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Historical Geology

The idea that any field science can be readily compared to history in any meaningful way at first seems like an exercise in futility. In most cases such a stance is completely justified. However there are some sciences, and some subsections of science that might lend themselves more readily to such a study. The Geological Sciences are broken into two separate courses at the undergraduate level: Physical Geology and Historical Geology. Physical Geology deals with the specific attributes of rocks and minerals as well as the practical application of theories such as uniformitarianism and plate tectonics. Historical Geology studies the history of geology as a science, as well as the history of the earth; the latter of which spans eons of time.

Vertebrate Paleontology falls under the Historical Geology discipline, and will be the focus for this comparison. Paleontology has somewhat of a split personality. Invertebrate paleontology falls under Geology studies and is mainly taught in that department. Vertebrate Paleontology is taught in Geology and Biology departments. Usually this working division is based on field retrieval and comparative anatomy. Most of the field retrieval work is completed by those who work in the Geology Departments. They know the area, landmarks, and the geology to ascertain a specific time period to the fossil that they find. The Biology Department is usually home to the comparative anatomists who help describe and articulate the fossils and understand their relationship to other fossils that have already been described. This is not always the case, but for the sake of comparison such as this generality will suffice.

Fossil research usually begins in the library. Most modern paleontological publications contain a literature review that showcases all the work that has examined the same area, fossil, or

idea. Many times the chronology of the literature review reveals changing attitudes or interpretations of a specific data set, whether that specific data set is for an actual fossil, interpretations on locomotion based on fossil measurements and reconstructions, or similar issue. Historians have extrapolated this point outwards into a whole niche study. Perhaps it is unfair to judge literature reviews and historiography the same given that they do not work with the same number of sources, but they are essentially the same. Historiography is important to historical research where it gives the current research context and generally helps explain where current scholarship is going and where the present work in question fits into that scheme. I see no difference in historiography as a standalone study and the idea of telling a narrative simply because it has not been told before.

Collecting is an entirely different matter. Some instances new fossils arrive from the field or they are unpacked after years in the lab. In history this would be similar to finding a book, more likely just a piece of a book, no one had ever read, or a slight revision that few people had read. The idea that fossils can be collected and held in research storage areas for decades without analysis on the service seems like a research waste to individuals who work with special collections of books. But, many books or correspondences held in those collections are never opened because no one has come along with an interest in their subject matter or provenience.

The real differences between historical work and paleontological work lie in the analysis of the finds, or in the case of history, the sources. Many historical texts are used if they reveal something different than has previously been reported, or they offer another, stronger indication that earlier interpretations were correct. A large number of fossil finds reveal nothing new to science. Most are pieces parts of ribs or long bones that cannot be used for any kind of identification of the animal. Some pieces of bone are simply not diagnostic. Imagine finding a

handful of pages from a manuscript that contained only prepositional phrases or verbs and no nouns. When something is new however the way to support the claim and present information differs greatly. With historical accounts, comparisons are drawn to existing material on the subject and it is the historian's job to create and maintain that link through other sources and logical connections. Fossils, especially teeth, can be submitted to a statistical T-test to mathematically reveal if size differences fall under the spread for a normal variation, or if that difference is statistically significant which would indicate that the sample may belong to a different species.

The theoretical claims made in historical research can be supported with primary documents such as journal entries, personal correspondence or even autobiographies. The claims can even be argued and supported within the secondary literature placing the author in this or that particular philosophers' camp. These claims cannot, however, be mathematically verified as more of the same or as something new. Historical research is only viewed as a valid endeavor when it adds something to the existing body of knowledge; that is to say it cannot be just more of the same. While Paleontology is greatly concerned with the addition of new species, it is also elated at the prospect of having more of the same. The more *Brontetherium* ankle bones there are to measure the finer they statistical tools can be calibrated to determine where new finds can be placed in relationship to the existing specimens.

Paleontology has the benefit of the holotype: One official representation of any one species that all other contenders are (mathematically) compared with. History has no such official ideal with which new interpretations of Aristotle, or ideas about post-colonial government failure can be compared with. That is not to say there are not strongly agreed upon seminal works about such things that scholars operate under, work to uphold, or (in rare bouts of

enthusiasm) overturn. Thankfully history does not have these holotypes. The very idea there may be one single correct interpretation of events, facts, reasons, outcomes, causes, and effects and that each time a given set of circumstances occur there is a predictable outcome would grind the discipline to a halt.

Paradigms exist in paleontology and are shifted at much slower rates and under greater wealth of evidence than many experimental sciences. The debate between cold and warm bloodedness is currently the most prominent argument. The trend toward endothermic dinosaurs is not one that many scientists are willing to accept. Since fossils do not maintain a body temperature, the arguments for and against have taken the path of historical interpretations. Mathematical and statistical comparisons are of little use for such a debate so theoretical "if a then b" scenarios are presented in papers. While strong theoretical arguments may result in historical paradigm shifts they are less likely to convince enough paleontologists that dinosaurs were warm-blooded. This idea was presented by Thomas Huxley back in the 1860s but no one paid any attention. This notion lay dormant for over 100 years until Yale professor John Ostrom at Yale University began to study it in 1976. His student, Robert Bakker, followed Ostrom's studies and published *The Dinosaur Heresies* in 1986. The debate continues but with recent finds coming out of China, the idea that dinosaurs were more warm-blooded, active, and intelligent is garnering more and more scientific support.

History and Paleontology are both charged with the same task of explaining the past. The time spans under review and the tools used to formulate those explanations are vastly different. They are not incompatible. While the outcomes of both include articles printed in esoteric journals and theories discussed between three or four specialists, many of those outcomes go on public display. Paleontology is extremely public, from the adventure of collecting fossils to the

ending exhibits, results of research mounted and placed inside enormous exhibit halls in natural history museums and visited by millions of people each year. While history is not quite as "on display" as paleontology it is still more interesting to individual non-specialists than most other disciplines. Very few documentaries follow the lives of the archivist with such intensity as they do paleontological field digs. The particular historian who has devoted his researched and devoted his life to understanding a topic rarely writes the popular history books, but their results and interpretations get organized by other authors and soon fill bookstore shelves. Both of these disciplines have the opportunity and the ability to connect with the public in ways that psychology, astrophysics, and nuclear engineering cannot. Paleontology is a science ambassador to the public world. This history of science can reach people that follow their interest in history. If they take such a caveat perhaps History of Science can bolster interest in the sciences as well.

Historical Geology is just that, historical. Paleontology in particular holds more similarities with history than differences. The ability to understand historically the evolution of the discipline of geology, which, in turn, tries to understand the evolution of the earth, is key to reaching the public with modern as well as historical sciences. Until recently I had never heard a succinct argument as to why history could not be scientific. I saw more similarities than differences with the geological sciences that I studied. The idea of causal systems giving predicted outcomes in science where they cannot in history is the best I have heard. History is not predictive, although many people will use the phrase, "If history is any indication then…" In that sense geology may not be predictive either. Geology is the systematic study of the earth as a way to understand the earth. "The present is the key to understanding the past" is their mantra. History is a systematic study of sources as a way to understand people, events, ideas, etc. Might

“the past is the key to understanding the present” be theirs? Does this mean that paleontology really is not a science, or do the mathematical models save it from falling into the liberal arts?