

AYUSH DEEP

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EDUCATION

Eidgenössische Technische Hochschule Zürich

M.S. in Molecular and Structural Biology

Thesis title: *Molecular Dynamics Simulations of Darobactin Analogues*

Advisor: Prof. Sereina Riniker

Zürich, CH
Sept 2021 - Nov 2023

Albany College of Pharmacy and Health Sciences

B.S. in Pharmaceutical Science, minor in Mathematics

Thesis title: *Overexpression and Purification of Human mtEF4*

Advisor: Dr. Rajendra K. Agrawal

Albany, NY
Aug 2015 - May 2019

Fair Lawn High School

High School Diploma

Fair Lawn, NJ
Sept 2013 - Jun 2015

RESEARCH EXPERIENCE

Riniker Lab, ETH Zürich

Masters Thesis Student

Zürich, CH
April 2023 - Present

- Utilized AMBER and GROMACS softwares to perform Molecular Dynamics simulations, exploring the interactions between macrocyclic peptides and membrane proteins
- Analyzed the properties of candidate novel macrocyclic compounds using Python and cpptraj for structure-function analysis
- Used cheminformatics toolkits such as RDKit and OEChem for conformer generation of macrocyclic peptides

Ban Lab, ETH Zürich

Semester Project Student

Zürich, CH
Oct 2022 - Jan 2023

- Investigated the role of proteins involved in non-canonical translation initiation by in-vitro translation techniques
- Standardized an immunodepletion protocol within an in-vitro translation system

Jonas Lab, ETH Zürich

Research Assistant

Semester Project Student

Zürich, CH
Jun 2022 - Aug 2022
Jan 2022 - Jun 2022

- Investigated the early steps of ribosome biogenesis by using biochemical techniques such as in-vitro transcription and northern blotting
- Gained experience in mammalian cell culture and transfection of human cell lines
- Conducted pulldown assays to determine interacting partners of protein complexes involved in early stages of ribosome biogenesis

Agrawal Lab, Wadsworth Center

Research Assistant

Undergraduate Student Researcher

Albany, NY
Jun 2019 - May 2021
Jun 2017 - May 2019

- Over-expressed mammalian translation factors of interest in bacterial systems. Purified these proteins using FPLC and a variety of chromatography methods (His-tag, ion exchange, GST-tag, size exclusion)
- Designed and standardized a GTPase assay to assess the difference in antibiotic effectiveness between bacterial and mitochondrial translational factors
- Interpreted ribosome structures in Chimera and ChimeraX to determine the structural mechanisms of resistance to antibiotics.
- Processed single particle cryo-EM data using cryoSPARC and RELION. Also experienced with the linux command line and scripting for communicating with clusters and data management
- Used CHARMM molecular dynamics package to simulate antibiotic binding to the ribosome
- Trained in the process of making high quality grids (carbon evaporation, vitrification) for cryo-EM
- Mentored high school interns in basic molecular biology techniques and protein purification

Zheng Lab, ACPHS
Undergraduate Student Researcher

Albany, NY
Oct 2015 - May 2017

- Wrote a program in Python for purposes of visualizing affinity of different cannabinoids to the CB1 and CB2 GPCR receptors in terms of binding affinity and agonistic, antagonistic, and inverse-agonistic properties. Data for these plots was obtained from literature research

Genspace
iGEM Student Member

Brooklyn, NY
Jun 2016 - Nov 2016

- Part of a team participating in the iGEM competition. Involved in the design and cloning of plasmid vectors into *E. coli*. Used RT-qPCR to quantify the plasmid copy number of one of the most commonly used plasmid backbones in the competition. This project resulted in the Genspace team winning a medal for Best Measurement project. Details of all projects can be found at <http://2016.igem.org/Team:Genspace>

EXTRACURRICULARS

Resonance Jams
Volunteer and Board Member

Zürich, CH
Jan 2022 - Present

- Volunteered as part of the music organization, Resonance, to organize weekly open jams for musicians in Zürich

PUBLICATIONS

1. Ravi K. Koripella, **Ayush Deep**, Ekansh K. Agrawal, Pooja Keshavan, Nilesh K. Banavali, and Rajendra K. Agrawal. Distinct mechanisms of the human mitoribosome recycling and antibiotic resistance. Nat Commun 12, 3607 (2021); <https://doi.org/10.1038/s41467-021-23726-4>

PREPRINTS

1. Soneya Majumdar*, **Ayush Deep***, et al. The small mycobacterial ribosomal protein, bS22, modulates aminoglycoside accessibility to its 16S rRNA helix-44 binding site. bioRxiv (2023); <https://www.biorxiv.org/content/10.1101/2023.03.31.535098v1>

POSTER PRESENTATIONS

1. Nathaniel Spaziani, **Ayush Deep**, Andrew Thurston, HaiAn Zheng. System Pharmacognosy Mapping of Phytocannabinoids for CB1/CB2 Activity and Specificity. International Cannabinoid Research Society Symposium. June 2017.

SKILLS

Languages: English (native), Hindi (native)
Software: Python, Jupyter, Bash shell, L^AT_EX, GROMACS, AMBER, CHARMM, PyMOL, Chimera/ChimeraX, COOT, cryoSPARC, RELION, PHENIX, RDKit, OEChem, Vim

AWARDS

Student Biolab Ideathon 1st place Bio-hackathon for the design of better biodegradable polymers	ETHZ Nov 2022
ESOP Scholarship Award covering living costs and study expenses in the ETHZ masters	ETHZ Sept 2021 - Dec 2022
Dean's Scholarship Awarded for high GPA and standardized testing scores	ACPHS Aug 2015 - May 2019
Pharmaceutical Science Scholarship Awarded for high GPA and standardized testing scores	ACPHS Aug 2015 - May 2019
Dean's List Recognized for GPA > 3.5	ACPHS Fall 2015 - Spring 2017, Fall 2018, Spring 2019
Best Measurement Project Awarded to the best synthetic biology measurement project	iGEM Nov 2016

REFERENCES

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Prof. Stefanie Jonas

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