

## **DR. ANNE BOOKER PH.D.**

Postdoctoral Research Scientist  
Bigelow Laboratory for Ocean Sciences  
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### **Mission Statement**

I am a microbiologist interested in understanding the influential roles microorganisms play in the environment. As I strive to learn more about the microorganisms in the world, I want to include others in the techniques and processes used to obtain this knowledge. When working with people, I believe feeling valued and included is a critical component of a workspace and enables teams to bring their whole selves to address problems. I value a person's whole self because it is different perspectives that bring transitional thought to problem solving. I strive to create an open space to explore the wonders of microbiology by welcoming diversity, treating everyone as equals, and valuing all thoughts, ideas, and opinions.

### **EDUCATION**

#### **PostDoc**

**Dr. Joaquín Martínez Martínez**, advisor  
Bigelow Laboratory for Ocean Sciences

October 2021 - present

Co-advised by Dr. Beth Orcutt & Dr. Joaquín Martínez Martínez

October 2021 – June 2022

**Dr. Beth Orcutt**, advisor  
Bigelow Laboratory for Ocean Sciences

January 2019-June 2022

#### **Graduate**

**Dr. Michael Wilkins**, advisor  
**Ohio State University**, Columbus, Ohio  
Doctor of Philosophy in Microbiology December 2018

GPA 3.930/4.0

#### **Undergraduate**

**Austin College**, Sherman, Texas  
Major: Biology | Minor: Chemistry

Bachelor of Arts Degree May 2014  
Summa Cum Laude Major GPA: 3.85 | GPA: 3.868/4.0

### **PROFESSIONAL EXPERIENCE**

**Postdoctoral Research Scientist:** Bigelow Laboratory for Ocean Sciences, East Boothbay, Maine, USA;  
lab of Dr. Joaquín Martínez Martínez (October 2021 - present)

- I began working on this project while finalizing the manuscript from my work with Dr. Beth Orcutt due to the proximity of a 10-day sampling cruise in the Gulf of Mexico that needed to be prepared for.
- With Dr. Martínez Martínez I ventured into the world of virology & single celled eukaryotes. Project focused on studying the interactions between natural marine viruses and the harmful algae species *Karenia brevis*. Work involved establishing and maintaining *K. brevis* cultures in the laboratory; microscopy to monitor cultures; flow cytometry to monitor & count viral populations during experiments; short and long read metagenomic sequencing, single viral particle

sequencing, & 18S sequencing; bioinformatic analysis of sequencing data using both the command line interface and R Studio, figure creation, & manuscript preparations.

**Postdoctoral Research Scientist:** Bigelow Laboratory for Ocean Sciences, East Boothbay, Maine, USA; lab of Dr. Beth Orcutt (Jan. 2019- June 2022)

- With Dr. Orcutt I transitioned from the terrestrial subsurface to the oceanic crust to learn about the microorganisms that inhabit this space. This project focused on measuring the activity rate of ocean crust inhabiting microbes and using ocean crust single cell genomics sequencing data to learn about the genes used by microbes living in the ocean crust. Work involved performing stable isotope experiments at sea; collecting & preserving samples for single cell genomic sequencing at sea; flow cytometry single cell sorting to prepare samples for nanoSIMS analysis to measure stable isotope incorporation; nanoSIMS data collection & analysis; bioinformatic annotation of single cell genomic sequencing data to decipher genes available to ocean crust microbes & hypothesizing how microbes live in this remote environment; Adobe Illustrator figure creation & manuscript preparation.
- I began working with Dr. Martínez Martínez while finalizing these project results for publication in October 2021.

**Graduate Research Assistant:** Department of Microbiology, The Ohio State University, Columbus, Ohio; lab of Dr. Michael Wilkins (August 2014 – December 2018)

- While at Ohio State University, I took classes in classic microbiology which included genetics, physiology, microbes in relation to human health, & microbes in relation to environmental health.
- In the lab of Dr. Wilkins my project focused on characterizing the microbial community associated with the fluid used to hydraulically fracture wells for natural gas production. The work involved anaerobically isolating & culturing bacteria from hydraulically fractured well fluid; anaerobically maintaining these cultures; performing growth curves at atmospheric and high pressure (0.1 – 48 MPa); measuring sulfide production using colorimetric assays; performing growth experiments for proteomic data collection; analyzing proteomic data; quantifying metabolites via Nuclear Magnetic Resonance (NMR); florescent microscopy to quantify bacterial abundance and their extracellular polymeric substance (EPS) production; Adobe Illustrator figure creation & manuscript preparation.

**Graduate Teaching Assistant:** Introduction to Microbiology, The Ohio State University, Columbus, Ohio; Non-Majors (Fall 2014, Spring 2015) Majors (Fall 2017, Spring 2017, 2018)

**Peer Mentor:** Biology Department, Austin College, Sherman, Texas (Fall 2013 – Spring 2014)

**Student Research Internship:** Biology Department, Austin College, Sherman, Texas (Spring 2013 - Spring 2014)

**Teaching Assistant:** Cell Biology, Austin College, Sherman, Texas (Spring 2012, 2013)

## PUBLICATIONS

ORCID ID: 0000-0001-9526-070X

**Booker AE, Fei C, Moreno C, Bercl T (2023)** Research on *Karenia brevis* blooms in the eastern Gulf of Mexico. *Harmful Algae News: An IOC Newsletter on Toxic Algae and Algal Blooms*. DOI: 10.5281/zenodo.8406489

**Booker AE**, D'Angelo T, Adams-Beyea A, Brown JM, Nigro O, Rappe' M, Stepanauskas R, Orcutt BN (2023) Life strategies for *Aminicenantia* in subseafloor oceanic crust. *The ISME Journal*. DOI: 10.1038/s41396-023-01454-5

D'Angelo T, Goordial J, Lindsay MR, McGonigle J, **Booker AE**, Moser D, Stepanauskas R, Orcutt BN (2023) Replicated Life-History Patterns and Subsurface Origins of the Bacterial Sister-Phyla Nitrospirota and Nitrospinota. *The ISME Journal*. DOI: 10.1038/s41396-023-01397-x

**Booker AE**, Hoyt DW, Meulia T, Eder E, Nicora CD, Purvine SO, Daly RA, Moore J, Wunch K, Pfiffner S, Lipton MS, Mouser PJ, Wrighton KC, Wilkins MJ (2019) Deep-Subsurface Pressure Stimulates Metabolic Plasticity in Shale-Colonizing *Halanaerobium* spp. *Applied and Environmental Microbiology*. AEM.00018-19; DOI: 10.1128/AEM.00018-19

Daly RA, Roux S, Borton MA, Morgan DM, Johnston MD, **Booker AE**, Hoyt DW, Meulia T, Wolfe RA, Hanson AJ, Mouser PJ, Sullivan MB, Wrighton KC, Wilkins MJ (2019) Viruses control dominant bacteria colonizing the terrestrial deep biosphere after hydraulic fracturing. *Nature Microbiology*. DOI: 10.1038/s41564-018-0312-6

Borton MA, Daly RA, O'Banion B, Hoyt DW, Marcus DN, Welch S, Hastings SS, Meulia T, Wolfe RA, **Booker AE**, Sharma S, Cole D, Wunch K, Moore JD, Darrah TH, Wilkins MJ, Wrighton KC (2018) Comparative genomics and physiology of the genus *Methanohalophilus*, a prevalent methanogen in hydraulically fractured shale. *Environmental Microbiology*. DOI: 10.1111/1462-2920.14467.

**Booker AE**, Borton MA, Daly RA, Welch SA, Nicora CD, Hoyt DW, Wilson T, Purvine SO, Wolfe RA, Sharma S, Mouser PJ, Cole DR, Lipton MS, Wrighton KC, Wilkins MJ (2017) Sulfide Generation by Dominant *Halanaerobium* Microorganisms in Hydraulically Fractured Shales. *mSphere*, 2 (4) e00257-17; DOI: 10.1128/mSphereDirect.00257-17

**Booker AE**, Johnston MD, Daly RA, Wrighton KC, Wilkins MJ. Draft Genome Sequences of Multiple *Frackibacter* Strains Isolated from Hydraulically Fractured Shale Environments. *Genome Announcements*. 2017;5(32): e00608-17. DOI:10.1128/genomeA.00608-17.

### Submitted and In Preparation

**Anne E Booker**, Cong Fei, Shady A. Amin, So Hyun (Sophia) Ahn, Nayani Vidyarthna, Patricia Glibert, Sarah Klass, Cynthia Heil. Viruses that interact with the harmful algae *Karenia brevis*. (*in review*).

### AWARDS, HONORS AND SCHOLARSHIP

#### Postdoctoral

Co-PI on Joint Genome Institute Community Science Program New Investigator award, 2024 (3Tb sequencing data at no cost)

ASLO Aquatic Sciences Travel Award, 2023 (\$500)

Bigelow Laboratory for Ocean Sciences Rodney L. White Fellowship, 2020 (\$40,000)

#### Graduate

OSU Department of Microbiology Outstanding Graduate Student Teaching Award, 2017 (\$500)

Ohio Branch American Society for Microbiology Best Oral Presentation Award, 2017 (\$100)

OSU Department of Microbiology Student Travel Award, 2017 (\$500)

American Association of Petroleum Geologists Eastern Section Student Travel Award, 2016 (\$500)

National Science Foundation Graduate Research Fellowship Program Honorable Mention, 2016

#### Undergraduate

Howard McCarley Biology Student Research Award

Beta Beta Beta Biological Honor Society  
Alpha Chi National College Honor Society  
Phi Beta Kappa Honor Society  
Dean's List, five of six semesters  
Presidential Scholarship  
Summa Cum Laude

## MENTORING & TEACHING EXPERIENCE

- Co-Mentor for Bigelow Laboratory for Ocean Science REU interns** Summer 2022  
Guided two interns through independent research projects involving marine viruses and harmful algal species. Project involved reviewing primary literature, culturing algae, flow cytometry to monitor bacterial & viral populations, bioinformatics, data organization, and poster presentations.
- Colby College JanPlan Mentor for Undergraduate Independent Research Project** January 2021  
Developed and guided student through independent research project which included reviewing primary literature, creating hypotheses, formulating methods to address hypotheses, data generation and analyses, organizing data into a clear story that was orally shared with an audience.
- Bigelow Laboratory for Ocean Science Keller BLOOM Instructor** August 2020  
A 1-week program immersive program for high school juniors in Maine that exposes them to oceanographic data collection and analyses. This program emphasizes the importance of all marine life from viruses, bacteria, phytoplankton, zooplankton, to small invertebrates. I led three bacterial and viral discussions.
- Co-mentor The New School Undergraduate Independent Research Project** Fall 2020  
Developed and guided student through independent research project which included reviewing primary literature, creating hypotheses, formulating methods to address hypotheses, data generation and analyses, organizing data into a clear story that was orally shared at the 2020 Virtual AGU Fall Meeting.
- Guest Lecturer at Maine Maritime Academy** Fall 2019  
Invited by Dr. LeAnn Whitney and her Biological Oceanography class to discuss deep biosphere microbiology and the techniques used to learn about microbes living in the environment.
- Bigelow Laboratory for Ocean Science, Sea Change Semester Program** Fall 2020  
*Mentor for Undergraduate Independent Research Project*
- Developed and guided student through independent research project which included reviewing primary literature, creating hypotheses, formulating methods to address hypotheses, data generation and analyses, organizing data into a clear story that was orally shared with an audience.
- Co-Instructor for Biological Oceanography Course* Fall 2019
- Created and delivered lectures, implemented laboratory materials, graded student written lab reports
- Bigelow Laboratory for Ocean Science, Post-Doctoral Research Experience**  
*REU Student Mentor* Summer 2019, Summer 2020

- Work one on one with undergraduate summer intern to teach them microbiological techniques, help them develop independent research project, guide them through effective scientific communication techniques

## **Graduate**

### **Ohio State University, Graduate School**

*Preparing Future Faculty Program*

Fall 2018

- Work with faculty at local teaching intensive colleges to gain experience in developing and executing classroom learning exercises

### **Ohio State University, Microbiology Department**

*Teaching Assistant*

Fall 2014-Spring 2015

- For non-major undergraduate course, guided students through lab

*Teaching Assistant*

Spring 2017-Spring 2018

- For major undergraduate course; create introductory presentations, guide students through lab, trouble shoot lab exercises, grade assignments

## **Undergraduate**

### **Austin College, Peer Mentor**

*Teacher/Learner Mentor*

Fall 2013-May 2014

- In class mentor for Cell Biology course, helped professor grade assignments and acted as tutor for students.
- Conducted workshops associated with material covered in Cell Biology as an additional guide for students

*Communication Leader*

Fall 2013-May 2014

- For a professors freshmen mentee group, act as an upper classmen student resource for freshmen in hopes of making the transition into college easier

### **Austin College, Biology Department**

Spring 2012 & 2013

*Teaching Assistant*

- For freshmen level Cell Biology, aid professor in monitoring the lab

## **PROFESSIONAL SERVICE**

### **Peer-Reviewer:**

#### **Journals:**

- Frontiers in Microbiology – 2024 (1)
- Environmental Microbiology – 2022 (1)
- BMC Microbiology – 2021 (1)
- PLOS ONE – 2019 (1)

#### **Proposals:**

- National Science Foundation – 2022 (1)

### **Scientific Conference Session Lead:**

- Association for the Sciences of Limnology & Oceanography (ASLO) Aquatic Sciences Meeting session co-chair, *SS088 Advances in Understanding, Prediction, and Monitoring of Toxic Karenia (Dinoflagellate) Blooms Around the Globe*, summer 2023

### **Bigelow Laboratory for Ocean Sciences, Applied Research & Commercialization Committee**

Spring 2020 – Fall 2021

- Meet to provide guidance and feedback to the Bigelow community on matters related to industrial collaboration, research commercialization, and technology transfer.

### **Bigelow Laboratory for Ocean Sciences, Education Development Committee**

Spring 2019- Spring 2020

- Meet to discuss educational opportunities Bigelow can provide to the community and offer suggestions of how postdocs can enhance these opportunities

## Ohio State University, Students for the Advancement of Microbiology Student Organization

Summer 2016-2018

Secretary 2016-2017

President 2017-2018

- Created and organized professional development and social events geared to enrich the graduate student experience of the organization members.
- Involved collaborations between faculty and graduate students within and outside of the Microbiology Department
- Involved inviting external speakers to OSU campus for graduate student hosted talks

## PRESENTATIONS

**Booker AE, Martínez Martínez J, Fei C, Amin SA, Ahn SH, Vidyarthna N, Glibert P, Klass S, Heil C.** Learning how marine viruses interact with harmful algal blooms. Bigelow Science Symposium, Spring 2024 (oral presentation)

**Booker AE, Martínez Martínez J, Fei C, Amin SA, Ahn SH, Vidyarthna N, Glibert P, Klass S, Heil C.** Can marine viruses cause *Karenia brevis* lysis? Horn Point Laboratory ECOHAB PI Meeting, Summer 2023 (oral presentation)

**Booker AE, Fei C, Amin SA, Ahn SH, Vidyarthna N, Glibert P, Klass S, Heil C.** Lytic viral infection of the harmful algal species *Karenia brevis*: A potential factor of bloom termination? ASLO Aquatic Sciences Meeting, Summer 2023 (oral presentation)

**Booker AE, Fei C, Amin SA, Ahn SH, Vidyarthna N, Glibert P, Klass S, Heil C.** Can viruses induce lysis of the harmful algal species *Karenia brevis*? Bigelow Laboratory for Ocean Sciences Seminar, Spring 2023 (oral presentation)

**Booker AE, Martínez Martínez J, Fei C, Amin SA, Ahn SH, Vidyarthna N, Glibert P, Klass S, Heil C.** Evidence of viral induced *Karenia brevis* lysis. Mote Marine Laboratory ECOHAB PI Meeting, Summer 2022 (oral presentation)

**Booker AE, Orcutt BN.** Measuring the Activity of Microbes in the Ocean Crust. AGU Virtual Fall Meeting, Winter 2020 (oral presentation)

**Booker AE, Orcutt BN.** Who is down there? Studying Microbes in the Deep Subsurface. Bigelow Laboratory for Ocean Sciences Seminar, Summer 2020 (oral presentation)

**Booker AE, Orcutt BN.** How slow do they go? Single Cell *in situ* activity rates of microbes in the oceanic crust. C-DEBI 2019 Annual Meeting, Fall 2019 (oral presentation)

**Booker AE, Orcutt BN.** How active is the crustal deep biosphere? Measuring *in situ* activity rates of crustal fluid microorganisms at the single cell level with nano-scale secondary ion mass spectrometry. Microbial Single Cell Genomics Workshop, Fall 2019 (poster)

**Booker AE, Meulia T, Hoyt D, Daly R, Welch S, Sharma S, Borton M, Nicora C, Purvine S, Wrighton K, Wilkins M.** Implications of *Halanaerobium* Growth and Persistence in Hydraulically-Fractured Shale Ecosystems. Recent Advances in Microbial Control – Microbiomes Matter Conference, Fall 2018 (invited oral presentation)

**Booker AE, Meulia T, Hoyt D, Lipton M, Wilkins M.** Implications of *Halanaerobium* Growth and Persistence in Hydraulically-Fractured Shale Ecosystems. Goldschmidt, Summer 2018 (oral presentation)

**Booker AE, Borton M, Dusane D, Meulia T, Hoyt D, Nicora C, Purvine S, Daly R, Lipton M, Wrighton K, Wilkins M.** Pressure induced survival strategies of *Halanaerobium* in hydraulically fractured deep shale wells. American Geophysical Union Fall Meeting, Fall 2017 (poster)

**Booker AE**, Borton M, Hoyt D, Sharma S, Wrighton K, Wilkins M. Potential Repercussions Associated with *Halanaerobium* Colonization of Hydraulically Fractured Shales. MidWest GeoBio Conference, Fall 2017 (poster)

**Booker AE**, Borton M, Daly RA, Nicora C, Welch S, Dusane D, Johnston M, Sharma S, Mouser PJ, Cole DR, Lipton MS, Wrighton KC and Wilkins MJ. Taking Advantage of an Opportunity: Hydraulic Fracturing and *Halanaerobium*. TEDxTheOhioStateUniversity Discovery Talks, Summer 2017 (oral presentation)

**Booker AE**, Borton MA, Daly R, Welch S, Nicora CD, Sharma S, Mouser PJ, Cole D, Lipton MS, Wrighton KC, and Wilkins MJ. Taking Advantage of an Opportunity: Repercussions of Deep Shale Colonization by *Halanaerobium* Strains. Ohio Branch American Society for Microbiology Meeting, Spring 2017 (oral presentation)

**Booker AE**, Johnston M, Hoyt D, Nicora CD, Lipton MS, Daly RA, Wrighton KC, Wilkins MJ. Taking Advantage of an Opportunity: Colonization of Hydraulically Fractured Deep Shales by *Halanaerobium* Strains. International Society for Microbial Ecology Meeting, Summer 2016 (poster)

**Booker AE**, Johnston M, Borton MA, Hoyt D, Nicora CD, Lipton MS, Daly RA, Wrighton KC, Wilkins MJ. Taking Advantage of an Opportunity: Colonization of Hydraulically Fractured Deep Shales by *Halanaerobium* Strains. Ohio State University Microbiology Departmental Symposium, Winter 2015 (oral presentation)

### Published Abstracts

**Booker AE**, Borton MA, Daly R, Welch S, Nicora CD, Sharma S, Mouser PJ, Cole D, Lipton MS, Wrighton KC, and Wilkins MJ. Sulfide Generation by Dominant Colonizing *Halanaerobium* Microorganisms in Hydraulically Fractured Shales. American Association of Petroleum Geologists Eastern Section Meeting, Fall 2016 (poster)

**Booker AE**, Meulia T, Hoyt D, Lipton M, Wilkins M. Implications of *Halanaerobium* Growth and Persistence in Hydraulically-Fractured Shale Ecosystems. Goldschmidt , Summer 2018 (oral presentation)

**Booker AE**, Borton M, Dusane D, Meulia T, Hoyt D, Nicora C, Purvine S, Daly R, Lipton M, Wrighton K, Wilkins M. Pressure induced survival strategies of *Halanaerobium* in hydraulically fractured deep shale wells. American Geophysical Union Fall Meeting, Fall 2017 (poster)

### **PROFESSIONAL WORKSHOPS**

- Science Party Member of 10-day research cruise aboard the Weatherbird II (to sample surface waters offshore the western Florida coast for harmful algal blooms), December 2021 and February 2023
- Participated in Bioinformatics of Microbial Single Cells course at Bigelow Laboratory for Ocean Sciences, Spring 2022
- Leading Diversity, Equity, and Inclusion, Weinberg College at Northwestern University, Spring 2021
- Demystifying the Integrated Ocean Drilling Program Proposal Process for Early Career Scientists: Pacific Ocean, Spring 2020
- Science Party Member of the 14-day research cruise AT42-11 aboard the Atlantis (to sample subsurface of the Eastern Flank of the Juan de Fuca Ridge, Pacific Ocean), May 2019
- Department of Energy Joint Genome Institute Microbial Genomics and Metagenomics Workshop, Spring 2016
- American Society for Microbiology Online Grant Writing Course, Spring 2016

### **Memberships**

- Association for the Sciences of Limnology and Oceanography
- Society for Advancement of Chicanos/Hispanics and Native Americans in Science
- American Geophysical Union
- American Society for Microbiology

- International Society for Microbial Ecology
- American Association for the Advancement of Science
- Sigma Xi

## **COMMUNITY OUTREACH**

### **Bigelow Laboratory for Ocean Sciences hosts Gateway Community Services Maine**      October 2023

- Created hands on activity named “grow your microbes” for Gateway Community visitors
- Gateway Community visitors were college and high school students from refugee families
- Each visitor was shown how to streak microbial samples onto agar plates
- Each visitor was given the opportunity to collect their own sample and streak microbes from seawater and their microbiome

### **Volunteer with ACEing Autism**      Fall 2021

- Paired with an autistic community member in elementary-high school
- As a pair, play tennis games each weekend to practice movement & social techniques

### **Panelist for Olympia Snow Women’s Leadership Institute**      April 2020

- Participated in a panel of women scientist who answered questions for high school students interested in pursuing science careers.

### **Bigelow Laboratory for Ocean Science Tour Stop**      Fall 2019 – Spring 2020

- When tour groups (children or adults) visit Bigelow they are brought by the laboratory I work in and I give ~20 minutes presentations on general microbiology and our work in the deep biosphere

### **Bigelow Laboratory for Ocean Science Open House**      Summer 2019, 2022

- Prepared ocean-science based demonstration booths for the public to better understand how climate change is altering the ocean

### **Boothbay Harbor Earth Day Celebration**      Spring 2019

- Prepared family friendly material and represented Bigelow Laboratory for Ocean Sciences with the goal to raise public awareness of the importance of microbes in the ocean

### **Franklin County Children Services College Bound Mentoring Program**      Spring 2017- Fall 2018

- Mentor to an assigned high school student under Franklin County Children Services care
- The goal of this mentorship program was to provide friendship and support to my assigned mentee as they prepared for college