



Arctic Breeze

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The research story

Many bacteria are capable of sensing changes in the concentration of chemical substances. They use this capability to move towards nutrient sources or away from toxic substances – a process called chemotaxis. Cells of higher organisms can also detect in which direction a concentration increases, simply by comparing the concentrations at different positions of the cell membrane. But bacteria are much smaller, and concentrations at opposite cell ends do not differ much. Bacteria of the type *Escherichia coli* therefore use a type of “sensory memory”. Hereby, a chemical signaling system inside the cell stores information about past concentrations. While swimming they compare the past value to the present concentration and decide if the direction is favorable. The chemotaxis system of *E. coli* bacteria is one of the simplest and best understood model systems – both on the experimental as well as on the theoretical side.

The image

In a study we investigated how a population of *E. coli* bacteria moves in a one-dimensional domain in which nutrients are constantly produced and consumed by the bacteria. Starting from a homogeneous distribution the bacteria accumulated in some region of the domain, reduced the concentration of the nutrients and then moved collectively to another domain. While the bacteria were feeding at one position, the nutrients in the deserted area were restored, and then attracted the population again. The image shows the distribution of the bacteria in the one-dimensional domain and its temporal dynamics.

