What moves these big rocks across the desert floor? Hint: It isn't UFOs

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Scientist Richard Norris surveys one of several hundred rocks that have left trails as they moved across the surface of the Racetrack Playa in California's Death Valley National Park, Aug. 18, 2014. Photo: Louis Sahagun/ Los Angeles Times/MCT

DEATH VALLEY NATIONAL PARK, Calif. — The cracking sounds were ferocious as an ankle-deep, frozen lake broke apart under sunny skies.

The normally dry lake bed here in Death Valley National Park is known as "the Racetrack Playa" — a playa being an area of flat dried-up land. As cousins Richard Norris and James Norris watched, a light wind began moving huge sheets of ice across the surface of the water.

Soon, that ice was sent ramming into large rocks weighing up to 200 pounds. Propelled by the ice masses, the rocks began to slide across the lake's slick, muddy bottom.

“My God, Jim, it’s happening,” Richard yelled, prompting James Norris to run and grab a camera.

Their photos last Dec. 21 provided the final evidence in solving a mystery of the Racetrack Playa that has long puzzled visitors and scientists: What is it that moves rocks across flat dirt in the heart of the hottest, driest place on Earth?

An Incredible Stroke Of Luck

Rocks of various sizes — some weighing 600 pounds or more — leave trails that wiggle like snakes or form complete loops or even rectangles. The trails are cut sharply into the ground but no other tracks are visible.

Various explanations for the rocks' movement have been proposed over the decades. Among them are hurricane-force winds when the lake's surface is covered with rain water, rocks carried across the mud by small rafts of ice, and even UFOs.

However, until the Norrises' incredible stroke of luck that day last December, no one had been able to prove anything definitively.

“I’m amazed,” James Norris said, nodding toward the glistening playa earlier this month. “In a place where rainfall averages 2 inches a year, rocks are being shoved around" by processes "typically seen in arctic climes.”

He added, “And the movement is incredibly slow. These rocks clock in at about 15 feet per minute.”

One Study Said Dust Devils Did It

Geologists have been studying the moving rocks since 1948, when the first scientific study suggested they were driven by

small whirlwinds known as dust devils. One reason the mystery endured is that the movements are episodic. Often, there is no motion for decades until a precise series of natural events occurs.

The first requirement is rain in a parched climate. Next, temperatures must fall low enough to freeze the water before it evaporates. Then the sun has to come out and thaw the ice.

Finally, wind has to blow strongly enough to break the ice into floes — free moving sheets — and move it across shallow water underneath. Even a light wind is enough to get the ice moving.

Physicist Ralph Lorenz, who had investigated playa rock movement for a decade, believed so strongly that ice floes were the cause that he erected time lapse cameras in the area about seven years ago. However, they failed to record the phenomenon.

The Norrises subscribed to a different theory — that hurricane-force winds were the cause.

Tracking Their "GPS Stones"

Richard Norris, 55, a biologist, and James Norris, 59, a research engineer, launched their “Slithering Stones Research Initiative” in 2011.

Over the next two years, they installed a weather station in the area. In addition, they placed 15 stones equipped with global positioning devices — a bit like a car's GPS — on the playa's pancake-flat surface.

The “GPS stones” were specially engineered to record movement and velocity. They were stationed at the southern end of the playa, where rocks begin their strange journeys after tumbling down a cliff.

On Dec. 20, the two cousins returned to inspect the instruments. “We found the playa covered with ice,” Richard Norris recalled. “We also noticed fresh rock trails near shards of thin ice stacked up along the shoreline.”

The following afternoon, “we were sitting on a mountainside and admiring the view when a light wind kicked up and the ice started cracking,” Richard Norris said. “Suddenly, the whole process unfolded before our eyes.”

A review of recent weather helped explain what the cousins saw: A rare winter storm had dropped about 1 1/2 inches of rain and 7 inches of snow on the region in late November. The playa was transformed into a shallow lake where the GPS stones recorded movements on sunny days with light winds following nights of subfreezing temperatures.

Captured On Camera

James Norris’ photographs made the process clear. Panes of ice hundreds of feet across and as thin as 1/4-inch thick blew into the rocks. Then, the rocks slid along the slushy, slippery mud along paths determined by the direction and velocity of the winds.

The Norris cousins’ fascination with Death Valley National Park began in the 1960s when their fathers — both well-known scientists — first took them there.

“Wouldn’t our fathers have loved to have known this?” James Norris said of their discovery.

He added that he almost felt a bit of regret, “because the mystery was no more.”

The cousins first shared the news with Lorenz, who became one of the five authors of a report documenting the discovery published Wednesday.

“While it takes away the mystery, it also underscores what an amazingly rare and wonderful" process "is at work there,” Lorenz said.