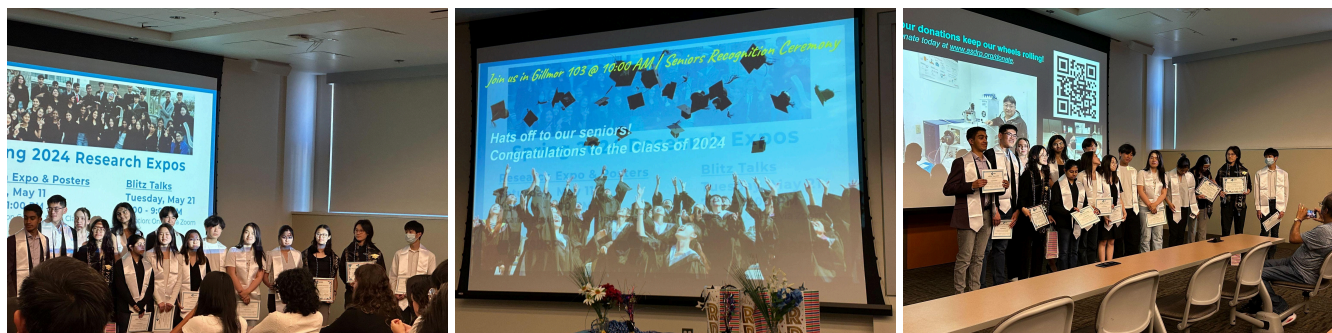


Announcing our 2024 Senior Scholar Scientist Award Recipients



The Senior Scholar-Scientist Achievement Award is the highest level of distinction for a senior research student at ASDRP who we believe exemplifies the spirit of the Institution. Every year, ASDRP produces some of the best high school researchers in the country, who go on to do fantastic things in college and beyond. The Graduating Senior Scholar-Scientist Award is designed to recognize outstanding seniors for a track record of excellence in research at ASDRP. Eligible students must be third- or fourth-year ASDRP students who joined as freshmen or sophomores, and must be hand-nominated with a letter of support from their faculty supervisor. Awardees are voted on by the three Department Chairs and determined by unanimous confirmation by the ASDRP leadership on the basis of their scientific merit, achievements, and character. Last year, the Senior Scholar Scientist Award was awarded to Sarah Su (Los Altos '23, Massachusetts Institute of Technology '27) from the Njoo Lab. This year, the ASDRP leadership opted to recognize three outstanding seniors: **Kimberly Khow (Amador Valley '24; UC Irvine '28; Njoo Lab)**, **Adelina Chau (Archbishop Mitty '24; UC Berkeley '28)**, and **Rosie Chen (Adrian Wilcox '24; Johns Hopkins '28)**.

Aspiring Scholars Directed Research Program

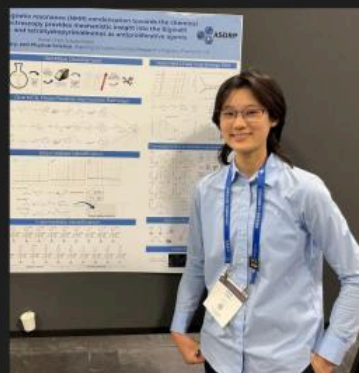
2024 Senior Scholar-Scientists



Adelina Chau
Archbishop Mitty '24
UC Berkeley '28
Advisor: Dr. McMahan



Kimberly Khow
Amador Valley '24
UC Irvine '28
Advisor: Dr. Njoo



Rosie Chen
Adrian Wilcox '24
Johns Hopkins '28
Advisor: Dr. Njoo

This last Saturday at Mission College, ASDRP recognized three seniors for their outstanding contributions to science, their integrity and character, and their embodiment of the ideals that define the excellence in research pursued by all ASDRP students. This Saturday, our seniors were all honored with a white stole recognizing all of their achievements and accomplishments while at ASDRP; our three Senior Scholar-Scientists were specifically honored with a black and gold stole and a blue and white cord, in addition to their gift bag (containing an iPad and gift for college!) More about the Senior Scholar-Scientist Distinction can be found online at <https://www.asdrp.org/senior-scholar-scientist>.

Rosie Chen - Njoo Lab [Organic Chemistry] (Adrian Wilcox High School '24) is a fourth year ASDRP student and current member of Dr. Njoo's research group. Rosie's journey at ASDRP began in the autumn of 2020 as a freshman. After a brief stint in the Kaur lab, where Rosie worked on the identification fungi using PCR and environmental DNA (eDNA) analysis, and another brief stint in Scott Clark's lab (formerly in the Chemistry Department) working on the chemical synthesis of aryl-substituted pyrazoles for anticancer therapy. Following this, in 2021, Rosie joined Dr. Njoo's group, initially working on an exceptionally challenging total synthesis of psychrophillin A, a cyclic indole N-acylated natural product with unique antifungal and anticancer properties, where Rosie and others developed a one-flask procedure for sequential installation of a t-butyl carbamate and basic hydrolysis of a methyl ester in pursuit of a key fragment of this natural product, while also working on the synthesis of a series of photocaged prodrugs of another natural product called podophyllotoxin (manuscript in progress). Following this, Rosie led an effort in using fluorine nuclear magnetic resonance (NMR) spectroscopy to probe the reaction mechanism of a three-component catalytic cyclocondensation, which was subsequently published in *ACS Omega* with Rosie as the first author ("[Benchtop 19F Nuclear Magnetic Resonance \(NMR\) Spectroscopy Provides Mechanistic Insight into the Biginelli Condensation toward the Chemical Synthesis of Novel Trifluorinated Dihydro- and Tetrahydropyrimidinones as Antiproliferative Agents](https://doi.org/10.1021/acsomega.3c00290)", *ACS Omega* **2023**, 8, 11, 10545–10554, DOI: <https://doi.org/10.1021/acsomega.3c00290>), where Rosie and co-authors established a new mechanism for the ytterbium-catalyzed preparation of fluorinated heterocycles with relevance in medicinal chemistry. Following this, Rosie jumped into a natural product synthesis project, and together with other students in the project co-authored a paper describing a means of using HPLC for real-time tracking of a ketal hydrolysis ("High-performance liquid chromatography insight in pH-dependent hydrolysis of andrographolide acetonide", *J. Emerging Investigators* **2023**, manuscript accepted). In parallel, Rosie expanded the lab's use of fluorine NMR spectroscopy and made key contributions in using it, along with gas chromatography - mass spectrometry, to mechanistically probe the mechanism of the Ugi four-component reaction towards the synthetic preparation of a key building block for atorvastatin (Lipitor). Most recently, Rosie helped to spearhead an exceptionally challenging catalysis project on the optimization of cobalt (II) complexes as difluorocarbene and trifluoromethyl carbene transfer reagents for the preparation of fluorinated cyclopropanes, and is currently wrapping up a methods project on solvent effects on *in situ* generated trifluorodiazaoethane stability. Over the last four years, Rosie has also over a dozen conference proceedings, including at the [American Chemical Society National meeting](#) (Spring '22 San Diego, Fall '22 Chicago, Spring '23 Indianapolis, Fall '24 SF) and an oral presentation delivered at SCCUR '22 (Pepperdine University), and has built up a very impressive list of research experiences from natural product total synthesis, catalyst optimization, and organometallic catalysis. This autumn, Rosie is off to **Johns Hopkins University** in Baltimore, majoring in Biophysics.

Kimberly Khow - Njoo Lab [Chemical Biology] (Amador Valley High School '24) is a fourth year ASDRP student and current member of Dr. Njoo's research group. Kimberly began her research career as a freshman in Nardeen Mikhail's group (formerly in the Biology Department), where she eventually

coauthored a paper [“Detection and Control of Spoilage Fungi in Refrigerated Vegetables and Fruits”](#) (*J. Emerging Investigators* **2021**, DOI: <https://doi.org/10.59720/20-188>). Following this, in 2021, Kimberly spent a semester in Prabhjeet Kaur’s lab, where she worked on the identification of mycorrhizal fungi in urban garden soil. The following semester and at the end of her freshman year, Kimberly moved to the Chemistry department, where she worked under Raymond Chen in using high performance liquid chromatography to perform stability assays on natural products as pharmaceutical agents. Finally, at the end of her sophomore year, Kimberly joined Dr. Njoo’s group. In the Njoo lab, Kimberly was one of the first students to work on antibody-drug conjugation chemistry, and in collaboration with a biotechnology company that collaborates with Dr. Njoo, this technology has now evolved into preclinical studies for the treatment of metastatic, triple negative breast tumors. Concurrently, Kimberly worked on the synthesis of analogs of a natural product lignin called podophyllotoxin, and subsequently co-authored a paper describing initial structure-activity relationships of a systematic library of C-4 ester analogs in arresting cell division in colon cancer cells - [“C-4 analogs of podophyllotoxin as tubulin inhibitors: Synthesis, biological evaluation, and structure-activity relationship”](#) (*ChemRxiv* **2023**, in review, *Nat. Prod. Research*, DOI: <https://doi.org/10.26434/chemrxiv-2023-d5lcg>). Following this paper, Kimberly and others involved in the project subsequently expanded this initial SAR to nearly thirty novel carbonate and carbamate derivatives, the most recent of which were disclosed this last weekend (manuscript in progress). In parallel to these efforts, Kimberly also helped to lead a project in the Njoo lab on developing biodegradable plant-lipid based cationic lipids for targeted mRNA delivery with applications in vaccination chemistry. From the efforts of Kimberly and others in the project, the lead lipids from this study are now being studied for mRNA delivery in cancer vaccination with an industry collaborator. Finally, Kimberly played a key role in leading a project on using a DNA-labeling fluorophore, called amonafide, to develop the first series of amonafide-lipid conjugates for selective labeling of nucleic acid-lipid boundaries in cells. On top of this, over her time at ASDRP, Kimberly has been a co-presenter in multiple conference proceedings, including at the Southern California Conferences for Undergraduate Research (SCCUR, ‘22 & ‘23), and the American Chemical Society National Meeting ([Fall ‘23 SF](#)) and has acquired an exceptionally broad skill set in microbiology, molecular biology, analytical chemistry, organic synthesis, fluorescent imaging, RNA delivery, and medicinal chemistry. This autumn, Kimberly will be attending the **University of California, Irvine**, where she will be majoring in biochemistry.

Adelina Chau - McMahan Lab [Quantum / Machine Learning] (Archbishop Mitty High School ‘24) is a third year ASDRP student and a current member of Dr. McMahan’s research group. Adelina joined Dr. McMahan’s group as a sophomore, where she jumped straight into the opportunities presented in using machine learning and Hybrid Quantum-Classical Graph Generative Adversarial Networks (QNetGAN) to probe various questions related to quantum mechanical calculations such as Hartree Fock free energy calculations, perturbations to electronic structure in physical systems, etc. Recently, Adelina and co-workers published two papers - [“Molecular Geometry Generation Processes Through Hybrid Quantum-Classical Generative Adversarial Networks and Python-Based Self-Consistent Field Molecular Calculations”](#) (*2023 IEEE International Conference on Quantum Computing and Engineering (QCE) 2023*, (Vol. 2, pp. 312-313). IEEE; and, [“Hybrid Quantum-Classical Generative Adversarial Network for synthesizing chemically feasible molecules”](#) (*J. Emerging Investigators* **2023**, DOI: <https://doi.org/10.59720/22-143>), with more in review. Beyond being an exceptionally productive member of Dr. McMahan’s group, Adelina has been an outstanding leader, and has always been willing to help new members of the group get up to speed on project basics and on the basics of QNetGAN. This autumn, Adelina will be attending the **University of California, Berkeley**, double majoring in electrical engineering and computer science, and in business administration in the Management, Entrepreneurship, and Technology program.