Emily Mulcahey Janeira Branham

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PERMANENT ADDRESS:

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EDUCATION

Yale University, Fall 2017-present

Chemistry Ph.D. Candidate, DiMaio Lab, April 2020-present
Chemistry Ph.D. Candidate, Spiegel Lab, December 2019-April 2020
Chemistry Ph.D. Student, Spiegel Lab, August 2017-December 2019
Chemical Biology, Organic Chemistry Tracks
Master of Science in Chemistry, 2019

The University of North Carolina at Chapel Hill, Fall 2013-Spring 2017

Bachelor of Science in Chemistry
Minor in Biology, Minor in Creative Writing
Degree: Highest Distinction, Honors in Chemistry
Honors Program Graduate
GPA: 3.815
Major GPA: 3.83

HONORS/AWARDS

Yale University, Fall 2017-present

Honorable Mention, 2019 National Science Foundation Graduate Research Fellowship Program (NSF GRFP)
Chemistry/Biology Interface (CBI) Training Program Scholar, support provided by the National Institute of Health (NIH grant: T32GM067543)

The University of North Carolina at Chapel Hill, Fall 2013-Spring 2017

Colonel Robinson Scholar
Honors Carolina Laureate
2016 Phi Beta Kappa
Dean's List: Eight Semesters

PROFESSIONAL EXPERIENCE

Yale University, Fall 2017-present

Yale University Ph.D. Student, 2017- present

April 2020-present: Joined Dr. Daniel DiMaio's lab at Yale University as a Chemistry Ph.D. candidate. Thesis work will focus on engineering small, artificial transmembrane proteins (traptamers) to facilitate the degradation of disease-relevant, endogenous transmembrane proteins. Similar to PROTAC technology, a traptamer transmembrane protein-targeting motif will be linked to an E3 ubiquitin ligase recruiting moiety through genetic engineering. We anticipate use of this targeting and recruitment molecule will lead to ubiquitination of the transmembrane protein of interest (such as the PDGFβ receptor or Epo receptor, which the DiMaio lab has studied at length) and lead to its degradation through the proteasomal pathway. This technology can be applied to the study of HPV as a way to identify new candidate proteins involved in viral infection. Committee: Daniel C. DiMaio, Craig M. Crews, Sarah A. Slavoff, Jason M. Crawford.

August 2017-April 2020: Joined Dr. David Spiegel's lab at Yale University as a Ph.D. student. Broad project aims include harnessing the function of the asialoglycoprotein receptor (ASGPR) for targeted hepatocytic degradation of specific circulating proteins. My branch of this research project focuses on synthetically engineering of monoclonal antibodies toward improved removal of circulating proteins, characterization of synthesized conjugates, evaluation of effectiveness of conjugates *in vitro* (mammalian cell culture), and other biological testing with the goal of improved therapeutic applications. This project necessitates the use of biochemical, organic, and biological techniques and is preformed independently. Committee: David A. Spiegel, James E. Rothman, Jason M. Crawford.

The University of North Carolina at Chapel Hill, Fall 2013-Spring 2017

American Chemical Society (ACS) International Research Experience for Undergraduates (IREU) Scholar, 2016-2017 Program

Accepted a position in Prof. Dr. Hans-Dieter Arndt's lab at Friedrich Schiller University of Jena in Jena, Germany. Joined a Notch inhibitor-focused structure activity relationship (SAR) project, and my part of this work focused on creating further candidate compounds for SAR testing. Specifically, I worked toward the synthesis of three different substituted cyclohexane-1,3-diones. This research was performed full-time for 10 weeks and resulted in an oral report and a written report. As part of this award, I received funding (housing, travel, and registration) to attend the 2017 Spring ACS National Meeting in San Francisco, California (April 2-6, 2017). During the ACS National Meeting, I gave an oral presentation at an IREU themed symposium and presented a poster about my summer research at an undergraduate poster session. The ACS IREU is financially supported by the U.S. National Science Foundation (NSF) under two separate grants and organized by the Office of International Activities at the ACS.

UNC Chemistry Undergraduate Researcher, Fall 2015, Spring 2016, Fall 2017

Accepted a position in Dr. Michael Crimmins' lab as an undergraduate researcher. Worked independently on a newly created project: the novel total synthesis of the natural product brianthein W, from the soft coral *Briareum polyanthes*. The experience allowed for the development of synthetic chemistry skills and necessitated independent decision making at the bench. Committed to work in the lab for 9-12 hours per week during each semester. Completed an honors thesis based on this research in Fall 2017, resulting in graduation from UNC Chapel Hill with Honors in Chemistry.

Vanderbilt University Chemical Biology REU Program Participant, Summer 2015

Worked in Dr. Gary Sulikowski's lab group full-time for 10 weeks. Worked on a novel synthetic route to a UV-cleavable bicyclononyne-biotin tag. This tag will be used in biological pull-down assays that take advantage of biotin-streptavidin binding to elucidate the molecular targets of certain anticancer agents. Performed organic synthesis, gained NMR experience, participated in weekly seminars and discussions, and gave a poster presentation at the end of the program. Work was done independently although a mentor helped to guide research. Research was funded by the National Institutes of Health (NIH), the Vanderbilt Institute of Chemical Biology, and the Vanderbilt University Department of Chemistry.

UNC Eshelman School of Pharmacy Undergraduate Researcher, Spring 2015

Accepted a position in Dr. K. H. Lee's Natural Products Research Laboratories (NPRL) as an undergraduate researcher. Research focused on discovery and development of bioactive natural products as clinical trial candidates for treating cancer or AIDS. Goals were achieved through bioactivity-guided or mechanism of action-directed isolation, characterization, design, and synthesis of bioactive natural products. Committed to work in the lab for 9-12 hours per week during the semester.

Georgia Institute of Technology Chemistry REU Program Participant, Summer 2014

Worked in Dr. Adegboyega Oyelere's lab group full-time for 10 weeks. Focused on achieving targeted cancer therapy through the combination of histone deacetylase inhibitors and non-steroidal anti-inflammatory drugs. Performed organic synthesis, gained NMR experience, gave a poster presentation, and completed two oral research presentations and a written report. Research was funded by the NIH, and the REU was funded by the NSF and 3M Corporation.

CONFERENCES, ORAL PRESENTATIONS, AND POSTER PRESENTATIONS

Candidacy Examination Presentation and Defense

Committee: David A. Spiegel, James E. Rothman, Jason M. Crawford. Engineering monoclonal antibodies to induce asialoglycoprotein receptor-mediated protein degradation. Gave an oral presentation, submitted a written research proposal, successfully defended thesis proposal, and advanced to candidacy. New Haven, Connecticut, United States, May 2, 2019. Yale University.

2017 Spring American Chemical Society (ACS) National Meeting

Gave an oral presentation about the summer 2016 research I performed at Friedrich Schiller University of Jena in Jena, Germany during an International Research Experience for Undergraduates (IREU) themed symposium. Presented a poster about this research at an undergraduate poster session. Funding provided by the American Chemical Society IREU Program. San Francisco, California, United States, April 2-6, 2017.

2016 UNC Chapel Hill Academic Research Conference (UNC-ARC)

Poster Presentation: **Janeira, Emily M.**; Crimmins, Michael T.* Efforts Towards the Total Synthesis of Brianthein W: A Route to a Potential Source of New Drugs. Presented at the UNC Academic Research Conference (UNC-ARC), Chapel Hill, North Carolina, United States, April 8, 2016. The University of North Carolina at Chapel Hill.

Vanderbilt University Research Experience for Undergraduates (REU) Poster Session

Poster Presentation: **Janeira, Emily M.**; Davis, Robert W.; Sulikowski, Gary A.* A Novel Synthetic Route to a UV-Cleavable Bicyclononyne-Biotin Tag. Presented at the Vanderbilt University Research Experience for Undergraduates (REU) Poster Session, Nashville, Tennessee, United States, July 30, 2015. Vanderbilt University.

Georgia Institute of Technology Research Experience for Undergraduates (REU) Poster Session

Poster Presentation: **Janeira, Emily M.**; Raji, Idris. Achieving Targeted Cancer Therapy through the Combination of Histone

Deacetylase Inhibitors and Non-Steroidal Anti-Inflammatory Drugs. Poster presented at the Georgia Institute of Technology Research Experience for Undergraduates (REU) Poster Session, Atlanta, Georgia, United States, July 23, 2014. Georgia Institute of Technology.

ABSTRACTS

Designed multiple ligands with dual histone deacetylase and cyclooxygenase activities

Raji, Idris; **Janeira, Emily**; Yadudu, Fatima; Fathi, Shaghayegh; Korniacki, James; Szymczak, Lindsey; Mrksich, Milan; Oyelere, Adegboyega K.* Designed multiple ligands with dual histone deacetylase and cyclooxygenase activities. *Abstracts of Papers*, 250Th ACS National Meeting & Exposition, Boston, MA, United States, August 16-20, 2015; MEDI-487.

PAPERS

Bifunctional conjugates with potent inhibitory activity towards cyclooxygenase and histone deacetylase.

Raji, Idris; Yadudu, Fatima; **Janeira, Emily**; Fathi, Shagayegh; Szymczak, Lindsey; Kornacki, James R.; Komatsu, Kensei; Li, Jian-Dong; Mrksich, Milan; Oyelere, Adegboyega K.* Bifunctional conjugates with potent inhibitory activity towards cyclooxygenase and histone deacetylase. *Bioorg. Med. Chem.*, **2017**, *25*, 1202-1218.

Bifunctional Small Molecules That Mediate the Degradation of Extracellular Proteins.

Caianiello, David; Zhang, Mengwen; Ray, Jason; Swartzel, Jake; **Branham, Emily**; Chirkin, Egor; Sabbasani, Venkata; Gong, Angela; Mcdonald, David; Muthusamy, Viswanathan; Spiegel, David.* Bifunctional Small Molecules That Mediate the Degradation of Extracellular Proteins. *ChemRxiv*. **2020,** Preprint (revised on 03.08.2020; posted on 04.08.2020). https://doi.org/10.26434/chemrxiv.12732689.v2

ORGANIZATIONS

American Chemical Society (ACS) Member, June 2016-present (ongoing)

Active member of the ACS.

The Phi Beta Kappa Society Member, Fall 2016 inductee (ongoing)

Active member of the Phi Beta Kappa Society. Phi Beta Kappa society is the nation's oldest academic honor society.

Yale University, Fall 2017-present

Yale Chemistry's Diversity and Climate Committee (DCC), Summer 2020-present (ongoing)

Mission statement: Working to maintain a diverse and productive community of chemists in a respectful climate that fosters creativity and learning.

Programming and Activity Planning Committee: Planned and organized seminars, workshops, social activities, and outreach opportunities. Implemented a "movie club" on structural racism during which attendees participated in relevant film viewings followed by open discussion sections. Other ongoing activities include organizing an anti-bias workshop for Yale's Chemistry Department and connecting and working with groups in neighboring departments on underrepresented minority-centered social groups.

Recruitment and Visiting Scholars Committee: Devised, applied for, advertised, and coordinated programs for bringing underrepresented groups to Yale, such as summer undergraduate research programs and post-baccalaureate research education programs. Coordinated fund-raising efforts for additional programs. Recruited at underrepresented minority-centered conferences, historically black colleges and universities, and Hispanic serving institutions. Organized a "Chemistry Bootcamp" for undergraduates. This intensive event included an informational session and career panel on the topic of considering a higher education in chemistry, a question and answer session about how to gain research experience, and an informational session about how to apply to a graduate program. Both current students and faculty from each discipline were recruited to speak during this event. Helpful resources were distributed to attendees, including cover letter, CV, and resume templates, information about fee waivers for the GRE and graduate school applications, handouts with advice for finding a graduate school that fits and how to find a PI and a supportive lab environment, and a link to Yale's Office of Graduate Student Development and Diversity.

Chemistry/Biology Interface (CBI) Leadership and Programming Board Member Fall 2017-present (ongoing)

Board Member: Allocated resources and funds to different events for CBI Training Grant Scholars. Planned, oversaw, and otherwise managed events designed to build community between trainees and allow for networking opportunities. These events have so far included planning a conference for CBI trainees, setting up networking opportunities with influential science community members, and planning gatherings to help facilitate interactions among CBI trainees in different years of graduate study.

2018 Northeast Regional Chemical Biology Interface Conference Planning Committee Member, Spring 2018:

Committee Member: Helped plan and organize a Yale-based conference for Chemistry/Biology Interface (CBI) trainees in the northeastern United States. The conference included a keynote lecture on science communication by Carl Zimmer, a

workshop about figure-making in the sciences, and three group discussions: the first was about hot topics in chemical biology research, the second was about career opportunities with graduate training in chemical biology, and the third was about diversity in the chemical biology community. Invited institutions included Harvard University, Cornell University, University of Massachusetts Amherst, University of Pennsylvania, Stony Brook University, and Memorial Sloan Kettering Cancer Center. The conference took place on May 10, 2018

STEM Mentors at Yale Leadership Board Event Coordinator, Fall 2017-present (ongoing)

Event Coordinator: planned, organized, and volunteered at outreach events, including a STEM Festival on Yale's West Campus, a college essay workshop, a college decision panel for local high school students, and a STEM career fair, participated in all STEM Mentors events, attended bi-weekly leadership meetings to plan and shape the organization, focused on planning public outreach events for local high school students, partnered with Yale Pathways to Science in the Office of New Haven and State Affairs

Mission Statement: STEM Mentors at Yale is a graduate student organization which aims to encourage young women and other under-represented groups to pursue STEM careers.

Girls' Science Investigations (GSI) Station Volunteer, Fall 2017-present (ongoing)

Volunteer: Acted as a mentor and helped provide a context for exploring and understanding the various disciplines of science through hands-on activities in a laboratory environment. Assisted in executing lessons, including supporting students as they work on hands-on activities. Attended Friday orientations before volunteering on Saturdays working with sixth, seventh, and eight grade girls during sessions such as The Invisible World, The Floating World, The Material World, and The Chemical World.

Mission Statement: The mission of Girls' Science Investigations is to motivate, empower, and interest girls in developing the skills they need to pursue careers in science. Through student-specific engagement and parental awareness, Girls' Science Investigations strives to close the gap in science found between males and females today.

The University of North Carolina at Chapel Hill, Fall 2013-Spring 2017

UNC ScienceDays Committee Member, Fall 2015-Spring 2017

Community Outreach Committee Member: Planned community outreach events to promote the mission of ScienceDays.

Lesson Planning Committee Member: Created and tested lesson plans for UNC student mentors to carry out with their mentees.

Organization Overview: ScienceDays is an organization that promotes diversity in STEM fields through a mentoring program meant to foster scientific curiosity in groups of elementary school students who are typically underrepresented in STEM fields. The goal is to empower these students to pursue interests in STEM fields regardless of their background.

Active Minds at Carolina Committee Member, Fall 2015-Spring 2017

Programming Committee Member: Planned, organized, and oversaw events for UNC's chapter of Active Minds.

Publicity Committee Member: Posted daily social media updates including information about mental health related events on campus, mental health related articles, encouraging posts, and other posts intended to break the silence surrounding mental health.

Organization Overview: Active Minds is a national, nonprofit organization dedicated to combatting the stigma against mental illness. The organization is dedicated to changing the conversation about mental health and empowers students to speak openly about the topic both to increase education about mental health issues and to encourage those who are struggling to seek help.

UNC Scholars Engagement Fund, Fall 2014-Spring 2017

Committee Head and Committee Member, Fall 2014-Spring 2016: Previously a member of committees for the planning of the Dance @ Carolina Showcase (Fall 2014), Fall Break Food Challenge (Fall 2014), Women in the Workforce (Fall 2015), and Scholars Night Live (Spring 2016).

Committee Head (Fall 2016-Spring 2016): Head of Arts @ Carolina Showcase Committee, which created a newly expanded version of Dance @ Carolina (Fall 2016-Spring 2016).

Academic Committee Co-Chair, Fall 2016-Spring 2017 Facilitated brainstorming, planning, and execution of programming for the scholars program that centered around academic inquiry and discovery. Partnered with faculty and other scholars to foster a spirit of learning and exploration outside the classroom among scholars.

Organization Overview: Allocated resources and funds to different events involving or related to scholars. Planned, oversaw, and otherwise managed events designed to increase cultural awareness within the UNC campus community. UNCSEF exists to connect scholars with the resources they need to pursue their passions. Through community building, intellectual engagement, and service, UNCSEF is devoted to making the scholars program a place where students can ask questions, give back to their communities, and develop lasting friendships.

Carolina Performing Arts Technical Staff Member, Fall 2014

Part time employment working backstage with a team in a fast-paced work environment.

UNC Symphony Orchestra Violinist, Fall 2013

Played violin in the symphony orchestra, a 100-member ensemble that performs two concerts per semester.

RELEVANT COURSEWORK

Yale University, Fall 2017-present

Graduate School Courses

Advanced Organic Chemistry
Chemical Biology
Natural Product Synthesis
Special Topics in Chemical Biology
Bio-inorganic Chemistry
Biotechnology

The University of North Carolina at Chapel Hill, Fall 2013-Spring 2017

Chemistry Lecture Courses

Chemistry Research Colloquium*, Introductory Organic Chemistry I*, Introductory Organic Chemistry II, Intermediate Organic Chemistry*, Introductory Biological Chemistry*, Analytical Chemistry*, Introductory Inorganic Chemistry, Intermediate Inorganic Chemistry, Physical Chemistry I: Thermodynamics, Physical Chemistry II: Quantum Mechanical Chemistry, (Advanced Organic Chemistry I), (Mechanisms of Organic and Inorganic Reactions)

Chemistry Laboratory Courses

Research in Chemistry for Undergraduates (four semesters), Organic Chemistry Laboratory, Synthetic Chemistry Laboratory I, Techniques in Biochemistry Laboratory, Organic/Analytical Chemistry Laboratory*, Physical Chemistry Laboratory I

Biology Lecture Courses

Molecular Biology and Genetics, Cellular and Developmental Biology

Biology Laboratory Courses

Laboratory Experiments in Genetics

*: Honors course or honors laboratory
(___): Graduate level course, audited

LABORATORY SKILLS

Biological techniques: *in vitro* mammalian cell culture, flow cytometry (FC), western blot (WB), enzyme-linked immunosorbent assay (ELISA), bicinchoninic acid assay (BCA), RNA interference (RNAi), competition assay, ternary complex assay, hemocytometry, sodium dodecylsulfate polyacrylamide gel electrophoresis (SDS-PAGE)

Characterization techniques: matrix-assisted laser desorption/ionization time of flight mass spectrometry (MALDI-TOF MS), nuclear magnetic resonance imaging (NMR), gas chromatography (GC), liquid chromatography-mass spectrometry (LC-MS), atomic absorption spectroscopy (AAS), NanoDrop

Organic synthesis: reaction set-up techniques, basic workup procedures, vacuum evaporation device use, solvent still setup, maintenance, and quenching, manual solid-phase peptide synthesis (SPPS), independent synthesis experience

Purification techniques: high performance liquid chromatography (HPLC), preparative thin-layer chromatography (TLC), recrystallization, distillation, column chromatography, His-Tag protein purification, molecular weight cutoff (MWCO) filtration, dialysis

Sterilization techniques: autoclave

Software: FlowJo, ChemDraw, MestReNova, GraphPad Prism, PyMol, Visual Molecular Dynamics (VMD), Zoom, Keynote, Microsoft Suite

Biosafety Training: Biosafety Level 2

Ongoing research will add further laboratory skills

REFERENCES

Available upon request