

Curriculum Vitae (updated 3/1/22)

ANN THOMAS TATE

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EDUCATION AND EMPLOYMENT HISTORY

Vanderbilt University , Nashville, TN Assistant Professor Department of Biological Sciences Vanderbilt Institute of Infection, Immunity, and Inflammation (VI4)	Jan. 2017 – present
University of Houston , Houston, TX Department of Biology and Biochemistry USDA NIFA Fellow and Research Assistant Professor	Oct. 2014 – Nov. 2016 Mentor: Dr. Tim Cooper
Princeton University , Princeton, NJ Ph.D., Ecology and Evolutionary Biology (Awarded Oct. 2014) Dissertation: <i>Invertebrate immune priming: An integration of mechanism, life history, and disease dynamics</i>	2009 – 2014 Advisor: Dr. Andrea Graham
Rice University , Houston, TX B.S., <i>magna cum laude</i> , Ecology and Evolutionary Biology & Biochemistry and Cell Biology Thesis: <i>Challenges of metamorphosis in infected invertebrate hosts</i>	2005 – 2009 Advisor: Dr. Volker Rudolf
University of Texas – Houston Medical School Department of Pathology and Laboratory Medicine Undergraduate Research Fellow Research: <i>Corticosterone regulation and cytokine expression in IL-6 knockout mice injected with an MTB virulence factor</i>	2007 – 2008 Advisor: Dr. Jeffrey Actor

AWARDS, HONORS, FUNDING

S-C Family Dean's Faculty Fellowship <i>Vanderbilt University</i>	2021-2023
Alfred P. Sloan Foundation Research Fellow <i>Computational and Evolutionary Molecular Biology</i>	2020-2022
NIH NIGMS R35 MIRA Grant (PI) Award number 1R35GM138007 Title: <i>The coevolutionary dynamics of pleiotropic genetic architecture</i>	2020-2025
NSF DEB/IOS Project Grant (PI) Award number 1753982 Title: <i>The impact of co-infection on host and parasite population dynamics</i>	2018-2022
USDA NIFA Postdoctoral Fellowship (PI) Award number 2014-67012-22278	2014–2016

Title: *The impact of stored grain pest immunological dynamics on the evolution of pathogen virulence*

NSF- sponsored NESCent Evolutionary Catalysis Meeting (Co-PI), Durham, NC **June 2015**

Title: *Forgotten Memories: immune memory beyond the adaptive immune system*

USDA NIFA Pre-doctoral Fellowship (PI) **2012 – 2014**

Award number 2012-67011-19893

Title: *Elucidating the mechanistic basis and population level consequences of immune priming in Tribolium beetles*

PUBLICATIONS

ORCID: 0000-0001-6601-0234

*indicates corresponding author ¹Maiden name ²Undergraduate co-author

- 1) Lazzaro, B. and **Tate, A.T.** 2022. Balancing sensitivity, risk, and immunopathology in immune regulation. *Current Opinion in Insect Science*. 50:100874.
- 2) Rovenolt, F. H.² and **Tate, A.T.***. 2022. The impact of coinfection dynamics on host competition and coexistence. *The American Naturalist*. 199(1):91-107.
- 3) **Tate, A.T.*** and Shulz, Nora. 2022. The within-host ecology of insects and their parasites: Integrating experiments and models. *Current Opinion in Insect Science*. 49: 37-41.
- 4) **Tate, A.T.***, Perry, A.², and Jent, D.G. 2021. Larvae and adults exhibit contrasting patterns of immune gene expression and infection resistance in wild flour beetle populations. *Ecological Entomology*. 46(5):1230-1235.
- 5) Gitschlag, B.L., **Tate, A.T.** & Patel, M.R. 2020. Nutrient status shapes selfish mitochondrial genome dynamics across different levels of selection. *eLife* 9: e56686. DOI: 10.7554/eLife.56686
- 6) Greischar, M.A.*, Alexander, H.K., Bashey, F., Bento, A.I., Bhattacharya, A., Bushman, M., Childs, L.M., Daversa, D.R., Day, T., Faust, C.L., Gallagher, M.E., Gandon, S., Glidden, C.K., Halliday, F.W., Hanley, K.A., Kamiya, T., Read, A.F., Schwabl, P., Sweeny, A.R., **Tate, A.T.**, Thompson, R.N., Wale, N., Wearing, H.J., Yeh, P., and Mideo, N. 2020. Evolutionary consequences of feedbacks between within-host competition and disease control. *Evolution, Medicine, & Public Health*. 2020(1):30-34.
- 7) Jent, D.G., Perry, A.², Critchlow, J.T., **Tate, A.T.*** 2019. Natural variation in the contribution of microbial density to inducible immune dynamics. *Molecular Ecology*. 28(24): 5360-5372.
- 8) Critchlow, J., Norris, A., **Tate, A.T.*** 2019. The legacy of larval infection on immunological dynamics over metamorphosis. *Philosophical Transactions of the Royal Society B*. 374(1783): 20190066.
- 9) **Tate, A.T.*** 2019. The role of multiple infections on immunological variation in wild populations. *mSystems*. 4(3): e00099-19.
- 10) Shaw, D.K.*, **Tate, A.T.***, Schneider, D.S., Levashina, E.A., Kagan, J.C., Pal, U., Fikrig, E., Pedra, J.H.F*. 2018. Vector immunity and evolutionary ecology: The Harmonious Dissonance. *Trends in Immunology*. 39(11): 862-873.
- 11) Graham, A.L., and **Tate, A.T.** 2017. Insight Article: Are we immune by chance? *eLife* 6, e32783.

- 12) Metcalf, C.J.E., **Tate, A.T.**, Graham, A.L. 2017. Demographically framing tradeoffs between sensitivity and specificity illuminates selection on immunity. *Nature Ecology and Evolution*, 1: 1766-1772.
- 13) **Tate, A.T.*** and Graham, A.L. 2017. Dissecting the contributions of time and microbe density to variation in immune gene expression. *Proceedings of the Royal Society B*. 284(1859): 20170727.
- 14) Luu, H.², and **Tate, A.T.*** 2017. Recovery and immune priming modulate the evolutionary trajectory of infection-induced reproductive strategies. *Journal of Evolutionary Biology*. 30(9): 1748-1762.
- 15) **Tate, A.T.*** Andolfatto, P., Demuth, J., and Graham, A.L. 2017. The within-host dynamics of trans-generational immune priming in flour beetles. *Molecular Ecology*. 26(14): 3794–3807.
- 16) Kennedy², M., Graham, A.L., and **Tate, A.T.*** 2017. Relative contributions of environmental and maternal factors to trans-generational immune priming in *T. castaneum*. *Ecological Entomology*. 42(1):100-104.
- 17) **Tate, A.T.*** 2017. A general model for the influence of immune priming on disease prevalence. *Oikos*. 126(3): 350-360.
- 18) **Tate, A.T.*** 2016. The interaction of immune priming with different modes of disease transmission. *Frontiers in Microbiology*. 7:1102.
- 19) Schneider, D.S. and **Tate, A.T.** 2016. Innate Immune Memory: Activation of Macrophage Killing Ability by Developmental Duties. *Current Biology*. 26(12), R503-505.
- 20) Louie, A., Song, K.H., Hotson, A., **Tate, A.T.**, and Schneider, D.S. 2016. How many parameters does it take to describe disease tolerance? *PLoS Biology* 14(4), e1002435.
- 21) Torres, B.Y., Oliveira, J.H.M., **Tate, A.T.**, Rath, P. Cumnock, K, and Schneider, D.S. 2016. Tracking resilience to infections by mapping disease space. *PLoS Biology* 14(4), e1002436.
- 22) **Tate, A.T.*** and Graham, A.L. 2015. Dynamic patterns of parasitism and immunity across host development influence optimal strategies of resource allocation. *The American Naturalist*. 186(4): 495-512.
- 23) **Tate, A.T.*** and Graham, A.L. 2015. Trans-generational priming of resistance in wild flour beetles reflects the primed phenotypes of laboratory populations and is inhibited by co-infection with a common parasite. *Functional Ecology*. 29(8), 1059-1069
- 24) **Tate, A.T.*** and Rudolf, V.H.W. 2012. Impact of life stage - specific immune priming on invertebrate disease dynamics. *Oikos* 121(7): 1083-1092.
- 25) **Thomas, A.M.¹** and Rudolf, V.H.W. 2010. Challenges of metamorphosis in invertebrate hosts: Maintaining parasite resistance across life-history stages. *Ecological Entomology*. 35(2): 200-205.
- 26) Abbott, A.N., Guidry, T.V., Welsh, K.J., **Thomas, A.M.¹**, Kling, M.A., Hunter, R.L., Actor, J.K. 2009.11-Hydroxysteroid Dehydrogenases are regulated during the pulmonary granulomatous response to the Mycobacterial glycolipid Trehalose-6,6-dimycolate. *Neuroimmunomodulation*. 16(3):147-154.

PREPRINTS

- 27) Birnbaum, S., Schulz, N., and **Tate, A.T.***. Interactions among evolved pesticide resistance and pesticide exposure on immunity against pathogens. *BioRxiv* 2/7/22.
- 28) Birnbaum, S., Schulz, N., Garrett, D., and **Tate, A.T.***. The experimental evolution of resistance to two distinct pesticide classes reveals context-dependent costs, benefits, and mechanisms. *BioRxiv* 9/2/21.
- 29) Ngo, T.M. and **Tate, A.T.*** The effect of developmental pleiotropy on the evolution of immune genes in *Drosophila melanogaster*. *BioRxiv*. DOI: <https://doi.org/10.1101/2021.05.12.443901>

INVITED SEMINARS AND LECTURES

- 2022 Invited Seminar, PBEE Program, Emory University.
- 2021 Invited Seminar, Dept. of Biology, University of Kentucky.
- 2021 Invited Seminar, EEB Dept, Cornell University.
- 2021 Invited Seminar, Freie Universitat Berlin. Berlin, Germany.
- 2021 Invited Seminar, University of Münster. Münster, Germany.
- 2021 Invited Seminar (virtual), Bucknell University.
- 2021 Invited Seminar (virtual), University of Memphis.
- 2020 Invited Seminar (virtual), Carnegie Institution for Science, Maryland.
- 2020 Invited Seminar (virtual), Max Planck Institute for Infection Biology – Berlin.
- 2020 Invited Seminar (virtual), Biology Department, University of Florida.
- 2019 Invited Seminar, Biology Department, Tennessee State University.
- 2019 Invited Seminar, Center for Evolutionary Studies, Vanderbilt University.
- 2019 Invited Seminar: Endowed Prather Lecture (Graduate student-invited). School of Biological Sciences, University of Nebraska – Lincoln.
- 2019 Invited Seminar, Center for Infectious Disease Dynamics, Penn State University.
- 2019 Invited Seminar, Biology Department. Middle Tennessee State University.
- 2018 Invited Seminar, Ecology and Evolutionary Biology Department, Indiana University.
- 2018 Invited Seminar: Biology Department, University of Louisville.
- 2018 Invited Seminar: Microbiology Department, University of Tennessee – Knoxville.
- 2017 Invited Seminar: Dept. of Pathology, Microbiology, and Immunology. Vanderbilt.
- 2017 Invited Seminar: Department of Biology, Virginia Tech, VA.

- 2016 Invited Seminar: Evolutionary Ecology Program, UNIM, Morelia, MX.
- 2016 Invited Seminar: Theoretical Ecology Group seminar, ETH Zurich, Zurich Switzerland.
- 2015 Invited Seminar: School of Biological Sciences seminar, Illinois State University
- 2015 Invited Seminar: Networks Seminar Series, University of Houston.

SELECTED CONFERENCE PRESENTATIONS (2014 – Present)

- 2022 Upcoming Invited Speaker: *Developmental genetics, energy and the environment influence disease dynamics*. Gordon Research Conference: Unifying ecology across scales. Southern New Hampshire University, NH.
- 2020 Symposium Speaker: *Evolutionary adaptation and constraint shapes variation in flour beetle (*Tribolium spp*) immune responses to their natural parasites*. Entomological Society of America Meeting (virtual).
- 2019 Contributed Talk: *The impact of within-host competition on coinfection dynamics*. The Ecological Society of America Annual Meeting, Louisville, KY.
- 2018 Symposium Speaker: *Disentangling microbe dependent and independent inducible immune dynamics*. Joint Meeting of Evolution and the European Society of Evolutionary Biology, Montpellier, France.
- 2018 Contributed Talk: *The impact of top-down vs. bottom-up regulation on co-infection dynamics*. The Ecological Society of America Annual Meeting, New Orleans, LA.
- 2018 Invited Keynote Speaker: *The dynamics of immunological plasticity under the threat of multiple infections*. Ecology and Evolution of Infectious Diseases Conference. Glasgow, Scotland.
- 2017 Contributed Talk: *The impact of natural variation in immune dynamics on functional disease resistance*. Jacques Monod “Open Questions in Disease Ecology” Meeting. Roscoff, France.
- 2017 Invited Keynote Speaker: *The dynamics of infection and immunity in flour beetles*. Frontiers in Insect Genomics Symposium. UNAM, Morelia, MX.
- 2017 Invited Keynote Speaker: *The dynamics of infection and immunity in wild flour beetles*. Ecological Immunology Workshop 2017. Blossin, Germany.
- 2016 Symposium Speaker: *Connecting within- and between-host disease dynamics in primed insect populations*. International Congress of Entomology. Orlando, FL.
- 2016 Contributed Talk. *Connecting within- and between-host disease dynamics in primed insect populations*. Evolution Meeting, Austin, TX.
- 2014 Contributed Talk. *Insights into resistance, tolerance, and virulence in trans-generationally primed flour beetles*. Jacques Mounod Conference on Host-Parasite Coevolution, Roscoff, France.

TEACHING APPOINTMENTS AND ACTIVITIES

Vanderbilt University

- 2021 Spring Undergraduate Seminar: The Ecology and Evolution of Infectious Diseases (BSCI 3965)

Guest Lecture: Journey into a beetle and the evolution of virulence (MHI 300)
 2020 Fall Immunology (BSCI 3226/5226)
 2020 Spring Undergraduate Seminar: The Ecology and Evolution of Infectious Diseases (BSCI 3965)
 Guest Lecture: Journey into a beetle and the evolution of virulence (MHI 300)
 2019 Fall Immunology (BSCI 3226/5226)
 2019 Spring Undergraduate Seminar: The Ecology and Evolution of Infectious Diseases (BSCI 3965)
 Guest Lecture: Journey into a beetle and the evolution of virulence (MHI 300)
 2018 Fall Immunology (BSCI 3226/5226)
 2018 Spring Undergraduate Seminar: The Ecology and Evolution of Infectious Diseases (BSCI 3965)
 2017 Fall Graduate Seminar in Biological Sciences (BSCI 6320)
 2018F,S Independent reading (BSCI 3850)

University of Houston

Fall 2015 **Faculty Supervisor**, Undergraduate Independent Research Study

Garden State Youth Correctional Facility

Spring 2014 **Co-instructor**, Environmental Science (accredited through Mercer Community College)

Princeton University

Spring 2013 **Assistant in Instruction**. Parasitology. Princeton in Panama Field Course

Fall 2009, 2011 **Assistant in Instruction**. Immune Systems: From Molecules to Populations

Spring 2010 **Writing Workshop Leader**. Senior Thesis improvement workshops

Mentoring

Postdoctoral Fellows

2022 – present: Arun Prakash, Ph.D.

2021 – present: Alissa Williams, Ph.D.

2021 – 2021: Jessica Hernandez, Ph.D. (NSF PRFB fellow)

2019 – present: Stephanie Birnbaum, Ph.D. (USDA NIFA fellow)

2019 – 2021: Nora Schulz, Ph.D.

2019 – 2021: Justin Buchanan, Ph.D. (USDA NIFA fellow)

Ph.D. students

2022 – present: Louise Perrier (BioSci)

2021 – present: Reese Martin (QCB)

2021 – present: Sadiq Rahman (BioSci)

2019 – present: Destane Garrett (BioSci)

2017 – present: Justin Critchlow (BioSci; Ph.D. candidate 2019)

Masters students

2020 – 2021: Thi Ngo (BioSci)

2019 – 2020: William Galardi (MBS)

Rotation students

2022 (Spring) Louise Perrier (BioSci)
2021 (Fall) Pi'ilani Noguchi (QCB)
2020 (Fall) Reese Martin (QCB), Zachary Sanchez (IGP), Sadiq Rahman, Lindsay Martin (BioSci)
2020 (Spring) Emily Overway (IGP)
2019 (Fall) Oyku Sensoy (IGP), Thi Ngo (BioSci), Marie-Claire Harrison (BioSci)
2019 (Spring) Jason Hughes (QCB), Kaitlyn Bunn (IGP), Hannah Nelson (BioSci)
2018 (Fall, Sp) Catie Shelton (IGP), Adriana Norris (BioSci), Destane Garrett (BioSci), Kerri-Ann Anderson (BioS), James Held (IGP)

Undergraduate research students

2021-present Anthony Hassell
2020-present Carly Stewart, Katherine Zhong
2018–2021 Ana Torres
2019- 2020 Anna Borchers
2017–2020 Yongjia “James” Deng, Faith Rovenolt, Abby Perry (McMinn Scholar)
2018-2019 Emma Blackford (Oberlin College), Kelsey Auman

Service to the Department and University

2020-present Associate Director of Graduate Studies, Department of Biological Sciences
2020-present Provost’s Sexual Misconduct Prevention Committee (PSMPC)
2020-present Vanderbilt Institute for Infection, Immunity, and Inflammation Diversity and Inclusion Committee
2019-present Departmental Graduate Admissions Committee
2019-present DGS Advisory Committee
2017-2019 Departmental faculty search committees (Microbiome, Microbial Biology)
2017-2019 Departmental faculty seminar committee (with Nicole Creanza)
2017-present PhD Committees (13), Undergraduate Honors Thesis Committees (5), Undergraduate research co-mentor (6), Independent reading mentor (2), Academic Advisor (8)
2018-present Faculty mentor, Student Chapter of the American Society for Microbiology
2018, 2019 Vanderbilt Postdoctoral Association Symposium Panelist

Professional Service and Activities

2021-present Editorial Board, *Philosophical Transactions of the Royal Society B* (The Royal Society)
2020-present Associate Editor: *The American Naturalist* (American Society of Naturalists)
2017-2020 Associate Editor: *Journal of Animal Ecology* (British Ecological Society)
2018 Guest editor, *PLoS Pathogens*

Peer review referee for the NSF (panelist and ad-hoc) and 25 journals including: *The American Naturalist*, *Biology Letters*, *BMC Biology*, *Ecology*, *Ecology Letters*, *Ecological Entomology*, *eLife*, *Functional Ecology*, *Frontiers in*

Microbiology, G3: Genes, Genomes, Genetics, Immunobiology, The ISME Journal, Journal of Animal Ecology, Journal of Experimental Biology, Journal of Insect Science, Methods in Ecology and Evolution, Molecular Ecology, Oikos, Physiological Entomology, PLoS Biology, PLoS Computational Biology, PLoS Neglected Tropical Diseases, PLoS Pathogens, Proceedings of the National Academy of Sciences, Proceedings of the Royal Society B, PNAS, Phil. Trans. Royal Soc. B, and Royal Society Open Science.

Member: The American Society of Naturalists, The Entomological Society of America, The Ecological Society of America, The American Society for Microbiology.

Faculty Advisor. Vanderbilt University Student Branch of the American Society for Microbiology (2017-present).

Co-organizer. Evolution and Coinfection modules at TWISTER (2017, 2018, 2019). Tennessee Women in Science, Technology, Engineering, and Research. Adventure Science Center, Nashville, TN

Participant in NSF-funded RCNs: IDEAS (2014-present), Insect Genetic Technologies (2015 – present), Eco-Immunology (2010-2014).

Co-organizer. Symposium: *Outlaws of invertebrate immunology*. International Congress of Entomology, Orlando, FL. June 2016.

Judge, Houston Science and Engineering Fair, Houston, TX (Spring 2015).

Judge, Hopewell Elementary School Science Fair, Hopewell, NJ (Spring 2011 – Spring 2013).