This Spring ('10) the Math Department offers the graduate course…

MATH 648M: Advanced Analytic Methods with Applications

TuTh 12:30-1:45pm, Rm Math 1311

Instructor: Doron Levy (***dlevy@math.umd.edu***)

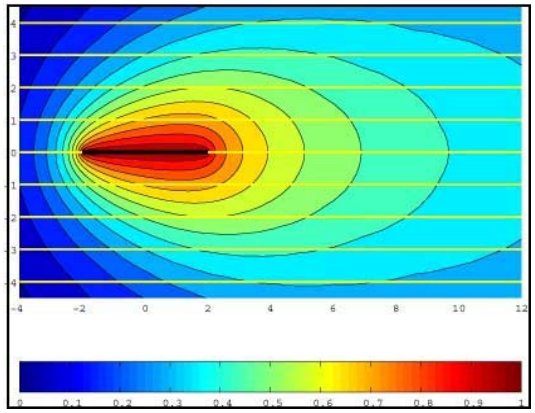

FIG. 1: Temperature around a plate (red: hot, to blue: cold). This can be derived by asymptotics to a PDE.

FOCUS: *Concepts* and analytical *tools* used in various scientific disciplines. *Applications* from condensed matter physics, fluid and solid mechanics, materials science, quantum mechanics, biology, number and probability theory.

TOPICS: PART I: ASYMPTOTICS: Asymptotics and perturbations for Ordinary & Partial Differential Eqs. (ODE's & PDE's) and difference eqs: WKB analysis; boundary layers; homogenization theory; multiscale expansions.

PART II: STOCHASTIC TOOLS: Review of probability theory. Brownian motion. Monte Carlo methods. Langevin & Fokker-Planck eqs. Stochastic ODE's, PDE's. Methods of statistical mechanics. Mori-Zwanzig formalism. Renormalization. Model reduction. Relations of **II & I**: Stochastic processes & homogenization.

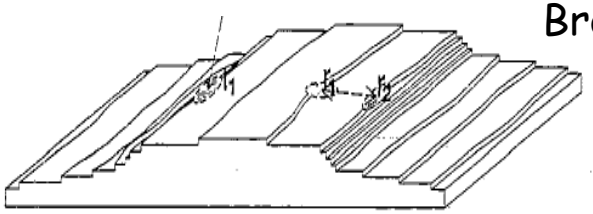

FIG. 2: Line defects (steps) on crystal surfaces fluctuate. Their motion is described by stochastic ODE's.

(Jeong & Williams, **Surf.Sci. Rep**. 1999)

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