

AYUSH DEEP

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EDUCATION

Memorial Sloan Kettering Cancer Center New York, NY
PhD in Cancer Biology Jul 2024 - Present

Eidgenössische Technische Hochschule Zürich Zürich, CH
M.Sc. 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.Sc. in Pharmaceutical Science, minor in Mathematics Aug 2015 - May 2019
Thesis title: *Overexpression and Purification of Human mtEF4*
Advisor: Dr. Rajendra K. Agrawal

RESEARCH EXPERIENCE

Chodera Lab, MSKCC New York, NY
Rotation Student Aug 2024

- Applied Molecular dynamics simulations in openMM and free energy calculations in PERSES to understand the effects of mutations in cancer relevant kinases

Riniker Lab, ETH Zürich Zürich, CH
Masters Thesis Student April 2023 - Nov 2023

- 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 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 script 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.

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>

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>

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>

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.

EXTRACURRICULARS

Resonance Jams

Volunteer and Board Member

Zürich, CH

Jan 2022 - Jan 2024

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

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

3,000 CHF bio-hackathon award for the design of better biodegradable polymers

ETHZ

Nov 2022

Excellence Scholarship (ESOP)

36,000 CHF stipend and full tuition waiver for top 2% of entering Master's students

ETHZ

Sept 2021 - Dec 2022

Dean's Scholarship

\$20,000 tuition deduction award for high GPA and standardized testing scores

ACPHS

Aug 2015 - May 2019

Pharmaceutical Science Scholarship

\$5,000 tuition deduction award 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

Prof. John Chodera

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