

MOUNTAINS

WORD FROM THE SMOKIES

Taking a walk across ancient land



Arthur "Butch" McDade
Word from the Smokies

My boots make a crunching sound on the rocks. It's a constant backdrop while hiking in the high country of the Smokies, except on those stretches of trail where I hit snow, ice, or leaves. The crunching has been an almost continuous background for my hikes in the Smokies over the decades.

More recently, I've been mindful of the fact that the rocks I crunch along the trails are ancient. They're around half a billion years old. The park's geology brochure says, "Most of the rocks in Great Smoky Mountains National Park are sedimentary. . . . As more and more of these sediments were deposited, they were eventually cemented together and changed into layers of rock over nine miles thick. Today these rocks are known as the Ocoee Supergroup."

These rocks have been slightly crystallized (metamorphosed) from mountain-building heat and pressure, so they're commonly referred to, for instance, as metasandstones or metasiltsstones. There is also a basement complex of billion-year-old gneiss and schists that were faulted and folded during mountain building, but this basement complex is exposed only in the southeastern part of the national park. In that regard, the sedimentary Ocoee rocks are the most common in the Smokies. They formed in ancient low-lying seas and basins millions of years ago. They're what we see (often draped in forest vegetation) when we look at the Smokies from afar or from a scenic vista.

So, how did these sedimentary rocks from ancient marine basins get thrust into high mountains? "The earth's outer crust is made of huge, continent-sized puzzle pieces, called plates, that fit together, but also move relative to each other, driven by heat from within. They crash together, slide against each other, or pull apart at about the same rate your fingernails grow," says Chief of Resource Education Stephanie Kyriazis. "The process is called plate tectonics, and it's been happening since very early in the earth's history."

That's what happened between 310



The Big Creek area near Waterville, North Carolina, is home to several different ancient rock groups formed hundreds of millions of years ago. The Great Smoky Mountains are considered to be the most complex and distorted geology in eastern North America. ASHEVILLE



A stone stairway on Alum Cave Trail weaves beneath Arch Rock. The slaty rocks are highly fractured and folded and have irregular pods and veins of white quartz in them. GREAT SMOKY MOUNTAINS ASSOCIATION

to 245 million years ago when the ancestral African tectonic plate slowly slid into the ancestral North American plate.

"You may have heard about the supercontinent Pangea," Kyriazis continues, "As the African tectonic plate gradually pushed against the edge of the North American plate to form Pangea, the original horizontal layers of the rocks were bent or folded and broken by faults. In this region, ancient, deeply buried rocks were pushed northwest-



Folded rock layers created by tectonic compression are well exposed on the face of the Alum Cave Bluffs in the Smokies. Dark gray slate and metasiltsstone of the Anakeesta Formation underlie the entire trail to the bluffs, and many outcrops of this rock can be seen along the way. GREAT SMOKY MOUNTAINS ASSOCIATION

ward, up and over younger rocks along a large, nearly flat-lying thrust fault, known as the Great Smoky Fault."

This coming together of continents created majestic mountains (the Appalachian Range), part of which came to be known as the Great Smokies. Geologists estimate these early mountains were as high as today's Rockies, and perhaps higher.

Ultimately, after millions of years of contact, the African and North American tectonic plates slowly pushed away from each other by the breakup of a supercontinent and gradually moved to their current locations. The two plates continue to drift from each other to this day.

With the tectonic plates drifting apart, the mountain building ceased, and erosion began a slow but unrelenting attack on the new Smokies. Bit by bit, storms, ice, wind, gravity (in the form of landslides and "rock creep"), and freezing and thawing wore into the mountains each year, carving valleys and gradually carrying off an astonishing amount of geologic material to streams, rivers, and valleys below.

In his book "Strangers in High Places," writer Michael Frome states, "Ages earlier than today, when the Appalachians [including the Smokies] were four times higher than now, a true alpine vegetation probably existed. In the course of 100 million years, the Appalachians were worn down by erosion and the vegetation changed."

Around 10,000 years ago, when gla-

ciers stopped just short of the Smokies during the last ice age, many northern species of plants and animals escaped the cold conditions by migrating south and into the Southern Appalachians. In the current geological and climatological age, the Smokies exist in a temperate zone with ample rainfall and sunlight and support a fascinating diversity of life thanks, in part, to the unique geological history of these old mountains.

So, when I listen now to the crunch of my boots on rocks, mile after mile on my hikes, I've come to appreciate the fantastic geologic journey these rocks have made from the ancient lowland basins where they formed millions of years ago to their lofty positions in today's Smokies. These old rocks all over the Smokies have been crushed, warped, and thrust up in the dim, distant geologic past and then intensely eroded over time. After all that immense geologic change, they are part and parcel of today's venerable Great Smoky Mountains.

When we visit the Smokies, we walk along ancient land.

Arthur "Butch" McDade is a native Tennessean and a retired Great Smoky Mountains National Park ranger. He's the author of "Old Smoky Mountain Days" and "The Natural Arches of the Big South Fork." Additionally, he's a contributing writer to the "Encyclopedia of Appalachia" published by the University of Tennessee Press, and he's written over 50 feature articles for numerous magazines. Reach him at smokiesguide@hotmail.com.

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