

Prof. Alexander Heckel

Triggers and Switches for Chemical Biology

Our work focusses on engineering new properties into nucleic acids and other molecules. In particular we introduce modifications that make it possible to control nucleic acid or small molecule function with light. Light is an ideal addressing mechanism since it can be generated and applied easily. In most cases it is a highly specific and harmless signal since only very few specialized cells react to light themselves and the wavelengths can be chosen so that unwanted phototoxic side effects can be avoided. We have for example shown that RNA interference can be controlled with light. Using light-responsive aptamers protein function can be controlled as well. Using caged small molecules it is possible to control ribozymes with light and arrange proteins in arbitrary fashion. With wavelength-selective uncaging complex trigger scenarios become possible. In our most recent endeavors we are trying to generate a riboswitch which accepts light as a signal, we are triggering nucleic acid activity with three-dimensional resolution, we are investigating tools for the light-control of miRNA activity and we are investigating tools for the single-molecule real-time tracking of RNA trafficking in living cells.