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Gang Bao, Chair Professor ("One Thousand Talent Program"), 2010-present and Dean of the School of Mathematical Sciences at Zhejiang University. After his PhD degree at Rice University in 1991, he was a Research Associate at Rice University and the IMA, University of Minnesota (1991-1994), Assistant and Tenured Associate Professor at University of Florida (1994-1999), and Full Professor at Michigan State University (1999-2014). He was the Founding Director of the Michigan Centre for Industrial and Applied Mathematics at Michigan State University (2006-2014). A recipient of the Feng Kang Prize on Scientific Computing in 2003 and the MSU University Distinguished Faculty Award in 2007, and elected SIAM Fellow in 2016, Dr. Bao's research interests include inverse problems for partial differential equations; mathematics and computation of diffractive optics, nonlinear optics, nano-optics, and electromagnetics. He has published over 150 papers in leading research journals including J. Ameri. Math. Soc.， Arch. Rational Mech. Anal., J. Math. Pures Appl., Trans of AMS, Math. Comp., as well as Nature Nanotechnology. Dr. Bao is currently on the editorial boards of over 10 international research journals on mathematics including SIAM J. Appl. Math, SIAM J. Numer. Anal., J. Differential Equations, Inverse Problems, Inverse Problems and Imaging, and DCDS B.

Title: Recent Developments of Inverse Scattering Problems in Wave Propagation

Abstract: Inverse scattering problems arise in diverse application areas, such as nondestructive testing, seismic imaging, near-field and nano optical imaging, and medical imaging. A model scattering (direct) problem is concerned with a given wave incident on a medium enclosed by a bounded domain. The problem is to determine the scattered field or the energy distribution for the known scatterer. The inverse problem is to determine the scatterer from the boundary measurements of the fields. Although this is a classical problem in mathematical physics, mathematical issues and numerical solution of the inverse problem remain to be challenging since the problem is highly nonlinear, large and multi-scale, and most of all ill-posed! The severe ill-posedness has thus far limited in many ways the scope of inverse problem methods in practical applications. It also presents a fresh source of exciting problems in mathematical modeling, analysis, and computation.

In this talk, the speaker will first introduce several inverse scattering problems of broad interest and discuss recent developments in the mathematical and computational studies of the problems. Of particular importance are inverse medium problems, inverse source problems, and inverse obstacle problems for acoustic and electromagnetic waves. Based on multi-frequency data and the uncertainty principle, effective computational and mathematical approaches will be presented for overcoming the ill-posedness of the inverse problems. Selected mathematical and computational results will be highlighted. In addition, recent stability results for inverse scattering problems in elasticity will also be presented. The talk will be concluded by remarks on related topics and open problems.