

## **Project 1.6 The structure and function of transcriptional condensates in embryonic development**

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**www:** <https://www.nencki.edu.pl/laboratories/laboratory-of-spatial-epigenetics/>

### **Background:**

At the frontier of cell biology, transcriptional condensates represent a revolutionary paradigm in understanding the organisation of genomic activity. These protein-rich, sub-micrometer assemblies of transcription factors and RNA Polymerase II have been observed in mammalian embryonic stem cells and in various animal embryos. Despite the ubiquity of these assemblies, we know little about their inner structure or their actual cellular function. While most research on transcriptional condensates has been constrained by in vitro limitations, this project offers an opportunity to explore these dynamic cellular structures within a living organism – a model organism *Caenorhabditis elegans*.

### **Aim:**

The research will investigate the spatial organization of transcription during embryonic development of *C. elegans*, employing an innovative approach that combines cutting-edge genetic and imaging technologies to probe fundamental cellular mechanisms. The first aim is to gain insights into the inner structure of transcriptional condensates using super-resolution microscopy techniques such as iSIM and STED. The second aim is to study the function of these bodies through genetic and environmental perturbations followed by molecular and phenotypic characterisation. Successful candidates will get trained in super-resolution live imaging, CRISPR/Cas9 transgenic techniques, high-throughput genomic assays like RNA-seq and ChIP-seq, and developing sophisticated automated microscopy and image analysis pipelines. The project promises to generate transformative insights into how transcriptional condensates regulate gene expression during animal development, contributing to our understanding of core principles of cellular organization and developmental biology. As a doctoral researcher, you will join an international, dynamic research group that offers exceptional professional development opportunities. The position provides a platform to gain proficiency in state-of-the-art scientific techniques, including advanced microscopy with super-resolution iSIM and STED systems.

### **Requirements:**

- a Master's degree (or an equivalent) in molecular biology, molecular biomedicine, biochemistry, medicine, genetics, bioinformatics, or biotechnology;
- excellent written and spoken English;
- excellent scientific track record in relation to career stage;
- good organizational skills;
- strong motivation and ability to drive the project independently;
- well-developed collaborative skills;
- knowledge of the standard molecular biology and biochemistry techniques;
- curiosity for the discovery of biological processes.