

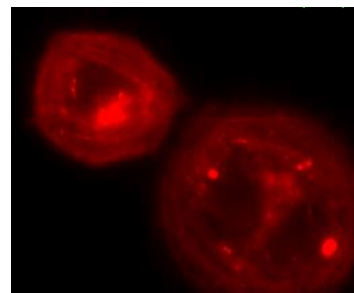
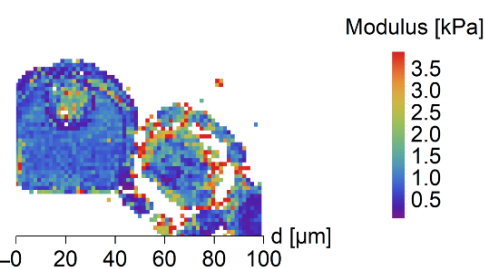
# Use of AFM for nanomechanical mapping of living cells, biomolecules and biomaterials

Jan Pribyl

<sup>1</sup>CEITEC MU, Masaryk University, Kamenice 5, CZ-62500 Brno, Czech Republic  
[pribyl@nanobio.cz](mailto:pribyl@nanobio.cz)

Atomic Force Microscope (AFM) is a three-dimensional high-resolution topographic technique. It is suitable for biological applications in native conditions with the ability to measure bending of the cantilever probe with extremely high precision. This allows AFM to be used as a mechanical nanosensor, in cell based biosensing of drug effects and in study of growth factor effects on cells. Among the multitude of methods applied to measure the stiffness of cells and tissues, micro-indentation using an Atomic Force Microscopy (AFM) provides a way to reliably measure the stiffness of living cells

Among the other devices for microindentation the Atomic Force Microscope (AFM) is commercially available and has been widely applied to characterize mechanical properties of living cells and tissues. Moreover, AFM allows to scan living cell topography under nearly physiological conditions (liquid medium, elevated temperature), and offers a force spectroscopy mode. In this mode, cell is indented at many sites and its complete elastic response is recorded which enables to reconstruct its stiffness map. However not only living cell cultures can be investigated by this method, but also a variety of soft bio samples such as plant tissues, extracellular matrix and hydrogels can be studied. Combination of the stiffness mapping with confocal microscopy would bring better understanding to the cellular processes, when the cytoskeleton remodelling is related to the mechanical properties of the cell.



*Simultaneous mapping of the cell stiffness by AFM nanoindentation (left), combined with the native staining of actine fibres in the living fibroblast cells.*

## References

- G. Nardone et al., "YAP regulates cell mechanics by controlling focal adhesion assembly" *Nature Communications*, vol. 8, p. 15321, May 2017.
- M. Golan et al., "AFM Monitoring the Influence of Selected Cryoprotectants on Regeneration of Cryopreserved Cells Mechanical Properties". *Front. Physiol.* 9:804, 2018.