

SFB
1078



Protonation Dynamics
in Protein Function

➔ **Colloquium**

Mon, June 17,
2024

15:15 – 17:30

Freie Universität Berlin
SupraFAB, Room 201
(Altensteinstr. 23a, 14195 Berlin)

➔ **Prof. Irene Coin** – Leipzig University, Institute of Biochemistry, Germany

Genetic code expansion for structural and dynamic studies of membrane receptors in living cells

We apply genetically encoded non-canonical amino acids (ncAAs) to address general questions about functioning of G protein-coupled receptors (GPCRs) directly from the natural environment of the live mammalian cell. On one hand, we use photo- and chemical crosslinking amino acids [1] to define the topology of GPCR interactions both with ligands (especially peptide ligands) [2] and intracellular partners [3]. On the other hand, we have engineered enhanced tRNAs that have enabled efficient incorporation of last generation ncAAs for bioorthogonal chemistry into challenging protein targets [4]. In this way, we could achieve quantitative single-residue labeling of sensitive GPCR regions, such as the loops, with small organic fluorescent probes [5] and put the basis for the development of small-size fluorescent sensors for in-cell studies of GPCR dynamics.

[1] Coin I*. *Curr. Opin. Chem. Biol.*, 2018, 46:156-163.

[2] Seidel L, Zarzycka B, Zaidi SA, Katritch V*, Coin I*. *eLIFE*, 2017, 6, 27711.

[3] Aydin Y, Böttke T, Lam JH, Ernicke S, Fortmann A, Tretbar M, Zarzycka B, Gurevich VV, Katritch V*, Coin I*. *Nat. Commun.* 2023, 14:1151.

[4] Serfling R, Lorenz C, Etzel M, Schicht G, Böttke T, Mörl M, Coin I*. *Nucleic Acids Res.* 2018, 46, 1-10 (2018).

[5] Serfling R, Seidel L, Bock A, Lohse MJ, Annibale P, Coin I*. *ACS Chem. Biol.* 2019, 14:1141-1149.

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➔ **Prof. Benjamin Kaupp** – Max-Planck Institute MPINAT, Göttingen & LIMES, Bonn University, Germany

Sperm chemotaxis – signaling at the physical limit

Sperm from marine invertebrates navigate to the egg in a chemoattractant gradient. The sperm flagellum serves as an antenna that registers the chemoattractant, as a motor that propels the cell, and as a rudder that steers sperm in the chemical landscape. Sperm are exquisitely sensitive: they can register the binding of a single chemoattractant molecule and translate binding events into a Ca^{2+} response that controls the flagellar beat and, thereby, the steering response. I will discuss the cGMP-signaling pathway that endows sperm with single-molecule sensitivity.

The dynamics of cellular responses, including changes in voltage, pH_i , and Ca^{2+} , is optically recorded in motile sperm using rapid kinetic techniques including caged compounds. We find that, during navigation, sperm perform a surprisingly rich variety of computational operations; they can count, differentiate, integrate, and reset the signaling pathway. Furthermore, we decipher how such cell algebra is embodied by biochemical and electrical mechanisms.

Coffee and tea will be available during the break at 16:15.

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