Seminar/Talk

Optically Controlled Inhibitors for High-Spatiotemporal-Resolution Studies and Therapy

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Progress in biology and medicine in the 20th Century was driven by small molecule inhibitors, that could be used to modulate protein function and disfunction, and to treat diseases. But many of the most important proteins actin, tubulin, topoisomerases, proton pumps, nuclear hormone receptors, kinases can never be fully studied and understood using classical inhibitors, and these inhibitors are not typically suitable as clean therapeutic drugs. This is because these critical proteins have many spatiotemporally distinct functions: either simultaneously but in different places (regions/cells/tissues), or in the same place but at different times: and some of those functions are critical for healthy cell/organism function. Downregulating or blocking all those functions in all organelles/cells/tissues at once, is about as sophisticated a research method as destroying the entire Vienna road network to learn what are night buses used for in the Naschmarkt? Yet, spatiotemporally-controllable inhibitors are recently becoming available, that do allow high-precision studies, and may also enable high-precision therapy.* This talk presents a case study of photopharmaceuticals for the tubulin and actin cytoskeleton that act as an optically-controlled interface between a researcher and the protein of interest. They can leverage the spatiotemporal precision of standard light delivery methods to achieve optogenetics-like spatiotemporal specificity of protein control, without requiring genetic manipulation and therefore offer new opportunities for research and therapy.

* Optogenetics has shown several unique applications of high-spatiotemporal-resolution protein control, relying on transgenic cells and animals. But usually, optogenetic modifications are restricted to non-critical proteins, and there are no attempts yet to use optogenetics as a therapeutic strategy for human patients.

Monday, August 28, 2017 11:00am - 12:00pm
Mondi Seminar Room 3, Central Building

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