

Can we exploit the autofluorescent proteins for lifetime imaging?

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In the past ten years, Green Fluorescent Protein (GFP) of a pacific jellyfish became an indispensable tool in cell biology. Mutagenesis of the wild-type protein led to the development of Blue (BFP), Cyan (CFP) and Yellow Fluorescent Proteins (YFP). With the finding of more chromoproteins in other sea animals, researchers in the life sciences dispose nowadays of fluorescence colors covering the visible range of the electromagnetic spectrum. The fluorescence color is not the only spectroscopic signature of an excited state which can be used in fluorescence microscopy, but also the fluorescence lifetime can bear valuable information. However, applications of lifetime imaging with GFP are yet rare [1]. In my presentation, several difficulties which are met when GFP is used in lifetime imaging are addressed and it is shown how they can be overcome: the coexistence of different protein conformers with different lifetimes [2, 3], the different sensitivity of the various proteins to changes in the protein backbone [4] and the photosensitivity of autofluorescent proteins [4]. Finally, a promising approach is discussed how the oligomerization of proteins in living cells can be visualized by lifetime-imaging, for which the fast energy-migration between close autofluorescent proteins can be utilized [5].

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