PhD thesis project:
Molecular mechanisms of integration site selection by *Dictyostelium* retrotransposons

Mobile elements are obligate genomic parasites that amplify as selfish DNA and play important roles in driving the evolution of their hosts. Retrotransposons amplify by reverse transcription of RNA intermediates and integration of the resulting DNA copies at new locations of their host's genomes. In gene-dense genomes, mobile elements are confronted with high selective pressure to amplify without compromising host fitness, and therefore develop strategies to transpose to "safe" sites that limit direct damage to the host genome. We are interested to evaluate how *D. discoideum* retrotransposons recognize tRNA genes as integration sites. We follow the working hypothesis that protein interactions between retrotransposon-derived proteins and tRNA gene-specific transcription factors mediate targeted integration.

In the PhD project the successful candidate will characterize integration site selection by the non-long terminal repeat retrotransposon TRE5-A upstream of tRNA genes. In vivo chromatin immunoprecipitation will be combined with Illumina sequencing (ChIP-seq) to evaluate whether sites of TRE5-A integration coincide with RNA polymerase III complexes. To analyze the influence of local chromatin structure upstream of tRNA genes on TRE5-A integration, we use nucleosome profiling (MNase-seq), comparing D. discoideum wildtype and a particular mutant in which TRE5-A retrotransposition is compromised. Further, an in vivo tRNA gene targeting assay with genetically tagged TRE5-A retrotransposons will be established to directly test requirements of protein interactions between the retrotransposon and its target sites.

Selected reading:

T. Spaller, M. Groth, G. Glöckner & T. Winckler (2017). TRE5-A retrotransposition profiling reveals putative RNA polymerase III transcription complex binding sites on the Dictyostelium extrachromosomal rDNA element. PLoS ONE 12(4): e0175729

T. Spaller, E. Kling, G. Glöckner, F. Hillmann & T. Winckler (2016). Convergent evolution of tRNA gene targeting preferences in compact genomes. Mob. DNA 7, 17

A. Schmith, T. Spaller, F. Gaube, Å. Fransson, B. Boesler, S. Ojha, W. Nellen, C. Hammann, F. Söderbom & T. Winckler (2015). A host factor supports retrotransposition of the TRE5-A population in Dictyostelium cells by suppressing an Argonaute protein. Mob. DNA 6, 14 (PubMed)

T. Winckler, J. Schiefner, T. Spaller & O. Siol (2011). Dictyostelium transfer RNA gene-targeting retrotransposons - Studying mobile element-host interactions in a compact genome. Mob. Genet. Elements 1(2), 145-150

O. Siol, T. Spaller, J. Schiefner & T. Winckler (2011). Genetically tagged TRE5-A retrotransposons reveal high amplification rates and authentic target site preference in the Dictyostelium discoideum genome. Nuc. Acids Res. 39(15), 6608-6619