Stochastic modelling of reaction, diffusion and taxis processes in biology

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Many cellular and subcellular biological processes can be described in terms of diffusing and chemically reacting species (e.g. genes and proteins). Several stochastic simulation algorithms suitable for the modelling of such reaction-diffusion processes will be analysed.

The movement of unicellular organisms can be also viewed as a stochastic process - a biased random walk. Examples include chemotaxis of bacteria or amoeboid cells and in both cases, cells detect extracellular signals (attractants or repellents) and alter their behaviour accordingly. The corresponding macroscopic partial differential equations describing the behaviour of cellular populations will be derived.