Genetically encoded tags and indicators are molecular spies that reveal specific
gene products and biochemical processes in living cells and organisms. Fluorescent
proteins from jellyfish and corals have been bred to eliminate multimerization and cover
the entire visible spectrum. Somatic hypermutation in B lymphoma cells can offer a
powerful new way to evolve protein properties. Indicators constructed from fluorescent
proteins can report local dynamic signals such as redox potential, kinase vs. phosphatase
activities, protein-protein interactions, and ion and neurotransmitter concentrations.
Improved reporters for protein kinase A and Src are revealing localized kinase activation
in cells that are locomoting or feeling external tensions. A new glutamate indicator is
showing promise for imaging glutamate release and reuptake and their modulation during
synaptic plasticity.

Short tetracysteine motifs are complementary tags, which can be labeled in live
cells with membrane-permeant biarsenical dyes. These labels are far smaller and
sometimes less perturbative than fluorescent proteins. Unique applications include green
vs. red pulse-chase labeling of old vs. new copies of the same protein, electron-
microscopic localization, chromophore-assisted light inactivation of a chosen protein
without the problems of antibody penetration, and measurement of local Ca\(^{2+}\) within
nanometers of proteins such as Ca\(^{2+}\) channels.