

Feathered dinosaurs, walking whales, killer kangaroos—these are but a few of the fantastic creatures that roamed the planet before the dawn of humans. For more than 200 years, scientists have studied fossil remnants of eons past, painstakingly piecing together the history of life on earth. Through their efforts, not only have long-extinct beasts come to light, but the origins of many modern animals have been revealed.

In this exclusive online issue, *Scientific American* authors ponder some of the most exciting paleontological discoveries made in recent years. Gregory Erickson reexamines *T. rex* and reconstructs how the monster lived. Ryosuke Motani describes the reign of fishlike reptiles known as ichthyosaurs. Kevin Padian and Luis Chiappe trace today's birds back to their carnivorous, bipedal dinosaur forebears. And Stephen Wroe presents the menacing relatives of Australia's beloved pouched mammals. Other articles document the descent of whales from four-legged landlubbers and recount the challenges and rewards of leading fossil-collecting expeditions to uncharted locales. —*the Editors*

## TABLE OF CONTENTS

- 2  **Breathing Life into *Tyrannosaurus rex***  
BY GREGORY M. ERICKSON; SCIENTIFIC AMERICAN, SEPTEMBER 1999  
By analyzing previously overlooked fossils and by taking a second look at some old finds, paleontologists are providing the first glimpses of the actual behavior of the tyrannosaurs
- 8  **The Teeth of the Tyrannosaurs**  
BY WILLIAM L. ABLER; SCIENTIFIC AMERICAN, SEPTEMBER 1999  
Their teeth reveal aspects of their hunting and feeding habits
- 10  **Madagascar's Mesozoic Secrets**  
BY JOHN J. FLYNN AND ANDRÉ R. WYSS, SIDEBAR BY KATE WONG; SCIENTIFIC AMERICAN, FEBRUARY 2002  
The world's fourth-largest island divulges fossils that could revolutionize scientific views on the origins of dinosaurs and mammals
- 18  **Rulers of the Jurassic Seas**  
BY RYOSUKE MOTANI; SCIENTIFIC AMERICAN, DECEMBER 2000  
Fish-shaped reptiles called ichthyosaurs reigned over the oceans for as long as dinosaurs roamed the land, but only recently have paleontologists discovered why these creatures were so successful
- 26  **The Origin of Birds and Their Flight**  
BY KEVIN PADIAN AND LUIS M. CHIAPPE; SCIENTIFIC AMERICAN, FEBRUARY 1998  
Anatomical and aerodynamic analyses of fossils and living birds show that birds evolved from small, predatory dinosaurs that lived on the ground
- 36  **The Mammals That Conquered the Seas**  
BY KATE WONG; SCIENTIFIC AMERICAN, MAY 2002  
New fossils and DNA analyses elucidate the remarkable evolutionary history of whales
- 45  **Killer Kangaroos and Other Murderous Marsupials**  
BY STEPHEN WROE; SCIENTIFIC AMERICAN, MAY 1999  
Australian mammals were not all as cute as koalas. Some were as ferocious as they were bizarre