

C. A. Marcus Carr, PhD

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Early-career enzymologist with substantial research experience in biochemistry, structural biology, and organic chemistry. Expert in enzyme kinetics, protein purification and characterization; experienced in protein crystallography. Proven record of innovation in assay development and applications.

Research experience

Kiverdi, Inc., January 2014–present

Scientist

- Designed and assembled gene expression vectors using Golden Gate assembly to produce target chemicals in non-model bacteria.
- Led grant writing effort on submissions to the Department of Energy (\$125K–\$2MM).
- Supervised and assigned work to two senior research associates.

University of California, Berkeley, April 2008–December 2013

On the role of enzyme structure and structural dynamics in lipoxygenase catalysis

Doctoral dissertation. Principal investigator: Prof. Judith P. Klinman

- Developed metal-substituted enzyme variant and sample conditions for pulsed electron paramagnetic resonance ENDOR experiments to directly measure substrate–cofactor distance for the first time.
- Designed and executed protein crystallography experiments to connect enzyme kinetics to side-chain structure using a novel data analysis method.
- Began new collaborations with Brian M. Hoffman at Northwestern and Tom Alber at UC Berkeley and for the ENDOR and crystallography projects, respectively.
- Used bioinformatics methods to identify homologs of SLO for expression and further characterization.
- Performed complete kinetic characterization of a prokaryotic lipoxygenase.
- Mentored three undergraduate student researchers.

University of California, Berkeley, October 2006–September 2007

Synthesis and self-assembly of a homochiral supramolecular complex

Master's thesis. Principal investigators: Profs. Robert G. Bergman & Kenneth N. Raymond

- Chemically synthesized novel chiral ligands to form a homochiral metal-organic supramolecular complex and screened conditions for complex formation.
- Demonstrated binding of a stable organic radical to a supramolecular complex.

Columbia University Medical Center, October 2005–August 2006

- Postgraduate research. PI: Assoc. Prof. Robyn J. Barst, MD; Compiled data for FDA trials.

Columbia University, January 2005–May 2005

- Undergraduate research. PI: Prof. Jack R. Norton; Synthesized early transition-metal catalysts.

Education

University of California, Berkeley

December 2013

PhD in Chemistry

*Significant coursework: biomolecular NMR, chemical biology, physical biochemistry, enzymology, Python for bioinformatics, advanced probability theory, advanced statistical methods (audited)
Cleantech to Market (**Haas School of Business**)*

May 2008

Master of Science in Chemistry

Significant coursework: mass spectroscopy, x-ray crystallography, physical organic chemistry, synthetic methods (audited), inorganic chemistry, organometallic chemistry

Columbia University, New York City

May 2005

Bachelor of Arts in Chemistry

Technical Skills

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| Protein expression and purification | Recombinant protein production in <i>E. coli</i> . Immobilized metal affinity, ion exchange and size-exclusion chromatography. Metal-free and minimal media expression. |
| Characterization methods | Kinetic characterization of enzymes, protein x-ray crystallography, NMR, mass spectroscopy (LC/MS, GC/MS, ESI, MALDI), analytical size exclusion chromatography, SDS-PAGE and native PAGE. |
| Spectroscopy | UV-visible, FTIR, circular dichroism, fluorescence, inductively coupled plasma atomic emission (ICP-AES), dynamic light scattering (DLS). |
| Assay methods | Developed several novel assays: Rapid testing of protein expression in different <i>E. coli</i> strains. Protein stability. Fatty acid micelle formation. |
| Molecular biology | PCR. Cloning, including ligation-independent cloning (LIC/SLIC) and Golden Gate. Site-directed mutagenesis. |
| Computational | Python, R (data processing and analysis). Gaussian and QChem (electronic structure); Desmond and AMBER (molecular dynamics); CCP4, MOSFLM, PHENIX (protein crystallography). |

Publications

Cody A. Marcus Carr, Judith P. Klinman. Hydrogen tunneling in a prokaryotic lipoxygenase. *Biochemistry* 2014, 53, 2212. doi: 10.1021/bi500070q

Shenshen Hu, Sudhir C. Sharma, Alexander D. Scouras, Alexander Soudackov, **Cody A. Marcus Carr**, Tom Alber, Sharon Hammes-Schiffer, Judith P. Klinman. Extremely Elevated Room-Temperature Kinetic Isotope Effects Quantify the Critical Role of Barrier Width in Enzymatic C–H Activation. *Journal of the American Chemical Society* 2014, accepted. doi:10.1021/ja502726s

Cody A. Marcus Carr, Masaki Horitani, Adam R. Offenbacher, Michael W. Knitz, Judith P. Klinman, Brian M. Hoffman. Direct detection of active-site geometries in soybean lipoxygenase-1 by ENDOR. In preparation for submission to the *Journal of the American Chemical Society*.

Awards

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| July 2009–June 2011 | NIH Molecular Biophysics Training Grant |
| May 2005 | Jackson Memorial Prize (outstanding scholar-athlete) |

Teaching Experience

UC Berkeley, Graduate Student Instructor, introductory biology lab, general chemistry lecture & lab, organic chemistry lecture & lab, synthetic inorganic chemistry lab.

Columbia Univ., Teaching Assistant, general chemistry lecture and lab.

Other Activities

California Triathlon, UC Berkeley Club Sports, 2008–2013
Sponsorships Chair, 2012–2013 season

Graduate Life Committee, College of Chemistry, UC Berkeley, 2009–2012
Funding Chair, November 2009–December 2012

Columbia University Men's Lightweight Rowing (EARC/NCAA Division I), 2002–2005

Languages

English (native)
German (expert, Goethe-Zertifikat C2)