

BIOGRAPHICAL SKETCH

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NAME: Marina E. Brown

eRA COMMONS USER NAME (credential, e.g., agency login): MARINABROWN

POSITION TITLE: Graduate Research Assistant

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Start Date MM/YYYY	Completion Date MM/YYYY	FIELD OF STUDY
Cameron University (CU) – Lawton, OK	BSc, Magna Cum Laude	08/2014	05/2018	Health Professions Chemistry (major) Psychology (minor)
University of Oklahoma Health Sciences Center (OUHSC) – Oklahoma City, OK	MS	07/2019	12/2022 (expected)	Biochemistry and Molecular Biology

A. Personal Statement

My long-term research goals are to contribute to the scientific understanding of disease by utilizing my skills in structural and functional biochemistry and by pursuing graduate-level training in neuroscience and neurodegeneration. I will integrate these competencies with computational components such as artificial intelligence and machine learning to expand the scope and depth of my future scientific contributions. I participated in part-time research at Cameron University for two semesters where I worked with Dr. Kyle Moore, gaining structural biology experience. I used molecular biology techniques such as site-directed mutagenesis and PCR to disprove the algorithm-predicted structure of subunit α in ATP synthase. I also have 3 years of experience in psychology research, working with Dr. Elisabeth Ponce-Garcia (discussed in Section C1). I accepted a competitive fellowship opportunity with the Summer Undergraduate Research Program (SURP), created by the NIH-funded Oklahoma IDeA Network of Biomedical Research Excellence (OK-INBRE,) under the mentorship of Dr. Dimitrios Karamichos (described in section C2). The cell culture experience I gained was central to the establishment of an auspicious collaboration between the Karamichos and Fuller labs (described in section C3). My work in the Fuller lab produced a first author manuscript¹. Upon my matriculation into the Ph.D. program at OUHSC, I capitalized on laboratory rotations that enhanced my research productivity and critical thinking skills. An early project in the laboratory of Dr. Blaine Mooers involved learning basic shell scripting, GitHub, and web development to design an interactive webpage. The website that I created is oriented toward enabling scientists to write shared command input using text editors that interface with the *PyMOL* molecular graphics program to customize views of macromolecules. These efforts produced a recently published second author manuscript².

I recently joined the laboratory of Dr. Veronica Galvan Hart, where I bring in my skills in biophysical research to the study of mechanisms of human neurodegeneration. My thesis research project will leverage my current skills in biophysics and cell biology to determine the impact of transmission of pathogenic soluble tau aggregates, causally involved in one of the most prevalent age-associated diseases, Alzheimer's disease (AD), to novel, non-conventional cellular tau targets including astrocytes and endothelial cells. These studies may reveal hitherto unknown pathways of tau toxicity in AD that link the etiology of disease to fundamental mechanisms of aging. I am confident that under the guidance and support of my mentor, my thesis committee, and by the acquisition of myriad of interdisciplinary technical skills during my dissertation work at Galvan lab, at the end of my graduate studies I will be equipped with a robust framework that will enable me to move on to the next step of my career towards becoming an independent investigator in aging and neurological diseases of aging.

1. **Brown ME**, Montgomery ML, Kamath MM, Nicholas S, Liu Y, Karamichos D, Fuller KK. A novel 3D culture model of fungal keratitis to explore host-pathogen interactions within the stromal environment. *Exp Eye Res.* 2021 Jun; 207:108581. doi: 10.1016/j.exer.2021.108581. Epub 2021 Apr 15. PMID: 33865843.
2. Mooers BHM and **Brown ME**. Templates for Writing PyMOL Scripts. *Protein Sci.* 2020. Epub 2020/11/13. doi: 10.1002/pro.3997. PubMed PMID: 33179363.

B. Positions and Honors

POSITION/HONORS	START DATE	End Date	INSTITUTION & LOCATION
Student Research Assistant	08/2017	05/2018	CU, Department of Chemistry, Physics, and Engineering – Lawton, OK
Teaching Assistant - Anatomy	01/2018	05/2018	CU, Department of Biology – Lawton, OK
Laura Fields Trust Scholarship	08/2014	05/2018	CU – Lawton, OK
Geospatial Summer Institute Fellow	06/2017	07/2017	OU, Center for Spatial Analysis, Norman, OK
MG James Ursano Scholarship Program (two-time recipient)	08/2016	05/2018	Army Emergency Relief – National
NASA STEM Scholarship	08/2017	05/2018	National Aeronautics and Space Administration
Summer Undergraduate Research Student	05/2018	07/2018	OUHSC (OK IDeA), Department of Ophthalmology – Oklahoma City, OK
Laboratory Technician	07/2018	07/2019	OUHSC, Department of Microbiology – Oklahoma City, OK
Graduate Research Assistant	07/2019	Present	OUHSC, Department of Biochemistry & Molecular Biology – Oklahoma City, OK
Stephenson Cancer Center Training Award	05/2021	Present	Stephenson Cancer Center – Oklahoma City, OK
T32 Research Training Grant	12/2021	Present	OUHSC, Oklahoma City, OK
Walter R. Nicolai Award – 3 rd Place	05/2022	05/2022	American Aging Association, OK

C. Contributions to Science

1. Protective factors that contribute to resilience in medical trauma patients. Resilience can be defined as the ability to (i) adapt to and buffer the effects of trauma and (ii) maintain positive or normative development. In a medical setting, resilient patients experience less pain, faster physical recovery, and improved health outcomes. Protective factors that contribute to positive health outcomes are a strong social support system, the ability to self-regulate, and optimism. The peri-trauma period is a pivotal moment for emotion regulation and is particularly important in childhood and early adolescence as major stress can have an impact on brain development; an inadequate or harmful social support system might impair psychological functioning. Social cognitive theory states that human behavior is dictated by a person's environment and that positive beliefs promote more sophisticated health perspectives and behaviors. I hypothesized that an optimistic perspective of health will predict resilience in a sample of young adults who reported medical trauma in childhood, adolescence, or emerging adulthood. Using a survey-based approach applying the Scale of Protective Factors corroborated by my previous research with Dr. Ponce-Garcia, we determined that an optimistic health perspective positively predicts overall resilience in young adults. This is supported by protective factors that include a positive self-rating, optimism, social support, and the ability to self-regulate emotions. Interestingly, participants who were raised in a dual-parent household did not meet inclusion criteria since they did not report the occurrence of medical stress and/or trauma. I predicted that this may be due to dual parents providing greater supervision and having access to pooled resources (health insurance, counseling, etc.). Clinically, the significance of this research is in its support of approaches that place greater emphasis on recovery that occurs during the peri-

traumatic experience to speed up recovery times and reduce likelihood of posterior trauma-related symptoms. I have presented this work orally and won 2nd place for a Distinguished Student Speaker Award at the 2018 Southwestern Psychological Association in Houston, Texas, at the 2018 Society for Personality and Social Psychology meeting in Atlanta, GA, and at the 2017 and 2016 Southwestern Psychological Association meetings in San Antonio and Dallas, TX, respectively. I am also third author on a publication that reported these studies, listed below.

Ponce-Garcia E, Madewell AN, **Brown ME**. Resilience in Men and Women Experiencing Sexual Assault or Traumatic Stress: Validation and Replication of the Scale of Protective Factors. *J Trauma Stress*. 2016;29(6):537-45. Epub 2016/11/20. doi: 10.1002/jts.22148. PubMed PMID: 27859691.

2. Treatments for diabetic keratopathy. Diabetes mellitus (DM) induces pathological and molecular abnormalities that disrupt the structural integrity of the cornea. Diabetic keratopathy (DK) is a disease characterized by several types of corneal abnormalities including corneal erosions and fibrosis secondary to DM. Pathological changes such as decreased epithelial adherence and corneal fragility can halt or delay proper corneal wound healing. No treatment currently exists to reverse the symptoms of DK; however, treatments such as lubricants and antibiotics can be used as palliative interventions. Quercetin (Que) and transforming growth factor- β 3 (TGF- β 3) have shown antifibrotic activity in the human cornea. Using a 3D corneal construct generated in the Karamichos lab, I investigated the impact of Que and TGF- β 3 on Type I and Type II DM donor corneas. Results revealed high variation in the response to treatment of Type I and Type II DM tissues, requiring more data to define whether Que and TGF- β 3 may be viable treatment methods. I presented these data as a poster at the 2018 Summer Undergraduate Research Program Symposium, Oklahoma City, OK.

3. Development of a three dimensional (3D) stromal model for use in studying mycotic keratitis. Fungal keratitis (FK) contributes to ocular morbidity and blindness worldwide. Corneal damage is largely attributed to a robust host response that includes a sharp up-regulation of matrix metalloproteases (MMPs) that breakdown stromal collagen. Corneal fibroblasts have been shown to undergo apoptosis in FK corneas. To better understand host-fungal interactions in mycotic keratitis, we utilized a 3D stromal model using human corneal fibroblasts and fungal spores of *Fusarium petrophilum*. Our studies revealed that the collagen matrix that comprises the stroma is disrupted in infected 3D constructs, as opposed to well-clustered collagen matrices in control constructs. Fungal infection resulted in the induction of metalloprotease (MMPs) expression and repression of tissue inhibitors of metalloproteases (TIMPs). I performed all experiments and data analysis in this project. My contributions to this project granted me first author position in the publication below. In addition, I presented this work as a poster at the 2019 international meeting of the Association for Research in Vision and Ophthalmology (ARVO) on May 1, 2019, Vancouver, Canada.

Brown ME, Montgomery ML, Kamath MM, Nicholas S, Liu Y, Karamichos D, Fuller KK. A novel 3D culture model of fungal keratitis to explore host-pathogen interactions within the stromal environment. *Exp Eye Res*. 2021 Jun; 207:108581. doi: 10.1016/j.exer.2021.108581. Epub 2021 Apr 15. PMID: 33865843.

4. Using GitHub to provide scientists with instructions and templates for writing PyMOL scripts.

An early project in the laboratory of Dr. Blaine Mooers involved learning basic shell scripting, GitHub, and web development to design an interactive webpage. The webpage that I created is oriented toward enabling scientists to write shared command input using text editors that interface with the PyMOL molecular graphics program to customize views of macromolecules. PyMOL commands enable the control of the appearance of a molecular model. However, many users struggle recalling commands due to infrequent use of PyMOL and therefore hinders users from writing new script. One solution is to build the new script by using code fragments as templates for modular parts of the task at hand. The code fragments can be accessed from a library while writing the code from inside a text editor (e.g., Visual Studio Code, Vim, and Emacs). We developed a library of PyMOL code templates or snippets called *pymolsnips* to ease the writing of PyMOL code in scripts. We made *pymolsnips* available on GitHub in formats for 18 popular text editors. The GitHub site includes animations that complement the instructions for installing the library for each text editor. These efforts produced a recently published second author manuscript, listed below.

Mooers BHM and **Brown ME**. Templates for Writing PyMOL Scripts. *Protein Sci*. 2020. Epub 2020/11/13. doi: 10.1002/pro.3997. PubMed PMID: 33179363.

<https://www.ncbi.nlm.nih.gov/myncbi/marina.brown.2/bibliography/public/>

Research Presentations

- Brown ME, Dorigatti A, Roa-De La Cruz L, Hernandez S, Hussong S, Kaye R, Hermann B, Galvan V. "Tau-Induced Astrocyte Senescence Accelerates Brain Aging and Drives Neuronal Dysfunction in Alzheimer's Disease". Poster presentation, 50th Annual American Aging Association AGE meeting, San Antonio, TX, May **2022**
- Brown ME, Karamichos D, Fuller KK. "Development of a three-dimensional stromal model to understand the fungal-corneal interaction during mycotic keratitis". Poster presentation, 2019 International meeting of the Association for Research in Vision and Ophthalmology (ARVO), Vancouver, Canada on May **2019**.
- Brown ME, Nicholas JS, Whelchel A, Karamichos D. "Therapeutic Targets for Diabetic Keratopathy". Poster presentation, 2018 Summer Undergraduate Research Symposium, Oklahoma City, Oklahoma, July **2018**.
- Brown M and Randell JA. "Evaluating Physicians through Ancient Eyes: How Ecological Contexts Affect Physician Evaluations". Poster presentation at the 2018 Society for Personality and Social Psychology in Atlanta Georgia in April **2018**.
- Brown ME and Ponce-Garcia E. "A Spoon Full of Sugar: Optimism and Resilience after Medical Intervention". Poster presentation at the 2018 meeting for the Southwestern Psychological Association in San Antonio, Texas in April **2018**.
- Brown ME and Ponce-Garcia E. "Optimistic Perception of Health as a Determinate of Psychological Resilience". Paper presentation at the 2018 meeting for the Southwestern Psychological Association in San Antonio in April **2018**.
- Brown ME and Randell, JA. "Evaluating Physicians through Ancient Eyes: How Ecological Contexts Affect Physician Evaluations". Poster presentation, 2018 National Conferences on Undergraduate Research in Edmond, Oklahoma in February **2018**.
- Brown ME and Randell JA. "Evaluating Physicians through Ancient Eyes". Poster presentation at the 2017 meeting for the Southwestern Psychological Association in San Antonio, Texas in April **2017**.
- Brown ME and Moore K. "Special Amino Acid Anabolism and the Inborn Errors that Result". Poster presentation, American Chemical Society Pentasectional Meeting in Lawton, Oklahoma, March **2016**.
- Brown ME and Randell JA. "Physician Selection and Personality: Does Empathy Matter?" Poster presentation at the 2016 meeting for the Southwestern Psychological Association in Dallas, Texas, April **2016**.

D. Additional Information: Research Support and/or Scholastic Performance

- 2020 Stephenson Cancer Center training award, University of Oklahoma Health Sciences Center
- 2018 Graduation, *Magna Cum Laude* with honors, Cameron University (3.84 GPA indicating an exemplary undergraduate scholastic performance)

Advanced placement (AP) courses from high school granted me college credit for said courses. At OUHSC, I continue this performance and maintain a 3.65 GPA.

The grading system at CU and OUHSC graduate college are reported as follows: standard letter grade or satisfactory/unsatisfactory. For undergraduate courses at CU, a passing grade is a D or higher. For graduate courses at OUHSC, a passing grade is a B or higher; satisfactory is a passing grade, unsatisfactory is a failing grade.

Advanced Placement courses for college credit at Cameron University

YEAR	COURSE TITLE	GRADE	YEAR	COURSE TITLE	GRADE
2014	AP: General Biology & lab	S	2014	AP: Beginning German I	S
2014	AP: Chemistry I & Lab	S	2014	AP: Beginning German II	S
2014	AP: Chemistry II & Lab	S	2014	AP: College Alg & Trig	S
2014	AP: Principles of Economics I	S	2014	AP: Calc & Analytic Geom I	S
2014	AP: Principles of Economics II	S	2014	AP: General Psych	S
2014	AP: English Composition I	S	2014	AP: Intro to Prob & Stats	S
2014	AP: Intro to Env Sci	S	2014	AP: General Biology & lab	S

Undergraduate courses completed at CU

YEAR	COURSE TITLE	GRADE	YEAR	COURSE TITLE	GRADE
2014	Human Anatomy & Lab	C	2016	Honors: Biochemistry I	A
2014	Fundamentals of Speech	B	2016	Phys I Sci/Eng Major & Lab	A

2014	U.S. History to 1865	A	2017	Principles of Genetics & Lab	A
2014	Lifespan/Human Grow & Dev	A	2017	Leading Effective Teams	A
2015	Organic Chem I & Lab	A	2017	Fund of Analytical Chem	A
2015	Intro to Philosophy - Honors	A	2017	Biochemistry II & Lab	A
2015	Applied Quant Methods	A	2017	Honors: Biochemistry II	A
2015	Experimental Psychology	A	2017	Phys II Sci/Eng Major & Lab	B
2015	Intro to University Life	A	2017	Manage Electr Rep Honors	A
2015	Organic Chem II & Lab	A	2017	Become Serv Leader Honors	A
2015	Intro to Comp Info Systems	A	2017	Ceramic Coil/Pinch Pot	S
2015	English Comp II	A	2017	Human Anatomy & Lab	B
2015	Research & Scholarly Activity	A	2017	Intro to Chem Lit	A
2015	American Fed Gov	A	2017	Quantitative Analysis Lab	A
2015	Psychological Research	A	2017	Special Problems in Chem	S
2016	Principles of Biology I & Lab	A	2017	Honors Seminar	A
2016	Intro to Micro & Lab	A	2017	Anxiety & Depression	A
2016	Exploring Multiculturalism	A	2017	Coach thru change Honors	A
2016	Personal & Comm Health	A	2018	Human Physio & Lab	A
2016	Foundations of Leadership	A	2018	Practicum Hum Anatomy	A
2016	Walking & Jogging	S	2018	Chemistry Capstone	A
2016	OSLEP: Galileo	S	2018	Special Problems in Chem	S
2016	Principles of Biology II & Lab	A	2018	Scholarly Res & Act Honors	A
2016	Molecular Cell Biology & Lab	A	2018	Honors Senior Project	S
2016	Biochemistry I & Lab	A	2018	Biopsychology	A

Graduate courses completed at OUHSC

YEAR	COURSE TITLE	GRADE	YEAR	COURSE TITLE	GRADE
2019	Integrity Sci Res	S	2020	Journal Club	S
2019	Research Methods	A	2020	Metabolic Regulation	A
2019	Animal Use	S	2020	Geroscience	A
2019	Interdis 1 st Yr Journal Club	A	2020	GTPases	A
2019	Molecular Systems I	A	2020	Bioscience Lab Rotation	S
2019	Molecular Systems II	B	2020	Tumor Board	A
2019	Cellular Systems I	B	2020	Molecular Mech of Hum Dis	A
2019	Cellular Systems II	B	2020	Cardiovasc Gen & Dis	A
2019	Bioscience Lab Rotation	S	2020	Experimental Design	A
2020	Analysis of Macromolecules	A	2020	Bioscience Lab Rotation	S
2020	Biochem/Biophys Instr Lab	A	2020	Research Project	S
2020	Survey of Data Science	A	2020	Graduate student Seminar	S
2020	Enzyme Catal & Modulation	A	2021	Graduate Student Seminar	S
2020	Geroscience	A	2021	Journal Club	S
2020	Bioscience Lab rotation	S	2021	Research Drs Dissertation	S
			2021	Entrepren. in Sci. & Tech.	S