Spying on cells with glowing chemical-genetic hybrids

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Deciphering the complex mechanisms controlling cells and organisms requires effective imaging systems and fluorescent probes to observe and quantify biomolecules in real time with high spatiotemporal resolution. A common strategy for imaging proteins is to fuse them to peptide or protein sequences that provide fluorescence (e.g. fluorescent proteins). Recently, the fluorescence toolkit has been expanded with methods for labeling biomolecules with exogenously applied small synthetic fluorescent probes. These innovative technologies offer additional labeling refinement and broaden fluorescent labeling to more diverse cellular molecules. Selectivity is ensured through fusion to a genetic tag that binds selectively tailored fluorescent molecules. The modular nature of such an approach enables to tune the synthetic part by molecular engineering, in order to address biological questions with the molecular diversity offered by modern chemistry. During this talk, I will present the development and applications of tunable fluorescent probes and biosensors that enable high imaging contrast relying on genetically encoded proteins that bind and activate fluorogenic synthetic molecules.