

PARTHO KUMAR PAUL

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PROFESSIONAL SUMMARY

Ph.D. candidate in synthetic organic chemistry specializing in the design and electrochemical characterization of redox-active molecules for CO₂ capture. Experienced in multi-step air-sensitive synthesis, transition-metal catalysis, and ultrafast spectroscopy via pulse radiolysis. Combines hands-on experimental expertise (Schlenk line, glovebox, cyclic voltammetry) with computational chemistry (TDDFT) and automated Python data pipelines. Passionate about science communication, mentoring undergraduate researchers, and developing inclusive instructional materials.

EDUCATION

Ph.D., Organic Chemistry | University of California, Irvine | Expected Summer 2026 *
Advisor: Prof. Jenny Y. Yang * Dissertation: Design, synthesis, and electrochemical characterization of bio-inspired redox-active molecules for CO₂ capture in organic and aqueous media * Fellowships: Eugene Cota-Robles Fellowship (1st & 4th Year) | Dissertation Year Fellowship (Summer 2025)

B.S., Chemical Engineering (Nanotechnology Emphasis), Minor in Chemistry | University of California, Riverside | 2020 * Honors: UC LEADS Scholar (2018), Bourns Scholar, Research Mini-Grant Recipient

RESEARCH EXPERIENCE

Visiting Researcher — Computational Chemistry | RIKEN Center for Computational Science, Kobe, Japan | Jun 2026 – Aug 2026 * Selected for the DOE SCGSR International Research Collaboration Award (IRCA) to perform TDDFT computational chemistry on the Fugaku supercomputer, modeling the excited-state electronic structure of molecular systems. * Applying density functional theory (DFT) methods to characterize reduced organic intermediates via spectral simulation, energy-minimized geometry, and pK_a calculations. * Developing Python-based workflows for high-performance computing job management, automated data extraction, and ML-assisted analysis of computational results across large compound libraries.

DOE SCGSR Fellow / Visiting Research Scientist | Brookhaven National Laboratory, Upton, NY | Jan 2026 – Jun 2026 * Designing and executing pulse radiolysis experiments to probe ultrafast electron transfer kinetics and radical formation mechanisms in water-soluble flavin derivatives, generating quantitative rate constants and transient

absorption spectra for reactive intermediates. * Analyzing time-resolved spectroscopic datasets to extract mechanistic insights into one-electron redox processes, structure–reactivity relationships, and the fate of short-lived radicals in solution. * Collaborating across BNL’s Chemistry Division with senior scientists in the Artificial Photosynthesis group, integrating experimental pulse radiolysis results with computational and mechanistic models. * Managing an independent research program under DOE protocols; coordinating seamlessly across institutional boundaries between UCI and BNL.

Graduate Student Researcher — Electrochemical CO₂ Capture | Yang Lab, UC Irvine | Apr 2024 – Present * Designed, synthesized, and characterized 15+ novel redox-active organic molecules (hydroxymethylated quinones, alloxazine/flavin derivatives) for electrochemical CO₂ capture, systematically correlating molecular structure with redox potentials, electron transfer kinetics, and stability. * Applied physical organic chemistry principles to enhance CO₂ selectivity while minimizing O₂-induced deactivation. * Performed cyclic voltammetry, bulk electrolysis, and spectroelectrochemistry to quantify binding thermodynamics, map operative pH-swing pathways, and identify degradation mechanisms. * Investigated transformation pathways using multi-technique characterization (NMR, UV-Vis, FTIR, GC-MS, LC-MS, ESI-MS), tracking reactive intermediates and catalyst deactivation across timescales. * Built Python-based data analysis and automation pipelines for electrochemical and spectroscopic workflows, enabling systematic structure–property analysis across compound libraries. * Led 4 concurrent research projects, developed standardized protocols, and prepared manuscripts for publication.

Graduate Student Researcher — Transition-Metal Catalysis | Pronin Lab, UC Irvine | Aug 2021 – Mar 2024 * Investigated cobalt-catalyzed radical–polar crossover reactions involving metal-hydride hydrogen atom transfer (MHAT), developing a detailed mechanistic understanding of selectivity in olefin functionalization. * Systematically optimized catalyst structure, ligand environment, and reaction conditions to control selectivity and yield, building transferable skills in experimental design and parameter optimization. * Performed ¹⁸O isotopic labeling studies and multi-technique product characterization (NMR, MS) to elucidate radical and polar intermediates in catalytic cycles. * Executed multi-step air-sensitive synthesis (Schlenk line, glovebox) of transition-metal complexes, developing rigorous handling skills for reactive and unstable species.

TEACHING & MENTORING EXPERIENCE

Faculty Intern (BLOOM Program) | Irvine Valley College, Irvine, CA | Jan 2025 – May 2025 * Collaborated with faculty mentors to design and implement inclusive teaching strategies aimed at fostering student success in community college settings. * Designed original instructional content using evidence-based pedagogy, connecting abstract course concepts to real-world applications in electrochemistry and energy science. * Assisted in curriculum planning and learning outcomes assessment, gaining hands-on

experience with course management systems while emphasizing diversity, equity, and inclusion in education.

Teaching Assistant, Chemistry | University of California, Irvine | Aug 2021 – Present *
Led weekly discussion sections and laboratory sessions for undergraduate General and Organic Chemistry courses over 4+ years, simplifying complex concepts through interactive, multi-modal teaching approaches. * Provided individualized support through office hours, designed detailed grading rubrics, and delivered targeted written feedback to 100+ students per quarter. * Developed a reputation for making difficult concepts accessible, particularly for students with limited prior chemistry backgrounds. * Mentored undergraduate researchers on synthesis, characterization techniques, and instrument operation.

Private Chemistry & STEM Tutor | Southern California | 2017 – Present *
Delivered one-on-one and small group instruction in STEM subjects to undergraduate and pre-medical students for over 8 years, adapting teaching strategies to diverse learning needs and levels of preparation.

AWARDS & FELLOWSHIPS

- **DOE SCGSR International Research Collaboration Award (IRCA)** — RIKEN, Japan (2026)
- **DOE Office of Science Graduate Student Research (SCGSR) Fellowship** — Brookhaven National Laboratory (2026)
- **Eugene Cota-Robles Fellowship** — UC Irvine (1st & 4th Year)
- **School of Physical Sciences Dissertation Year Fellowship** — UC Irvine (Summer 2025)
- **Poster Award** — UC Irvine Undergraduate Research Symposium in Chemistry (Summer 2019)
- **Bourns Foundation Engineering Scholarship** — UC Riverside (Spring 2019)
- **UC LEADS Scholar** — UC Riverside (2018)

PUBLICATIONS

- **Paul, P. K.**; Lin, C. C.; Yang, J. Y. Design, Synthesis, and Studies of Hydroxymethylated Quinone Derivatives for Electrochemical CO₂ Capture. Manuscript in preparation.
- **Paul, P. K.**; Yang, J. Y. Synthesis and Evaluation of Charged Flavin Derivatives for pH-Swing Mediated CO₂ Capture. In preparation.

PRESENTATIONS

- **Presentation**, 249th ECS Meeting, Seattle (2025).
- **Presentation**, UC Chemical Symposium, Lake Arrowhead (September 2025).

- **Oral Presentation**, Applications of physical-organic principles in enhancing electrochemical CO₂ binding ability of Quinones, SoCal Electrochemistry Conference for Students (April 5, 2025).
- **Seminar Presentation**, Applications of physical-organic principles in enhancing electrochemical CO₂ binding ability of Quinones, UCI Graduate Student and Post-doctoral Researcher Seminar (Nov 2024).

SERVICE & LEADERSHIP

- **Organizer**, Postdoc and Graduate Student Seminar, UC Irvine (2022–2023)
- **Elected Representative**, Associated Graduate Students (AGS), School of Physical Sciences, UC Irvine (May 2024 – Present)
- **Graduate Student Representative**, Committee on Student Teaching and Learning Experience (CSTLE), UC Irvine (2024–2025)
- **Volunteer**, Sanatan Bengali Society of California

TECHNICAL SKILLS

- **Computational**: TDDFT (Fugaku supercomputer), density functional theory (Gaussian, Avogadro), electronic structure calculations, Python scripting for HPC workflows, ML/TensorFlow for predictive modeling.
- **Programming & Data Science**: Python (NumPy, SciPy, Matplotlib, pandas), MATLAB, JavaScript/HTML data tools, Git, Linux/Unix, automated data pipelines for analytical workflows.
- **Experimental Techniques**: Pulse radiolysis, transient absorption spectroscopy, cyclic voltammetry, bulk electrolysis, spectroelectrochemistry, NMR (¹H, ¹³C), UV-Vis, IR/FTIR, GC-MS, LC-MS, ESI-MS.
- **Synthesis & Catalysis**: Multi-step organic synthesis, transition-metal catalysis, main group catalysis, air-sensitive techniques (Schlenk line, glovebox), isotopic labeling (¹⁸O), molecular design and optimization.
- **Software**: Origin, ChemDraw, MestReNova, Igor Pro, Adobe Illustrator, PyMOL, Microsoft Office Suite.

REFERENCES

- **Jenny Y. Yang, PhD** Professor, UCI Chemistry (Academic Advisor) j.yang@uci.edu
- **Steven Nguyen, PhD** Professor, Irvine Valley College Chemistry (Mentor) snguyen@ivc.edu
- **Prof. Emeritus Scott Rychnovsky** Professor Emeritus, UC Irvine srychnov@uci.edu | (949) 517-8075