



CONFERENCE 2023

**Recent Advances in Structural Biology
and Drug Discovery**

September 18-19, 2023

Riga

Latvian Institute of Organic Synthesis



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Project No. 1.1.1.5/19/A/004 "Biotechnology at Latvian Institute of Organic Synthesis to achieve excellence in drug discovery (BioDrug)"

The conference organizers gratefully thank the benefactors:



pharmaceutics

MONDAY, September 18th, 2023

9:00-9:30	Registration
9:30 – 9:45	Welcome from the LIOS Director Osvalds Pugovics
9:45-10:10	Emilio Parisini Latvian Institute of Organic Synthesis, Riga, Latvia <i>"BioDrug: an ERA-chair story"</i>
10:10-10:40	Luca Pellegrini University of Cambridge, Cambridge - United Kingdom <i>"CryoEM insights into primer synthesis by the human primosome"</i>
10:40-11:10	Marco Mazzorana Diamond Light Source, Oxford - United Kingdom <i>"Improving reliability, accuracy and turnover of MX data collection campaigns"</i>
11:10-11:40	Coffee Break
11:40-12:10	Alfonso T. Garcia-Sosa University of Tartu, Tartu - Estonia <i>"Beyond protein structure prediction"</i>
12:10-12:40	Isabel Uson-Finkenzeller ICREA at IBMB CSIC, Barcelona - Spain <i>"Predictions and experiments in structure determination: ARCIMBOLDO and VAIRO"</i>
12:40-14:15	Lunch break and networking (poster session)
14:15-14:45	Carlo Matera University of Milan, Milan – Italy <i>"Photoswitchable Molecular Tools: Applications to Enzymes, GPCRs and Ion Channels"</i>

14:45-15:15	Galyna Maleeva Institute of Bioengineering of Catalonia IBEC, Barcelona – Spain <i>“Photopharmacology for the control of the neuronal activity”</i>
15:15-15:45	Francesco Calzaferri Institut des Biomolécules Max Mousseron CNRS, Montpellier - France <i>“Novel strategies to target epigenetic mechanisms for cancer treatment: from rational compound optimisation to PROTAC development”</i>
15:45-16:30	Short talks (10' each): Nikhil Agrawal: <i>“A coarse-grained molecular dynamics investigation on spontaneous binding of Aβ1–40 fibrils with cholesterol-mixed DPPC bilayers”</i> (Poster n 1) Kristīne Krūkle-Bērziņa: <i>“Cyclodextrin Metal organic frameworks as a drug delivery system for selected pharmaceutical active ingredients”</i> (Poster n 10) Pilar M. Luque Navarro: <i>“Sulphur bioisosterism exerts different antiplasmodial responses”</i> (Poster n 11) Karlis Pleiko: <i>“Targeting triple-negative breast cancer cells with a β1-integrin binding aptamer”</i> (Poster n 15)
16:30-18:30	Networking & poster session & coffee
19:30	Conference Dinner

TUESDAY, September 19th, 2023

9:00	Registration
9:30-10:00	Alfonso Gautieri Politecnico di Milano, Milan - Italy <i>“Computer aided redesign of deglycosylating enzymes for therapeutic and diagnostic applications”</i>
10:00-10:30	Rob Meijers Institute for Protein Innovation, Boston – USA <i>“Generating synthetic antibodies for the human surfaceome at the Institute for Protein Innovation”</i>
10:30-11:00	Piermichele Kobauri Aqemia, Paris - France <i>“Rational Design of Light-Controlled Bioactive Compounds for Photopharmacology”</i>
11:00-11:30	Coffee Break
11:30-12:00	Elena Ishow University of Nantes, Nantes – France <i>“Photoactive organic nanoparticles as versatile tools for theranostics”</i>
12:00-12:30	Silvia Giordani Dublin City University, Dublin – Ireland <i>“Carbon nano-onions for biomedical applications”</i>
12:30	Poster Prizes – Closing remarks
12:45	Lunch
14:00	Visit to LIOS (for registered participants)

INVITED TALKS

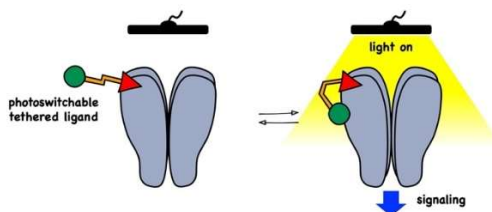
Photoswitchable Molecular Tools: Applications to Enzymes, GPCRs and Ion Channels

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Photocontrolled molecular tools provide powerful means to manipulate and interrogate biological functions with high spatiotemporal precision and low invasiveness. Our research efforts in the field have focused on the design of reversible photoswitchable compounds to photocontrol enzymes, GPCRs, and ion channels. Among others, we have developed phototrexate, the first photoswitchable inhibitor of the human dihydrofolate reductase with demonstrated cytotoxicity in vitro and in zebrafish larvae,¹ and PAI, a light-controlled dualsteric agonist of muscarinic M₂ receptors that enabled photomodulation of cardiac function in tadpoles and brain states in mice.² More recently, we have designed a fast photoswitchable tethered ligand of ionotropic glutamate receptors to enable activation of the auditory neurons with light. This compound, named TCP_{fast}, induced photocurrents in untransfected neurons upon covalently tethering to endogenous glutamate receptors and activating them reversibly with blue light. We applied it to the ultrafast synapses of cochlear auditory neurons that encode sound and provide auditory input to the brain. TCP_{fast} functions as a molecular prosthesis that bypasses the neurotransmitter-encoded signal with a photonic signal. Photosensitization of cochlear spiral ganglion neurons (SGNs) by locally administered TCP_{fast} enabled temporally precise light-evoked firing up to a rate of approximately 1 kHz, matching the fastest optogenetic SGN stimulation.³ Hence, TCP_{fast} shows that photopharmacology might serve as an interesting alternative for the development of optical cochlear implants for hearing restoration. The main results of all these studies will be presented and discussed.



References

1. Matera C et al. *Journal of the American Chemical Society* **2018**, *140* (46), 15764–15773.
2. Riefolo F, Matera C et al. *Journal of the American Chemical Society* **2019**, *141* (18), 7628–7636.
3. Garrido-Charles A, Huet A, Matera C et al., *Journal of the American Chemical Society* **2022**, *144* (21), 9229–9239.