

Stanford



William Gearty

Ph.D. Student in Geological Sciences

Bio

PROFESSIONAL AFFILIATIONS AND ACTIVITIES

- Member, The Paleontological Society (2011 - present)
- Member, Society of Systematic Biologists (2014 - present)
- Member, The Society of Vertebrate Paleontology (2012 - present)
- Member, Society for the Study of Evolution (2014 - present)
- Member, Geological Society of America (2011 - present)

EDUCATION AND CERTIFICATIONS

- BS, Yale University , Geology and Geophysics: Paleontology and Geobiology (2014)

LINKS

- My Web Site: <https://people.stanford.edu/wgearty/>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Scientists and non-scientists have forever marveled at the great degree to which life varies in size. Even within modern animals, body sizes span more than 10 orders of magnitude! Biological rules populate the scientific literature in attempts to explain how and why animal body sizes vary. However, very little research has dealt with the effect major environmental adaptations, such as living in water versus on land or living in salt water versus in fresh water, have on body size evolution. One case of a significant relationship can be seen in mammals and reptiles, where we know that marine groups are much larger than their terrestrial relatives.

My overall goal is to improve our understanding of the effect of major evolutionary environmental transitions on the sizes of organisms. Using phylogenetic comparative methods, I analyze various animal groups that inhabit an array of different habitats (such as marine, freshwater, and terrestrial environments) for significant differences in body size between group members that inhabit those different habitats. Taking into account fossil taxa and geologic time, I analyze the reaction of body sizes of these taxa to environmental transitions.

I also employ machine learning to compile data using the DeepDive software, which has been produced by Christopher Ré's lab at Stanford. I am further developing this software to analyze images in the paleontological literature, producing measurements for specimens that would otherwise never have been included in body size datasets.

Currently, my research is focused on Gastropods (snails and slugs). Gastropoda, the largest group within molluscs, comprises more than 60,000 species of snails, slugs, and limpets, more than one quarter of which are extinct. Gastropod body size spans eight orders of magnitude, with the smallest gastropods having shell volumes of less than .03 cubic millimeters and the largest gastropods having shell volumes of nearly 14,000 cubic centimeters. They are cosmopolitan in distribution and occupy a wide range of habitats, ranging from high mountains to deserts and rainforests, coral reefs, lagoons, and the deep sea, and from the tropics to high latitudes. They are the only molluscs that can be found in deep sea and shallow sea marine, estuarine, freshwater, and terrestrial habitats. Gastropods have made the transition between marine and freshwater and between marine and terrestrial environments more than 4 independent times. While many different animal groups may inhabit both marine and non-marine habitats, this evolutionary history and the long time span over which it has taken place make gastropods uniquely suited for studying the relationships of body size and habitat over time.

LAB AFFILIATIONS

- Jonathan Payne, Paleobiology (9/12/2014)

Teaching

COURSES

2018-19

- Coevolution of Earth and Life: EARTHSYS 4, GEOLSCI 4 (Aut)

2017-18

- Evolution of Marine Ecosystems: EARTHSYS 122, GS 123, GS 223B (Aut)
- Evolution of Terrestrial Ecosystems: EARTHSYS 128, GS 128, GS 228 (Win)

2016-17

- Coevolution of Earth and Life: EARTHSYS 4, GS 4 (Aut)
- Evolution of Terrestrial Ecosystems: GS 228 (Win)

Publications

PUBLICATIONS

- **Energetic tradeoffs control the size distribution of aquatic mammals.** *Proceedings of the National Academy of Sciences of the United States of America*
Gearty, W., McClain, C. R., Payne, J. L.
2018; 115 (16): 4194–99
- **Comparative anatomy of the bony labyrinth of extant and extinct porpoises (Cetacea: Phocoenidae)** *BIOLOGICAL JOURNAL OF THE LINNEAN SOCIETY*
Racicot, R. A., Gearty, W., Kohno, N., Flynn, J. J.
2016; 119 (4): 831-846
- **Melanin Concentration Gradients in Modern and Fossil Feathers** *PLOS ONE*
Field, D. J., D'Alba, L., Vinther, J., Webb, S. M., Gearty, W., Shawkey, M. D.
2013; 8 (3)

PRESENTATIONS

- Resolving the Relationships of the Squamate Tree of Life: An Assessment of New Approaches and Problems - Society of Vertebrate Paleontology (November 5, 2014 - November 8, 2014)
- Melanin concentration gradients in modern and fossil feathers - Society of Vertebrate Paleontology (October 30, 2013 - November 2, 2013)
- Assessing the completeness of the fossil record using brachiopod Lazarus taxa - American Geophysical Union (December 3, 2012 - December 7, 2012)