

# TITANS

**of the Earth, Sea, and Air**

*by Dr Jonathan Sarfati & Joel Tay*

## Titans of the Earth, Sea, and Air

by Dr Jonathan Sarfati & Joel Tay



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Stegosaurus

# Preface

## Why this book?

What is the first thing that comes to your mind when you hear the word ‘dinosaur’? Does it conjure up images of gigantic ferocious creatures that once roamed the earth—along with images of volcanos and strange-looking plants? Why do so many of us even picture dinosaurs this way?

Could it be that our thoughts betray the subconscious influence of the culture on our minds? More than any other topic, dinosaurs have been used to promote the idea of ‘millions of years’ and evolution in the minds of the general public. From an early age, children are exposed to the idea that there was an ‘age of dinosaurs’—millions of years before man ever entered the evolutionary big picture. Movies and books like the *Jurassic Park/World* series reinforce this idea to both children and adults alike. Unfortunately, this impacts the faith of many when they realize that the Bible teaches the earth is only around 6,000 years old.

However, we believe that the Word of God allows us to make good sense of dinosaurs. This book demonstrates that good science supports the Bible. Far from being a stumbling block to the Christian faith, dinosaurs are consistent and are best understood when we start with a biblical worldview.

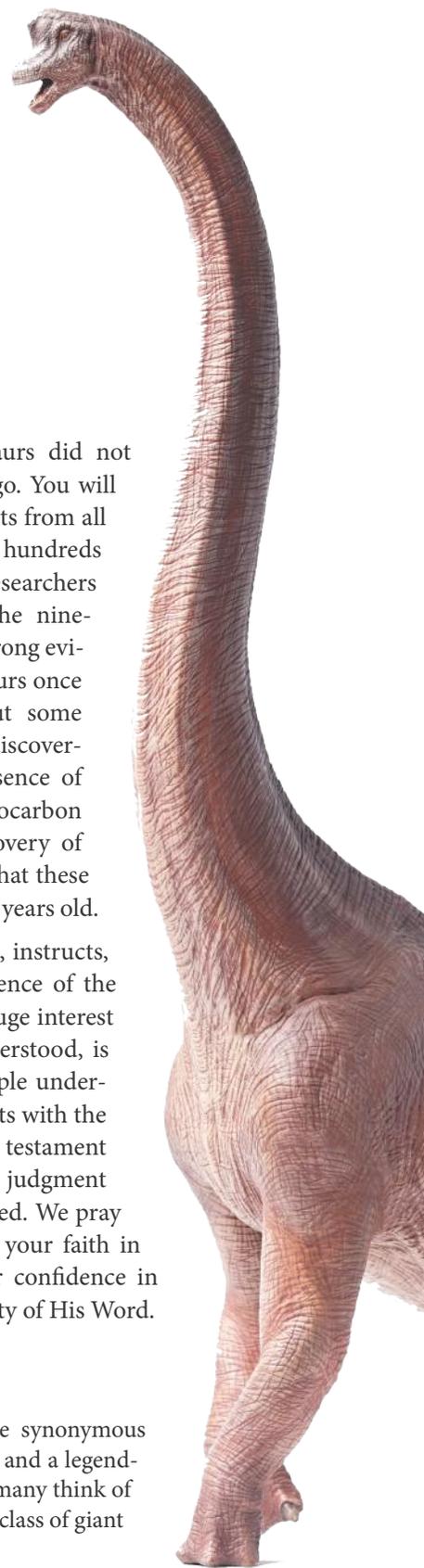
In this book, we cover what dinosaurs were (and what they were not). What were the biggest (and smallest) dinosaurs? What did they eat, and how many kinds of dinosaurs were there? How can we be sure that most of the dinosaur fossils we find today were caused by the global Flood of Noah’s day? And did you know that the Bible tells us that dinosaurs lived after the great Flood and were onboard the Ark? How could such huge creatures fit on board?

We will learn that dinosaurs did not die out millions of years ago. You will read about dinosaur artefacts from all over the inhabited world, hundreds of years before modern researchers (re-)discovered them in the nineteenth century. These are strong evidence that man and dinosaurs once lived together. Read about some recent ground-breaking discoveries on dinosaurs—the presence of dinosaur soft tissue, radiocarbon dating, and even the discovery of dinosaur DNA—evidence that these bones cannot be millions of years old.

We hope this book inspires, instructs, and equips you in the defence of the faith. We believe that the huge interest in dinosaurs, properly understood, is a great way of helping people understand how the Bible connects with the real world. Dinosaurs are a testament to God’s creation and His judgment of the world that then existed. We pray that this book strengthens your faith in Christ and shores up your confidence in the inerrancy and infallibility of His Word.

## Why ‘Titans’?

The word *Titan* has become synonymous with beings of great strength and a legendary status. This is often how many think of dinosaurs. The Titans were a class of giant



Brachiosaurus

semi-divine beings in the Greek creation myth *Theogony* (Θεογονία= *Birth of the gods*), by Hesiod (Ἡσίοδος), who lived in the 8<sup>th</sup> century 700 BC. They were offspring of the male ‘Heaven’ god, Ouranos or ‘Uranus’ (Οὐρανός) and the ‘earth’ goddess Gaia (Γαῖα). Ouranos was afraid of his children, so he hated them and hid them away. Eventually, Gaia plotted with the youngest and strongest, Kronos (Κρόνος, = Saturn in Roman mythology), to overthrow Ouranos and exact horrifying revenge. The next time Ouranos “came ... longing for love”, Kronos sprang from his ambush position and castrated Ouranos. For this reason, Ouranos named Kronos and his siblings ‘Titans’ (*Titanes* Τιτᾶνες) meaning ‘strainers’, because “they strained (τιταίνοντες/*titainontas*) and did presumptuously a fearful deed.”

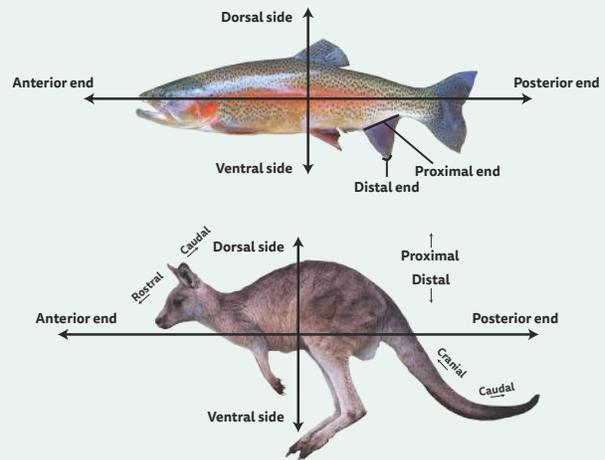
In Greek mythology, the reign of Kronos was a ‘Golden Age’ for mankind. Eventually, most of the Titans themselves warred against their children, the future Olympian gods, led by Zeus, the youngest child of Kronos. The Titans lost and were thrown into the deepest part of the underworld, Tartaros. Thus, in the Greek myths, the Titans had no more contact with man. Similarly, the ‘titans’ of this book once had contact with man, but no longer (see Ch. 15 and 16).

## Scientific, technical, and dating terms

- Standard SI unit symbols are used throughout. For example, 1 metre (m)  $\cong$  3.28 feet. For dinosaur masses, the most common unit is the tonne (t) =  $10^3$  kg. 1 kg  $\cong$  2.2 lb.
- Note that mass is different from weight. Weight is the strength of gravity on an object. So the dinosaurs would have the same mass on the moon but  $\frac{1}{6}$  the weight. However, many people, including scientists, sometimes slip into the language of dinosaurs ‘weighing’ so many tonnes.
- The unit of weight must be a force unit, the newton (N). 1 kg on earth weighs  $\sim$ 9.81 N, and 1 lb weighs  $\sim$ 4.45 N. Bite strengths are also forces, so must likewise be measured in newtons. Force per unit area (pressure) is N/cm<sup>2</sup>; 1 N/cm<sup>2</sup> = 10 kPa  $\cong$  1.45 psi.
- We also use the standard evolutionary names for rock strata, so communication is possible. But we make it clear that we deny the claimed millions of years age of these rock layers. We

also use the objective stratigraphic terms such as “upper Cretaceous” and “lower Jurassic”, rather than the evolutionary terms “late Cretaceous” and “early Jurassic”, since these layers were all laid down during the Flood year of Noah’s time.

- Ga = giga-annum or a billion ( $10^9$ ) years ago; Ma = mega-annum or a million years ago; ka = kilo-annum or a thousand years ago—these are (alleged) *dates*. For *duration*, it is Gyr, Myr, kyr, e.g., evolutionists believe that the Mesozoic Era was 252–65 Ma; thus, it lasted 187 Myr.
- Anatomical directions (see diagrams)
  - Anterior vs posterior: front vs back. The anteroposterior axis goes from the front to back.
  - Ventral vs dorsal: stomach vs back side.



- Caudal vs cranial or rostral: Caudal = towards the tail tip; cranial = towards the top of the skull; rostral = the tip of nose or beak.
- Proximal vs distal: towards the trunk vs towards the tips of limbs.
- CBP = Creation Book Publishers.
- Throughout the book, we will highlight terms (in **bold blue**) that are further explained in the Glossary in the Ancillary section at the back of the book.



*Tyrannosaurus rex*

# Worldview and dinosaurs

## Summary

Dinosaurs have fascinated scientists from the time they were first discovered. These creatures were different from all living creatures they had previously seen. Scientists realized they were looking at the remains of some of the largest land animals that ever lived. But what were they dealing with?

The best way to understand them is by using the historical framework that God revealed in Scripture. The Bible tells us that the creation of the earth was just a little over 6,000 years ago, in the space of six ordinary-length days. This is the true beginning of dinosaurs.

God originally created everything to be “very good”, including the dinosaurs. But our foreparents disobeyed God, and God subjected the world to death and degradation. About 1,500 years after creation, mankind had become so evil that God sent a global Flood to wipe almost all of them out. But He preserved eight people and at least one pair of all land vertebrate kinds so they could repopulate the earth. This must also logically include dinosaurs.

But the evolutionary view says instead that the earth is 4.5 billion years old. And somehow matter, time, and energy became the first living cell. After much more time, energy, and natural selection, bacteria somehow became brachiosaurids. There was allegedly an ‘age of dinosaurs’ 243–66 million years ago. This is long before man was supposed to have swung down from the trees.

## Our starting point

*Creation Ministries International* (CMI) is often called a ‘young-earth creationist’ ministry, but we are really a

*biblical creationist* ministry.<sup>1</sup> Views such as the ‘billions of years’ in the big bang and ‘millions of years’ of evolution are not derived *from* the Bible. The ‘young-earth’ view is not our starting point, but is derived from our *real* starting point, the Bible as God’s inerrant written Word.<sup>2</sup>

All philosophical systems, not just Christianity, start with *axioms* or *presuppositions*. These are the starting assumptions that underpin every other. There are good reasons for accepting the axioms of Scripture as true because they lead to a consistent view of physical and moral reality, which other axioms can’t provide. Specifically, the ‘young-earth’ view is not an axiom, but a *theorem* logically deduced from the biblical propositions.

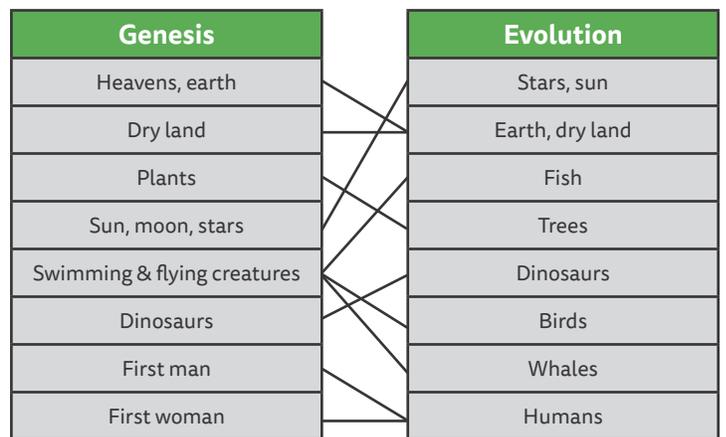
How does this work? Genesis contains many Hebrew grammatical features that show it presents a straightforward history of the world from its creation.<sup>3</sup> The New Testament authors, and Jesus Himself, affirmed this history. In particular, Genesis, backed up by the rest of Scripture, unambiguously teaches several facts about the history of the earth and life upon it. We outline them below and refer to some of our previous works for more information. The other chapters of this book reinforce most of them:

- God created the heavens, Earth, and everything in them in six consecutive normal days, the same as those of our working week (Exodus 20:8–11).<sup>4</sup>
- God created many different plants and animals that could reproduce “after their kinds”. This is the opposite of evolution, which claims that all living creatures evolved from a single-celled organism, which itself came from non-living chemicals.<sup>5</sup>





- From Genesis 5 and 11, and various other time markers in the Bible’s history, we can deduce that man was created about 6,000 years ago.<sup>6</sup>
- Earth is about 6,000 years old since Jesus said that mankind was there from the ‘beginning of creation,’ not billions of years later (Mark 10:6).<sup>7,8</sup>
- Adam sinned and brought physical death to mankind (Romans 5:12–19; 1 Corinthians 15:21–22).<sup>9,10</sup>
- Since man was the federal head of creation, the whole creation was cursed (Romans 8:20–22),<sup>11</sup> which included the death of animals.<sup>12</sup>
- This included the end of the original vegetarian diet for both humans and animals (Genesis 1:29–30). While God didn’t permit humans to eat meat until after the Flood (Genesis 9:3), many animals became carnivorous before that.
- About 1,500 years after creation, God judged the world by a globe-covering Flood<sup>13</sup>—not a local flood.<sup>14</sup> Jesus and Peter compared this Flood with the coming Judgment (Luke 17:26–27; 2 Peter 3:3–7). This destroyed all land vertebrate animals and people not on the ocean-liner-sized Ark.<sup>15</sup>
- Since the fossils show evidence of dead humans and animals, the fossil record must have been laid down after Adam’s sin. All views that try to mix millions of years with the Bible place the fossils long before Adam.<sup>16</sup> If so, death is not the result



**Figure 1:** The evolutionary order of events conflicts with the Genesis account of creation (each time the centre lines intersect). For example, in Genesis, land creatures like dinosaurs were created after the swimming and flying creatures, though evolution says the opposite.

of sin, which undermines the Gospel’s claim that Jesus died for our sin.<sup>17</sup> In reality, most of the fossil record was caused by the Flood.

- A century or more after the Flood, in the “days of Peleg” (Genesis 10:25), God divided the earth that “had one language and the same words” (Genesis 11:1).<sup>18</sup> This division was God’s judgment on the people at Babel for disobeying His command to spread out and repopulate the earth after the Flood. So, God came down and forced them to disperse.<sup>19</sup>

## Evolutionary bias vs biblical coherence

It's important to realize that 'scientific data' does *not* speak for itself, but is *interpreted* within a framework. Evolutionists start with the axiom of *naturalism* or *materialism*. They mean that nature or matter is all that exists; so, God (if He even exists in their framework) performed no miraculous acts of creation. Theistic evolutionists don't claim that matter is all that exists, but their view of history differs in no *practical* way from that of atheistic evolutionists. Biblical creationists have the *same* data and observations, but interpret them within the framework of God's Word.

Both creationists and evolutionists may appeal to scientific as well as philosophical assumptions outside of science/empiricism. Biblical creationists believe in a creator who is actively involved in His creation and who not only created all things, but also upholds His creation (Colossians 1:15–17). Thus, the existence of miracles is logically consistent with a Christian worldview.

'**Natural law**' came from a biblical worldview that teaches a God of order, not of confusion (1 Corinthians 14:33). This is why science began with a biblical worldview and was 'stillborn' in other ancient cultures such as Greece and China. But, if there is no creator, or if Zeus and his gang were in charge, why should there be any order at all? So, on the one hand, materialists assume some kind of 'natural law', and on the other hand, they cannot explain why there should even be a 'natural law'. Indeed, the biblical worldview has been both historically and logically fruitful for the foundation and advancement of science.<sup>20</sup>

Miracles are not a 'violation' of 'natural laws', because natural laws are *descriptions* of the way that God *normally* operates in sustaining the universe. Conversely, a miracle is just a description of God working in an *extraordinary* way within the universe. Therefore, miracles are an *addition* to natural law, not a 'violation'.<sup>21</sup>

But apart from instances in the Bible that tell us that a miracle is involved, creationary scientists have no problem operating consistently within the scientific paradigm. In contrast, most evolutionists operate within a materialistic worldview and cannot appeal to miracles. In a materialistic worldview, appeals outside 'known scientific law' necessarily result in a self-contradictory worldview. For that matter, even when they appeal to

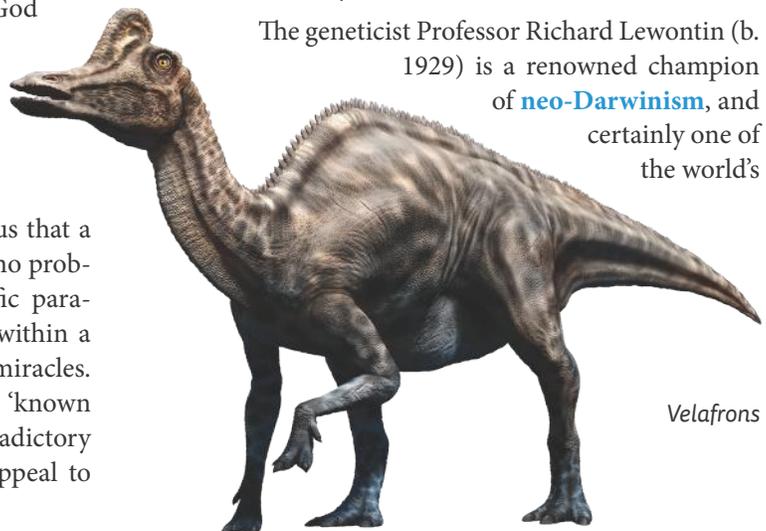
natural law, they are hijacking a Christian concept. There is nothing in atheism *per se* that implies that the universe should follow laws. That is, the proposition "there is no God" does not imply "the universe is orderly."

Yet evolutionists often appeal to philosophical assumptions from outside of science. In particular, evolution is a theorem inferred from their axiom of materialism. Evolution is essentially the idea that things made themselves. It requires evolutionists to deny 'scientific laws' such as biogenesis, thermodynamics, and information theory. Thus, if evolution is true, it contradicts even the materialism it is derived from. Evolution includes these unproven and unscientific ideas:

- Nothing gave rise to something at an alleged 'big bang' (cosmological evolution).
- Non-living chemicals gave rise to the first living cell (chemical evolution).
- Single-celled organisms gave rise to multi-celled organisms (biological evolution).
- Invertebrates (animals without backbones) gave rise to vertebrates (animals with backbones).
- Ape-like creatures gave rise to man.
- Non-intelligent and amoral matter gave rise to intelligence and morality.
- Man's yearnings gave rise to religions.

So, it's not a question of biased religious creationists versus objective scientific evolutionists. Instead, it is the biases of the Christian religion versus the biases of the religion of secular humanism. They result in different *interpretations* of the *same* scientific data. The creationists embrace a coherent worldview when they appeal to additions to 'natural law', but the same results in a contradictory worldview for evolution.

The geneticist Professor Richard Lewontin (b. 1929) is a renowned champion of **neo-Darwinism**, and certainly one of the world's



Velafrons



Allosaurus at Dinosaur National Monument, Utah  
Keaton Halley

leaders in promoting evolutionary biology. He wrote this very revealing comment (the italics were in the original). It illustrates the implicit philosophical bias against Genesis creation regardless of whether or not the facts support it:

We take the side of science *in spite* of the patent absurdity of some of its constructs, *in spite* of its failure to fulfil many of its extravagant promises of health and life, *in spite* of the tolerance of the scientific community for unsubstantiated just-so stories, because we have a prior commitment, a commitment to materialism.

It is not that the methods and institutions of science somehow compel us to accept a material

explanation of the phenomenal world, but, on the contrary, that we are forced by our *a priori* adherence to material causes to create an apparatus of investigation and a set of concepts that produce material explanations, no matter how counter-intuitive, no matter how mystifying to the uninitiated. Moreover, that materialism is absolute, for we cannot allow a Divine Foot in the door.

The eminent Kant scholar Lewis Beck used to say that anyone who could believe in God could believe in anything. To appeal to an omnipotent deity is to allow that at any moment the regularities of nature may be ruptured, that miracles may happen.<sup>22</sup>

## Operational/experimental vs origins/historical science

What about Lewontin's concern in the last paragraph that materialism is essential for science? To answer that, we must differentiate between two types of 'science': *experimental (operational) science* and *origins or historical science*.<sup>23</sup> Normal (operational) science deals only with repeatable, observable processes in the *present*, while origins science helps us to make educated guesses about origins in the *past*.

### Operational science

Science is, by nature, always subject to change. For example, there are very few scientific theories that can go for decades without small modifications. Part of this is due to the inductive, and therefore subjective, nature of science. However, science in general allows us to exercise a pragmatic understanding of the world around us. Operational science, in particular, allows us to experiment and disprove hypotheses that do not line up with the scientific data. Experimentation sets it apart from historical science. With historical science, we cannot travel back in time to carry out experiments on historical events. All we can do is to piece together clues in the present and

make an educated guess of what previously took place. This makes historical science far more subjective compared to operational science.

Operational science has led to many improvements in the quality of life, e.g., putting men on the moon and curing diseases. Because creation was *finished* at the end of Day 6, biblical creationists would try to find natural laws for every aspect of operational science. They would not invoke a miracle to explain any repeating event in nature *in the present*.

### Historical science

In contrast, evolution is a speculation about the unobservable and unrepeatable *past*. So even if it is called science, it is not the same as operational science. One of the leading evolutionary biologists of the 20<sup>th</sup> century, Ernst Mayr (1904–2005), admitted just that:

For example, Darwin introduced historicity into science. Evolutionary biology, in contrast with physics and chemistry, is a historical science—the evolutionist attempts to explain events and processes that have already taken place. Laws and experiments are inappropriate techniques for the explication of such events and processes. Instead, one constructs a historical narrative,



Operational Science



Historical Science

consisting of a tentative reconstruction of the particular scenario that led to the events one is trying to explain.<sup>24</sup>

Biblical creation is also a claim about the past. Thus, both creation and evolution come under *origins* or *historical science*. Rather than observation, origins science uses the principles of *causality* (everything that has a beginning has a cause<sup>25</sup>) and *analogy* (e.g., we observe that intelligence is needed to generate complex coded information in the present, so we can reasonably assume the same for the past). And because there was no material intelligent designer for life, it is reasonable to invoke a non-material designer for life. Creationists invoke the miraculous only for origins science, and as shown, this does *not* mean they invoke it for operational science.

To explain further: the laws that govern the *operation* of a computer are not those that made the computer in the first place. That is, we can study the computer's operation in terms of the laws of electron behaviour in semiconductors. But these laws didn't make the computer; this required an intelligent engineer. And note that proposing a *designer* for a computer is not denying that the computer works by repeatable laws of physics.

Indeed, another prominent evolutionist made a similar comparison, Edward Osborn ("E.O.") Wilson (1929–2021). He was a world-renowned expert on ants and a pioneer of sociobiology and biodiversity. He explained:

If a moving automobile were an organism, functional biology would explain how it is constructed and operates, while evolutionary biology would reconstruct its origin and history—how it came to be made and its journey thus far.<sup>26</sup>

Similarly, it is good science to propose that the enormous information in the genetic code was *originally* designed. This does not preclude us from believing that it *works* entirely by the laws of chemistry involving DNA, RNA, proteins, etc. Conversely, we can agree that the coding machinery works according to reproducible laws of chemistry. But this does not prove the sufficiency of the laws of chemistry to build it from a primordial soup.

## The poster children for evolution!

Dinosaurs have been the subject of media interest, fascinating documentaries, and Hollywood blockbusters for many decades now. And invariably, they are associated

with an alleged 'great age of dinosaurs' from 243–66 million years ago, where these great creatures dominated the earth. Even many young children parrot that they died 66 million years ago when a giant asteroid hit the earth and wiped them out. One of the authors (JS) remembers that his first introduction to millions of years was through dinosaurs when he was only seven years old. Some children today even echo that dinosaurs grew feathers and evolved into birds.

These popular views contradict the biblical creation view outlined above. Therefore, it's imperative to deal with the topic. Dinosaurs are *not* proof of evolution. Rather, they are a powerful testimony to the awesome power of the Creator God of the Bible. Having the right interpretative filter when studying this subject is the key.

## Book outline

We need to define what we are talking about. So, what does the word *dinosaur* mean? And what distinguishes dinosaurs from non-dinosaurs? Then, after defining the term, determine the major groups of dinosaurs. Were they warm- or cold-blooded? Were they really the 'pea-brained', lumbering brutes that older books portray? Some dinosaurs were undoubtedly enormous, but how big were they? And what was *really* the biggest of them all? See Chapter 3 for answers to these questions, as well as the meaning of 'created kinds'.

But how did dinosaurs become an issue? It began with people discovering the bones of creatures that they had never seen. They realized that they belonged to a new type of reptile, named 'dinosaur' in 1841. Ever since then, people have raced to try to find new types of dinosaurs. At times, there was an infamous bitter rivalry, especially in late 19<sup>th</sup>-century America. Dinosaurs have been found all over the world. Chapter 2 covers the history of their discovery.



## What can we know?

Can science actually answer all of these questions? The answer is no! Our task is more difficult because no person alive today has seen a dinosaur. So how can we be even sure what they looked like?

There is enough evidence to have a good idea of the body shape at least. We have dinosaur bones, and the muscle scars provide evidence for the position and size of the muscles. In many cases, we even have some skin or other soft tissue, much to the surprise of evolutionists (see Ch. 13). Finally, in several cases, we have 3-dimensional preservation of the body shape and its organs. From these, we can see the enormous variety in these magnificent creatures of the land, the dinosaurs (see Ch. 5–9), as well as non-dinosaur reptiles of the sea and air (Ch. 10). These can fascinate people of all ages. From ages about 7–10, one of the authors (JS) learned everything he could get his hands on about them, and even modelled a chess set of dinosaur figurines.

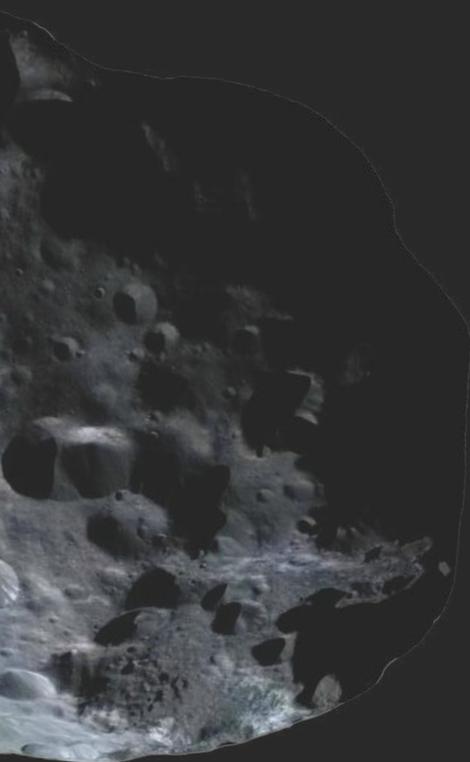
What did these great creatures eat? We know from the Bible that God created all of them to be plant-eaters. But some became meat-eaters after the Fall and before the Flood. Sometimes dinosaur remains are so well preserved that we have remnants of their last meal (see Ch. 11).

Why did dinosaurs become extinct? The fossils are a clue: the Flood buried many. Indeed, they provide strong evidence that this Flood *did* occur (see Ch. 12). But some survived on the Ark (see Ch. 14), which explains how we have records of humans seeing them (Ch. 15). Sadly, it's not likely that any are still alive (Ch. 16).

But wait, you might be thinking—maybe some are alive, but are called “birds”. Actually, no. The claims that dinosaurs evolved into birds are fraught with problems (see Ch. 17 and 18).

## What does all this mean?

We hope that this book provides much fascinating information about unquestionably fascinating creatures. But in the last chapter (19), we want to tie it all together into the biblical framework outlined above. Far from being evidence for millions of years and evolution, dinosaurs fit best with the Bible's history. We want people to know that the Bible can and should be trusted—and dinosaurs, properly understood, are a huge help and witness to God's creation.



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Sir Richard Owen

# 2

# History of dinosaur discoveries

## Summary

Centuries after dinosaurs died out, scientists beginning in the 17<sup>th</sup> century discovered bones of creatures no one alive had seen. This began in the UK, but the USA proved to be a very fruitful dinosaur hunting ground. The competition to discover dinosaurs could be intense, as in the Bone Wars (or Great Dinosaur Rush) in the late 19<sup>th</sup>-century USA. Many of the most famous dinosaurs were (re)discovered in these wars.

Dinosaurs captured the popular imagination as slow, stupid, lumbering giants. But the ‘Dinosaur Renaissance’ beginning in the late 1960s has substantially revised this. Now, we know that dinosaurs were very active creatures.

In recent decades, some very interesting dinosaurs have been found in China and Argentina. Some of these are among the largest dinosaurs ever found.



Robert Plot

## Premodern

There should be no doubt that such creatures once roamed the earth. We have many of their fossil bones and some trackways. This chapter concerns the history of *fossil* discoveries after dinosaurs had become extinct.

The fossil hunters were really *re*-discovering dinosaurs. Long before this, dinosaur bones were known to the ancient Chinese—the 4<sup>th</sup>-century historian Chang Qu discussed findings of what were considered to be dragon bones. There is also evidence that ancient people had seen living dinosaurs, but this is covered in chapter 15.

## Modern

The modern period began in 17<sup>th</sup> century England, where scholars discovered bones that they knew were not part of any creature alive today.

## Robert Plot (1640–1696)

The modern discovery of dinosaurs begins in 1677 with Robert Plot, an eminent English naturalist. He was later appointed Professor of Chemistry at the University of Oxford, and First Keeper of the Ashmolean Museum.<sup>1</sup> In *The Natural History of Oxford-shire*, Plot described the lower end of a femur that weighed almost 9 kg.<sup>2</sup> He initially thought that it was from an elephant. But he later realized that the bone was different from elephants, humans, horses, and oxen. However, he came to the strange conclusion that the bone must have been from giant men or women.<sup>3</sup>

Many people today believe that Robert Plot’s bone was part of a *Megalosaurus* femur. But Plot did not know

what the femur was during his time, nor was the specimen named *Megalosaurus* until many years later. Unfortunately, none of Robert Plot's fossil specimens exist today, and all we have are copies of his illustration.

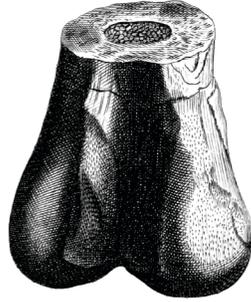
## William Buckland (1784–1856)

The identification of Plot's femur as belonging to *Megalosaurus* would only come many years later through William Buckland. He was an Anglican clergyman, paleontologist, and a leading geologist in England. He was appointed as the first Reader of Mineralogy at Oxford University in 1813 and was endowed with a second Readership in Geology in 1819. He went on to be appointed as the Canon of Christ Church in 1825 and Dean of Westminster in 1845. During his time at Oxford, Buckland resided at the Old Ashmolean building (now the History of Science Museum). Just as Robert Plot was the first Keeper of the Ashmolean Museum, Buckland served as an unofficial curator over the museum's collection.<sup>4</sup>

Georges Cuvier (1769–1832), a well-known opponent of evolution and the 'founding father of paleontology', visited the University in 1818. On this visit, he was shown

several huge unidentified teeth and jaw. Cuvier realized that the bones belonged to a giant reptilian-like animal.

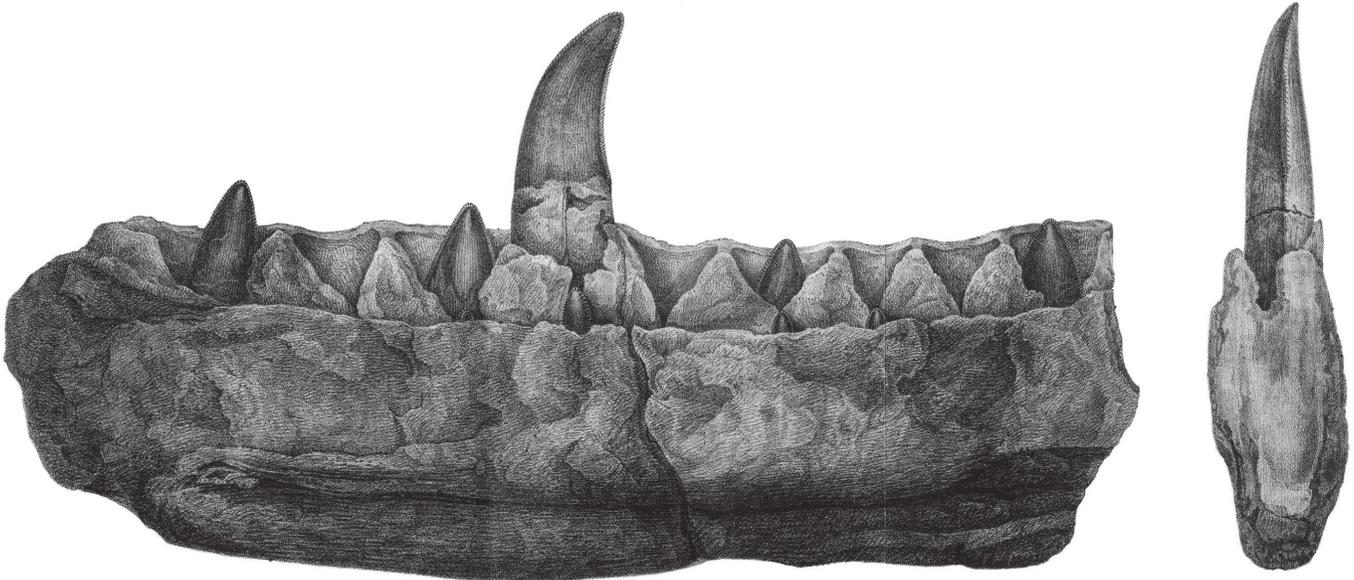
After he informed Buckland, Buckland began to study the bones more closely.



Robert Plot's illustration of a 'giant human bone', which we now know to be the femur of the dinosaur, *Megalosaurus*.

In 1824, Buckland became the first to publish a scientific paper describing a dinosaur.<sup>5</sup> He called his specimen *Megalosaurus*, meaning, 'great lizard'. *Megalosaurus bucklandi* is now known to have been a 9-m-long meat-eating dinosaur that walked on two legs. Now classified as a theropod, the group includes *T. rex* (see Ch. 7). However, when first discovered, it was believed to be a 15-m, four-footed reptile.

Unfortunately, Buckland was influenced by the idea that the rock layers were a record of vast periods of time in Earth history. So, rather than accepting the original meaning of Scripture, he held to a form of the Gap theory.<sup>6</sup> Buckland allegorically interpreted the word 'beginning' in Genesis to refer to an undefined period with countless cycles of creation of new plant and animal groups. Although he also professed belief in a global Flood in Noah's day, he actively and vocally rejected the view of the 19<sup>th</sup> century scriptural geologists. They showed that the rock layers are consistent with what would be expected from the global Flood.<sup>7</sup>



Anterior extremity of the right lower jaw of the *Megalosaurus* from Stonesfield near Oxford.

Buckland wrongly assumed that the Noahic Flood could only have contributed to a small number of strata in the geological record. He pointed to hyena remains in a cave and assumed that these creatures lived before the global Flood. Since only a thin layer of mud covered those bones, the global Flood did not contribute much to the geological strata. Buckland claimed that the thick rock layers under the hyena bones had to be evidence of vast ages of time before the Genesis Flood. Buckland even published a full-scale treatise, *Reliquiae Diluvianae, or, Observations on the Organic Remains attesting the Action of a Universal Deluge*. Here, he argued against the biblical view of creation based on his interpretation of those cave remains.<sup>8</sup>

Of course, he was mistaken since, as most biblical creationists point out today, caves were likely formed by hydrothermal waters of the Flood.<sup>9</sup> So, any hyenas that lived in caves must have been post-Flood. Same with the thin layer of mud on top of their bones. In other words, the real Flood deposits would have to be the vast layers that made up the strata below (not above) those bones. Ironically, these are the very same layers Buckland interpreted as evidence for vast ages of time.

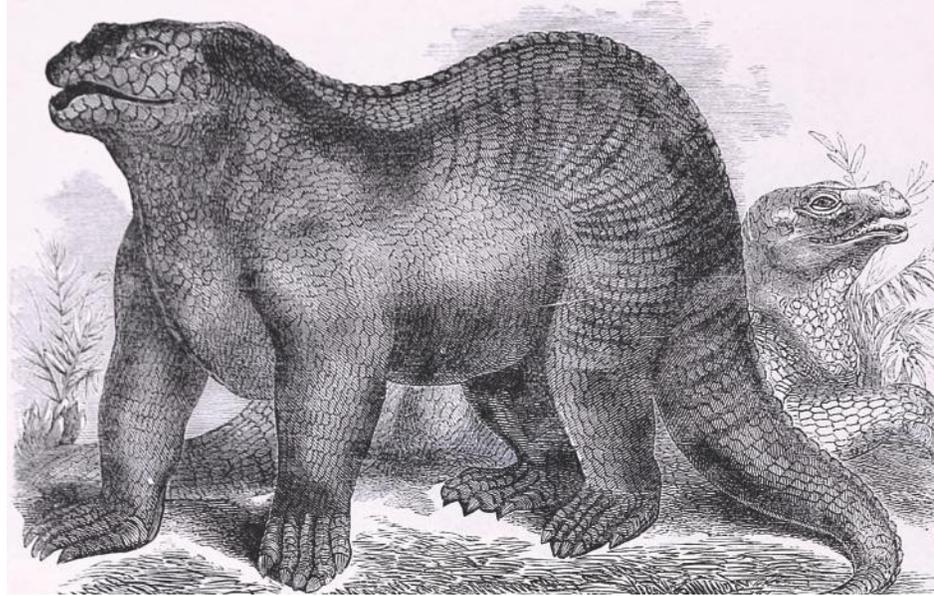
## Gideon Mantell (1790–1852)

In 1822, around the same time as Buckland, obstetrician and paleontologist Gideon Mantell began to study several huge unidentified teeth. As with Buckland's bones, Cuvier was consulted. He suggested that they resembled that of a giant reptile, but this time it was a plant-eater. Mantell thought the teeth closely resembled iguana teeth except they were twenty times larger; so, he named this creature *Iguanodon*, meaning 'iguana tooth'.

Some of the earlier reconstructions of *Iguanodon* were not very accurate. Mantell wrongly assigned the thumb spike to the tip of the snout, not unlike that of a rhinoceros horn. And just like Buckland's *Megalosaurus*, Mantell presented this creature as a four-footed reptile.<sup>10</sup>

At first, Buckland, as well as Cuvier, dismissed the teeth as rhinoceros' teeth. But they admitted their error, and Mantell got to name an enormous hitherto unknown herbivorous reptile. He first wanted 'Iguanosaurus' ('iguana lizard'). But since an iguana is itself a lizard, this

term would be redundant. So, his friend, clergyman and geologist William Conybeare (1787–1857), persuaded him that *Iguanodon* ('iguana tooth') was better.<sup>11</sup> *Iguanodon* is now classified as an ornithopod (see Ch. 9).



**Figure 1:** An early, inaccurate reconstruction of *Iguanodon*

Only a few years later in 1832, Mantell discovered some limited remains of an armoured dinosaur (see Ch. 8) he called *Hylaeosaurus* ('forest lizard').

## Mary Anning (1799–1847)

Mary Anning was another prominent figure in those early days of dinosaur paleontology. From an earlier age, Mary would follow her father on fossil hunting trips along the cliffs and shorelines in England. She soon became known as a reputable fossil collector and dealer.

Some of her discoveries include several species of marine reptiles such as ichthyosaurs (1811), plesiosaurs (1823, 1830), and flying reptiles now called pterosaurs (1828). It is important to note that these flying and marine reptiles are *not* dinosaurs, which are terrestrial creatures (see Ch. 10).<sup>12</sup> Dinosaurs also have very distinctive features (see Ch 3).

Anning's creatures were soon nicknamed sea dragons and flying dragons in several museums, but this was several years before the word 'dinosaur' was first used.<sup>13</sup>

## Richard Owen (1804–1892)

Richard Owen was probably the leading paleontologist and anatomist of his day. He was also one of the strongest

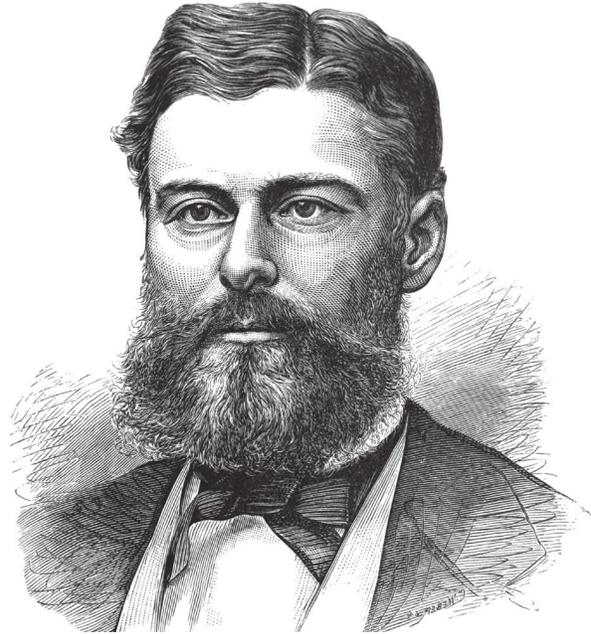


Natural History Museum in London





Othniel Charles Marsh



Edward Drinker Cope

vertebrae. This was *Hadrosaurus foulkii* ('strong lizard of Foulke') in Woodbury Formation in New Jersey.

Joseph Mellick Leidy (1823–1891) reconstructed this dinosaur as bipedal. In 1868, this became the first mounted dinosaur skeleton. Leidy was a paleontologist, parasitologist, and anatomist at the University of Pennsylvania—and an early American supporter of Darwin. Now *Hadrosaurus foulkii* is the official state dinosaur of New Jersey. It is today classified as an ornithomimid and a 'duck-billed' dinosaur (see Ch. 9).

One of Leidy's students, Edward Drinker Cope (1840–1897), played a huge role in what would come to be known as the Bone Wars. The bitterness and intensity of these 'wars' drove Leidy out of American vertebrate paleontology.

## Bone Wars

All these discoveries in the USA led to widespread excitement at the possibility of finding new dinosaurs in the vast continent. Thus began the Bone Wars, or the Great Dinosaur Rush, from 1877 to 1892. This was a fierce rivalry between Othniel Charles Marsh (1831–1899) and Cope. This pair of talented men had formidable personalities and had started as friends, but became bitter enemies. Each tried to outdo the other in dinosaur discoveries. Sometimes they even tried to undermine each other's expeditions.

They were also both staunch evolutionists, but with different ideas of that as well. Marsh was one of Darwin's first converts in the USA, and they even corresponded. Marsh wanted to find fossil support for Darwinism. He discovered many of the fossils that have often been touted as 'the evolution of the horse'.<sup>14</sup>

But Cope thought that natural selection could not explain the origin of different types of creatures. Instead, he revived the discredited idea of pre-Darwinian evolutionist Jean-Baptiste Lamarck (1744–1829), that creatures inherited acquired characteristics. This is called *Lamarckian inheritance* or **Lamarckism** (which Darwin accepted more than most evolutionists claim<sup>15,16</sup>). Cope also believed in *orthogenesis*, or evolution directed along certain pre-ordained paths. One has been called 'Cope's rule', that lineages increased in body size as they evolved. However, other evolutionary paleontologists have presented counterexamples. Another was his belief that non-white races of human were more ape-like—a belief shared by most evolutionists of the day.<sup>17</sup> Cope thought that these evolutionary paths were directed by a consciousness that God



had built into life. Thus, he was a sort of theistic—or even pantheistic—evolutionist.

In the end, Marsh ‘won’ the Bone Wars with 80 new species to Cope’s 56, although both discovered many non-dinosaur species as well. In another sense, both lost, by being both financially ruined and their reputations damaged by their underhanded tactics. The unethical behaviour harmed the reputation of American paleontology in general. In their rush to name as many species as possible, they were premature in naming some, and lost or destroyed some samples. But many of the best-known dinosaurs, as well as several extinct marine and flying reptiles, owe their discovery to these obsessive men.

Among Marsh’s discoveries were *Allosaurus* (‘other lizard’), *Apatosaurus* (‘deceptive lizard’), *Diplodocus* (‘double-beam’), *Stegosaurus* (‘roofed lizard’), and *Triceratops* (‘three-horned face’). He also discovered ‘Brontosaurus’ (‘thunder lizard’), but that turned out to be an *Apatosaurus* skeleton to which he had attached the wrong head. This was ironic because his feud with Cope probably also began with a wrong head! Namely, Marsh pointed out that Cope had reconstructed the plesiosaur *Elasmosaurus* (‘thin plate lizard’) with the head at the tail end. Another probably overturned discovery was *Torosaurus* (‘perforated lizard’), which was probably just a mature *Triceratops* (see *Shape-shifting dinosaurs*, Ch. 5).

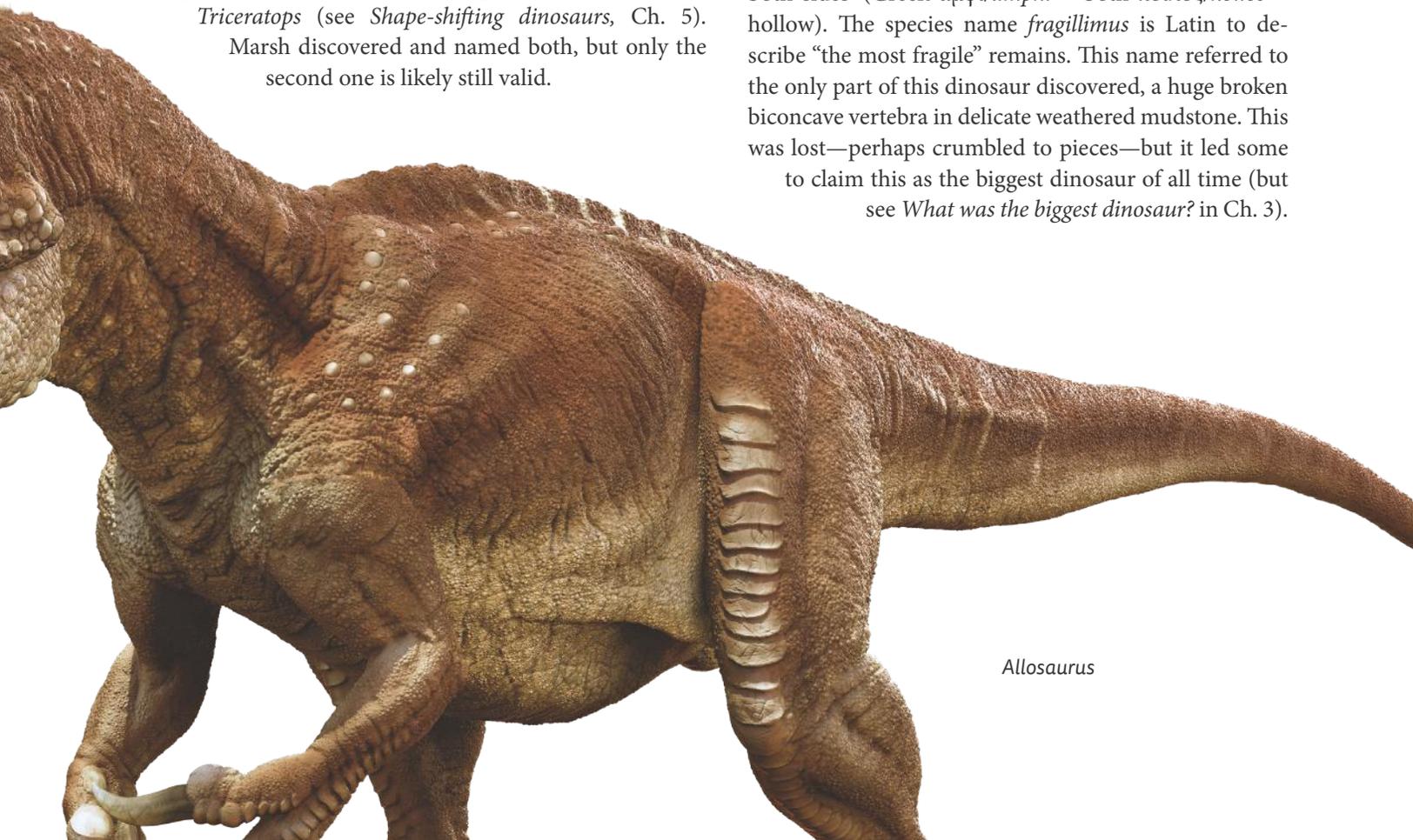
Marsh discovered and named both, but only the second one is likely still valid.

Cope discovered the huge *Camarasaurus* (‘chambered lizard’), the most common sauropod found in North America. This was the first sauropod whose skeleton was reconstructed. Cope also discovered the relatively small *Coelophysis* (‘hollow nature’).

Cope also found two broken vertebrae (1892)—one since lost—of probably the most iconic dinosaur of all. This is the only dinosaur commonly known by both its genus and species name: *Tyrannosaurus rex* (‘tyrant lizard king’). But he thought these bones were of a ceratopsian (horned) dinosaur he called *Manospondylus gigas* (‘giant porous vertebra’).

Barnum Brown (1873–1963), assistant curator of the American Museum of Natural History, discovered a partial skeleton of *T. rex* in 1900, then an almost complete one in 1902. The museum’s president Henry Fairfield Osborn (1857–1935), also a leading eugenicist, was the one who recognized they were the same type. He was responsible for giving them the famous name in 1905. Normally in classification, the first valid name has priority. However, the limited use of *Manospondylus* made it a **nomen oblitum** (‘forgotten name’). *Tyrannosaurus* is so famous that it’s a **nomen protectum** (‘protected name’).

Another dubious dinosaur Cope discovered was *Amphicoelias fragillimus*. *Amphicoelias* means ‘hollow on both sides’ (Greek ἀμφί/*amphi* = both κοίλος/*koilos* = hollow). The species name *fragillimus* is Latin to describe “the most fragile” remains. This name referred to the only part of this dinosaur discovered, a huge broken biconcave vertebra in delicate weathered mudstone. This was lost—perhaps crumbled to pieces—but it led some to claim this as the biggest dinosaur of all time (but see *What was the biggest dinosaur?* in Ch. 3).



*Allosaurus*

## Huge sauropod

Around the same time, an enormously massive sauropod was discovered in Colorado. Elmer Samuel Riggs (1869–1963), of the Field Museum of Natural History in Chicago, named it *Brachiosaurus* ('arm lizard') in 1903. Riggs declared this to be "the largest known dinosaur," a designation virtually unchallenged until the last few decades.

A few years later, a German paleontological expedition into German East Africa (a site now in Tanzania) discovered some nearly complete skeletons of *Brachiosaurus*. These included several skulls, a rare find for sauropods. From these, a huge composite skeleton was constructed and mounted in the *Museum für Naturkunde* (Natural History Museum) in Berlin (once called the 'Humboldt Museum'). Even today, it's the tallest mounted dinosaur skeleton in the world; it managed to survive even World War 2 bombings.

Riggs named the American one *B. altithorax* ('high chest'). But Werner Janensch (1878–1969) called the African one *B. brancai* ('of Branca', after fellow German paleontologist Wilhelm von Branca, 1844–1928). In more recent times, the African one has been renamed *Giraffatitan* ('titanic giraffe') *brancai*.

## Dinosaur fascination

Dinosaur popularity increased greatly with the iconic paintings of Charles Robert Knight (1874–1953). His paintings were all the more impressive because he was legally blind and needed special glasses to correct severe astigmatism. Probably his most famous painting was a face-off between *Triceratops* and *T. rex* (1906).

His paintings inspired the way dinosaurs were portrayed in the most-likely fraudulent Ica Stones<sup>18</sup> as well as many books and movies. These include classics such as the silent *The Lost World* (1925) and *King Kong* (1933), the Disney animated musical *Fantasia* (1940). This portrayal continued in much later movies like *The Land that Time Forgot* (1975).

Unfortunately, a lot of Knight's pictures were wrong. He impressed on many that dinosaurs were sluggish, lumbering, tail-dragging brutes; the bipedal ones were drawn in an errant tripod pose. (This is strong evidence that the dinosaur-bearing Ica Stones really are forgeries; see also Ch. 15.) Many sauropods were drawn largely submerged in water. Elmer Riggs had rightly taught that their leg structure was of a land creature, but this view was eclipsed.



*Brontosaurus* by Charles R. Knight



*Leaping Laelaps* by Charles R. Knight



One exception to the ‘sluggish’ portrayal was a pair of large fighting theropods called *Leaping Laelaps* (1896). *Laelaps* was another casualty of the Bone Wars. Cope had named it in 1866 after a magical dog in Greek mythology who never failed to catch her prey. (In the myth, she was sent to catch the uncatchable Teumessian fox. But Zeus realized that these attributes of infallible hunting and infallible evasion were mutually incompatible. So, he turned Laelaps and the fox into the constellations Canis Major and Canis Minor, respectively). But then it was realized that the name was taken—by a mite of all things—and Marsh renamed the creature *Dryptosaurus* (‘tearing lizard’) in 1877.

## Dinosaur renaissance

In the late 1960s and into the 1970s, some scientists questioned the received wisdom of dinosaurs as sluggish, lumbering creatures. This ‘renaissance’ was led by paleontologist John Ostrom (1928–2005). It was ably continued by his student Robert Bakker (b. 1945). Bakker,

in turn, mentored freelance researcher and illustrator Gregory Paul (b. 1954).

Ostrom discovered the dinosaur *Deinonychus* ('terrible claw'), the first known Dromaeosaurid ('runner dinosaur'). He gave it the specific name *D. antirrhopus* ('counterbalancing'). The name emphasized his contention that this stiff tail was held out and used for balance while running. Ostrom is also credited for popularizing the belief today that birds evolved from these dinosaurs (see Ch. 17). His detailed monograph, especially with Bakker's illustration of it in a running pose, was revolutionary.<sup>19</sup>

Bakker later extended this research to argue that dinosaurs, in general, were active and agile creatures, and even warm-blooded.<sup>20</sup> He also vindicated Riggs' teaching that the sauropods were terrestrial, not aquatic. Then Paul, who has no formal degree in paleontology but is a highly gifted illustrator, produced many drawings and paintings of dinosaurs. These included illustrating their skeletal and musculoskeletal features.<sup>21</sup> Notably, Bakker is an ecumenical Pentecostal minister and a theistic evolutionist, while Paul is a vocal **misotheist**.

Thanks to their research, more modern dinosaur films and documentaries portray dinosaurs much more accu-

rately. For example, dinosaurs are correctly shown with the spine roughly horizontal over the hip and their tails held out and active, not dragging. This was notable in the BBC's documentary *Walking with Dinosaurs* (1999), and in films such as *Jurassic Park* (1993) and its sequels.

Unfortunately, Michael Crichton (1942–2008), in his 1990 *Jurassic Park* novel, and Stephen Spielberg (b. 1949), in the related movies, portrayed several dinosaur-related errors. Some of these errors were intentional artistic license, like portraying *Dilophosaurus* at half their height and able to spit venom; others were just poorly introduced mistakes. Regardless of the intent, the successful series firmly established dinosaurs as active creatures in the reading and viewing public's minds, errors and all.

Some of the results of the 'dinosaur renaissance' are summarized in Ch. 3. This includes whether they were warm-blooded, smart, and agile.

## Chinese dinosaurs

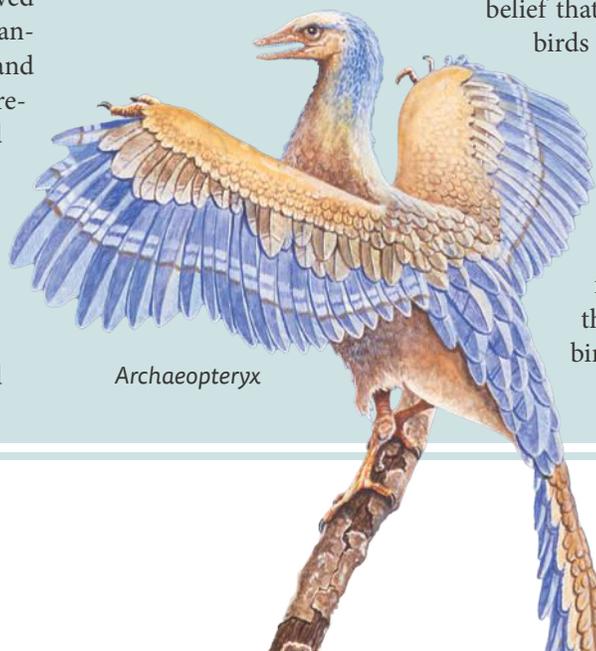
Some of the most influential and important dinosaur discoveries in modern times have been in China. Many new kinds have been discovered, as well as others that are new varieties of previously known kinds. The pioneer was

The belief that birds evolved from dinosaurs preceded Ostrom. Two years after Darwin wrote *The Origin of Species* in 1859, German Paleontologist, Christian Erich Hermann discovered *Archaeopteryx*, a feathered bird (see Ch. 18). Evolutionists at that time started to toy with the idea that reptiles evolved into birds. Richard Owen, an anti-Darwinian, Thomas Huxley, and even Charles Darwin alike, all regarded *Archaeopteryx* as a bird that came from various reptilian-like creatures. In 1864, a few years after Darwin's *Origin of species*, Gegenbaur, an embryologist and anatomist, studied the small dinosaur, *Compsognathus*, and compared

it to the bird, *Archaeopteryx*. He was the first to suggest that dinosaurs evolved into birds. This convinced Thomas Huxley. Four years later, in 1868, Thomas Huxley (see Ch. 17), proposed that ancient flightless birds evolved from dinosaurs such as *Compsognathus*.

And through intermediate forms similar to *Archaeopteryx*, these creatures evolved into the modern birds that we see today.<sup>23</sup>

In other words, the belief that dinosaurs evolved into birds far preceded Ostrom, but Ostrom was responsible for repopularizing the belief that dinosaurs evolved into birds in contemporary paleontology. Most evolutionists today who believe that dinosaurs evolved from birds, believe that modern birds evolved from theropods rather than from much 'older' birds like *Archaeopteryx*.



Archaeopteryx

Chung Chien (“C.C.”) Young, (Chinese: 杨钟健, Pinyin: Yáng Zhōngjiàn, 1897–1979), widely considered the “Father of Chinese Vertebrate Paleontology”. One of his most famous students is Zhiming Dong (董枝明, Dǒng Zhīmíng, b. 1937), discoverer of many new dinosaurs.

The current leading figure is probably Xing Xu (徐星, Xú Xīng; b. 1969; *xīng* is the Chinese word for ‘star’), who has probably named more dinosaurs than any other person alive today. He is especially well known for his discoveries of alleged feathered dinosaurs (see Chapters 17 and 18 for details on feathered dinosaur claims).

Unfortunately, China is also known for its dubious and even fraudulent discoveries, such as the ‘Piltdown bird’, Archaeopteryx. Dr Xu was one of the first to expose that fraud.

## Argentine dinosaurs

Another country rich in dinosaur fossils is Argentina. Some of the most famous are many titanosaurs, which, according to evolutionists, were the last surviving group of sauropods. Some are candidates for the largest dinosaur of all (see Ch. 3), including *Argentinosaurus*, *Patagotitan*, *Futalognkosaurus*, and *Puertosaurus*. There were also large theropods including *Giganotosaurus* and *Mapusaurus*.

Many important discoveries were made by José Fernando Bonaparte (1928–2020; no close relative of Napoleon). Although he was self-taught, he achieved so much that he was called the ‘father of Argentinian dinosaur paleontology’, and Robert Bakker called him the “Master of the Mesozoic” (*Maestro del Mesozoico*). Bonaparte also mentored the next generation of Argentine dinosaur discoverers. One of these is Rodolfo Aníbal Coria (b. 1959), who discovered and named *Argentinosaurus* and *Giganotosaurus*. Others include Luis Chiappe, Agustín Martinelli, Fernando Novas, Jaime Powell, Guillermo Rougier, Leonardo Salgado, and Sebastián Apesteguía.<sup>22</sup>



*Giganotosaurus* skeleton

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## TITANS OF THE EARTH, SEA, AND AIR

**D**INOSAURS are fascinating! Yet evolutionists have exploited their popularity to push their millions-of-years dogma, without which evolution is impossible.

From an early age, children are exposed to the idea that there was an ‘age of dinosaurs’—millions of years before man supposedly ‘evolved’. Popular movies, documentaries and books reinforce this idea to children and adults alike. But the Bible clearly indicates a much younger age for the earth, and this seeming disconnect impacts the faith of many Christians, both young and old.

However, when properly understood in the light of *real* science, dinosaurs provide exciting support for the Bible. In fact, it is one of the most exciting areas of research for biblical creationists. But, until now, there has not been a comprehensive dinosaur book for high school and above. *Titans* has an amazing array of pictures of fossils, and the best artistic impressions of dinosaurs available. It also answers the key questions you are likely to ask. For example:

- What are dinosaurs—and what are NOT?
- How do dinosaur fossils show they were buried by a global watery cataclysm? Why are so many dinosaurs fossilized with their necks thrown backwards? Why are armoured dinosaurs found upside down?
- When did they live? Soft tissue, proteins, DNA, and radiocarbon in dinosaur fossils is strong evidence against their living over 66 million years ago. But this evidence makes sense if the fossils were formed by Noah’s Flood, around 4,500 years ago.
  - How could such huge dinosaurs fit on the Ark? How long after the Flood did their descendants live?
  - What did they eat? What was their diet before and after the Fall?
  - How many kinds of dinosaurs were there? What were the biggest (and smallest) dinosaurs?

Dinosaurs are some of the most awesome creatures that God ever created. *Titans of the Earth, Sea, and Air* gives glory to the Creator, God, for His incredible ingenuity and imagination.

