Atomic force microscopy (AFM) enables sample imaging at the micro and nanoscale. Recently, the method is applied to investigate biomacromolecules. Here, we describe the basic principles of AFM with a special emphasis for bioapplications. We tested experimental abilities of Alpha 300 – the Raman microscope with AFM/SNOM accessory from WITec company. The ability of AFM to study objects of cellular dimensions was demonstrated on erythrocytes and green algae Desmodesmus quadricauda. We were able to observe growing of lysozyme protein fibrils on day scale – from dimensions of seeds (~3 nm height) up to fibrils itself (3–10 nm height and 100 nm up to micrometers length). Subsequently, we observed separate protein molecules of thyroglobulin (~6 nm) and also γ-globulin (~3 nm). It seems plausible to image objects up to 2 nm dimensions by the given device with respect to the signal/noise ratio.