"Photopharmacology: Towards Light-Controlled Pharmacological Therapy"

PROGRAMME

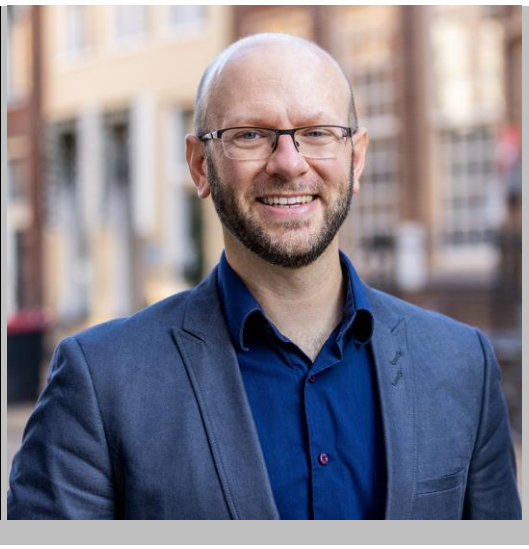
11:30 Colloquium
13:00 Lunch with the speaker (all participants are invited at LENS)

Enrico Fermi Colloquium

Friday 23th June 2023
11:30

LENS - Via Nello Carrara 1
Sesto F.no (Firenze)

Conference room Querzoli



Prof. Wiktor Szymanski

Department of Radiology, Medical Imaging Center,
University Medical Center Groningen,
The Netherlands

ABSTRACT

Molecular photomedicine holds the promise for precise treatments, which avoid systemic adverse effects and development of drug resistance. This promise is supported by current medical imaging modalities that are able to reveal the nature and location of malignancies, such as cancer and infections. At the same time, biomedical engineering has recently created methods to deliver light deep into human body. The photomedicine puzzle is currently missing its final piece – the way of translating light into a therapy. To address this challenge, drugs could be introduced whose activity could be reversibly or irreversibly turned on with light. The aim of this presentation is to describe the emerging concept of photopharmacology (Figure A),[1] which is currently being developed and applied to precisely control the activity of drugs using light. The presentation will focus on our efforts towards bridging light and medicine, focusing first on new light-operated tools[2] (molecular photoswitches[3,4] and photocages[5,6], Figure B). Next, I will highlight the synergies between medical imaging and therapy, offered by light, through photo-responsive optical[7] and magnetic resonance[8] imaging agents. The examples of light-controlled bioactive molecules presented will include small molecules[9,10] and proteins[11]. Finally, using those examples, I will highlight the structural aspects[12] of photopharmacology.

[1] Hoorens, M. W. H. *et al.* (2018) *Trends. Biochem. Sci. 43*, 567-575; [2] Welleman, I. M. *et al.* (2020) *Chem. Sci. 11*, 11672-11691; [3] Lameijer, L. N. *et al.* (2020) *Angew. Chem. Int. Ed. 59*, 21663-21670; [4] Hoorens, M. W. H. *et al.* (2019) *Nature Comm. 10*, 2390; [5] Schulte, A. M. *et al.* (2022) *J. Am. Chem. Soc.* 144, 12421-12430; [6] Alachouzos, G. A. *et al.* (2022) *Angew. Chem. Int. Ed.* 61, e202201308; [7] Reeßing, F. *et al.* (2020) *ACS Omega 5*, 22071-22080; [8] Reeßing, F. *et al.* (2019) *ChemComm 55*, 10784-10787; [9] Hoorens, M. *et al.* (2019) *Eur. J. Med. Chem.* 179, 133-146; [10] Kolarski, D. *et al.* (2021) *Nature Comm. 21*, 3164; [11] Mutter, N. *et al.* (2019) *J. Am. Chem. Soc. 141*, 14356-14363; [12] Arkhipova, V. *et al*. (2021) *J. Am. Chem. Soc. 143*, 1513–1520;

Klein Colloquium by Sara Venturi: "Amyloid and Non-Amyloid Aggregation of β-Lactoglobulin in Self-Crowded Regime"