题目：Protein organic chemistry in live cells and beyond
摘要：
The aim of this research is to develop state-of-the-art molecular technologies that can
facilitate the deep understanding of intracellular signal transmission and intercellular network
formation in the neural systems and brain at the individual protein molecule level of resolution.
Using such methods that enable to chemically label and image several key proteins such as
neurotransmitter receptors, GPCRs and channel proteins in neural cells and brain tissues, the
dynamic structural changes and critical functions of proteins in living cellular systems can be
unveiled. Furthermore, by combining selective functional control of a target receptor in live
cells with imaging techniques, we expect to analyze and clarify the complicated intercellular
networks involving target receptor proteins for memory formation in brain. For this objective,
this proposal will attempt to develop a new live-cell organic chemistry that can modify and
regulate the target protein under the living cell conditions, which should be unique and
complimentary to conventional chemical genetics or optogenetics approaches. In addition to
developing these molecular technologies in the basic research fields of neuroscience and
chemical biology, I am aiming to create a new field, a really interdisciplinary research area,
termed neuro-chemical biology, which should be critically important between chemistry,
biology and neuroscience toward a goal including development of innovative technologies
for diagnosis and treatment of brain and neurological disorders such as schizophrenia and
dementia.