

Robert W. Burroughs

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Education

Ph.D. Evolutionary Biology 2014-2021

University of Chicago

Committee on Evolutionary Biology

Thesis: *Voles, Molars, and Molecules: Integrating Quantitative Morphology, Genetics, and Evo-devo to Study Evolutionary Processes*

Laboratories of Dr. Kenneth Angielczyk and Dr. Zhe-Xi Luo

M.S. Geological Sciences 2010-2013

The University of Texas at Austin

Jackson School of Geosciences

Thesis: *Fossils, Phylogeny, and Anatomical Regions: Insights Exemplified through Turtles*

Laboratory of Dr. Christopher J. Bell

B.A. Anthropology 2006-2010

The University of Texas at Austin

College of Liberal Arts

Appointments

NIH IRACDA Postdoctoral Associate 2022-Present

Stony Brook University

Center for Inclusive Education

Project: *Environmental Effects on Molar Morphology in Mouse Model Systems*

Laboratories of Dr. Natasha S. Vitek and Dr. Christopher J. Percival

IRACDA PI: Karian Wright (Director, Center for Inclusive Education)

Designated Campus Colleague 2022

University of Arizona

Department of Cellular and Molecular Medicine

Postdoctoral Fellow 2021-2022

Seattle Children's Research Institute

Center for Developmental Biology and Regenerative Medicine

Project: *3D Quantitative Analysis of Mouse Models of Structural Birth Defects through Computational Analyses*

Laboratory of Dr. A. Murat Maga

Peer-Reviewed Publications

Burroughs, R. W., Vitek, N. S. **In Review.** Nested Morphological Modularity in Rodent Molars Matches Evolutionary Incorporation of Developmental Modules. *Evolution*.

Burroughs, R. W., Parham, J., Stuart, B. A., Smits, P. D., and Angielczyk, K. D. **In Review.** Morphological Species Delimitation in the Northern and Southern Pacific Pond Turtle (*Actinemys marmorata*, *Actinemys pallida*): Can Machine Learning Methods Aid in Cryptic Species Identification? *Journal of Integrative and Comparative Biology*.

Burroughs, R. W. 2019. Phylogenetic and Developmental Constraints Dictate the Number of Cusps on Molars in Rodents. *Scientific Reports* 9:10902 doi:10.1038/s41598-019-47469-x

Bell, C.J., C.N. Jass, and **R. W. Burroughs**. 2019. Dental variation in a collection of *Lemmiscus curtatus* from the northern plains of southern Saskatchewan: implications for morphological evolution. *Western North American Naturalist* 79:219–232.

Angielczyk, K. D., **Burroughs, R. W.**, Feldman, C. F. 2015. Do Turtles Follow Rules? Latitudinal Gradients in Species Richness, Body Size, and Geographic Range Area of the World's Turtles. *Journal of Experimental Zoology Part B* 324(3): 270-294.

Burroughs, R. W., Morris, Z. S., Marsh, A. D. 2014. *Trachemys scripta*, Red-Eared Slider, *Pseudemys texana*, Texas River Cooter, *Chelydra serpentina*, Common Snapping Turtle, Feeding Behavior and Scavenging. *Herpetological Review* 45(2): 321-322.

Burroughs, R. W., Bell, C. J., LaDuc, T. J., and Hendrickson, D. A. 2013. Morphological Variation in the Carapace and Plastron of *Terrapene coahuila* Schmidt and Owens, 1944. D. B. Brinkman, P. A. Holroyd, and J. D. Gardner (editors), "*Morphology and Evolution of Turtles: Origin and Early Diversification.*" Springer, Dordrecht: 535-566.

Published Abstracts

Burroughs, R. W., Vitek, N. S., Ward, D. L., Pomeroy, E., Martin-Gronert, M., and Ozanne, S. 2024. Poor nutrition induces phenotypically plastic changes in size, but not shape, of rat lower molars. Society of Integrative and Comparative Biology.

Burroughs, R. 2022. INVESTIGATING THE ROLE OF DEVELOPMENTAL MODULARITY AS AN EVOLUTIONARY MECHANISM WITHIN RODENT MOLARS. SVP 2022 Program Guide: 95.

Burroughs, R. 2020. GLACIAL CYCLES DRIVE QUATERNARY POPULATION DYNAMICS IN THE SAGEBRUSH VOLE, *LEMMISCUS CURTATUS*(RODENTIA, ARVICOLINAE). Journal of Vertebrate Paleontology, Programs and Abstracts 2020: No Page Number Available.

Burroughs, R. 2020. Modeling rodent tooth morphogenesis reveals constraints on mammalian tooth evolution. Integrative and Comparative Biology Vol. 60 (Supplement to No. 1): e28.

Burroughs, R. 2019. Voles, Molars, and Molecules: Integrating Quantitative Morphology, Genetics, and Evo-Devo to Study Evolutionary Processes. Geological Society of America Abstracts with Programs Vol. 51, No. 5, ISSN 0016-7592 doi: 10.1130/abs/2019AM-332324

Burroughs, R. 2018. IDENTIFYING DEVELOPMENTAL CONSTRAINTS TO UNDERSTAND CONVERGENCE IN RODENT DENTITION. Journal of Vertebrate Paleontology, Programs and Abstracts 2018: 99.

Burroughs, R. 2017. ASSESSING THE PALEOBIOGEOGRAPHIC HISTORY OF *LEMMISCUS CURTATUS* (MAMMALIA, RODENTIA): SINGLE SPECIES OR SPECIES COMPLEX? Journal of Vertebrate Paleontology, Programs and Abstracts 2017: 90.

Socki, F. and **Burroughs, R.** 2017. REASSESSING THE BIOCHRONOLOGY OF KENNEWICK ROAD-CUT (WASHINGTON, USA) USING ARVICOLINE RODENTS. Journal of Vertebrate Paleontology, Programs and Abstracts 2017: 197.

Burroughs, R. 2016. Use of automated three-dimensional morphometrics to detect taphonomic bias: Fossil arvicoline rodent teeth as a case study. Journal of Vertebrate Paleontology, Programs and Abstracts 2016: 98.

- Burroughs, R.** 2016. Voles, Molars, and Molecules: Integrating Quantitative Morphology, Genetics, and Evo-Devo to study evolutionary processes. International Congress of Vertebrate Morphology 11: June 29-July 3, 2016, Washington, D.C.
- Burroughs, R.**, Grossnickle, D., Jass, C., Bell, C. 2015. Enamel patterns and surface morphology of the lower first molars of *Lemmiscus curtatus* (Rodentia: Arvicolinae). Journal of Vertebrate Paleontology, Program and Abstracts 2015: 100.
- Molineux, A., **Burroughs, R.**, Geigerman, F. 2014. The virtually browseable collection: connecting GIS to whole drawer imaging. Society for the Preservation of Natural History Collections, Annual Meeting, June 22-27th, Cardiff, Wales, UK.
- Burroughs, R. W.** 2014. Evaluating the impact of anatomical partitions on morphology-based phylogenetic reconstructions. Society of Integrative and Comparative Biology Annual Meeting Abstracts: 43.
- Burroughs, R.**, Morris, Z., Colbert, M. 2013. Use of a Network Algorithm to Rapidly Generate Ontogenetic Sequences. Journal of Vertebrate Paleontology 33 (Online Supplement): 97.
- Morris, Z., **Burroughs, R.**, Colbert, M. 2013. Developmental Variation Complicates Reconstructions of Skeletal Ontogeny of Extinct Vertebrates: A lesson from *Triceratops* and *Torosaurus*. Journal of Vertebrate Paleontology 33 (Online Supplement): 181.
- Burroughs, R. W.** 2012. Exploring and evaluating the impact of anatomical partitions on morphology-based phylogenetic analyses. Journal of Vertebrate Paleontology 32 (Supplement to 6): 71.
- Vitek, N.S. and **Burroughs, R. W.** 2012. Variation and complex systematic problems: A case study. Journal of Vertebrate Paleontology 32 (Supplement to 6): 189-190.
- Molineux, A., **Burroughs, R.W.**, Zachos, L., Criswell, K.E. 2012 Gaining ground on the Digital Roundabout: Project to Archive to Project Annual GSA, Charlotte, NC GSA Abstracts with Programs V. 44, No. 7.
- Burroughs, R. W.** 2012. Exploring and Evaluating the Impact of Anatomical Partitions on Morphology-based Phylogenetic Analyses. Symposium on Turtle Evolution, Karls Eberhard Universität Tübingen Abstract Volume: 12.
- Vitek, N. S., and **Burroughs, R. W.** 2012. Cf. *Terrapene carolina*: A complicated evolutionary history. Symposium on Turtle Evolution, Karls Eberhard Universität Tübingen, Abstract Volume: 45.
- Burroughs, R.W.**, Wicks, T. Z., Clarke, J. A. 2012. Adapting the paper time roll technique for teaching the diversity of Life in conjunction with deep geologic time in geology, paleontology, and biology courses. Texas Academy of Science 115th Annual Meeting Program and Abstracts Volume: 99.
- Burroughs, R. W.** 2011. New fossil box turtles from the Paleogene of west Texas: A new taxon with critical insights into the evolutionary history of box turtles. Journal of Vertebrate Paleontology 31 (Supplement to 6): 80.
- Burroughs, R. W.**, Bell, C. J., LaDuc, T. J., and Hendrickson, D. A. 2011. Evaluation of the post-cranial skeletal variation of *Terrapene coahuila* (Schmidt and Owens 1944) and implications. Texas Herpetological Society Student Research Symposium Program and Abstracts Volume: 7.
- Burroughs, R. W.**, Bell, C. J., Latimer, A. E., and Kirk, E. C. 2011. Fossil turtles from the Devil's Graveyard formation of southwest Texas: large terrestrial turtles and a geographic range extension for carrettochelyid turtles. Texas Academy of Science 114th Annual Meeting Program and Abstracts Volume: 91-92.

Burroughs, R. W., LaDuc, T. J., Bell, C. J., and Hendrickson, D. A. 2009. Morphological Variation in the Carapace and Plastron of *Terrapene coahuila* Schmidt and Owens, 1944. Gaffney Turtle Symposium Abstract Volume 2009: 24.

Invited Seminars

Models, Modularity, and Molars: Integrative Efforts In Understanding Rodent Tooth Evolution. 2023. Stony Brook University, Department of Ecology and Evolution. Hosts: Dr. Natasha Vitek and Dr. Tara Smiley.

Developmental and Evolutionary Mechanisms that Shape Rodent Molars. 2021. The Ohio State University, Department of Ecology and Evolution. Host: Dr. Jonathan Calede.

Teaching

Summary - Since 2010, I have taught ten different courses a total of 13 times at three different institutions. I am currently certified in Freshman Education by The University of Texas School of Education Freshman Education Program.

In each course for which I was a teaching assistant, my duties were to aid the instructor, but also to independently instruct labs and develop course and laboratory materials.

In courses where I was a teaching specialist, lecturer, or assistant instructor, my duties were that of a full-time lab instructor and/or instructor of record (described below).

Assistant Instructor, University of Arizona, School of Medicine

2022

Assistant instructor for the **Human Gross Anatomy**. This is a 5-week (5-days a week), accelerated, course in human anatomy, via cadaver based dissection. The course is taught to a combination of pre-med (undergraduate), nursing, graduate, and medical students. I served as an assistant instructor responsible for cadaver dissection, exam preparation, and facilitative teaching via demonstrations and guided instruction.

Teaching Assistant, University of Chicago, Division of Biological Sciences

2017-2019

Teaching assistant for **Human Evolution**. This course is an upper division course for biological sciences and anthropology students at the University of Chicago. My responsibilities included organizing weekly lab sections focused on studying human anatomy and evolution. This was the first time this course was taught at the University of Chicago in the fall of 2018. I again served as TA for this course in fall of 2019.

Teaching assistant for **Biogeography**. This course is an upper division undergraduate majors-only course for biological sciences students at the University of Chicago. My responsibilities included independently leading weekly lab sections for University of Chicago undergraduates. Training them in the technical aspects of biogeographic analysis. And developing new materials for lab. I served as TA twice in Winter 2017 and Winter 2018 for this course.

Lecturer, The University at Texas, Jackson School of Geosciences

2013-2014

Lecturer (Instructor of Record) for **Plate Tectonics and Earth and Life History**. This course serves as one of two options of historical geology for undergraduate geology majors at The University of Texas at Austin. My responsibilities included selection and creating new course materials, giving lectures, holding office hours, and being responsible for 74 undergraduate enrollees. I was also responsible for managing two graduate teaching assistants and worked with those TAs to update and construct new lab materials to match constructed lectures.

Teaching Specialist for **Freshman Research Methods**. My responsibilities for this course were varied. I was responsible for managing eight laboratory sections for 94 undergraduate freshmen. The core goal of FRM is to provide freshmen students interested in STEM research-based careers to learn how to become scientists. Over the course of 15-weeks students propose a research project (lab-based) with related hypotheses, order materials, collect data to address their hypotheses, write up their data, and present their research findings. Thus, my responsibilities included managing the laboratory, eight undergraduate teaching assistants, grading assignments, reviewing and providing feedback on written project proposals and written project results, teaching lab techniques, lab safety, managing lab inventory and budgets, and helping students develop quantitative and systematic ways to collect scientific data.

Teaching Assistant, The University of Texas at Austin, Jackson School of Geosciences

2010-2013

Teaching Assistant for **Introduction to Geology**. This course is the introductory level geology course for geology majors at The University of Texas. This course requires TAs to teaching basic theory and tools necessary for students to begin to interpret and map geological sections, identify common fossils, and understand basic principles of geology.

Teaching Assistant for **Life Through Time**. This course is one of two options for undergraduate geology majors at The University of Texas. Lab materials for this course included teaching students to identify major invertebrate fossils commonly found in central Texas. I served as a teaching assistant twice for this course.

Teaching Assistant for **Age of Mammals**. This course is one of two non-major lower-division open enrollment courses taught in geological sciences at The University of Texas. It offers concepts and information similar to historical geology for majors.

Teaching Assistant for **Age of Dinosaurs**. This course is one of two non-major lower-division open enrollment courses taught in geological sciences at The University of Texas. It offers concepts and information similar to historical geology for majors.

Grants and Awards

Summary - Since 2009 (beginning as an undergraduate) I have actively pursued funding to support my academic research. To date, I have had 7 awards funded for a total of \$16,055. In addition, I was a PI Collaborator who contributed a significant amount to the writing of an awarded NSF Proposal totalling \$495,880.

Funded

National Science Foundation

2015-2019

Ann Molineux* (PI), Rowan Martindale (Co-PI), James Sprinkle (Collaborator), **Robert Burroughs** (Collaborator). **Funded**. *Natural History: Critical infrastructure upgrades and expanded digital access to Non-vertebrate Paleontology Collections at the University of Texas at Austin*. NSF proposal number 1458198; Requested amount: \$495,880; Duration 36 months; Start date 7/1/2015; Solicitation NSF14-564 of DBI-Biological Research Collections unit.

*In March 2018, Dr. Ann Molineux passed away, prior to the completion of this grant. At present Co-PI Dr. Martindale has taken over the grant in conjunction with a new Co-PI, Dr. Lisa Boucher (Interim Curator and Collections Manager of Non-Vert Paleo Collections). In May 2018, we filed a No Cost Extension for 12-months to begin 7/1/2018. This work was completed in June of 2019.

Field Museum Women in Science and The Women's Board of the Field Museum

2017

Robert Burroughs (PI), Kelsey Stilson (Co-PI). **Funded.** *Tongue Twisters from the Triassic to Today: Studying the Evolution of the Modern Mammalian Tongue.* Award Amount: \$10,000 (Summer Salaries and Benefits for two interns). Start date 5/31/2017; End 8/15/2017.

Burke Museum of Natural History, University of Washington 2016
Vertebrate Paleontology Research Grant. Award Amount: \$1400

University of Chicago - Biological Sciences Division 2015
Hinds Fund Research Award. Award Amount: \$1205

Society of Vertebrate Paleontology 2014
Jackson School Student Travel Award. Award Amount: \$700

Texas Academy of Science 2012
Master's Student Research Award. Award Amount: \$750

Jackson School of Geosciences 2011
Ernest L. Lundelius Fellowship for Research in Vertebrate Paleontology. Award Amount: \$1000

The University of Texas at Austin 2010
Undergraduate Research Fellowship. Award Amount: \$1000

Students Mentored

Summary - Since 2011 I have taken an active role in mentoring undergraduate and high school students in research (9 in total), primarily those conducting independent research. I have mentored 7 undergraduates and 2 high school students. Their individual successes reflect my mentorship, they have each contributed to my own academic and professional development.

University of Chicago/Field Museum of Natural History 2014-Present

Marta de Giuli - Marta began working with me in January of 2018. She is a rising senior in the College at the University of Chicago. She is currently studying the biogeographic distributions of *Artemesia sp.* (North American sagebrush). Her research in biogeography of sagebrush forms the core of her Undergraduate Thesis for specialization in her dual majors; Ecology and Evolution and Environmental Science. In summer of 2018, Marta was funded on an independent undergraduate research scholarship. Marta completed her thesis and graduated in June of 2019. She is currently a Master's student in Environmental Geography at Bayreuth University.

Francesca Socki - Francesca began working with me in 2016 and is currently studying the biostratigraphy of fossil voles from the Kennewick Roadcut locality in south-central Washington State. In 2017 she was an NSF REU Intern with the Moreau Ant Lab at the Field Museum of Natural History, studying the morphological disparity of head morphology of turtle ants. Francesca graduated with her A.B. in Zoology from Ohio Wesleyan University in 2018. Francesca worked as an Animal Research Assistant at Loyola University in Chicago from 2018-2019. She is currently a PhD Candidate in the University of Minnesota Paleobiology and Paleoecology Group.

Amy Chang - Amy worked on studying the evolution of the modern mammalian tongue apparatus. She was funded via the Field Museum Women-in-Science Summer Internship Program in 2017 while she was a Naperville North High School Senior. Beginning Summer 2018, Amy is a college Freshman at the University of Illinois at Chicago as part of the Guaranteed Professional Program Admission initiative. Amy will partake in an accelerated undergraduate program (3-years), before moving on to begin post-bacc studies in dentistry.

Kathryn Jin - Kathryn worked on cranial and tooth morphology of mammals, specifically *Didelphis virginiana*. She began working with me in 2017 as a Naperville North High School Senior. In Fall of 2018, Kathryn began attending University of Illinois at Urbana-Champaign to study biochemistry.

Emma Wise - Emma worked on studying the evolution of the modern mammalian tongue apparatus. She was funded via the Field Museum Women-in-Science Summer Internship Program in 2017. Emma graduated from Macalester College with a degree in Biology in the fall of 2017 and is currently pursuing her work as an independent artist.

Ann Cebulski - Annie worked on elevational gradients and how they effect the biogeographic distributions of extant turtles. She was funded under a summer internship program via Northwestern University in 2017. She is currently a journalism intern in Washington, D.C.

Maria Viteri - Maria completed her undergraduate degree in June of 2016. She began her doctoral studies with the Department of Evolution and Ecology at Stanford University in the fall of 2017 and completed her Phd in 2022. Maria works on new methodology and techniques for integratating paleobiology and modern conservation ecology to help develop and inform modern biological conservation efforts. Maria is currently the Ecologist for the Frank and Joan Randall Preserve working for The Natyry Conservancy.

R. Ben Sulser - Ben completed his undergraduate degree in June of 2016. He began his doctoral studies at the Gilder School of the American Museum of Natural History in the fall of 2017 and completed them in the spring of 2022. He is investigating the shape and function of nerve canals in the inner-ears of bats, utilizing comparative anatomy, morphometrics, and CT endocasts. Ben is currently a NSF Postdoctoral Fellow at the University of Bern.

Jackson School of Geosciences

2011-2014

Samuel Muller - Sam worked on evaluating the cranial morphology of the extant turtle *Notochelys platynota* by building a digital atlas of the skull using x-ray CT data. Sam graduated from the Jackson School in May of 2015. He is currently employed as a Senior Scientist with Banda Group International (Environmental Consulting).

Professional Service (Selected Entries)

Society of Vertebrate Paleontology

2012-2022

Diversity Committee (2017-2020) - Student/Contributing Member. I served as a co-host for 2017 Diversity Committee Workshop. And as a student ambassador for introducing first time members to the society.

Development Committee (2012-2022) – Student Member/Representative. My work with the development committee included regular interaction with donors to raise funds for a variety of awards funds given by the society. To date (May 2022) – I have helped raise in collaboration with other development committee members in excess of \$350,000 for the society. Primarily in support the Stephen Cohen Student Research Award and the SVP Futures Award. Both Awards are designed to support undergraduate and graduate students to conduct scientific research.

University of Chicago

2014-2016

Multicultural Graduate Community - Served as official representative of the Multicultural Graduate Community (MGC) registered student organization within the University of Chicago (2015-2016).

Vertebrate Paleontology Reading Group - Organizer for the Vertebrate Paleontology Reading Group, with weekly meeting held at the Field Museum (2015-2016).

Texas Academy of Science

2011-2013

Executive Board - Elected Graduate Student Member (Voting). I served as one of two inaugural graduate student board members on the Texas Academy of Science Executive Board. Graduate Student Board Members are elected by the student members of the Texas Academy of Science, they serve two year terms, and have full voting membership as part of the executive board.

Journals Served as Reviewer

Proceedings of the Royal Society of London, Series B

PeerJ

Bulletin of the Yale Peabody Museum

Nature Scientific Reports

Herpetologica

Herpetological Review

Zoological Journal of the Linnean Society

Journal of Paleontology