Ayush Deep

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Education

Eidgenössische Technische Hochschule Zürich — Zürich, CH
M.S. in Molecular and Structural Biology — Sept 2021 - Nov 2023
Thesis title: *Molecular Dynamics Simulations of Darobactin Analogues*
Advisor: Prof. Sereina Riniker

Albany College of Pharmacy and Health Sciences — Albany, NY
B.S. in Pharmaceutical Science, minor in Mathematics — Aug 2015 - May 2019
Thesis title: *Overexpression and Purification of Human mtEF4*
Advisor: Dr. Rajendra K. Agrawal

Fair Lawn High School — Fair Lawn, NJ
High School Diploma — Sept 2013 - Jun 2015

Research Experience

Riniker Lab, ETH Zürich — Zürich, CH
Masters Thesis Student — 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 — Zürich, CH
Semester Project Student — 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 — Zürich, CH
Research Assistant — Jun 2022 - Aug 2022
Semester Project Student — 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 — Albany, NY
Research Assistant — Jun 2019 - May 2021
Undergraduate Student Researcher — Jun 2017 - May 2019

- Over-expressed mammalian translation factors of interest in bacterial systems. Purified these proteins using FPLC and a variety of chromotography 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 — Albany, NY
Undergraduate Student Researcher — 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 — Brooklyn, NY
iGEM Student Member — 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 — Zürich, CH
Volunteer and Board Member — Jan 2022 - Present

- Volunteered as part of a the music organization, Resonance, to organize weekly open jams for musicians in the 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, LaTeX, GROMACS, AMBER, CHARMM, PyMOL, Chimera/ChimeraX, COOT, cryoSPARC, RELION, PHENIX, RDKit, OEChem

Awards

Student Biolab Ideathon 1st place — ETHZ
Bio-hackathon for the design of better biodegradable polymers — Nov 2022

ESOP Scholarship — ETHZ
Award covering living costs and study expenses in the ETHZ masters — Sept 2021 - Dec 2022

Dean's Scholarship — ACPHS
Awarded for high GPA and standardized testing scores — Aug 2015 - May 2019

Pharmaceutical Science Scholarship — ACPHS
Awarded for high GPA and standardized testing scores — Aug 2015 - May 2019

Dean's List — ACPHS
Recognized for GPA $>$ 3.5 — Fall 2015 - Spring 2017, Fall 2018, Spring 2019

Best Measurement Project — iGEM
Awarded to the best synthetic biology measurement project — Nov 2016

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