



Open position for LMU-CSC scholarship candidates 2027

Department/Institute: Department of Chemistry

Subject area: Chemical Biology

Name of supervisor: Prof. Dr. Andrea Rentmeister

Number of open position: 1

Project title: Engineering mRNA–Protein Interactions at the 5' Cap and Poly(A) Tail to Control Translation

Project description:

Translation is a tightly regulated process that ultimately determines protein output in the cell. Two elements are central to this control in eukaryotes: the 5' cap and the 3' poly(A) tail, which together govern mRNA stability, translation efficiency, and engagement with the translation machinery. Both ends are read out by dedicated RNA-binding proteins — cap-binding proteins such as eIF4E at the 5' terminus and poly(A)-binding protein (PABP) at the 3' terminus — whose association is a decisive step in translation initiation.

This project aims to define the molecular principles that govern how chemically modified mRNA termini are recognized by their cognate binding proteins. The first objective is a systematic characterization of the interaction between structurally diverse 5' cap analogs and cap-binding proteins, resolving how specific chemical and structural features dictate binding affinity, specificity, and selectivity. The second objective addresses the 3' end, asking how modifications of the poly(A) tail alter PABP binding and, in turn, protein production. Combining quantitative binding analyses with functional translation readouts will allow structure–activity relationships to be established across both termini.

Together, these results will yield a mechanistic framework for engineering selective mRNA–protein interactions and provide a rational basis for new strategies to control translation — with direct relevance for the design of next-generation mRNA therapeutics.

Project time plan:

Full Doctoral Study-Model: 36 or 48 months

Language requirements:

Fluent English in speaking and writing

Academic requirements:

We are looking for motivated MSc (or equivalent) candidates with a background in biochemistry, molecular biology, cellular biology or a related field.

Contact information of supervisor:

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To applicants:

- Resume and Research Motivation Letter
- Certificate of Proficiency in English, equivalent to IELTS Test Academic 6.5 (no module below 6) or TOEFL IBT 95, is required
- Two letters of recommendation directly sent from your current Supervisors/Professors to LMU-CSC Office