CAMILLE Z. MCAVOY

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EDUCATION

California Institute of Technology Pasadena, CA
PhD, Department of Chemistry, GPA: 3.7/4.0 June 2018

Massachusetts Institute of Technology Cambridge, MA
B.S. Double Major Chemistry and Chemical Engineering, Minor Biology, GPA: 4.5/5.0 June 2012

RESEARCH EXPERIENCE

INDUSTRIAL

Nektar Therapeutics San Francisco, CA
Scientist II, Protein Therapeutics Feb. 2021 - Present

- Prepare and purify novel protein PEG conjugates to create high value therapeutics to address unmet medical needs.
- Design, develop, and apply methods for production and characterization of proteins for human therapeutic use.
- Analyze the structure and dynamic behavior of small organic molecules.
- Participate in both the characterization of recombinant proteins and in small and large molecule drug discovery.

AbbVie Redwood City, CA
Senior Scientist, Oncology Early Development Sept. 2019 - Jan. 2020

- Utilized various LCMS and complimentary analytical techniques including SDS-MCE, HIC, SEC, and peptide mapping to characterize antibody and antibody-drug conjugate drug substances and drug products.
- Assessed the composition, glycosylation patterns, and modifications of oncology drug candidates through these methods to ensure drug stability, potency, and safety.
- My analyses directly contributed to decisions about cell line choice, cellular growth conditions, formulation conditions, and other critical factors for oncology drug candidates going into clinical trials.

Ionis Pharmaceuticals Carlsbad, CA
Senior Scientist, Developmental Chemistry July 2018 - Aug. 2019

- Optimized oligonucleotide drug synthesis for yield and purity through variation and characterization of such parameters as coupling conditions, sulfurization reagent and conditions, capping method, and temperature.
- Improved oligonucleotide purity through development of reversed phase chromatography and anion exchange chromatography methods.
- Performed coupling reactions to modify oligonucleotides with small molecules for specific targeting.
- Analyzed oligonucleotide products via ion-pair high performance liquid chromatography paired with mass spectrometry.
- Presented research through Process Research presentations and reports; research results directly informed synthesis and purification strategies for the manufacturing of clinically used oligonucleotide therapeutics.

Biogen Idec Cambridge, MA
Intern, Protein Formulation Jun. - Aug. 2012

- Studied whether secondary structure analysis via FTIR could be utilized for monitoring Factor IX Fc (hemophilia drug candidate) protein damage under various stress conditions to ensure drug stability during shipping.
- Presented research poster at Biogen Idec Intern Poster Session and via PowerPoint presentation to lab group.

Merck & Co.
Rahway, NJ *Intern, Process Chemistry* Jun. - Aug. 2011

- Developed one-pot Negishi cross-coupling methodology for C-C bond formation between crude thiazole zinc chloride mixture and various aryl bromides using RuPhos precatalyst with yield of 55-99%.
- Synthesized trisubstituted olefins via cross-coupling with yields of 55-74%.
- Presented research poster at Merck Intern Symposium.

Pfizer Pharmaceuticals Groton, CT
Intern, Research API and Research Analytics Jun. - Aug. 2010

- Performed two-step reductive amination reactions toward the synthesis of an ophthalmology target in order to study the effect of substrate electron density on reaction time using online FTIR and Raman spectroscopy to monitor reaction kinetics.

- Confirmed product formation via UPLC-MS and NMR and established standard operating procedures for using online spectroscopy tools for real time reaction monitoring.
- Presented research poster at Pfizer Intern Symposium and PowerPoint presentation to lab group.

ACADEMIC

Caltech Department of Chemistry, *Graduate Researcher* Pasadena, CA
Advisors: Dr. Shu-ou Shan and Dr. Douglas Rees Dec. 2012-Jun 2018

- Characterized structure-function relationship of plant-derived membrane protein chaperone cpSRP43 capable of preventing aggregation of amyloid-beta ($A\beta_{40}$) peptides found in Alzheimer's.
- Used cpSRP43 as a co-expression chaperone in E. coli to increase expression of membrane proteins, which are often very challenging to study because of their low expression.
- Characterized biocatalyzed carbon-carbon bond formation mechanisms for industrial synthesis applications using metalloenzyme nitrogenase with representative substrate methyl isonitrile.
- Trained two undergraduate and two high school researchers to express, purify, and characterize cpSRP43 mutants.
- Membrane protein chaperone research secured a National Institutes of Health R01 grant of approximately $1 million.
- Developed understanding of structural biology strategies at the West Coast Protein Crystallography Workshop and presented work at Protein Society Annual Symposium in Montreal.
- Published work in *PNAS, JBC,* and *JMB*.

MIT Department of Organic Chemistry, *Undergraduate Researcher* Cambridge, MA
Advisor: Dr. Stephen L. Buchwald Sept. 2010-May 2012

- Developed palladium-catalyzed carbon-nitrogen cross-coupling methodologies for the synthesis of drug-like molecules using amidine salts with aryl halides as well as amides with ortho-substituted aryl iodides.
- Applied these methodologies to perform one-pot synthesis of pharmaceutically useful quinazoline derivatives.
- Published work in *Organic Letters* and presented a poster at the MIT Chemistry Research Symposium.

MIT Department of Biological Chemical Engineering, *Undergraduate Researcher* Cambridge, MA
Advisor: Dr. Jean-François P. Hamel Feb. - May 2012

- Increased biofuel yield from sorghum flour hydrolysis by 300% through optimization of heating apparatus, mixing impeller type, temperature, and reaction time.
- Presented poster at the Society for Industrial Microbiology and Biotechnology Conference in Washington DC.

TEACHING EXPERIENCE

360 Academy and Tutors.com Virtual
Chemistry/Biology Instructor and Tutor Jun. 2020-Jun. 2021

- Taught AP biology and biology honors courses weekly including lectures and practice problems.
- Organized courses and communicated with students through Google Classroom.
- Tutored students in introduction to chemistry lab, chemistry honors, AP chemistry, biology honors, and AP biology by reviewing subject matter and answering questions about various types of problems.

Caltech Department of Chemistry Pasadena, CA
Head Teaching Assistant, Introduction to Biochemistry Oct. - Dec. 2013, 2015, 2016
Instructor: John Richards (2013), Scott Virgil (2015), Judith Campbell and Carl Parker (2016)

- Led a group of three graduate and two undergraduate teaching assistants (TA's).
- Prepared problem set and exam questions and graded problem sets and exams; organized a weekly recitation and conducted weekly office hours; organized reviews for the midterm and final.
- Interfaced between professors, TA's, and students to organize all course content (lectures, recitations, reviews, and assignments), and was honored for my TA work through an outstanding TA award.

Caltech Department of Chemistry Pasadena, CA
Teaching Assistant, Biophysical Chemistry: Thermodynamics Apr. - Jun. 2013, 2014, 2015
Instructor: Doug Rees

- Conducted recitations and review sessions for exams, conducted weekly office hours, graded assignments.

Caltech Department of Chemistry Pasadena, CA
Recitation Teaching Assistant, General Chemistry Jan. - Mar. 2013
Instructors: Sarah Reisman and Geoffrey Blake

- Conducted a weekly recitation section reviewing concepts from lecture and practice problems.
- Formulated problems for quizzes and exams and conducted weekly office hours.

Caltech Department of Chemistry Pasadena, CA
Teaching Assistant, Fundamental Techniques of Experimental Chemistry Oct. - Dec. 2012
Instructor: Jeffrey Mendez

- Oversaw students running chemistry experiments in an introductory lab course on a weekly basis.
- Graded weekly assignments, provided constructive feedback on technical understanding and scientific writing performance, and held weekly office hours.

TECHNICAL SKILLS

Experimental: Chemistry: LC-MS, SDS-MCE, HIC, SEC, Oligonucleotide Synthesis (AKTA oligopilot), Oligonucleotide Purification (AKTA Avant 25), IP-HPLC-UV, FTIR (KBr pellet, BioCell, ReactIR), UV-Vis Spectroscopy, NMR (Varian, Bruker), GC, HPLC, TLC, Flash Column Chromatography, Biotage, Glovebox.
Biology: Bacterial Cloning, PCR, Miniprep, Gel electrophoresis (agarose, SDS-PAGE), Bacterial Cell Culture (E. Coli and Azotobacter vinelandii), Protein Purification (soluble proteins, membrane proteins, anaerobic proteins), FPLC (AKTA and Bio-Rad), Dialysis, Lyophilization, Western Blot, EPR, NEM Alkylation, Fluorescence Anisotropy, Kinetic Light Scattering Assay, CD, Optical Microscopy.
Computational: Protein Deconvolution, BioPharma Finder, Protein Metric Byonic, ChemStation, Microsoft Office, ChemBioDraw, Matlab, PyMOL, KaleidaGraph, Inkscape, HDX Workbench.

PUBLICATIONS

- **C.Z. McAvoy**, A. Siegel, V. Lam, F.-C. Liang, G. Kroon, E. Miaou, P. Griffin, P. Wright, and S. Shan. (2020) A cooperative folding transition activates an ATP-Independent Membrane Protein Chaperone. *JMB, 432, 24*.
- **C. Z. McAvoy**, A. Siegel, S. Piszkiewicz, E. Miaou, M. Yu, T. Nguyen, A. Moradian, M. Sweredoski, S. Hess, and S. Shan. (2018) Two Distinct Sites of Client Protein Interaction with the Chaperone cpSRP43. *JBC, 293, 23*.
- F.-C. Liang, G. Kroon, **C. Z. McAvoy**, C. Chi, P. E. Wright, and S. Shan. (2016) Conformational dynamics of a membrane protein chaperone enable spatially regulated substrate capture and release. *PNAS, 113, 12*.
- M. A. McGowan, **C. Z. McAvoy**, S. L. Buchwald. (2012) Palladium-Catalyzed N-Monoarylation of Amidines and a One-Pot Synthesis of Quinazoline Derivatives. *Organic Letters*, *14, 14*.

SELECTED PRESENTATIONS

- **C. McAvoy**, F.-C. Liang, T. Nguyen, E. Miaou, S. Piszkiewicz, and S. Shan. (2017) Dynamics of Membrane Protein-Chaperone Interaction. Poster Presentation at the Protein Society Annual Symposium, Montreal, Canada.
- **C. McAvoy**. (2015) Inter-domain Dynamics of an ATP-Independent Chaperone. Center for the Chemistry of Cellular Signaling Seminar Series. California Institute of Technology.
- **C. McAvoy**, I. Chen, N. Consul, L. Song, K. Lee, J. Kucharski, and J.-F. P. Hamel. (2012) Development of methodology for the hydrolysis pretreatment of sorghum during the biofuel production process. Society for Industrial Microbiology Conference.
- **C. McAvoy**, S. Ali, B. Fors, S. L. Buchwald. (2011) Palladium-Catalyzed Cross-Coupling of Ortho-Substituted Aryl Iodides with Amides. MIT 150 Chemistry Symposium and Undergraduate Research Symposium.

AWARDS/HONORS

Finn Wold/Protein Science Travel Award	May 2017
Caltech Microbiology Travel Grant Award	Apr. 2017
Philanthropic Education Organization (P.E.O.) Scholar	Mar. 2015
NIH/NRSA Training Grant Fellow	July 2013 - July 2015
Mike and Stella Banich Chemistry and Chemical Engineering Fellowship	Jun. 2014
Honorable Mention, National Science Foundation Graduate Research Fellowship Program	Mar. 2013

ACTIVITIES

Vice President, Caltech Women in Chemistry	Jun. 2016-Jun. 2018
Caltech Chemistry Club Outreach	May-Dec. 2013
President, National Society of Collegiate Scholars, MIT	Sept. 2010-May 2012