

# ***Computational and Applied Math Seminar (CAM)***

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**Wednesday, April 4, 2012  
10:00 a.m., HH3017**

***Global optimization and Bayesian inversion for finding  
effective elasticity tensors***

## **Abstract:**

Given a generally anisotropic tensor that represents a material, we wish to estimate its relations to the remaining seven symmetries of a Hookean solid. Such relations allow us to infer information about properties of the material in question, such as its layering or fractures. We consider the Frobenius norm to find the closest tensors that belong to particular symmetries. The distance between an elasticity tensor and a given symmetry class is obtained by finding the orientation that minimizes the distance function. The necessity of performing a search under all orientations leads to a highly nonlinear problem. We use the particle-swarm-optimization method (PSO) as a global optimization strategy, since it does not require any internal parameter tuning, as do other metaheuristic methods, such as a genetic algorithm. In the analyzed problem, there is no unique global minimum. Several rotations result in the shortest distance to a given symmetry. A single PSO run does not address this issue. Only one solution is returned; it is randomly chosen among equivalent solutions. To obtain information about distribution of solutions, other methods must be used, such as the Bayesian inversion.