Math Colloquium

Nevanllina-Herglotz functions and effective properties of composite materials with microstructure

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4:30 PM
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It has been a long quest in mathematical material sciences to study the relation(s) between microstructure and various effective properties of composite materials. The class of methods based on Nevanllina-Herglotz functions was pioneered in physics by David Bergman and further developed mathematically by Grame Milton, Ken Golden, Elena Cherkaev and many others in the context of using this method to find bounds for effective properties for given constituents with constraints on volume fractions or on microstructural symmetries. The key in this class of method is the Integral representation formula (IRF) of a Nevanllina-Herglotz function or its 'cousins'.

In this talk, a brief review of the history of the method will be given. A detailed explanation of the recent development on the IRF for the viscodynamic operator of poroelastic media will also be presented. Finally, the implication of this method in handing the memory term in solving the wave equations will be made clear with numerical examples.

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