During the last decade biomedical and pharmaceutical applications became more and more common in scanning probe microscopy. Easy sample preparation that requires no freezing or coating of samples made biological samples easy to be imaged in their natural environment. Today atomic force microscopy (AFM) is a well established technique in biology and physiology.

A number of diseases come along with abnormal structures in fibrillar proteins like collagen. It belongs to the most studied proteins showing its characteristic band pattern of repeatedly occurring sections every 68 nm. The AFM experiments were performed with dried collagen samples and those imaged after swelling in buffered solution (Fig 1).

![Fig 1. Deflection image of two collagen strands. Image size 4.3 x 2.1 µm². Image courtesy of Michael A. Horton, University College, Dep. of Medicine, London.](image)

Cell adhesion
Collagen also plays an important role in bone and tooth mineralization. Depending on the sample preparation it also can be aligned into characteristic patterns giving interesting growth templates for cell adsorption.
In general, collagens are widely used in cell culture as suitable substrates for cell adhesion. With cells bound to a cantilever cell adhesion measurements have been performed. Different kinds of substrates (fibronectin, BSA) have been tried out and rupture forces were studied.

Cell motility
In a cell motility study the AFM cantilever was used as a force sensor for cell movement. The cantilever was rested in idle mode waiting for a keratocyte crawling under it. The resulting cantilever deflection was measured and the typical pressure applied by the cell’s lamellipodium is calculated. From force distance curves elasticity moduli were calculated and it was shown that this kind of cells belong to the softest materials ever found. From the slope of the trace curves elasticity data were calculated, as well as the pushing force of the cell.