Yale University

Mike Blazanin, Ph.D.

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July 8, 2023

Dear Dr. King,

I write to you for consideration for the Postdoctoral Research Fellow position you recently advertised on the experimental evolution of virulence. I am currently a postdoctoral scientist at Yale University in the research group of Dr. Paul Turner, where I also recently completed my PhD in Ecology and Evolutionary Biology.

My work uses a combination of experimentation, theory, and computational tools, spanning the fields of microbiology, ecology, and evolutionary biology. My past work has focused on understanding how biotic interactions shape microbial ecology and evolution, and developing methods for high-throughput characterization of microbial phenotypic diversity. However, I hope to pivot into work on the ecology and evolution of host-microbe interactions for my next post-doc, making your group an ideal environment.

Understanding how biotic interactions shape microbial ecology and evolution

A rich body of research has gained insights on the principles of ecology and evolution using observations of the natural world and simple experiments with microbes. However, the dichotomy between those two approaches leaves a gap that limits our full understanding. In my past work, I've sought to fill this gap using theory and medium-complexity experiments. I have primarily worked with bacteria and their viral parasites, phages, as tractable model systems that also are increasingly relevant for human health. For instance, I reviewed and highlighted the emerging body of experiments that have tested phage-bacteria ecology or evolution in multispecies microbial communities (Blazanin and Turner. "Community context matters…" https://doi.org/10.1038/s41396-021-01012-x). During my current post-doc, I am following up on these ideas using experimental evolution, testing how bacterial diversity can alter phage-bacteria coexistence and coevolution (Blazanin et. al. *In prep.*). I have also explored how spatial structure can alter bacterial evolution in response to phages. Many hosts evolve strategies to avoid contact with parasites, but little was known about whether bacteria can do so. I used experimental evolution and mathematical modeling to show that phages rarely, if ever, select for bacterial avoidance (Blazanin et. al. "Fight not flight…" *bioRxiv*. https://doi.org/10.1101/2023.04.29.538831).

Developing methods for high-throughput characterization of microbial phenotypic diversity

Recent advancements have made it easier than ever to sequence microbial genomes in the lab and nature. However, this has now accelerated the need for novel methods to characterize microbial phenotypes. In my past work, I've built computational tools and used theory and experiments to fill this gap. For instance, in the lab we often characterize microbial growth by measuring population density over time. These growth curves are easily automated, but existing computational tools to analyze the resulting data required strong assumptions or were unable to wrangle common data formats. To address these shortcomings, I developed a new R package called gcplyr (Blazanin. "gcplyr: an R package…" *bioRxiv*. https://doi.org/10.1101/2023.04.30.538883). gcplyr can flexibly import growth data in every common format, and enables model-free calculation of many growth traits. I have also contributed to a method for high-throughput quantification of phage infectivity. Recent papers had proposed using growth curves to infer phage killing of bacterial hosts, but it was unclear how these proposed metrics related to one another or to underlying phage traits. I used ecological modeling to validate these metrics, showing that growth curves can be used to accurately quantify phage infectivity (Blazanin et. al. "Theoretical validation of…" *bioRxiv*. https://doi.org/10.1101/2023.06.29.546975).

Future work

I look forward to the opportunity to discuss potential research projects on the evolution of virulence with you. I am broadly interested in doing post-doctoral work on the ecology and evolution of host-microbe interactions, and so a number of avenues of work with your nematode-microbe systems interest me deeply. For instance, I am intrigued by the possibility of leveraging my expertise in phage-bacteria interactions to test how bacterial virulence evolves in the face of pressures from both phages and protective symbionts or host immune systems. Indeed, I have recently begun collaborating on a related project with Dr. Jordan Lewis, a fellow Turner lab post-doc here at Yale and a recent graduate from Levi Morran's lab, testing for tradeoffs between phage resistance and bacterial virulence to *C. elegans*. I hope to more exclusively focus on nematode-microbe interactions in my next post-doc appointment, and naturally your group would be an excellent fit.

I look forward to hearing from you to discuss our shared research interests. I also want to express my intention to apply for post-doctoral funding opportunities over the next year before starting my next position in spring or summer of 2024. I would love to discuss potential funding avenues enabling me to come work with your group in lieu of, or in addition to, this evolution of virulence position.

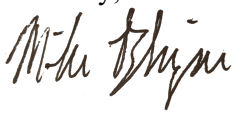
The following three people have agreed to be references for my application.

Dr. Paul Turner
Rachel Carson Professor of Ecology and Evolutionary Biology
Faculty, Yale School of Medicine
Yale University
paul.turner@yale.edu
203-432-5918

Dr. Michael Travisano
Distinguished McKnight University Professor
EEB Department Head
Department of Ecology, Evolution, and Behavior
University of Minnesota – Twin Cities
travisan@umn.edu
612-626-6201

Dr. Alvaro Sanchez
Tenured Group Leader
Department of Microbial Biotechnology
National Center for Biotechnology (CNB-CSIC), Madrid
alvaro.sanchez@cnb.csic.es

Sincerely,



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EDUCATION

2017 - 2023	Ph.D.	**Ecology and Evolutionary Biology** Graduate School of Arts and Sciences, Yale University Advisor: Dr. Paul Turner
2013 - 2017	B.S.	**Ecology, Evolution, and Behavior** College of Biological Sciences, University of Minnesota – Twin Cities Summa Cum Laude honors thesis advisor: Dr. Michael Travisano

PUBLICATIONS

*equal contribution †mentee #corresponding author

Preprints and other products

2023

M Blazanin#. gcplyr: an R package for microbial growth curve data analysis. *bioRxiv*. https://doi.org/10.1101/2023.04.30.538883

M Blazanin#, JP Moore, S Olsen†, and M Travisano. Fight not flight: parasites drive the bacterial evolution of resistance, not avoidance. *bioRxiv*. https://doi.org/10.1101/2023.04.29.538831

M Blazanin, E Vasen†, CV Jolis†, W An†, and P Turner. Theoretical validation of growth curves for quantifying phage-bacteria interactions. *bioRxiv*. https://doi.org/10.1101/2023.06.29.546975

Published, peer-reviewed papers

2022

M Blazanin*#, WT Lam*, E Vasen†, BK Chan, and PE Turner. Decay and damage of therapeutic phage OMKO1 by environmental stressors. *PLOS ONE*. https://doi.org/10.1371/journal.pone.0263887

2021

M Blazanin# and PE Turner. Community context matters for bacteria-phage ecology and evolution. *The ISME Journal*. https://doi.org/10.1038/s41396-021-01012-x

2018

M Baskerville*, A Biro*, **M Blazanin***, C-Y Chang*, A Hallworth*, N Sonnert*, JCC Vila*, and A Sanchez. Ecological effects of cellular computing in microbial populations. *Natural Computing*. https://doi.org/10.1007/s11047-018-9708-8

RESEARCH EXPERIENCE

2023 - present	Post-doctoral scientist, lab or Dr. Paul Turner, Yale University
2017 - 2023	PhD student to PhD candidate, lab of Dr. Paul Turner, Yale University
2017	PhD rotation student, lab of Dr. Alvaro Sanchez, Yale University
2014 - 2017	Undergraduate research assistant and Undergraduate Research Opportunity Program (UROP) Awardee, lab of Dr. Michael Travisano, University of Minnesota – Twin Cities
2016	Program participant, National Science Foundation Research Experience for Undergraduates (REU), lab of Dr. Tom Platt, Kansas State University
2015 - 2016	MnDRIVE Undergraduate Research Fellow, lab of Dr. Satoshi Ishii, University of Minnesota – Twin Cities
2015	Undergraduate research project in Tropical Ecology and Field Botany, supervised by Shantiluz Sanchez, VENUSA Instituto de Lenguas Modernas y Estudios Internacionales Sociedad Anonima, Mérida, Venezuela

TEACHING AND MENTORING

Research mentoring

2022 - present	Undergraduate research assistant and STARS II Program participant William An, Yale University
2020 - 2022	Undergraduate research assistant Emma Vasen, Yale University ‘22
2020	Visiting undergraduate research assistant Cèlia Vilaró Jolis, Universitat de Barcelona
2019	Research Experience for Veteran Undergraduates (REVU) participant Teresa Carter, Middle Tennessee State University
2017 - 2019	Undergraduate research assistant Sydney Olsen, University of Minnesota
2017	Undergraduate research assistant Bobby Barclay, University of Minnesota
2016	High school research assistant Spencer Parish, Manhattan High School West/East Campus, Kansas

Teaching

Yale University

2021	Visiting Graduate Teaching Fellow, Evolutionary Biology

2019	Graduate Teaching Fellow, Evolutionary Biology
2018	Graduate Teaching Fellow, Introductory Ecology & Evolutionary Biology
	Graduate Teaching Fellow, Virus Discovery

University of Minnesota

2014	Undergraduate Teaching Fellow, Foundations of Biology Lab

PRESENTATIONS

†mentee

Invited talks

2022 **M. Blazanin**, J. Moore, S. Olsen†, and M. Travisano. Fight, not flight: parasites drive bacterial evolution of resistance, not migration. *Hamilton Awards Symposium, Evolution*

Contributed talks

2022 **M. Blazanin**, J. Moore, S. Olsen†, and M. Travisano. Fight, not flight: parasites drive bacterial evolution of resistance, not migration. *Yale Ecology & Evolutionary Biology Graduate Student Symposium*

2021 **M. Blazanin** and P. E. Turner. Community context matters in experimental bacteria-phage ecology and evolution. *BEACON Congress*

M. Blazanin, S. Olsen†, and M. Travisano. Fight or flight? Bacteria evolve resistance against spatially-distributed parasites. *Evolution*

M. Blazanin and P. E. Turner. High-throughput quantification of microbial host-parasite interactions. *GREBE Symposium*

2016 **M. Blazanin**. Host Cues Select for the Evolution of Avirulent *Agrobacterium* Cheaters. *Kansas State University Biology Research Experience for Undergraduates Symposium*

M. Blazanin. Experimental Evolution of Bacterial Motility. *Winchell Undergraduate Research Symposium at the Annual Meeting of the Minnesota Academy of Science*

2014 **M. Blazanin**. Investigating Motility in a Colicinogenic-Resistant-Susceptible System. *Evolution in the Twin Cities, University of Minnesota*

Contributed posters

2022 **M. Blazanin** and P. E. Turner. Community context matters for bacteria-phage ecology and evolution. *International Society for Microbial Ecology Meeting* (*ISME18*)

M. Blazanin, E. Vasen†, C. Vilaró Jolis†, and P. E. Turner. High-throughput quantification of bacteria-phage interactions using growth curves. *American Society for Microbiology* (*ASM*) *Microbe*

2020 **M. Blazanin** and P. E. Turner. Community context & lytic phages modulate bacterial competition and evolution. *Microbial Ecology and Evolution Virtual Meeting* (*MEEVirtual*)

2019 **M. Blazanin** and P. E. Turner. Generalized Lotka-Volterra Modeling of Phage Resistance Tradeoffs in Bacterial Communities. *Gordon Research Seminar & Conference in Microbial Population Biology*

M. Blazanin and P. E. Turner. Developing a sequencing workflow for sequencing of bacteriophage Phi6. *Yale Ecology & Evolutionary Biology Graduate Student Symposium*

2018 **M. Blazanin**, S. Olsen†, and M. Travisano. Parasite spatial distributions drive bacterial host evolution. *Evolution*

M. Blazanin, S. Olsen†, and M. Travisano. Parasite spatial distributions drive bacterial host evolution. *BEACON Congress*

M. Blazanin, S. Olsen†, and M. Travisano. Parasite spatial distributions drive bacterial host evolution. *Yale Ecology & Evolutionary Biology Graduate Student Symposium*

2017 **M. Blazanin** and M. Travisano. Phage Selection on Motile Bacteria. *Region One American Society for Microbiology Branch Meeting*

2017 **M. Blazanin** and M. Travisano. Phage Selection on Motile Bacteria. *Evolution*

2016 **M. Blazanin** and M. Travisano. Experimental Evolution of Bacterial Motility. *14th Annual Ecological Genomics Symposium.*

M. Blazanin, S. Parish†, and T. Platt. Host Cues Select for the Evolution of Avirulent *Agrobacterium* Cheaters. *14th Annual Ecological Genomics Symposium.*

WORKSHOPS

2019 Participant, Guarda workshop in evolutionary biology, Switzerland

AWARDS AND ACCOLADES

Notable awards and accolades

2022	Hamilton Award Finalist, Society for the Study of Evolution
2020	Early Grant, Yale Institute for Biospheric Studies, $4,000
2018	Honorable Mention, NSF Graduate Research Fellowship (NSF GRFP)
2017	Best Graduate Student Poster**,** Region One American Society for Microbiology Branch Meeting
	Gruber Science Fellowship**,** Yale University, $100,000
	Semifinalist, Fulbright Fellowship Research Award, Spain
2016	Astronaut Scholar, Astronaut Scholarship Foundation, $10,000
	Monica Tsang and James Weatherbee Merit Scholarship, College of Biological Sciences at the University of Minnesota, $5000
2015	Grant Awardee, Undergraduate Research Opportunities (UROP) Program, $1700
2013	Gold Scholar, the University of Minnesota, $40,000
	Bentson Family Scholarship, the University of Minnesota, $24,000
	National Merit Scholarship, National Merit Scholarship Corporation, $4,000

Other awards and accolades

2023	Yale University nominee, Schmidt Science Fellowship
2022	Conference Travel Fellowship, Yale Graduate Student Assembly, $750
2019	Conference Travel Fellowship, Yale Graduate Student Assembly, $750
2018	Nominee, Sigma Xi
	Conference Travel Fellowship, Yale Graduate Student Assembly, $500
2017	Chair's Fund Award, Yale Department of Ecology & Evolutionary Biology, $1,400
2016	Travel Grant Award, National Science Foundation Research Experience for Undergraduates (REU), $1000
	Undergraduate Research Travel Award, College of Biological Sciences at the University of Minnesota, $500
	Churchill Scholarship Nominee, University of Minnesota
	Honorable Mention for Best Oral Presentation**,** Winchell Undergraduate Research Symposium
2015	Study Abroad Scholarship, College of Biological Sciences at the University of Minnesota, $1250
2014	Study Abroad Scholarship, Learning Abroad Center at the University of Minnesota, $1500
	Freshman Study Abroad Scholarship, University of Minnesota, $1000
	MacGray Leadership Scholarship, University of Minnesota, $500
2012	Eagle Scout, Boy Scouts of America

PROFESSIONAL SERVICE

2019 - present	Reviewer for *mBio*, *UJEMI* (*Undergraduate Journal of Experimental Microbiology and Immunology*), *Evolutionary Applications*, *Microbiome,* and *JoVE (Journal of Visualized Experiments)* Web of Science verified peer reviews (formerly Publons): https://www.webofscience.com/wos/author/record/3232571 ORCID verified peer reviews: https://orcid.org/0000-0003-4630-6235
2023	Discussion leader, Gordon Research Seminar in Microbial Population Biology
2022, 2023	Mentor, Undergraduate Diversity at Evolution program, Evolution Meeting
2018 - 2023	Yale Organizing Member, annual GREBE Symposium (Graduate Research in Ecology, Behavior, & Evolution at Columbia, Rutgers, Princeton, Penn, and Yale)
2022 - 2023	Founder, coordinator, and mentor, Graduate Student Peer Mentorship Program, Yale Department of Ecology & Evolutionary Biology
2020 - 2021	Graduate Student Member, Diversity, Equity, and Inclusion Committee, Yale Department of Ecology & Evolutionary Biology
2019 - 2020	Prospective Students Visit Co-coordinator, Yale Department of Ecology & Evolutionary Biology
2018 - 2019	Graduate Student Social Co-Chair, Yale Department of Ecology & Evolutionary Biology

OUTREACH

2021	Speaker, Exploring Science series, Open Labs at Yale
2018 - 2020	Member, Yale EEB Graduate Student Outreach Group
2019	Panelist, College Decision Making Panel, STEM Mentors at Yale
2017 - 2018	Talk Coordinator, Science in the News, Yale Science Diplomats
2017	Volunteer, College Essay Writing Workshop Volunteer, STEM Mentors at Yale
2017	“Grad Student Tax Disaster” Op-ed article, Yale Daily News

PROFESSIONAL SOCIETIES

2022 - present	Member, American Society for Microbiology (ASM)
2018 - present	Member, Society for the Study of Evolution (SSE)
2019 - 2020	Member, American Association for the Advancement of Science (AAAS)
2017 - 2018	Member, Society for Molecular Biology and Evolution (SMBE)