

FLUORESCENT PROTEINS: PROMISING NOVICES AND UNEXPECTED ABILITIES OF OLD FRIENDS

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Study and applications of fluorescent proteins went a long way from a subject of highly specialized research to widely known indispensable tool for in vivo labeling, and from single known member—Green Fluorescent Protein from jellyfish *Aequorea victoria*—to hundreds of natural proteins of different colors with still poorly studied and quite unusual phylogeny. Besides, a number of mutant fluorescent proteins with new properties were engineered: improved blue and red fluorescent proteins for multicolor labeling and FRET-based methods, photoswitchable fluorescent proteins for cell and protein tracking and ultra-high resolution imaging, phototoxic fluorescent proteins for light-induced cell killing and protein inactivation, diverse fluorescent sensors for monitoring intracellular events, and others. In this talk I will provide an overview of recent achievements in the field and describe our current progress in development and studies of fluorescent proteins. In particular, novel far-red fluorescent proteins with enhanced brightness, photo- and pH-stability for multicolor and whole-body imaging have been developed. Also, we discovered a new feature of GFPs to act as the light-induced electron donors in photochemical reactions with various electron acceptors, including biologically relevant ones. Moreover, this process accompanying with green-to-red GFP photoconversion can be observed in living cells without additional treatment. This finding changes our general view of GFPs as passive light absorbers/emitters and provides new insights into evolution and biology of this protein family.