

GITANJALI E. GNANADESIKAN

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Updated: July 26, 2021

EDUCATION

University of Arizona

August 2017 - Present

PhD Candidate in Biological Anthropology

Minor in Cognitive Science

University Fellow, NSF Graduate Research Fellow, PEO Scholar

Adviser: Evan MacLean

GPA: 4.0

University of Arizona

May 10, 2019

MA in Anthropology

Report: *Estimating the Heritability of Cognitive Traits Across Dog Breeds Reveals a Heritable Cooperative-Communicative Factor*

Adviser: Evan MacLean

GPA: 4.0

Princeton University

June 3, 2014

AB in Ecology and Evolutionary Biology, *magna cum laude*.

Thesis: *Exploring the Canine Methylome: The Impacts of Domestication on the Regulatory Genome*

Adviser: Bridgett vonHoldt

GPA: 3.72

PEER-REVIEWED PUBLICATIONS

Gnanadesikan, Gitanjali E., Elizabeth A. D. Hammock, Stacey R. Tecot, C. Sue Carter & Evan L. MacLean (2021). Specificity of Plasma Oxytocin Immunoassays: A Comparison of Commercial Assays and Sample Preparation Techniques Using Oxytocin Knockout and Wildtype Mice. *Psychoneuroendocrinology*. doi: 10.1016/j.psyneuen.2021.105368

Salomons, Hannah, Kyle Smith, Megan Callahan-Beckel, Margaret Callahan, Kerinne Levy, Brenda S. Kennedy, Emily Bray, **Gitanjali E. Gnanadesikan**, Daniel J. Horschler, Margaret Gruen, Jingzhi Tan, Philip White, Bridgett M. vonHoldt, Evan MacLean & Brian Hare (2021). Cooperative communication with humans evolved to emerge early in dogs. *Current Biology*, 31(14), 3137-3144.e11. doi: 10.1101/2021.01.12.425620

Bray, Emily E., **Gitanjali E. Gnanadesikan**, Daniel J. Horschler, Kerinne M. Levy, Brenda S. Kennedy, Tom R. Famula & Evan L. MacLean (2021). Early-emerging and highly-heritable sensitivity to human communication in dogs. *Current Biology*, 31(14), 3132-3136.e5. doi: 10.1016/j.cub.2021.04.055

Bray, Emily E., Margaret E. Gruen, **Gitanjali E. Gnanadesikan**, Daniel J. Horschler, Kerinne M. Levy, Brenda S. Kennedy, Brian A. Hare & Evan L. MacLean (2021). Dog cognitive development: A longitudinal study across the first two years of life. *Animal Cognition*, 24(2), 311-328. doi: 10.1007/s10071-020-01443-7.

Gnanadesikan, Gitanjali E., Brian Hare, Noah Snyder-Mackler, Josep Call, Julianne Kaminski, Ádám Miklósi & Evan MacLean (2020). Breed differences in dog cognition associated with brain-expressed genes and neurological functions. *Integrative and Comparative Biology*, 60(4), 976–990. doi: 10.1093/icb/icaa112

Bray, Emily E., Margaret E. Gruen, **Gitanjali E. Gnanadesikan**, Daniel J. Horschler, Kerinne M. Levy, Brenda S. Kennedy, Brian A. Hare & Evan L. MacLean (2020). Cognitive characteristics of 8-to-10-week-old assistance dog puppies. *Animal Behaviour*, 166, 193-206. doi: 10.1016/j.anbehav.2020.05.019

Gnanadesikan, Gitanjali E., Brian Hare, Noah Snyder-Mackler & Evan L. MacLean (2020). Estimating the Heritability of Cognitive Traits Across Dog Breeds Reveals Highly Heritable Inhibitory Control and Communication Factors. *Animal Cognition*, 23(5), 953-964. doi: 10.1007/s10071-020-01400-4

Gnanadesikan, Gitanjali E., William D. Pearse & Allison K. Shaw (2017). Evolution of mammalian migrations for refuge, breeding, and food. *Ecology and Evolution*, 7(15), 5891–5900. doi: 10.1002/ece3.3120

Janowitz, Ilana L., Michelle M. Creek, Michael J. Thompson, Kerry A. Deere-Machemer, Jun Wang, Lionel Duarte, **Gitanjali E. Gnanadesikan**, Eskender L. McCoy, Liudmilla Rubbi, Daniel R. Stahler, Matteo Pellegrini, Elaine A. Ostrander, Robert K. Wayne, Janet S. Sinsheimer & Bridgett M. vonHoldt (2016). The concerted impact of domestication and transposon insertions on methylation patterns between dogs and grey wolves. *Molecular Ecology*, 25(8), 1838–1855. doi: 10.1111/mec.13480

MANUSCRIPTS IN PREPARATION OR REVIEW

ManyDogs Project, Julia Espinosa, Emily E. Bray, Daphna Buchsbaum, Sarah-Elizabeth Byosiere, Molly Byrne, Marianne S. Freeman, **Gitanjali E. Gnanadesikan**, C.-N. Alexandrina Guran, Daniel J. Horschler, Ludwig Huber, Angie M. Johnston, Evan L. MacLean, Madeline H. Pelgrim, Laurie Santos, Zach A. Silver, Jeffrey R. Stevens, Christoph J. Völter, & Lena Zipperling (under review). ManyDogs 1: A multi-lab replication study of dogs' pointing comprehension. doi: 10.31234/osf.io/f86jq (preprint)

Horschler, Daniel J., Emily E. Bray, **Gitanjali E. Gnanadesikan**, Molly Byrne, & Evan L. MacLean (submitted). Dogs re-engage human partners when joint social play is interrupted.

Gnanadesikan, Gitanjali E., Evan L. MacLean & Jessica R. Andrews-Hanna (in prep). Do Animals Imagine? Behavioral and Neural Evidence for Imaginative Capacities in Non-human Animals.

OTHER PUBLICATIONS

Gnanadesikan, Gitanjali E. (2014) Exploring the Canine Methylome: The Impacts of Domestication on the Regulatory Genome. Thesis (Senior)-Princeton University, 2015. <http://arks.princeton.edu/ark:/88435/dsp011544bp26d>

Gnanadesikan, Gitanjali E. (2012) Identifying PRDM9 binding sites in meiotic recombination hotspots." *Summer and Academic Year Student Reports*. Paper 2371. <http://mouseion.jax.org/strp/2371>

HONORS, AWARDS, AND GRANTS

- 2021 University of Arizona Graduate College Travel Grant.
- 2020 - 2021 PEO Scholar Award.
- 2019 University of Arizona Graduate College Travel Grant.
- 2018 - 2023 NSF Graduate Research Fellowship.
- 2018 University Fellows Professional Development Award.
- 2018 School of Anthropology Summer Award: Traditions, Transitions, and Treasures Fund.
- 2018 Graduate and Professional Student Council Research and Project Grant.
- 2018 Graduate and Professional Student Council Travel Grant.
- 2017 - 2018 University Fellow - University of Arizona first-year fellowship.
- 2017 NSF GRFP Honorable Mention.
- 2014 - 2015 Teaching Fellow - Teach for China.
- 2014 Elected to the Sigma Xi scientific honors society.
- 2014 Charlotte Magnum Student Support Award
from the Society for Integrative and Comparative Biology.
- 2014 Porter '52 EEB Research Fund conference award to present thesis work.
- 2013 Princeton Ecology and Evolutionary Biology department grant to attend the
International Canine and Feline Genomics conference.
- 2013 John T. Bonner Senior Thesis Fund grant for summer thesis work.
- 2012 Research Experience for Undergraduates summer program at Jackson Laboratory.

INVITED TALKS

- Arizona Senior Academy. *How Do Our Pets Think? And How Do We Know?* July 14, 2021.
- Yale Comparative Cognition Lab. *Exploring the Genetic Underpinnings of Dog Cognition.* February 19, 2021.
- Petminded. *Dognition & Genetics.* February 7, 2021.

CONFERENCE PRESENTATIONS AND ABSTRACTS

- Gnanadesikan, Gitanjali E.**, Elizabeth A. D. Hammock, Stacey R. Tecot, Rebecca J. Lewis & Evan L. MacLean. *Developing a new extraction method to minimize interference in immunoassay of urinary oxytocin.* Recorded talk for the International Society of Wildlife Endocrinology Virtual Conference 2021. August 16 - 17, 2021.
- Gnanadesikan, Gitanjali E.**, Emily E. Bray, Evan L. MacLean & Bridgett M. vonHoldt. *Williams-Beuren Syndrome in Dogs? Genetic Variation, Social Behavior, and Assistance Dog Success.* Presented at the East Coast Canine Cognition Workshop. April 23 - 24, 2021.
- Gnanadesikan, Gitanjali E.**, Julia Espinosa & ManyDogs. *ManyDogs 1: An International Collaborative Approach to Pointing Comprehension in Domestic Dogs.* Presented at the Animal Behaviour Twitter Conference. January 27, 2021. <https://twitter.com/ManyDogsProject/status/1354550089918767105>

- Gnanadesikan, Gitanjali E.** & Evan L. MacLean. *Breed Differences in Heritable Cognitive Traits Associated with Brain-Expressed Genes and Neurological Functions in Dogs*. Presented at the Animal Behaviour Twitter Conference. January 27, 2021. https://twitter.com/g_gnanadesikan/status/1354547287112880134
- Bray, Emily E., **Gitanjali E. Gnanadesikan**, Daniel J. Horschler & Evan L. MacLean. *Heritable variation in dog social cognition*. Presented by Emily Bray at the Animal Behaviour Twitter Conference. January 27, 2021. <https://twitter.com/DrEmilyBray/status/1354554832749645826>
- Gnanadesikan, Gitanjali E.**, Brian Hare, Noah Snyder-Mackler & Evan L. MacLean. *Exploring the Genetic Bases of Breed Differences in Dog Cognition*. Presented at the East Coast Workshop on Canine Cognition. February 15 - 16, 2020.
- MacLean, Evan L., Emily E. Bray, **Gitanjali E. Gnanadesikan** & Daniel J. Horschler. *Associations between individual differences in cognition and training outcomes in assistance dogs*. Presented by Evan MacLean at the East Coast Workshop on Canine Cognition. February 15 - 16, 2020.
- Bray, Emily E., **Gitanjali E. Gnanadesikan**, Daniel J. Horschler & Evan L. MacLean. *Early development and longitudinal stability of cognitive traits in working dogs*. Presented by Emily Bray at the East Coast Workshop on Canine Cognition. February 15 - 16, 2020.
- MacLean, Evan L., **Gitanjali E. Gnanadesikan**, Emily E. Bray & Noah Snyder-Mackler. *Dog Diversity as a Natural Experiment in Cognitive Evolution*. Presented by Evan MacLean at the Society for Integrative and Comparative Biology Annual Meeting. January 3 - 7, 2020.
- Gnanadesikan, Gitanjali E.**, Brian Hare, Noah Snyder-Mackler, and Evan L. MacLean. *Estimating the Heritability of Cognitive Traits Across Dog Breeds*. Presented at the University of Arizona – Arizona State University Cognitive Science Conclave. December 7, 2019.
- Gnanadesikan, Gitanjali E.**, Brian Hare, Noah Snyder-Mackler, and Evan L. MacLean. *Estimating the Heritability of Cognitive Traits Across Dog Breeds Reveals Highly Heritable Inhibitory Control and Cooperative-Communicative Factors*. Presented at the Southwestern Association of Biological Anthropologists Annual Meeting. November 1-2, 2019.
- Gnanadesikan, Gitanjali E.**, Brian Hare, Noah Snyder-Mackler, Evan L. MacLean. *Estimating the Heritability of Cognitive Traits Across Dog Breeds Reveals a Heritable Cooperative-Communicative Factor*. Presented at the International Canine Science Conference. October 18 - 20, 2019.
- MacLean, Evan L., Emily E. Bray, **Gitanjali E. Gnanadesikan** & Daniel J. Horschler. *Ontogeny and heritability of cognitive and temperamental traits in an assistance dog population*. Presented by Evan MacLean at the International Canine Science Conference, October 18 - 20, 2019.
- Gnanadesikan, Gitanjali E.**, Brian Hare & Evan L. MacLean. *Estimating the Heritability of Cognitive Traits Across Dog Breeds*. Presented at the 26th International Comparative Cognition Conference. April 10 - 14, 2019.
- Bray, Emily E., **Gitanjali E. Gnanadesikan**, Daniel J. Horschler & Evan L. MacLean. *Early emerging cognition in 9-week-old puppies*. Presented by Emily Bray at the 26th International Conference on Comparative Cognition. April 10 - 14, 2019.
- MacLean, Evan L., Emily E. Bray, **Gitanjali E. Gnanadesikan**, Daniel J. Horschler. *Heritability of cognitive traits in a pedigreed dog population*. Presented by Evan MacLean at the 26th International Conference on Comparative Cognition. April 10 - 14, 2019.
- Gnanadesikan, Gitanjali E.**, Daniel J. Horschler & Evan L. MacLean. *Social Cues and Hormonal Profiles Over Development in Wolf Puppies*. Poster presented at the Graduate and Professional Student Council Research Showcase. February 13, 2019.

Gnanadesikan, Gitanjali E. & Evan L. MacLean, *Estimating the Heritability of Cognitive Traits*. Presented at the East Coast Workshop on Canine Cognition. November 10 - 11, 2018.

Gnanadesikan, Gitanjali E. & Bridgett M. vonHoldt. *Exploring the Canine Methylome: The Impact of Domestication on the Regulatory Genome*. Poster presented at the annual meeting for the Society for Integrative and Comparative Biology. January 3-7, 2014

RESEARCH EXPERIENCE

Laboratory for the Evolutionary Endocrinology of Primates (LEEP) August 2017 - Present
Research Assistant with Evan MacLean and Stacey Tecot Tucson, AZ

- Developing, validating, and performing extraction and immunoassay protocols for oxytocin, vasopressin, and cortisol in a variety of biological samples; training others on these methods.
- Species studied include canines, humans, mice, and lemurs.

ManyDogs November 2017 - Present
Project Coordinator, Team Captain

- General project administration, infrastructure building, and team management.
- Led the methods and protocol development, integrating suggestions from participating labs, and developing consensus among diverse groups.

Fieldwork with Captive Wolf Pups May - July 2018
Graduate Student Wildlife Science Center, MN

- Socialized, conducted behavioral and cognitive tests on, and collected biological samples from captive wolf puppies.

Arizona Canine Cognition Center (ACCC) August 2016 - August 2017
Laboratory Coordinator Tucson, AZ

- Collaborated with multiple institutions to develop a battery of cognitive tests to use on puppies.
- Conducted cognitive behavioral experiments with companion dogs in the Tucson area at the ACCC and puppies at Canine Companions for Independence.

Senior Thesis Research Summer 2013 - Spring 2014
Student Princeton, New Jersey

- “Exploring the Canine Methylome: The Impacts of Domestication on the Regulatory Genome”
- Conducted computational analysis of genome-wide methylation data with the aim of discovering differences in genetic regulation between dogs and wolves.

Coyote Sample Collection February 2014
Research Assistant Tunkhannock, Pennsylvania

- Collected morphological data and samples for DNA sequencing from coyotes.

Field Courses Spring 2013
Student Smithsonian Tropical Research Institute, Panama

- Tropical Ecology, Biology of Coral Reefs, Ecology and Epidemiology of Parasites and Infectious Diseases, Pre-Columbian Peoples of Tropical America and Their Environments.

The Jackson Laboratory*Summer Student*

Summer 2012

Bar Harbor, Maine

- Worked in a molecular biology laboratory on a project to identify the binding sites of PRDM9, a zinc-finger protein involved in meiotic recombination.

Princeton Ecology and Evolutionary Biology Department*Princeton Environmental Institute Intern*

Summer 2011

Princeton, New Jersey

- Compiled a database of mammalian migratory behavior and related factors and analyzed the database for patterns regarding motivations for migration, geographic distribution, and spatial patterns.

UNIVERSITY TEACHING EXPERIENCE

NSCS320: Issues and Themes in Cognitive Science*Guest Lecturer*

December 3, 2020

University of Arizona

- Topic: Comparative cognition, canine cognition, cognitive evolution.

PSYC 3362: Mind of a Dog*Guest Lecturer*

September 10, 2020

Boston College

- Topic: Breed differences and the genetic bases of dog cognition.

New Start Summer Program*Guest Lecturer*

August 2020, July 2021

University of Arizona

- Topic: Introduction to biological anthropology and comparative cognition for incoming undergraduates.

ANTH 170C2: Animal Minds*Graduate Teaching Associate*

Fall 2019

University of Arizona

- Led two weekly discussion sections; contributed to curriculum development and designed activities.
- Graded assignments and final papers for 59 students.

ADDITIONAL TEACHING AND MENTORING EXPERIENCE

- 2021 - Mentoring a junior graduate student through the WoC in EEB program.
- 2020 - Mentoring a first-year graduate student in the School of Anthropology.
- 2020 - Mentoring a first-generation/low-income Princeton undergraduate.
- 2020 - Mentored an undergraduate research assistant in the ACCC.
- 2019 - 2020 Peer editor for University of Arizona's Fellowship Application Support Program.
- 2018 - 2019 Mentored a first-year graduate student in the University Fellows Program.
- 2017 - 2018 Mentored a high school student from the Arizona MESA program.
- 2016 - 2017 Trained undergraduates for research activities at the ACCC.
- 2016 Tutored and mentored elementary school students in Baltimore.
- 2014 - 2015 Taught English and music to third and fifth graders in rural China.
- 2011 - 2013 Student mentor for Princeton University's Integrated Science Curriculum.

SCIENTIFIC OUTREACH

- 2019 - 2020 Science Olympiad: weekly volunteer at Mansfield Middle School in Tucson.
- 2017 - 2018 Arizona MESA: weekly volunteer with a science club at Flowing Wells High School.
- 2017 Dog Days with the Dean: experimental demonstration for undergraduate students.
- 2017 Office of Admissions: experimental demonstration for AP high school students.

ACADEMIC SERVICE

- 2020 - Organizer of the bioanthropology journal club.
- 2015 - Princeton alumni interviewer.
- 2020 - 2021 Vice president for the Anthropology Graduate Students at the University of Arizona.
- 2020 Member of the School of Anthropology's anti-racism ad hoc committee.
- 2019 - 2020 Co-organizer for a students of color community group in the School of Anthropology.
- 2018 - 2020 Organizer of the Arizona Canine Cognition Center's journal club.
- 2020 Co-organizer of a student-led departmental discussion on racism and anti-racism.
- 2020 Organizer of weekly School of Anthropology "teatime" for students, faculty, and staff.
- 2019 - 2020 Student representative on the department's Curriculum & Scheduling Committee.
- 2019 - 2020 Secretary for the Anthropology Graduate Students at the University of Arizona.
- 2018 - 2019 Travel and research grant judge for the Graduate and Professional Student Council.
- 2010 - 2011 Co-founder of and historian for the Women in Science Colloquium at Princeton.

AD HOC REVIEWER

Animal Cognition, Physiology & Behavior, Ethology Ecology & Evolution, PeerJ

PROFESIONAL MEMBERSHIPS

Sigma Xi Honor Society, Comparative Cognition Society, Cognitive Science Society, International Society for Wildlife Endocrinology, Animal Behavior Society

SELECTED MEDIA COVERAGE

- "Man's Best Friend" *Utah Public Radio: Undisciplined*. <https://www.upr.org/post/undisciplined-mans-best-friend>
- "Puppies are biologically wired to communicate with people" *Radio New Zealand*. <https://www.rnz.co.nz/national/programmes/sunday/audio/2018800500/puppies-are-biologically-wired-to-communicate-with-people>
- "Puppies Are Born Ready to Communicate With Humans" *Smithsonian Magazine*. <https://www.smithsonianmag.com/science-nature/puppies-are-born-ready-communicate-humans-180977881/>

“These adorable puppies may help explain why dogs understand our body language” *Science Magazine News*. <https://www.sciencemag.org/news/2021/03/these-adorable-puppies-may-help-explain-why-dogs-understand-our-body-language>

“Do Dog Breeds Differ in Cognitive Traits?” *Psychology Today Blog: Animal Minds*. <https://www.psychologytoday.com/us/blog/animal-minds/202008/do-dog-breeds-differ-in-cognitive-traits>

“What a Crowdsourced Study Taught Us About How Dogs Learn.” *Smithsonian Magazine*. <https://www.smithsonianmag.com/science-nature/how-much-dogs-intelligence-hereditary-180975448>

“What separates dogs and wolves? Researchers journey to Anoka County to find out.” *Minnesota Star Tribune*. <http://www.startribune.com/what-separates-dogs-and-wolves-researchers-journey-to-anoka-county-to-find-out/488199251/>

TECHNICAL STRENGTHS

Lab Skills:	Immunoassays, Solid-Phase Extraction, DNA Extraction, PCR
Computer Languages:	R
Also familiar with:	Python, C++, Arduino, MATLAB, HTML
Other tools:	LaTeX, High Performance Computing, Emacs, ImageJ
Languages:	English (native), Mandarin (moderate fluency and literacy)
Certifications:	TESOL