The Mathematical Theory of Diffusion and Reaction in Permeable Catalysts. By RUTHERFORD ARIS. Clarendon Press, Oxford, England, 1975. Vol. 1: *The Theory of the Steady State*, xvi + 444 pp., $39.50; Vol. 2: *Questions of Uniqueness, Stability, and Transient Behavior*, xiv + 217 pp., $25.75.

This two-volume set is a first-rate treatment of several wide and diverse areas which both classically and very much at the present time occur naturally within the realms of chemical reactor and chemical reaction theory. The author has done an admirable job in achieving his central objective of bringing together "in a convenient form the many results on the theory of diffusion and reaction that are now scattered through the literature of chemical engineering, applied mathematics and biophysics."

Mathematically, the entire two volumes revolve around various considerations of reaction-diffusion systems, that is, systems of the form

$$U_t = LU + F(U),$$

where U is a vector, L is a uniformly elliptic operator, and F is a nonlinear function (called the rate function, reaction rate or chemical kinetics) which is explicitly stated for each class of problems considered. Certain preliminary necessary concepts and quantities are introduced briefly in Chapter 1, together with brief sections on the early history of the various problems and an outline of selected experimental work. The general equations of motion with boundary and initial conditions, together with explicit specializations to most of the problems later considered, are very carefully derived in Chapter 2. Chapters 3, 4 and 5, comprising the rest of Volume 1, consist of studies of successively more difficult special problems concerning steady state solutions.

Volume 2 consists of Chapters 6, 7 and 8 and deals with the more difficult mathematical questions of existence, uniqueness, bifurcation, multiplicity, stability and control. In particular, Chapters 7 (*The stability of the steady state*) and 8 (*Some features of the transient behavior of diffusing and reacting systems*) bring one to the very forefront of current research considerations in these areas.

The author has succeeded admirably in assembling and presenting the problems and results in a field currently under such intensive investigation. Simply because things are so rapidly developing, no topic or problem is treated completely, and it is sometimes difficult to get any sort of comprehensive picture of what is going on even in the specific problem being considered. Nevertheless, one can very quickly and efficiently approach the current research status of the problems considered by combining the material presented with the previous theories and results which are nicely exposed by the author's bibliographical comments at the end of each chapter and the incredibly complete list of references. Particularly welcome is the well-balanced coverage and treatment of the mathematical and the engineering and physics approaches and literature. This is an excellent contribution to the general field of research which, broadly speaking, considers diffusion and reactions.

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