

Life in crowded conditions

Stefan Klumpp

University of Goettingen, Friedrich-Hund-Platz 1, 37077 Göttingen, Germany

The interior of cells is densely packed with macromolecules. These crowded conditions affect the fundamental processes of life in a variety of ways, some of which are specific to certain molecules and some of which are generic. The generic effects of crowding are a slowing of diffusion and a shift of binding equilibria towards the bound states. In combination, these effects can already result in rather complex phenomena. As examples, I will discuss the search of DNA-binding proteins such as transcription factors for their binding sites on the genome and the folding of proteins. Beyond excluded volume, crowding in cells may also involve nonspecific attractive interactions and interactions with active processes, increasing the complexity further. These effects will also be discussed. The latter type of scenario, where processes occur in a dense suspension of active particles can also describe phenomena on a larger scale, such as dense systems of cells in tissues and biofilms.