

## Fall Colloquium Series

### Degenerate diffusion in heterogeneous porous media with vanishing viscosity

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#### Abstract:

In this talk, I will present some recent results on the long-time behavior of non-negative solutions to the Cauchy problem for the Porous Medium Equation in the presence of variable density vanishing at infinity. Of concern is the problem

$$(P) \begin{cases} \rho(x)\partial_t u = \Delta u^m & \text{in } Q := R^n \times R_+ \\ u(x, 0) = u_0(x) & \text{in } R^n \end{cases}$$

where we assume  $m > 1$ ,  $n \geq 3$ , and  $\rho(x)$  is positive, smooth, and has a power-like decay at infinity. The data  $u_0$  are assumed to be non-negative and such that

$$\int_{R^n} \rho(x)u_0(x)dx < \infty.$$

Main results: The behavior of solutions depends on the power of decay. In one regime, the asymptotic behavior is described in terms of a one-parameter family of source-type, self-similar solutions of a related singular problem (so called Barenblatt-type solutions), thus representing a natural extension of the corresponding result for the standard PME. In the second regime, however, solutions to (P) have a universal long-time behavior in separate variables, typical of initial-boundary problems on bounded domains. Thus, the presence of a rapidly decreasing density has the effect of “compactifying” the domain.

Wednesday, November 19, 3:05 - 3:50pm in 3-2643