

Aaron T. Whiteley

Assistant Professor and Boettcher Investigator
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EDUCATION & POSTGRADUATE TRAINING

- 2004 – 2008 B.S. in Biochemistry and Molecular Biology – *University of California, Davis*
- 2010 – 2016 Ph.D. in Infectious Diseases and Immunity – *University of California, Berkeley*
- Advisor: Dr. Daniel A. Portnoy
 - National Science Foundation Graduate Research Fellow
 - Thesis: “Cyclic di-AMP signaling in *Listeria monocytogenes*”
- 2016 – 2019 Jane Coffin Childs Fund Postdoctoral Fellow – *Harvard Medical School*
- Advisors: Dr. John J. Mekalanos and Dr. Philip J. Kranzusch
 - Research into the biochemistry of nucleotidyltransferases related to the enzyme cGAS and their role in bacterial pathogenesis, bacterial immunity to phage, and eukaryotic immune signaling

FACULTY POSITIONS HELD

- 2020 – pres. Assistant Professor of Biochemistry – *University of Colorado Boulder*
- My research group is broadly interested in how pathogens interact with, and often subvert, their hosts. Host–pathogen dynamics are shaped by chemical signals that are exchanged between invaders and their victims. In mammals, detection of pathogenic bacteria and viruses starts with receptors of the innate immune system that sense microbe-derived chemicals. Innate immune signaling results in activation of the immune system and identification of ligands for the innate immune system has led to a better understanding of vaccines and the design of novel adjuvants. Our lab studies the innate immune system, the microbe-derived ligands important for immune activation, and general bacterial pathogenesis. We are particularly focused on immune pathways that use nucleotide second messengers to amplify signaling. One of the most exciting characteristics of these pathways are that they are found both in animal and in bacterial cells. The same molecular machinery that allows eukaryotes to respond to DNA viruses (cGAS–STING), also is found in bacteria, where cGAS-like enzymes are important for responding to phages. The ultimate goal of our work is to better understand immune signaling to inform the development of therapeutics that target these pathways, which is relevant to defeating human pathogens and cancers.
 - [Lab website](#)

FELLOWSHIPS, HONORS, & AWARDS

- 2010 – 2011 National Institutes of Health Training Grant Trainee – *Grant #5T32AI007620-10*
- 2011 Graduate Research Fellowship Honorable Mention – *National Science Foundation*
- 2012 – 2015 **Graduate Research Fellowship Award** – *National Science Foundation #DGE1106400*
- 2014 Outstanding Ph.D. Leadership [Award](#) – *School of Public Health, UC Berkeley*
- 2014 Irving H. Wiesenfeld Fellowship [Award](#) – *Center for Emerging & Neglected Diseases, UC Berkeley*
- 2015 Richard and Mary Finkelstein Travel Grant and Young Investigator Oral Presentation – *American Society for Microbiology, ASM General Meeting 2015*
- 2016 Ridpath Memorial [Award](#) for Excellence in Oral Presentation of Dissertation Research – *IDV Division, School of Public Health, UC Berkeley*
- 2017 – 2019 **Postdoctoral Fellowship** – *Jane Coffin Childs Memorial Fund for Medical Research*
- 2018 **Outstanding Postdoctoral Fellow [Award](#)** – *Microbiology & Immunobiology, Harvard Medical School*
- 2019 Student and Postdoctoral Travel Award – *American Society for Microbiology, ASM Microbe 2019*
- 2022 Boettcher Investigator and Webb-Waring Biomedical Research Awardee – *Boettcher Foundation*
- 2022 **NIH Director’s New Innovator [Award](#) (DP2)** – *National Institutes of Health (DP2AT012346)*

PROFESSIONAL ACTIVITIES

- 2012 – 2014 Admissions committee student representative – *IDI Graduate Program at UC Berkeley*
- 2013 Faculty search committee student representative – *UC Berkeley*

- 2013 – 2014 Student President of the Graduate Group in Infectious Diseases and Immunity – *UC Berkeley*
 2015 – pres. Member – *American Society for Microbiology*
 2016 Co-chair of the Microbial Toxins & Pathogenicity Gordon Research Seminar – *Waterville Valley, NH*
 Funding Awarded: NIAID-1R13AI124475-01 (\$1,000), Gilead Sciences-#17668 (\$5,000), AstraZeneca-#72390 (\$1000)
 2019 Postdoc-to-PI [Panelist](#), a series on academic job searches – *Harvard Medical School, Boston, MA*
 2020–2023 ASM Microbe Program Committee Member, HMB Track – *American Society for Microbiology*
 Ad hoc reviewer: *EMBO, Journal of Bacteriology, Journal of Molecular Biology, mBio, Nature Cell Biology, Nature Communications, PNAS*

PUBLICATIONS ([NCBI](#) · [ORCID](#))

- 1 Witte CE, **Whiteley AT**, Burke TP, Sauer JD, Portnoy DA, Woodward JJ.
[Cyclic di-AMP is critical for *Listeria monocytogenes* growth, cell wall homeostasis, and establishment of infection.](#)
mBio. 2013 May 28;4(3):e00282-13. PMC3663569.
- 2 Reniere ML, **Whiteley AT**, Hamilton KL, John SM, Lauer P, Brennan RG, Portnoy DA.
[Glutathione activates virulence gene expression of an intracellular pathogen.](#)
Nature. 2015 Jan 8;517(7533):170-3. PMC4305340.
- 3 Kellenberger CA, Chen C, **Whiteley AT**, Portnoy DA, Hammond MC.
[RNA-Based Fluorescent Biosensors for Live Cell Imaging of Second Messenger Cyclic di-AMP.](#)
J Am Chem Soc. 2015 May 27;137(20):6432-5. PMC4521591.
- 4 **Whiteley AT**, Pollock AJ, Portnoy DA.
[The PAMP c-di-AMP Is Essential for *Listeria monocytogenes* Growth in Rich but Not Minimal Media due to a Toxic Increase in \(p\)ppGpp.](#)
Cell Host Microbe. 2015 Jun 10;17(6):788-98. PMC4469362.
 - **Previewed in the same [issue](#)**
- 5 Reniere ML*, **Whiteley AT***, Portnoy DA. (*equal contribution)
[An In Vivo Selection Identifies *Listeria monocytogenes* Genes Required to Sense the Intracellular Environment and Activate Virulence Factor Expression.](#)
PLoS Pathog. 2016 Jul;12(7):e1005741. PMC4945081.
- 6 **Whiteley AT**, Garelis NE, Peterson BN, Choi PH, Tong L, Woodward JJ, Portnoy DA.
[c-di-AMP modulates *Listeria monocytogenes* central metabolism to regulate growth, antibiotic resistance and osmoregulation.](#)
Mol Microbiol. 2017 Apr;104(2):212-233. PMC5391996.
- 7 **Whiteley AT**, Ruhland BR, Edrozo MB, Reniere ML.
[A Redox-Responsive Transcription Factor Is Critical for Pathogenesis and Aerobic Growth of *Listeria monocytogenes*.](#)
Infect Immun. 2017 May;85(5). PMC5400837.
 - **Spotlight in the same [issue](#)**
- 8 Portman JL, Dubensky SB, Peterson BN, **Whiteley AT**, Portnoy DA.
[Activation of the *Listeria monocytogenes* Virulence Program by a Reducing Environment.](#)
mBio. 2017 Oct 17;8(5). PMC5646252.
- 9 Mitchell G, Cheng MI, Chen C, Nguyen BN, **Whiteley AT**, Kianian S, Cox JS, Green DR, McDonald KL, Portnoy DA.
[Listeria monocytogenes triggers noncanonical autophagy upon phagocytosis. but avoids subsequent growth-restricting xenophagy.](#)
Proc Natl Acad Sci U S A. 2018 Jan 9;115(2):E210-E217. PMC5777066.
- 10 Zhou W*, **Whiteley AT***, de Oliveira Mann CC, Morehouse BR, Nowak RP, Fischer ES, Gray NS, Mekalanos JJ, Kranzusch PJ. (*equal contribution)
[Structure of the Human cGAS-DNA Complex Reveals Enhanced Control of Immune Surveillance.](#)
Cell. 2018 Jul 12;174(2):300-311.e11. PMC6084792.
 - **Previewed in [Immunity](#)**
 - Highlighted by [HMS News](#) and at the [Advanced Photon Source](#)

- 11 **Whiteley AT**, Eaglesham JB, de Oliveira Mann CC, Morehouse BR, Lowey B, Nieminen EA, Danilchanka O, King DS, Lee ASY, Mekalanos JJ*, Kranzusch PJ*. (*co-cor. author)
[Bacterial cGAS-like enzymes synthesize diverse nucleotide signals.](#)
Nature. 2019 Mar;567(7747):194-199. PMC6544370.
- **Previewed in [Cell Host & Microbe](#)**
- Editors choice highlight in [Science Signaling](#)
- Highlighted and discussed in ***This Week In Microbiology*** Podcast [Episode #206](#)
- 12 Zhou W, **Whiteley AT**, Kranzusch PJ.
[Analysis of human cGAS activity and structure.](#)
Methods Enzymol. 2019;625:13-40. PMID: 31455523.
- 13 Lau RK, Ye Q, Birkholz EA, Berg KR, Patel L, Mathews IT, Watrous JD, Ego K, **Whiteley AT**, Lowey B, Mekalanos JJ, Kranzusch PJ, Jain M, Pogliano J, Corbett KD.
[Structure and Mechanism of a Cyclic Trinucleotide-Activated Bacterial Endonuclease Mediating Bacteriophage Immunity.](#)
Mol Cell. 2020 Feb 20;77(4):723-733.e6. PMC7065454.
- 14 Lowey B, **Whiteley AT**, Keszei AFA, Morehouse BR, Mathews IT, Antine SP, Cabrera VJ, Kashin D, Niemann P, Jain M, Schwede F, Mekalanos JJ, Shao S, Lee ASY, Kranzusch PJ.
[CBASS Immunity Uses CARF-Related Effectors to Sense 3'-5'- and 2'-5'-Linked Cyclic Oligonucleotide Signals and Protect Bacteria from Phage Infection.](#)
Cell. 2020 Jul 9;182(1):38-49.e17. PMCID: PMC7728545.
- **Previewed in the same [issue](#)**
- 15 Peterson BN, Young MKM, Luo S, Wang J, **Whiteley AT**, Woodward JJ, Tong L, Wang JD, Portnoy DA.
[\(p\)ppGpp and c-di-AMP Homeostasis Is Controlled by CbpB in *Listeria monocytogenes*.](#)
mBio. 2020 Aug 25;11(4). PMID: 32843560; PMCID: PMC8549634.
- 16 Chang D, **Whiteley AT**, Bugda Gwilt K, Lencer WI, Mekalanos JJ, Thiagarajah JR.
[Extracellular cyclic dinucleotides induce polarized responses in barrier epithelial cells by adenosine signaling.](#)
PNAS. 2020 Nov 3;117(44):27502-27508. PMID: 33087577; PMCID: PMC7959571
- 17 Kibby EM, **Whiteley AT**.
[The linguistics of bacterial conflict systems reveal ancient origins of eukaryotic innate immunity.](#)
J Bacteriol. 2020 Nov 19;202(24):e00507-20. PMCID: PMC7685558 [Commentary]
- 18 Govande AA, Duncan-Lowey B, Eaglesham JB, **Whiteley AT**, Kranzusch PJ.
[Molecular basis of CD-NTase nucleotide selection in CBASS anti-phage defense.](#)
Cell Rep. 2021 Jun 1;35(9):109206. PMID: 34077735.
- 19 Ledvina HE*, Ye Q*, Gu Y, Quan Y, Lau RK, Zhou H, Corbett KD†, **Whiteley AT**† (*equal contribution, †co-cor. author)
[An E1–E2 fusion protein primes antiviral immune signalling in bacteria.](#)
BioRxiv. 2022 Mar 31. doi.org/10.1101/2022.03.31.486616 (**In press, *Nature***)
- 20 Kibby EM, Conte AN, Burroughs AM, Nagy TA, Vargas JA, Aravind L, **Whiteley AT**
[Bacterial NLR-related proteins protect against phage](#)
BioRxiv. 2022 Jul 20. doi.org/10.1101/2022.07.19.500537

PATENTS

- 06/2018 STRUCTURE OF THE HUMAN cGAS-DNA COMPLEX AND USES THEREOF
PCT filed June 26th, 2019 - PCT/US2019/039171
Authors: Kranzusch PJ., Mekalanos JJ, Whiteley, AT, Zhou W
- 09/2018 CGAS/DNCV-LIKE NUCLEOTIDYLTRANSFERASES AND USES THEREOF
PCT filed September 4th, 2019 – PCT/US2019/049478
Authors: Whiteley AT, Kranzusch PJ, Mekalanos JJ, Eaglesham JB.
- 03/2022 METHODS AND COMPOSITIONS FOR THE GENERATION OF PROGRAMABLE POST-TRANSLATIONAL PROTEIN MODIFICATION AND HYDROLYSIS
Provisional Patent filed March 14th, 2022 - US Pat App No 63/319,673
Authors (not ordered): Ledvina HE, Ye Q, Gu Y, Corbett KD, Whiteley AT

RESEARCH TALKS

- 12/2013 **West Coast Bacterial Physiologists Conference – Asilomar, CA**
Genetic Determinants of c-di-AMP Essentiality in *Listeria monocytogenes*
- 03/2015 **Bay Area Microbial Pathogenesis Symposium – San Francisco, CA**
The PAMP c-di-AMP Is Essential for *Listeria monocytogenes* Growth in Macrophages and Rich but Not Minimal Media due to a Toxic Accumulation in (p)ppGpp
- 06/2015 **ASM General Meeting – New Orleans, LA**
The PAMP c-di-AMP Is Essential for *Listeria monocytogenes* Growth in Rich but Not Minimal Media due to a Toxic Accumulation in (p)ppGpp
Selected as ASM Richard and Mary Finkelstein Travel Grant Award and Young Investigator Oral Presentation
- 04/2016 **UCSF Microbial Pathogenesis Seminar Series – San Francisco, CA**
Why is cyclic-di-AMP essential in bacteria? (Invited seminar)
- 07/2016 **Microbial Toxins & Pathogenicity Gordon Research Conference – Waterville Valley, NH**
Why is the PAMP c-di-AMP essential in *Listeria monocytogenes*?
- 06/2018 **Harvard Medical School Department of Microbiology Retreat – Falmouth, MA**
Bacterial cGAS-like enzymes at the host-pathogen interface.
- 07/2018 **Microbial Toxins & Pathogenicity Gordon Research Conference – Waterville Valley, NH**
Bacterial cGAS-like enzymes at the host-pathogen interface
Poster prize winner, selected for oral presentation
- 10/2018 **Vanderbilt University Medical Center VI4– Nashville, TN**
Bacterial cGAS-like enzymes at the host-pathogen interface. (Invited seminar)
- 11/2018 **HMS Outstanding Postdoctoral Fellow Symposium – Boston, MA**
Novel Bacterial Signaling Molecules. (Invited speaker)
- 01-05/2019 **Duke University SOM, Department of Molecular Genetics and Microbiology – Durham, NC**
University of Pennsylvania SOM, Department of Microbiology – Philadelphia, PA
Johns Hopkins SOM, Department of Molecular Biology & Genetics – Baltimore, MD
UC Santa Cruz, Department of Microbiology and Environmental Toxicology – Santa Cruz, CA
Stanford SOM, Department of Microbiology & Immunology – Palo Alto, CA
University of Colorado Boulder, Department of Biochemistry – Boulder, CO
University of California, Los Angeles SOM, Dept. of Biological Chemistry – Los Angeles, CA
Northeastern University, Department of Biology – Boston, MA
The University of Chicago, Department of Microbiology – Chicago, IL
University of Dundee, School of Life Sciences – Dundee, Scotland
University of Massachusetts Amherst, Department of Microbiology – Amherst, MA
Bacterial cGAS-like enzymes at the host-pathogen interface. (Invited seminars)
- 07/2019 **Microbial Adhesion and Signal Transduction Gordon Research Conference – Newport, RI**
Bacterial cGAS-like enzymes at the host-pathogen interface. (Invited speaker)
- 04/2020 **Rockefeller University – New York, NY (presented via video conference)**
cGAS-like Enzymes in Bacterial Immunity. (Invited seminar)
- 02/2021 **San José State University – San Jose, CA (presented via video conference)**
cGAS-like Enzymes in Bacterial Immunity. (Invited seminar)
- 09/2022 **Bacterial networks (BacNet21) – Sant Feliu de Guixols, Spain**
cGAS-like enzymes in bacterial immunity. (Invited speaker)

LIST OF TRAINEES

Name	Years	Lab Position	Awards
Aidan Litt	2020 – 2021	Research Associate	
Emily Kibby	2020 – pres.	Graduate Student	NIH Signaling and Cellular Regulation Trainee
Toni Nagy	2020 – pres.	Sr. Research Associate	
Hannah Ledvina	2020 – pres.	Postdoctoral Fellow	Jane Coffin Childs Postdoctoral Fellowship
Uday Tak	2021 – pres.	Postdoctoral Fellow	Cancer Research Institute Irvington Postdoctoral Fellowship
Ricardo Carale	2021 – pres.	Undergraduate Researcher	UROP Grant Recipient, BSI Scholar
Jose Alfredo Vargas	2021 – pres.	Undergraduate Researcher	Wuttke–Beckman Scholar, BSI Scholar
Amy Conte	2021 – pres.	Graduate Student	
Melissa McEvoy	2021 – pres.	Undergraduate Researcher	UROP Grant Recipient
Peace Holguin-Walth	2021 – pres.	Undergraduate Researcher	UROP Grant Recipient

Samantha Ridgeway	2022 – pres.	Undergraduate Researcher	BSI Scholar
Ryan Sayegh	2022 – pres.	Graduate Student	NIH Signaling and Cellular Regulation Trainee
Ashley Sullivan	2022 – pres.	Graduate Student	NIH Biophysics Trainee
Lindsay Whalen	2022 – pres.	Undergraduate Researcher	BSI Scholar
Alexa Macklin	2022 – pres.	Undergraduate Researcher	STEM Routes Trainee

TEACHING EXPERIENCE

2020 Spring	Guest lecturer in BCHM-5781 Advanced General Biochemistry 2 – <i>University of Colorado Boulder</i>
2020 Fall	BCHM-5771 Advanced General Biochemistry 1 Co-organizer – <i>University of Colorado Boulder</i>
2020 Fall	BCHM-5776-001 Scientific Conduct Co-organizer – <i>University of Colorado Boulder</i>
2021 Fall	BCHM-5771 Advanced General Biochemistry 1 Co-organizer – <i>University of Colorado Boulder</i>
2021 Fall	BCHM-5776-001 Scientific Conduct Co-organizer – <i>University of Colorado Boulder</i>
2022 Fall	BCHM-5771 Advanced General Biochemistry 1 Co-organizer – <i>University of Colorado Boulder</i>
2022 Fall	BCHM-5776-001 Scientific Conduct Co-organizer – <i>University of Colorado Boulder</i>

SERVICE

AY2020–21	Biochemistry Graduate Group (Ph.D.) Admissions Committee Member – <i>CU Boulder</i>
AY2021–22	Biochemistry Graduate Group (Ph.D.) Admissions Committee Member – <i>CU Boulder</i>
AY2022–23	Biochemistry Graduate Group (Ph.D.) Admissions Committee Member – <i>CU Boulder</i>

THESIS COMMITTEES

03/2020	Ph.D. Thesis committee external examiner for Philip Nussenzweig, The Rockefeller University
2020 – 2022	Ph.D. Dissertation Committee for Kelsey Dahlgren, University of Colorado Boulder Biochemistry
2022 – pres.	Ph.D. Dissertation Committee for Isaac Richardson, CU Boulder Ch.B. Engineering
2022 – pres.	Ph.D. Dissertation Committee for Chris Brininger, University of Colorado Boulder Biochemistry
2022 – pres.	Ph.D. Dissertation Committee for Megan Mitchell, University of Colorado Boulder Biochemistry
2022 – pres.	Ph.D. Dissertation Committee for Shawn Laursen, University of Colorado Boulder Biochemistry

COMPREHENSIVE/QUALIFYING EXAM COMMITTEES

03/2021	Ph.D. Candidacy Oral Exam for Karl Widney, University of Colorado Boulder Biochemistry
03/2022	Ph.D. Candidacy Oral Exam for Dominique Ramirez, University of Colorado Boulder Biochemistry

ACTIVE RESEARCH GRANTS

10/1/21– 9/30/24	<p>Funding agency: Edward Mallinckrodt, Jr Foundation Award: Mallinckrodt Grant Project Name: Investigating a primordial ubiquitin signaling system Total Funds Granted: \$180,000 Direct Costs: \$180,000 Start and End Dates: 10/1/21–9/30/24 PI: Aaron Whiteley</p> <p><i>This grant is for a detailed investigation of the biochemical mechanism of bacterial ubiquitin transferases, including how specificity is achieved in this system.</i></p>
3/14/21– 3/14/24	<p>Funding agency: Pacific Northwest Center for CryoEM (PNCC) Award: Voucher (Microscope time) Project Name: Structural basis of nucleotide-activated antiviral toxins Total Funds Granted: 48 hrs of microscope time Start and End Dates: 3/14/21–3/14/24 PI: Aaron Whiteley Co-PI: Uday Tak</p> <p><i>This grant of microscope time is to understand the molecular architecture of transmembrane antiphage effector proteins.</i></p>
07/1/22– 06/30/24	<p>Funding agency: The Boettcher Foundation Award: 2022 Boettcher Foundation Webb-Waring Biomedical Research Award Project Name: Evolution and Molecular Mechanisms of STING Signaling Total Funds Requested: \$235,000 Direct Costs: \$219,491 Start and End Dates: 07/1/22–06/30/24 PI: Aaron Whiteley</p> <p><i>This investigator award supports investigation of human and bacterial homologs of STING.</i></p>
06/1/22– 05/30/23	<p>Funding agency: University of Colorado Award: 2022 Spring AB Nexus Project Name: Nucleotide second messengers at the host-pathogen interface</p>

Total Funds Requested: \$19,798 Direct Costs: \$19,798
Start and End Dates: 07/1/22–06/30/23 Co-PIs: Aaron Whiteley and Kelly Doran (CU Anschutz)
This grant supports a collaboration to investigate c-di-AMP signaling during Group B Streptococcus infection.

07/1/22–
06/30/23 Funding agency: **CU Boulder RIO**
Award: 2022 Core Facility Assistant Grant
Project Name: **Expanding the capabilities of the Shared Instruments Pool in Biochemistry through purchase of a multi-well plate reader**
Total Funds Requested: \$16,178 Direct Costs: \$15,000
Start and End Dates: 07/1/22–06/30/23 PI: Aaron Whiteley, Co-PI: Annette Erbse
This grant supports purchase/upgrade of core facilities that are critical to the Whiteley Lab.

09/1/22–
08/31/27 Funding agency: **National Institutes of Health Common Fund, Office of the Director**
Award: 2022 NIH Director's New Innovator Award (DP2) – DP2AT012346
Project Name: **Deciphering the crosstalk between bacteria and their mammalian hosts**
Total Funds Requested: \$2,324,900 Direct Costs: \$1,500,000
Start and End Dates: 09/1/22–08/31/23 PI: Aaron Whiteley
This grant supports investigation of the production of cyclic dinucleotides by bacteria, their impact on human immune signaling, and general investigation of human and bacterial cGAS-like enzymes.

ACTIVE FELLOWSHIPS TO WHITELEY LAB TRAINEES

7/1/21–
6/30/24 Funding agency: **Cancer Research Institute**
Award: Irvington Postdoctoral Fellowship
Project Name: **Mechanistic basis for STING signaling in immunity to cancer**
Total Funds Granted: \$175,500 Direct Costs: \$175,500
Start and End Dates: 7/1/21–6/30/24 PI: Uday Tak, Mentor: Aaron Whiteley
This is a fellowship that was awarded to a postdoctoral scholar I mentor in my laboratory

7/1/21–
6/30/24 Funding agency: **Jane Coffin Childs Memorial Fund for Medical Research**
Award: Postdoctoral Fellowship
Project Name: **Activation and Inhibition of Antiviral Immunity**
Total Funds Granted: \$177,000 Direct Costs: \$177,000
Start and End Dates: 7/1/21–6/30/24 PI: Hannah Ledvina, Mentor: Aaron Whiteley
This is a fellowship that was awarded to a postdoctoral scholar I mentor in my laboratory

COMPLETED RESEARCH GRANTS

7/1/21–
6/30/22 Funding agency: **University of Colorado Core Facilities Voucher Program**
Award: Voucher (Mass Spectrometry Core)
Project Name: **Determining the substrate and target of a bacterial ubiquitin transferase using mass spectrometry**
Total Funds Granted: \$4,420.92 Direct Costs: \$4,067.24
Start and End Dates: 7/1/21–6/30/22 PI: Aaron Whiteley