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Book review:
Texas through time—Lone Star geology, landscapes, and resources

Ewing TE. 2016. Texas through time—Lone star geology, landscape, and resources. Austin (Texas): Bureau of Economic Geology, The University of Texas at Austin. ISBN 978-1-970007-09-1

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Despite being deemed the “Undergraduate Geology Scholar” when I graduated from New Mexico Tech, I’m not a geologist. My undergraduate degree is in geophysics, which meant drinking wine with physicists and mathematicians more frequently than drinking beer with geologists (which is why geologists tend to be suspicious of geophysicists). My graduate studies were focused on hydrogeology, which is more about wet rocks than the rocks themselves. I say all this to put my review of Thomas Ewing’s book—*Texas Through Time: Lone Star Geology, Landscapes, and Resources*—into perspective: I’m interested in geology, but I don’t wake up every morning eager to lick rocks.

Texas takes many forms. Culturally, there’s the Texas of lore—the battles for independence from Mexico, cowboys and their dusty hats herding cattle, and swashbuckling oilmen with pockets full of cash one moment and air the next. Archeologically, there’s the Texas of antiquity, ranging from the Caddos, whose word Tejas—meaning “friends”—was bequeathed by Spaniards to the area, back through the pre-Clovis Paleoindians that came here some 20,000 years ago. And then, geologically, there’s the Texas beneath our feet, the dirt and rock of this place we Texans call home.

This book follows Texas as a hunk of rock and sediments from its beginnings some 1.7 billion years ago to the present. It’s a story of Earth’s ever-changing crust building mountains and then gnawing them to nothing, ever-waxing and waning seas, evaporating oceans, impacting meteors, venting volcanoes, and the inexorable tag-team nibbling of water and time. It’s a story bigger than Texas, but the author aptly tells the tale in 431 pages of this beautiful, full-color book.

Ewing—with 35 years of experience as an Earth scientist in Texas—humbly characterizes his tome as an “extremely brief and incomplete summary of the history of geologic research” in Texas. After all, each page covers, on average, four million years, but he rightly hits the mark in providing an excellent overview of the geologic history of the state. The most recent attempt at overviewing this topic is the 1932 classic *The Geology of Texas—Volume 1: Stratigraphy* by E.H. Sellards, W.S. Adkins, and F.B. Plummer. Ewing’s book is far more approachable than Sellards et al. and, given its recent publication, includes the latest research on the geologic history of the state.

Ewing divides the book into ten chapters: (1) Landscapes of Texas; (2) What is geology?; (3) Texas in space and time: An overview; (4) A long time ago in a world not so far away: Texas in the Proterozoic (1,700–700 Ma); (5) Buried mountains and salt seas: Texas in the Paleozoic (700–250 Ma); (6) Life in a newborn gulf: Mesozoic seas of Texas (265–252 Ma); (7) A world re-formed: Texas Cenozoic (65–0 Ma); (8) Humans in the geologic landscape: The last 20,000 years; (9) Earth resources of Texas: Soils, minerals, water, and energy; and (10) Earth impacts and hazards: Geology and the environment. The book also includes a foreword by Dr. Scott Tinker, director of

the Bureau of Economic Geology; a glossary (with key words bolded in the text); an index; and a helpful appendix of where to see the rocks of the state.

Chapters and topics are well-balanced—Ewing doesn’t dwell disproportionately on any single topic. The first three chapters take just under 50 pages to introduce Texas’ current landscape, geology, and the concept of Texas over time. And, except for the 20 pages dedicated to the Proterozoic period, he spends about 60 pages on each geologic era of the Paleozoic, Mesozoic, and Cenozoic. The last three chapters, representing 88 pages, answers the question: Why do we care about the geologic history of Texas? In short, if you care about people, agriculture, water, energy, earthquakes, climate, and flooding, you care about geology!

Ewing begins his narrative of the geologic eras 1.7 billion years ago with the oldest rocks in Texas, probably located beneath the Panhandle (‘probably’ because rocks of this age are exposed in New Mexico to the west and probably extend beneath our state). The oldest dated rock in Texas comes from beneath Amarillo at 1.384 billion years old (with Van Horn a close second at 1.383 billion years). After the next billion years of volcanic activity to form the Proterozoic crust, Texas spent much of the next 700 million years south of the Equator, as far south as the modern-day Falkland Islands. Half a billion years ago, Texas was turned 100 degrees clockwise such that West Texas was North Texas and East Texas was South Texas.

Appalachian mountain building about 300 million years ago reached deep into Texas, following present-day I-35 down to San Antonio and then continuing west out to Marathon (where rocks from that time are exposed [there’s a historical marker on U.S. Highway 90 east out of Marathon noting the rocks in the base of a nearby mountain]). About 250 million years ago, Texas was near the center of the supercontinent Pangea. About 150 million years ago, as Pangea slowly exploded apart, the Gulf of Mexico opened with beaches just a 15-minute drive away from the present-day locations of Dallas, Waco, Austin, and San Antonio. About 100 million years ago, increased volcanic activity in the oceans raised sea levels, moving the beach to Amarillo and El Paso. About 80 million years ago, some 200 shallow-sea volcanoes popped off in Central Texas near Austin (Saint Edwards University in Austin perches on top of an old volcano!) and south of Uvalde. Shortly thereafter, we had dinosaurs crawling all over the state, including the mighty Alamosaurus, the largest known dinosaur from North America at 100 feet long and 80 tons (sadly, this glorious beast was not named after the beloved mission in San Antonio but instead for the formation from which it was originally found, the Ojo Alamo Formation in New Mexico).

About 66 million years ago, a 6-mile-wide asteroid traveling at 50,000 miles per hour slammed into the Yucatan with a force equivalent to 100 million megatons of TNT (5,000 times

more powerful than all the nuclear weapons on Earth). The impact sent waves of water over Texas at heights of hundreds to possibly thousands of feet high, scraping the landscape and dumping a “Cretaceous cocktail” of sediment in the gulf. The meteor’s impact sent sky-darkening dust and sulphuric acid around the globe, leading to the demise of 75% of all species, including most of the dinosaurs. This massive impact and subsequent die-off allowed for the rise of the mammals (i.e., us).

As the Rocky Mountains formed between 80 to 40 million years ago, they began to erode, creating an apron of sediment now known as the Ogallala that fell across western New Mexico into northwestern Texas as far east as Wichita Falls. After the Pecos River—assisted by the dissolution of ancient sea sediments beneath it—ate its way from West Texas into northern New Mexico, cutting the Ogallala from its sediment source, the aquifer began to erode westward, a process that continues today at a rate of one inch a year.

When humans first arrived in Texas 20,000 years ago during the last ice age, the shoreline for the Gulf of Mexico was 100 miles out from today, near the shelf break, and the Sabine and Neches rivers emptied into the Trinity River. Then, as the glaciers retreated, sea levels rose. If you’ve ever wondered why the Brazos, Colorado, and Rio Grande do not have bays, it’s because they carried enough sediment to fill their retreating basins as sea levels rose. In the other bays, sea levels rose faster than sedimentation. Today, sea levels are rising at 2.1 to 6.3 mm per year (0.7 to 2.1 feet per 100 years) along the Gulf Coast; thus, about 80% of the Texas shoreline is retreating.

Ewing includes a fascinating discussion on global temperatures over the last 65 million years and the possible effects of the configuration of oceans and continents, mountain building, solar radiation, variations in the Earth’s orbit, and burps of Arctic methane from gas hydrates. The Antarctic ice sheet formed about 35 million years ago when global deep-ocean temperatures were about 11° Celsius warmer than today, and the northern ice sheet formed when temperatures were about 3° Celsius warmer—potential clues to what a warmer planet means for our current ice caps.

Even though I’m not a geologist proper, I come from the general direction of geoscience, so the book was an easy—and thoroughly enjoyable—read, a testament to how well-written it is. As a hydrologist, I particularly loved learning more about the geologic history of the state’s aquifers and rivers and why they are the way they are. However, I should admit that some of the thorough descriptions of the comings and goings of seas got old after a few hundred million years: You need to bleed silt to be interested in that level of detail. Besides that small (selfish) observation, there’s not much to quibble about in this book.

Texas Through Time should grace every geologist’s and hydrogeologist’s bookshelf and, perhaps, the bookshelves of more advanced geologic amateurs. As a geologic amateur, I know that I will be referring to this book time and again in future years.