

---

# Controlling Cells with Light – and LOV(E)

Dominik Niopek\*<sup>1,2</sup>

<sup>1</sup>University of Heidelberg – Im Neuenheimer Feld 267 69120 Heidelberg, Germany

<sup>2</sup>German Cancer Research Center (DKFZ) – Im Neuenheimer Feld 280, 69120 Heidelberg, Germany

## Abstract

Optogenetics, i.e. controlling biomolecules in living cells with light, has quickly advanced cell biology research over the past decade. The expanding toolbox of natural and engineered light sensors enables us to modulate and study cellular pathways with increasing precision. We only begin to understand that the cellular information flux is by no means statically wired. In contrast, signals are often encoded by spatial and temporal cues and finally interpreted and integrated at the gene expression or functional level to yield a defined cellular behavior. In my talk, I will discuss recent advances and remaining challenges in the field of optogenetics, thereby focusing on tools for elucidating the spatiotemporal encoding and decoding of information in cells. Employing light-oxygen-voltage (LOV) domains as example, I will present novel strategies for engineering artificial light control of protein intracellular trafficking, gene expression, epigenetic modification or enzymatic activity.

**Keywords:** Optogenetics, Protein engineering, LOV domains, Protein trafficking

---

\*Speaker