

Self-similar fast-reaction limits of reaction-diffusion systems with nonlinear diffusion

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This talk is concerned with the characterisation of fast-reaction limits of systems with nonlinear diffusion, when there are either two reaction-diffusion equations or one reaction-diffusion equation and one ordinary differential equation, on unbounded domains. The ideas used extend previous results in the linear diffusion case and show that in the fast-reaction limit, spatial segregation leads to the two components of the original systems each converging to the positive and negative parts of a self-similar limit profile that satisfies one of four ordinary-differential systems. The position of the free boundary separating where such self-similar profiles are positive from where they are negative provides information on the rate of penetration of one substance into the other and for specific forms of nonlinear diffusion, some results will be presented on the relationship between the form of the nonlinear diffusion and the position of this free boundary. This is joint work with Yini Du.