**Project 9.3:** The impact of cytoplasmic polyadenylation on local translation in neurons

**Supervisor:** prof. dr hab. Andrzej Dziembowski

**Institute:** International Institute of Molecular and Cell Biology in Warsaw

**Laboratory:** Laboratory of RNA Biology

**WWW:** https://www.iimcb.gov.pl/en/research/laboratories/41-laboratory-of-rna-biology-dziembowski-laboratory-era-chairs-research-group

**Background:** Neurons communicate with each other through synapses, specialized contact sites that enable electrical impulses to be transmitted between cells. Synapses are small, but partly independent compartments of the neuron because they contain the molecular machinery indispensable for protein synthesis. This process of protein production on the basis of mRNAs transported to distant synapses from the cell body is called local translation. Local protein synthesis is essential for the proper functioning of the synapse, and its dysregulation is the cause of severe neurodevelopmental disorders. In recent years, thanks to the development of new technologies, we have learned more about these essential processes taking place in synapses. However, the precise molecular mechanisms by which synaptic translation is regulated is still far from being understood.
The ends of mRNA molecules are specifically modified in order to enhance their stability and ability to serve as a template for proteins synthesis at ribosomes: at the 5' end so-called cap structure is positione, while at the end, there is a poly(A) tail. Nearly all mRNAs in the cell are polyadenylated in the nucleus right after being transcribed from DNA and before their transport to the cytoplasm. However, there is growing evidence that the process of polyadenylation can also take place in the cytoplasm and is therefore called cytoplasmic polyadenylation. In neurons, cytoplasmic polyadenylation of synaptic mRNAs plays a significant role in the regulation of protein synthesis. However, until now, it was studied only for a few mRNAs, and the global impact of this phenomenon and the specific enzymes carrying out the reactions are unknown.
This research project will be performed in cooperation with Prof. Clive Bramham from the University of Bergen and Prof. Magdalena Dziembowski from CENT UW.

**Aim:** We aim to elucidate the function and mechanism of cytoplasmic polyadenylation of neurons. To achieve our goals, unique animal models constructed using the CRISR/Cas9 method, combined with advanced transcriptomic and proteomic approaches, will be used.
Two positions are available in the laboratory. The exact project will depend on the specific skills and preferences of the student.
We are looking for students with experience in working with animal models, RNA biology or bioinformatics.