'Dillos.
Roadkill on Extinction Highway?

A fun book on these amazing creatures, dealing with:

- natural history,
- evolution,
- anatomy and physiology,
- medical research,
- pop culture,
- the future of armadillos

The book not only summarizes the natural history of armadillos, but it provides a fascinating exploration of the 55-million-year history of armadillos and what it is about them that has enabled their survival when most early mammalian species became extinct. As life goes on over eons of time, the armadillo endures its walnut-sized brain oblivious to the laws and perils of “survival of the fittest.” The armadillo has been endowed by nature with a lifestyle and physical attributes that put it into the ranks of the fittest, right up there with crocodiles and turtles. That’s pretty impressive for a mammal.

For most of us, certainly Texans, armadillos inspire admiration. We admire their tenacity, resourcefulness, peacefulness and humble origins. Armadillos epitomize the underdog that has over.
"An easy, interesting read that allows you to 'put your arms around' this wonderfully weird creature. Packed with science, culture, and a few proven recipes. Viva armadillos! " J. Stephen McCusker, Executive Director, San Antonio Zoo

"A fascinating read about nature's cloner, presented by a distinguished scientist, who knows them up close and personal. Dr. Klemm has captured the scientific and mythical nature of this remarkable species. You will enjoy the comprehensive coverage of this versatile animal, including its natural history, contributions to biomedical research, and cultural impacts. This book is appropriate for everything from the classroom to the coffee table." Duane C. Kraemer, D.V.M., Ph.D., Texas A&M University.

"This intelligent, fun, and readable book ... is full of personal anecdotes, observations, and original research. The book is an excellent blend of fact and folklore, research and readability. Dr. Klemm’s speculation on the future of the loveable armadillo caps this enlightening, thoroughly enjoyable book. Pick up the book and take pleasure in learning about these amazing creatures.” Jack Lowry, Editor, Texas Highways

“I thoroughly enjoyed the book with its many facets of science and natural history lore. Bill Klemm ranges widely from cutting-edge biomedical research to homespun appreciation of the critters and their cultural impacts, especially on Texans. He also highlights the special role of armadillos as primordial mammals still conducting themselves in a Paleocenemanner.” David Webb, Distinguished Research Professor & Curator, Univ. Florida

_Dillos_ is the most comprehensive volume on our TX state mammal I have read to date. From recipes to hard science, this book appeals to the layman and researchers alike. Michael Fouraker, Executive Director, Fort Worth Zoo

**Available at Amazon.com**

Bookstores, museums, zoos, gift shops are invited to become retail outlets. Contact me at billATSIGNthankyoubain.com to make distribution arrangements.

**Links**

[My wildlife interests](#)

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When this book was released critic, Glenn Dromgoogle name it one of the 10 best books in Texas
My Wildlife Interests

— As a veterinarian, it should not be surprising that I love living things (including plants). In the Winter of 2006, I took an ecology tour of Costa Rica, and had a great time. I was especially thrilled to meet howler monkeys face to face. I had been fascinated with them for over 50 years after I had first encountered them in a college term paper assignment.

— I live in the country, and dillos live on my place (and die on the road to town (where I took the book cover photo). I don't see live dillos much any more. I worry for them.

— I am on the Board of Directors of the Texas Wildlife Rehabilitation Center
When you have one of the strongest and lightest shells in nature, you are sure to attract admirers.
Genetic abnormal clawed tail (on the left - normal on right)

The 9-banded species in the U. S. always gives birth to identical quadruplets
Dillos News Updates

Why Armadillos Have a Horny Carapace

Perhaps the most conspicuous feature of armadillos is the horny shell (carapace) that surrounds their bodies. Throughout their evolution, this shell has helped them survive attacks from other species (but not the automobile attacks of modern humans).

A study of the evolutionary consequences of the carapace has been published in 2011 by Mariella Superina and W. J. Loughry.* These consequences go beyond that of protective armor, which the authors contend is a logical interpretation but one that has never been experimentally tested.

For example, there are obvious constraints on reproduction. These include:

1. Slower locomotion due to physical constraints. However, armadillos can run fast for short distances when they need to.

2. A lowered aerobic capacity and metabolic rate. Actually, their metabolic rate is among the lowest for any mammalian species. Thus, they can tolerate low levels of oxygen when they grub deeply in dirt for food and when they hole up in their burrows.

3. A lowered requirement for high-quality diets. Thus armadillos do well just eating bugs and worms.

4. Excessive body heat loss. There is no insulating fur and not much subcutaneous insulation from fat. There is high thermal conductance, causing excessive heat loss in the cold and minimization of body heat accumulation in hot weather. This limits their geographical range but actually promotes their adaptability in the hot climates where they originated and live today. Al Prudom and I showed that soon after they go to sleep, they start to shiver violently, even at laboratory room temperature.

5. Mating performance. The carapace makes mounting difficult. One apparent adaptation is a long penis, amounting to as much as 50-60% of body length.
6. Birthing. A rigid carapace would make difficult the delivery of offspring through the birth canal. Thus, fetal carapace is soft and flexible. Ossification of dermal scutes occurs after birth.

7. Limited social interactions. Armadillos don’t have the time. For metabolic reasons, they can’t be very active, and during the limited time when they are active they have to spend 80-90% of their time in food acquisition.


Armadillos and Leprosy (June 25, 2013)

In my book, 'Dillos, I explained some of the history of leprosy research and the findings in Louisiana that some dillos carried the leprosy bacterium. This bacterium is related genetically to tuberculosis. The leprosy organisms has been hard to study because it is almost impossible to grow in tissue culture. The issue all along has been whether armadillos get infected with leprosy from humans (the organism is found in soil and dillos are notorious for grubbing around in dirt). In 2011, Richard Truman in a government lab in Baton Rouge, reported that 65% of human lepers had leprosy organisms that were genetically identical to those found in 'dillos, suggesting strongly that humans got the disease from handling dillos. Historically this does not make sense, because human leprosy originated in the Middle East (probably Iran and Turkey), where there are no dillos, nor have there ever been.

Now, the picture is clearer, based on new genetics research on a heavily infected 700-year old human tooth in Denmark from a woman who died in a leper colony. Using techniques that researchers recently developed for ferreting out the DNA of the tuberculosis organism from old bones, the researchers isolated enough of the leprosy DNA to sequence it. The genes in that human DNA are essentially the same as those found in modern-day leprosy, showing that this organism has evolved slowly. More relevant to the dillo transmission issue, the DNA sequences in this human sample are strikingly similar to that of strains found in dillos. This makes it likely that originally, dillos
caught leprosy from humans. Clearly, transmission of the disease can go in both directions.


Links to Other Dillo Sites

Summaries of armadillo trivia, from an Austin, Tx site: 
http://austin.about.com/od/armadillos/Armadillos_in_Austin.htm

Tips on controlling armadillos that disturb gardens and flower beds:
http://www.wildlife.pro/orlando-armadillo.html
http://www.howtogetridofarmadillo.com

This website includes biological information on all twenty recognized species of armadillo. There are pictures for many species, and a small number of video clips.
http://www.msu.edu/~nixonjos/armadillo/

Reviews

Rebeccas Reads

By RebeccasReads.com (Austin, Texas) - See all my reviews
Reviewed by Sandie Kirkland for RebeccasReads (5/08)

W.R. Klemm, a veterinarian and PhD, has researched the armadillo extensively, so "Dillos" tells the reader everything they'd ever want to know about these amazing creatures. Armadillos are considered primitive mammals, as they can be
traced back to the dinosaur age. They are nocturnal, and live almost entirely on insects, thus benefiting farmers. Armadillo females in the U.S., which are the nine-banded armadillos, always give birth to quadruplets, who are clones of each other. This, plus the fact that armadillos are capable of having leprosy, makes them valuable medical research animals.

Klemm has covered all facets of armadillo facts, from genetic backgrounds, to habitat range to popular culture that focuses on armadillos in many different ways. Some of the interesting items were the discussion of how armadillos came to the U.S. (migration from Mexico in Texas and nearby states while Florida's armadillos are descendants of zoo animals that got loose), how the fertilized female can somehow control implantation, sometimes having the babies up to two years later, and the story of how school children initiated a campaign that resulted in the armadillo being named the state small mammal of Texas. He discusses the past, the present, and the future of these animals.

For anyone interested in armadillos, or simply in animals, this book is recommended. "Dillos: Roadkill on Extinction Highway?" is thorough and very readable.

COLLEGE STATION, Texas (AP) _ Bill Klemm's expertise in the brain capacity of animals doesn't keep him from marveling at the staying power of one of nature's more dunderheaded species. "I have an enormous respect for something that's lasted for 55 million years," said Klemm, a retired Texas A&M University professor of neuroscience and veterinary biosciences and author of "Dillos," an entertaining and informal new book looking at the official state mascot of Texas. "We know they're dumb," Klemm added. "But they're smart enough to live in the South."

*Dasypus novemcinctus*, the cat-sized, nine-banded species of the mammal known for its coat of armor, has been proliferating in much of the southeastern United States since making its way from Mexico 150 years ago.

A year in the making, "Dillos" shows Klemm's academic pedigree with a detailed index and 11-page source list. But a mere glance at the cover quickly dispels any notion this is a dry
After all, how many textbooks feature a color photo of roadkill on the cover? "I was driving my grandkids," Klemm said. "We saw this fresh roadkill. I went back home and got the camera." The image is all too familiar to folks in Texas and throughout the South: a motionless armadillo on its back on the pavement, legs up, tail outstretched. Klemm said armadillos foolishly leap as a vehicle approaches. For a motorist, there's a distinctive thump reverberating from the undercarriage. For the armadillo? "Looks like a concussion," the professor proffered.

In the book, Klemm offered a look at prehistoric armadillos and recipes for cooking one you might find munching on insects in your garden or digging up your grass.

"Catch them by the tail," he advised. "They really don't bite. They don't have good teeth. But they do have big claws."

While he acknowledged he never ate one, he said others have described the meat as like greasy pork. Make sure it's well cooked. Armadillos are known for carrying diseases that don't infect them, which Klemm says should be of interest to scientists and fodder for future study.

Klemm opens with a description of the back porch of his home in the country outside College Station. He sits on a swing at sunset to "enjoy the sights, sound and smells of summer." One of these sounds emerging from the din of crickets is a shuffling of the leaf mulch that I'd put in the flower bed last winter," he writes. "The rustling grows louder, and I suddenly realize: it's that damn armadillo, tearing up the flower bed again."

His gardening woes aside, Klemm clearly admires the armadillo, describing it as an "evolutionary superstar" and "animal version of a Bradley tank." He points out images of the animal show up everywhere from Mayan culture to pop culture and suggests that
given its incessant devouring of insects, it may be responsible for heading off locust plagues.

"They mind their own business and shove dirt up their nose every day," he said. "As long as there are insects ... as long as there are cockroaches, there will be armadillos." Well, they are stupid," he added. "Let's not go overboard."

J. Stephen McCusker, director of the San Antonio Zoo, touted the book an easy interesting read "that allows you to put your arms around this wonderfully weird creature." Dewey Kraemer, an A&M researcher involved in cloning the first white-tailed deer, characterized the book as "appropriate for everything from the classroom to the coffee table."

Klemm sees the animal, despite being nearly deaf and blind and somewhat dimwitted, surviving another 55 million years.

"It's hard to imagine that armadillos would ever become endangered as a species," he writes. "The world is in no short supply of insects to feed on."

**Midwest Book Review**

‘Dillos: Roadkill on Extinction Highway? is a tribute to the humble armadillo, the hardy state mammal of Texas. From the natural history of these “living fossils” to their value in medical research, their representations in pop culture, and even a recipe for armadillo chili, ‘Dillos gives a jovial portrait of armadillos and their relationship to humans. On a more sobering note, 'Dillos also examines why armadillos are so vulnerable to becoming Roadkill (to the extent that they have been alluded to as “Texas speed bumps”) and the sad possibility that their decreasing numbers could lead to the species’ extinction. Black-and-white photographs illustrate this layman’s guide, recommended for armadillo aficionados everywhere.

Glenn Dromgoole, Book Critic
Armadillos as Underdogs
DR. W.R. Klemm, who teaches in the College of Veterinary Medicine at Texas A&M University, has written an entertaining and easy-to-read book on a fascinating Texas icon: the armadillo.

'Dillos: Roadkill on Extinction Highway? is a 146-page paperback (Benecton Press, $15.95; Web site: dillos.us) filled with interesting facts, observations and comments about the official small state mammal of Texas (the longhorn is the official large state mammal).

"Freak, weird, quaint, cute, opportunist, survivor, miracle of nature all are terms that have been used to describe this strange creature of nature," Klemm writes. Focusing primarily on the nine-banded armadillo, the one most common in Texas, Klemm describes the animals as "evolutionary super stars. They are to mammals as turtles are to reptiles: well-adapted to their niches and long-term survivors."

There is plenty of scientific information presented here. But Klemm doesn't let science get in the way of a good story. He devotes the longest chapter in the book to "Armadillos in Pop Culture." Texans, Klemm writes, "admire their tenacity, resourcefulness, peacefulness, and humble origin. Armadillos epitomize the underdog that overcomes insurmountable obstacles."

Notwithstanding our admiration, we - or at least some of us - are not averse to eating them. Klemm offers nine armadillo recipes, including two for armadillo chili and two armadillo casseroles. Others are mu shu armadillo, armadillo in cream sauce, armadillo and rice, smoked armadillo chops, and one called Sally's armadillo something or other. The author doesn't testify to the tastiness of these dishes.

Despite the question mark in the book's title, Klemm remains optimistic about the armadillo's future. Certainly there are threats to its survival, including urbanization and fire ants. But armadillos "still have many things going for them as a species," he says. "The same traits that got them this far should serve them in good stead in the future. There is the protection offered by body armor: There is a food supply based on insects,
which seem always to be in super abundance. There is the efficient reproduction. "If we humans drive ourselves into extinction," Klemm predicts, "armadillos will still be here."

Glenn Dromgoole

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