

Identifying dinosaur-like creatures in the mural paintings of the temple of the Emerald Buddha: an implication to study paleontological knowledge in Thailand

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Abstract

In the murals of Thailand's centuries-old "Temple of the Emerald Buddha", a depiction of two dinosaur-like creatures is present within a Ramakien scene: "Sukrip lifting Mount Kailash". Thus, to provide insights into the depiction, this research was conducted to find out why prehistoric creatures were depicted, what could be their hypothetical species, and how the artist knew of them. This was done first by, identifying the components of the painting to find out what the creatures might represent. Then, comparison results with extant, extinct, and mythical creatures were combined with analysis by experts to find the hypothetical species. Lastly, in order to learn how the artist knew about them, prehistoric publications that entered Thailand during the period in which the mural was painted were compiled. Results revealed that the creatures represent mythical "Himmavanta" creatures, which isn't unusual as these representations sometimes occur with real animals. Next, the two creatures' species were hypothesized, with the one having quadrupedal characteristics and rows of triangular plates and tail spikes hypothesized as a Stegosaur dinosaur and the other with bipedal characteristics, and short forelimbs hypothesized as a Theropod dinosaur, after combining experts' analysis and comparison with creatures, including Otters, Kangaroos, Iguanodon dinosaurs, and Himmavanta creatures. Finally, after examining historical records and determining that the mural was repainted in 1911 and restored in 1987, it is likely that the artist knew about dinosaurs from publications that entered Thailand with the first evidence of dinosaur exhibits, TV shows, and media articles being in 1965, 1967 and 1976, respectively. The possibility that the depiction was influenced by dinosaur fossils near Mount Kailash is ruled out as the area yielded no dinosaur fossils. In summary, these results provide useful context and identification of dinosaur depictions in Thailand's temple and the background of early Thai paleontological knowledge.

Keywords

Dinosaurs, Paleontology, Paleo-art, Mural Paintings.

Introduction

The temple of the Emerald Buddha is one of Thailand’s most famous Buddhist temples, located in the Thai capital, Krung Thep Maha Nakhon (Bangkok), it symbolizes the prosperity of Buddhism, arts, and cultures of Thailand in the Rattanakosin era (Liu and Yang, 2023). One of the temple’s most elaborate and important works of art is perhaps the 178 panels of murals depicting the Ramakien epic surrounding the temple complex, where its presence reinforces the importance and meanings associated with the Emerald Buddha (Roeder, 1999). Moreover, mural paintings are also increasingly becoming a topic of interest for many researchers studying the depictions of plants and animals (Stimpson and Kemp, 2023; Pareja *et al.*, 2019; Landon, 2011) and the way of life (Thavorntaweevong, 2022; Trachoo *et al.*, 2014). Hence, two dinosaur-like creatures were identified from one of the panels of the mural paintings of the temple of the Emerald Buddha depicting a Ramakien scene (Rungrot, 2017), where its presence had raised multiple questions regarding its context and background. Thus, this research aims to: (1) Study why dinosaur-like creatures were depicted; (2) Study what could be the creatures’ hypothetical species and (3) Study how the artist could have possibly been influenced to draw these creatures.

Materials and Methods

1. Dinosaur-like creature depictions

The temple of the Emerald Buddha is located in the Grand Palace, along the Chao Phraya River, in the Thai capital, Krung Thep Maha Nakhon. The temple was constructed according to the standard plan of most Thai temples but with the specific purpose of housing the Emerald Buddha, which is associated with the country’s welfare and the nation’s protection (Roeder, 1999).

The mural depictions that are identified in this research are located above the lintel of the main entrance number four of the mural paintings’ corridor in the Ramakien mural scene of “Sukrip lifting Mount Kailash” (Rungrot, 2017) (Figures 1–2). Unfortunately, unlike the structure of the temple which had not changed much since its construction in 1782 or during the reign of Rama I, the murals had been significantly repainted and restored multiple times



Figure 1. Ramakien mural scene of “Sukrip lifting Mount Kailash”.

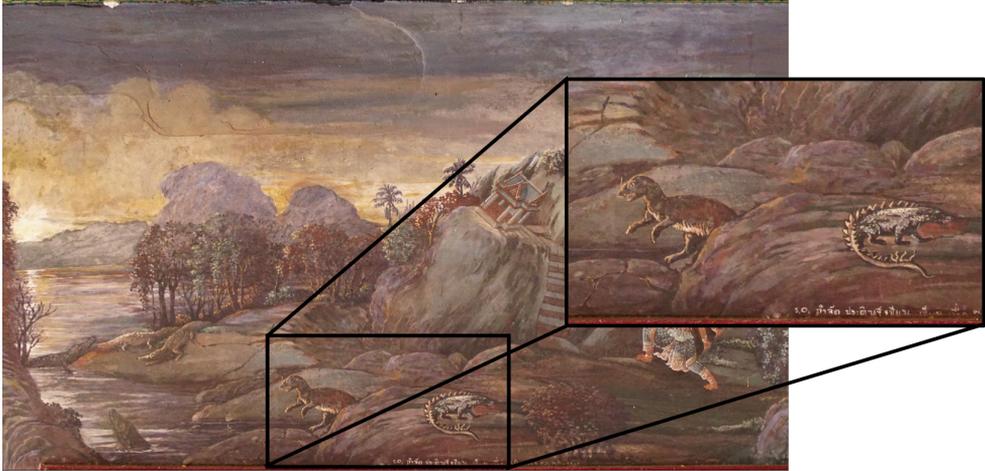


Figure 2. Enlargement of the creatures in question from the Ramakien mural scene.

during the reign of Rama III, IV, V, VII, and IX (Thavornatweevong, 2022; Roeder, 1999). Consequently, this specific mural panel in question does not date back to 1782 but instead is recorded to have been repainted in the year 1911 and restored in 1987, although the possibility of inaccuracies in the repainting date should be noted (Rungrot, 2017).

2. Identifying why dinosaur-like creatures are depicted

The reason why dinosaur-like creatures were depicted in the mural paintings was investigated by identifying the mural's components, layouts and comparing the mural with old beliefs and folklore (Figure 3). Learning about the stories associated with the depiction could provide an answer as to why dinosaur-like creatures were depicted in the mural paintings.

3. Identifying the hypothetical species of dinosaur-like creatures

In the past, many researchers identified creatures depicted in mural paintings by comparing their external morphology and by asking the opinions of experts in the field (Chatakul and Janpathompong, 2022; Akers *et al.*, 2011; Landon, 2011). Likewise, since the murals were painted in a realistic style, this identification of the dinosaur-like creatures from the temple of the Emerald Buddha made use of two consecutive processes, first by comparing the creatures' external morphology with creatures of old Thai beliefs, real extant taxa, and Paleontological extinct taxa. Then, the results from the first process was analyzed by four specialists and experts in the field, which were: (1) Dr. Nares Sattayarak, discoverer of the type specimens of the dinosaur *Psittacosaurus sattayarakii* (Buffetaut and Suteethorn; 1992); (2) Dr. Varavudh Suteethorn, discoverer of the type specimens of the dinosaur *Siamosaurus suteethorni* (Buffetaut; 1986); (3) Dr. Phornphen Chanthasit, Paleontologist and Director of the Sirindhorn Dinosaur Museum; and (4) Mr. Inrayuth Thepakun, Paleo-artist and a published author (Figure 4).

4. Identifying how the artist was influenced to draw dinosaur-like creatures

To identify how the artist was influenced to draw dinosaur-like creatures in the mural painting, various information and background knowledge at the time of the depiction needed to be compiled to investigate the connections with the depicted creatures, this included: (1) Publications in books, magazines, TV shows, and newspapers; (2) Museum displays; and (3) Exhibitions. This could be done by searching in the National Library of Thailand and the Thai Film Archive. Moreover, as the scene of the mural depiction is "Sukrip lifting Mount Kailash", information surrounding Mount Kailash in Tibet also had to be compiled (Figure 5).

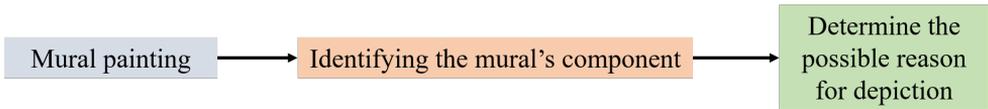


Figure 3. Methods to identify why dinosaur-like creatures were depicted.

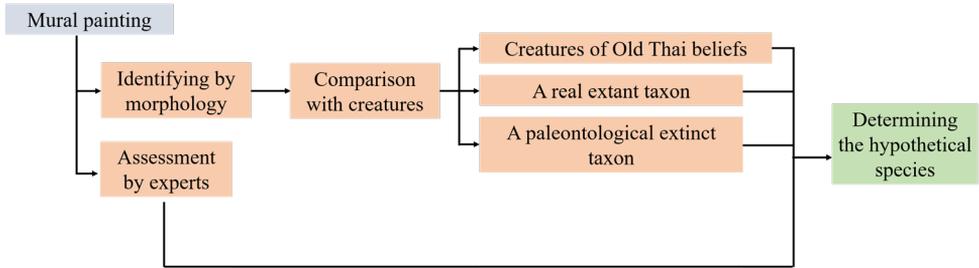


Figure 4. Methods to identify the hypothetical species of dinosaur-like creatures.

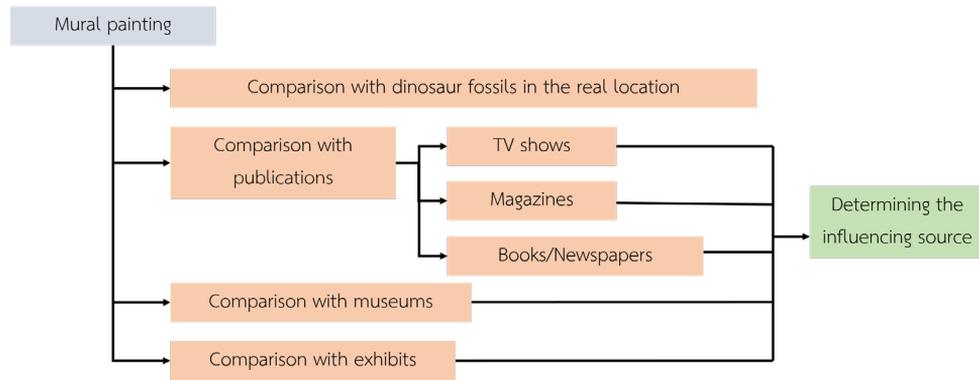


Figure 5. Methods to identify the hypothetical species of dinosaur-like creatures.

Results and discussion

1. Why dinosaur-like creatures are depicted

Thai beliefs and folklore talk of a mythical forest “Himmapan” at the center of the continent and within the Himmapan is a sacred lake “Anotatta”, which is surrounded by five towering Himmapan peaks, one of them being Mount Kailash (Laorsuwan, 2018; Jatuma, 2018) (Figure 6). Furthermore, the mural scene of interest in this research “Sukrip lifting Mount Kailash” also contains the depiction of Mount Kailash; therefore, it is possible to overlay the layout from Thai beliefs and folklore onto the mural scene (Figure 7). Doing so places the two dinosaur-like creatures in the section of the mural that is likely depicting the Himmapan forest, and as Thai beliefs and folklore also talk about the magical and mythical creatures that live in the Himmapan forest, it is very likely that the artist intended to use the dinosaur-like creatures to represent mythical Himmapan creatures. This representation isn’t abnormal as artists sometimes use hearsay descriptions of a real taxa to draw their Himmapan creatures with examples of various depiction of rhinoceros as Himmapan creatures (Fine Arts Department, 2018; Silpachaisri, 2017).

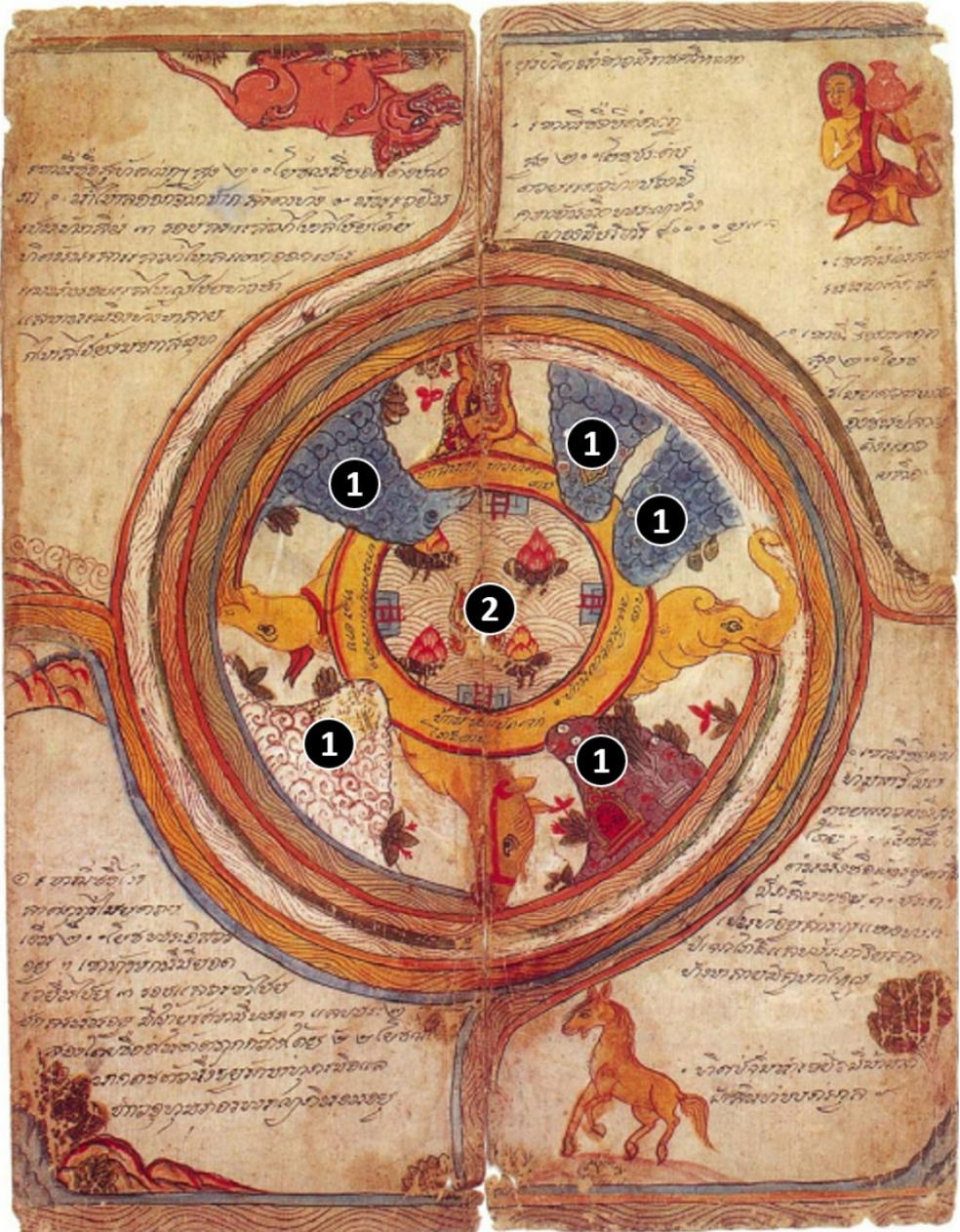


Figure 6. Thai beliefs and folklore layout of the Himmaman with the five Himmaman peaks labelled as “1” and the Anotatta lake labelled as “2”. Mount Kailash is the mountain depicted on the lower left corner. Modified from the National Library of Thailand (1999).

2. Hypothetical species of the depicted creatures

The two creatures from the mural depiction are named Creature One and Creature Two. Creature One has reptile-like, quadrupedal characteristics with rows of triangular plates on its back and pairs of spikes near the end of its tail, while Creature Two bares bipedal characteristics

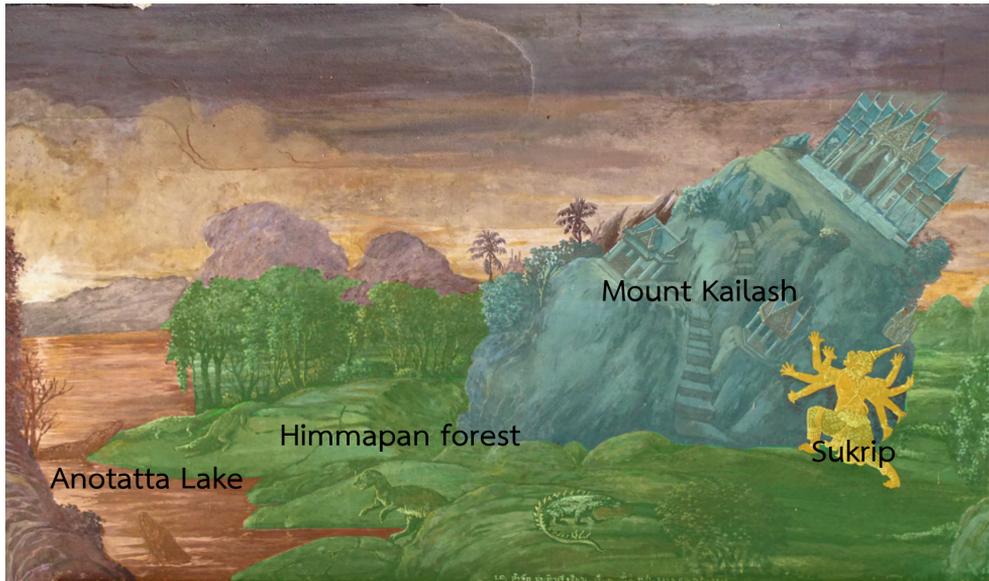


Figure 7. Thai beliefs and folklore layout overlaid onto the mural painting with the Anotatta Lake in red, the Himmapan forest in green, Mount Kailash in blue, and Sukrip in yellow.



Figure 8. Depicted Creature One (left) and depicted Creature Two (right).

with short neck, no visible ear, two forelimbs, and a cat-like eye (Figure 8).

2.1 Hypothetical species of depicted Creature One

In order to identify the hypothetical species of Creature One, it was first compared with Himmapan creatures from the book of the drawings of the Himmapan creatures: Mang-gon, Ghilen Peek, and Sagoon Kraisor, which have some similarities with Creature One (Figure 9). Unfortunately, upon closer inspection, Mang-gon was ruled out due to the drastic difference in tail and spike shape, and Ghilen Peek and Sagoon Kraisor were both ruled out due to their crest-like characteristics (Fine Arts Department., 2018). Next, as real extant taxa that match the preliminary characteristic of Creature One could be found, Creature One was compared to

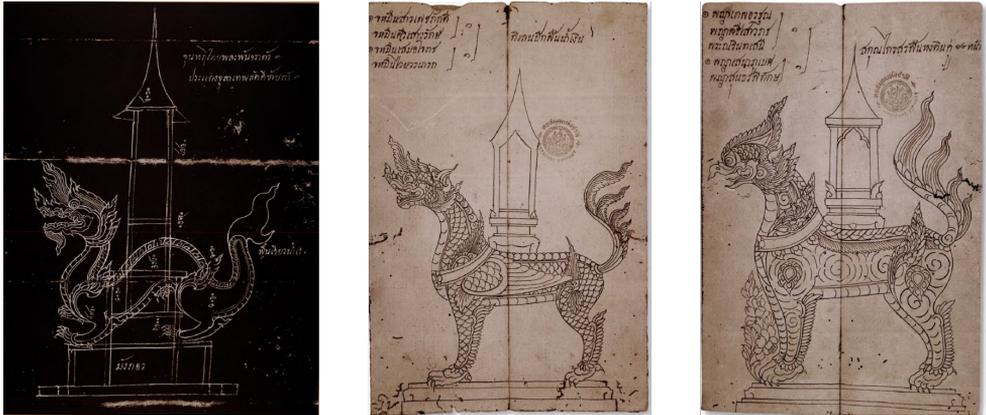


Figure 9. Mang-gon (left), Ghilen Peek (Middle), and Sagoon Kraisorn (Right) (Fine Arts Department, 2018).



Figure 10. Illustration of a Stegosaur in “The BBC Book of Dinosaurs” from the same period as the depiction (Appleby, 1990).

a Paleontological taxon: a Stegosaur Dinosaur (Stegosauria) (Figure 10). Furthermore, upon inspection, the morphological characteristics of Creature One and Stegosaur showed significant correspondence, especially with the rows of triangular plates and tail spikes which are present in both Creature One and Stegosaur.

Analyses by the experts further concluded that the most likely hypothetical species for Creature One is a Stegosaur (Stegosauria). As presented in Table 1, three of the four experts agreed that Creature One is a dinosaur, while two of those experts agreed that Creature One is most likely a Stegosaur dinosaur. Whereas the other expert suggests that Creature One is a Dinosaur but shows no resemblance to any known species. On the other hand, only one expert suggests that Creature One isn't a dinosaur, but rather a carnivorous reptile.

Table 1. Table of analyses of the hypothetical species of Creature One by experts in the field.

Name of Experts	Roles	Is Creature One a dinosaur?	What dinosaur/ animal is it?
Mr. Nares Sattayarak	Discoverer of dinosaur <i>P.sattayarakii</i>	Yes	No similarity to known dinosaur species
Dr. Varavudth Suteethorn	Discoverer of dinosaur <i>S.suteethorni</i>	No	A carnivorous reptile
Dr. Phornphen Chanthasit	Paleontologist, Director of the Sirindhorn Museum	Yes	Stegosaur
Mr. Intrayuth Thepakun	Pleo-artist, and published author	Yes	Stegosaur
Total Answers combined		Most likely a Dinosaur	Most likely a Stegosaur

2.2. Hypothetical species of depicted Creature Two

Like the identification of the hypothetical species for Creature One, Creature Two was compared to four Himmaman creatures which resemble its preliminary description from the book of the drawings of the Himmaman creatures: Nok Garawake, Subun Hayra, Suea Peek, and Nok Tuntima (Figure 11). Nok Garawake was ruled out first due to its beak and crest-like characteristic which does not resemble Creature One. Moreover, Subun Hayra was also ruled out due to its crest-like characteristics, and Suea Peek and Nok Tuntima were finally ruled out due to their wing-like characteristics which aren't present in Creature One (Fine Arts Department, 2018).

Creature Two is compared to possible extant taxa that it could potentially resemble: a kangaroo (*Macropodidae*). Both Creature Two and kangaroos share some common characteristics, such as being bipedal and having two short forelimbs. Despite this, Creature Two lacks some important characteristics of a kangaroo, such as its ears, its pouch, and its fur. Even though kangaroos are indigenous to Australia, historical records showed them in Thailand since the year 1878 (Navigamune, 2008), allowing their depictions in mural paintings of other Thai temples including Wat Somanas Rajavaravihara, Wat Arun Ratchawaram Ratchawaramahawihan, and Wat Saen Suk (Figure 12). With this information, it was possible to compare Creature Two with these mural depictions which confirms that Creature One lacks vital characteristics of a Kangaroo and most likely isn't one.

Creature Two was compared with another extant taxa that matched its preliminary characteristic: an otter (*Lutrinae*). Both Creature Two and otters share some common characteristics, including their short neck, forelimbs, and bipedal characteristics. Regardless, otters still have some characteristics that do not align with Creature Two such as their visible ear, whiskers, and fur. Thus, in order to validate the possibility of Creature Two being an otter, an inspection of mural depictions of otters in another Thai temple (Wat Suthat Thepwararam Ratchaworamahawihan) (Figure 13) is conducted, which led to the conclusion that Creature Two lacks the features of an otter and most likely isn't one.

Creature Two was then compared with Paleontological extinct taxa, which were: an Iguanodontian Dinosaur (Iguanodontia) (Figure 14), and a Theropod Dinosaur (Theropoda) (Figure 15). The Iguanodontian dinosaur is a large herbivorous dinosaur from the Early Cretaceous of the Mesozoic Era (Paul, 2008), while the Theropods consist of most of the Mesozoic predatory dinosaurs and have a global span of over 120 million years (Carrano *et al.*,

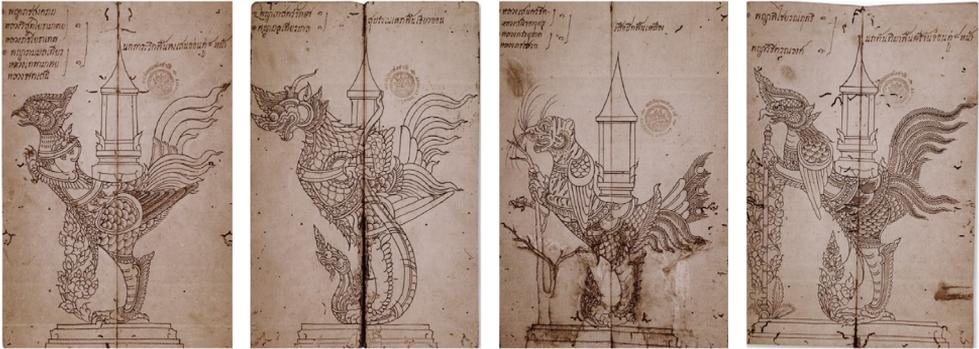


Figure 11. Nok Garawake (first from left), Subun Hayra (second from left) Suea Peek (third from left), and Nok Tuntima (fourth from left) (Fine ArtsDepartment, 2018).



Figure 12. Depictions of Kangaroos in Wat Somanas Rajavaravihara (left), Wat Arun Ratchawaram Ratchawaramahawihan (middle), and in Wat Sean Suk (right) Image courtesy of Dr. Cholawit Thongcharoenchaikit.

2012). Moreover, both the Iguanodon, Theropod, and Creature Two share a variety of common characteristics, which include their elongated skull, forelimb claws, curved back, and bipedal characteristics but still lack some features such as a large eye. Therefore, expert analyses were reviewed which led to the conclusion that Creature Two is most likely a Theropod dinosaur. As presented in Table 2, three of the four experts agreed that Creature Two is a dinosaur, while two of those experts agreed that Creature Two is most likely a Theropod dinosaur. Whereas the other expert suggests that Creature Two is an Iguanodon. Only one expert suggests that Creature Two isn't a dinosaur, but rather an otter.

3. Influencing source for the artist to depict dinosaurs

There could be multiple influencing sources for the depiction of dinosaurs in the mural painting, but the main sources are discussed for their possibility of influencing the depiction by compiling dinosaur-related sources that entered Thailand before the mural restoration in 1987. Furthermore, it should be noted that the first dinosaur fossil found in Thailand was in the year 1976, so it could be possible that artist had been influenced by this as well (Samathi, Chantasit and Sander, 2019).

3.1 Possibility of dinosaur fossils near Mount Kailash influencing the depiction

The dinosaur depiction in the mural painting is located close to the foot of Mount Kailash. Therefore, could it be possible that this depiction was influenced by dinosaur fossils being found in the proximity of Mount Kailash in the Tibet Autonomous Region of China? Unfortunately, the Tibetan Region is one of the world's least explored places in terms



Figure 13. Depiction of an otter in Wat Suthat Thepwararam Ratchaworamahawihan.

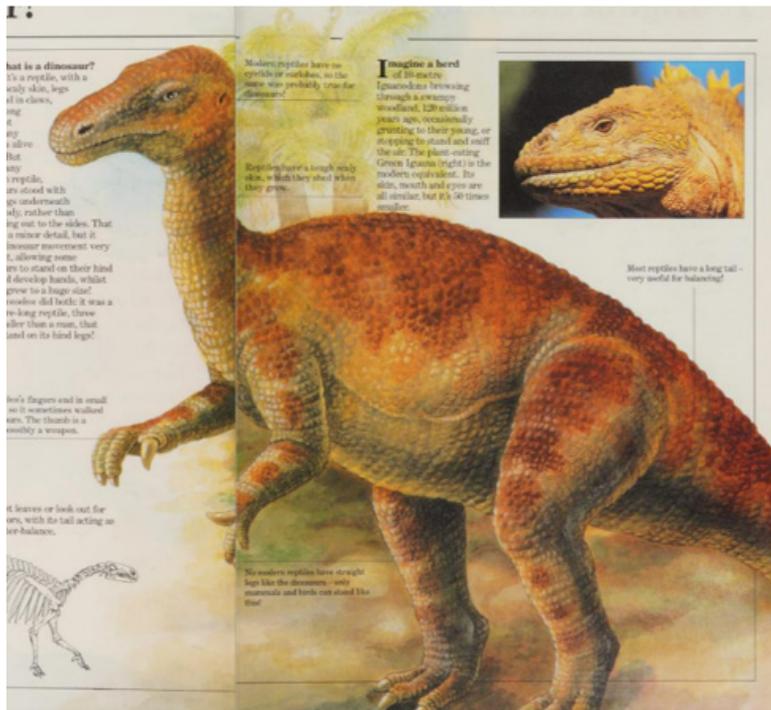


Figure 14. Illustration of an Iguanodon in “The BBC Book of Dinosaurs” from the same period as the depiction (Appleby, 1990).

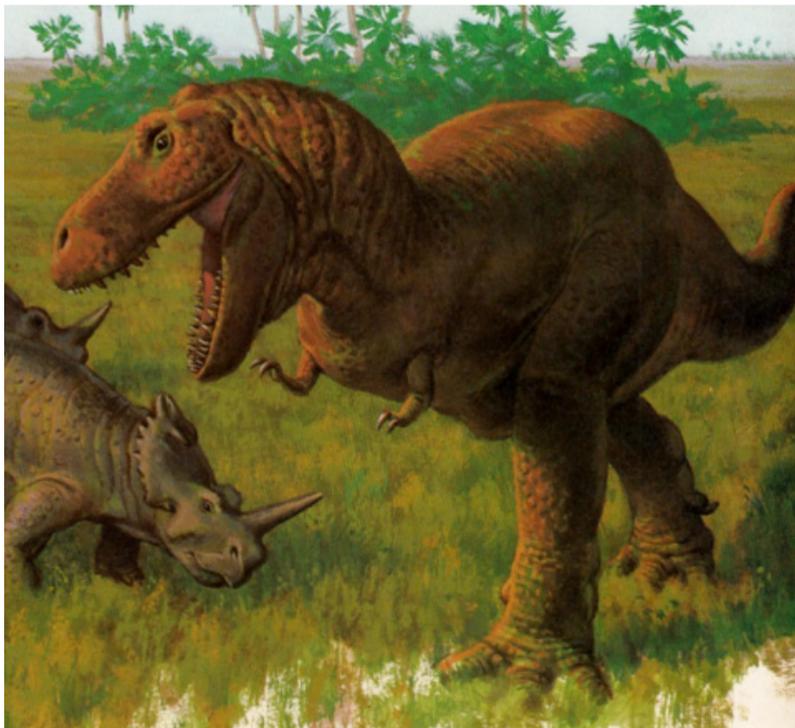


Figure 15. Illustration of a *Tyrannosaurus rex* (a Theropod) in “Dinosaurs” from the same period as the depiction (Jackson, 1972).

of Paleontology and as most of the fossils of the Tibetan plateau have been found close to the borders of other provinces to the east (Yu *et al.*, 2023; Wei *et al.*, 2023), the possibility of dinosaur fossils being found in the proximity of Mount Kailash is low. Therefore, the possibility of dinosaur fossils in the proximity of Mount Kailash influencing the dinosaur depiction was ruled out.

3.2 Possibility of dinosaur media influencing the depiction

It is possible that the dinosaur depiction was influenced by dinosaur-related media such as various dinosaur-related media that had entered Thailand for some time, although there are no records of the time when they started appearing in Thailand. Here, dinosaur media that entered Thailand before the year 1987 is compiled as follows:

(1) Around the year 1967-1968, a Japanese-made TV series “The Monster Prince” was aired in Thailand. The series contained multiple “monsters” which were based on dinosaurs.

(2) Since the year 1971, multiple Thai books and magazines have started publishing dinosaur-related content, this includes the Chaiyapruet Science Magazine published in October of 1971 and in April of 1976 and the “Dinosaurs” book published in April of 1982. (Figure 16).

(3) In December of 1976, Thairath and Dailynews newspaper publishers published dinosaur-related articles in their newspaper (Thairath, 3 December 1976, Issue 6893, Page 8 and Daily News, 6 December 1976, Issue 9963, Page 1) in order to promote the film “At the Earth’s Core” (Figure 17).



Figure 16. Dinosaur content in Chaiyapruke Science Magazine published in October of 1971 (left), Chaiyapruke Science Magazine published in April of 1976 (middle), and Dinosaurs book published in April of 1982 (right).



Figure 17. Dinosaur article in Thairath newspaper, 3 December 1976, Issue 6893, Page 8 (left), and Daily News newspaper, 6 December 1976, Issue 9963, Page 1 (right).

Table 2. Table of analyses of the hypothetical species of Creature Two by experts in the field.

Name of Experts	Roles	Is Creature Two a dinosaur?	What dinosaur/animal is it?
Mr. Nares Sattayarak	Discoverer of dinosaur <i>P.sattayarakii</i>	Yes	<i>Tyrannosaurus rex</i> (Theropod)
Dr. Varavudth Suteethorn	Discoverer of dinosaur <i>S.suteethorni</i>	No	Otter
Dr. Phornphen Chanthasit	Paleontologist, Director of the Sirindhorn Museum	Yes	Iguanodon
Mr. Intrayuth Thepakun	Pleo-artist, and published author	Yes	<i>Allosaurus</i> (Theropod)
Total Answers combined		Most likely a Dinosaur	Most likely a Theropod



Figure 18. Dinosaur exhibit of the Chulalongkorn University from the front cover of the Magazine of the Science Society of Thailand, issued in November of 1965.

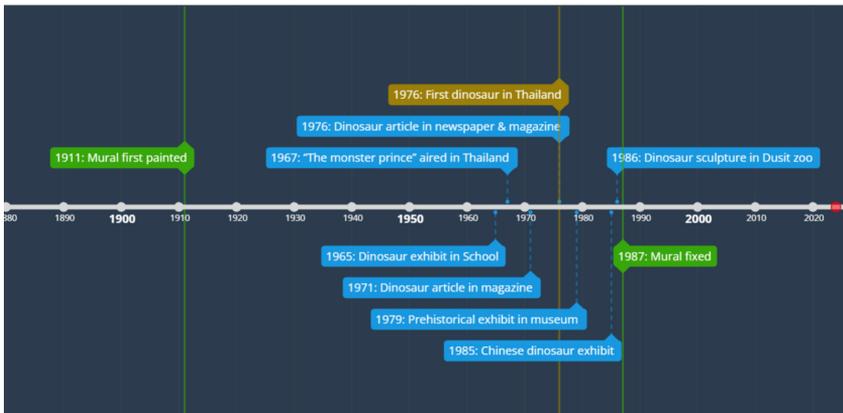


Figure 19. Timeline of Dinosaur-related publications, museum descriptions and exhibits in Thailand. Made using TIMEGRAPHIC.

3.3 Possibility of Museum displays influencing the depiction

At the time of the depiction, the Science Center for Education (Bangkok Planetarium) was one of the main museums in Bangkok. Furthermore, evidence from a TV show in 1979 touring the museum showed that the museum contained “Prehistorical exhibits” although it isn’t certain what the exhibit was actually about.

3.4 Possibility of Exhibits displays influencing the depiction

Multiple dinosaur exhibits have been documented in Thailand, thus it is possible that the artist could have been influenced to depict dinosaurs by these following exhibits:

(1) From 1 to 7 of December 1965, the Geology department of Chulalongkorn University arranged a dinosaur exhibit at Triam Udom Suksa School. This consists of the model of a duck-billed dinosaur, an Iguanodontian-like dinosaur, and many fossils (Figure 18).

(2) In July and August of 1984, an exhibition of Chinese dinosaur fossils was held at the PATA department store. The exhibition consisted of fossils and models of *Tsintaosaurus* and *Mamenchisaurus*.

Discussions

Results regarding how the artist was influenced to draw dinosaurs showed that multiple dinosaur-related media and knowledge had entered Thailand for at least 11 years before the first dinosaur discovery in 1976 and continued to do so afterward (Figure 19), inferring that the early Thai Paleontological knowledge would have to be from a foreign country. This supports the spread and globalization of dinosaur-related knowledge and sheds light on the early Paleontological knowledge among the Thai general population.

Summary

In the Ramakien mural scene of “Sukrip lifting Mount Kailash” in the Temple of the Emerald Buddha, which was repainted in 1911 and restored in 1987, two dinosaur-like creatures were identified, and conclusions were made that they were a representation of mythical Himmaman creatures. This was because they are specifically placed in the section of the Himmaman forest in the mural. Next, by comparing the creatures with mythical Himmaman creatures, real extant taxa (including otters and kangaroos), and Paleontological extinct taxa (Including a Stegosaur and an Iguanodon) and combining the results with analyses by four experts, the creature with quadrupedal characteristics, rows of triangular plates and tail spikes was considered to be a Stegosaur dinosaur, while the other with bipedal characteristics, and short forelimbs was considered to be a Theropod dinosaur. Finally, after compiling publications, museum displays, and exhibits that entered Thailand before 1987, it is likely that the artist was influenced to draw dinosaurs from these sources. The first discovery of dinosaur fossils in Thailand was in 1976, with the first evidence of dinosaur publications, museum displays, and exhibits in Thailand being in 1967, 1979 and 1965, respectively. Whilst the possibility that the depiction was influenced by dinosaur fossils found in the proximity of the real Mount Kailash in the Tibetan Plateau of China was ruled out since the area comprises no known dinosaur fossils. In summary, these results provide useful context and identification of dinosaur depictions in one of Thailand’s most famous and significant Buddhist temples and the background and entry of early Paleontological knowledge in Thailand.

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