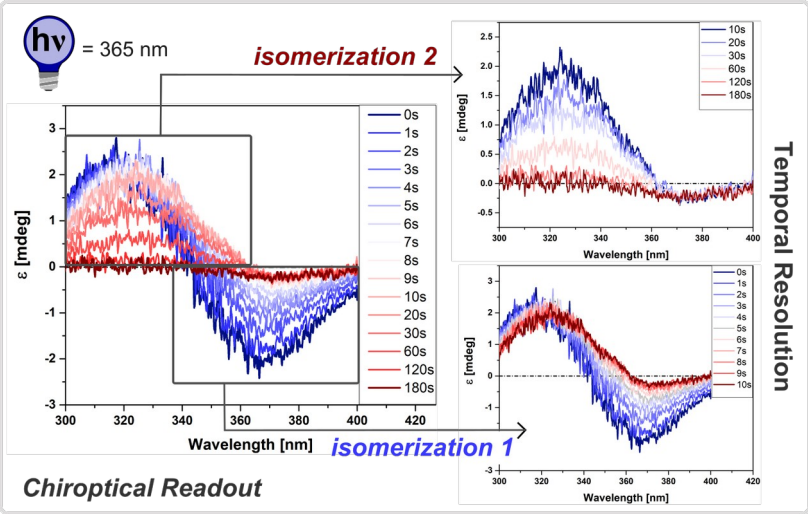
TUNING THE PROPERTIES OF LIGHT-RESPONSIVE MOLECULES THROUGH SUBSTITUENT EFFECTS

Nadja A. Simeth[1,2]

[1]Institute for Organic and Biomolecular Chemistry, Department for Chemistry, University of Göttingen, Tammanstraße 2, 37077 Göttingen, Germany.
[2]Cluster of Excellence "Multiscale Bioimaging: from Molecular Machines to Networks of Excitable Cells" (MBExC), University of Göttingen, Germany.
nadja.simeth@uni-goettingen.de

In recent years, light has been employed as an external stimulus to photo-control diverse functional processes.[1] This approach relies on the use of small, light-responsive molecules that undergo a structural change upon irradiation, generating different functional states from a single molecule.[2] By attaching suitable substituents to such photoactuators, these molecules can be embedded in a system of choice to link their structural change to a change in the system's properties.[3] On the other hand, the sterical and electronic characteristics of the substituents influence the photophysical and photochemical properties of the core.[4] This mutual interaction needs to be finely balanced and studied in detail to rationally design complex systems.

Here, we show how optimizing the substituents on different photoactuators allows us to tune several of their properties, such as their UV-Vis absorption profile and photoconversion quantum yield. We will demonstrate how these properties can be employed to achieve both temporal and spectral resolution in a model system.[5,6]
Deriving such design principles for an increasing number of light-responsive tools will pave the way to individually addressing a single photoactuator in a complex ensemble and thus, to the precise regulation of individual gears in multi-components molecular machinery.



References
[1] D. Habault, H. Zhang, Y. Zhao, Chem. Soc. Rev. 2013, 7244-7256.
[2] B. L. Feringa, Angew. Chem. Int. Ed. 2017, 11060-11078.
[3] N. A. Simeth, S. Crespi, Photochemistry 2021, 344-375.
[4] H. M. D. Bandara, S. C. Burdette, Chem. Soc. Rev. 2012, 1809-1825.
[6] N. A. Simeth et al., Chem. Sci. 2021,9207-9220
[5] N. A. Simeth et al. 2022 manuscript in preparation.