SIGEST

This issue's SIGEST paper, "Chemical Reactions as Γ-Limit of Diffusion," by Mark A. Peletier, Giuseppe Savaré, and Marco Veneroni, is an update of their paper "From Diffusion to Reaction via Γ-Convergence" from the *SIAM Journal on Mathematical Analysis*. The work uses advanced ideas from measure theory to connect macroscale chemical reactions, the ones you see in a test tube, to a limit of a molecular (micro)scale diffusion processes.

The macroscale reactions of interest in this paper are "unimolecular," $A \rightleftharpoons B$. The meaning of this is that A and B are two forms of the same molecule and one can convert to the other. One can express the reaction between the two forms with a reaction diffusion equation, which you may have seen in an elementary course in applied partial differential equations. The microscale or molecular problem is very different. Here we think of A and B as the endpoints of the domain of an continuous "chemical variable." The chemical variable is the *independent variable* in the microscale equation for a probability distribution. This microscale equation is the Kramers–Smoluchowski diffusion equation, which is parabolic. The authors show that for reactions like $A \rightleftharpoons B$, the classical reaction-diffusion equations are a singular limit of the microscale equations.

The authors have completely rewritten the introduction for *SIAM Review*, and the new introduction is a delight. In four pages they walk the reader through much of the technical background and preview the analysis to come. With this background, one can appreciate the discussion of the models and the statements of the two main theorems.

This paper is a fine example of how hard analysis contributes to our understanding of multiscale phenomena.

The Editors