

Fluorescence microscopy is one of the most widely used imaging techniques in biological research. Despite its numerous advantages, it can be used only for studies of structures larger than 200 nanometres, due to diffraction limit caused by a wave nature of light. The value of 200 nanometres is the best reachable value of optical resolution, in other words, the smallest distance of two objects, which can be separately recognized by conventional optical systems. Up to the end of the 20th century it was therefore impossible to observe finer details of cells. However, recently several breakthrough imaging techniques, named super-resolution microscopy techniques, managed to bypass the diffraction limit and enabled biologists to study much more delicate structures, such as small organelles, virions, protein complexes or even particular proteins, while still using a visual light. This thesis introduces some selected super-resolution methods, explains briefly their principles and presents some of their applications in biology.