EMILY CLIFF

Seattle, WA | LinkedIn | Personal Website

EXECUTIVE SUMMARY

I am a collaborative and purpose-driven synthetic biologist seeking a scientist position in biotech that will allow me to apply my skills to the development of new and impactful medical technologies. I have 6 years of experience in synthetic and molecular biology. I have a strong understanding of gene regulatory proteins, 3D genome structure-function interactions, RNA structure/function, and RNA-protein interactions from my work developing molecular tools for gene regulation using CRISPR technology. During the last three years, I independently managed my project end-to-end. My work has resulted in the publication of one paper in ACS Synthetic Biology and a second manuscript that I am currently preparing for submission. Applications for the molecular tools I designed and worked with include cell fate engineering, mutation-independent gene therapy, and the study of genetic diseases.

EDUCATION

PhD, Synthetic Biology **May 2023**
Zalatan Lab, Department of Chemistry, University of Washington – Seattle
Dissertation: CRISPR-Cas Tools for Engineering Genome Structure and Gene Expression

Bachelor of Arts, Chemistry **May 2017**
Minor in Biology | Ripon College, WI
Thesis: Using Microfluidic Platforms to Develop a Model of Cell-Cell Communication in Cancer

TECHNICAL SKILLS

Development and Application of CRISPR-Cas tools
Molecular Cloning
DNA/RNA purification
PCR and RT-qPCR
Mammalian Cell Culture
Cell Transfection
Lentiviral Production and Infection (BSL2+)
Human Cell Fixation
DNA Fluorescent in Situ Hybridization (FISH)
Confocal Fluorescence Microscopy
Microscopy Analysis software (FIJI, Imaris)
Reporter Gene Assays
Flow Cytometry
Flow Assisted Cell Sorting (FACS)
Yeast Genetics
Bacterial Genetics

EXPERIENCE

Graduate Research, University of Washington January 2018 – June 2023
Zalatan Lab, Department of Chemistry

- Developed molecular tools which used mutated CRISPR-Cas proteins (nuclease-deficient) for gene control and programmable 3D genome organization. These projects resulted in a publication in ACS Synthetic Biology and a manuscript in preparation.
- Independently planned and executed experiments, performed troubleshooting, analyzed data, determined statistical significance, and interpreted results.

- Communicated the results in written (papers, SOPs, summary reports, electronic laboratory notebooks (ELNs), etc.) and oral formats (presentations at team meetings, scientific conferences, non-profit events, etc.) to diverse audiences.
- Expertise in three model systems: mammalian cell culture (*U2OS*, *HEK293*, *Patski*, *HeLa*), yeast (*S. Cerevisiae*), and bacteria (*E. coli*).
- Designed reporter assays to demonstrate the efficacy of tools for gene control. Utilized fluorescent reporter genes, such as GFP, for a readout. Measured reporter expression using flow cytometry assays and analyzed data using FlowJo.
- Performed confocal fluorescent microscopy on live or fixed yeast and human cell samples to evaluate the efficacy of 3D genome organization tools. Analyzed microscopy images using FIJI or Imaris.
- Trained, mentored, and supervised junior graduate students and undergraduate research assistants.
- Taught 100- and 200-level chemistry laboratory courses. Trained students in basic organic chemistry wet-lab techniques. Prepared and graded coursework and exams.
- Collaborated on a variety of projects with members from multiple groups, including David Baker, Christine Disteche, Alessandro Bertero and Chuck Murry.

Product Safety and Regulatory Affairs Intern May 2017 – August 2017

Bostik, Wauwatosa WI

- Assisted in the review of hazard communications and labeling for internal and external customers.
- Prepared background documentation, including compilation of Chemical Abstract Service Registry Numbers [CASRN] for mandatory TSCA Inventory Reset Rule.
- Assisted in the transfer of raw material codes and hazard information to new ERP system.

Undergraduate Research Assistant, Princeton University June 2016 – August 2016

Tom Muir Group

- Synthesized designer histones with varying post translation modifications to examine which influenced Polycomb Repressive Complex 2 mediated methylation.
- Performed Fmoc-SPPS (solid phase peptide synthesis), recombinant histone production, and HPLC for analysis and purification of protein components.

Undergraduate Research Assistant, University of Minnesota June 2015 – August 2015

Christy Haynes Group

- Performed bioanalytical research which sought to mimic the process of tumor metastasis via microfluidic platforms containing cell-cell co-culture systems.
- Aided in the optimization of microfluidic design, maintained cell lines in human tissue culture, and performed time-lapsed live cell imagining.

Undergraduate Research Assistant, Ripon College September 2014 – May 2015

Patrick Willoughby Group

- Performed the synthesis and characterization of N,O-acetals from acyl phthalimides via C-H bond insertion. Research resulted in the publication in Tetrahedron and a US patent.
- Performed wet organic laboratory techniques including acid-base extraction, column chromatography, thin layer chromatography, vacuum filtration, and NMR.

PUBLICATIONS

Cliff, E.R.*; Kirkpatrick, R.L.*; Cunningham-Bryant, D.; Fernandez, B.; Harman, J.; Zalatan, J. CRISPR-Cas-Mediated Tethering Recruits the Yeast HMR Mating-Type Locus to the Nuclear Periphery but Fails to Silence Gene Expression. *ACS Synth. Biol.*, **2021**, *10*, 2870-2877.

Cliff, E.R.; Roggenbaum, M.; Kibler, R.; Kirkpatrick, R.L.; Baker, D.; Zalatan, J. Orthogonal Single-Layer CRISPR-Based AND, OR, and NOR Gates for Genetic Logic Circuits. *In Preparation*

Enright, R. N.; Grinde, J.L.; Wurtz, L.I.; Paeth, M.A.; Wittman, T.R.; **Cliff, E.R.**; Sankari, Y.T.; Henningsen, L.T.; Tan, C.; Scanlon, J.D.; Willoughby, P.H. Synthesis of N,O-acetals by net amide CN bond insertion of aldehydes into N-acyl phthalimides and N-acyl azoles. *Tetrahedron*, **2016**, *72*, 6397-6408.

PATENTS

Willoughby, P.H.; Enright, R.N.; Henninsen, L.T.; Wurtz, L.I.; **Cliff, E.R.**; Grinde, J.L. Methods and Intermediates Useful for the Preparation of alpha-Branched Aryl Phthalimides and alpha-Branched Aryl Amines. US20160200680 A1. July 14, 2016.

PRESENTATIONS

"A CRISPR-Based Single-Layer AND Logic Gate for Complex Genetic Circuit Construction in Yeast" Volcano Conference, February 11, 2023.

"CRISPR-Based Single-Layer AND and NAND Logic Gates for Complex Genetic Circuit Construction in Yeast" 5th International Conference on CRISPR Technologies, November 2, 2022.

"Probing the Relationship Between Peripheral Gene Localization and Function Using CRISPR-Cas Mediated Tethering" University of Washington, Synbio Supergroup, March 7, 2022.

HONORS AND AWARDS

Diversity, Equity, and Inclusion Leadership Award, UW	2023
UW STF Funding Award	2021
Honorable Mention NSF GRFP	2017 & 2018
ARCS Foundation Fellowship, UW	Awarded 2017
Laurel Society (Academic Honor Society), Ripon College	2017
EKA Francian Chemistry Honor Society, Ripon College	2016

LEADERSHIP AND OUTREACH

Founder and Head of Promoting Chemistry Undergraduate Research Equity, UW	2020 - 2023
Graduate Student Chair Advisory Committee, UW	2020-2021
Inclusion in Chemical Sciences, Treasurer, UW	2017 – 2022
Denny International Science Career Presentations	*2021*
Hazel Wolf Career Day	*Annual Event, 2018-2020*
Presidential Leadership Program, Ripon College	2013 – 2017

References available upon request.