Published in 2018 by Ruby Tuesday Books Ltd.

Copyright © 2018 Ruby Tuesday Books Ltd.

All rights reserved. No part of this publication may be reproduced in whole or in part, stored in any retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without written permission from the publisher.

Editors: Ruth Owen and Mark Sachner
Designer: Emma Randall
Production: John Lingham

Photo Credits:
Alamy: 6 (bottom), 8, 9 (top), 12 (top), 14 (top), 15, 27 (bottom); Dr. Antoine Bercovici: 25 (bottom right); Black Hills Institute of Geological Research, Larry Shaffer (2004): 12 (bottom); Burke Museum: 24 (top) Larry Mose, 24 (bottom) Dave Demar, 25 (top) Dave Demar, 26 top, 27 (top); David A. Burnham, University of Kansas: 18 (top); Tom Connell: 21, 22–23; Kieran Davis: 25 (bottom left); Gregory M. Erickson, Ph.D.: 28 (top); Aaron Fredlund: 18 (bottom); Getty Images: 9 (bottom left), 20 (bottom), 28 (bottom); James Kuether: 10, 19; Public Domain: 9 (bottom right), 11 (bottom), 17 (centre), 19 (top), 28 (centre); Ruby Tuesday Books: 17 (bottom); Science Photo Library: 14 (bottom); Shutterstock: Cover, 2, 4–5, 6–7, 11 (top), 13, 20, 26 (bottom), 29, 31; Franco Tempesta: 16, 17 (top).

British Library Cataloguing In Publication Data (CIP) is available for this title.

ISBN: 978-1-911341-75-8

Printed in Poland by L&C Printing Group

www.rubytuesdaybooks.com



Contents

A Deadly Threat 4
King of the Dinosaurs 6
Meet *T. rex* 8
T. rex's World 10
Scales or Feathers? 12
Get Inside *T. rex*'s Head 14
A *T. rex* Grows Up 16
A Meal Fit for a King 18
Illness, Injury and Death 20
T. rex Becomes a Fossil 22

Science in Action: Excavating *T. rex* 24
Science in Action: Into the Laboratory 26
Science in Action: *T. rex* the Bone Crusher 28

Glossary 30
Index, Learn More Online 32



Naming the King

All living things have a **Latin** scientific name in two parts – a **genus** name and a **species** name. You are *Homo sapiens*. A dog is *Canis familiaris*. It is the same with dinosaurs – *Triceratops prorsus*, *Stegosaurus stenops* and, of course, *Tyrannosaurus rex*. When a scientific name is abbreviated it should be written like this: *T. rex*.

What Does ***Tyrannosaurus rex*** Mean?
tyrannos = tyrant *sauros* = lizard *rex* = king

It's a hot, steamy evening on the island continent of Laramidia. Insects buzz around tall redwood trees. A herd of hadrosaurs is grazing low-growing flowers with their broad, duck-like beaks.

But in this peaceful scene,
a deadly threat lurks.

A fearsome predator waits in the leafy shade.

Its nostrils take in the scent of the prey.

Its enormous teeth become coated
with saliva in anticipation.



The unsuspecting hadrosaur herd
comes closer,
and closer . . .

King of the Dinosaurs

With a crash, the great animal charges from its hiding place. It is a huge male *Tyrannosaurus rex* — the biggest and most powerful meat-eater on the continent. There is no escape for one of the hadrosaur herd.

A Deadly Attack

As the hadrosaurs wheel and turn in panic, one female, smaller and younger than the rest, is unsure what to do. Her moment of hesitation is fatal. The great jaws of the hunter crash down on her neck, stripping flesh, shearing **tendons** and crushing bone. She is dead in seconds, and crumples at her attacker's feet.

Is this how *T. rex* captured its prey?

Predator or Scavenger?

Was *T. rex* a solitary **ambush** predator, lying in wait for unsuspecting plant-eaters to come along? Or did *T. rex* hunt in packs as lions do today? Maybe *T. rex* was mainly a **scavenger**, eating the remains of animals that were already dead? What can **fossils** and other types of prehistoric **evidence** tell us about *T. rex*? Can we uncover the secret world of the King of the Dinosaurs?

Teeth Like Knives

Two types of lethal, banana-shaped teeth lined *T. rex*'s great jaws. At the front were thick, stubby teeth for grabbing and holding on to struggling victims. At the sides of the jaws were teeth with flattened edges. These teeth were serrated, like a saw or steak knife. They were designed for slicing meat off the bones of its prey.



How Big Was *T. rex*?

The largest and most complete skeleton found to date is a *T. rex* nicknamed Sue.

Length: Up to 12.8 metres

Height at hips: 3.66 metres

Estimated weight: 8400 to 14000 kilograms (the weight of two African elephants)

Meet T. rex

We all think we know what *Tyrannosaurus rex* looked like, don't we? The problem is that our idea of what it really looked like has changed over the last 100 years as more and more information has come to light. And it is changing still.

Building a King

For 80 years, we thought that *T. rex* stood upright. In 1915, the first *T. rex* skeleton to be shown in this way went on display at the American Museum of Natural History (AMNH) in New York City.



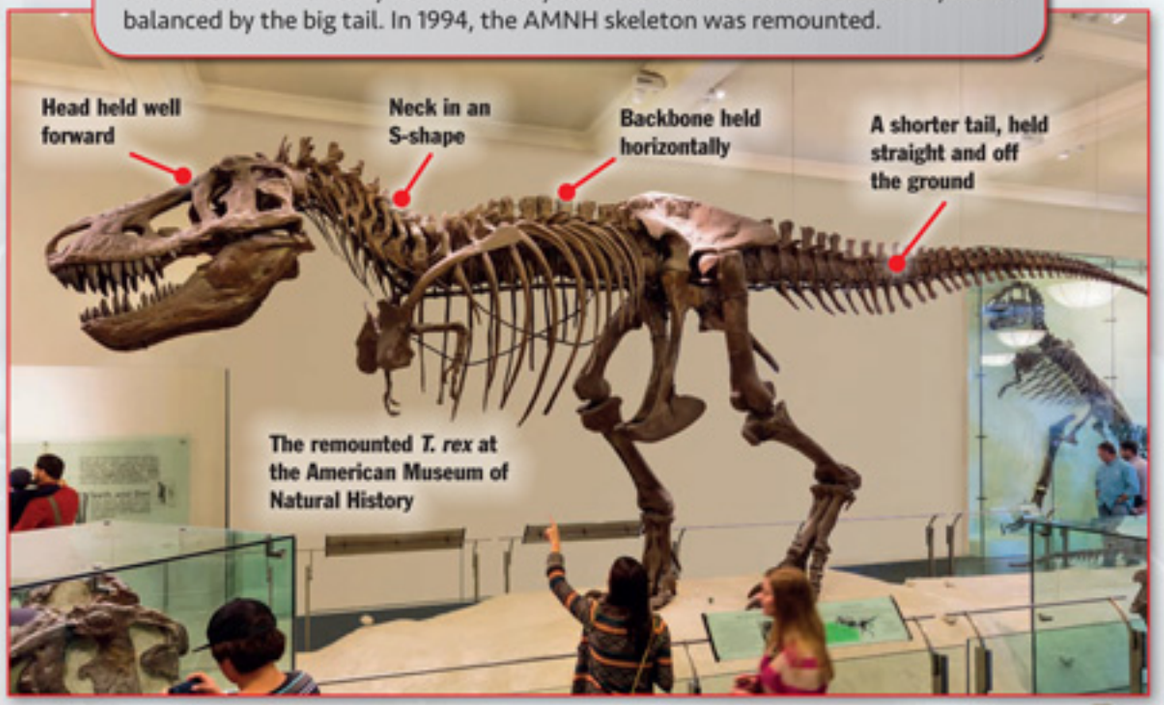
T. rex on display in 1915

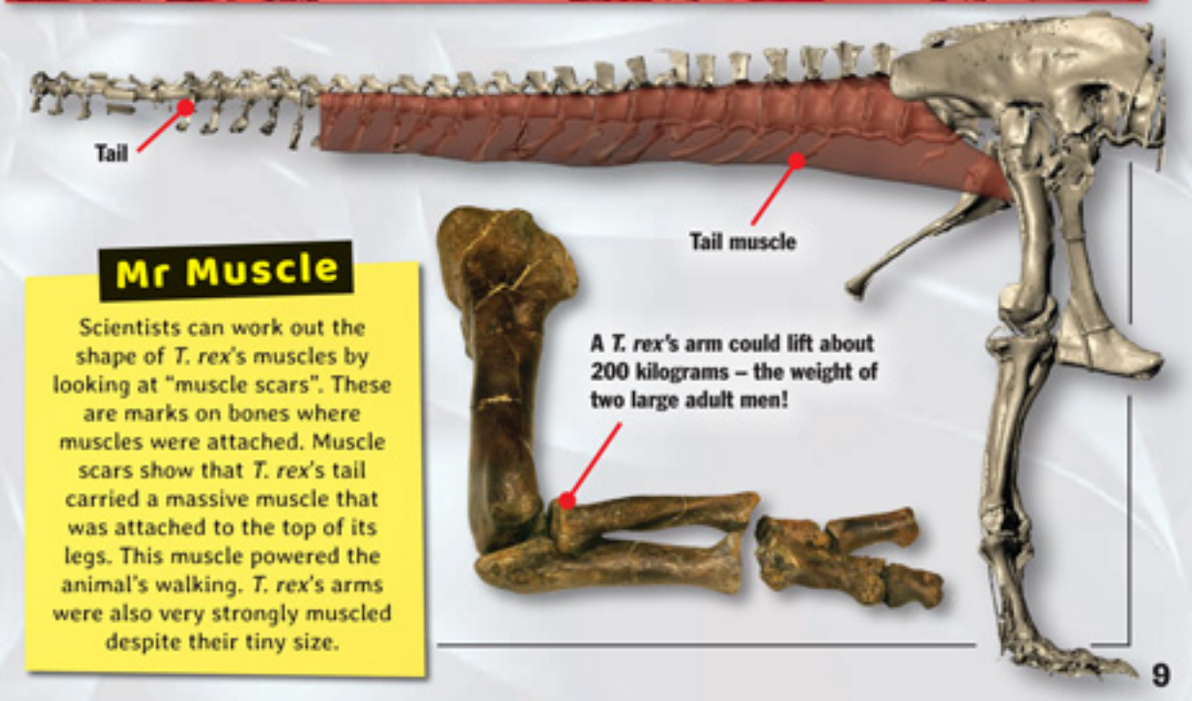
Two Claws

The three fingers on the hands of the 1915 skeleton were from a different dinosaur altogether. Then other tyrannosaurs were found to have hands with only two fingers. In 1989 a complete *T. rex* hand was found that proved *T. rex* had two clawed fingers on each hand.

Rebuilding the King

By the 1980s, dozens of *T. rex* skeletons had been found. Scientists also knew that birds **evolved** from dinosaurs. A bird stands with its feet directly beneath its hips. Scientists realised that the balance of *T. rex*'s whole body was at the hips, a little like a seesaw. The heavy head and body could be held forward because they were balanced by the big tail. In 1994, the AMNH skeleton was remounted.





Mr Muscle

Scientists can work out the shape of *T. rex*'s muscles by looking at "muscle scars". These are marks on bones where muscles were attached. Muscle scars show that *T. rex*'s tail carried a massive muscle that was attached to the top of its legs. This muscle powered the animal's walking. *T. rex*'s arms were also very strongly muscled despite their tiny size.

T. rex's World

Tyrannosaurus rex lived in western North America at the end of the **Cretaceous period**, around 66 million years ago.

Meet the Family

Before *T. rex* became king of the continent, Laramidia was home to other tyrannosaurs. These early relatives of *T. rex* evolved on the land mass that we now call Asia. In time, they crossed over a land bridge into Laramidia. By 70 million years ago, Laramidia was home to several large meat-eaters.

Where Was Laramidia?

Today, North America is one continent. During the Cretaceous period, North America was divided by a sea into two great land masses, Laramidia and Appalachia.



This map shows the places where the remains of tyrannosaurs have been found.

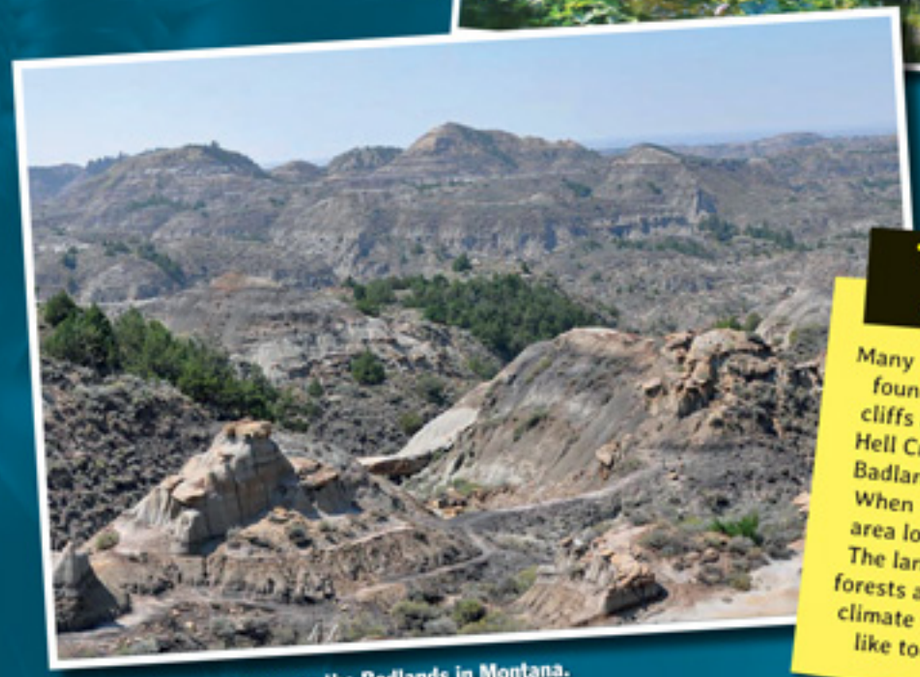
T. rex Becomes King

T.rex was the last tyrannosaur. It lived at the very end of the Age of Dinosaurs. *T. rex* may have evolved from an animal like *Daspletosaurus* that was already in Laramidia. Another **theory** is that it evolved from its close relative *Tarbosaurus* in Asia and then migrated to North America.

The Last Tyrannosaur

One thing we do know is that by the late Cretaceous period no other tyrannosaurs existed in North America. *T. rex*'s relatives had all become extinct. *T. rex* was the continent's biggest and most powerful predator.


The land where *T. rex* lived was steamy and swampy.


This is the area known as the Badlands in Montana. Many *T. rex* fossils have been found here.

The Land of *T. rex*

Many *T. rex* fossils have been found among the hot, dry cliffs and mountains of the Hell Creek Formation in the Badlands of Montana, USA. When *T. rex* lived here this area looked very different. The land was covered with forests and swamps, and the climate was warm and wet, like today's rainforests.

Scales or Feathers?

We know *Tyrannosaurus rex*'s size and shape from its fossilised bones. But what did *T. rex* actually look like? For many years, scientists believed that *T. rex* had **scales** like today's reptiles. However, there was no evidence to prove or disprove this theory.

Meet the Feathered Family

In 2004, a dog-sized tyrannosaur named *Dilong* was discovered. This tiny relative of *T. rex* had a body covered with feathers. In 2012, a larger feathered tyrannosaur, named *Yutyrannus*, was also discovered. These fossil finds led scientists to rethink their ideas. Was it possible that *T. rex* had feathers like its relatives?



A model of a feathered *Yutyrannus*

The largest *Yutyrannus* skeleton that's been found is 9 metres long.



Fossilised scales from a *T. rex* that was found in Montana, USA.

Prehistoric Skin

In 2017, a team of scientists made an exciting announcement. They had found patches of fossilised scaly skin on the skeleton of an adult *T. rex*. The skin was from the animal's neck, chest, stomach, pelvis and tail.

What Do We Know?

The discovery of fossilised scaly skin proves that *T. rex* definitely had scales on some parts of its body. But did *T. rex* have feathers or bristles on other places, such as its back? Maybe. Until more evidence is found, no one can say for sure. . . .

Perhaps *T. rex* had a cloak-like covering of feathers or bristles along its spine.

The King of Cool

Scientists think there's a good reason why *T. rex*'s whole body wasn't feathered. *T. rex* was an enormous animal. When walking or running, its giant body would quickly overheat. Not having a full covering of feathers made it easier for *T. rex* to stay cool.

What Colour Was *T. rex*?

For now, we don't know what colour *T. rex* was. We can only make guesses based on the colours that work for modern animals. Perhaps *T. rex* was grey or brown. Big animals, like elephants and rhinos, are usually a dull colour all over their bodies. If *T. rex* attacked its prey by ambush, it may have hidden itself with **camouflage**, like today's tigers and leopards.



A *T. rex* with camouflage markings for hiding in forests and swamps.