

I BET YOU DIDN'T KNOW...

The fossilised secrets of the rhino and the beetle

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cutting-edge research with
the principles of primary science



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Secret number 1

Giant rhinos once roamed the Earth

According to the World Wildlife Fund (WWF), there are only five species of rhinoceros left on Earth (Figure 1). These magnificent mammals have distinctive horns and are huge - the largest weighing over 3 tonnes - but they mainly eat grass and leaves! No wonder that the collective noun for rhinos is a crash!

Figure 1. The White Rhino is Africa's largest rhino, living on grassland and savanna. It weighs 1,800 kg to 2,700 kg. There are fewer than 20,000 animals left.



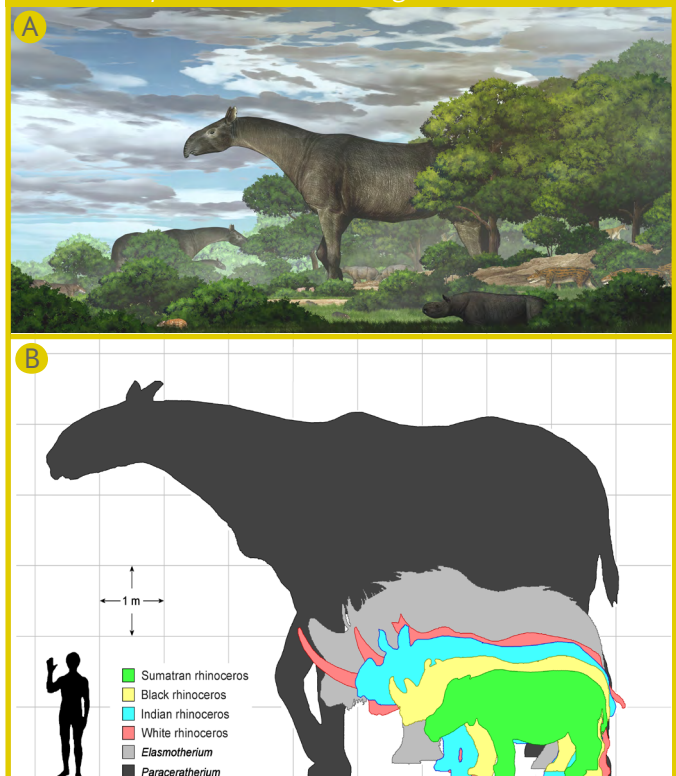
Impressive as they are, modern rhinos are small compared to their ancestors! Palaeontologists working in Northern China have recently uncovered fossils of one of the largest mammals ever to have walked on land. After finding the completely preserved skull and jawbone in 26.5 million year old deposits (Figure 3), the scientists were able to name it as a new species of giant rhinoceros. There are thought to have been many species of giant rhinoceros and the fossil evidence shows that they spread across a wide land mass.

The shapes and sizes of the fossilised bones of giant rhinos indicate that they were up to 7 metres tall. Their skulls were narrow and they had two cone shaped upper incisors. They could have eaten leaves from the tops of the trees. Scientists think that they would have looked

more like horses than rhinos, with long necks and narrow heads. Interestingly, although the new species would have been one of the biggest, it did not have a horn. Scientists used their knowledge of bones and muscles of existing animals to estimate that they would have weighed about 21 tonnes, equivalent to the weight of four large African elephants.

Using the combined skills of scientists and artists, these enormous skeletal fossils give us an awe-inspiring glimpse at what the Earth may have looked like 26.5 million of years ago when giant rhinos were roaming the Earth (Figure 2).

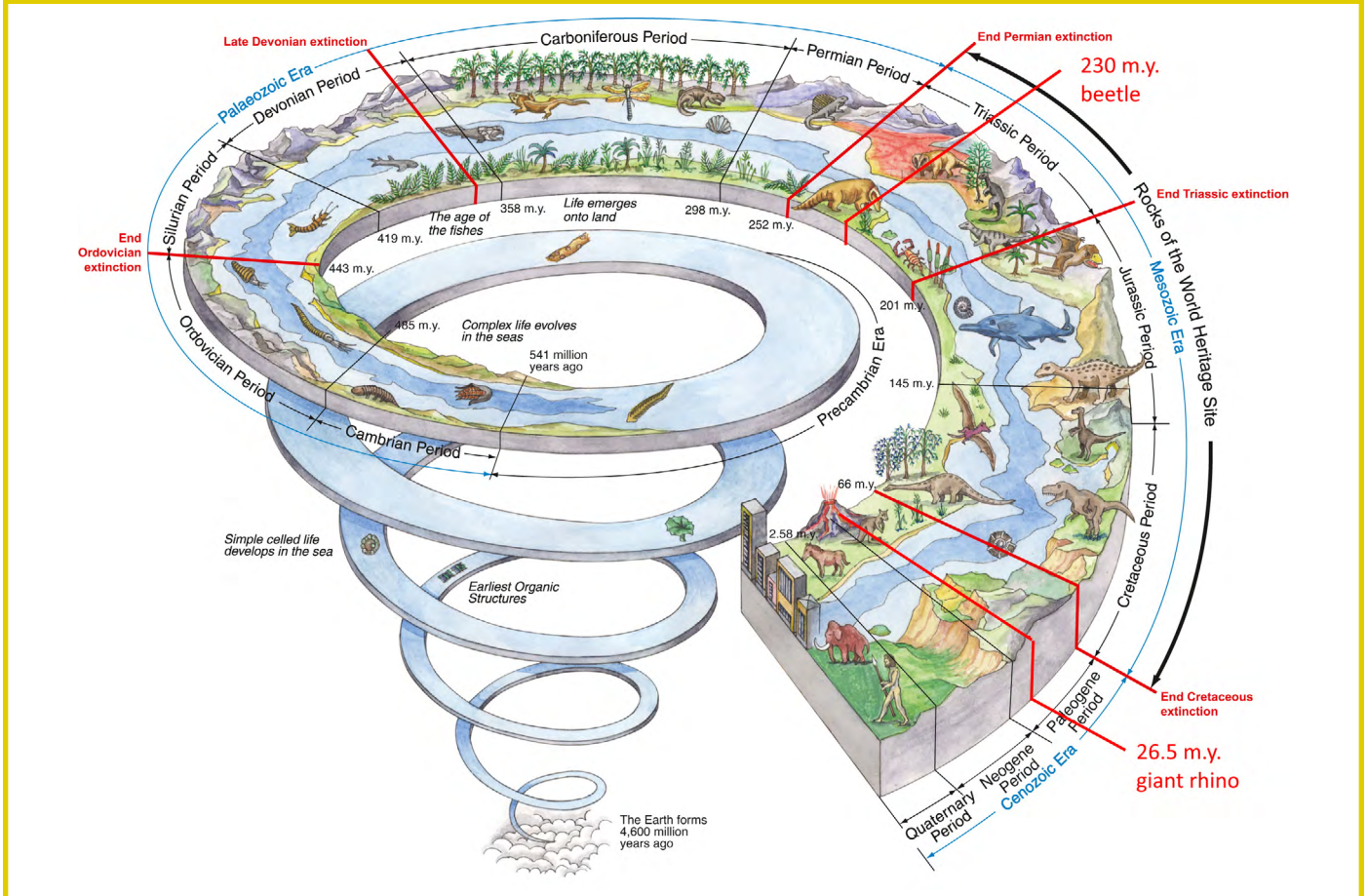
Figure 2. A, An artist's impression of the giant rhino and its habitat. B, The relative sizes of the 5 current species of rhinos compared with the extinct giant rhino.



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Figure 3. Time spiral to show the history of the Earth. The periods when the giant rhino and beetle existed are shown. More details can be found in PSTT's Big Jurassic Classroom Resource Pack available [here](#).



Secret number 2

New species can be discovered in coprolite (fossilised poo)

The next fossilised secret revealed by scientists in 2021 takes us back much further in time: this creature existed 230 million years ago (Figure 3). Scientists have, for the first time, identified a new *insect* species in an ancient animal's fossilised faeces (poo).

Beetles (*Coleoptera*) are one of the most diverse groups currently on Earth. New species are discovered every day. Three of the new beetle species found in 2021 are named after the Pokemon birds: Articuno, Moltres and Zapdos. However, fossilised beetles are very rare and specimens have proved difficult to interpret. This is because most fossils are created from hard materials such as bones and shells. Soft body parts tend to decompose before they can leave an impression.

The best samples of ancient invertebrates have previously been found in amber. Amber is fossilised tree resin. Small creatures (most commonly flies) crawled or flew into fresh tree sap and got stuck. When amber is formed with an *inclusion* of an insect, their soft tissues do not rot away and all their features are easy to see (Figure 4). However, the oldest amber samples are about 100 million years old. Scientists do not know much about insects which existed before then.

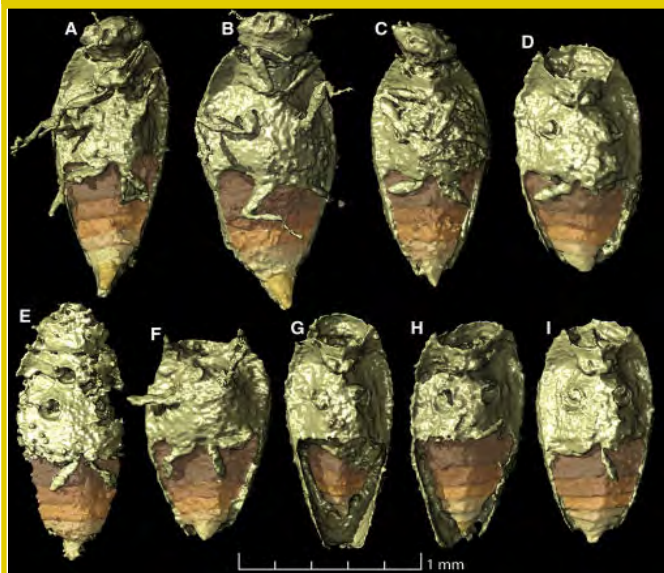
Figure 4. A, Tree resin, B, An insect inclusion in amber.



Coprolites are called *trace fossils* because they do not contain actual body parts. Ever since Mary Anning first identified them in 1824, fossilised faeces have provided *palaeontologists* with interesting insights into the diets of animals and food chains. They have never been used to identify animals before, because researchers did not think that small insects which had passed through the digestive systems of larger animals would be recognisable.

Using *synchrotron microtomography*, Qvarnström and his team (2021) created an almost complete 3D reconstruction of the beetle without destroying the coprolite. They found that even the delicate structures of the legs and antennae were clear. This technology uses X-rays and is so precise that abdominal segments and the exact position of the antennae could be used to classify the beetle as a new species (Figure 5).

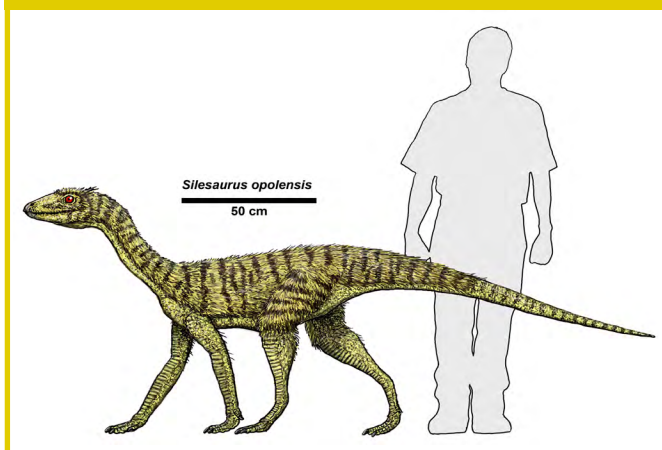
Figure 5. *Triamyxa coprolithica*, a Triassic insect, found preserved in fossilised poo.



© Martin Qvarnström, Martin Flikáček, Joel Vekberg Wernström, Sigrd Huld, Rolf G. Beutel, Emmanuel Ariaga-Varela, Per E. Ahlberg, Grzegorz Niedźwiedzki, licenced through Creative Commons and accessed [here](#).

This newly discovered beetle species was just 1.4 mm long and the science team think that it may have lived on *algae* in wet habitats. From looking at the nearby fossils, they have also suggested that the fossilised poo was from an animal with features similar to dinosaurs (Figure 6).

Figure 6. An artist's impression of *Sileasaurus opolensis*, compared to the size of a human.



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Both these recent fossil discoveries have revealed secrets about the *fauna* of ancient Earth. As new technology is developed, perhaps even more secrets will be discovered. We will have to wait and see.

A [Teacher Guide](#) with links to appropriate webpages and describing activities for children is available.

GLOSSARY

algae

a simple, non-flowering plant that usually lives in water

coprolite

fossilised faeces (poo) of animals that lived millions of years ago

fauna

the animals of a particular region, habitat or period

incisors

the front teeth of most mammals

inclusion

a body or particle of distinct composition embedded in a rock or other material as it forms

insect

an invertebrate with three distinct body parts: head, thorax and abdomen

palaeontologist

a scientist who studies the remains of plants and animals that lived millions of years ago

synchrotron microtomography

a process that uses x-rays to recreate a virtual 3D model of an object without destroying the original object

trace fossil

a fossil of a footprint, trail, burrow, or other trace of an animal (or plant), rather than of the animal itself

x-rays

a type of radiation which is able to pass through many materials

The two papers that inspired this article are:

An Oligocene giant rhino provides insights into Paraceratherium evolution

By Tao Deng^{1,2,3}, Xiaokang Lu⁴, Shiqi Wang^{1,2}, Lawrence J. Flynn⁵, Danhui Sun^{1,3}, Wen He⁶ and Shanqin Chen⁶.

Published in *Communications Biology* 4:639 (2021), <https://doi.org/10.1038/s42003-021-02170-6> Last accessed 24.02.22

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Exceptionally preserved beetles in a Triassic coprolite of putative dinosauriform origin

By Martin Qvarnström^{1,8}, Martin Fikáček^{2,3,4}, Joel Vikberg Wernström¹, Sigrid Huld⁶, Rolf G. Beutel⁶, Emmanuel Arriaga-Varela⁷, Per E. Ahlberg¹ and Grzegorz Niedźwiedzki¹.

Published in *Current Biology* 31, 1-8 (2021), <https://doi.org/10.1016/j.cub.2021.05.015> Last accessed 24.02.22

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