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GETTING A LIFT: GEOPHYSICIST MAY HAVE FIGURED OUT HOW VOLCANOES HELPED FORM THE COLORADO PLATEAU

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Jun. 21--The thing that makes the Colorado Plateau so beautiful has long been one of geology's great mysteries.

You can see it looking west from White Mesa northwest of Albuquerque -- beds of rock stacked one atop another, a layer cake stretching as far as the eye can see.

It is the landscape that makes the Grand Canyon so distinctive. At its heart is a scientific puzzle that has stumped scientists since John Wesley Powell came here more than a century ago.

"The rocks," geophysicist Mousumi Roy explained as she sat in her University of New Mexico office, "are essentially flat-lying."

That flat look, the plateau's signature landscape, seems simple enough, until you realize that those elegant layers once sat at the bottom of an ocean. They have been lifted, largely intact, more than a mile into the sky.

Hoisting rocks is easy business for Earth's mountain-building forces, but doing it without ripping and tearing them up in the process?

Imagine wrapping your arms around a wedding cake and squeezing. The cake would get pushed up in the middle, but the results would not be pretty. Substitute shifting continental plates for your squeezing arms, and you've got a simplified explanation for how most mountains are built.

Roy's answer to how the Colorado Plateau was lifted, published Thursday in the scientific journal Nature, is different. A gentle and long-lasting heating from below, argue Roy and colleagues from the University of Southern California and the University of Utah, literally floated the plateau -- slowly, gently over tens of millions of years without damaging the cake in the process.

Stretching from Albuquerque's West Mesa volcanoes nearly to the Arizona-California border, and north into Utah and Colorado, the Colorado Plateau is a distinctive desert landscape of red rocks, mesas and beautiful desert canyons.

In puzzling over the question of its formation, Roy joins one of science's great traditions, stretching back to the summer of 1869 when Powell's first daring trip down the Green and Colorado rivers entered a gap in the Uinta Mountains.

For months, Powell and his band of explorers boated through the layers, and for the rest of his career Powell, the pioneer of western geology, puzzled over how they had been lifted into the sky.

"He recognized right from day one," said Joel Pederson, a **Utah State University** professor and one of Roy's collaborators.

Working out the answer largely happened at a computer, as Roy sifted through enormous data sets: numbers showing how much the plateau had been lifted, rocks blasted up by volcanoes holding clues to conditions in the crust beneath, and data on the age of volcanoes in the region surrounding the plateau.

Assembling the pieces into a coherent explanation is "the funnest part of my job," Roy said as she sat in her office at UNM's Northrop Hall.

Key to Roy's insight was that the Colorado Plateau is thicker than the crust around it. That means it sticks down farther into the mantle. So when a pulse of heat came up from below, the Colorado Plateau was heated first.

Earth's crust is made of rocks that are buoyant, floating on the hot mantle below. The Colorado Plateau, because of its unique shape, got an extra burst of heat and expanded as it warmed, making it lighter.

"As a result," Roy explained, "it pops upward."

But it takes more than just gently lifting the rocks to make a beautiful landscape, so Roy and Pederson and their colleagues say they are not done trying to tease out the Colorado Plateau's complex story.

John Wesley Powell would have had no place to float his boat, and we would not be able to see the beautiful rocks -- "a layer cake that's laid bare," in Pederson's works -- if erosion had not followed uplift.

"Uplift is half of the story," Pederson said.

"It's a process of uplift and erosion that sculpted the landscape," Roy noted.

One of the beauties of the work, Pederson said, is that it provides a timeline for the uplift of the plateau. So he and his colleagues are now returning to the rocks, armed with the new data, to look at the patterns and timing of the creation of the mesas and canyons that give the Colorado Plateau its distinctive look.

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