

"Historians should read this book—they will never look at overland migrations the same way."—Malcolm J. Rohrbough, author of *Days of Gold*

"For many, the Gold Rush required a transcontinental trek of epic proportions. Here now is documented the geographical and human struggle of that heroic journey, mile by mile, across barriers of land and endurance that stood between—and frequently vanquished—a generation and its dreams."—Kevin Starr, author of California, A History

An excerpt from

Hard Road West

History and Geology along the Gold Rush Trail Keith Heyer Meldahl

An American Journey

As when some carcass, hidden in sequestered nook, draws from every near and distant point myriads of discordant vultures, so drew these little flakes of gold the voracious sons of men.

HUBERT HOWE BANCROFT, History of California (1884)

October was dangerously late to be crossing the Forty-Mile Desert, and Sarah Royce knew it. Only three years earlier, in 1846, October snows had doomed the Donner party in the high Sierra Nevada, and the Royces still had a long pull before reaching those mountains.

But snow was the furthest thing from Sarah's mind right now. First, they had to cross this desert. The lone wagon made slow progress through the hammering heat. Sarah, her husband, Josiah, and the three other adults in the group walked alongside the wagon to spare the oxen, while the Royce's two-year-old daughter, Mary, rode. Ahead, an ocean of salt flats and sand dunes stretched to the horizon. Beyond those lay the Carson River.

Three weeks of hard travel along the salty, foul Humboldt River had sapped the oxen's strength and nearly finished off their food supplies. Then the Royces had made a colossal navigation error. Traveling by night, they had unwittingly missed their last chance to take on water and grass before heading out onto the Forty-Mile Desert. Many hours later they had realized their mistake—and what it meant.

Turn back! What a chill the words sent through one. *Turn back*, on a journey like that; in which every mile had been gained by most earnest labor, growing more and more intense, until, of late, it had seemed that the certainty of *advance* with every step, was all that made the next step possible. And now for miles we were to *go back*. In all that long journey no steps ever seemed so heavy, so hard to take, as those with which I turned my back to the sun that afternoon of October 4th, 1849.

The exhausting backtrack had cost precious travel time. Now they again plodded west along the same route.

Knowing she would need her strength for the all-night walk ahead (no one camped in the Forty-Mile Desert if they could help it, and night travel conserved water), Sarah lay down for a nap in the wagon. She woke to her husband's voice, "So you've given out have you Tom?" The ox lay prostrate in the yoke. His partner was also near collapse, unable to pull. They unhitched both animals and left them to die. Four oxen remained to haul the same burden, and the Carson River now seemed even farther from reach. A guilty Sarah resolved to ride no more.

They entered the worst of the crossing as darkness fell. By hazy starlight, they passed through a gauntlet of horrors. Discarded possessions and putrefying carcasses of livestock lined the trail. Abandoned wagons loomed up in the darkness. The owners had loaded what they could onto the backs of their remaining animals and pressed on with no hopes beyond survival itself. These "scenes of ruin . . . kept recurring," Sarah remembered, "till we seemed to be but the last, little, feeble, struggling band at the rear of a routed army." Amid the wreckage lining the trail, Sarah spied a small clothbound book titled *Little Ella*. She pocketed it, thinking it would please Mary. It was a simple gesture of faith—I will read this book to my daughter in better times ahead.

They stopped often throughout the night to rest, eat a little, and feed handfuls of stored grass to the weakening oxen. "So faithful had they been, through so many trying scenes," Sarah reflected, "I pitied them, as I observed how low their heads drooped as they pressed their shoulders so resolutely and yet so wearily against the bows."

The last of the water ran out near dawn, and with the sun arose the understanding that they would not survive the day without water. No one spoke. They trudged on, scanning the horizon in the emerging daylight for some sign of the river.

"Was it a cloud? It was very low at first, and I feared it might evaporate as the sun warmed it." They dared to hope that the smudge Sarah had spotted on the horizon might be timber along the Carson River. The oxen knew before the people could be sure. First one and then another gave a low moan and lifted his head to sniff the wind—with the scent of water and trees that it bore. Salvation. They would reach the Carson River.

To cross the Sierra Nevada, the Royces had to follow the Carson River upstream and then make a steep drive to the mountain crest. With the desert ordeal behind them, the threat of October snows loomed larger in their minds. To be cut off, trapped on the east side of the mountains over the winter in a land with little game, would be to court starvation. There was nothing to do but to press on as fast as possible.

This late in the emigration season, the Royces had no reason to expect company, especially headed east. Yet that is what they saw on October 12, as they rolled west up the valley of the Carson River. Two riders descended toward them out of the

mountains ahead. Sarah wrote, "Their rapidity of motion and the steepness of the descent gave a strong impression of coming down from above, and the thought flashed into my mind, 'They look heaven-sent.'"

The riders pulled up. "Well sir," they hailed Josiah, "you are the man we are after!"

"How can that be?" responded Josiah.

"Yes sir, you and your wife, and that little girl, are what brought us as far as this."

The riders were part of a relief party dispatched by the California territorial government to help late-arriving emigrants over the Sierra Nevada. The men had orders to go no farther east than the crest of the mountains; their job was to assist emigrants across the summit passes. But nearly a week earlier, on their forced backtrack in the desert, the Royces had passed another group of emigrants headed west. That group, now several days travel ahead, had reached one of the summit passes and been immediately trapped in a snowstorm. They had nearly died but had battled their way to the government men's relief camp. There was a woman in that group, and as one of the riders explained:

[She] set right to work at us fellows to go on over the mountains after a family she said they'd met on the desert going back for water and grass 'cause they'd missed their way. She said there was only one wagon, and there was a woman and child in it; and she knew they could never get through . . . without help. We told her we had no orders to go any farther then. She said she didn't care for orders. She said she didn't believe anybody would blame us for doing what we were sent out to do. . . . You see I've got a wife and little girl of my own; so I felt just how it was.

The men explained the situation. The recent snowstorm had cleared, but another could come at any time and seal the pass for the season. The Royces must abandon the wagon. It would slow their progress to a crawl on the rough ascents ahead. Besides, their four weakened oxen would never manage the final, steepest pull near the summit pass. The Royces must abandon the wagon and move on with all haste, packing a few essentials on the backs of the animals. That night of October 12, Sarah reflected:

I lay down to sleep for the last time in the wagon that had proved such a shelter for months past. I remembered well, how dreary it had seemed, on the first night of our journey (which now seemed so long ago) to have *only a wagon* for shelter. Now we were not going to have even that. But, never mind, if we might only reach in safety the other foot of the

mountains, all these privations would in their turn look small.

The next day the Royces packed what they could on their four oxen and one old horse, as well as two mules that the government riders lent them. They moved swiftly now, and by October 17 they were approaching the final, roughest part of the ascent. The trail went up a narrow canyon boxed in by high walls and plugged with massive granite boulders. By the next evening, they had neared the mountain crest. They slept near snowbanks from the recent storm. Water froze in every container. But the skies stayed clear. The next morning, October 19, Sarah ascended the final heights.

Whence I looked, *down*, far over constantly descending hills, to where a soft haze sent up a warm, rosy glow that seemed to me a smile of welcome; while beyond, occasional faint outlines of other mountains appeared; and I knew I was looking across the Sacramento Valley.

California, land of sunny skies—that was my first look into your smiling face. I loved you from that moment, for you seemed to welcome me with loving look into rest and safety.

It took several days to make the descent. One week later heavy snows sealed the Sierra Nevada passes for the winter. The Royces were on the right side of the mountain. They started a new life in the hardscrabble mining towns springing up in the western Sierra Nevada foothills. In the years ahead, Mary would learn to read with a book called *Little Ella*.

THE FORTY-MILE DESERT and Sierra Nevada crossings were fearsome ordeals for nearly all California-bound emigrants. But these hardships were just part of a four-month, 2,000-mile journey.

It began with a 700-mile crossing of the Great Plains—easy stuff compared to what would follow. At the western edge of those plains, they entered the Rocky Mountains, the beginning of the North American Cordillera—the great mountain belt that stretches from the Rockies to the Pacific coast. To reach California, they had to pass through five Cordilleran geologic provinces: the Foreland Ranges of the Rockies, the Overthrust Belt, the Snake River Plain, the Basin and Range/Great Basin, and the Sierra Nevada. Each province slung its own peculiar arrows of outrageous fortune at those passing through. Each one evoked wonder, joy, fear, or detestation, depending on circumstances. And each has a marvelous scientific story to tell.

THE EMIGRANTS set out once the warmth of spring had pushed winter off the Great Plains and the young grass needed for the livestock had sprung up. They headed upstream along the valleys of the Platte River and North Platte River across present Nebraska. The Great Plains lie on a stack of sedimentary layers, several thousand feet thick, shed east from the Rocky Mountains. The layers rise and thicken to the west, making a smoothly ascending ramp that took the emigrants steadily uphill to the foothills of the Rockies. Deep below the plains, the continental basement—the crystalline rock that makes up the foundation of North America—bears evidence of titanic collisions between small blocks of primordial crust that built the core of the continent nearly 2 billion years ago.

Moving west across the Great Plains, the emigrants saw aridity slowly wrap its tendrils around the land. There were fewer trees, and then none at all. Rolling grasslands stretched to the horizon, interrupted only by passing buffalo herds. In the valley of the North Platte River, they came into a landscape of stunning rock formations—stony vanguards of the great mountains that still lay ahead. First Courthouse Rock and Jail Rock loomed up, then Chimney Rock, Castle Rock, and Scotts Bluff. "No conception can be formed of the magnitude of this grand work of nature [Chimney Rock] until you stand at its base & look up," fortyniner Elisha Perkins marveled. "If a man does not feel like an insect then I don't know when he should."

Although massive on a human scale, the rock monuments of the North Platte Valley are but puny remnants of sedimentary layers that once stacked up so high on the Great Plains they lapped at the chins of the highest Rocky Mountain peaks to the west. Several million years ago, the ancestral rivers of the plains began to eat into these layers, carving them away from the mountains. The rivers left a few scraps, standing today as isolated monuments high above the denuded landscape. We see the Rockies rising abruptly from the Great Plains today because these rivers have exhumed the mountains from deep burial.

The emigrants entered the Rockies in present southeastern Wyoming as they followed the North Platte River around the north end of the Laramie Range. Here they wrote with amazement of the tortured rocks-bent, broken, tilted up on edge —products of the grand geologic violence that spawned the Rockies. W. S. McBride, an 1850 emigrant, gazed at distorted rock layers, "standing edgewise . . . thrust through the earth's surface by some convulsion or subterranean force." These easternmost uplifts of the Rocky Mountains are the called the Foreland Ranges. Each is made of a distinct block of basement rock squeezed up thousands of feet along faults by colossal sideways compression of the Earth's crust. Broad basins, 20 to 100 miles across, separate the ranges. As the deep basement blocks rose, they bowed up the sedimentary layers overhead so that today you see these layers leaning up against the mountains like boards stacked against the walls of mighty houses.

The Foreland Ranges face the Great Plains like a great wall. But a wide gap in the wall exists in Wyoming, between the Laramie, Bighorn, and Wind River ranges. This is why the Oregon-California Trail passed through here. By following the valleys of the North Platte River and then the Sweetwater River west through this gap, the emigrants could ascend gradual slopes all the way to the Continental Divide at South Pass. It was a good travel plan, as long as the rivers cooperated. But in some places, the rivers slash deep canyons straight through ridges and uplifts —even where a clear route around lies nearby. Faced with these impassable canyons, where the water thrashes against vertical walls, the emigrants had to detour. Where the North Platte River cuts through the Hartville Uplift, forty-niner William Swain endured a weeklong detour through "a broken, rocky, mountainous country [where the] road has been strewn with articles left by the emigrants to lighten their loads."

The oddity of rivers going through mountain ridges rather than around bothered many emigrants. Why would a river cut through millions of tons of solid rock to go through an obstacle when, in theory, it could have gone another way? Contemplating the Sweetwater River at Devils Gate, where the river punches straight through a granite ridge, forty-niner A. J. McCall wrote, "It is difficult to account for the river having forced its passage through rocks at this point when a few rods south is an open level plain over which the road passes." The puzzle is solved when we realize that the rivers once flowed high above the ridges that they cut through today. Thousands of feet of sand and gravel once covered all but the tallest Rocky Mountain ranges. Rivers wandered this ancient gravel plain, oblivious to ridges buried far below. A few million years ago, rejuvenated by uplift of the region or wetter climates, the rivers began to flow faster and bite downward into the sand and gravel layers. Where the downcutting rivers met long-buried ridges, they sliced on through to establish the paths that we see today.

Onward, westward, and upward. Leaving the North Platte River, the emigrants crossed overland to the Sweetwater River and followed its smoothly ascending valley upstream to the Continental Divide at South Pass, 7,550 feet above sea level, in present southwestern Wyoming. Here, at this "elevated and notable back-bone of Uncle Sam's," they celebrated. They were halfway to California—1,000 more miles to go. Some of them may have seen South Pass as a divine validation of Manifest Destiny. The gentle ascent and the relatively low elevation seemed to mark the pass as God's natural gateway through the Rocky Mountains.

Whether by God's hand or nature's, South Pass exists by geologic consent. After the Foreland Ranges squeezed upward, a massive mountain blocked the way to South Pass. Later, as the crust stretched, this mountain slid down like a wedge between two large faults to form the Sweetwater Valley, opening the way west through South Pass. Had this not occurred, there would be

an unbroken mountain barricade from Montana to New Mexico, and the Oregon-California Trail—and America's westward expansion—would not exist as we know it.

Crossing the Continental Divide, the emigrants drank for the first time from waters that flow west to the Pacific Ocean. Spirits were high. The first 1,000 miles were over, and it hadn't been that bad.

UP TO SOUTH PASS, the emigrants had ascended the valleys of eastflowing rivers—the Platte, the North Platte, and the Sweetwater. The rivers gave water, the grassy bottomlands provided feed for livestock, and the smooth slopes of the valleys made natural avenues for overland travel. West of South Pass, the land becomes less cooperative. The grain of the landscape—the trend of rivers, canyons, and ridges—tends to be north-south, cutting across westerly routes of travel. The reason comes down to North America's own history of westward migration. For the past 200 million years, our continent has pushed west, overriding several thousand miles of ancient seabed. The resulting sideways compression has erected a landscape of north-south-trending mountains from Wyoming to California. The proliferation of trail cutoffs west of South Pass reflects this shift in the landscape. Up to South Pass, there was one road. Beyond the pass, the overland trails look like a rope pulled apart in the middle, with strands splitting off from the main trail and then rejoining it tens or hundreds of miles farther west. Some of these cutoffs shortened distances through the rough land. Others were worse than useless, saving no time at the cost of harder travel.

The emigrants descended from South Pass into the Green River Basin—6,000 square miles of a desolate sagebrush wilderness flanked by mountains and riven by north-south-trending canyons. The Green River flows south across the basin and exits through the Uinta Mountains, joining the Colorado River on the other side. The Green and its many tributaries have sliced deeply into the flat sedimentary layers that fill the basin, cutting dozens of steep-walled valleys. Down into the valleys the emigrants skidded—and up they labored on the far sides. In between, they crossed miles of parched plains, teeth set against the wind. "It had been so windy and dusty today that we sometimes could scarcely see the length of the team, and it blows so tonight that we cannot set the tent or get any supper, so we take a cold bite and go to bed in the wagons. The wagons are anchored by driving stakes in the ground and fastening the wagon wheels to them with ox chains." That was how 17-year-old Eliza Ann McAuley celebrated Independence Day, July 4, 1852.

With relief, they passed from the Green River Basin into the Overthrust Belt, along the present Idaho-Wyoming border. Here they climbed into a landscape of serial valleys and ridges that run north and south for miles. Like the folds in a carpet shoved

against a wall, the Earth's crust in the Overthrust Belt has been pushed from the west and bent into parallel north-south ridges. Slabs of rock thousands of feet thick have broken free along ramplike faults and slid east for as much as 100 miles, stacking up on one another like overlapping shingles. The Overthrust Belt is a geologic fold-and-thrust belt—a mountain belt formed by horizontal squeezing and sliding of the upper few thousand feet of the Earth's crust.

The pine forests and sparkling streams of the Overthrust Belt were an improvement over the desiccated Green River Basin. But getting through the north-south ridges was miserable hard work. "The word steep does not begin to convey an idea of the roads," 1852 pioneer Enoch Conyers wrote. "Several times I felt sure the wagon would tip over on the tongue yoke of cattle" during the precipitous descents. They skidded down the worst slopes in a controlled free fall, slowing the wagons by locking the wheels with chains and pulling back mightily on ropes.

West of the Overthrust Belt, the emigrant trail clips across the northwestern corner of the Basin and Range Province before arriving at the southern edge of the Snake River Plain in present southern Idaho. This vast volcanic region stretches more than 500 miles from northwestern Wyoming across southern Idaho into Nevada and Oregon. It is a bleak, black-rock landscape, paved with basalt flows and dotted with volcanic cones. The Snake River cuts a steep-walled canyon several hundred feet deep into the lava beds. "Of all countries for barrenness I have ever seen, it certainly exceeds any. I doubt if it can be equaled in any part of this continent," Major Osbourne Cross declared. The black lava blasted summer heat like an oven. It was bitter irony that the Snake—the largest river the emigrants had seen since the Missouri River nearly 1,300 trails miles back—could provide little relief from thirst and heat. As Ezra Meeker explained, "In some places we could see the water of the Snake River winding through the lava gorges, but we could not reach it, as the river ran in the inaccessible depths of the canyon." Below the lava beds of the Snake River Plain lies a set of yawning volcanic craters, some of them 50 miles across. They speak of volcanic Armageddon—a 16-million-year history of repeated, lifeincinerating eruptions whose latest creation is Yellowstone National Park.

Where the Raft River joins the Snake River from the south, California-bound emigrants bid farewell to their Oregon-bound trail brethren. "The Oregon Trail' strikes off to the right & leaves us alone in our glory, with no other goal before us but Death or the Diggins," forty-niner Wakeman Bryarly noted at this parting of the ways. The Oregonians continued west along the Snake, while the Californians turned south up the Raft River Valley, bound for the headwaters of the Humboldt River in present northeastern Nevada. They now faced a 600-mile push through the Basin and Range Province, most of it across the heart of present Nevada. Only the 700-mile crossing of the Great

Plains represented a longer haul within a single geologic province. But travel across the Basin and Range was a far cry from the easygoing trek across the Great Plains. It would be hard to imagine worse country for east-west travel. The Basin and Range takes its name from its topography—dozens of long, narrow mountain ranges separated by arid, gravel-filled basins. Basin, range, basin, range, lined up north-south from western Utah clear across Nevada to the Sierra Nevada. From high and distant vistas, the emigrants stared glumly west at range after range, cresting toothy and raw to the horizon like rock waves on a frozen sea. John Hawkins Clark gave this report while crossing the Tuscarora Mountains in 1852:

Our road this afternoon is up a steep mountain side seven miles long; the steepest, roughest, most desolate road that can be imagined. The mountains that border this valley . . . have a decrepit and wornout look. . . . It makes a man lonesome and homesick to contemplate their forlorn, deserted and uncanny appearance. Stunted and scattered cedar trees, broken down by the snows and wild winds of the winter season, gives them a sort of ghost-like appearance that makes one shudder to behold.

Most mountain ranges, including the Foreland Ranges and the Overthrust Belt of the Rockies, form through horizontal compression of the Earth's crust—sideways squeezing that thickens the crust and pushes up mountains. The Basin and Range is different. Here the Earth's crust has stretched more than 200 miles east to west, breaking up into north-south-trending basins and ranges. For the emigrants, there was only one viable path west through this gauntlet of ranges—the Humboldt River. The Humboldt snakes west for 350 miles across Nevada, nosing its way around the ends of the north-south ranges or cutting through them. It is the largest and longest river of the Great Basin—a vast region of internal drainage within the Basin and Range Province where rivers have no outlet to the sea. The Humboldt was the emigrants' lifeline across the Great Basin, the only route with reliable water and grass. But what a river muddy and sullen, foul-tasting and salty from evaporation, shrinking downstream before expiring at the Humboldt Sink, 40 miles shy of the Sierra Nevada. And the surrounding country was no better. "Nothing but the hot sterile lands and dust immediately around us & naught in the distance to relieve the eye, but bare rugged hills of basalt," forty-niner Bennett Clark groaned. "Our feelings now [are] that if we once get safely out of this great Basin we will not be caught here again in a hurry."

Once the Humboldt died, the going only got worse. From the Humboldt Sink, the emigrants had to make a near-waterless leap—a leap of faith—across the hottest, driest section of the trail: the Forty-Mile Desert. It was 40 miles from the end of the Humboldt River to either the Truckee River or the Carson River—the nearest streams flowing off the eastern slopes of the Sierra

Nevada. Here the grim trails were easy to find, marked by bloated carcasses and bleaching bones of hundreds of livestock that had perished from heat and thirst. Their decomposing bodies filled the air with the stench of death. Desperate emigrants discarded tons of valuable possessions to lighten loads for weakened animal teams. Wagons and goods piled up, abandoned, in the desert. The only water, barely potable, lay in a handful of dug wells clogged with algae, or in sulfurous holes that belched steam like portals to hell. Aridity reigns in the Forty-Mile Desert—and across the rest of the Great Basin—because of the Sierra Nevada. The mountain traps cloud moisture on its western flanks. To the east, downwind of its rain shadow, a desert now stretches for hundreds of miles across five western states.

The Sierra Nevada greeted those who stumbled, with cracked lips and swollen tongues, out of the Forty-Mile Desert. Here loomed the final and greatest barrier of the journey, with passes as high as 9,500 feet that threatened snow and a frozen fate to stragglers. This great block of the Earth's crust began to rear up in earnest about 5 million years ago, and it continues to rise today. Earthquakes pop off periodically along the faults that bound the range. Each one lifts the mountain a bit higher. The quakes are part of the ongoing stretching of the Basin and Range Province—a process that each year pulls Sacramento away from Salt Lake City by nearly a half-inch. On the other side of the Sierra Nevada, scattered through its western foothills, lay the gold that all hoped would "repay them for all their hardship and suffering"—gold that migrated to California long ago through the quirks of geologic history.

THE EMIGRANTS could not know of these links between the history of the North American continent and their experiences on the road west. Geology was an infant science in emigrant days. It sprouted from the seeds of deep time germinating in the minds of European thinkers during the seventeenth and eighteenth centuries. It grew up during the nineteenth and early twentieth centuries with exploration, mapping, cataloging, and observing, and burst into maturity in recent decades with a unifying theory called plate tectonics.

Nonetheless, many emigrants were intensely curious about the geologic landscape. They wanted to understand the rocks, rivers, and mountains. The landscape around them changed as they went west, but its influence on their lives was constant. The land occupied their thoughts during the day and often dominated their writings at night. Sometimes the landscape inspired rapture, at other times loathing. In June 1850 by Chimney Rock, emigrant Dan Carpenter wrote, "From the top of the bluff near the chimney I had a splendid view westward of some of the most beautiful wild and romantic scenery as I ever beheld." Some two months later, along the Humboldt River, he was less enchanted. "This is the poorest and most worthless country that man ever



saw—No man that ever saw has any idea what kind of a barren, worthless, valueless, d—d mean God forsaken country there is, . . . not God forsaken for He never had anything to do with it." Carpenter's sentiments mirror the geologic diversity of the West—a land of warts and wonder, simultaneously hostile and sublime, spectacular and severe.

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