

Illuminating and controlling cell function with chemogenetics

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Cells and organisms are complex machines driven by a set of dynamic biological events tightly orchestrated in space and time. The comprehensive molecular understanding of their inner workings requires acute molecular tools to observe and modulate the key triggers and cell signaling events. To study the molecular mechanisms that govern cells and organisms over different scales in time and space, we combine molecular chemistry with protein engineering and genetic tools to develop novel approaches for the quantitative imaging and acute modulation of individual small molecules, proteins, organelles or cells. Made of organic synthetic molecules coupled to genetic tags, these systems combine the advantage of synthetic molecules with the targeting selectivity of genetically encoded tags, challenging the paradigm of fully genetically encoded systems. During this talk, I will present how these systems can be used for imaging, sensing and controlling cell biochemistry with high spatial and temporal resolution.

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5. Benaissa et al. *Nature Communications* **12**, 6989 (2021)
6. Bottone et al. *Nature Methods* **20**, 1553–1562 (2023)