

## In vitro recapitulation of RNA programs that govern animal development

Laboratory of RNA function

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Recent advances in the field of non-coding RNAs have highlighted the importance of post-transcriptional regulations in living organisms. For examples, microRNAs (miRNAs) regulate a broad spectrum of biological processes including cell fate decision, cell proliferation, homeostasis and human diseases. Small interfering RNAs (siRNAs) are generated to counteract exogenous RNAs such as viral genomes, whereas Piwi-interacting RNAs (piRNAs) maintain the genome stability by silencing transposable elements in the germline. These RNA molecules form complexes with protein factors and regulate gene expression by affecting key steps in mRNA life, including mRNA transcription, translation and degradation. Importantly, these steps are also targeted by other regulatory mechanisms. The main focus of our lab is to dissect these RNA regulatory machineries by combining biochemistry, genetics and biophysics.

Although much has been reported on the basic molecular mechanism of miRNAs, less is known about the variability and flexibility of their action during animal development. Zebrafish (*Danio rerio*) will be a useful model organism to address this



question; hundreds of fertilized eggs can be obtained from genetic mutants, and development proceeds synchronously. However, a lack of in vitro experimental system that recapitulates the developmental miRNA program has hampered a progress of the



research in this organism. Based on our broad expertise in biochemistry, we propose **in vitro recapitulation of miRNA-mediated gene silencing from zebrafish embryos** as a research subject during an internship. This challenging project will allow us to examine basic features of the miRNA pathway at various developmental stages. Depending on candidate's

interest, this project may be extended towards understanding other unique features of RNA regulation during development, such as cytoplasmic polyadenylation / deadenylation and decapping. The candidate will be able to develop expertise in biochemistry as well as developmental biology during the internship program.