

Organic chemistry with proteins: in vitro, in live cells, and in vivo

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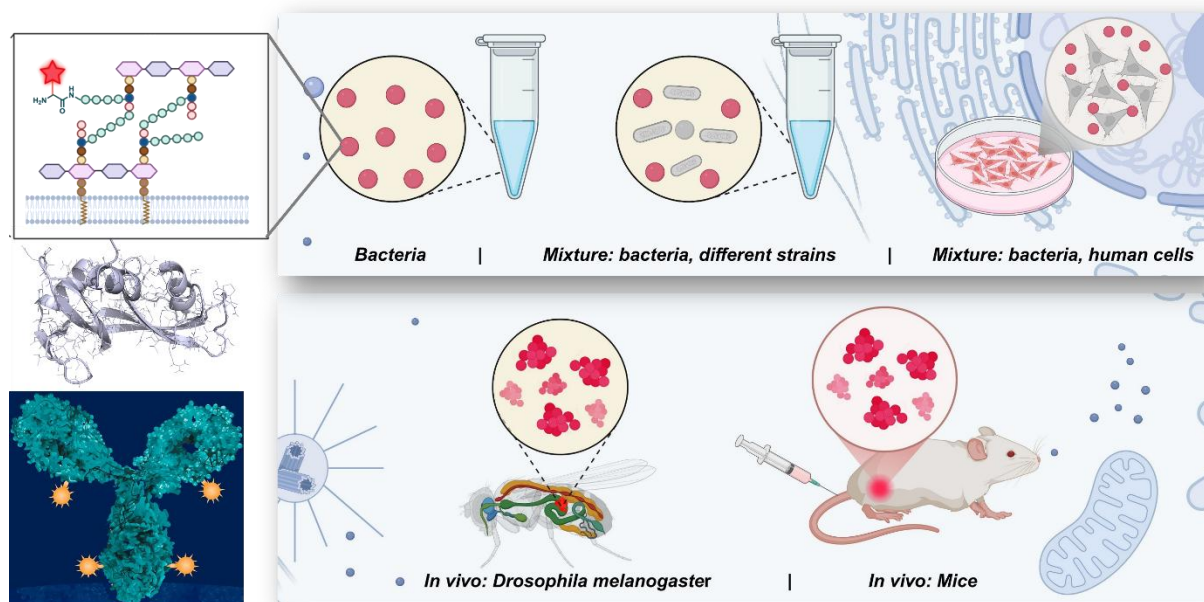
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Abstract:

Control over the selectivity of chemical modification of a protein presents a research question spanning chemistry, biology, and medicine. Regulated by multiple variables, it renders limited observables, making it challenging to perform hypothesis-driven research. In this presentation, I will discuss the principles of chemical technologies for the precision engineering of proteins and antibodies.^[1-4]

Additionally, these insights can lead to technological advancements in homogeneous antibody-drug conjugates (ADCs) for targeted cancer chemotherapy and fluorophore conjugates (AFCs) for imaging-guided tumor surgery.^[4,5] Lastly, I will provide a glimpse into how applying these principles in cellular or living systems can foster the development of chemistry for precision therapeutics.^[6]



References:

1. DIN theory: *Cell Rep. Phys. Sci.* **2026**, 7, 103340; *Chem. Soc. Rev.* **2024**, 53, 380; *ACS Cent. Sci.* **2023**, 9, 137.
2. Reactivity hotspots: *Nat. Commun.* **2026**, 17, 454; *Chem. Commun.* **2021**, 57, 7083.
3. Gly-tag[®] technology: *Nat. Commun.* **2026**, accepted (*ChemRxiv*: <https://doi.org/10.26434/chemrxiv-2025-28nj>); *Nat. Commun.* **2019**, 10, 2539.
4. LDM[®] platform: *Nat. Commun.* **2022**, 13, 6038; *Chem. Sci.* **2021**, 12, 6732; *Angew. Chem. Int. Ed.* **2020**, 59, 10332; *J. Am. Chem. Soc.* **2018**, 140, 15114.
5. ADCs: *Nat. Biomed. Eng.* **2019**, 3, 917; *Chem. Commun.* **2019**, 55, 9979.
6. Precision therapeutics: Unpublished work.