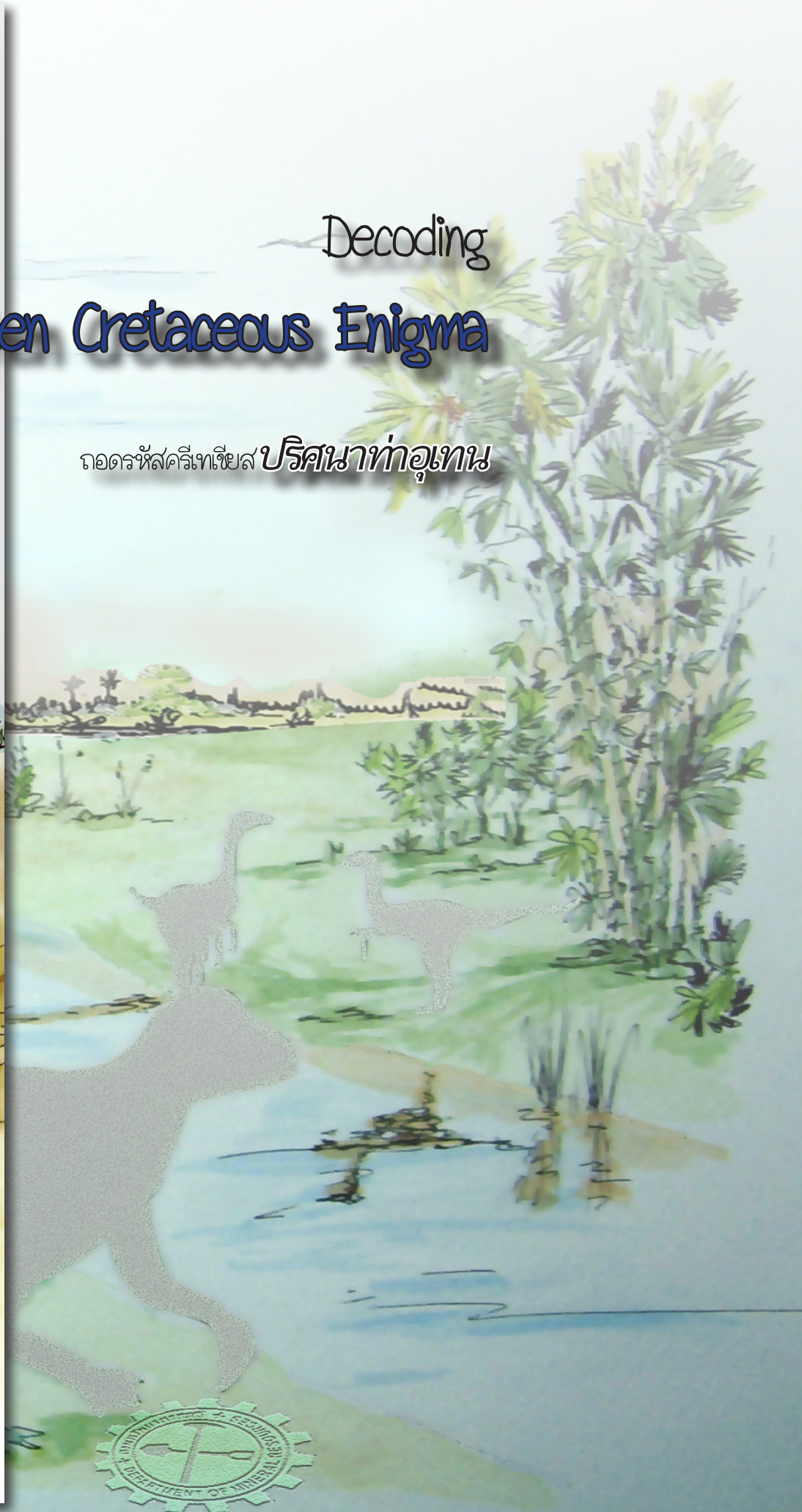
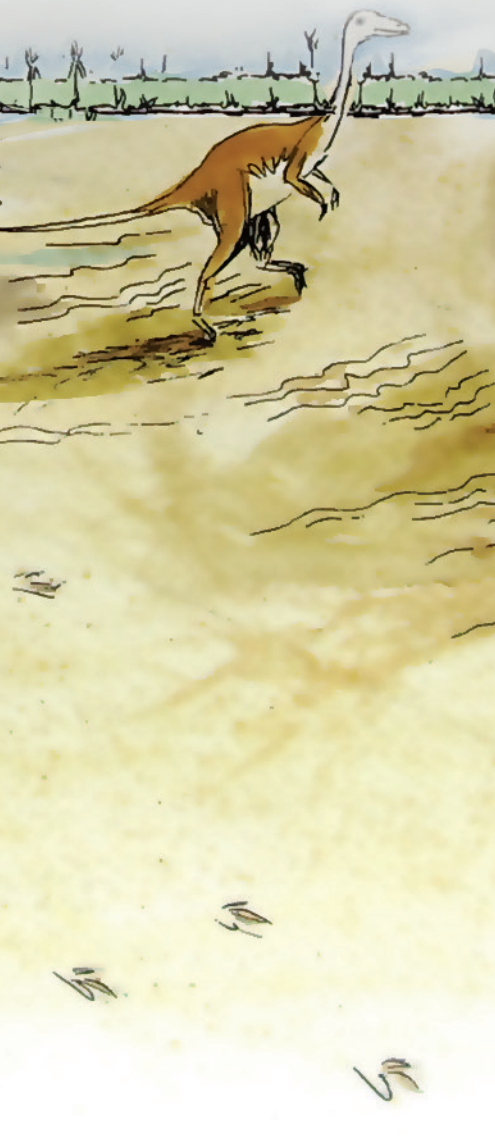




# Decoding The Tha Uthen Cretaceous Enigma

ศาสตราจารย์ ดร. ศิริทิพย์ เจริญกุล *ปริศนาท่าอุเทน*



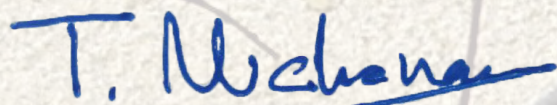


# Invaluable Impressions

“Fossils are important natural resources that took Mother Nature millions and millions of years to craft.” For centuries, fossils of various animals and plants have been discovered throughout Thailand. Amongst these fossils, the ones that have attracted the most attention from people of all ages are the ones belonging to dinosaurs. Especially fossilized skeletal fragments, egg shells, feces, and footprints. The first dinosaur fossil was discovered in Changwat Khon Kaen in 1976. Since then, more and more have been found throughout the country with the majority being from the Isan region.

As the Department of Mineral Resources recognizes that “fossils are important natural resources that took Mother Nature millions and millions of years to craft,” we consider the excavation and study of all fossils significant. Hence, systematic approaches have been developed to ensure accurate and proper data gathering. Not only for the benefit of Thais, but all around the world, as some of these fossilized remains belong to dinosaur species currently unique to Thailand. Furthermore, the Department of Mineral Resources has proposed that laws be passed to protect and preserve these fossils. As a result, an ACT to protect fossils was issued in 2008. And by means of this ACT, the Department of Mineral Resources was able to declare the Footprints at tha Uthen in Changwat Nakhon Phanom Thailand’s first registered fossil site in 2011.

What makes the footprints of Tha Uthen so special that it deserves special protection? What can these prints tell us about the past? “Decoding the Tha Uthen Cretaceous Enigma” will unravel these mysteries and take you back to the Cretaceous period, when these prints are still fresh, and the creatures that left them behind are still roaming Tha Uthen.



(Mr. Tawsaporn Nuchanong)

Director General

Department of Mineral Resources



# The Secret Marks

Prior to the flood season of every year, the people of Changwat Nakhon Phanom who live along the bank of Mekong River must gather large sand stones and arrange them along the bank of the river to shield their homes from the currents of the mighty river. These refrigerator sized blocks of sandstone are from a mining area owned by Saha Rungrueang Co., Ltd. in Tambon Phanom of Amphoe Tha Uthen.

During the transport of these sandstones, some of the miners noticed strange three-pronged patterns resembling chicken footprints on some of these reddish brown stones. Some of these prints were on backgrounds with wave-like patterns while others have backgrounds of unusual geometric shapes.



**Sandstone-paved bank shields homes from the currents of the Mekong River**



**The sandstone quarry where the strange prints were found**



**Strange prints on a background with wave-like patterns**



**Tracing of the footprints on plastic sheets for remote studies**

Not knowing what they were, the news stayed merely between those who came in direct contact with the stones.

It was not until the mid-2001 during the exploration of the Tha Uthen area by Mr. Nares Sattayarak, a geologist from the Department of Mineral resources that these prints were ascertained to belong to a prehistoric creature. Further investigation lead by Mr. Varavudh Suteethorn, a fossil specialist from the Department of Mineral Resources involved the collection of visual samples, geological mapping of the area, as well as tracing of the footprints on plastic sheets for remote studies in the department's laboratories.





# Solving the Ancient Mysteries

The decoding team lead by Dr. Varavudh Suteethorn collaborated with French scientists, Paleo-biologists, and aspiring geologists to uncover the hidden clues left behind on this layer of sandstone.

By analyzing the shape, size, direction, and the relative angle and distance between each print we can learn a great deal about the anatomy of the print's owner. By comparing with modern day animals, we can ascertain the creature's height, width of hip, and even the speed of its movement. We can even learn whether the creature prefers to live in solitary or seeks the companionship of a herd. Further study of microscopic geological evidence can also lend clues to the creature's diet and paints us a picture of its habitat. Furthermore, stratigraphy tells us these prints were left during the Late Early Cretaceous period over 100 million years ago.

Putting the pieces of the puzzle together, it has been determined that the footprints belong to at least 3 distinct prehistoric creatures as follows:

- 1 Iguanodon – A herbivore with a single row of teeth.
- 2 Ornithomimosaur- An ostrich-like toothless omnivorous dinosaur that lives in a group.
- 3 Ancient Crocodile – A carnivorous reptile with a long tail, hard skin and big jaws.



**The shape, size, direction, and the relative angle and distance between each print, together with other geological evidences e.g. rock type and other prints, are basic information for decoding.**





## Prehistoric terrain and atmospheric conditions

The footprints of Tha Uthen were left on a formation of sedimentary rocks consisting of fine red sandstones, siltstone, with a thin layer of mudstone covering sandstone exhibiting ripple marks and mud cracks. A number of footprints can be found on top of these ripple marks and mud cracks.

Analyzing these clues we can learn a number of things about the environment during the Cretaceous period and how these prints were formed and preserved.

The prints were made at the shore of a river with a winding bend that flows gently near the end of the flooding season. As the water level gradually decrease shallow parts of the river become still muddy ponds while the parts that still manage to flow made ripple marks on the sediment. Decoding these patterns tells us that this river flows northwest.

As the dry season approaches, the prints made on the wet soil begin to dry out. The muddy ponds that some prehistoric creatures have stepped in dry out creating polygonal cracks. Over time, the prints that our Ostrich-like friend, Ornithomimosaur left atop the tiny ripple marks on the soil harden and solidify.

As the rain returns, flood waters bring sediments of sand and dirt from high ground. The mixture acts as the plaster to our “footprint mold” that the previous dry season has created thus, perfectly preserving them until the present day.



**Fine particles of sand deposited and hardened in the mud cracks**



**Ripples marks indicate that the owners of the marks roamed along a river side.**

**Essential conditions** that must be met for the formation of fossilized prints on sandstone:

The formation of any fossilized prints from footprints, wormholes to rain marks, ripple marks, and mud cracks can only occur under the following conditions:

1. The prints must be made on wet sediment without being tampered by nearby animals
2. An arid environment must harden the print preserving its original shape
3. The collection of sediment after the prints had hardened must occur gradually without affecting the original print
4. More and more sediments collect over time
5. All the layers become solid through compaction over time

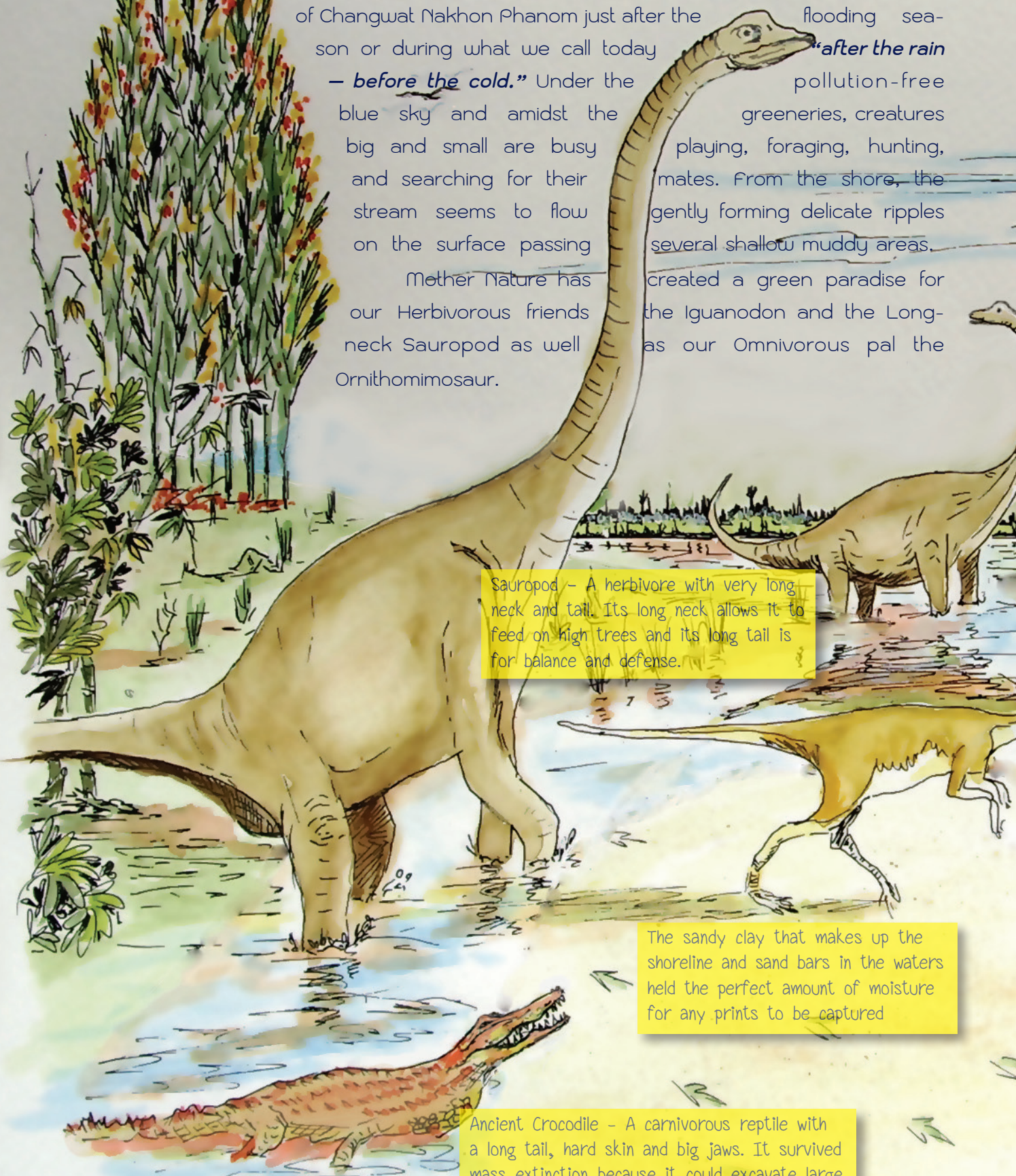
Without any one of these conditions, geological preservation of prints cannot occur.





# Back to Cretaceous

Let us go back to 100 millions years ago in Amphoe Tha Uthen of Changwat Nakhon Phanom just after the flooding season or during what we call today – *“after the rain – before the cold.”* Under the blue sky and amidst the greeneries, creatures big and small are busy playing, foraging, hunting, and searching for their mates. From the shore, the stream seems to flow gently forming delicate ripples on the surface passing several shallow muddy areas. Mother Nature has created a green paradise for our Herbivorous friends the long neck Sauropod as well as our Omnivorous pal the Ornithomimosaur.



Sauropod – A herbivore with very long neck and tail. Its long neck allows it to feed on high trees and its long tail is for balance and defense.

The sandy clay that makes up the shoreline and sand bars in the waters held the perfect amount of moisture for any prints to be captured

Ancient Crocodile – A carnivorous reptile with a long tail, hard skin and big jaws. It survived mass extinction because it could excavate large borrows or occupy underground caves and enter into a period of summer-sleep.



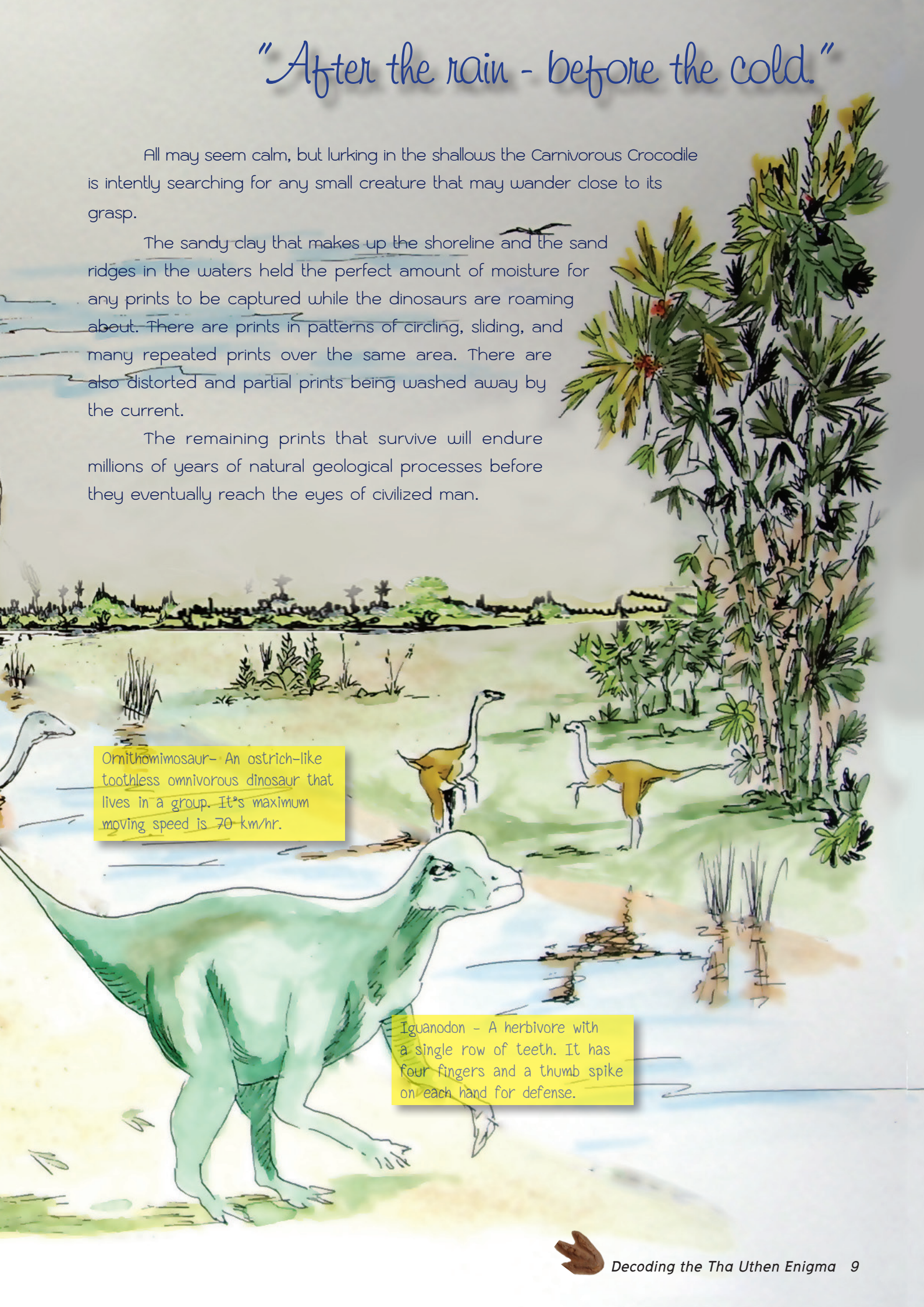


# "After the rain - before the cold."

All may seem calm, but lurking in the shallows the Carnivorous Crocodile is intently searching for any small creature that may wander close to its grasp.

The sandy clay that makes up the shoreline and the sand ridges in the waters held the perfect amount of moisture for any prints to be captured while the dinosaurs are roaming about. There are prints in patterns of circling, sliding, and many repeated prints over the same area. There are also distorted and partial prints being washed away by the current.

The remaining prints that survive will endure millions of years of natural geological processes before they eventually reach the eyes of civilized man.

A watercolor illustration of a prehistoric landscape. In the foreground, a large green dinosaur (Iguanodon) is walking towards the right. In the middle ground, several smaller dinosaurs (Ornithomimosaur) are visible, some near a body of water. A crocodile is partially visible on the left side of the water. The background shows a hazy landscape with trees and a distant horizon. The sky is a pale, hazy blue.

Ornithomimosaur - An ostrich-like toothless omnivorous dinosaur that lives in a group. Its maximum moving speed is 70 km/hr.

Iguanodon - A herbivore with a single row of teeth. It has four fingers and a thumb spike on each hand for defense.

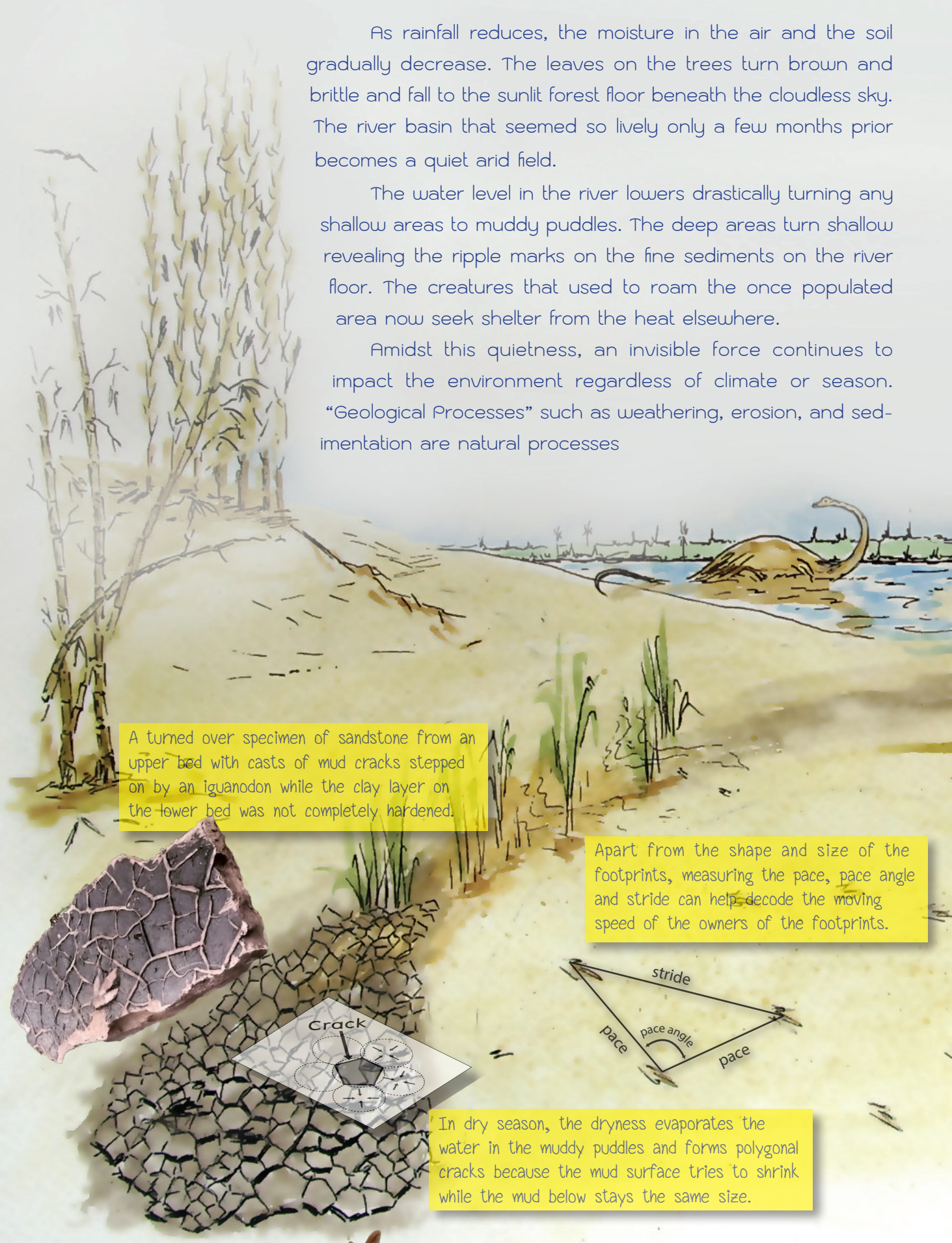




As rainfall reduces, the moisture in the air and the soil gradually decrease. The leaves on the trees turn brown and brittle and fall to the sunlit forest floor beneath the cloudless sky. The river basin that seemed so lively only a few months prior becomes a quiet arid field.

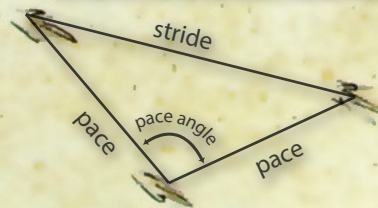
The water level in the river lowers drastically turning any shallow areas to muddy puddles. The deep areas turn shallow revealing the ripple marks on the fine sediments on the river floor. The creatures that used to roam the once populated area now seek shelter from the heat elsewhere.

Amidst this quietness, an invisible force continues to impact the environment regardless of climate or season. "Geological Processes" such as weathering, erosion, and sedimentation are natural processes



A turned over specimen of sandstone from an upper bed with casts of mud cracks stepped on by an iguanodon while the clay layer on the lower bed was not completely hardened.

Apart from the shape and size of the footprints, measuring the pace, pace angle and stride can help decode the moving speed of the owners of the footprints.



In dry season, the dryness evaporates the water in the muddy puddles and forms polygonal cracks because the mud surface tries to shrink while the mud below stays the same size.



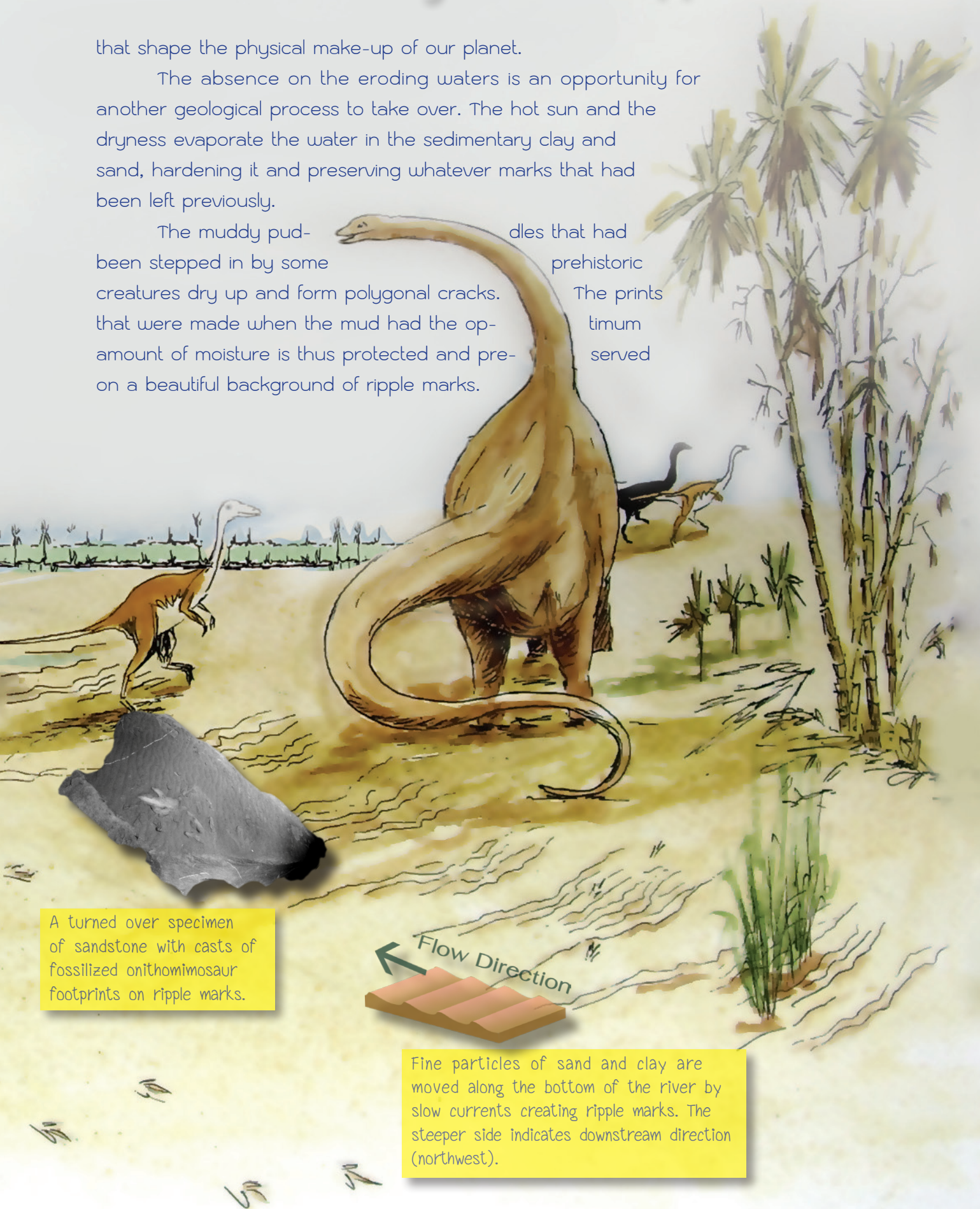


# "The dry season approaches"

that shape the physical make-up of our planet.

The absence of the eroding waters is an opportunity for another geological process to take over. The hot sun and the dryness evaporate the water in the sedimentary clay and sand, hardening it and preserving whatever marks that had been left previously.

The muddy puddles that had been stepped in by some prehistoric creatures dry up and form polygonal cracks. The prints that were made when the mud had the optimum amount of moisture is thus protected and preserved on a beautiful background of ripple marks.

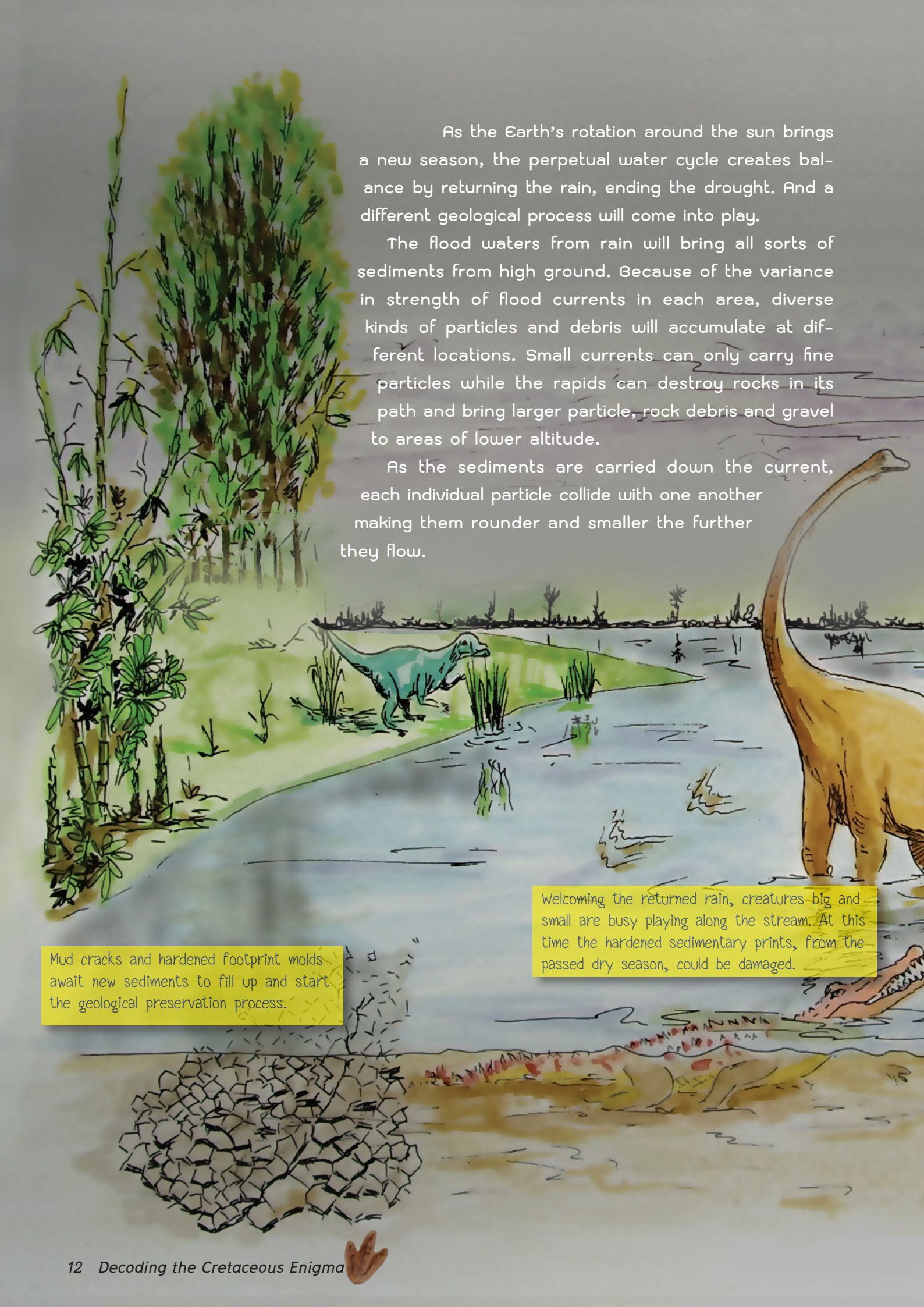


A turned over specimen of sandstone with casts of fossilized ornithomimid footprints on ripple marks.

Fine particles of sand and clay are moved along the bottom of the river by slow currents creating ripple marks. The steeper side indicates downstream direction (northwest).







As the Earth's rotation around the sun brings a new season, the perpetual water cycle creates balance by returning the rain, ending the drought. And a different geological process will come into play.

The flood waters from rain will bring all sorts of sediments from high ground. Because of the variance in strength of flood currents in each area, diverse kinds of particles and debris will accumulate at different locations. Small currents can only carry fine particles while the rapids can destroy rocks in its path and bring larger particle, rock debris and gravel to areas of lower altitude.

As the sediments are carried down the current, each individual particle collide with one another making them rounder and smaller the further they flow.

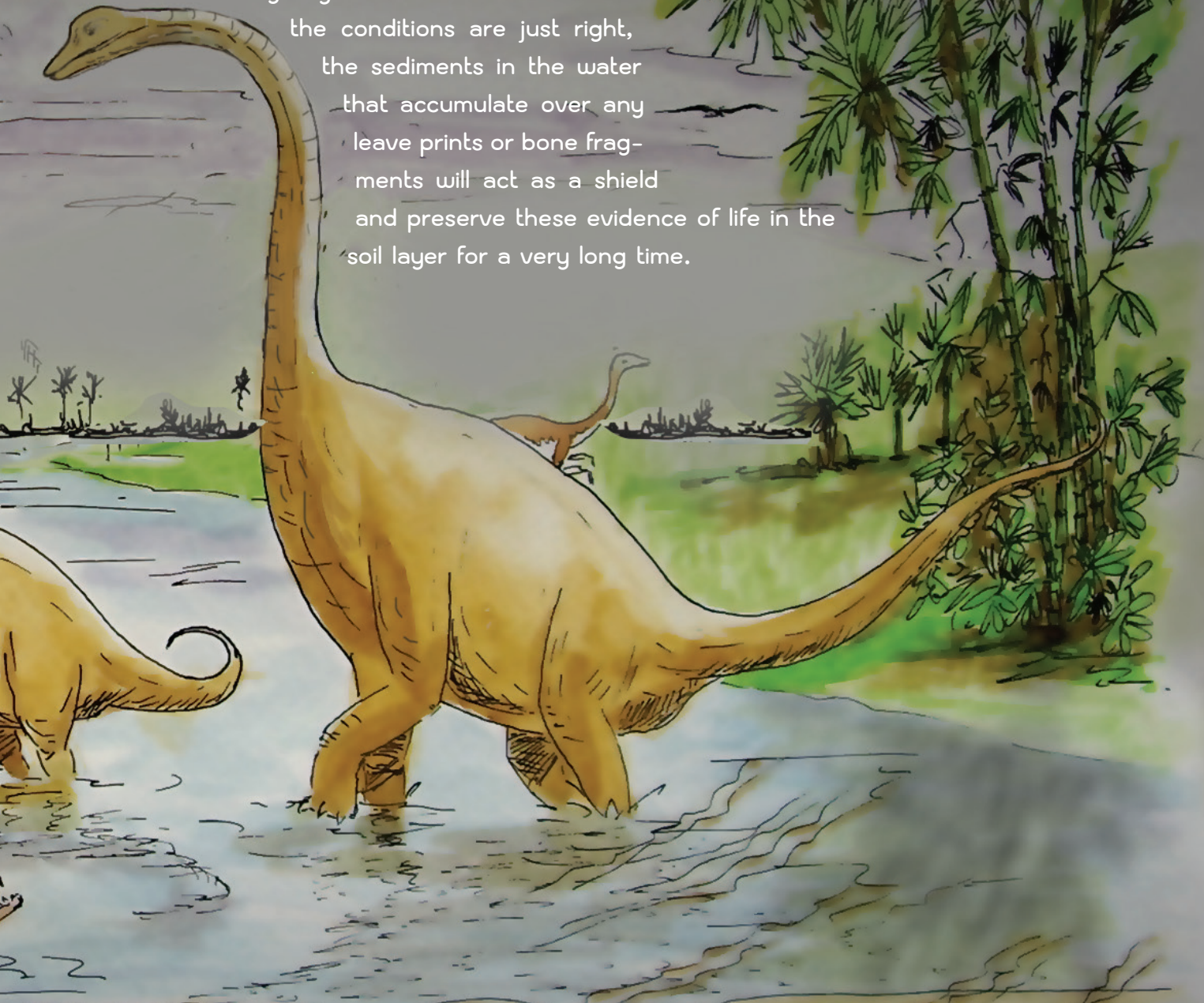
Mud cracks and hardened footprint molds await new sediments to fill up and start the geological preservation process.

Welcoming the returned rain, creatures big and small are busy playing along the stream. At this time the hardened sedimentary prints, from the passed dry season, could be damaged.



# "The rain returns"

The flood waters will flow over any fallen leaves, branches, and even carcasses of creatures that passed in the previous dry season. It may destroy any evidence of there ever being any life in an area. But when the conditions are just right, the sediments in the water that accumulate over any leaf prints or bone fragments will act as a shield and preserve these evidence of life in the soil layer for a very long time.



The new returned rains carry fine sediments to fill up all the hardened sedimentary prints, and fossilization can begin.

Most of the hardened ripple marks formed in the passed dry season are covered with new sediments. Some marks in the middle of the channel might be disintegrated by strong flows.



# The last particle...at the end of K.

## Enormous amounts of sediments filled the Khorat Paleo-basin

Geological processes can be both destructive and formative depending on the conditions and area. Rocks at high ground go through physical and chemical erosion and weathering. While lower areas and bodies of water are the perfect locations for sediments to gather and collect. These processes are in perpetual motion but varying according to season and environmental conditions.

After the flood season, when the sediments in the water have covered and protected the hardened footprints, ripple marks and mud cracks, winter returns and the entire process repeats. Year after year, the sediments that collect and accumulate influence the water level in a particular area and eventually changing where and how the water flows.

These processes occur like clockwork year after year until the Khorat Paleo-basin is met with a drastic change in environmental conditions. During the Mid-Cretaceous period, the Khorat basin endured repeated floods of sea water under dry conditions leaving behind layers of rock salts hundreds of meters thick as a result. After the sea water flooding episodes ended, the red dust that is characteristic of the soil in the region is allowed to blanket the entire basin, closing the curtains on the millions of years of sedimentation that has occurred throughout the Mesozoic era.

## The last particle...at the end of K.

The sedimentation along with the preservation of footprints that occurred during the Early-Cretaceous period over 100 million years ago is merely small part of the entire history of sedimentation in the Khorat Paleo-basin. It began approximately 220 million years ago during the Late-Triassic period with periodic sedimentation during the Jurassic period.

Continuous sedimentation occurs once more during the Cretaceous period up until the end of “K” 65 million years ago. (the Cretaceous period is known to geologists worldwide as “K”). At which time the last particle becomes one with the many kilometer deep layers of sediments that has been collecting since 150 million years prior.





# Revealing the mysterious legend

## Continents Collide

Over to the west, the India plate is moving northward in collision with the Eurasia plate. The tremendous amount of force from underneath the Earth's crust is so great that the tectonic plates continue to move toward each other even though the plates have come into contact. As a result the plate's edges rose up to form the great Himalaya mountain range we all know today.

What this massive collision does as well is expose the sediments from underneath that have been collecting for the past 150 million years and raise it up much higher than the surrounding areas. This makes the Khorat plateau the perfect target for erosion and weathering to take place.

## The Mysterious Prints at Tha Uthen

65 Million years has passed after the last sediment collected and we are back in the present. The present day Khorat plateau consists of two main regions the Sakon Nakhon Basin in the north and the Khorat basin in the south with the Phu Phan mountain range acting as the divider.

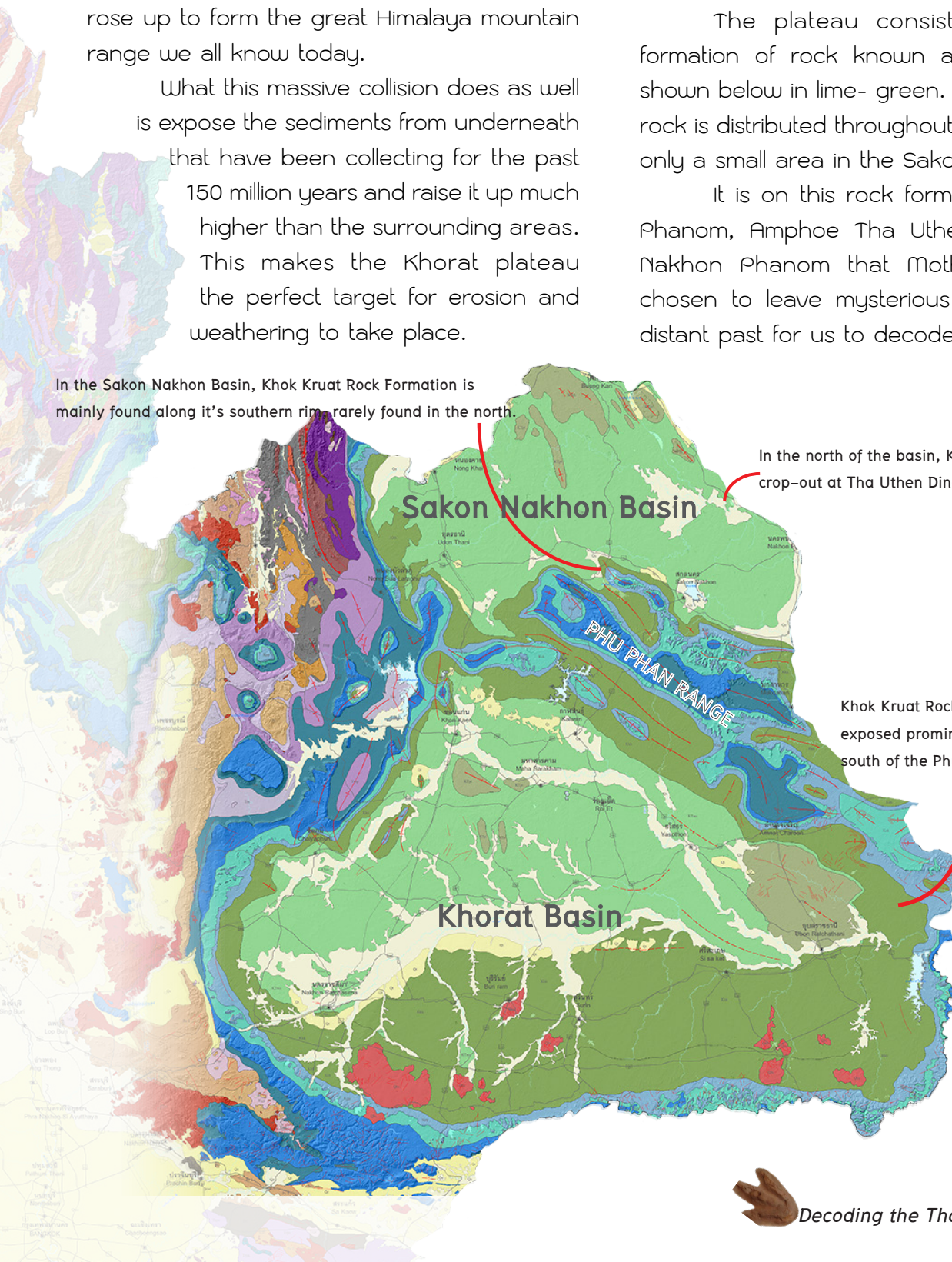
The plateau consists of a special formation of rock known as "Khok Kruat," shown below in lime-green. This formation of rock is distributed throughout the plateau with only a small area in the Sakon Nakhon Basin.

It is on this rock formation in Tambon Phanom, Amphoe Tha Uthen of Changwat Nakhon Phanom that Mother Nature has chosen to leave mysterious prints from the distant past for us to decode.

In the Sakon Nakhon Basin, Khok Kruat Rock Formation is mainly found along it's southern rim, rarely found in the north.

In the north of the basin, Khok Kruat rocks crop-out at Tha Uthen Dinosaur Footprint Site.

Khok Kruat Rock Formation (lime-green) exposed prominently around the Khorat Basin, south of the Phu Phan Range.



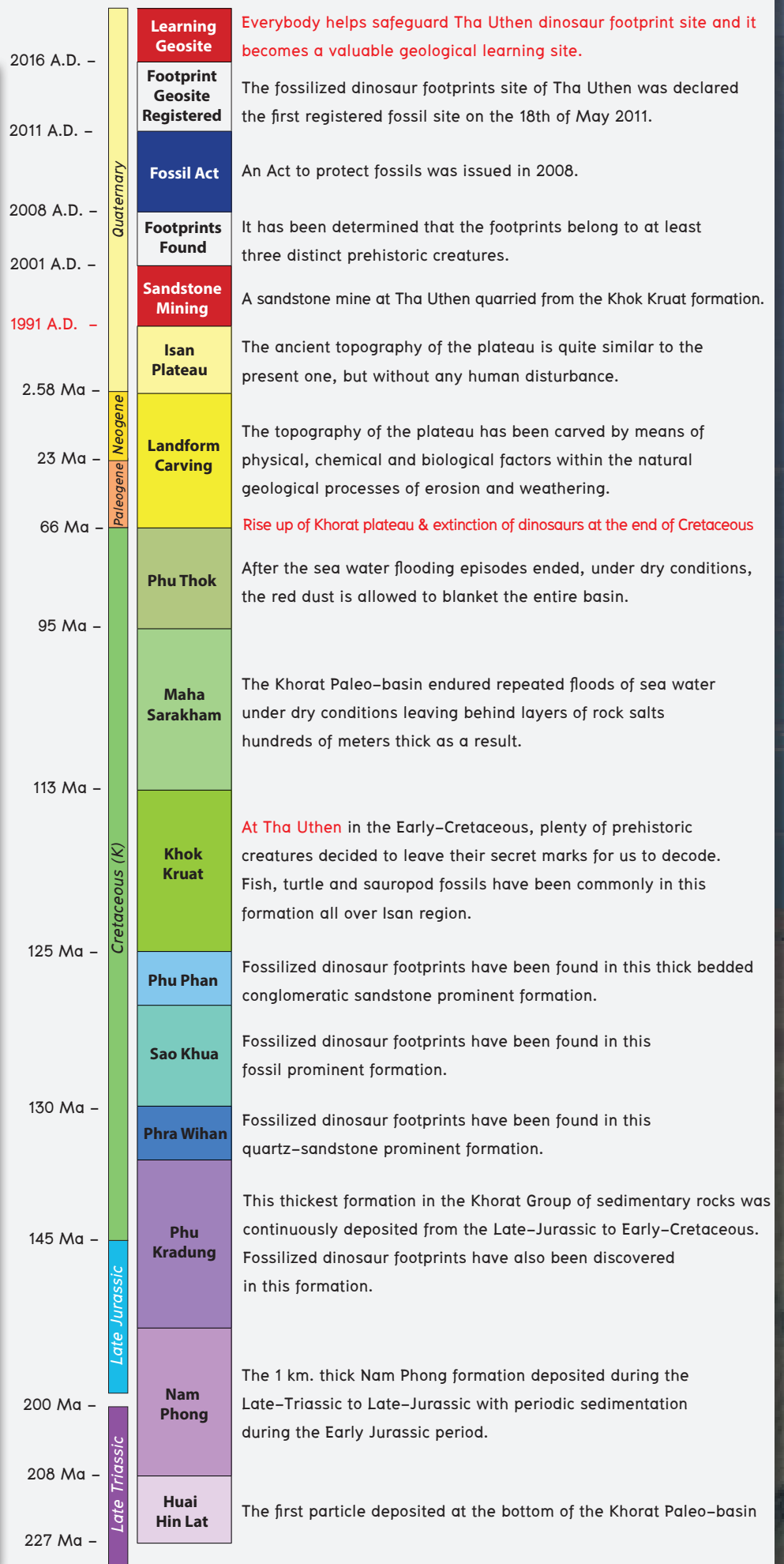


## The arid route to Tha Uthen dinosaur footprint site

The 150 million years of sediment collection in the Khorat Paleo-basin was mostly a continuous process. Geological evidence suggests that at certain periods, sedimentation did not take place.

Changing environmental conditions which directly affect the climate in turn determine what kind of geological process will take place at a particular time and location. Humidity level, temperature, and amount of rainfall all play a role in influencing how much, what type, and where sediments collect. Consequently, the make-up of sediments in the Khorat basin varies in type, particle sizes, and amount according to each time period.

The geological evidence in the Khorat basin can be classified into 9 different formations from the deepest to the top as follows: Huai Hin Lat, Nam Phong, Phu Kradung, Phra Wihan, Sao Khua, Phu Phan, Khok Kruat, Maha Sarakham and Phu Thok. The fossilized dinosaur prints is merely a small fraction of the rock type in the Khok Kruat formation.



(Ma = Million years)



# Coincidence... *or Fate?*

For the fossilization of the prints at Tha Uthen to occur, not only must the 5 geological conditions previously mentioned be met, but a myriad numbers of serendipitous events must also take place. It makes us wonder whether these footprints were created by chance or perhaps... fate.

## If that day....

If on that day the dinosaurs didn't roam about on the wet sandy clay beach, or if its pals trampled over the original prints, we would not see them today.

If on that day, the air was not dry enough to evaporate the water in the clay and harden the prints, or if the Crocodiles and Sauropods erased the prints away with their massive tails, we would not see them today.

If on that day, the perfect type of sediment did not collect at the perfect spot, or if 65 million years ago the Khorat Paleo-basin did not rise up to form a plateau, we would not see them today.

If on that day, the Mekong River did not erode the banks at Nakhon Phanom, there would not be any sandstone mines, and we would not see the footprints today.

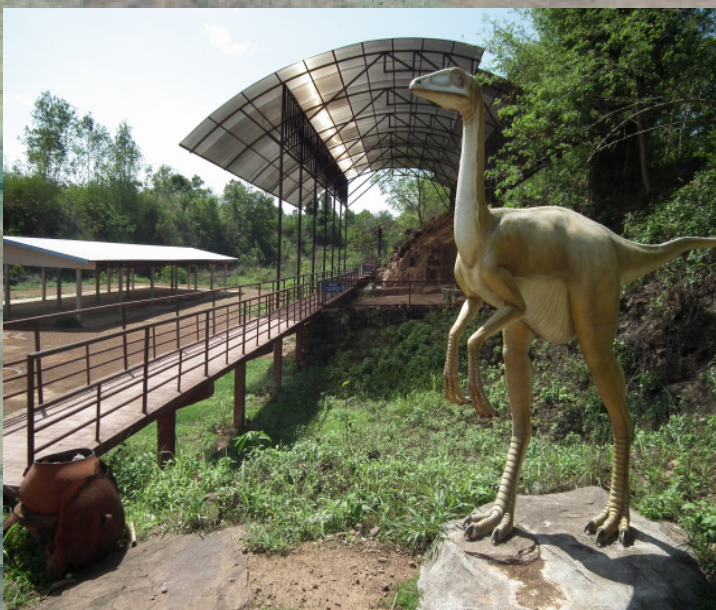
## The miraculous coincidence

Although dinosaur footprints were made ubiquitously all over the world for millions of years, fossilized prints are so rare, as in most cases at least one of the five geological conditions are lacking. Fossilized prints are found throughout the world, but are much less common compared to fossilized bones and skeletons.

The fossil site at Tha Uthen can be considered one of most important fossilized print sites in Asia due to the completeness, condition, and sheer volume of its collection. It is as if Mother Nature purposely gift-wrapped these "prehistoric gems" that took over 100 million years to craft for the world to cherish and pass on.

Presently, most countries worldwide consider geology an important part in education. The increasing public interest makes many nations want to have a fossil site of their own. But unlike other attractions, fossil sites cannot be constructed nor imported, but only discovered. Even more so the ones like the Tha Uthen site are so much more uncommon as prints are many times less likely to be discovered compared to remains.

*Because "the value of a fossil site depends on the understanding and appreciation of the people", we should spread the word and share with others what we have learned today. The more people realize the rarity and magnificence of this site, the better it can be protected and the more valuable it will become to society.*







The type of fossilized remains that Thais are mostly familiar with are the ones belonging to dinosaurs. The first dinosaur fossil was discovered in the country in 1976. Since then, fossilized remains of numerous dinosaur species have been excavated in the Northeastern region.

Perhaps it was because of their larger than life and terrifying persona portrayed in the blockbuster “Jurassic Park” that these gigantic creatures’ fossils have received so much extra attention. Subsequent discoveries of fossilized footprints have also garnered interest from the general public. Notably are the giant T-rex footprints found in the Phu Faek

Forest Park, Changwat Kalasin and the long stretch of reptilian prints found on sandstone in Amphoe Nam Nao of Changwat Phetchabun.

The prints at Tha Uthen also garnered interest from the public especially after it was declared Thailand’s first registered fossil site. This declaration is a guarantee that whatever one will witness at “the fossilized footprint site of Tha Uthen” will be extraordinary. Let’s take a look at what makes this site one of a kind

- The more than 200 prints at the Tha Uthen site is the most numerous and most dense ever found in Thailand.
- There are about 160 bipedal footprints and 40 quadrupedal footprints.



**100 million years old mud crack casts formed by the filling in of fine particles of sand in the polygonal cracks.**



**Many preserved dinosaur trackways on sandstone beds indicate their habitat and living behaviour.**





# Tha Uthen Dinosaur Footprint Site



- The fact that prints from multiple species are found on sandstone with a thin layer of mudstone indicate that many species share this river basin.
- Many prints were found on stones with ripple marks and mud cracks enabling us to determine the direction of the river's current as well as the direction of the dinosaurs and crocodiles.
- Although the fossilized remains of Ornithomimosaur and prehistoric crocodiles have been found in the "Khok Kruat" formation in many parts of the Isan region, their footprints along with those of the Iguanodon can only be found in Tha Uthen.

If the reader has the opportunity to visit the site at Tha Uthen, while standing amongst the million year old prints, close your eyes and let your imagination roam free.

It is the Cretaceous period. You are surrounded by prehistoric dinosaurs of all sizes as the cool breeze foretells the coming of winter. The hunters are busy chasing their preys while the plant eaters are doing whatever they need to survive and procreate. Suddenly, you hear a big splash in the gentle stream ahead as a crocodile pulls its lunch into the water. Your heart races and you want to run and hide, but as you open your eyes you realize they are no longer there.

**Where else in the world can one do the same?**



**Dinosaur footprints on a sandstone bed covered by thin clay layers deposited at the end of the rain.**



**The trail and the roof are vital to protect the invaluable footprints of Tha Uthen from possible damage from the rain and sun.**







พระราชบัญญัติ

คุ้มครองซากดึกดำบรรพ์

พ.ศ. ๒๕๕๑

ภูมิพลอดุลยเดช ป.ร.

Fossils are natural resources that take millions of years to craft. Any particular fossil that is destroyed cannot be replaced or rebuilt within a person's lifetime. According to this Act, a "fossil" is preserved remains or trace of any prehistoric organism that is found within or has been removed from the Earth's crust. This definition

Although Thailand has enjoyed many decades of fossil discoveries, a new problem had arose in the recent years. The illegal excavation of fossils by poachers for personal gains has led to the destruction of many fossil sites. As a result, an Act to protect fossils was issued in 2008. This definition excludes any man-made archeological sites and artifacts.

While a "Fossil site" is an area where a fossil has been discovered or excavated from. Section 14 of the Act states that if any fossil site can significantly contribute to the study of the Earth's history, Paleontology, Paleobiology, or Stratigraphy with the agreement from the board members of the fossil conservation committee shall be declared in the Royal Thai Government Gazette as a registered fossil site.

*"The discovery of significant fossils in Thailand is on the rise and so should its conservation. The study of fossils, which can be considered a nation's heirloom, can enlighten us on the Earth's history. Fossil sites also have the potential to become educational and tourist sites which can bring many benefits to the nation. However, as there is currently no specific law to protect, conserve, or govern its excavation illegal removals of fossils are on the increase. This has led to the loss of many valuable finds and the destruction of numerous sites due to improper handling and excavation. Laws must be passed to protect and conserve fossils in an efficient manner. Thus the issuance of this Act is a necessity. "*

With the authority given by the act coupled with the significance of this site, the director general of the Department of Mineral Resources has declared the fossilized dinosaur footprints site of Tha Uthen of Changwat Nakhon Phanom Thailand's first registered fossil site on the 18th of May 2011.





### ประกาศกรมทรัพย์สินทางปัญญา

เรื่อง ให้แหล่งชานิกดักดำบรรพ์เป็นแหล่งชานิกดักดำบรรพ์ที่ขึ้นทะเบียน

อาศัยอำนาจตามความในมาตรา ๑๔ วรรคหนึ่ง แห่งพระราชบัญญัติคุ้มครองชานิกดักดำบรรพ์ พ.ศ. ๒๕๕๑ และข้อ ๒ (๓) แห่งประกาศคณะกรรมการคุ้มครองชานิกดักดำบรรพ์ เรื่อง หลักเกณฑ์การประกาศเป็นแหล่งชานิกดักดำบรรพ์ที่ขึ้นทะเบียนและเป็นชานิกดักดำบรรพ์ที่ขึ้นทะเบียน พ.ศ. ๒๕๕๒ อธิบดีกรมทรัพย์สินทางปัญญา โดยความเห็นชอบของคณะกรรมการคุ้มครองชานิกดักดำบรรพ์ กำหนดให้แหล่งชานิกดักดำบรรพ์ รหัสประจำแหล่งชานิกดักดำบรรพ์ TSH ๒๕๕๒ ๕๐๐๐๐๑ ชื่อแหล่งชานิกดักดำบรรพ์ แหล่งรอยตีนไดโนเสาร์ท่าอุเทน จังหวัดนครพนม สถานที่ตั้ง เมืองหินเก่า หมู่ที่ ๒ ตำบลพนอม อำเภอท่าอุเทน จังหวัดนครพนม จำนวนพื้นที่ ๑๒.๘๐๐ ตารางเมตร

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- ยาว ๒๐๑.๑๒๑ เมตร (กค ๘๐๐๙-กค ๘๐๔๒)
- ๒๐๑.๑๑๑ เมตร (๘๖ ๓๘๕๙-๑๖ ๒๘๕๕)

ลักษณะของชานิกดักดำบรรพ์ที่ปรากฏ รอยตีนไดโนเสาร์กินเนื้อขนาดเล็กพวกเทอโรพอด และรอยตีนไดโนเสาร์กินพืช พวกซอโรพอด  
สภาพทางภูมิศาสตร์ของแหล่งชานิกดักดำบรรพ์ ที่ราบลอนคลื่น มีชั้นหินทรายสีแดงรองรับอยู่ด้านล่าง  
ชื่อผู้ค้นพบ นายนเรศ สัตยรักษ์ วันเดือนปีที่พบ กรกฎาคม ๒๕๕๔ ชื่อเจ้าของ/ผู้ครอบครอง/ผู้มีสิทธิในที่ดินโดยชอบด้วยกฎหมาย ที่ราชพัสดุ หน่วยงานที่ใช้ประโยชน์ กรมทรัพย์สินทางปัญญา  
ตามรูปถ่ายและแผนที่แนบท้ายประกาศนี้ เป็นแหล่งชานิกดักดำบรรพ์ที่ขึ้นทะเบียน  
ทั้งนี้ ตั้งแต่วันถัดจากวันประกาศในราชกิจจานุเบกษาเป็นต้นไป

ประกาศ ณ วันที่ ๑๘ พฤษภาคม พ.ศ. ๒๕๕๔  
อดิศักดิ์ ทองไข่มุกต์  
อธิบดีกรมทรัพย์สินทางปัญญา





Fossils are not  
millions of years to  
that is destroyed  
rebuilt within a person

Although Thailand  
decades of fossil discovery  
had arose in the recent  
excavation of fossils by  
gains has led to the discovery  
sites. As a result, an Act  
issued in 2008.

"The discovery of  
Thailand is on the rise and  
preservation. The study of  
considered a nation's heritage  
us on the Earth's history  
have the potential to become  
tourist sites which can bring  
the nation. However, as there  
specific law to protect, control  
its excavation illegal removal  
the increase. This has led to  
valuable finds and the destruction  
ous sites due to improper handling  
excavation. Laws must be passed  
conserve fossils in an efficient  
the issuance of this Act is a



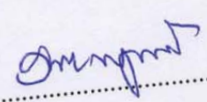
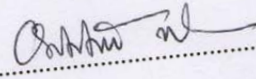
รูปถ่ายแสดงพื้นที่แหล่งรอยตีนไดโนเสาร์ท่าอุเทน จังหวัดนครพนม (มองไปทางทิศเหนือ)



รูปถ่ายแสดงรอยตีนไดโนเสาร์ท่าอุเทน จังหวัดนครพนม



รูปถ่ายแสดงส่วนจัดแสดงแหล่งรอยตีน ไดโนเสาร์ท่าอุเทน จังหวัดนครพนม

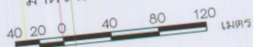
ผู้ตรวจ	ผู้อนุมัติ
 ..... (นายวินิต พุดเทียง) ผู้อำนวยการสำนักคุ้มครองซากดึกดำบรรพ์	 ..... (นายอดิศักดิ์ ทองไข่มุกต์) อธิบดีกรมทรัพยากรธรณี





# แผนที่ทำயประกาศกรมทรัพยากรธรณี

เรื่อง ให้แหล่งซากดึกดำบรรพ์ เป็นแหล่งซากดึกดำบรรพ์ที่ขึ้นทะเบียน  
ชื่อแหล่งซากดึกดำบรรพ์ แหล่งรอยตีนไดโนเสาร์ทำยูเทน จังหวัดนครพนม  
จำนวนพื้นที่ 12.800 ตารางเมตร หรือ 8 ไร่ ๐ งาน ๐ ตารางวา  
มาตราส่วน 1:4,000



- คำอธิบาย**
- แหล่งซากดึกดำบรรพ์ที่ขึ้นทะเบียน
  - เส้นชั้นความสูง 5 เมตร
  - เส้นชั้นความสูง 1 เมตร
  - หนองน้ำ ที่ลุ่มน้ำขัง

หมายเหตุ แผนที่นี้อยู่ในลำดับชุด L7017 ราว 5844 II



หมายเลข	N	E
8ฎ 3859	1959075.281	434278.352
กค 8009	1959129.258	434332.042
กค 8042	1958981.679	434468.678
1ฎ 2855	1958945.311	434431.824

ผู้ตรวจ  (นายวินัด พุฒเพียง) ผู้อำนวยการสำนักคุ้มครองซากดึกดำบรรพ์	ผู้อนุมัติ  (นายอดิศักดิ์ ทองไข่มุกด์) อธิบดีกรมทรัพยากรธรณี
 (นายสันติ ศรีง่า) นายช่างสำรวจชำนาญงาน	 (นายปริญญา โพธิ์แก้ว) นายช่างสำรวจ



# The Tha Uthen

*Because “the value of and appreciation of the people, others what we have learned and magnificence of this site, valuable it will become to*





Decoding  
**Cretaceous Enigma**

*a fossil site depends on the understanding  
"we should spread the word and share with  
today. The more people realize the rarity  
the better it can be protected and the more  
society.*

*Department of Mineral Resources, 2017*





