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Sommario/riassunto

The book provides a self-contained and complete description of the long time evolution of the solutions to a class of one-dimensional reaction–diffusion equations, in which the diffusion is given by an integral operator. The underlying motivation is the mathematical analysis of models for biological invasions. The model under study, while simple looking, is of current use in real-life situations. Interestingly, it arises in totally different contexts, such as the study of branching random walks in probability theory. While the model has attracted a lot of attention, and while many partial results about the time-asymptotic behaviour of its solutions have been proved over the last decades, some basic questions on the sharp asymptotics have remained unanswered. One ambition of this monograph is to close these gaps. In some of the situations that we envisage, the level sets organise themselves into an invasion front that is asymptotically linear in time, up to a correction that converges exponentially in time to a constant. In other situations that constitute the main and newest part of the work, the correction is asymptotically logarithmic in time. Despite these apparently different behaviours, there is an underlying common way of thinking that is underlined. At the end of each chapter, a long set of problems is proposed, many of them rather elaborate and suitable for master's projects or even the first question in a PhD thesis. Open questions are also discussed. The ideas presented in the book apply to more elaborate systems modelling biological invasions or the spatial propagation of epidemics. The models themselves may be multidimensional, but they all have in common a mechanism imposing the propagation in a given direction; examples are presented in the problems that conclude each chapter. These ideas should also be useful in the treatment of further models that we are not able to envisage for the time being. The book is suitable for graduate or PhD students as well as researchers. .