

Elucidating the principles of primate thalamocortical circuitry

Abstract for a General Audience

In this project, we will study the so-called corticothalamic loop in the primate brain. This neural circuit plays a critical role in motor and cognitive processes. The project aims to thoroughly understand the structure, circuitry, and functional organization of the corticothalamic loop and investigate specific features of the primate brain compared to rodent brains.

We will utilize spatial transcriptomics (i.e., the identification of a set of mRNA molecules) at single-cell resolution, investigate the connectivity between brain structures in various ways, and develop innovative methods for data analysis. By employing a wide range of experimental and computational techniques, we will create a comprehensive multimodal atlas of the corticothalamic tract of the common marmoset. Additionally, we will systematically characterize the observed connections, analyze the correlation between spatial gradients of gene expression and connections, and identify the structural and functional properties of the primate thalamocortical circuit in comparison to rodents.

We aim to develop a comprehensive, publicly accessible database of the information we have gathered on the marmoset thalamocortical circuit. This resource will encompass connectivity data, molecular characteristics, and species-specific features. Additionally, we will publish significant papers and train young scientists across various fields.

The project is a joint effort by the team of Dr. Cirong Liu of the Chinese Academy of Sciences and the team of Dr. Piotr Majka of the Marceli Nencki Institute of Experimental Biology PAS. Both teams have complementary expertise and a long history of cooperation.