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Review of Stephen Meyer's New Book *Darwin's Doubt*

By Dan W Reynolds

Darwin's *Doubt: The Explosive Origin of Animal Life* and the *Case for Intelligent Design* is Stephen Meyer's sequel to his previous book *Signature in the Cell*.¹ Published earlier this year, *Darwin's Doubt* at the time of this writing is #1 on Amazon.com in the categories of organic evolution, paleontology, and creationism and #745 overall (out of more than one million books). Meyer has a doctorate in the History and Philosophy of Science from Cambridge University, bachelor's degrees in physics and geology and is the director of the Discovery Institute, the flagship organization for the Intelligent Design movement.

Darwin's Doubt investigates the rapid appearance of animal phyla at the base of the geologic record known as the Cambrian Explosion from the point of view of biological information. Meyer documents the Cambrian Explosion and discusses the various explanations that have been put forth to explain it from Darwin's time until now.²

Prologue

Meyer explains that biology has come to be understood in terms of the information found in the genetic code.³ Building new body plans (phyla) requires new information. There is no known physical process that can generate the digital code found in DNA, RNA, and proteins. The only known agency that can create new specified information is a mind. This is a real problem for the origin of life since natural selection can't operate until a self-replicating information rich chemical system is in place.

Many biologists now doubt the Neo-Darwinian mechanism of random mutations and natural selection is capable of building things like new body plans, echolocation, blood clotting, and molecular machines. Microevolutionary examples (finch beaks, moth coloration, antibiotic resistance, etc.) don't explain the origin of the new information macroevolution requires. Darwinism explains the survival but not the arrival of the fittest. The public is told "all is well" in the evolutionary camp, but scientific journal articles reveal there are real problems.

Meyer explains that *Darwin's Doubt* deals with the sudden appearance of most phyla in the fossil record without apparent precursors. Darwin thought that future exploration of the fossil record would discover the missing precursors but instead the problem has gotten worse.

Chapter 1: Darwin's Nemesis

Darwin's theory says that all life is related through universal common ancestry by a process of descent with modification. Descent with modification is brought about by random variations acted upon by natural selection. Change would necessarily be gradual. Natural selection would preserve all adaptive variations and reject harmful ones. Over geological deep time, the accumulation of these beneficial variations would eventually lead to new species and body plans. Hence Darwin envisioned the history of life as a tree with the first living thing at the base of the trunk of the tree.

Darwin was aware of the fossil record in the Cambrian (called the Silurian in his day) and admitted that it was a mystery not readily explained by his theory. Louis Agassiz, a contemporary of Darwin and a Harvard-trained paleontologist, said that the fossil record did not fit Darwin's theory, especially the Cambrian. The Cambrian is full of well preserved fossils of many very complex and different animals such as brachiopods and trilobites.⁴

¹ For a review of *Signature in the Cell* see http://tasc-creationscience.org/sites/default/files/newsletter_pdf/jan10.pdf

² There is also a video, released in 2009, entitled *Darwin's Dilemma: The Mystery of the Cambrian Fossil Record* put out by Illustra Media that features Meyer and several other ID proponents. The film has pictures of fossils and animation of what the Cambrian creatures may have looked like.

³ Reynolds DW (2013 May) The origin of information in biology, *TASC Newsletter*, http://tasc-creationscience.org/sites/default/files/newsletter_pdf/may2013.pdf

⁴ Throughout this review, references will be made to various fossil organisms without much description. The interested reader should consult the internet for images

Darwin's theory requires much time to bring about large changes. But the Cambrian records many disparate animals appearing suddenly without precursors over a relatively brief period of time, something Darwin's theory could not readily explain. Agassiz thought the fossil record refuted Darwin's theory. Other paleontologists pointed out that the general character of the fossil record—abrupt appearance, stasis, extinction—did not fit Darwin's theory.

Darwin said future research would vindicate his theory, but Agassiz said that the record already contained fossils of soft-bodied animals without hard body parts. Agassiz said the missing intermediates and precursors Darwin's theory predicted were not an artifact of the fossil record but were truly missing. Nevertheless, many of Darwin's other contemporaries embraced his theory and soon it was widely accepted. Science was shifting from "idealism," which held that animals were the product of ideas and a mind, to methodological naturalism, which holds that everything must have a natural cause.

Agassiz said the nodes in Darwin's tree of life—the intermediates that would prove Darwin's theory—were conspicuously and consistently absent from the fossil record while the end branches and twigs were always present. Darwin seemed to be explaining away the evidence—the intermediates would be found some day—instead of explaining the evidence.

Chapter 2: The Burgess Bestiary

Charles Doolittle Walcott was the first to explore the Burgess Shale in Canada. The shale contains fossils from the middle Cambrian with more variety and sudden appearance than were known in Darwin's time. Walcott collected more than 65,000 specimens. Many bizarre forms such as *Marrella* and *Hallucigenia* were found. During the Cambrian Explosion, 20 out of the 26 known phyla appeared.

The fossil record shows that disparity precedes diversity, the opposite of what Darwin's theory predicted. The biological classification system contains various categories (in order of increasing differences): species, genus, family, order, class, phylum. Different species have the closest resemblance while different phyla are very different (have different body plans altogether). Darwin's theory predicted evolution would work through small incremental changes. So, the first living thing would have slowly evolved into another species (diversity), similar to the parent species, but with some distinguishing characteristics. Over geological time, different phyla (disparity) would eventually emerge. But the fossil evidence is that most phyla appear suddenly and at the beginning of the history of life (Cambrian Explosion).

of these fossils and reconstructions of what the animals may have looked like.

Only after the appearance of the phyla do the variations in the lower taxonomic categories emerge. This pattern has been called the "inverted cone of diversity" and is the opposite of what is predicted by Darwinism.

A new system of classification has now emerged that uses similarities in molecules across various organisms to determine evolutionary relatedness. The new system assumes common ancestry. This new system often ignores the fossil evidence when proposing evolutionary trees.

There was a quantum leap in the complexity of organisms found in the Precambrian and the Cambrian. There are no intermediate forms connecting the Precambrian with the Cambrian.

The soft body parts of the Cambrian animals were well preserved. It is believed that these animals were sea creatures living near a carbonate reef near the equator. Continental drift and uplift have placed them where they are found today (Canadian Rockies). These animals were buried in some catastrophic event which excluded oxygen. The fossils are found positioned at various angles to the bedding in silt and clay.⁵

There have been various theories put forth to explain the Cambrian Explosion and its missing precursors. One is the Artifact Hypothesis. This theory claimed that the missing fossils were buried in deep sea sediments and were inaccessible. Presumably, during the Cambrian, the seas were uplifted and the Cambrian animals were washed out onto and buried on the continents which were later uplifted. However, the Precambrian layers remained at the bottom of the sea and were continuously buried under more sediment. Hence the abrupt appearance of the Cambrian fauna was an illusion created by known geological processes.

Chapter 3: Soft Bodies and Hard Facts

More recent has been the discovery of fossils in the Maotianshan Shale in China. J.Y. Chen has been the primary investigator. The Maotianshan Shale is older than the Burgess and contains even more fossils of many different phyla. Chen says that the fossil evidence does not fit Darwin's theory. Chen has famously commented "In China we can criticize Darwin, but not the government. In America, you can criticize the government, but not Darwin."

Oil companies have not found the missing fossils during deep sea drilling. However, some say the desired sedimentary layers no longer exist because of sea floor recycling (sea floor spreading and subduction). However, much of the Precambrian has survived after all and

⁵ Author's note: this evidence is consistent with a global flood and catastrophic plate tectonics.

has been found in Canada and China. These Precambrian layers have been studied thoroughly.

Some said that the missing fossils were too small or too soft to have been preserved. Evidence for bacterial colonies (stromatolites) have been found in the Precambrian. There are single celled algae fossils that have been found in the Precambrian. The late Precambrian contains many soft-bodied organisms such as lichens, algae, and protists. Slate has preserved the soft body parts of Cambrian organisms such as *Marrella splendens*. The Burgess Shale contains many soft-bodied organisms such as worms, gelatinous animals, segmented animals, and jellyfish-like animals. The existing Burgess collections represent ~70,000 specimens, 95% of which are soft-bodied or have thin skeletons.

Among the Cambrian fossils found at Chengjiang, China (part of the Maotianshan Shale) are many soft-bodied animals which, because of the fine-grained sediment, are preserved in great detail. There are corals, jellyfish, comb jellies, ringed segmented worms, segmented worms with legs, and so on. Details of the anatomy of adaptations such as eyes, intestines, stomachs, digestive glands, sensory organs, epiderms, bristles, mouths, and nerves have been observed. Sponges have been preserved in the late Precambrian; even sponge embryos undergoing cell division have been found. Some internal structures of cells have been preserved.

These discoveries discount the Artifact Hypothesis. Sponges and other Precambrian fossils have been preserved, but not precursors to the Cambrian fauna. There were many environments favoring fossil preservation in the Precambrian: phosphorites, carbonates, and shales, yet no Cambrian fossil precursors.

In many locales, the pattern of sedimentation around the Precambrian/Cambrian boundary are the same. Hence the conditions which preserved the Cambrian fossils were also present during the Precambrian, yet no Cambrian fossil precursors are found. Some geologists even say that the conditions of the Precambrian were more favorable for fossil preservation than the Cambrian.

New fossil discoveries have either had radically new body plans or fit into previously discovered phyla. This pattern of discovery makes it less and less likely that the missing precursors are missing because of poor sampling or lack of preservation. Again, the end branches of Darwin's tree are consistently found, but not the inner branches and nodes. The evidence suggests that the inner branches and nodes never existed.

According to conventional radiometric dating,⁶ the Cambrian took place between 543 and 490 million years ago, with the explosion occurring between 530 and 525 million years ago. Meyer points out that this five million year period represents one tenth of 1% of the age of the earth, assuming the earth is 4.6 billion years old. The main pulse of the Cambrian innovation has 16 new phyla and 30 new classes. By any measure, the appearance of the Cambrian fossils was abrupt.

The first appearance of the chordates (creatures related to mammals, fish, amphibians, reptiles, birds, and others that have a hollow dorsal nerve cord) is in the Cambrian.

Chapter 4: The Not Missing Fossils

Some claim that the fossils in the Precambrian are Cambrian animal precursors so there was no explosion after all. There are enigmatic animal fossils in the Ediacaran Hills in Australia (Precambrian) dated at 570-565 million years ago, but most paleontologists don't think these were Cambrian precursors. Some say that early bilaterians (e.g. arthropods and echinoderms) arose in the Precambrian.

In the late Precambrian (570-543 million years ago), there are 4 kinds of fossils found: (1) sponges, (2) *Dickinsonia* (flat air mattress like creatures), (3) trace fossils (animal tracks, burrows, fecal remains that may have been formed by worms), and (4) primitive mollusks (e.g. *Kimberella*).

These discoveries do not explain the Cambrian Explosion. Most body plans in the Precambrian do not resemble Cambrian fauna with the possible exceptions of sponges and *Kimberella*. Precambrian organisms such as *Dickinsonia*, *Spriggina*, and *Charnia* don't have a head, mouth, gut, bilateral symmetry, or sense organs like eyes. There is much disagreement about how to classify these creatures. These creatures went extinct early and have no characteristics of later organisms.

Trace fossils such as tracks, fecal remains, burrows, and feeding trails suggest worms with a head, tail, nervous system, muscular body, gut, mouth, and anus. Some scientists disagree and say trace fossils are of inorganic origin; they are either inorganic sedimentary structures, land plants, or have been misdated. Others say tracks could have been left by protists. At best, the Ediacaran trace fossils represent 4 total debatable Cambrian ancestral forms. But the Cambrian has 23 phyla, so there is still a large problem. However, these four body plans were not necessarily ancestral or transitional to the

⁶ Meyer accepts standard geological dating techniques and results. They are included here since Meyer discusses them. The discussion in no way implies that this author accepts these dating schemes or the dates mentioned.

Cambrian. Precambrian sponges are similar to those in the Cambrian so are not really a simpler precursor.

For allegedly three billion years there were only single-celled organisms, then in the Precambrian, *Kimberella*, *Dickinsonia*, and sponges arose. The transition from single-celled organisms to the multicellular organisms of the Precambrian was an enormous leap. Some say the appearance of the Precambrian biota during a 15 million year period was a mini explosion and is inexplicable in Darwinian terms. Even if one concedes that the Precambrian organisms were ancestral to the Cambrian, it all still took place in too short a time (40-50 million years) for Darwinian processes to explain.

Some say the Precambrian animal *Parvancorina* was an ancestor of arthropods, but it did not have a head, compound eyes or jointed limbs, so the superficial resemblance to trilobites may be misleading. Some say that *Arkarua* is ancestral to Echinoderms (starfish, sand dollar, etc.) that have five-fold symmetry. However, *Arkarua* lacks a vascular system, so its relationship to Echinoderms remains uncertain. *Vernanimalcula* is believed by some to be a precursor to bilaterians, but its form is unlike any known bilaterians. Some have said the fossil impressions are just mineral deposits and not from an animal.

Differentiated and complex Precambrian forms could not have been precursors to Cambrian phyla, i.e., there are no obvious similarities. On the other hand, simple undifferentiated Precambrian forms could have been ancestral to all Cambrian forms but provide no evidence by themselves of the alleged gradual emergence of the complex anatomical novelties that define Cambrian animals. There is no evidence of the gradual development of these novelties in the fossil record.

Chapter 5: The Genes Tell the Story?

Historically, similarities in structure between different organisms were thought to have been derived from a common evolutionary ancestor. The more similar the structures, the more recent the split from the last common ancestor. For example, creatures with five digits such as horses, frogs, humans, and bats are all thought to have had a common ancestor that had five digits. The common structure is said to be homologous. Today, the degree of difference between the monomer sequences in DNA, RNA, and proteins of different organisms are used to determine the time since the last common ancestor (assuming a constant mutation rate). Note that the whole scheme of homologies is based on the *assumption* of common ancestry.

Some biologists think that comparative anatomy and molecular homologies of animals which are alive now and which arose (phyla) during the Cambrian could be the way to determine the evolutionary history of the

Cambrian biota. Presumably, if one knew the mutation rate of a particular gene one could calculate when the last common ancestor of related organisms lived. These biologists want to construct the Precambrian/Cambrian tree of life. They say that the abrupt appearance of the Cambrian biota in the fossil record is an illusion. They claim that the molecular evidence shows that the common ancestors of the Cambrian animals lived between 0.6 and 1.2 billion years ago.

The use of “molecular clocks” to determine when the last common ancestor of two organisms lived assumes a constant and similar mutation rate of the same gene in animals since divergence. Several studies with various genes have allegedly pointed to a common ancestor for Cambrian animals that lived one billion years ago. However, many other studies with various molecules have given very different results even though there was supposed to be one common ancestor.

Estimates for the time of the first common ancestor vary from 100 million years to 1.5 billion years before the Cambrian explosion. Some molecular clock studies indicate the common ancestor lived *after* the Cambrian Explosion! The assumptions of constant mutation rates and common ancestry may both be wrong but in any event have not been supported by the data.

In fact, it is known that “molecular clocks” don’t all tick at the same rate and that the rates don’t always remain constant. Even the same molecule in different animals may mutate at different rates. Therefore estimates about when certain divergences occurred may be incorrect, the phylogenies could be wrong, the dating of the fossils could be wrong, etc.

Descent with modification from a common ancestor is assumed and not demonstrated by the data. Divergence points in phylogenetic studies may be artifacts of software written to find divergence points. Hence, alleged Precambrian ancestors found with molecular clocks have not been demonstrated in any rigorous way.

Some still hold on to the artifact hypothesis. They say that soft-bodied precursors of some Cambrian phyla with some hard body parts may have existed but did not fossilize. However, many soft-bodied animal fossils have been found in the Precambrian and Cambrian but were not the missing fossils sought. In addition, many animals with hard body parts need those parts to live; it is unclear that a purely soft-bodied precursor would have been viable.

Chapter 6: The Animal Tree of Life

Some claim that the family trees derived from fossil and molecular evidence are the same. However, the fossil evidence in the Precambrian does not point to a universal common ancestor or a specific tree of life.

Several studies with various genes allegedly point to a common ancestor that lived one billion years ago. However, trees based on different molecules are often different. Many now doubt that evolution follows a tree like pattern. One study looked at 2,000 genes in 6 animals spanning 4 phyla (chordates, echinoderms, arthropods, nematodes). No consistent pattern of ancestry was found. Another study tried to determine the evolutionary history of 17 taxa across 50 genes; again, no consistent pattern was found. Some say that animals diverged so rapidly in the Precambrian and Cambrian that some genes did not record much of a signal. Then after much time, the weak signal was lost. Ironically, this admits that the Cambrian radiation was very rapid and not the result of some gradual process starting in the deep Precambrian.

If molecular and anatomical evidence converged, this would be strong evidence for macroevolution. However, they contradict one another. The phylogeny of bilaterian animals (having symmetry along the head-to-tail axis) has been built upon the coelom (central body cavity), assuming this feature was homologous. However, a different phylogeny is obtained when 18S ribosomal RNA is assumed homologous. Later datasets have not solved the problem. There are many other examples given in the book.

Trees based on different anatomical features of developmental characteristics often conflict. All metazoans (multicellular eukaryotes) show one of two orders in their embryological development: mouth first (protostomes) or anus first (deuterostomes). There are also two modes of germ cell formation during embryogenesis: preformation and epigenesis. In preformation, cells inherit internal signals that lead to the formation of RNA that triggers the formation of sex organs. In epigenesis, there are molecular signals from other tissues causing some cells to differentiate into germs cells. Now one might expect that the descendants of an organism would continue to have the same developmental order or mechanism of sex cell differentiation. However, one finds development orders and mechanisms of sex cell differentiation scattered randomly in metazoan animal groups without any pattern due to ancestor/descendant relationships. Hence, no coherent trees can be constructed using these criteria. Moreover, for invertebrates, different phylogenetic trees result when using the pattern of body symmetry, the number of germ layers within the body, the nature of body cavity, and the type of serial repetition (segmentation).

Convergent evolution is also a problem. Convergent evolution occurs when animals from different phyla have a similar trait which presumably was not possessed by the last common ancestor. In other words, the same trait evolved twice independently. As will be discussed in the second part of this review, the evolution of some

complex adaptations is extremely unlikely, let alone twice.

An incoherent picture of the history of life emerges from the evidence. Instead of a single tree there is a forest. These results cast doubt on the assertion that there ever was descent from a common ancestor. Hence, the fossil evidence must be taken at face value: the Cambrian fossils appear abruptly without precursors because they did emerge in a short period of time, and there never were any precursors.

The second part of this review will be published in the November, 2013 TASC newsletter. ☞

COMING EVENTS

Thursday, October 10, 7:00 pm, Providence Baptist Church, 6339 Glenwood Ave., Raleigh, Room 631

We will have a presentation about dinosaurs! You may have heard of the discovery of *Tyrannosaurus rex* soft tissue within fossil bones, which was so surprising that many scientists initially doubted it. Are there any other amazing, unexpected, scientific discoveries about dinosaurs? Yes. Many other interesting scientific findings about dinosaurs will be presented, including the results of carbon-14 dating of dinosaur fossils. The implications of these findings will be explored also.