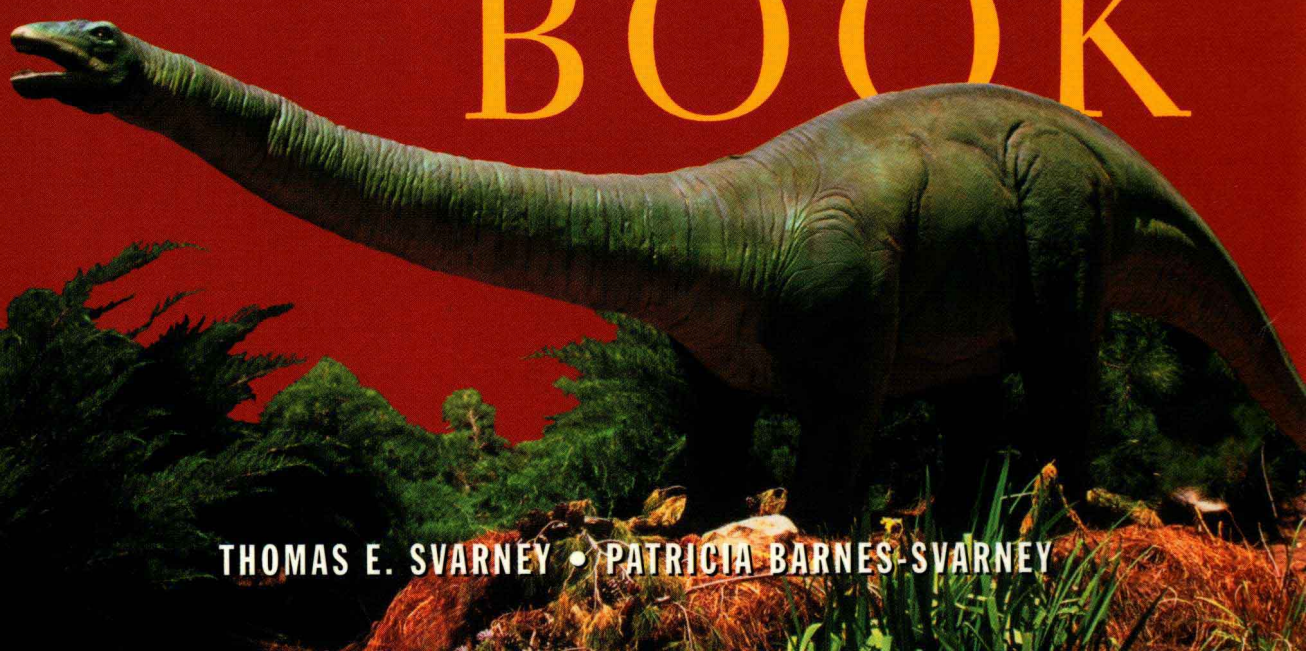
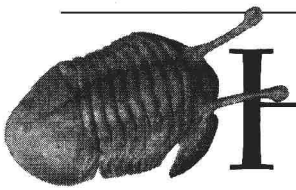
THE HANDY DINOSAUR ANSWER BOOK



THOMAS E. SVARNEY • PATRICIA BARNES-SVARNEY

THE HANDY DINOSAUR ANSWER BOOK™



Thomas E. Svarney • Patricia Barnes-Svarney

VISIBLE INK PRESS

DETROIT • SAN FRANCISCO • LONDON • BOSTON • WOODBRIDGE, CT

THE HANDY DINOSAUR ANSWER BOOK™

Visible Ink Press™
42015 Ford Rd. #208
Canton, MI 48187-3669

Visible Ink Press is a trademark of Visible Ink Press LLC.

Most Visible Ink Press books are available at special quantity discounts when purchased in bulk by corporations, organizations, or groups. Customized printings, special imprints, messages, and excerpts can be produced to meet your needs. For more information, contact Special Markets Director, Visible Ink Press, at www.visibleink.com.

Art Director: Michelle DiMercurio
Typesetting: The Graphix Group
ISBN 1-57859-072-8

Printed in the United States of America

10 9 8 7 6 5 4 3

THE HANDY DINOSAUR ANSWER BOOK

The Handy Answer Book™ Series

The Handy Answer Book for Kids (and Parents)
The Handy Bug Answer Book
The Handy Dinosaur Answer Book
The Handy Geography Answer Book
The Handy History Answer Book
The Handy Ocean Answer Book
The Handy Physics Answer Book
The Handy Politics Answer Book
The Handy Religion Answer Book
The Handy Science Answer Book
The Handy Space Answer Book
The Handy Sports Answer Book
The Handy Weather Answer Book

To Dave Bilcik, for his friendship and humor—
and for years of jawless fishes. . . .

About the Authors

Thomas E. Svarney is a scientist, naturalist, and artist. With Patricia Barnes-Svarney, he is the author of numerous science books, including *Skies of Fury* and *The Handy Ocean Answer Book*. He has also contributed to several books, including *The New York Public Library Desk Reference*.

Patricia Barnes-Svarney has been a nonfiction science and science fiction writer for more than fifteen years. She has a master's degree in geography/geomorphology and has worked professionally as a geomorphologist and oceanographer. She has written or coauthored more than twenty books, including *The New York Public Library Science Desk Reference*, and has written more than 300 articles for science magazines and journals.

Introduction

In today's world, we are surrounded on land by animals no larger than the African bush elephant and, in the seas, no greater (that scientists know of) than the blue whale. Our backyard wildlife consists of small squirrels, songbirds, and the occasional opossum or deer. In fact, when we see a hawk, condor, or owl, we are mesmerized by its size—a flying creature larger than the usual cardinal or blue jay that visits the birdfeeder.

That is what fascinates the general public when it comes to dinosaurs: It's almost impossible to believe that something larger than a house once stomped on the grounds of our school or workplace—or in our own backyards. Admittedly, the land has changed over 65 million years—but just to think that a *Tyrannosaurus rex* may have looked for dinner on a distant hill, or a *Parasaurolophus* may have waded in a stream that once flowed nearby, is almost beyond our ken.

Everyone loves to hear and read about dinosaurs for other reasons as well—and their interest has been provoked by discoveries made in the past decade. We know now that dinosaurs had diverse behaviors. Some were strictly herbivores, while others were omnivores or carnivores. None were found in the oceans or in the sky, but rather made their home over most of the known landmasses. Their defenses varied, as did their body shape and height. Some of them may have been warmblooded. Many wandered in herds and had social groups. And one of the most perplexing questions in science has to do with dinosaurs: How and why did such a wide range of reptiles die out at such a seemingly rapid rate?

Still other questions intrigue: From what animals did the dinosaurs evolve? Who found the first dinosaur remains? What other plants and animals lived at the same time as the dinosaurs? How many dinosaurs lived on the planet? How do scientists classify these creatures? What were the continents like during the time of the dinosaurs? Did dinosaurs have muscles? What is the largest dinosaur claw ever found? What is the largest dinosaur bone ever found? How accurate was the movie *Jurassic Park?*

The Handy Dinosaur Answer Book attempts to answer these questions, taking you through the highlights of three main periods of geologic history: the Triassic, Jurassic, and Cretaceous—the age of the dinosaurs. As with all sciences, it is good to remember that the field of dinosaur study is in a constant state of flux. One reason is that scientists—amateur and professional—are continually discovering new dinosaur bones. They are digging deeper into the layers of rock, using new instruments and tools to analyze the bones—and discovering new connections between dinosaurs and other species. We've made every effort to ensure the accuracy and reliability of this book's contents; but even as we wrote the text, new discoveries were being made. It seemed as if every week we were adding to the text—covering the latest, greatest findings, along with the accompanying shifts in dinosaur theory.

Because of these recent discoveries, the study of dinosaurs prompts some great debates. Are birds really dinosaurs? Were any of the dinosaurs warmblooded? What was the cause of the dinosaurs' demise? All these questions and more are constantly being examined and discussed—and will continue to be for decades to come.

The Handy Dinosaur Answer Book is meant to take you deep into the world of dinosaurs—a great ride through what we currently know (and are debating) about these creatures and their surroundings. It will pique your interest and expand your knowledge of the field. It may even convince you to study dinosaurs, or to go out to seek fossils in your own backyard—not only of dinosaurs, but also of other ancient life.

And who knows? You may be the one to find the next major dinosaur discovery!

Acknowledgments

This book would not have been possible if not for the hard work and dedication of the editors at Visible Ink Press. Many thanks go out to Christa Brelin and Michelle Banks for their efforts in overseeing this project and crossing many bridges that arose; Julia Furtaw for her guidance and insight on this project; and Michelle DiMercurio for her page and cover designs.

Additional thanks must be extended to Gina Misiroglu for careful copyediting; Rebecca Nelson-Ferguson for advice and for the creation of a detailed resource section; Justin Karr, Sarah Chesney, Pam Reed, and Mike Logusz for photo identification, permissions, cropping, and scanning; Dean Dauphinais, Diane Maniaci, Brad Morgan, Matt Nowinski, Carol Schwartz, and Christine Tomassini for proofreading and coding; and Marco Di Vita of the Graphix Group for expert typesetting.

Cover photo of *Apatosaurus* model courtesy of Corbis.

Cover photo of *Triceratops* courtesy of Francois Gohier/Photo Researchers Inc.

Cover photo of fossil trilobite courtesy of JLM Visuals.

Back cover photo of dinosaur tracks courtesy of Tom Bean/Corbis.

Back cover photo of *Triceratops* courtesy of University of Michigan Exhibit, Museum of Natural History.

Timeline of Major Dinosaurs of the Mesozoic Era

GEOLOGIC TIME

Geologic Time Scale

Era	Period	Millions of Years Ago	Life Form(s) at That Time
Cenozoic	Quaternary	2	Modern life, including man, evolves; man takes the place of dinosaurs and becomes the dominant creature of the land.
	Tertiary	65	Flowers begin to flourish and mammals diversify into myriad shapes and sizes.
Mesozoic	Cretaceous	144	As many dinosaurs become extinct, flowering plant life appears.
	Jurassic	136	Huge dinosaurs (divided into herbivores and carnivores) roam the land, toothed birds appear along with the first primitive marine life and reptiles.
	Triassic	245	Dinosaurs evolve from thecodont ("socket-tooth") reptiles; dicynodonts ("two dog tooth") or primitive mammals such as *Kannemeyeria,* and early placental mammals such as *Zalambdalestes,* appear.
Paleozoic	Permian	250	Seed plants (gymnosperms) begin to grow; insects, snails, and other invertebrates face mass extinction.

Era	Period	Millions of Years Ago	Life Form(s) at That Time
	Carboniferous	290	Forests flourish with fern trees; huge insects, amphibians, and evolving reptiles take advantage of the growing foliage.
	Devonian	350	Cartilaginous fishes (sharks and eels) are abundant; first amphibians, invertebrates, and land plants appear.
	Silurian	400	Invertebrates dominate the land and wide coral reefs cover the planet; agnathans (fish without jaws) and armored fish flourish.
	Ordovician	510	First vertebrates (agnathans) appear, along with marine invertebrates of all shapes and sizes.
	Cambrian	550	Only marine invertebrates exist, along with few land creatures.
Pre-Cambrian		600 mil.–4.6 bil.	Origin of the solar system and Earth, only one-celled, soft-bodied marine organisms exist.

MAJOR DINOSAURS OF THE TRIASSIC PERIOD (250 TO 205 MILLION YEARS AGO)

Major Triassic Period Dinosaurs

Name	Meaning	Age (millions of years ago)	Locality	Length (feet/meters)
Anchisaurus	Near Lizard	200 to 190	USA	Up to 6.5/2
Coelophysis	Hollow Form	225 to 220	USA	Up to 10/3
Eoraptor	Dawn Hunter	225	Argentina	Up to 3/1
Herrerasaurus	Herrera Lizard	230 to 225	Argentina	Up to 10/3
Plateosaurus	Flat Lizard	about 210	France, Germany, Switzerland	Up to 23/7

MAJOR DINOSAURS OF THE JURASSIC PERIOD (205 TO 144 MILLION YEARS AGO)

Major Jurassic Period Dinosaurs

Name	Meaning	Age (millions of years ago)	Locality	Length (feet/meters)
Apatosaurus	Deceptive Lizard	154 to 145	USA	up to 70/21
Allosaurus	Other Lizard	150 to 135	USA	up to 50/15
*Archaeopteryx**	Ancient Wing	147	Germany	up to 1.5/.5
Barosaurus	Heavy Lizard	155 to 145	USA	up to 80/24
Brachiosaurus	Arm Lizard	155 to 140	USA, Tanzania	up to 75/23
Camarasaurus	Chambered Lizard	155 to 145	USA	up to 65/20
Camptosaurus	Bent Lizard	155 to 145	USA	up to 16/5
Coelurus	Hollow Tail	155 to 145	USA	up to 8/2.4
Compsognathus	Pretty Jaw	147	Germany	about 2/.7
Dacentrurus	Pointed Tail	157 to 152	France, England, Portugal	about 20/6
Diplodocus	Double Beam	155 to 145	USA	up to 90/27
Dryosaurus	Oak Lizard	155 to 140	USA, Tanzania	up to 13/4
Kentrosaurus	Spiky Lizard	140	Tanzania	up to 10/3
Mamenchisaurus	Mamenchi Lizard	155 to 145	China	up to 72/22
Massospondylus	Massive Vertebra	208 to 204	England, South Africa	up to 13/4
Megalosaurus	Big Lizard	170 to 155	Tanzania	up to 30/9
Ornitholestes	Bird Robber	155 to 145	USA	up to 6.5/2
Pelorosaurus	Monstrous Lizard	150	England	unknown
Scelidosaurus	Limb Lizard	203 to 194	England	up to 13/4
Stegosaurus	Roof Lizard	155 to 145	USA	up to 30/9
Tuojiangosaurus	Tuojiang Lizard	157 to 154	China	up to 21/6.4

*Dinosaur origin/nature has been debated since the first fossil was found in 1861.

Major Jurassic Period Sauropods

Sauropod	Dinosaur	Comments
Diplodocidae	*Diplodocus*	This dinosaur gives this group its name; it was 89 feet (27 meters) in length, with an estimated weight of 11 to 12 tons.
	Apatosaurus	Commonly known as *Brontosaurus,* it was shorter and stockier than the *Diplodocus.*
	Barosaurus	Similar to *Diplodocus,* but its cervical vertebrae were 33 percent longer.
	Seismosaurus	One candidate for the longest known dinosaur; it is estimated to have been between 128 and 170 feet (39 and 52 meters) long; its weight was probably more than 100 tons.
	Supersaurus	Another candidate for the longest dinosaur; it is estimated to have been about 130 feet (40 meters) long.
Brachiosauridae	*Brachiosaurus*	This dinosaur gives its name to the group; the late Jurassic dinosaur was approximately 75 feet (23 meters) long; it was 39 feet (12 meters) high, about the height of a four-story building, with an estimated weight of 55 tons
	Ultrasaurus	This may be a very large *Brachiosaurus;* only a few bones have been discovered; the estimates from the bones give a length greater than 98 feet (30 meters), and a weight of 140 tons.
Camarasauridae	*Camarasaurus*	A relatively small sauropod; it was approximately 59 feet (18 meters) long; its forelimbs were not as proportionally long as the brachiosaurids.

Major Jurassic Period Theropods

Theropod	Dinosaur	Comments
Ceratosauria	*Syntarsus*	Small and slender, similar in form to *Coelophysis.*
	Dilophosaurus	Up to 20 feet (6 meters) long and fairly slender; the skull had a double crest of thin, parallel plates on its nose and forehead; it was fancifully portrayed in the motion picture *Jurassic Park* with a frill, spitting poison, and much smaller than in actuality.
	Ceratosaurus	A large, heavy carnivorous dinosaur up to 23 feet (7 meters) long; it had short bladelike

Theropod	Dinosaur	Comments
		crests over the eyes, and a short triangular nose horn; it was the largest known ceratosaur, and appeared in the late Jurassic period; some scientists believe the dinosaur was an oddball: it appeared long after the other ceratosaurs, and may not even belong to this group; in fact, some people put it with the carnosaurs.
Carnosauria	*Allosaurus*	A large predator, with fairly long and well-muscled forelimbs and huge claws; it had large legs with heavy, clawed feet, and large, narrow jaws.
	Megalosaurus	The first dinosaur to be described; it was thought to be up to 30 feet (9 meters) long, but recently studies of the fragmentary remains indicate that they may actually be parts of different carnosaurs.
Coelurosauria	*Compsognathus*	A small coelurosaur that evolved during the late Jurassic; one example is the *Compsognathus longipes,* found in the limestone quarry of Solnhofen, Germany, where the first known bird, *Archaeopteryx lithographica,* was also discovered.
	Gallimimus	An ornithomimosaur that evolved during the late Jurassic; the Gallimimus bullatus was featured in the motion picture *Jurassic Park,* and were thought to have been some of the fastest dinosaur runners, judging from their long hindlimbs.

Major Jurassic Period Ornithischians

Ornithischian	Ornithischian Sub-group	Dinosaur	Comments
Thyreophora	Stegosauria	*Huayangosaurus*	These animals had small plates in skin, with spikelike armor and equal length front and rear legs; they were approximately 13 feet (4 meters) long, with a short snout; they are considered the most primitive of the stegosaurs.
		Stegosaurus	A late Jurassic dinosaur weighing approximately one to two tons; it had an array of bony plates along

Ornithischian	Ornithischian Sub-group	Dinosaur	Comments
			the length of the back, with tail spikes; the hindlegs were long, with short, massive forelegs; the head was small and elongated, and the brain size was extremely small for an animal of this size.
		Kentrosaurus	This dinosaur had spines on tail, hip, shoulder, and back; its bony plates, similar to those on *Stegosaurus,* were also present on the neck and anterior part of the back.
	Ankylosauria	*Sarcolestes*	This nodosaurid dinosaur ("flesh robber") developed in the middle Jurassic period, and was thought to be the first ankylosaur; it had a large piece of armor plating on its outer surface.
		Dracopelta	The Dracopelta ("armored dragon") was a small late Jurassic period nodosaurid from Portugal.
Cerapoda	Ornithopoda	*Camptosaurus*	A medium-sized, bipedal herbivore; it weighed up to 1,000 pounds, reaching lengths up to 23 feet (7 meters); it is thought to be the ancestor to many of the highly successful plant-eating dinosaurs in the Cretaceous period.
		Heterodontosaurus	This dinosaur was only about 3 feet (1 meter) in length; it had caninelike teeth and relatively long arms, with large hands; its teeth were designed for cutting.

MAJOR DINOSAURS OF THE CRETACEOUS PERIOD (144 TO 65 MILLION YEARS AGO)

Major Cretaceous Period Dinosaurs

Name	Meaning	Age (millions of years ago)	Locality	Length (feet/meters)
Albertosaurus	Alberta Lizard	76 to 74	Canada	Up to 30/9
Avimimus	Bird Mimic	about 75	Mongolia	Up to 5/1.5
Baryonyx	Heavy Claw	about 124	England	34/10
Centrosaurus	Horned Lizard	76 to 74	Canada	Up to 16/5
Chasmosaurus	Cleft Lizard	76 to 74	Canada	Up to 16/5
Corythosaurus	Helmet Lizard	76 to 74	Canada, USA	Up to 33/10
Craspedodon	Edge Tooth	86 to 83	Belgium	Unknown
Deinocheirus	Terrible Lizard	70 to 65	Mongolia	Unknown, arms about 10/3
Deinonychus	Terrible Claw	110	USA	Up to 11/3
Dromaeosaurus	Running Lizard	76 to 74	Canada	Up to 6/1.8
Dryptosaurus	Wounding Lizard	74 to 65	USA	About 16/5
Edmontonia	Of Edmonton	76 to 74	Canada	About 13/4
Edmontosaurus	Edmonton Lizard	76 to 65	Canada	Up to 43/13
Euoplocephalus	Well-armored Head	About 71	Canada	Up to 20/6
Gallimimus	Chicken Mimic	74 to 70	Mongolia	Up to 18/5.5
Gilmoreosaurus	Gilmore's Lizard	80 to 70	China	About 20/6
Hadrosaurus	Big Lizard	83 to 74	USA	Up to 26/8
Hylaeosaurus	Woodland Lizard	150 to 135	England	Up to 13/4
Hypsilophodon	High Ridge Tooth	about 125	England	Up to 7.5/2
Iguanodon	Iguana Tooth	130 to 115	USA, England, Belgium, Spain, Germany	Up to 33/10
Kritosaurus	Noble Lizard	80 to 75	USA	Up to 26/8
Lambeosaurus	Lambe's Lizard	76 to 74	Canada	Up to 30/9
Maiasaura	Good Mother Lizard	80 to 75	USA	Up to 30/9
Ornithopsis	Birdlike Structure	about 125	England	Unknown, perhaps 65/20
Orodromeus	Mountain Runner	about 74	USA	Up to 6.5/2
Ouranosaurus	Brave Monitor Lizard	about 115	Niger	Up to 23/7
Oviraptor	Egg Thief	85 to 75	Mongolia	Up to 6/2