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EDUCATION

PhD in Ecology and Evolution

University of Montana

May 2026

BS in Biology

Gonzaga University

May 2020

- Research Concentration
- Minor in Music

Study Abroad

University of Auckland

February – July 2018

- Semester-long study abroad program in New Zealand; tested effectiveness of invasive mammal control methods

Issues and Trends in Education

Pacific University

October 2020 – May 2021

- 4-credit graduate course exploring modern issues in education

PUBLICATIONS

Delplanche, R. A., & Tobalske, B. W. (In Review). Body accelerations and metabolic costs of flight in outdoor turbulence in doves. *Journal of Experimental Biology*.

Delplanche, R. A., Greil, K. E., Inman, D. J., & Tobalske, B. W. (2026). The neuromuscular control of wing morphing in response to upward gusts during gliding flight in doves. *Proceedings of the Royal Society B: Biological Sciences*, 293(2072), 20260187.

Tu, R., Delplanche, R. A., Tobalske, B. W., Inman, D. J., & Sodano, H. A. (2024). 3D printed feathers with embedded aerodynamic sensing. *Bioinspiration & Biomimetics*, 19(6), 066010.

CONFERENCE PRESENTATIONS

2026. Delplanche, RA, Delplanche, KE, Inman, DJ, Tobalske, BW. “Neuromuscular control of wing morphing in response to upward gusts during gliding flight in doves.” Podium presentation, The Society for Integrative and Comparative Biology Conference, Portland, OR.

2025. Delplanche, R.A. “Proximodistal muscle function and neuromuscular control during steady and nonsteady flight in doves.” Podium presentation, The Society for Integrative and Comparative Biology Conference, Atlanta, GA.

2024. Delplanche, R.A. “Effects of perturbation by vertical gusts upon the kinematics of gliding flight in doves.” Podium presentation, The Society for Integrative and Comparative Biology Conference, Seattle, WA.

2023. Delplanche, R.A. “Strain and vibration of selected wing feathers during different flight modes in doves.” Podium presentation, The Society for Integrative and Comparative Biology Conference, Austin, TX.

2019. Delplanche, R.A. “The Distribution of Hemphillian Rhinocerotids and Equids: Taphonomy or Ecology?” Poster presentation, Geological Society of America Conference, Phoenix, AZ.

2018. Delplanche, R.A. “Niche partitioning, taphonomy, and the distribution of Hemphillian rhinocerotids and equids.” Podium presentation, Society of Vertebrate Paleontology Conference, Albuquerque, NM.

2017. Delplanche, R. “Large Mammals from the Hemphillian of McKay Reservoir, Oregon.” Poster presentation, Geological Society of America Conference, Seattle, WA.

IN-HOUSE PRESENTATIONS

2026. Delplanche, R.A. “Fly, you fools! Flight control and costs in unsteady airflows in doves.” Dissertation defense, University of Montana Ecology and Evolution Noon Seminar Series, Missoula, MT.

2024. Delplanche, R.A. “Neuromotor control of flight in doves.” Podium presentation, University of Montana Ecology and Evolution Noon Seminar Series, Missoula, MT.

2023. Delplanche, R.A. “Winging It: an exploration of active and passive wing morphing responses to aerial perturbations in doves.” Podium presentation, University of Montana Ecology and Evolution Noon Seminar Series, Missoula, MT.

2022. Delplanche, R.A. “Where there’s a wing there’s a way: Feather deformation and wing morphing in response to aerial perturbations in doves.” Podium presentation, University of Montana Ecology and Evolution Noon Seminar Series, Missoula, MT.

2019. Delplanche, R.A. “The Distribution of Hemphillian Rhinocerotids and Equids: Taphonomy or Ecology?” Poster presentation, Fall Family Weekend Poster Session, Spokane, WA.

2019. Delplanche, R., Ritchey, T. “Gonzaga MEAT Lab.” Podium presentation, Gonzaga Summer Research Symposium, Spokane, WA.

2017. Delplanche, R. “Large Mammals from the Hemphillian of McKay Reservoir, Oregon.” Poster presentation, Fall Family Weekend Poster Session, Spokane, WA.

2017. Delplanche, R., Pratt, E., Vietri, C. “Gonzaga MEAT Lab Summer Research.” Podium presentation, Gonzaga Summer Research Symposium, Spokane, WA.

INVITED PRESENTATIONS

2023. Delplanche, R.A. “Where there’s a wing there’s a way: Feather deformation and wing morphing in response to aerial perturbations in doves.” Podium presentation, Gonzaga University Biology Research Seminar Series, Spokane, WA.

RESEARCH EXPERIENCE

Postdoctoral Research

Department of Biological Sciences, University of Massachusetts Lowell | Lowell, MA June 2026 – Current

- Researching muscle physiology and the biomechanics of locomotion, with emphases on a) the simultaneous force production of muscle antagonists at joints and b) the functional implications of structural compartmentalization within single muscles.
 - Improving competency in experimental skills commonly used in biomechanics research, including high-speed videography, surgical techniques, the construction and implantation of instrument clusters and cables, the operation of data recording equipment and animal handling.
 - Assisting with *in-vivo* rat and guineafowl experiments utilizing synchronized high-speed video cameras with implanted sonomicrometry crystals, EMG electrodes and tendon-mounted leaf-spring strain gauges to measure joint kinematics and contractile dynamics for two ankle

antagonist muscles, allowing the functional implications of muscle antagonism to be ascertained for terrestrial locomotion.

- Assisting with *in-situ* rat and guinea fowl experiments performing *in-vivo*-realistic work loops at maximal and submaximal activation for the muscles measured *in-vivo*, testing whether all skeletal muscles possess the same contractile properties under identical stimulation conditions.
- Gaining further experience in the analysis of kinematic and muscle data using MATLAB and IGOR software.
- Preparing to conduct *in-vivo* experiments measuring antagonist force production in the biceps and scapulothoracic muscles of pigeons during various flight modes, thereby improving our understanding of the benefits provided by antagonist co-activation during flight.

Ph.D. Research

Department of Biological Sciences, University of Montana | Missoula, MT

August 2021 – May 2026

- Investigated the control and costs of flight in unsteady and turbulent airflow conditions in ringneck doves (*Streptopelia risoria*) in three major areas (detailed below): 1) feather aeroelasticity and 2) neuromuscular control in the lab, and 3) body accelerations and metabolic costs under semi-natural conditions.
- Investigated feather aeroelasticity as a gust damping and airflow sensing mechanism
 - Methods:
 - Ran wind tunnel tests using single primary and secondary feathers, primary- and secondary-shaped force transducers, prepped wings, 3D printed rigid wings, and live birds in a wind tunnel.
 - Quantified aerodynamic forces for both 3D-printed and prepped wings, and *ex-vivo* natural and transducer feathers, using a force plate.
 - Quantified bending forces and vibration frequencies for feather transducers, both in isolation and when implanted in prepped wings, using strain gauges and piezoelectric transducers integrated within the feather transducers.
 - Quantified natural feather deformations *in-vivo* during induced upward gusts using high-speed videography.
 - Quantified vibration frequencies in transducer feathers *in-vivo* during induced upward gusts using integrated piezoelectric transducers.
 - Results:
 - Feathered wings showed improved gust rejection capabilities compared with rigid wings
 - Both primary and secondary feather transducers provided airflow sensing during steady-state gliding, with strain tracking lift production and vibration indicating onset of aerodynamic stall
 - Primary feather transducers provided gust sensing, with strain reflecting gust magnitude and vibration detecting gust onset and offset
 - Natural primary and secondary feathers *in-vivo* deformed during simulated gusts, consistent with a role in gust rejection and mechanosensation.
- Studied the neuromuscular control of the gust response during gliding flight in doves
 - Methods:
 - Tested doves flying in a wind tunnel using 4 flight modes: slow flapping flight, fast flapping flight, glides without gusts and glides with gusts
 - For each flight mode:
 - Quantified wing kinematics using high-speed videography
 - Quantified the length and activation of select wing muscles using sonomicrometry and electromyography
 - Results:
 - Identified a stereotyped gust response consisting of 1) initial wing elevation followed by 2) wing depression and modulation of wrist kinematics

- Discovered a reflex in the pectoralis which arrested wing elevation without modulation in neural control
- During flapping flight, a proximo-distal gradient in muscle function and control was supported
- During gliding flight, wing muscles operated nearly isometrically, allowing even proximal muscles to respond to perturbations
- Tested the impacts of turbulence on dove flight in natural conditions
 - Methods:
 - Flew doves in outdoor aviaries during calm and turbulent weather conditions
 - Quantified weather conditions (particularly temperature and turbulence) using an ultrasonic anemometer
 - Quantified dynamic body accelerations (VeDBA) using back-mounted accelerometers
 - Quantified excess post-exercise metabolic rate (EPOC) using a custom-built respirometry chamber
 - Results:
 - Environmental turbulence increased the metabolic cost of perch-to-perch flights in doves
 - Dynamic body accelerations were unaffected by turbulence but did reveal intraspecific variation in mechanical power or maneuverability, likely predicting individual flight proficiency
 - Turbulence could serve as a selective pressure, acting on variation in flight ability to promote the evolution of compensatory structures and behaviors

Undergraduate Research

Department of Biology, Gonzaga University | Spokane, WA

June 2017 – May 2020

- Investigated patterns of abundance between Hemphillian rhinos and horses, revealing possible niche partitioning
- Collected occurrence data for over 38,000 specimens from 7 online museum databases and 2 physical museum collections
- Analyzed the relative abundance and geographic distribution of specimens using chi-squared and ANOVA analyses in JMP and Excel
- Obtained paleoenvironment data from the MIOMAP and Paleobiology databases

COURSE-BASED RESEARCH EXPERIENCE

Wildlife Management Experiments

University of Auckland | Auckland, New Zealand

Spring 2018

- Collected field data using chew and track cards, bird counts and other methods to assess invasive species management within Pureora Forest Park in New Zealand, suggesting that invasive predator control measures were somewhat successful

Physiology and Biodiversity Experiments

Gonzaga University Biology Department | Spokane, WA

Fall 2017

- Investigated competing phototropic and geotropic effects on the growth of the pole bean plant, *Phaseolus vulgaris*, using various plant orientations relative to gravity and light sources to determine optimal growth conditions

Bacteriophage Research

Gonzaga University Biology Department | Spokane, WA

Fall 2016, Fall 2018

- Isolated, identified and characterized a novel bacteriophage virus using various microbiological and genetics techniques, thereby adding a new virus to the Actinobacteriophage Database at PhagesDB.org

UNDERGRADUATE COURSES TAUGHT

Principles of Biological Diversity Laboratory

University of Montana | Missoula, MT

January 2026 – May 2026

- Utilizing live and preserved specimens in the lab and the UM Zoological Museum, introduced undergraduates to representative taxa from major biological groups so that they could develop an appreciation for the diversity of microbial and multicellular diversity of life on earth
- Instructed students in the use of dissecting, compound and scanning electron microscopes to observe and characterize biological diversity
- Used hands-on group activities to teach students how biologists infer evolutionary history with phylogenies and gather empirical data to test hypotheses, while also developing teamwork and communication skills

Human Anatomy and Physiology Laboratory

University of Montana | Missoula, MT

August 2022 – May 2024

- Utilizing physical models, histology slides and human cadavers, identified and explained anatomical structures and their functions to pre-med undergraduate students via experiential learning strategies.
- Provided opportunities for creative expression through the use of drawing assignments, further increasing student retention anatomical structure identification.
- Integrated various anatomical structures and functions into broader physiological processes, contextualizing them into the function of the body as a whole.

Ornithology Laboratory

University of Montana | Missoula, MT

January 2022 – May 2022

- Through the use of powerpoint slides, weekly quizzes and field trips, undergraduate biology majors were trained to identify local bird species using visual and auditory characteristics.
- Principles of avian ecology and conservation were explored through individual and group projects, customizable to the individual interests of each student.

INSTRUCTION AND INTERPRETATION EXPERIENCE

UM Flight Lab Outreach

Field Research Station, University of Montana | Missoula, MT

May 2022, July 2022, April 2023,
July 2023, July 2025

- Led outreach program for middle-school girls attending the STEEM Summer Institute, exploring the physics of animal flight and providing experiential learning opportunities to young students while simultaneously building competence and confidence in the sciences.
- Led outreach program middle school teachers participating in the Wings Over Water (WOW) program, explaining physical and biological aspects of bird flight while providing examples of scientific demonstrations which visiting teachers could apply in their classrooms.
- Assisted in running this program for summer camps and high school science classes.

Partnerships for Student Achievement (AmeriCorps Service Member)

Forest Grove High School | Forest Grove, OR

October 2020 – July 2021

- Tutored low-achieving and at-risk high school students in writing and literacy analysis by providing daily one-on-one and small group essay-writing support through Zoom, thereby facilitating academic achievement and on-time graduation
- Supported academic performance and fostered a positive school community through coordinating the after-school Homework Club, as well as organizing and facilitating other activities and projects
- Through participation in weekly trainings, received 4 graduate-level credits from Pacific University for the Issues and Trends in Education class

Dinosaurs Revealed Exhibit Docent

Oregon Museum of Science and Industry | Portland, OR

March 2021 – August 2021

- Interacted with museum guests, facilitating gallery exhibits and handling questions, thereby inspiring curiosity about paleontology, evolution, and extinction through life-size dinosaurs and fossil casts from the Mesozoic of North America

Virtual Classes Technology Assistant

Oregon Museum of Science and Industry | Portland, OR

January 2021 – March 2021

- Hosted and operated Zoom meetings for weekly OMSI virtual classes, thereby facilitating science outreach and education for children and families. Specific tasks include camera operation to improve teaching effectiveness and Zoom chat monitoring to allow for better class participation.

Pompeii Exhibit Docent

Northwest Museum of Arts and Culture | Spokane, WA

February 2020 – March 2020

- Interacted with museum guests, providing interesting facts about the exhibit and handling questions, thereby cultivating an appreciation for ancient history

Ecology Lab Teaching Assistant

Department of Biology, Gonzaga University | Spokane, WA

January 2020 – March 2020

- Assisted undergraduate biology students in conducting lab exercises on such topics as inter- and intraspecific competition, island biogeography, and soil biochemistry

Paleontology Outreach

March for Science | Spokane, WA

April 2019

- Presented scientific concepts, such as evolution and taphonomy, to the public

National Fossil Day | Spokane, WA

October 2017, 2018, 2019

- Explained the current research of Gonzaga's paleontology lab to the student body, thereby promoting the lab and its work

Science Teaching and Outreach Member

Gonzaga University Science in Action | Spokane, WA

February – May 2019

- Presented scientific topics to 21 5th graders with a team of 3 Gonzaga students through games, videos and interactive experiments to foster a passion for science

Wilderness Survival Merit Badge Instructor

Boy Scouts of America, Camp Meriwether | Tillamook, OR

July – August 2015, June – August 2016

- Taught the wilderness survival merit badge to groups of 5-30 young scouts by explaining required concepts and providing relevant examples, thereby facilitating their journey to the eagle scout rank
- Expanded curriculum to include additional shelter ideas and other survival tips to better equip campers with wilderness survival situations
- With the other wilderness survival instructors, supervised overnight trips where 20-60 scouts built and slept in their own shelters, advising them on shelter construction and providing emotional support to homesick campers
- Composed a guide to help future staff members teach the merit badge, including possible answers and examples for each requirement

ACADEMIC HONORS AND AWARDS

Dean's List – Spring 2017, Fall 2017, Spring 2018, Spring 2019, Fall 2019

President's List – Fall 2016, Spring 2020

SOCIETIES AND MEMBERSHIPS

Society for Integrative and Comparative Biology

FIELD EXPERIENCE

Rattlesnake Formation

John Day Fossil Beds | Kimberly, OR

July 2019

- Performed surface collecting methods to collect fossils with a research team from the John Day Fossil Beds

Inland Northwest Lagerstätten

Clarkia and Stonerose localities | Clarkia, ID and Republic, WA

July 2017, 2019

- Performed surface collecting methods to gather plant fossils

McKay Formation

McKay Reservoir | Pendleton, OR

July 2017

- Used various surface collecting techniques, including screen washing and transects, to collect fossil specimens over 10 days

OTHER SKILLS

Proficiency with MATLAB software

Proficiency with IGOR data analysis software

Proficiency with LabChart recording software

Proficiency with Photron Viewer software

Proficiency with Canvas illustration software

Proficiency with Microsoft Office suite

Experience with R statistical software

Experience with instructional methods via Zoom

Experience with XMA Lab marker tracking software