Fluorescence microscopy has become an indispensable tool in life sciences. The information within a microscopic image can be largely extended by the simultaneous acquisition of spectral information from a microscopic volume because fluorophores act as sensors to their nano-environment. In this work, different classes of autofluorescent biomolecules are spectro-microscopically investigated. It is shown that the photophysical properties of GFP derivatives largely depend on the composition of the surrounding protein shell, allowing for a better understanding of these proteins. Furthermore, the spectro-microscopic investigation of photosystems in living plant cells enables the observation of adaptation processes of plants to external and internal growth conditions. The parallel implementation and establishment of novel spectro-microscopic modalities further extends the accessible parameter space, offering even deeper insights into the photophysics of autofluorescent biomolecules.

Key words: autofluorescent biomolecules, spectral information