Cross-diffusion systems: from spin semiconductors to biological populations with stochastic forcing

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Many real-world applications consist of multiple components, leading on the macroscopic scale to cross-diffusion systems which consist of strongly coupled parabolic equations. The applications may be very diverse and range from spin-polarized transport in semiconductors and ion transport in cell membranes to population dynamics. In this talk, some existence results for global-in-time weak solutions are proven, based on entropy methods. This technique was already used by Herbert Gajewski, and we detail some of his ideas to prove the large-time behavior and uniqueness of weak solutions, followed by some extensions like boundedness-by-entropy and martingale solutions to stochastic cross-diffusion systems.

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