Synthetic Sensory Physiology

Dirk Trauner*
Department of Chemistry and Perelman School, University of Pennsylvania, USA
E-mail: dtrauner@upenn.edu

Photopharmacology can be defined as an attempt to control biological function with synthetic photoswitches, which can be combined in various ways with natural receptors. This approach can be used to convert voltage-gated ion channels or neurotransmitter receptors into photoreceptors. I will discuss how voltage-gated sodium and potassium channels, metabotropic glutamate receptors, dopamine receptors, and serotonin receptors have been converted into photoreceptors and how this can be applied toward restoring vision to the blind. I will also show how TRPV1, TRPM8 channels, and taste receptors, can be made photosensitive, paving the way toward Synthetic Sensory Physiology, perhaps even “Photogastronomy “.

References

"A Roadmap to Success in Photopharmacology" Broichhagen, J.; Frank, J.A.; Trauner, D. *Acc. Chem. Res.*, **2015**, 48, 1947-1960.
"Photoswitchable Serotonins for Optical Control of the 5-HT2A Receptor" Morstein, J.; Romano, G.; Hetzler, B.E.; Plante, A.; Haake, C.; Levitz. J.*, Trauner, D.* *Angew. Chem. Int. Ed.*, **2022**, 61, e202117094
"Photoswitchable Fatty Acids Enable Optical Control of TRPV1" Frank, J. A.; Moroni, M.; Moshourab, R.; Sumser, M.; Lewin, G. R.; Trauner, D. *Nature Commun.* **2015**, 6, 7188.

Dirk Trauner was born and raised in Linz, Austria, studied biology and chemistry at the University of Vienna, and received his Master’s degree in chemistry from the Free University, Berlin. He then pursued a Ph.D. in chemistry under the direction of Prof. Johann Mulzer, with whom he moved to the University of Frankfurt and then back to Vienna. Subsequently, he became a postdoctoral fellow with Prof. Samuel J. Danishefsky at the Memorial Sloan-Kettering Cancer Center. After two years in New York City, Dr. Trauner joined the Department of Chemistry at the University of California, Berkeley, where he rose through the ranks to become an Associate Professor of chemistry and a member of the Lawrence Berkeley National Laboratory. In the summer of 2008, he moved to the University of Munich, where he served as a Professor of Chemical Biology and Chemical Genetics. In March of 2017 he returned to the U.S. to become the Janice Cutler Chair of Chemistry at New York University. In the Summer of 2022, he became a Penn Integrates Knowledge Professor at the University of Pennsylvania with an appointment in the Perelman School of Medicine and in the Department of Chemistry. He is a member of the Leopoldina Academy of Sciences and the Austrian Academia of Sciences, and a recipient of the Otto Bayer Award, the Emil Fischer Medal, an ACS Cope Scholar Award, and a Sloan Fellowship. The broad objective of Prof. Trauner’s research is to demonstrate the awesome power of chemical synthesis and to use it toward the precision control of biological pathways, especially in neuroscience.