

By Susan L. Doyle

# The Fault

**A TERRIBLE EARTHQUAKE! DREADFUL DESTRUCTION OF PROPERTY AND HUMAN LIFE. CHARLESTON VISITED BY A CALAMITY UNPRECEDENTED. EARTHQUAKE SHOCK FELT IN DIFFERENT PARTS OF THE STATE.**

—*Rock Hill Herald*, Thursday, September 9, 1886

**T**he words “earthquake” and “South Carolina” are not usually strung together, but they should be, as our state has an earthquake past, present and future. The best-known South Carolina earthquake occurred in 1886. Although its epicenter was in Summerville, it became known as the “Charleston Earthquake of 1886” because Charleston was the largest city affected. The quake shook the Eastern Seaboard north of Washington, DC, and the waters of Bermuda and Cuba. Classed as the largest recorded earthquake in the southeastern United States, it is a quake seismologists and historians still study.

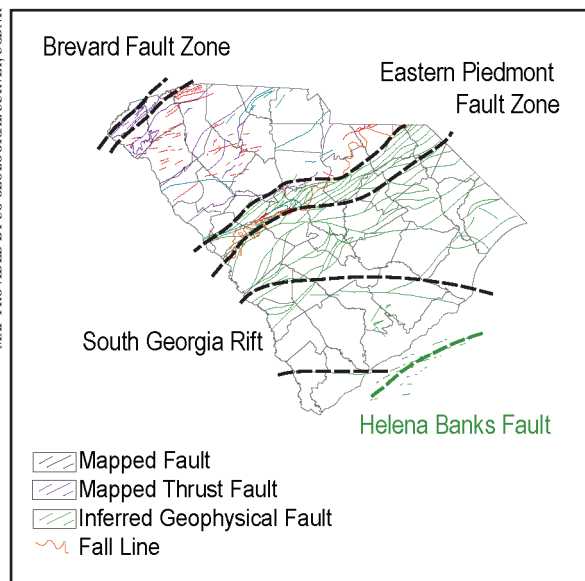
*Faults and fissures, zones and rifts—a seismologists’ view of South Carolina. Facing page: the effects of earthquake activity on quartz.*

An astute sixth grader can tell us an earthquake is what happens when plates that make up the earth’s bedrock rub against each other. The earth’s constant movement, contracting and stretching like Silly Putty, creates great amounts of energy. This friction manifests itself as a quake and occurs along a fault, the place where the constant rubbing has caused the rock to crush down into small particles.

“Earthquakes are areas of dislocation,” says Dr. Scott Howard, project leader for Structural Framework Studies at the South Carolina Department of Natural Resources (SCDNR) in Columbia. “Rocks absorb a lot. Faults are where the rock becomes brittle, reflecting the release of energy.” Faults could be conduits or barriers for water, the earth’s natural lubricant. When the fault is a conductor, quakes that happen right under our feet can be felt many miles away.

“Essentially, the continent is like a log raft,” explains Dr. Erin Beutel, director of the South Carolina Earthquake Education and Preparedness Program (SCEEP) and associate professor at the College of Charleston’s Department of Geology and Environmental Geosciences. “California is where the North American raft is rubbing

MAP PROVIDED BY SC GEOLOGICAL SURVEY, SCDNR



# *EARTHQUAKES* *In South Carolina*

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## Lies Within



against the Pacific raft, hence they have a lot of earthquakes. But the Summerville area is similar to a location on a large log raft where the lashings are loose. When the raft is ‘pushed,’ the logs move against each other and the quake occurs.”

Western and eastern quakes do not affect the land in the same way. “In California, the [earth’s] crust is intensely fractured,” Howard notes. “The upper crust consists of broken-up fault slices of all sizes. This makes it difficult to transfer seismic energy from one piece to the next piece to the next.”

South Carolina bedrock, on the other hand, is not as broken by active faults as California; therefore, seismic waves transfer energy better, contributing to the extensive statewide damage levels experienced in 1886.

South Carolina has its own geological faults. Four are well-known: Brevard, Pax Mountain, Eastern Piedmont and Helena Banks. The most documented is the Eastern Piedmont Fault System. This fault runs southwest to northeast—unlike the well-known California San Andreas Fault that runs north to south. Extending from Alabama to Virginia, the Eastern Piedmont Fault is made up of hundreds of smaller faults, each taking a different route. Some extend for a few miles and end, or jump left or right before continuing. Despite its many smaller faults, the Eastern Piedmont system does not have multifracted layers like California.

The SCDNR reports approximately 70 percent of documented quakes have occurred in the Coastal Plain. The earliest noted earth tremor occurred in that area in February 1698, with 20 “movements” happening before the “big one” in 1886. Since then, seismic monitors have recorded more than 300 tremors in South Carolina. Some made it to the surface, but most happened deep underground.

“The Summerville area is an area of weakness where two faults—the deeper, northeast-trending Woodstock Fault and the shallower, northwest-trend-

ing Ashley River Fault—intersect, in an otherwise relatively stable continental interior,” Beutel says.

On top of the Woodstock and Ashley River faults sits Charleston’s man-made “land” and loose sandy soil—not known to be strong conduits for earth movement. Regardless, it was ascertained that the tremors intensified as they passed through the “water loose sediment.” This one aspect of the Charleston quake still puzzles seismologists.

Some research indicates the 1886 quake occurred when underlying faults (possibly the Woodstock and Ashley River) deep in the basement rock were fed by smaller active faults, perhaps coming off the Eastern Piedmont system. The gathered energy released itself in a violent earth-moving event. It wasn’t the quaking that caused the most damage, but the rolling of the surface’s reaction to the underground movement. Much of the damage that occurred came during the eight aftershocks.

Dr. Gabriel E. Manigault, curator of The College of Charleston Museum, reported in 1887: “. . . [H]eard a rushing, roaring sound compared by some to a train of cars at not great distance, others compared it to a clatter produced by two or more omnibuses moving at a rapid rate over our paved street . . . followed immediately by a thumping and beating of the earth underneath the houses which rocked and swayed to and fro.”

The SCDNR’s Scott Howard confirms that “we are more concerned with the surface waves. As energy reaches the surface, it does the most damage as the land moves side to side.”

Charleston’s quake created surface rolls that knocked buildings down and pushed railroad tracks sideways. A phenomenon of this quake was the many “craterlets” created by “sand blows” (surface holes caused by air-pushed sand and rock) throughout the Summerville-Charleston area.



Historic accounts differ, but in today's dollars, Charleston and the Summerville area suffered \$112 million in damages. Falling buildings and chimneys caused close to 100 deaths. Charleston's quake rated X on the Mercalli scale.

The Mercalli scale was an early system used to measure quake magnitudes. The well-known Richter scale is usually referenced in the western United States. The Modified Mercalli Intensity Scale of 1931 was in use before the 1970s. Today, many geologists use the Moment Magnitude Scale (MMS). Richter and MMS scales use logarithmic calculations; Mercalli used roman numerals from I to XII, with I representing not felt and XII representing damage total.

Another noted "earth movement" occurred January 1, 1913, in Union. Receiving a Mercalli scale rating of VIII, this New Year's surprise affected an area of 43,000 square miles. No deaths were reported, but it caused chimneys to fall, machinery to move,

windows to break and goods to fall from shelves. Yet, it was the quake that occurred 27 years earlier that people still talked about.

In the 1930s, local history columnist Will C. Lake, writing for the *Union Daily Times*, shared recollections of that evening:

"We were living on South Street in Union," said the late Charles B. Counts, printer, "when we felt the tremor. We ran out of the house into the yard. Father thought it was the end of time. One of my sisters started back into the house. Father saw her and yelled: 'Where are you going, daughter?' 'I am going to get the clock!' 'Don't bother about the clock,' he said, 'Time is up!'"

On a visit to Charleston, ask a tour guide about the 1886 earthquake. You might hear that earthquakes are the reason many buildings have plates, some shaped like a lion's face, on the outside walls. These iron rod "earthquake bolts" run horizontally through the buildings. Historic documentation, though, indicates use of the plates was in place before the earthquake as stabilizers against hurricanes, tornados and driving rains. Against earthquakes they did not hold up so well since, as noted earlier, the deaths occurred because of falling chimneys and buildings.

Lately, South Carolina's terra firma has been, well, firm. The state experiences between two and seven 'felt' quakes a year, which is normal. Still, according to Beutel, even the slightest earth movement (which could be no more noticeable than the ground shake of a passing tractor-trailer or caused by a sonic boom) causes South Carolinians in the affected areas to quickly report the occurrences to the South Carolina Earthquake Education and Preparedness Program—unlike in western states, where a slight tremor is a "nonevent."

The last recorded South Carolina earth tremor, as of this writing, occurred May 6, 2009, near Summerville. Can another damaging quake, such as the one that rock 'n' rolled Charleston the night of August 31, 1886, and shook 'n' rattled Union the afternoon of January 1, 1913, occur soon?

"We can't predict earthquakes," Howard says. "We can only talk in probabilities."

Maybe humans can't predict earthquakes, but there is some evidence that animals can. "Animals act differently," says Scott Pfaff, animal curator at Riverbanks Zoo and Garden in Columbia. "Some of our animals, such as elephants, giraffes and crocodiles, have stronger [senses]. They can hear subsonic vibrations that our ears cannot pick up."

According to Pfaff, it's quite possible the curators, who are in tune with the animals under their care, would be forewarned by the animals' behavior if



*Dr. Erin Beutel of the South Carolina Earthquake Education and Preparedness Program (facing page) stands at a historic Charleston locale; note the “earthquake bolt” above her left shoulder. This page: The Cross Keys House in Union County was ravaged by the 1913 earthquake, as illustrated stunningly in the vintage photograph above; the modern-day side view of the old-and-new brickwork clearly illustrates the repair line.*

an earthquake were to occur. But for the rest of us, if no animals are in the vicinity, we need to rely on the geological experts. Completed studies of the Coastal Plain rock and sediment show earthquakes reoccur approximately every 500 years.

Based on these findings, it’s a probable guess that another damaging quake like the one that rocked Charleston in 1886 could occur in the same area in 2386 . . . or tomorrow. ❖

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*Susan L. Doyle is a writer in the Lesslie area of Rock Hill. She remembers when, after a noticeable silence, dogs in her Connecticut neighborhood howled in unison just before a quake hit.*

For more South Carolina earthquake and geological information, check out these sources:

**Earthquake.usgs.gov**  
**[www.dnr.sc.gov/geology/index.htm](http://www.dnr.sc.gov/geology/index.htm)**  
**[www.digitalgeology.net/page12.html](http://www.digitalgeology.net/page12.html)**  
**<http://scearthquakes.cofc.edu>**

A nine-page booklet, “The Charleston Earthquake Tour: A Walk Through History August 31, 1886 and Today,” highlights still visible damage on many Charleston structures. It’s available on the SCEEP site.

See “Earthquakes in South Carolina 1698-1975,” T.R. Visvanathan, Bulletin 40, South Carolina Geological Survey 1980.