EMERGENCE OF LARGE DENSITIES IN CHEMOTAXIS SYSTEMS

Michael Winkler
Paderborn University, Warburger Str. 100, 33098 Paderborn, Germany
michael.winkler@math.upb.de

In mathematical biology, chemotaxis terms partially oriented movement of individuals - usually of single cells - along gradients of a chemical signal substance. Experimental findings report striking effects of such chemotactic migration, inter alia phenomena of self-organization such as spatial aggregation. A prototypical class of models for the description of such chemotactic dynamics, consisting of two parabolic equations with a cross-diffusive term as its most characteristic ingredient, was proposed by Keller and Segel in 1970 already and intensively discussed since then in the mathematical literature. Fundamental qualitative questions, however, particularly concerning the spontaneous emergence of large densities and cell aggregates, could only be answered satisfactorily in the context of simplified systems for a long time. The presentation aims at reporting traditional as well as some more recent developments, with a particular focus on mathematical methods of detecting phenomena related to the occurrence of singular solution behavior, inter alia in the extreme sense of finite-time blow-up.