

SENSORS AND PROBES

A fluorescent protein with staying power

A newly described fluorescent protein, StayGold, is bright and extremely photostable, enabling extended time-lapse imaging.

Fluorescent proteins serve as versatile probes in all aspects of biological research. Numerous fluorescent proteins have been discovered, largely from ocean invertebrates, and even more have been engineered on the basis of these natural templates. Fluorescent proteins are now available that span the visible spectrum and have a wide range of chemical and photophysical properties that can be exploited in experimental settings. However, a common concern when imaging fluorescent proteins is that they photobleach, meaning their signal decreases over time upon continued illumination. Photobleaching can be problematic for quantitative imaging, time-lapse imaging, and especially for imaging low-abundance targets.

Atsushi Miyawaki at the RIKEN Center for Brain Science in Saitama, Japan, and

colleagues have a longstanding interest in discovering, engineering and using fluorescent proteins. In new research, they describe and engineer a green fluorescent protein from the jellyfish *Cytaeis uchidae* called StayGold with unique and desirable photophysical properties. In addition to being of similar brightness, StayGold is roughly ten times more photostable than other state-of-the-art fluorescent proteins. StayGold is naturally dimeric, so the authors engineered a tandem dimer version that functions as a pseudomonomer and is suitable for tagging proteins to image subcellular structures.

The researchers exploited its photostability for extended time-lapse 3D super-resolution imaging of the endoplasmic reticulum in mammalian cells, where they were able to observe agonist-induced structural rearrangements. They further

used StayGold to image fast mitochondrial dynamics and to map spike proteins in fixed mammalian cells infected with SARS-CoV-2.

While the power and promise of StayGold are clear, a truly monomeric version with similar photophysical properties could make the probe smaller and more versatile for tagging. In addition, with the extended imaging times offered by StayGold, experimental phototoxicity should also be kept in mind.

Rita Strack

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Research papers

Hirano, M. A highly photostable and bright green fluorescent protein. *Nat. Biotechnol.* <https://doi.org/10.1038/s41587-022-01278-2> (2022).

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