# Caleb M. Gordon

PhD Candidate, MPhil | Department of Earth and Planetary Sciences, Yale University
c.gordon@yale.edu | Phone: +1 646-315-0960 | ResearchGate | LinkedIn | ORCID

## *Curriculum Vitae*

In the Mesozoic Era, for the first time in their history, reptiles became the dominant megafauna on land and in the sea. Reptiles owed this accomplishment to anatomical innovations in the limb and skull that allowed them to swim more efficiently and kill larger prey. I use anatomical, morphometric, and computer modeling approaches to trace the advent of these innovations in the fossil record. I ground-truth my work in fossils by studying the anatomy and embryology of extant tetrapods within a phylogenetic framework, and using inferential statistics to determine the trophic and locomotor anatomy of extinct species. I aim to graduate my PhD program in May 2025. For my postdoctoral research, I hope to gain new experience in applied biomechanics with live reptiles, to better understand the behavioral and ecological implications of these key anatomical innovations in the fossil record.

## Education

**Yale University**, New Haven, CT
Doctor of Philosophy (PhD): Earth and Planetary Sciences, expected 2024
Master of Philosophy (MPhil): Earth and Planetary Sciences, 2021
Dissertation: *Anatomical innovations associated with aquatic and macrocarnivorous lifestyles in reptiles.*
**Advisor:** Bhart-Anjan Bhullar | **Committee:** Jacques Gauthier, Derek Briggs, Casey Dunn

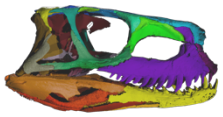
**Bowdoin College**, Brunswick, ME
Bachelor of Arts, *Cum Laude*: Biology, Philosophy, 2018
Honors Thesis: *Identifying a developmental module in the zebrafish dentition.* | **Advisor:** William Jackman

## Technical Skills

- **Statistical Analysis:** basic & inferential statistics (R, PAST); ROC analysis; phylogenetics (TNT, Mesquite)
- **Paleontology:** fossil identification, preparation, interpretation, chemical analysis (SEM-EDX)
- **Morphometrics:** linear and landmark-based (geometric) morphometrics (ImageJ, geomorph, PAST)
- **Embryology:** Staging, dissection, tissue-clearing, immunohistochemistry
- **3D data analysis:** µ-CT scanning, segmenting (VG Studio), mesh manipulation (Slicer, Autodesk Maya)

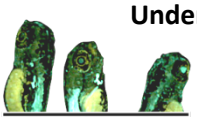
## Research Experience

**Graduate Student Researcher**, *Yale University*, New Haven, CT | August 2018–present



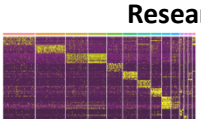
My PhD dissertation explores the evolution of flipper form, interdigital webbing, and jaw muscles in stem archosaurs and aquatic tetrapods. Primary methods have included immuno-staining, linear and geometric morphometric analyses, modeling, and 3D skull reconstruction.

**Undergraduate Research Assistant**, *Bowdoin College*, Brunswick, ME | June 2017–May 2018



For my undergraduate thesis, I used CRISPR/Cas9 reporter constructs to investigate the developmental autonomy of suspected tooth modules with gene knockouts and expression assays.

**Research Intern**, *Solvuu*, Brooklyn, NY | Summer 2015



For this REU, I worked on The Microbe Directory, a searchable microbial metagenomic annotations database, at Weill Cornell Medical College (Dept. of Computational Biomedicine).

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## Teaching Experience | Yale University, MILRD, Bowdoin College

*Yale University* - New Haven, CT
**Graduate Teaching Fellow** | January 2019–May 2020
• Wrote and graded assignments, ran labs, and/or led review sessions for the following courses:
- *Vertebrate Paleontology* (Jacques Gauthier) | Fall 2023
- *Comparative Developmental Anatomy of Vertebrates* (Günter Wagner) | Spring 2020
- *History of Life* (Derek Briggs, Pincelli Hull, Bhart-Anjan Bhullar) | Spring 2019

*MILRD Education* - Brooklyn, NY
**Consultant** | December 2016–December 2018
• Composed and structured content for educational exercises in MILRD's Virtual Training Projects.
• Composed technical specification documents for structuring Virtual Training Project content.

**Project Mentor** | Summer 2016
- Mentored high-school student through a metagenomics research assistantship at Weill Cornell Medical College, providing project feedback and tutoring the student in molecular biology methods.

*Bowdoin College* - Brunswick, ME
**Teaching Assistant** | Spring 2016
- Graded exams and ran sections for *Scientific Reasoning in Biology* (Vlad Douhovnikoff) | Spring 2016

## Volunteer Experience | Science Communication, Museum Work, Teaching

*BioRender.com* - New Haven, CT
**Brand Ambassador** | Sept 2022 – present
- Collaborated with my department Chair and the BioRender Sales team to make BioRender more financially accessible for Yale graduate and undergraduate students in my department.

*Yale Science Communication – A Graduate Student Organization* - New Haven, CT
**Communications Director** | May 2020 – Aug 2022
- Developed digital media platforms to make us remote-ready during the COVID-19 pandemic. To this end, I built the Yale Scicomm website, produced our LinkedIn and Facebook pages, and revamped our YouTube channel. I also produced various Yale Scicomm media (posters, presentations, flyers, videos, and social media posts) to advertise upcoming presentations, and onboard new speakers. In addition, with the other program Directors, I provided feedback on all of our public presentations.

*Yale Peabody Museum* - New Haven, CT
**Special Events Volunteer** | Dec 2019 – present
- Designed short lessons or interactive marine reptile displays for the following events and audiences:
  - *EVOLUTIONS* After School Program (1-hr lessons for high-school students) | Feb 10, Apr 2, 2023
  - *Fiesta Latina* (kids in the broader ESL community in Fair Haven, CT) | Oct 15, 2022
  - *Meet the Scientist* (museum visitors passing through the Great Hall) | Dec 7, 2019

*Artworks for Youth* - Port Elizabeth, South Africa
**Volunteer Biology Teacher** | July 2013
• Taught original two-week biology curriculum to students at a public school in the Joe Slovo Township.

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## Publications

**Caleb M. Gordon**, Casey W. Dunn. Persistence despite change: evaluating the anti-essentialist case for global processualism in biology. *Philosophy, Theory, and Practice in Biology*. In revision.

Giovanni Serafini, **Caleb M. Gordon**, Davide Foffa, Miriam Cobianchi, Luca Giusberti. Tough to digest: first record of Teleosauroidea (Thalattosuchia) in a regurgitalite from the Upper Jurassic of northeastern Italy. *Papers in Paleontology* 8(6): e1474. https://doi.org/10.1002/spp2.1474.

**Caleb. M. Gordon**, Brian. T. Roach, William G. Parker, Derek. E. G. Briggs. 2020. Distinguishing regurgitalites and coprolites: A case study using a Triassic bromalite with soft tissue of the pseudosuchian archosaur *Revueltosaurus*. *Palaios* 35(3): 111–121. https://doi.org/10.2110/palo.2019.099.
——— Featured on Gizmodo: Fossilized Vomit and Feces are Delighting Paleontologists.

## Presentations

**Caleb M. Gordon**, Christopher T. Griffin, Jacques A. Gauthier, Bhart-Anjan S. Bhullar. Aquatic amniote limbs converge on a common morphology beyond terrestrial morphospace. Society of Integrative and Comparative Biology Annual Meeting, 2024. Seattle, WA, USA. In *Adaptation and ecomorphology in fluids*. Oral Presentation.

Olaf Ellers, **Caleb M. Gordon**. Scaling of induced power from dragonflies suggests that griffenflies were under-powered. Society of Integrative and Comparative Biology Annual Meeting, 2024. Seattle, WA, USA. In *Evolution, Physiology, and Biomechanics of Insect Flight*. Oral Presentation.

**Caleb M. Gordon**, Christopher T. Griffin, Jacques A. Gauthier, Bhart-Anjan S. Bhullar. Limb proportions predict aquatic habits in extinct tetrapods: a case study for assessing predictive model accuracy in paleontology. Geological Society of America Connects, 2023. In *Phylogenetic and Computational Approaches in Paleobiology and Paleoecology*. Oral Presentation. Recording available upon sign-in for all GSA members here.

**Caleb M. Gordon**, Jacques A. Gauthier, Bhart-Anjan S. Bhullar. Validating osteological correlates of interdigital webbing and flipper form in extinct aquatic amniotes. Society of Vertebrate Paleontology 82nd Annual Meeting, 2022. Toronto, Canada. Oral Presentation.

Kelsey M. Jenkins, **Caleb M. Gordon**, Jacques A. Gauthier, Bhart-Anjan S. Bhullar. Visualizing an elusive holotype: the cranial osteology of *Bolosaurus major* (Parareptilia: Bolosauridae). Society of Vertebrate Paleontology 82nd Annual Meeting, 2022. Toronto, Canada. Oral Presentation.

**Caleb M. Gordon**, Noah J. Planavsky. Phosphorus levels predict genomic novelty production in the Neoproterozoic: a preliminary mathematical model. Geological Society of America Connects, 2021. In topical session T109 - Life's Innovations from the Early Earth to the Search on Modern Mars: Honoring the Career of Andrew H. Knoll. Portland, OR, USA. Poster.

Lizzy Nand, Emma Carley, **Caleb Gordon**, Nicholas Ader, Harini Sadeeshkumar, Yangqi Gu, Milind Singh. Yale Science Communication – A Graduate Student Organization: Communicating science, igniting scientific engagement, and training science communicators. SciPEP (Science Public Engagement Partnership), Communicating the Future: Engaging the Public in Basic Science, 2021. Poster, virtual.

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**Caleb. M. Gordon**. Investigating the developmental evolution of the limb and skull in aquatic reptiles. Max Planck-Yale Mini-Conference, 2021. Max Planck-Yale Center for Biodiversity Movement and Global Change. Oral Presentation, virtual.

**Caleb. M. Gordon**, Brian. T. Roach, William G. Parker, Derek. E. G. Briggs. Distinguishing regurgitalites and coprolites: A case study using a Triassic bromalite containing soft tissue from *Revueltosaurus*. Society of Vertebrate Paleontology 79th Annual Meeting, 2019. Queensland, Australia. Oral Presentation.

**Caleb. M. Gordon**, Brian. T. Roach, Derek. E. G. Briggs. A regurgitalite containing *Revueltosaurus* muscle tissue from the Upper Triassic Chinle Formation of Arizona. NE Regional Geobiology Symposium, 2019. Amherst College, MA, USA. Poster.

William R. Jackman, **Caleb M. Gordon**, Amber Rock. Analysis of gene function during zebrafish tooth development using "reporting" knockouts. 13th International Zebrafish Conference, 2018. WI, USA. Poster.

**Caleb M. Gordon**, William R. Jackman. Identifying a distinct developmental module in the zebrafish pharynx. Annual Maine Biological and Biomedical Sciences Symposium, 2018. MDI Biological Laboratory, ME, USA. Poster.

**Caleb M. Gordon**, William R. Jackman. Determining the cellular mechanisms associated with tooth module dissociation in the ventral pharyngeal dentition of zebrafish (*Danio rerio*). President's Summer Research Symposium, 2017. Bowdoin College, ME, USA. Poster.

## Grants/Fellowships

**Doctoral Dissertation Improvement Grant** | *Yale Institute for Biospheric Studies*
Spring 2022 | $4930

**FH Veterinary Science Student Research Assistance Scheme** | *IUCN-SSC Crocodile Specialist Group*
Spring 2021 | $1000

**NSF GRFP** | *National Science Foundation*
Spring 2020 | $34,000 x 3

**Doctoral Pilot Grant** | *Yale Institute for Biospheric Studies*
Spring 2019 | $3000

**Bateman Fellowship** | *Yale University, Department of Earth and Planetary Sciences*
Spring 2018 | $2000

**Life Sciences Fellowship** | *Bowdoin College, Department of Biology*
Summer 2017 | $3840

## Honors/Awards

**Earl Ingerson Fellowship** | *Yale University, Dept. Earth and Planetary Sciences* | Spring 2019
**Honorable Mention** | *National Science Foundation, Grad. Research Fellowships Program* | Spring 2018
**Copeland-Gross Biology Prize** | *Bowdoin College, Department of Biology* | Spring 2018
**Sarah and James Bowdoin Scholarship** | *Bowdoin College* | Fall 2014 and Fall 2015
**Joshua Chamberlain Scholarship** | *Bowdoin College* | Summer 2014
**National Silver Medal**, Non-Fiction Writing Portfolio | *Scholastic Art & Writing Awards* | Spring 2014

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## Fieldwork

**Petrified Forest National Park**, Arizona, USA | May 2019

- Prospected for phytosaur material and excavated aetosaur remains for the Division of Vertebrate Paleontology at the Yale Peabody Museum.

**Southern Glades WMA, Lake Placid, Okeechobee County, and Key Largo**, Florida, USA | March 2019

- Collected squamate specimens for the Div. of Vertebrate Zoology at the Yale Peabody Museum.

## Museum Exhibit Contributions

**Conquering the Land, with a Monster's Skull** | Kline Geology Laboratory, Yale University, CT, USA

- Built a single-shelf original exhibit showcasing the evolution of macrocarnivorous skulls in archosaurs. This exhibit features original text, posters, diagrams, and 3D prints of reconstructed fossil skulls, as well as fossils from the Yale Peabody Museum. On display since January 2023.
    - Contacts: Noah Planavsky, Vanessa Rhue

**Reconquering the Sea, with a Monster's Wings** | Kline Geology Laboratory, Yale University, CT, USA

- Built a single-shelf original exhibit showcasing the recurrent evolution of flippers in secondarily aquatic tetrapods. This exhibit features original text, posters, and diagrams, along with fossils and extant skeletons from the Yale Peabody Museum. On display since January 2023.
    - Contacts: Noah Planavsky, Vanessa Rhue

**T. Rex: The Ultimate Predator** | American Museum of Natural History, NY, USA

- Produced two panoramic videos of a segmented *T. rex* coprolite for use in an interactive display on tyrannosaur feeding. This exhibit contribution was on display 2019–2021.
    - Contacts: Mark Norell, Terri Foxman

## Service to Profession

- Reviewer: *Frontiers in Earth Science* (1), *PALAIOS* (1), *International Journal of Osteoarcheology* (2)
- Yale Dept. Earth and Planetary Sciences Graduate Student Mentor | Summer 2021–Spring 2023
- Yale Dept. Earth and Planetary Sciences Ad-Hoc Committee on Advising Guidelines | Spring 2021

## Professional Societies

Society of Vertebrate Paleontology
Society for the Study of Evolution
Paleontological Society
Geological Society of America
Society for Sedimentary Geology
The Ocean Conservancy

## Languages

English (fluent), French (working proficiency), Spanish (elementary proficiency)