



# Simulation Model of the Mitochondrial Ribosome

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## Introduction

### Mitochondrial Ribosomes

Mitochondrial ribosomes (mitoribosomes) are **biomacromolecular complexes** composed of mitochondrial rRNAs and proteins. As their name suggests, they are located within the **mitochondrion** and perform a function analogous to cytosolic ribosomes - facilitating **mitochondrial translation**, where mitochondrial mRNA is translated into proteins. These mitochondrial proteins are co-translationally integrated into the inner mitochondrial membrane, where they constitute essential components of the oxidative phosphorylation (OxPHOS) complexes. OxPHOS is a biochemical pathway crucial for **ATP production**.

### Mitoribosomal Structure

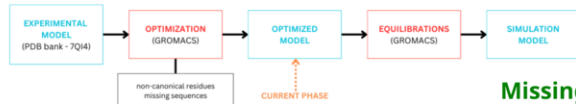
Structurally, mitoribosomes **differ significantly from cytosolic ribosomes**. They are smaller and exhibit an **inverted protein-to-rRNA ratio**, with a higher proportion of proteins. Derived from bacterial ribosomes, mitoribosomes have evolved **distinct structural adaptations** absent in cytosolic ribosomes, for example including **iron-sulfur ( $\text{Fe}_2\text{S}_2$ ) clusters** associated with proteins and the **mL45 protein**, which is essential for co-translational insertion of proteins into the inner mitochondrial membrane.

## Project

### Goals

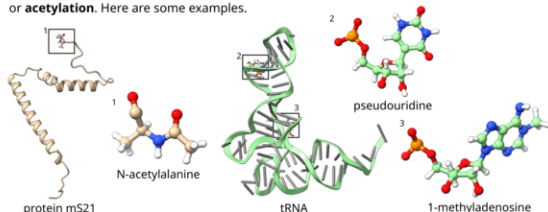
1. Create complete all-atom simulation model
2. Describe dynamics of a chosen part of the mitoribosome

### Process



### Non-canonical residues

Mostly these are **modified amino acids** (in proteins) or **nucleotides** (in rRNA). Modifications are usually **small**, such as **methylation** or **acetylation**. Here are some examples.



## Worth-to-remember

Mitoribosomes are biomacromolecular complexes of proteins and rRNAs within mitochondria. This project aims to create an all-atom simulation model to capture their dynamic behavior. That means we want to breathe life into them and see their moves :).

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## Contact

If you have any further questions, feel free to contact me via email:  
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