Alexander M. Chang

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Department of Chemistry | Stanford University

EDUCATION

2019 – Present	**Stanford University**	Stanford, CA Ph.D.	Theoretical Chemistry Research Advisor: Prof. Todd J. Martínez
2015 – 2019	**Yale University**	New Haven, CT B.S.	Chemistry, Applied Mathematics (Distinction in both Majors) Research Advisor: Prof. Victor S. Batista Cumulative GPA: 3.80/4.00

AWARDS & HONORS

2023	Linus Pauling Teaching Award *Stanford University – Department of Chemistry*
2021 – 2024	National Science Foundation Graduate Research Fellowship *National Science Foundation*
2020	Outstanding Graduate Student Poster – Virtual Conference of Theoretical Chemistry 2020
2019 – 2022	Stanford Graduate Fellowship in Science and Engineering *Stanford University – Department of Chemistry*
2019	Arthur Fleischer Award (for Outstanding Performance in Chemistry) *Yale University – Department of Chemistry*
2016	Yale College Freshman Summer Research Fellowship *Yale University*

TEACHING & OUTREACH

Fall 2023 — Center for Teaching and Learning Teaching Advancement Grant
- Designing lab for Chem 31A (General Chemistry) that integrates Interactive Molecular Dynamics in virtual reality into curriculum
- Acquired grant money and partnered with Stanford Virtual Human Interaction Lab to supply Oculus VR headsets for students

2023 – Stanford Jail & Prison Education Project
- Designed course with team of co-lecturers for inmates in San Francisco jail
- Gave lectures on chemical bonding adapted for jail classroom (*e.g.* no electronics)

Spring 2023 — Splash
- Taught high schoolers chemistry using interactive molecular dynamics in virtual reality

Fall 2022 — Chem 31A (General Chemistry) Head Teaching Assistant
- Managed day-to-day logistics for 300-student course
- Led team of first-year TAs, delegated their duties and organized office hour/lab schedules

- Helped create exams and write answer key as well as design novel questions for students
- Ran grading sessions of TAs and mercenary graders for three midterms and final exam

2021 – 2023   Stanford Future Advancers of Science and Technology (FAST) Mentor
- 2021-2022: Designed machine learning project for student to predict Amazon booksales
- Helped student learn how to code in python via weekly Saturday FAST sessions
- 2022-2023: Designed math-based freezing point depression project for student
- Tailored experimental design to fit student's interest in calculus

Summer 2021   Martinez Group Summer School Lecturer
- Gave 3-hour lecture on enhanced sampling methods for free energy calculations
- Created and graded homework assignments based on lecture material

Fall 2020   Chem 33 (Organic Chemistry) Teaching Assistant | Stanford University
- Served as Exam TA: helped make, vet, and grade 8 quizzes and 2 exams
- Held 6 office hours a week
- Guided students through practice problems in breakout rooms during lectures

2019, 2021-2023   Mercenary Grader for General Chemistry
- Graded midterms and final exam for Stanford general chemistry classes

2019   Yale Young Global Scholars Instructor | Yale University
- Guided high schoolers on their own machine learning research projects
- Created/gave seminars on probability, machine learning, research ethics, and geophysics
- Led discussion sections on lectures by Yale faculty

2018   Center for Teaching and Learning Science & QR Tutor | Yale University
- Tutored freshmen each for 1 hr/week in organic chemistry

2015 – 2016   MathCounts Outreach Instructor | Nathan Hale School, New Haven CT
- Created lecture plans and led group sessions for MathCounts

PUBLICATIONS

05.   Efficient Acceleration of Reaction Discovery in the *Ab Initio Nanoreactor*: Phenyl Radical Oxidation Chemistry
Chang, A. M.; Meisner, J.; Xu, R.; Martínez, T. J., *Journal of Physical Chemistry A,* **2023**, DOI: 10.1021/acs.jpca.3c05484

04.   First Principles Reaction Discovery: From the Schrodinger Equation to Experimental Prediction for Methane Pyrolysis
Xu, R.; Meisner, J.; **Chang, A. M**.; Thompson, K. C.; Martínez, T. J., *Chem. Sci.* **2023**

03.   The non-adiabatic nanoreactor: towards the automated discovery of photochemistry
Pieri, E.; Lahana, D.; **Chang, A. M**.; Aldaz, C. R.; Thompson, K. C.; Martínez, T. J., *Chem. Sci.* **2021**

02.   Hammett Neural Networks: Prediction of Frontier Orbital Energies of Tungsten-Benzylidyne Photoredox Complexes
Chang, A. M.; Freeze, J. G.; Batista, V. S., *Chem. Sci.*, **2019**, *10*, 6844-6854.

01.   Inverse Design of a Catalyst for Aqueous CO/CO_2 Conversion Informed by the Ni^{II}-iminothiolate Complex
Chang, A. M.; Rudshteyn, B.; Batista, V. S., *Inorg. Chem.* **2018**, *57* (24), 15474-15480.

RESEARCH

2019 – Present	Graduate Student, Stanford University | Advisor: Prof. Todd J. Martínez

- Developing and applying *ab initio* nanoreactor framework and codebase
- Created novel reaction discovery methods for accelerated molecular dynamics
- Analyzed and compared efficiencies and biases of various reaction-accelerating forces

2017 – 2019	Undergraduate Researcher, Yale University | Advisor: Prof. Victor S. Batista

- Used a tight-binding linear combination of atomic potentials (TB-LCAP) inverse design to discover optimal nickel catalysts for CO oxidation; ran density functional theory (DFT) calculations on catalytic cycle, including relaxed scans and transition state calculations.
- Developed novel neural network methodology using Hammett parameters to describe ligands of tungsten catalyst for molecular design; employed machine learning techniques to examine data and hypothesize chemical theory behind mathematical trends.
- Created inverse design gradient descent algorithm using neural network scoring function to optimize catalyst ligands for reductive power

Summer 2016	Undergraduate Researcher, Yale University| Advisor: Prof. Seth Herzon

- Aided in synthesis of precolibactins

POSTER PRESENTATIONS

2023	West Coast Conference on Theoretical Chemistry | Davis, CA
2022	American Conference on Theoretical Chemistry | Olympic Valley, CA
2021	Bay Area Theoretical Chemistry Virtual Poster Session
2020	Virtual Conference of Theoretical Chemistry 2020
2019	257th ACS National Meeting | Orlando, FL
2018	Boston University Cokerfest Symposium | Boston, MA

SKILLS

Language/Script:	Python, R, Bash, LaTeX, C
Programs:	VMD, Gaussian, TeraChem, Avogadro, Keras/TensorFlow, ChemDraw, Excel, Prism

LEADERSHIP & VOLUNTEER EXPERIENCES

2020 – 2021	Student Affairs Committee for Chemistry Department | Stanford University
2016 – 2018	Volunteers Around the World Yale Chapter | Peru; Dominican Republic 2017 – 2018 Team Co-Leader and Head of Finances
2015 – 2019	Davenport Pops Orchestra | Yale University 2017 – 2018 Director of Development | 2016 – 2017 Treasurer