in implied volatility", (with Jean-Pierre Fouque, K. Ronnie Sircar and K. Solna). Finance and Stochastics, 8, (2004), pp. 451-477.

"Statistical stability in time reversal", (with Leonid Ryzhik and Knut Solna). SIAM J. on Appl. Math., vol 64 (2004), pp. 1133-1155.

"Theory and applications of time reversal and interferometric imaging", (with Liliana Borcea and Chrysoula Tsogka). Inverse Problems, vol 19, (2003), pp. 5139-5164.

"Super-Resolution in Time-Reversal Acoustics", (with P. Blomgren and H. Zhao). Journal of the Acoustical Society of America, vol 111, (2002), pp. 230-248.

"Self-focusing in the perturbed and unperturbed nonlinear Schrödinger equation in critical dimension", (with G. Fibich). SIAM Journal on Applied Mathematics 60, (2000), pp. 183-240.