

# Distinguished Colloquium Series

## Partial Differential Equations of Mixed Type: Analysis and Connections

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### Abstract

Three of the basic types of linear partial differential equations (PDEs) are elliptic, hyperbolic, and parabolic, following the classification for linear PDEs proposed first by French Mathematician Jacques Hadamard in the 1920s. Since then, linear theories of PDEs of these types have been considerably better developed. On the other hand, many nonlinear PDEs arising in Mathematics and Science naturally are of mixed type, especially mixed elliptic-hyperbolic type. The solution of some longstanding fundamental problems greatly requires a deep understanding of such nonlinear PDEs of mixed type. Important examples include shock reflection/diffraction problems in fluid mechanics (the Euler equations) and isometric embedding problems in differential geometry (the Gauss-Codazzi-Ricci equations), among many others. In this talk, we will present some old and new underlying connections of nonlinear PDEs of mixed type with the longstanding fundamental problems and will then discuss some recent developments in the analysis of these nonlinear PDEs through the examples with emphasis on developing/identifying unified approaches, ideas, and techniques for dealing with the mixed-type problems. Further trends, perspectives, and open problems in this direction will also be addressed.

### Short Bio

Gui-Qiang Chen is the Statutory Professor in the Analysis of PDEs, Director of the Oxford Centre for Nonlinear PDEs, and Professorial Fellow of Keble College, University of Oxford, as well as Life Member of Clare Hall, University of Cambridge. His main research areas lie in PDEs, nonlinear analysis, and their connections/applications to mechanics, geometry, and other areas of mathematics and science. He is the Fellow of the European Academy of Sciences, Fellow of the American Mathematical Society, Fellow of the Institute of Mathematics and its Applications (FIMA), Turner-Kirk Fellow of the Isaac Newton Institute for Mathematical Sciences, SIAM Fellow, the 2011 SIAG/Analysis of Partial Differential Equations Prize, Royal Society Wolfson Research Merit Award, and Alfred P. Sloan Foundation Fellow etc.

**Date: Friday, April 22, 2022**

**Time: 12:00-1:00 pm CT**

**Zoom: <https://utrgv.zoom.us/j/87563104950>**

**For further information or for special accommodations, please contact Dr. Alexey Glazyrin via email [alexey.glazyrin@utrgv.edu](mailto:alexey.glazyrin@utrgv.edu) and Dr. Zhaosheng Feng via email [zhaosheng.feng@utrgv.edu](mailto:zhaosheng.feng@utrgv.edu)**