



MESOZOIC

Peter C Whitaker

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By

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And for Roy.

Mesozoic

Part One

The Triassic Period

251 – 200 Million Years Ago

Chapter One

A horn-covered beak belonging to a short but wide-faced animal pushed out from behind the fern tree's fronds. The smell of water was in the air and as the sun was heading towards its zenith. Like many another thirsty animal, this creature was heading for the river. Driving on through the low-lying ferns, past the stout but taller trunk of the nearby cycad, and over the dry dirt, the animal entered a clearing. Its triangular shaped head was attached by a short neck to a stocky, heavily built body supported on four squat limbs that were, however, long enough to keep its stomach off the ground. Although short the limbs were positioned vertically, like a mammal. It did not sprawl like a lizard. A short tail, held clear of the ground, accounted for perhaps a quarter of its body length. The herbivore was perfectly designed for its food source having evolved upper jaws that were lined with several rows of teeth. They interacted with a single row on the lower jaw to create an impressive chopping action. It was a plant specialist, feeding on seed husks and its teeth could easily split open the tough plant material. It was a source of food that was hardly touched by other browsers. As a result of this specialisation members of its particular family were quite numerous and found all over the super-continent of Pangea. Having eaten its fill of fern seeds for the moment the need to drink had become a priority, to which the animal responded entirely instinctively.

Moving between the ferns, cycads, and the various other plants that covered the Triassic landscape, the small animal continued on its way down towards the slow-moving river. The foliage thinned out appreciably the closer it came to its destination, which made it easier to follow the herbivore in its movements. A pair of reptilian-eyes did just that very thing. From behind the bole of a large cycad, a narrow, triangular-shaped head remained perfectly still. Only the eyelids moved, blinking to keep the surface of the eye moist and clean. With impressive patience, it stood on four strong legs, also like a mammal, its body held well off the ground. The skull was long and the jaws armed with dagger-like teeth. It was a prime example of one of the largest carnivore species of its day.

The herbivore continued on its way, wending a path through the thinning flora as it neared its destination. Occasionally, it would stop and search the area with its eyes, taking a moment to listen for anything untoward. Nothing in the immediate vicinity suggested that there was

anything for it to worry about, however, but then the hunter that watched it remained as still as the tree it used to mask its presence. It was hidden in the shadows cast by the overhead sun as it fell on the voluminous branches of the tree. Despite being almost four times the size of the herbivore that it was hunting the meat-eater choose not to charge down its prey. It was a consummate ambush predator and it waited patiently from within the cooler cover of the cycad's leaves for the opportune moment to strike.

The peace of the Triassic morning was broken by an explosion of violence. Suddenly, the hunter reared up on its hind legs. The long jaws opened and it crashed down onto the back of the herbivore. Sharp teeth cut into the smaller animal's neck. The attacker's forelimbs pushed down and the considerable weight of the armoured predator caused the smaller animal's own legs to give way underneath it. In a moment its squeal of surprise turned to fear and then was cut short. Blood spilt onto the ground as the body was rent by long sharp teeth. The hunter began to eat.

"That's a rauisuchian archosaur!" Dr Cope grinned at Eva. He looked too young to be a qualified field palaeontologist, what with his mop of sandy hair, pale blue eyes, and boyish good looks. Even from within the confines of his encounter suit Edward Cope exuded an air of a sun-kissed young Apollo who spent most of his time outside, exercising his undeniably athletic body.

"Probably because the rhynchosaurs are so much smaller than it the rauisuchian archosaur can kill its prey immediately in this instance, Dr Kiesler." Dr Jun added. "It looks like a Postosuchas by the way. Note the protective osteoderms, the thick scales that form a coat of armour on its back. We have observed these kinds of predators ambushing their prey in exactly the same fashion previously. With some of the bigger species of prey animals, such as Placerias for example, which can grow to over three and a half metres in length they do more or less the same thing. In those instances, however, the rauisuchians often fail to kill their prey in the initial attack. Instead, they inflict serious wounds that usually proves fatal due to blood loss and the animal slipping into shock."

"Please, call me Eva, Jun. The rauisuchian archosaur looks so much like a crocodile to me, especially with that armour on its back."

"Yes, Dr Kiesler, I mean Eva, the archosaurs do look similar to ancient crocodiles and there is an evolutionary link between them, but the

archosaurs walk with an upright gait, their legs are closer to being mammalian in design than reptilian. They hold their tails off the ground as well. As you can see, the predator animal is almost five metres long, much bigger than its prey, which was barely one-point-three metres.”

“The herd hasn’t moved too far from the scene of the attack,” Eva noted. “I would have thought that the shock of the kill would have scared them away?” She glanced off to the right where a large number of the animals that they had been observing were even now making their way down to the river and could still be clearly seen. Eva and her companions were laid down on the reverse slope of a modest hill from where they had been watching for any animal activity for some time before the herd of rynchosaurs had appeared.

“They don’t have to as they’re not the ones being eaten,” Marsh told her. His large round body lay off to her right.

“Besides, a predator that you can see is less dangerous than the one that you can’t. These animals really are ambush experts, and also this one is distracted by its meal.” Cope added. “Look at the blood!”

“Is it likely to try and kill another one?”

“Possibly, Eva, it looks to be an adult, quite large actually, but it’s lost the element of surprise now and like Ed says, as long as the rynchosaurs can see it they can stay out of harm’s way. Like crocodiles, the rauisuchidae can sprint surprisingly fast over short distances but they lack stamina. The rynchosaurs will keep a safe distance between themselves and it for as long as it remains visible to them.” Jun returned her focus back on the herd of smaller animals. “Archosaurs are ectothermic like other reptiles. These animals can go up to a month between feeds when necessary. This species of rynchosaur are quite small, however, so it’s possible that the Postosuchas will move away from the river and circle round to the other side of the herd to try its luck again.”

“What species are the herbivores?”

“They may be Hyperodapedon or something close to that,” Jun replied without taking her eyes from the slowly moving scene below.

“You don’t know?” There was no criticism in Eva’s tone, just surprise.

“There are many thousand more species here in the late Triassic Period than are represented in the fossil record. The palaeontologists that were working before the Collapse had the benefit of examining animals that didn’t get up and walk away. These guys don’t stay still for too long, there’s always another meal to be had and we just observe them going about their daily business.”

“Dr Chen is quite correct, we observe and record whatever we see,” Dr Twilight’s deep baritone murmured. “Mr Chesterman collects everything that we record from the headsets built into our encounter suits and downloads it into his mobile storage unit. During the return journey, back to Triassic Station B, the computer collates all the data and converts it into a transferable file format. We upload the data to our network computer at the station and that interrogates it so as to organise the information into a preliminary taxonomy. Our real work begins then when we study the results. We try to marry them up to known fossil species to create a more viable cladogram. In short, it does not sound so difficult but, as Dr Chen notes, we have discovered thousands of species in each different time period that were previously unknown to science.”

“As well as all the kind of things that preserved fossils could not show the early scientists. We also get to observe movement, behaviour, skin textures and colours, sounds, and even smells. It all has to be collated and catalogued and studied.” Jun enthused.

Eva glanced back down the hill behind them at the Field Technician, John Chesterman. He was not watching the animals like everyone else but was rather studying the display on a piece of his equipment. Normally this resided in a backpack for easy transportation but he had deployed it now. The pack was cleverly constructed so that it all folded out but remained a single unit. Solar panel arrays were also set up to ensure that the micro-system did not lose any power during the recording and collation process. He seemed to lack the rest of the team’s interest in the objects of their observation, however.

“Now might be a good time to try the Almanac!”

“Is that the encyclopaedia for all the species that you have so far observed, Dr Twilight?”

“Yes, Eva, it is. You should be able to access it through your encounter suit using your pCom. I didn’t want you to use it initially as it can detract

from the spectacle that you are witnessing when you are not used to it being displayed on the visor.”

“It gets to be second nature after a while.” Ed Cope told her. “At first having all the information project as a head-up display can be a little disorientating when you are on the move but really, you do get to be able to filter it out when necessary.

Eva called up the Almanac and then focused on the nearest animal. A small reticule moved to surround the creature and then a succinct description appeared on the inside right of her visor in the manner of a head-up display as Cope had told her.

ALMANAC

Name: Hyperodapedon - Diet: herbivore

Order: Rhynchosauria - Family: Rhynchosauridea

Subfamily: Hyperodapedontinae

Species: *H. gordonii*, *H. huenei*, *H. huxleyi*, *H. mariensis*, *H. sanjuansensis*,

H. tikiensis, *H. stockleyi*

This species: *H. gordonii*

Length: 1.3m Temporal range: Triassic

“This is the really fascinating part of the work!” Dr Darwin suddenly said. Eva could not remember him talking since they had arrived here from their own time, well over two hundred million years in the future. She wondered absently if becoming taciturn was a trait of these people who spent so much time out in the field studying long extinct animals. “We are organising the team’s finds into an almost complete system of classification. Of course, there was a previous tree of life for prehistoric animals, prior to the Collapse that is, but it was based entirely upon the fossil record and, as we know, that was, and never could have been,

complete.” For a serious looking man he was speaking with considerable passion.

“We should be taking precautions now, blood has been spilt.” Tanya interrupted the scientist’s discussion. “The smell of it could attract other carnivores; we need to keep that in mind.” Her voice was calm but assertive. She was scanning the area immediately around them.

A head-up display was projected onto the inside of her visor and she was using it to spot heat emissions that might possibly come from a large animal, a carnivore in particular. Behind her stood Mule, the robot that they had brought with them from Triassic Station B.

“Everybody, have a look around,” Twilight instructed. “Do you see anything, Tanya?”

“No, we’re okay at the moment.”

“Do you want us to bag the remains, Dr Twilight?” Lizzie asked.

“Yes please.”

“Will it leave any?”

“Oh yes, Eva. Archosaurs like Postosuchas tend to concentrate on eating soft body parts. Certainly, I have yet to see one swallow large bones, not that they cannot do that with smaller prey but I don’t think it is a preference for them. The gape of the jaws is not as wide as in crocodylians so swallowing large bones is more difficult for them. Also, they’re not aquatic, I mean they can swim like most other animals but they are mainly terrestrial. They only swim when they have to, so they don’t just sink to the bottom of the river and quietly digest their food undisturbed like crocodiles can do.”

“That would explain the difference in their teeth then?”

“Exactly, crocodylians have teeth designed to grasp and crush, rauisuchian teeth are meant to cut and slash meat,” Cope added eagerly.

“You mentioned that they can’t hide in a river like a crocodile, why would they want to? What would disturb an animal as formidable as a Postosuchas when it is digesting its meal?”

“Another *Postosuchas* typically. They don’t maintain feeding territories as such so their hunting grounds often overlap. Normally, they will tolerate each other’s presence much like modern crocodiles do, unless food is scarce in which case it becomes every archosaur for themselves. Also, during the mating season, males become very aggressive towards one another and will kill to maintain their proximity to local females. The females also become aggressive after mating, they frequently turn on the males that they have just mated with as if to drive them away. Actually, that is probably the real reason for such behaviour; they don’t want hungry males hanging around when the eggs that they’ve laid and incubated begin to hatch.”

“Is cannibalism a trait?”

“Yes, but not overly so. They are not particularly intelligent. Like most animals, they are clever enough to do what they need to do to survive. They rely heavily on instinctive responses. These particular predators have a snap-reflex and if anything triggers it they bite first and check whether it is food or not later. Sometimes, if young archosaurs get too close to an adult and trigger that reflex they end up as another meal.”

“You know, there’s a very good reason why a raurisuchian like *Postosuchas* wouldn’t want to hide in a river and digest its’ meal; *Phytosaurs* live there!”

“Are they a threat to animals like *Postosuchas*, Ed?”

“You bet, Eva. We’ve recorded raurisuchians in and around waterways being attacked by *Phytosaurs*. They look and live very much like crocodiles do but they are far more primitive.”

“Originally, *Phytosaurs* as a group were thought to be directly ancestral to crocodylians but we now know that they evolved prior to the *Suchia*, which is the clade to which *Crocodylomorpha* belong, that being the group that includes modern crocodiles and alligators.”

“So they appeared much earlier than the first true crocodiles then?”

“Yes, Eva. Because the animals look remarkably similar this is often said to be an example of parallel evolution as a result of them living very similar lifestyles due to the fact that they filled the same ecological niches.”

“I presume that there is sufficient evidence to allow you to tell the difference between them, physiologically at least?”

“Phytosaurs possess an ankle structure that is actually more primitive than any modern-day crocodylian’s and they don’t have a bony second palate. Their armour is also much more developed, they have heavy bony scutes for example and their abdomens are reinforced with gastralia. Perhaps the most noticeable difference, however, is that Phytosaurs most commonly have their nostril placed either close to or even above the eyes whereas all crocodylians have them at the end of the snout.”

“There’s the teeth as well!”

“Yes, Ed, there’s the teeth as well.” Jun rolled her eyes. “Phytosaurs are more like rauisuchians in that their teeth are more blade-like.”

“They have serrated teeth!” Cope grinned.

“For slicing flesh no doubt?”

“No doubt about it, rauisuchian flesh included.”

“Nature, red in tooth and claw. We call this the ‘Bloody Triassic!’”

“No, we don’t, Marsh.”

“Yes we do, Cope.”

“No, you do because you’re so uncouth.”

“Watching predators like archosaurs feed gives us an enormous amount of information,” Dr Twilight said but to no one in particular. It was his way of derailing another Cope-Marsh tirade before it got going.

“And we get to go and bag all the left-overs!” Lizzie added with a hint of sarcasm.

“It’s quite amazing, the fact that we are even here, in the Triassic Period, seeing all these fascinating animals and plants for real.” Eva enthused. “I have watched documentaries on the HV of course and as authentic as those holograms look they cannot compare to actually being here.”

“We shot most of the footage concerning prehistoric life,” Cope grinned at her, “I’m a bit of specialist at getting the grisly stuff. Did you see my recorded battle between an Allosaurus, a Stegosaurus, and two Ceratosuaruses?”

“Hey, I filmed most of that!” Marsh protested.

“I’m not sure.” Eva shook her head.

“It was awesome. The Ceratosaurus went for the Stegosaur but the Allosaur chased them away and then came off worse itself against the Stegosaur. It was fatally wounded and the Ceratosaurus dined on the Allosaurus for a week. Old Steggy just wandered off as if nothing had happened!”

“Hey, spoilers!” Marsh protested.

“I dined on it for a week myself; the ladies love an adventurous Palaeontologist you know!”

“There is a more serious side to all of this, of course, the Permian-Triassic boundary is marked by one of the most serious extinction events ever recorded,” Twilight told Eva. “It is sometimes referred to as the Great Dying and with good reason. Almost ninety percent of marine life and seventy percent of terrestrial life died. We cannot possibly imagine the level of devastation that was experienced then. The Collapse that occurred several decades ago in our own time was severe and we did lose many forms of life, but nothing like the magnitude of the Permian-Triassic extinction event. The one thing that is remarkable to me in all of these instances, however, is that life continues to exist.”

“Which is the very reason why the Palaeontological Time Unit, and by extension the Palaeontological Field Time Unit, exists!” Dr Darwin said.

“Obviously, you could go back to the Permian Period and witness the extinction event as it occurred, which makes me wonder why you do not?”

“Well, Dr Kiesler, we understand well enough the causes of the extinction event already and really our prime interest is in understanding how life survived and then recovered after such devastation. The qualification of our work here is not just the extension of our knowledge of life from the Mesozoic Era, although that is fascinating in and of itself,

especially to we Palaeontologists, it lies in achieving an understanding of how surviving species are capable of adapting and radiating into vacant or new niches within the changing ecology of their various habitats. Life in our time is recovering from the Collapse and what we learn here can help us to ensure that it continues to do so. The knowledge that we accrue here in the Mesozoic Era influences our actions and the development of our society back in our own time. The rise of technological efficiency that people like you have contributed to means that we can exploit the planet's resources with both the minimum of damage to the environment and even an active encouragement for other life, both animal and plant, to flourish. It's a debt that we owe to the natural world and one that all of us here at the PFTU are keen to pay."

"Also, the conditions at the end of Permian that led to the mass extinctions were obviously very lethal to most forms of life, they would be just as dangerous for us, if not more so," Tanya added.

"Yes, there is that. Our encounter suits would have to be much more robust than the ones we wear now but the danger would still be very great. I don't think that anyone could justify putting lives at risk with such an undertaking merely to confirm what we already know."

"I see, so the reason that you alluded to, examining how life survives the devastation of mass extinction events, justifies the development and use of the time-travel technology to allow you to conduct this particular kind of scientific research?"

"Absolutely!" Cope turned to look at Eva. "I know that some people think that this is some kind of fun jaunt that we take to play with dinosaurs but there is some real scientific work going on here that allows us to better understand changes in our own environment. Not just factors concerning climate change but our impact on the ecosystems in which we live. Everything that lives or even exists has a role to play in the constantly changing environment, which is clear from both previous studies and our observations of the Mesozoic Era. Previously, we, as a species, looked at the natural world as an infinite supply of resources and we almost ruined it accordingly. The Collapse was the inevitable end result of that kind of thinking, that kind of mercenary attitude towards other life. Hopefully, the more we come to understand how life not only recovers but develops and radiates into new and vacant niches after an extinction event the more likely we will be able to tailor our new civilisation so that it influences

changes that are beneficial rather than destructive, as it largely seems to have been in the past.”

“You know, you’re devilishly sexy when you talk science,” Lizzie commented.

“Yeah, well, sometimes I have to remind myself that I am a scientist.”

“And a devilishly sexy one at that!”

“What?!” Cope turned to look at Marsh.

“I’m just saying what she said.”

“She’s a girl!”

“A woman actually,” Lizzie insisted.

“It was meant as a compliment.”

“Hey Marsh, I’ve told you before, I don’t share your inclinations.”

“I’m not...I mean, I don’t like you...I mean, not that way. Oh come on, you know what I meant!”

“Yeah, I sure do and because I do I don’t want you walking behind me appraising my sexy ass in this encounter suit that I make look so good, you sleaze.”

“Well, that went back to normal pretty fast.” Lizzie scowled.

“If anyone is actually interested the rhynchosaurs have drifted off towards the river and the archosaur has moved further downstream, probably to get a drink of its own,” Jun told them.

“Then let’s move in on the kill.” Twilight urged, rising to his feet as he spoke. The others followed his example. He was by far the tallest member of the group and although the encounter suits that they wore did not exactly help to define muscular attributes he had a striking physical presence. He was over two metres tall but had a very athletic body that was the result of a passion for physical fitness. Even at fifty-four Dr Lucius Twilight was an impressive specimen.

As always, Tanya went led the way. She held a stock-prod in her gloved right hand as she walked confidently but cautiously towards the area where the rhynchosaur had been killed. She looked around her constantly, always aware that they were out in the wild. Just because they had seen one predator it did not mean that there were no others around, perhaps also in hiding.

“I presume you collect the remains for study back in the lab?”

“Absolutely, Dr Kiesler! We do not kill any of the animals that we observe, in fact, we try very hard not to have any contact with them whatsoever, but when an opportunity arises to collect actual physical remains then we seize it.” Twilight looked quite excited by the prospect.

“As you can see, the ground is stained with blood, most of which will be washed away by the seasonal rainstorms that blow across the coastal regions of Pangea. There are small pieces of flesh and viscera scattered about, these archosaurs are not the most efficient of eaters. It’s consumed about two-thirds of the rhynchosaur but left the rest, probably finds it too fiddly. The head and tail remain and the skeleton is still articulated. I think this animal was too small to be stripped by the archosaur’s teeth but also too large for it to swallow whole. Scavengers would have enjoyed the carcass.” Lizzie then stepped forward and removed a specimen bag from a pack that hung from her belt. Marsh produced a pair of metal tongs that he used to lift the animal’s remains from the ground and then he dropped them into the bag that Lizzie held open. Fortunately, it was made from opaque material so the grisly body was not on display. “Bagged and tagged!”

Without waiting to be asked the quadrupedal robot that was designated ‘Mule’ approached Lizzie. It looked more like a large dog than an equine but it lacked a neck, head, and tail. Lizzie opened one of the canisters that were slung over its back and dropped the remains of the dead animal into it.

“Then I suggest that we return to the station,” Twilight said.

“Already?!” Eva was surprised.

“Dr Kiesler, this is not really a tourist outing. We agreed to you joining us on a field trip in each of the periods of the Mesozoic Era but not to conducting a guided tour of this or any other portion of prehistory.”

Twilight sounded grave. “Our purpose remains one of research but our activities coincide with the granting of your request to be here by the authority that governs the work of the Palaeontological Field Time Unit.”

Ed Cope turned his upper arm towards Eva and pointed at the large badge fixed to the sleeve of his encounter suit. She tried not to laugh. “Point taken.”

“But it’s not over yet,” Cope told her enthusiastically, “next stop is the Jurassic, my speciality. Forget these unimpressive no-shows, I’m going to introduce you to some real dinosaurs!”

“Which he knows intimately!” Marsh chimed in.

“Why, Second Field Assistant Marsh whatever do you mean?”

“First Field Assistant Marsh if you don’t mind!”

“I bet that Lizzie can outrun you, butterball, especially if we’re chased by an Allosaurus, which would make her First Field Assistant and you first loser, better known as a theropod’s lunch!”

“Are they always like this?” Eva asked.

“Almost never stops!” Lizzie rolled her eyes. Eva remembered thinking that these scientists might be prone to becoming taciturn through spending so much time outside observing animals. Clearly, this was not always the case.

“Okay, listen up!” Tanya called out to them through their suit’s communication system. “We’re heading back to Triassic Station B. You all know the drill but seeing as we have a guest with us today, Dr Kiesler who prefers to be called Eva, I will just reiterate the protocol. We will be swinging towards the coastal region so as to give Eva an opportunity to see more of the wildlife here on Pangea. Remember, the animals are wild and can be dangerous and not just the predators, some of the larger herbivores as well. Our intent remains to observe and to avoid any unnecessary contact with the fauna. I will take point position as usual. If you see anything let the team know discreetly. Follow my lead and do as I say. When I need an expert’s advice I will ask for it, otherwise, as your survival expert, I am in charge in the field.” With that, she turned and started walking away, back up the hill that they had so recently descended.

The team of six and their guest fell in behind her. Mule the robot trotted at Tanya's side. Team Leader Dr Lucius Twilight and his fellow palaeontologist Dr Darwin followed. Behind them walked Eva Kiesler, noted physicist, actress, and soon to be a politician, accompanied by Dr Jun-Yuan Chen, another palaeontologist who was enthusiastically explaining the Triassic Period to their guest. Field Assistant Liz Smith came to a few paces behind them and she was followed by the incessant and often inane banter of Dr Edward Cope and Field Assistant Charles Marsh. John Chesterman, as so often seemed to be the case, brought up the rear and walked on his own. He glanced frequently at a handheld device that was monitoring the progress of the data collation in the mobile storage device on his back but when he did look up his eyes fixed on the figure of the Eva Kiesler, the Assembly Leader-Elect.