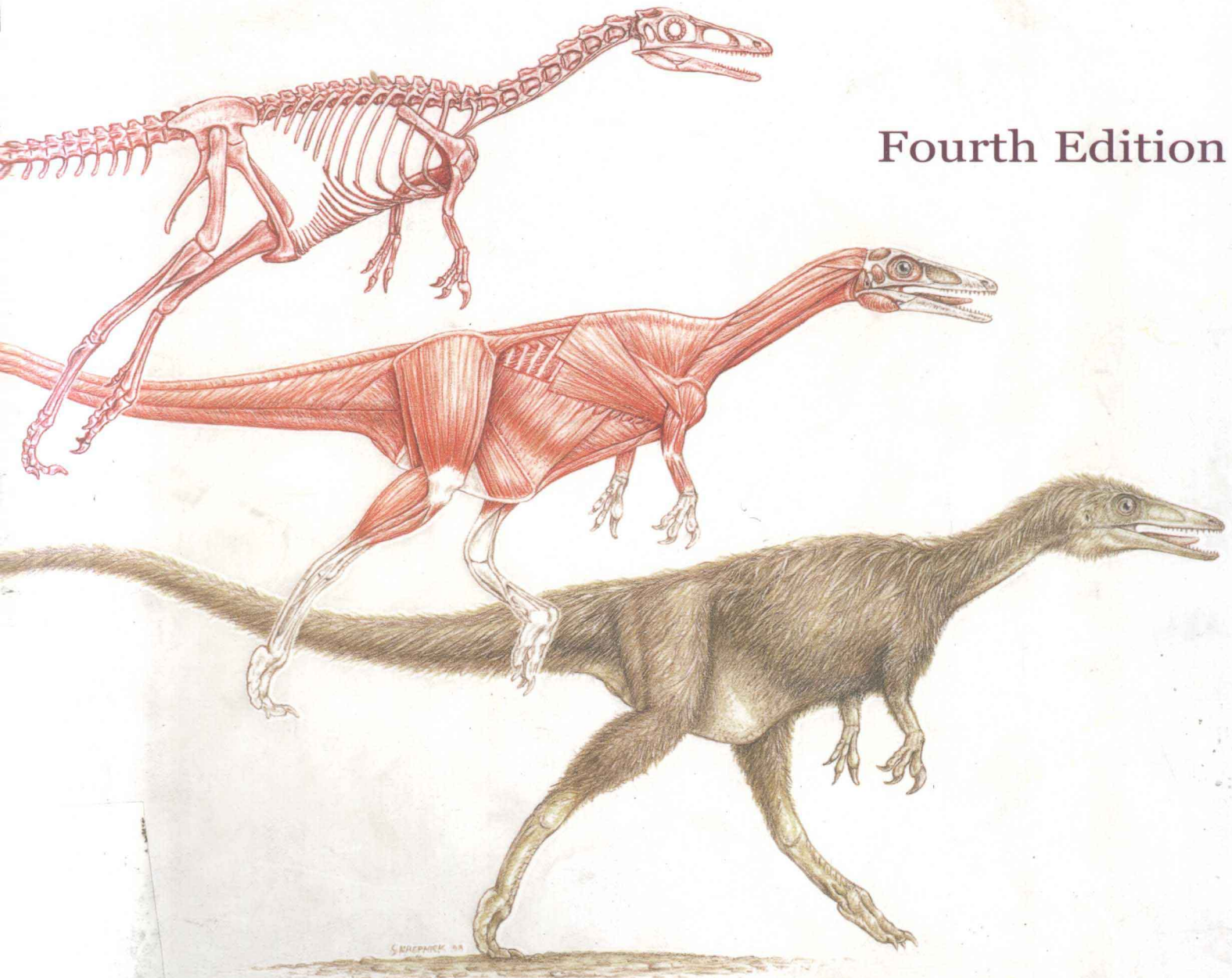


# Dinosaurs

## THE TEXTBOOK

Fourth Edition



Spencer G. L.

FOURTH EDITION

# DINOSAURS THE TEXTBOOK

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**Spencer G. Lucas**

NEW MEXICO MUSEUM OF NATURAL HISTORY

UNIVERSITY OF NEW MEXICO



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DINOSAURS: THE TEXTBOOK, FOURTH EDITION

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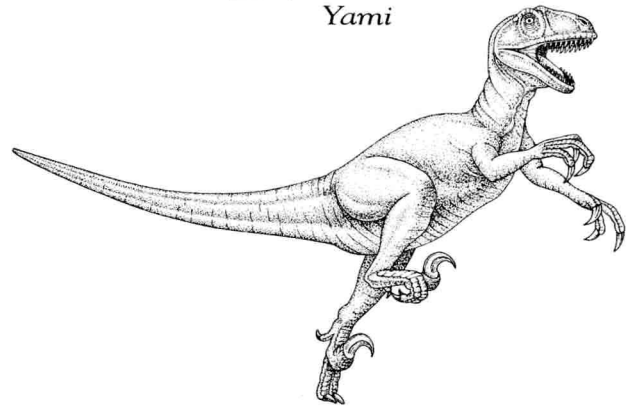
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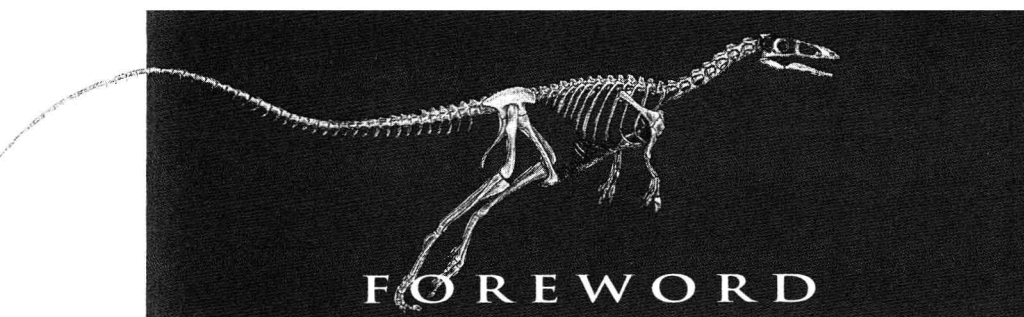
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*Yami*





**D**inosaurs have been a source of fascination for students of all ages since their discovery over 150 years ago. For a hundred years dinosaurs epitomized failure. But as we now know, it was simply a failure of science to recognize the group's successes. In the early years of discovery, interpretation of dinosaurs as animals was based on preconceived notions concerning reptiles. Reptiles were generally thought of as stupid, sluggish animals that had survived almost accidentally. Dinosaurs, thought of at the time as "good reptiles," were burdened with the same misconceived notions of science as were other reptiles. Reptiles drag their tails when they walk, so dinosaurs must also have dragged their tails. Reptiles are cold-blooded and sluggish in cool weather, so dinosaurs must also have been cold-blooded and sluggish. But, reptiles survived and the dinosaurs did not, so in the minds of many, dinosaurs were thought of as unfit animals that were simply waiting for a place in time to go extinct.

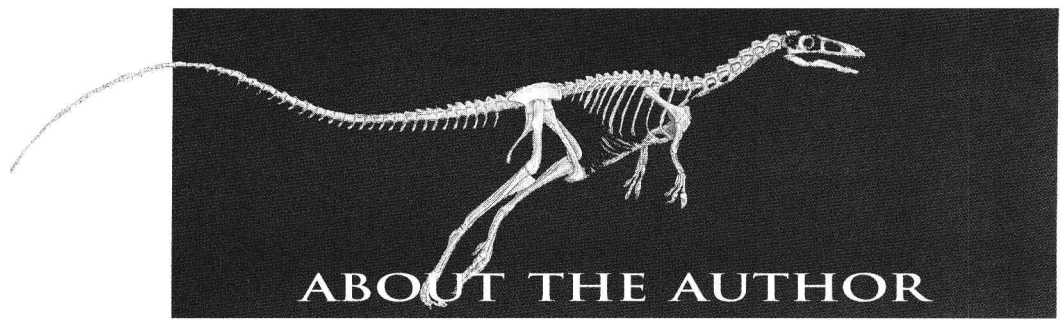
Fortunately, over the years many more dinosaur specimens were found, and together with some very careful studies of their morphology, phylogeny, and ecology, it has been determined that dinosaurs were a highly specialized group of animals related not only to other reptiles, but also to birds. And although the dinosaurs are extinct, we now know that they represented one of the greatest evolutionary success stories of all time. *Dinosaurs: The Textbook* is a monument to our present understanding of these wonderful creatures. It is a book that will take the student on a journey through nearly every aspect of dinosaur biology, geology, and the history of their discovery. It is a text that presents facts together with current ideas, notions, and controversies. Dr. Lucas presents dinosaurs as successful, living creatures that were merely different in appearance from animals living today.

Dr. Lucas has written a comprehensive book that is easily read and understood by students with little scientific background—a book that teaches students not only how to use scientific methods, but also how to synthesize data to create their own ideas. In contrast with many dinosaur books from the past, Dr. Lucas, although indicating his own views, allows students the opportunity to think for themselves.

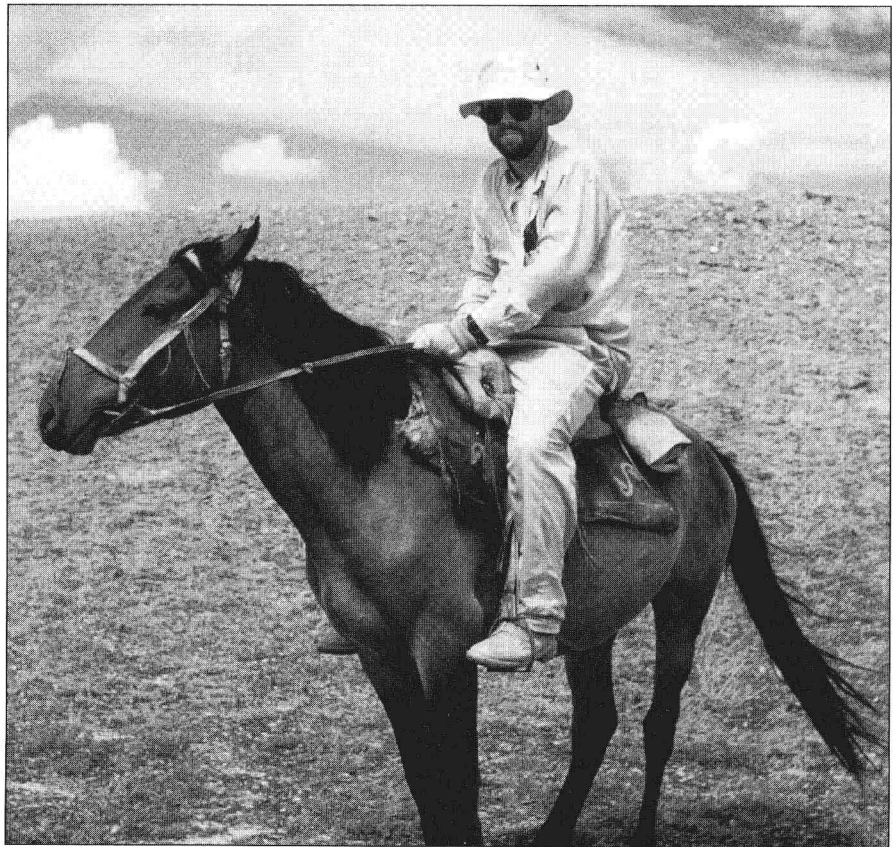
This is an incredible achievement for future learning about past mysteries.

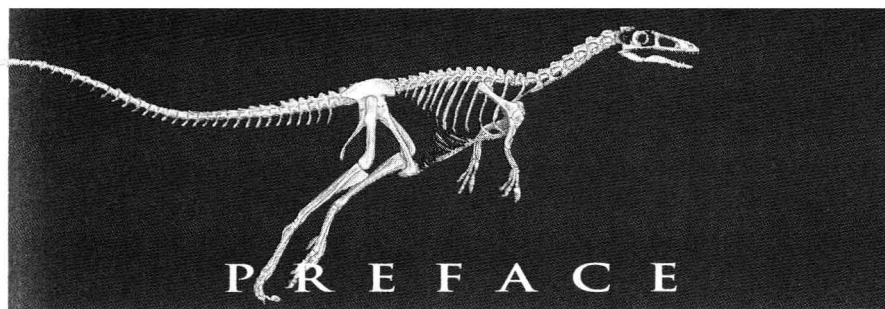
John R. Horner  
Curator of Paleontology  
Museum of the Rockies  
Montana State University  
Bozeman, Montana





**S**pencer Lucas received his bachelor of arts degree in anthropology from the University of New Mexico in 1976 and his Ph.D. in geology from Yale University in 1984. Since 1988 he has served as curator of paleontology and geology at the New Mexico Museum of Natural History and as adjunct professor of geology at the University of New Mexico. Spencer is also an active member of several professional organizations. He has served as vice president (1990) of the Albuquerque Geological Society, president (1991) of the New Mexico Academy of Science, president (1991) of the Rocky Mountain section of The Paleontological Society, and has been a voting member of the International Union of Geological Sciences' Subcommittee on Triassic Stratigraphy since 1990. The recipient of several research grants and awards, Spencer remains a very active participant in this ever-changing field of study.





**I**n the 1980s, the geology faculty at the University of New Mexico, at my suggestion, initiated an introductory-level course on dinosaurs. As the lone vertebrate paleontologist on campus, I, of course, was to teach this course. I had several years of teaching introductory geology—both physical and historical geology—under my belt. But now a problem faced me: no textbook existed for a dinosaur course. Furthermore, in a decade-long stint as a university student—from freshman to doctorate—I never took a course on dinosaurs. Few colleagues were teaching dinosaur courses at that time, and all they could offer was a syllabus with a suggested list of readings. Not fully satisfied with their offerings, I set out to design a course and provide reading material from available sources to suit my own prejudices about how to teach college freshmen and sophomores about dinosaurs.

Although the students were enthusiastic the first time I taught the course, I was not satisfied. I had tried to teach about dinosaurs within the broader context of vertebrate evolution and used Edwin Colbert's excellent survey book, *EVOLUTION OF THE VERTEBRATES*, as the text. But it seemed to me the course was too diffuse—not enough of a focus on dinosaurs—and the book lacked needed depth on the drawing card of the course, the dinosaurs themselves. So, I shifted gears and subsequently taught a course more focused on dinosaurs, using Alan Charig's stimulating book, *A NEW LOOK AT THE DINOSAURS*. This worked better, but after a couple of years, I realized that Charig's book was neither broad enough nor sufficiently detailed to suit the course. Fortunately, David Norman's outstanding *THE ILLUSTRATED ENCYCLOPEDIA OF THE DINOSAURS* appeared. It is the one dinosaur book I hope to have if ever marooned on a desert island. Norman's book provided excellent coverage of dinosaur details and lore for the students. But it did not meet head on the most interesting topics—dinosaur extinction, hot-blooded dinosaurs, and so forth—that had become the causes celebres of my course.

The book I have written is the semester-long course I teach as it has been honed by years of experimentation and student feedback to a lean but comprehensive introduction to the dinosaurs. This book thus fulfills my selfish need for a textbook. But I also believe that it will meet the needs of the growing number of paleontologists teaching introductory-level dinosaur courses across the United States. My reviewers share this belief, and I hope we are right.

There is, however, a second reason why I wrote this book. It represents my attempt to slog through the available morass of information and ideas about dinosaurs, some controversial, others ridiculous, to stand on the firm ground of established facts and reasonable inference. Much of what Americans think they know about dinosaurs is wrong, and some of what they are being told today, in some popular books by "experts," is baloney. This book tries to right the wrongs and slices up the baloney by going out of its way to not promote unreasonable speculation about dinosaurs. Not everything in it is above debate, but nothing here is science fiction. As such, I want this book to teach many people about dinosaurs and the science of studying dinosaurs as few other books do.

These are heady times for dinosaur science. Almost daily, new discoveries, novel methods, and innovative ideas are pushing forward the frontiers of our knowledge of dinosaurs. Americans seem to have an insatiable appetite for information on dinosaurs. This book provides a “first course,” and I hope it fosters an accurate understanding of the dinosaurs and a deep appreciation of dinosaur science in all who read it.

## ORGANIZATION

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**T**he table of contents essentially divides the book into three parts. The first part, Chapters 1–3, is designed to provide the beginning student with the minimum background in geological and biological concepts necessary to understand the remainder of the text. In the second part, Chapters 4–9, I have you “meet the dinosaurs.” These chapters review each group of dinosaurs. Each chapter focuses on two or three well-known taxa that are exemplary of the group. The remaining discussion covers aspects of phylogeny, diversity, distribution, and functional morphology. The third part, Chapters 10–16, covers a variety of thought-provoking “topics.” These chapters discuss everything from the history of the great dinosaur hunters to the extinction of the dinosaurs. The emphasis in many of the chapters will be on concepts of broad applicability, in other words, concepts also relevant to subjects other than dinosaurs. Thus, for example, I believe that the history of dinosaur collecting and study can be used to tell the student much about how scientific perceptions change through time. Finally, I have included an appendix of dinosaur anatomy, a dinosaur dictionary, and a glossary for ease in using anatomical terms, locating definitions, and identifying information.

I have strived to present a balanced review of competing ideas in controversial areas. For example, I believe the weight of evidence suggests that some dinosaurs had a higher metabolic rate than that of living ectotherms, whereas there is no evidence of such a heightened metabolic rate in other dinosaur groups. I intend to present the range of evidence on this subject, not push a particular point of view not justified by the evidence.

## ACKNOWLEDGMENTS

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**I**wish to extend my thanks and appreciation to the reviewers whose thoughtful comments, criticisms, and encouragement have helped tremendously in revising and improving the final draft. Reviewers of the first edition were Bonnie Blackwell, Purdue University; Matthew J. James, Department of Geology, Sonoma State University; Norman R. King, University of Southern Indiana; John H. Ostrom, Yale University; John M. Rensberger, Department of Geological Sciences and Burke Museum, University of Washington; J. Keith Rigby, Jr., University of Notre Dame; André Wyss, Department of Geological Sciences, University of California–Santa Barbara; William J. Zinsmeister, Department of Earth & Atmospheric Sciences, Purdue University. Reviewers for the second edition include Robert Cox, University of Michigan–Ann Arbor; Norman R. King, University of Southern Indiana; George (Rip) Rapp, Jr., University of Minnesota–Duluth; Robert Thorson, University of Connecticut; Craig B. Wood, Providence College. Reviewers for the third edition were R. L. Ethington, University of Missouri–Columbia; Karl W. Flessa, University of Arizona; Ronald L. Parsley, Tulane University; Don C. Steinker, Bowling Green State University. Reviewers for the fourth edition were Bobby H. Bammel, Hardin-Simmons University; Roger J. Cuffey, Pennsylvania State University; Thomas E. Hetherington, Ohio State University; and Joanna Wright, University of Colorado at Denver.

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Several colleagues, museums, and other institutions provided photographs that add to the quality of instruction in this textbook. Their contributions are acknowledged, where appropriate, throughout the text.

Over the years, I learned much about dinosaurs from my colleagues and students. Heavy hitters on my scorecard in this regard are John Ostrom, who long ago tried to convince me, without success, that dinosaurs are more interesting than mammals; Adrian Hunt, with whom I have dug and studied many dinosaurs; Barry Kues and Jeff Froehlich, who first taught me vertebrate paleontology and still put up with me; Niall Mateer, who has kept me in touch with the Cretaceous; Bob Sullivan, who forced me to think hard about dinosaur extinction after I had ceased to care; Jack McIntosh, who taught me everything I know about sauropods; J. Keith Rigby, Jr., and Bob Sloan, who believe in Paleocene dinosaurs and know that I don't; Martin Lockley, who convinced me that dinosaur footprints really are important; and Zhen Shuonan, who opened up the world of Chinese dinosaurs to me. Each of the aforementioned have made invaluable comments and suggestions throughout the development of this project. To the rest of you who collect dinosaurs, do the research, give the talks, and write the papers, thanks for teaching me so much. Finally, I thank the hundreds of undergraduate students at the University of New Mexico who have sat through my dinosaur course. You were the guinea pigs upon which I experimented. This is the book you asked for.

In the prefaces to previous editions of this textbook, I spoke of the rapid pace of new dinosaur discoveries and the American public's insatiable appetite for information on dinosaurs. Since I wrote those words, the pace has picked up, and that appetite appears at best to have only been whetted.

The fourth edition of this textbook thus updates many areas, large and small, to keep current in one of the most rapidly moving fields of scientific discovery and research that I know of. This new edition also corrects as many sins of commission and omission as I could beat out of the third edition; there were a few!

*Spencer G. Lucas*

## BOOK-SPECIFIC WEBSITE/INSTRUCTOR'S MANUAL [www.mhhe.com/dinosaurs](http://www.mhhe.com/dinosaurs)

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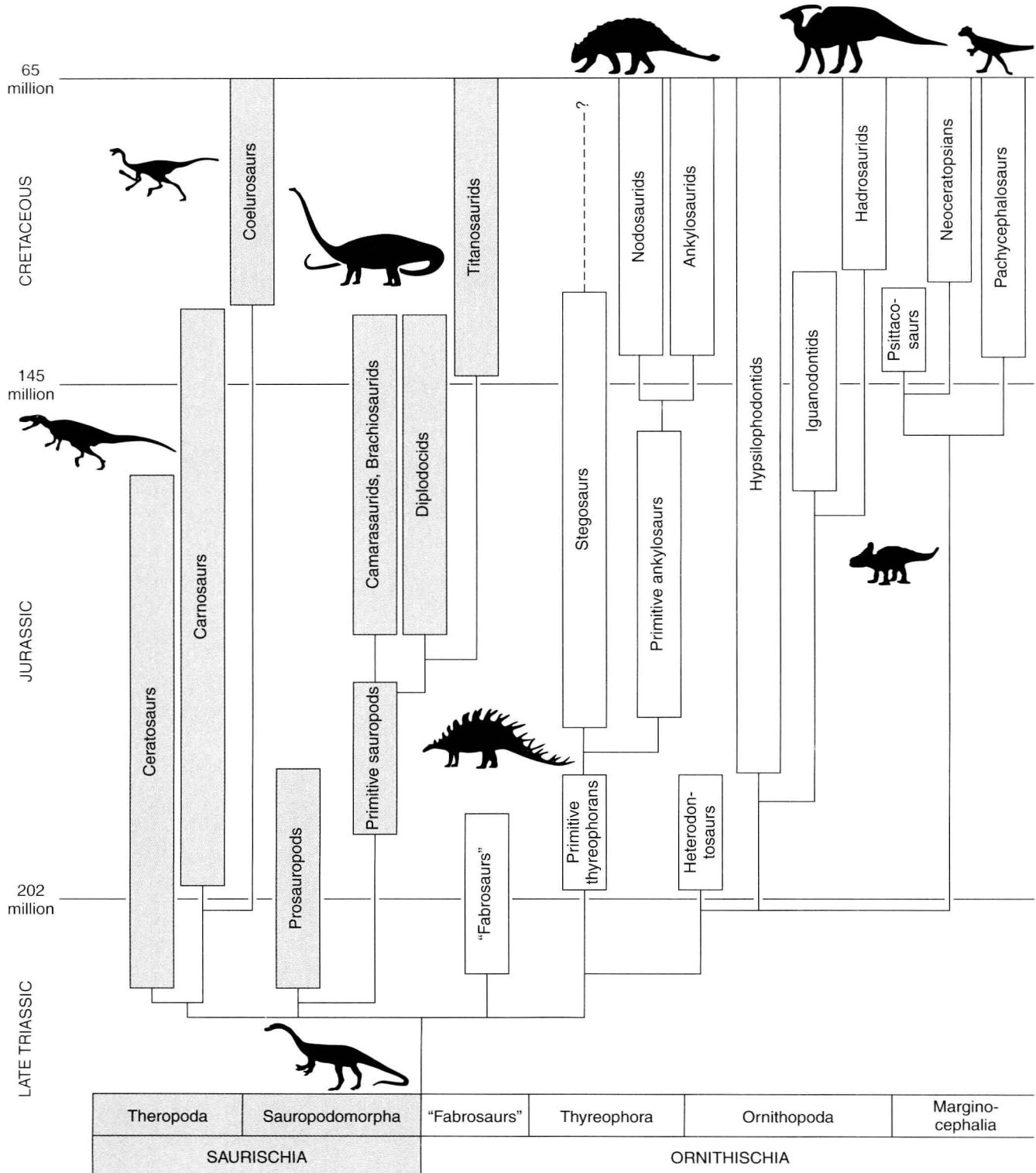
**M**any who teach dinosaur courses are not vertebrate paleontologists, and few, if any, of the instructors have ever had the opportunity to enroll in a dinosaur course during their college-student careers. The first edition of this book was the first textbook written specifically for a dinosaur course. For these and other reasons, I have written an Instructor's Manual to accompany the text.

The Instructor's Manual is now a part of a comprehensive website, which provides a wealth of electronic resources for instructors. There is a suggested syllabus along with a description of the text's organization and chapter interdependence to assist instructors in planning how best to use the text to meet the needs of their courses. The manual provides a description of the material covered in each chapter as well as suggestions for presenting the material. The suggestions discuss what material should be emphasized and methods for overcoming potential difficulties. Answers to all of the review questions are also provided for each chapter.

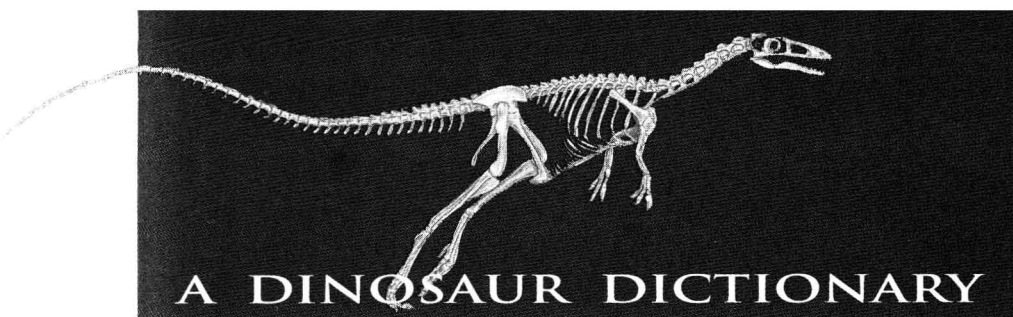
A list of books that the instructor may find helpful in gathering additional information for teaching the course is provided along with a list of suggested videos that may be used to supplement the text.

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Finally, the Instructor's Manual includes a test item file with 25 to 30 multiple-choice and true-false questions for each chapter.



### Evolution of the dinosaurs.



All of the dinosaur generic names that appear in this book are listed here with a guide to pronunciation, a brief identification of the dinosaur, and the derivation of the genus name. Note that sauros is Greek for “lizard” or “reptile.”

**Abriodontosaurus** (uh-brick-toe-SORE-us) A heterodontosaurid ornithomimid from the Lower Jurassic of South Africa [Greek *abriktos*, “wakeful”]. 103

**Acrocantanosaurus** (ak-row-KANTH-uh-sore-us) An Early Cretaceous theropod from the United States [Greek *akros*, “high” + *akanthos*, “spine”]. 69

**Afrovator** (AFF-row-ven-AY-tor) An Early Cretaceous theropod from western Africa [Latin *afro*, “Africa” + *venator*, “hunter”]. 64

**Alamosaurus** (AL-uh-mo-sore-us) A Late Cretaceous sauropod from the western United States [for Ojo Alamo, a spring in New Mexico]. 93

**Albertosaurus** (al-BURR-tuh-sore-us) A Late Cretaceous tyrannosaurid from western North America [for Alberta, Canada]. 73

**Allosaurus** (AL-uh-sore-us) A Late Jurassic allosaurid theropod from North America and East Africa [Greek *allos*, “strange”]. 69

**Alxasaurus** (AL-kha-sore-us) An early Cretaceous theropod from China [for the Alxa Desert of Inner Mongolia]. 78

**Ammosaurus** (AM-oh-sore-us) An Early Jurassic prosauropod from North America [Greek *ammos*, “sand”]. 85

**Amphicoelias** (am-fee-see-lee-us) A Late Jurassic sauropod from North America; not considered a valid name, which is *Camarasaurus* [Greek *amphi*, “double” + *kouilos*, “hollow”]. 87

**Anchisaurus** (AN-key-sore-us) An Early Jurassic prosauropod from North America and South Africa [Greek *anchi*, “near or close to”]. 82

**Ankylosaurus** (ang-KY-low-sore-us) A Late Cretaceous ankylosaur from North America [Greek *ankylos*, “stiff” or “fused”]. 130

**Antarctosaurus** (ant-ARK-toe-sore-us) A Late Cretaceous sauropod from South America and Asia [Greek *antarktikos*, “southern”]. 93

**Apatosaurus** (uh-PAT-oh-sore-us) A Late Jurassic sauropod from North America [Greek, *apatel*, “deceit”]. 89

**Bagaceratops** (bag-uh-SAYR-uh-tops) A Late Cretaceous ceratopsian from Asia [Mongolian *baga*, “small” + Greek *ceratops*, “horned face”]. 135

**Barapasaurus** (bah-RAP-uh-sore-us) An Early Jurassic sauropod from India [Hindi *bara*, “big” + *pa*, “leg”]. 99

**Barosaurus** (BAHR-oh-sore-us) A Late Jurassic sauropod from North America and eastern Africa [Greek *barys*, “heavy”]. 89

**Brachiosaurus** (BRAK-ee-oh-sore-us) A Late Jurassic sauropod from North America and eastern Africa [Greek *brachion*, “arm”]. 91

**Brontosaurus** (BRON-toe-sore-us) A Late Jurassic sauropod from North America; not a valid name, which is *Apatosaurus* [Greek *bronte*, “thunder”]. 89

**Camarasaurus** (KAM-uh-ruh-sore-us) A Late Jurassic sauropod from North America [Greek *kamara*, “chamber”]. 89

**Camptosaurus** (KAMP-toe-sore-us) A Late Jurassic–Early Cretaceous ornithomimid from North America and Europe [Greek *kamptos*, “flexible”]. 106

**Centrosaurus** (SEN-tro-sore-us) A Late Cretaceous ceratopsian from North America [Greek *kentron*, “sharp point”]. 137

**Ceratopsaurus** (sir-AT-oh-sore-us) A Late Jurassic theropod from North America and eastern Africa [Greek *keratos*, “horned”]. 67

**Cetiosaurus** (SEAT-ee-oh-sore-us) A Middle to Late Jurassic sauropod from England and North Africa [Greek *keteios*, “whale-like”]. 99

**Chaoyangsaurus** (chow-YANG-sore-us) A Jurassic ceratopsian from China [for Chaoyang, an area in northeastern China]. 139

**Chasmosaurus** (KAZ-mo-sore-us) A Late Cretaceous ceratopsian from North America [Greek *chasma*, “opening”]. 137

**Chirostenotes** (KIY-row-sten-OH-tees) A Late Cretaceous theropod from Canada [Greek *cheir*, “hand” + *stenos*, “narrow”]. 78

**Coelophysys** (see-low-FY-sis) A Late Triassic theropod from North America [Greek *kouilos*, “hollow” and *fysis*, “form”]. 67

**Coloradisaurus** (col-oh-rah-dih-SORE-us) A Late Triassic prosauropod from Argentina [for the Los Colorados Formation in Argentina]. 84

**Compsognathus** (comp-sug-NAY-thus) A Late Jurassic theropod from Europe [Greek *kompso*, “elegant” + *gnathos*, “jaw”]. 68

**Corythosaurus** (core-EETH-oh-sore-us) A Late Cretaceous hadrosaur from North America [Greek *korythos*, “Corinthian” (helmet)]. 111

**Cryolophosaurus** (cry-uh-LOAF-uh-sore-us) An Early Jurassic theropod from Antarctica [Greek *cryo*, “cold” + *lophos*, “crest”]. 64

**Daspletosaurus** (das-PLÉE-toe-sore-us) A Late Cretaceous theropod from North America [Greek *daspletos*, “frightful”]. 73

**Datousaurus** (DAH-toe-sore-us) A Middle Jurassic sauropod from China [Chinese *da*, “big” + *tou*, “head”]. 93

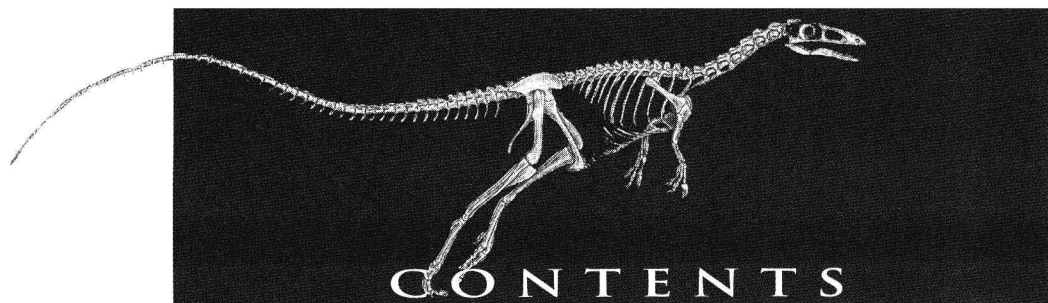
**Deinodon** (DIE-no-don) A name originally given to large theropod teeth from the Upper Cretaceous of North America; not considered valid [Greek *deinos*, “terrible” + *odon*, “tooth”]. 4

**Deinonychus** (die-NON-ik-us) An Early Cretaceous theropod from North America [Greek *deinos*, “terrible” + *onychos*, “claw”]. 76

- Dilophosaurus** (die-LOWF-oh-sore-us) An Early Jurassic theropod from North America [Greek *di*, “two” + *lophos*, “crest”]. 67
- Diplodocus** (di-PLOD-oh-kus) A Late Jurassic sauropod from North America [Greek *diplos*, “double” + *dokos*, “beam”]. 87
- Dryosaurus** (DRY-oh-sore-us) A Late Jurassic ornithopod from North America and eastern Africa [Greek *dryos*, “tree”]. 105
- Dryptosaurus** (DRIP-toe-sore-us) A Late Cretaceous theropod from North America [Greek *drypto*, “to tear”]. 253
- Edmontonia** (ed-mun-TONE-ee-uh) A Late Cretaceous ankylosaur from North America [for the Edmonton Formation, Alberta, Canada]. 130
- Edmontosaurus** (ed-MON-toe-sore-us) A Late Cretaceous ornithopod from North America [for the Edmonton Formation, Alberta, Canada]. 109
- Eoraptor** (ee-oh-RAP-tore) A Late Triassic theropod from Argentina [Greek *eo* “dawn” + Latin *raptor*, “robber”]. 56
- Euhelopus** (you-HEE-low-pus) An Early Cretaceous sauropod from China [Greek *eu*, “true” + *helos*, “marsh” + *pous*, “foot”]. 90
- Euoplocephalus** (you-oh-plo-SEF-uh-lus) A Late Cretaceous ankylosaur from North America [Greek *euoplo*, “well armed” + *kephale*, “head”]. 129
- Fabrosaurus** (FAB-row-sore-us) An Early Jurassic primitive ornithischian from southern Africa [named for French geologist Jean Fabre]. 57
- Gastonia** (gas-TONE-ee-uh) An Early Cretaceous ankylosaur from North America [named for Robert Gaston, who discovered the dinosaur]. 127
- Giganotosaurus** (jiy-ga-NO-to-sore-us) An Early Cretaceous theropod from Argentina [Latin *gigan*, “giant” + Greek, *notos*, “southern”]. 64
- Hadrosaurus** (HAD-row-sore-us) A Late Cretaceous ornithopod from North America [Greek *hadros*, “heavy”]. 4
- Haplocanthosaurus** (hap-low-KANTH-uh-sore-us) A Late Jurassic sauropod from North America [Greek *haplos*, “single” + *akantha*, “spine”]. 90
- Herrerasaurus** (her-RARE-uh-sore-us) A primitive saurischian from the Late Triassic of Argentina [named for Argentine rancher Don Victorino Herrera]. 56
- Heterodontosaurus** (het-ur-oh-DONT-oh-sore-us) An Early Jurassic ornithopod from South Africa [Greek *heteros*, “different” + *odontos*, “tooth”]. 102
- Homalocephale** (ho-mah-low-SEF-uh-lee) A Late Cretaceous pachycephalosaur from Asia [Greek *homalos*, “level” + *kephale*, “head”]. 141
- Huayangosaurus** (hwah-YANG-oh-sore-us) A Middle Jurassic stegosaur from China [for Huayang, Shanxi Province, China]. 117
- Hylaeosaurus** (HI-lee-oh-sore-us) An Early Cretaceous ankylosaur from Europe [Greek *hylaos*, “Wealden”]. 1
- Hypselosaurus** (HIP-se-low-sore-us) A Late Cretaceous sauropod from Europe [Greek *hypselos*, “high”]. 97
- Hypsilophodon** (hip-si-LOAF-uh-don) An Early Cretaceous ornithopod from Europe [for the living iguana *Hypsilophus*]. 103
- Iguanodon** (i-GWA-no-don) An Early Cretaceous ornithopod from Europe and North Africa [iguana, a living lizard, + Greek *odon*, “tooth”]. 107
- Kentrosaurus** (KEN-tro-sore-us) A Late Jurassic stegosaur from eastern Africa [Greek *kentron*, “spike”]. 118
- Leptoceratops** (LEP-toe-sayr-uh-tops) A Late Cretaceous ceratopsian from North America [Greek *leptos*, “small” + *ceratops*, “horned face”]. 135
- Lesothosaurus** (le-SOW-toe-sore-us) An Early Jurassic ornithischian from southern Africa [for Lesotho, Africa]. 57
- Liaoceratops** (lee-OW-sayr-uh-tops) An Early Cretaceous ceratopsian from China [for Liaoning, China + Greek *ceratops*, “horned face”]. 139
- Lufengosaurus** (loo-FUNG-oh-sore-us) An Early Jurassic prosauropod from China (for Lufeng, Yunnan Province, China). 85
- Maiasaura** (my-uh-SORE-uh) A Late Cretaceous hadrosaur from North America [Greek *maia*, “good mother”]. 176
- Mamenchisaurus** (ma-MENCH-ee-sore-us) A Late Jurassic sauropod from China [for Mamencheng, Sichuan Province, China]. 87
- Massospondylus** (MASS-oh-spon-die-lus) An Early Jurassic prosauropod from North America and southern Africa [Greek *masos*, “longer” + Greek *spondylus*, “vertebra”]. 84
- Megalosaurus** (MEG-uh-low-sore-us) A Middle-Late Jurassic theropod from Europe [Greek *megalo*, “big”]. 71
- Mononykus** (maw-no-NIGH-kus) A late Cretaceous theropod from Mongolia [Greek *mono*, “one” + *onychos*, “claw”]. 224
- Montanaceratops** (mon-TAN-uh-sayr-uh-tops) A Late Cretaceous ceratopsian from North America [Montana + Greek *ceratops*, “horned face”]. 135
- Mussaurus** (mus-AW-rus) A hatchling prosauropod from the Late Triassic of Argentina [Latin *mus*, “mouse”]. 84
- Nanotyrannus** (nan-oh-tie-RAN-us) A Late Cretaceous theropod from North America [Greek *nanos*, “small” + *tyrannos*, “tyrant”]. 73
- Nodosaurus** (NO-do-sore-us) A Late Cretaceous ankylosaur from North America [Latin *nodus*, “knot” or “swelling”]. 128
- Opisthocoelicaudia** (oh-PIS-tho-SEE-li-kaw-dee-uh) A Late Cretaceous sauropod from Asia [Greek *opisthe*, “behind” and *kailos*, “hollow” + Latin *cauda*, “tail”]. 90
- Orodromeus** (or-oh-DROM-ee-us) A Late Cretaceous hypsilophodontid from North America [Greek *oros*, “mountain” + *dromeus*, “runner”]. 189
- Ouranosaurus** (oh-RAN-oh-sore-us) An Early Cretaceous ornithopod from Africa [from *ouran*, a monitor lizard that lives in the Sahara]. 108
- Oviraptor** (oh-vi-RAP-tor) A Late Cretaceous theropod from Asia [Latin *ovum*, “egg” + *raptor*, “robber”]. 76
- Panoplosaurus** (pan-OH-plo-sore-us) A Late Cretaceous ankylosaur from North America [Greek *pan* “everywhere” + *oplo*, “armored”]. 128
- Parasaurolophus** (par-us-sore-ALL-uh-fus) A Late Cretaceous ornithopod from North America [Greek *para*, “similar” + *Saurolophus*, a related ornithopod]. 109
- Parksosaurus** (PARKS-oh-sore-us) A Late Cretaceous ornithopod from North America [for Canadian paleontologist W. A. Parks]. 105
- Patagosaurus** (PAT-uh-go-sore-us) A Middle Jurassic sauropod from South America [for Patagonia, Argentina]. 99
- Pentaceratops** (PEN-tuh-sayr-uh-tops) A Late Cretaceous ceratopsian from North America [Greek *pente*, “five” + *ceratops*, “horned face”]. 138
- Piatnitzkysaurus** (pee-yot-NITS-kee-sore-us) A Middle Jurassic theropod from Argentina [for Argentine geologist Alejandro Piatnitzky]. 69
- Pinacosaurus** (pin-AK-oh-sore-us) A Late Cretaceous ankylosaur from Asia [Greek *pinakos*, “board”]. 130
- Pisanosaurus** (pee-SAHN-oh-sore-us) A primitive ornithischian from the Late Triassic of Argentina [for Argentine paleontologist Juan Pisanos]. 56
- Plateosaurus** (PLAT-ee-oh-sore-us) A Late Triassic prosauropod from Europe [Greek *plateo*, “broad”]. 82
- Poekilopleuron** (po-kee-low-PLEW-ron) A Middle Jurassic theropod from Europe [Greek *poikilos*, “mottled” + *pleuron*, “rib”]. 1
- Polacanthus** (po-luh-KAN-thus) An Early Cretaceous ankylosaur from Europe [Greek *polys*, “many” + *akantha*, “spine”]. 129
- Protoceratops** (pro-toe-SAYR-uh-tops) A Late Cretaceous ceratopsian from Asia [Greek *protos*, “first” + *ceratops*, “horned face”]. 135
- Psittacosaurus** (si-TAK-oh-sore-us) An Early Cretaceous ceratopsian from Asia [Greek *psittakos*, “parrot”]. 134
- Revueltosaurus** (ruh-VWEL-toe-sore-us) A primitive ornithischian from the Late Triassic of North America [for Revuelto Creek, New Mexico, U.S.]. 56
- Rhoetosaurus** (REET-oh-sore-us) A Middle Jurassic sauropod from Australia [Rhoetus, a mythical giant]. 99
- Riojasaurus** (ree-OH-ha-sore-us) A Late Triassic prosauropod from Argentina [for La Rioja Province, Argentina]. 81
- Saichania** (SY-kan-ee-uh) A Late Cretaceous ankylosaur from Asia [Mongolian *saikhan*, “beautiful”]. 130

- Saltasaurus** (SAUL-tuh-sore-us) A Late Cretaceous sauropod from Argentina [for Salta, a province of NW Argentina]. 93
- Sarcolestes** (sar-ko-LESS-tees) A Middle Jurassic ankylosaur from Europe [Greek *sarkos*, "flesh" + *lestes*, "robber"]. 131
- Sauropelta** (sore-oh-PEL-tuh) A Late Cretaceous ankylosaur from North America [Latin *pelta*, "small shield"]. 128
- Sauromithoides** (sore-or-nith-OID-eez) A Late Cretaceous theropod from Asia [Greek *ornithoides*, "bird-like"]. 77
- Scelidosaurus** (skel-id-oh-SORE-us) A primitive thyreophoran from the Lower Jurassic of Europe [Greek *skelidos*, "limb"]. 115
- Scutellosaurus** (skew-TELL-oh-sore-us) A primitive thyreophoran from the Lower Jurassic of North America [Latin *scutella*, "little shield"]. 115
- Seismosaurus** (SIGHS-mow-sore-us) A Late Jurassic sauropod from North America [Greek *seismos*, "earthquake"]. 94
- Shunosaurus** (SHOO-no-sore-us) A Middle Jurassic sauropod from China [*shu* is the ancient Chinese name for Sichuan Province, China]. 93
- Sinosauropteryx** (sigh-no-sore-OP-te-riks) An Early Cretaceous theropod from Asia [*sino*, pertaining to China + *sauros* + Greek *pteron*, "feather"]. 219
- Spinosaurus** (SPY-no-sore-us) A Late Cretaceous theropod from Egypt [Latin *spina*, "spine"]. 71
- Staurikosaurus** (stor-IK-oh-sore-us) A Late Triassic dinosaur from South America [Greek *staurikos*, "cross," for the constellation the Southern Cross]. 55
- Stegoceras** (steg-OS-ur-us) A Late Cretaceous pachycephalosaur from North America [Greek *stego*, "covered" + *keras*, "horn"]. 142
- Stegosaurus** (STEG-oh-sore-us) A Late Jurassic stegosaur from North America [Greek *stego*, "covered"]. 118
- Struthiomimus** (strooth-ee-oh-MIME-us) A Late Cretaceous theropod from North America [Latin *struthio*, "ostrich" + *mimus*, "mimic"]. 74
- Suchomimus** (soo-ko-MY-mus) An early Cretaceous theropod from Niger [Greek *souchos*, "crocodile" + *mimos*, "mimic"]. 64
- Supersaurus** (SOO-per-sore-us) A Late Jurassic sauropod from North America [Latin *super*, "above"]. 93
- Syntarsus** (sin-TAR-sus) An Early Jurassic ceratopsian from North America and southern Africa [Greek syn, "together" + *tarsos*, "ankle"]. 67
- Szechuanosaurus** (sech-WAN-uh-sore-us) A Late Jurassic theropod from China [for Sichuan (Szechuan) Province, China]. 69
- Tarbosaurus** (TAR-how-sore-us) A Late Cretaceous theropod from Asia [Greek *tarbos*, "terror"]. 73
- Tatisaurus** (tah-TEE-sore-us) A primitive thyreophoran from the Lower Jurassic of China [for Tati, Yunnan Province, China]. 117
- Technosaurus** (TECK-no-sore-us) A Late Triassic ornithischian from North America [for Texas Tech University]. 56
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- Thecodontosaurus** (THEE-ko-dont-oh-sore-us) A Triassic prosauropod from Europe. [Greek *theka*, "socket" + *odontos*, "tooth"]. 1
- Therizinosaurus** (THAYR-uh-zeen-uh-sore-us) A Late Cretaceous theropod from Mongolia. 78
- Thescelosaurus** (THESS-el-oh-sore-us) A Late Cretaceous ornithopod from North America [Greek *theskelos*, "marvelous"]. 105
- Titanosaurus** (TIE-tan-oh-sore-us) A Late Cretaceous sauropod from Europe, Asia, and South America [for the Titans of Greek mythology]. 93
- Torosaurus** (TOR-oh-sore-us) A Late Cretaceous ceratopsian from North America [Greek *toreo*, "to perforate"]. 138
- Trachodon** (TRACK-oh-don) Originally applied to teeth of a Late Cretaceous ornithopod from North America [Greek *trachys*, "rough" + *odon*, "tooth"]. 4
- Triceratops** (try-SAYR-uh-tops) A Late Cretaceous ceratopsian from North America [Greek *tri*, "three" + *ceratops*, "horned face"]. 138
- Tuojiangosaurus** (twoa-JEEANG-uh-sore-us) A Late Jurassic stegosaur from China [for the Tuojiang, a river in Sichuan Province, China]. 118
- Tyrannosaurus** (tie-RAN-oh-sore-us) A Late Cretaceous theropod from North America and Asia [Greek *tyrannos*, "tyrant"]. 73
- Ultrasauros** (UHL-tra-sore-os) A Late Jurassic sauropod of North America; considered an invalid name, which is *Brachiosaurus* [Latin *ultra*, "excessive"]. 93
- Valdosaurus** (VAL-doe-sore-us) An Early Cretaceous ornithopod from England [Latin *valdo*, "Wealden"]. 105
- Velociraptor** (vuh-LOSS-ih-rap-tor) A Late Cretaceous theropod from Asia [Latin *velocis*, "swift" + *raptor*, "robber"]. 75
- Vulcanodon** (vul-CAN-oh-don) An Early Jurassic prosauropod from southern Africa [for Vulcanus, Roman god of the forge + Greek *odon*, "tooth"]. 81
- Xenotarsosaurus** (zeen-oh-TAR-so-sore-us) A Late Cretaceous theropod from South America [Greek *xenos*, "stranger" + *tarsos*, "ankle"]. 67
- Xiaosaurus** (she-OW-sore-us) A Middle Jurassic ornithopod from Asia [Chinese *xiao*, "small"]. 105
- Yaverlandia** (yah-ver-LAND-ee-uh) An Early Cretaceous pachycephalosaur from Europe [for Yaverland Battery, Isle of Wight, England]. 145
- Yunnanosaurus** (you-NAN-oh-sore-us) An Early Jurassic prosauropod from China [for Yunnan Province, China]. 82
- Zuniceratops** (ZOO-nee-sayr-uh-tops) A Late Cretaceous ceratopsian from New Mexico [for Zuni Pueblo in New Mexico]. 140





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