

Rationale for this book

To investigate prehistory one thinks back into not forward from it. The latter would beg the question as prehistory initially is a void in our knowledge that only science can rationally fill. Some rethinking of approach is needed for our enquiry, for while experienced episodes come to mind out of sequence, we remember forwards in reliving the content of each.¹ However, if the episode was a forensic enquiry we should remember how our investigative discovery of events proceeded in the reverse of their temporal order (say, restoration of folded and faulted formations in a geological cross section, to their likely initial state). But when presenting the “case to the jury,” it is easier to retell the sequence as a forward running just-so story. This hides rather than reveals the actual discovery process. Pedagogically, telling the discovery tale is surely the way to go if we are to train others in our methods.

Historical Geology in recent decades has come to embody much new information as a result of methodological advances. Revolutions in thought result from these or inspire them. My book presents material more or less in the order in which it was originally discovered. This historical investigation of prehistory means, for example, that: the revelation and proof of an Ice Age is near the beginning and mysteries of the Precambrian are toward the end; evidence of organic evolution begins with a study of the macrofossils and, later, genes; and, understanding of the geological record begins with a discussion of the scenery and ends with a discussion of the Hadean.

A 1960's revolution in geology replaced the precept of the fixity of continents with the reality that they move. Also, geological understanding is that the present continents are fragments of a former supercontinent, called *Pangea*. The fragments of Pangea have been scattering during the last twenty-fifth of geological time (180 million years). Pangea existed geologically briefly (40 million years). It had assembled from a scattering of prior continents that were fragments of an earlier supercontinent in existence some 700 million years ago. This had assembled from a scattering of prior continents that themselves were fragments ... , you get the picture.

Have other geological history textbooks been rewritten? The answer is, yes somewhat, and added to, but in a way that has made the organization of their content awkward for the following reason. The authors persist in the “Roll call of the Ages” tradition *: the prehistory of Earth told from the beginning and in keeping, since 1859, with Darwin's theory of evolution. The result, given the new reality, is a tale for the credulous rather than the inquiring.

Ordinarily now, the story of the prehistory of Earth, after cursory, speculative, remarks about the origin of our stony planet, begins with the time that fossil record of life became abundant in the rock record. That is when the Cambrian period began (542 million years ago). That story, we now know, recounts the last one ninth of geological time. Before the 1960s, a few paragraphs sufficed the first eight-ninths of geological time—a geological blank. Now an enormous amount of information is available about this greatest part of prehistory. But what is known does not lend itself for easy inclusion in historical geology textbooks that present a forward-running narrative.

A textbook, I used in the 1960s was *History of the Earth: An Introduction to Historical Geology*, 1961, by Bernhard Kummel (1919-1980).² The organization of this book is, in its first three chapters, to describe geological tools used to read the rock record and then to tell the tale of Earth's geological history: “Chapter 4, The Precambrian Eras.” Kummel admits that “Precambrian rocks represent more than three-quarters of the time span of the record observable in the earth's crust.” However he warns that “Today the Precambrian rocks are the most difficult portion of the earth's record to study.” In six pages he reviews what was then known about the Precambrian of North America and in fewer pages, for each, he describes the record of this time in other continents. The succeeding eleven chapters then deal in turn with each of the geological periods, ordered chronologically from oldest to youngest. The fossil record he prunes as near as possible to a linear progression of evolving forms to modern humans that appeared (“35,000 B.C.”) during the Pleistocene Epoch. This theme is continued in current historical geology textbooks by Condie & Sloan,³ by Dott & Batten,⁴ by Foster,⁵ by Eicher & McAleaster,⁶ by Mintz,⁷ by Stanley,⁸ and by Wicander & Monroe.⁹ However, the authors of these books have to deal fairly with the body of knowledge that, since the 1960s, has become available for the Precambrian. A new understanding for the workings of the our Earth is called *Plate Tectonics*. In this, the seafloor is nowhere older than 180 million years. Named continents are ephemeral.

* which had its origin in Murchison's desire to showcase his Silurian. In his *The Silurian System*, 1839, he had used, as had Lyell in his *Principles of Geology*, 1830-33, the top-down description of strata standard then (except for De la Beche's contra-Lyellian *Theoretical Geology*, 1834) to “Baconian” stratigraphical geologists (unlike “scriptural” geologists who began with the Creation).⁹ But not to have his Silurian near the end of his *The Geology of Russia*, 1846 (presented to the Czar in 1845), Murchison dissembled: “[H]aving learnt to decipher the very first letters in the long records of animal life, [geologists can now] assume a more distinct position as historians.”¹⁰ What is lost is *how* the finished “model ship” was inserted into the “bottle” and made to look so “natural” there.¹¹

A typical textbook that I used to indicate to the student for additional reading is *Historical Geology: An Evolution of the Earth and Life Through Time*, 1998, by Reed Wicander & James S. Monroe.¹² In the common mold, its authors devote the first third of the book to a discussion of geological tools. Special tools are developed that are needed to read the rock record of the Precambrian. Principles of geology are elucidated. Plate tectonics theory is introduced. The abstract discussion of all this is quite elegant. Still the messy need is for actually telling the story of the history of Earth. Finally this is taken up. But to begin at beginning of history of the world is to begin in a very weak place. For one thing, nothing is known of the actual history of Earth for the first half billion years. This part of the story has been lost to erosion and to plate tectonics. It must be speculatively reconstructed by references to Moon and meteorites and to the admittedly unsolved origin of life from the inanimate. None of this makes for a good kickoff strategy. When the story has some Earth-rock to flesh it out, the embarrassment is that it is, to use J. W. Schoppe's colorful term, "fubaritic"¹³ (fouled up beyond all recognition).

None of this is good news, so what do these authors do? They avoid the issue by telling, what is in fact a speculative tale, as a simple story well known. So the patulous just-so story starts: a telescoped account of the eons before the Cambrian followed by the roll call of the ages set to the refrain of "the seas came in and the seas went out," of what was happening in "North America" (*sic*) and in the world elsewhere. A sustained implication is that North America, as an entity, has always existed. But it has not always existed. Nor will it. The fragmentation of North America continues today in the opening of the Gulf of California. The continent that we know as North America came to be when, beginning 75 million years ago, it and Greenland-to-be separated fragmenting the continent called *Laurasia* that had separated out of Pangea (ending it) some 180 million years ago. Given that Earth history spans 4,550 million years, the existence of North America has been, and will be, geologically brief. Another sustained implication is that there is something inevitable about the progression of life in this world. This impression is reinforced by discontinuing discussion of branches of life in favor of those encountered which are more on line to us. For the reader, the pressure is on to remember what is offered as a forward driving whole. In this recounting, mammals would seem to make their appearance only after the dinosaurs have become extinct. That linear whole is contrived and is not as thought provoking as the truth. The appearance of dinosaurs in the fossil record was long preceded by the appearance of mammal-like reptiles. The illogic of happenstances is the reality.

A great surprise for me in the putting my book together was the very large component of myth that is passed on and which, well learned, I had been passing on. This aspect to the tale would seem to be there for convenience to make a strong case when the material is weak or to make a telling point when the material is dull. Historical figures



are especially prone to being etched in a way that is too clear cut to be the person who lived. Ideas are not born in a vacuum and the setting in which an idea comes to be can be more interesting than the person to whom the idea may have become attached. I strive not to perpetuate myth, and have been amazed by the amount of time that goes into research to avoid it. Each topic in my book has its origin in a question that I have posed in the classroom. Originally, my plan (ca. 1970) was to give a single sentence or short paragraph answer for each. The book got away from me in that goal. Part of the time taken was because I have had no ready model for its structure. A great moment for me, now some years ago, was to discover reference in a footnote in a book by G. G. Simpson to a book by **William Berryman Scott**, in which "The grand old man of American Paleontology," as Simpson called him, tells the history of fossil mammals "in reverse."¹⁴

I have since acquired a copy of Scott's book: *A History of Land Mammals in the Western Hemisphere*, 1937.¹⁵ In the preface to the 2nd edition Scott, writes: "Almost twenty-four years have passed since the appearance of the first edition of this book, and during that time the work of exploring and collecting has gone on unremittingly ... the plan and purpose of the work remains as before, ... the history of the successive faunas and the various mammalian groups was told in the reverse order of time. This method has its inconveniences and would not have been employed had I been writing a text-book or a scientific treatise for professional readers. To the amateur it has the advantage of beginning with the familiar life of to-day and working gradually back to the less and less known. To commence with the Paleocene [which began 65.5 million years ago] would have landed the reader in a world where every mammal was altogether strange and unlike anything he had ever seen. So far as I can discover, this inverted narrative has been approved and objected to in almost equal measure and I trust that I shall not be regarded as unduly obstinate in adhering to it in favour of the non-professional reader."

I have since found that, earlier, Charles Lyell (as had Cuvier and, before him, had Desmarest) made a similar case in *Principles*, 3rd vol. 1833, and *The Student's Elements of Geology*, 1870, for "inverting what might at first seem to be the more natural order of historical research. "We advance," he assures, "with securer steps when we begin with the study of the geological records of later times, proceeding from the newer to the older, or from the more to the less known."¹⁶ So too in De la Benche, *Manual*, 1831,¹⁷ and Conybeare & Phillips, *Outlines*, 1822.¹⁸

I, having arrived, for the same reasons, at a similar place, find that I am in good company. □