Title: A Whale of a Tale: The Origin of Tail-Powered Swimming in Early Cetaceans

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Introduction: Modern whales are aquatic mammals, but the fossil record indicates that they are descended from ancestors that lived on land. In recent decades, this strange and seemingly counterintuitive transition has become one of the most prominent examples of macroevolution, but many details remain to be elucidated. This project aims to explore one key aspect of this transition: the evolution of tail-powered swimming. Through a greater understanding of the transition between limb and tail-powered swimming we can get a better and more complete picture of whale evolution and macroevolution in general.

Narrative: Last year, measurements were taken of all caudal (tail) vertebrae in fossil cetaceans as well as over seventy specimens of modern mammals. This year, Principle Component Analysis (PCA) was used to analyze these measurements. PCA is a statistical method that uses variance to discover simple trends in complex data. This project primarily focuses on the fossil cetacean Maiacetus Innus but also includes Dorudon Atrox and Remingtonocetus domandaensis. Quantitative comparison of fossil skeletons with those of modern mammals will provide the framework for assessing the functional capabilities of these early whales, providing insight into how ancient whales became increasingly adapted for efficient modes of swimming.

Results to date: At this point we are still running many analyses and sorting through our data. While we have begun interpretation, it is still in the early stages and I am hesitant to state any specific results.

Impacts on own life: Undergraduate research has been beneficial to me in many ways. First, it has given me an opportunity to do what I love—ask good questions and search to find answers. It is incredibly humbling yet rewarding to explore the unknown—hoping to expand our base of scientific knowledge. Second, research has given me a greater understanding and appreciation for scientific literature and other researchers. Through my research, I realize how and why others are driven to perform research of their own. Thirdly, research has given me the opportunity to develop my skills working both independently and collaboratively. Much of the work for this project has been done on my own—helping me to become more focused, organized, and self-motivated. Meanwhile, through frequent meetings with my research mentor I have learned what it means to work as a team and have developed my communication skills. Finally, this research opportunity has enabled me to get to know my research advisor on a personal level—opening up opportunities for conversations about everything from whale fossils to evolution and faith.