Project Description

Ribonucleic acids (RNAs) are versatile biopolymers involved in various biological functions, including storage and transfer of information, structural scaffolding, gene expression and regulation. RNA self-assembly and dynamics within the functionally competent, folded structure can be described by conformational transitions within highly complex energy landscape. Understanding these characteristics of the RNA molecules is a key aspect in explaining their biological mode of action.

The main interests are focused on two specific RNA molecules.
The first is a SAM-I riboswitch molecule, which is a RNA molecule capable to regulate gene expression and is thus an attractive target for genome engineering and synthetic biology. Whereas isolated aptameric domains of riboswitches have been intensively studied, we investigate the interactions between the aptameric and the expression platform in complete riboswitches, because a detailed knowledge is still lacking.
The second one is a Diels-Alderase ribozyme with true catalytic properties. Understanding the mechanistic relationships between RNA structure, folding and function will help to further develop artificial ribozymes, which may find applications in biotechnology and medicine.

In our group, we study the dynamics of these RNAs, using highly sensitive fluorescence spectroscopy in combination with single-molecule Förster (fluorescence) resonance energy transfer (FRET).