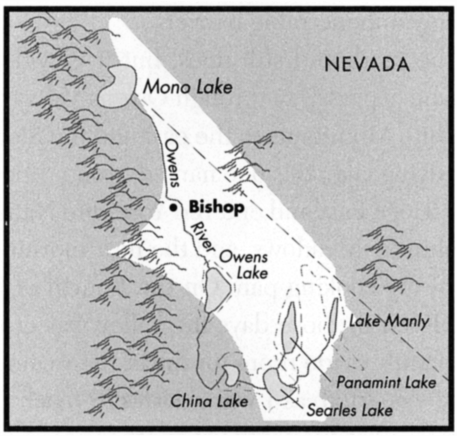
I

Deserts



I felt my way into California in 1960 via the desert and arrived on the crest of the wave of immigration that would establish it as the most populous state in the union and an exceedingly rich and well-endowed nation in its own right. Those were proud and naive times.

My route crossed the midsection of California. Inadvertently, I had chosen the perfect introduction to the landscape.

I had not known real heat until I entered Death Valley in early July, nor had I ever encountered such physical extremes in close proximity as when I drove from below sea level to the ten-thousand-foot heights of the Sierra Nevada on that same day.

I dallied only for gas at Furnace Creek, then proceeded across the valley floor as the temperature rose to over one hundred degrees. I pushed my Volkswagen Bug, loaded with all my worldly possessions, as fast as I could up the alluvial fan that led out of that inferno and into the next valley. I stopped for nothing in that fearful landscape.

The descent was into the Panamint Valley and past more history I was ignorant of: a history that bespoke other transients crossing this violent,

convoluted land and making their way via foot or horse or wagon or train or car or plane across deserts, over mountain barriers, and into the luscious heartland of California.

The route lay across yet another pass and into the Owens Valley. It wound past the blinding, white salt flats of a desiccated Owens Lake, and at last reached the visual safety of a row of green cottonwood trees at Olancha. Far above, the granite heights of the towering Sierra Nevada formed a seemingly impenetrable barrier.

North went the road, and still does, but it is widened now into an occasional four-lane expressway through Owens Valley, a tectonic trough framed by the White Mountains to the east and the Sierra Nevada to the west. At another dying lake, this one named Mono, I turned left onto the narrow road over Tioga Pass and entered Yosemite National Park. I spent that night in Tuolumne Meadows, and the next morning ice had formed around the rim of my cooking pan. On the Fourth of July I headed for Yosemite Valley. Even in those days the valley was crowded on holiday weekends, but a family made room for me at their campsite.

The next day I departed, as I was anxious to reach the Pacific Ocean and end my journey. I dropped into yet another hot valley, this one called the San Joaquin, where I would return to live in six months' time. I descended into an unfamiliar landscape of green, irrigated lands clasped between the dry thighs of foothills. I pushed the small, uncomplaining car over the Coast Range, where the lustrous gold of summer grasses flowing across the soft flanks of hills was both dazzling and sensuous—almost too much for this easterner to bear.

A hint of cool ocean breezes filtered across the Salinas Valley. I headed south to Big Sur where, after asking directions, I took a dirt road to the right and drove to Pfeiffer Beach. It was dusk and the fog had descended to isolate presences. A small boy darted out of a ranch house where a lamp was lit in a window. It was his job to collect the twenty-five-cent toll. By making it necessary to stop and back up to negotiate a sharp curve, the family cannily forced me, and other motorists, to pause just long enough for someone to run out and collect the money.

I drove the remaining short distance to the beach, walked the dark path between the coastal scrub, and ran across the white sand to the water. I dove straightaway into the surf, as I had done thousands of times before in summertime on the other shore. I was shocked by the frigid water. I surfaced gasping and stared directly into two black holes that

held the eyes of an alien beast. It stared unblinkingly at me and then slowly sank into the water. Something slimy brushed against my leg.

I swam toward shore against an unseen force, but lost ground; the riptide dragged me out. I lunged with desperation verging on panic against the current, then swam sideways and finally struggled to shore. I threw myself upon the sand that still retained a hint of the sun that had blazed earlier in the day, and the warm land slowly revived me.

I had barely survived my entry into California. I learned a few months later that I had encountered a harbor seal and giant kelp, both of which were benign. By that time I had been initiated into other California mysteries and was swimming toward the mainstream of the California experience.

It is difficult to fix time in the desert. A tiny fraction of the last one billion years, which is only one-fifth the age of the earth, has been given over to long glacial periods alternating with warm, dry periods. We live in an exceedingly short interval within one of the periods of glaciation called the Quaternary Period, which began about two million years ago. The Quaternary Period is divided into two epochs, the Pleistocene and the Holocene. The Holocene extends into present time. The dividing line between the two epochs was about 10,000 years ago, the point of transition between the last full-blown ice age, known as the Wisconsin, and the present, warmer epoch.

Change is a constant. There are variations within epochs. The warmest time within the Holocene occurred not long after the changeover and lasted 3,000 to 4,000 years. Then came a time of renewed glaciation. That was followed by a warming trend and then the Little Ice Age that extended into the last century. Another warming trend lasted until the 1940s, then it cooled and was wetter for thirty years. The last twenty-five years have been warmer and drier.

The Owens River ran its full course from Mono Lake through a chain of lakes to Death Valley in the late Pleistocene Epoch. There was a different landscape then. A cooler, wetter climate produced woodlands and grasslands where there is now desert. As the glaciers that covered the Sierra Nevada to the four-thousand-foot elevation mark during the late Wisconsin disgorged their contents into the Owens River, marshes formed around the edges of the lakes and became rich food sources for roving bands of ancient Californians. Dark coniferous forests and thick

aspen groves descended much lower than they do today. Horses, camels, bison, deer, and the saber-toothed cat prowled these savannas.

When the Pleistocene gave way to the Holocene Epoch, there was a wave of extinctions. The principal victims were the larger animals. Gone were the five species of Pleistocene horses, bison, western camels, large cats, giant beavers, and the Shasta ground sloth. They may have been hunted to death by the early humans or were unable to adapt to the increasing aridity.

The flowing rivers became intermittent, and the deep lakes evaporated. The dry lakes, or *playas* as they are also known (from the Spanish word for beach), are ultimate desert. There are more than fifty playas in the California desert. Heat rises off their white surfaces in shimmering waves that cause mirages. An early desert traveler noted, "Everywhere you meet with the dry lake-bed—its flat surface devoid of life and often glimmering white with salt."

The playas are both ancient lake beds and contemporary landing fields for drug traffic from Central America, experimental aircraft, and flights from space. The dry lakes have received a fair amount of scientific attention, since the runways at Edwards Air Force Base in the Mojave Desert are laid out across a playa and test pilots like Chuck Yeager have landed exotic craft, such as the first jets, space shuttles, and stealth bombers, on the flat terrain.

The California desert has a wide assortment of landscapes. There are mountains, valleys, alluvial fans, badlands, canyons, oases, dry washes, and sand dunes. The playas are the only flat component of the desert. Their surfaces vary one inch or less per mile. To qualify as a playa, evaporation on this flat surface must exceed precipitation.

Dry lakes may seem like extremely stable landforms, but they are dynamic. They can be under a few inches of water one week and be dry with a new surface coating a few weeks later. Over longer periods of time, say a few thousand years, the variations are more extreme. Some lake beds that are dry now were once seven hundred feet under water.

Playas were formed when the runoff from surrounding mountains accumulated in large depressions. When the water evaporated, mineral deposits left a white frosting on the surface. Dry lakes are seemingly devoid of life. When it rains, however, brine shrimp, flies, mosquitoes, toads, and tiger salamanders emerge from the ancient lake beds. Where the saline, sulfate, and carbonate minerals are greater, pickleweed pre-

dominates. Where these minerals are less, mesquite grows in isolated patches.

The glittering surfaces, which can be seen from satellites, are expanding as the climate grows drier. This raises interesting questions: What if they should expand greatly, and what if another form of intelligent life should catch sight of them from space? Such observers could be fooled. Sheet wash stains, giant contraction polygons, evaporate-pressure polygons, contraction stripes, parallel vegetation stripes, phreatophyte mounds, and giant fissures might indicate that these places of near lifelessness were created for a purpose by intelligent beings, like the "canals" on Mars. They could also be mistaken for the ruins of an ancient civilization.

To confuse such observers even further, each playa has a distinctive surface, and there are long, arcing lines across the surfaces that end in an object, such as a rock, stick, or burro dropping. There is an unconfirmed explanation for such phenomena. Two researchers, one from Caltech and the other from the University of California at Los Angeles, wrote:

> No authenticated record has been discovered of anyone seeing a stone actually make a track by natural means on Racetrack or any other *playa*. Some immutable law of nature probably prescribes that movements occur in the darkness of stormy, moonless nights, so that even a resident observer would see newly made tracks only in the dawn of a new day.

The guess is that when rain causes a fine layer of slippery clay to form, and a strong wind comes along, the rocks and other objects glide over the surface of the playa, much like a sailboat before the wind. They leave tracks in their wake for as long as two miles. But there are some puzzling circumstances, such as what caused two rocks on opposite sides of one dry lake to move toward each other?

Six of these playas were once large lakes connected by the Owens River, which extended from Mono Lake to Death Valley. The fossilized course of that ancient riverbed can be traced today, and along it is found a revealing slice of the natural and human history of the desert.

The birth and continuing growth of the desert are geologic processes that are rife with violence. The California desert and the Sierra Nevada

formed in tandem. As the young, dynamic mountain range rose, the deserts to the east dropped. Sometimes the movement was sudden. The earth shook, adobe buildings collapsed, and twenty-seven people were killed in Lone Pine in 1872 when an earthquake—perhaps the strongest in California's recorded history—rippled across the sparsely settled eastern slope of the Sierra Nevada.

The newspaper that served the area, the *Inyo Independent,* dropped the usual ads that crowded the front page and ran the following headline decks in descending order: HORRORS!!/APPALLING TIMES!/EARTHQUAKES/AWFUL LOSS OF LIFE/25 PERSONS KILLED/EARTH OPENS/HOUSES PROSTRATED/LONE PINE! ITS TERRIBLE CONDITION/MOST HEART RENDING SCENES!/MIRACULOUS ESCAPES!/INDIVIDUAL HEROISM!/A DEMORALIZED PRINTING OFFICE. The story began:

> Between 2 and 3 o'clock Tuesday morning last, the inhabitants of this region experienced one of the most terror striking awe inspiring sensations that ever falls to the lot of mortal man—an earthquake—an earthquake in all its mighty power! The solid earth was loosened from its very foundations, and heaved and tossed as if in the throes of a terrible agony. It was a terrible scene when all were so rudely awakened from deep slumber to face death in its most terrifying form. Strong wooden houses bounded up and down and rolled to and fro like ships in a heavy sea way. Crockery smashed and furniture danced about the floors, chimneys dropped instantly to the ground, stone and adobe houses crumbled and went to earth like piles of sand, burying the miserable occupants in the ruins, and the whole world was in its last convulsions!

A young John Muir in Yosemite Valley on the opposite side of the Sierra Nevada thought when the earthquake struck that his beloved mountains were falling down. He wrote, "The shocks were so violent and varied, and succeeded one another so closely, that I had to balance myself carefully in walking as if on the deck of a ship among waves, and it seemed impossible that the high cliffs of the Valley could escape being altered."

The earth rumbled and heaved. Birds fled in panic. "A cloud of dust particles, lighted by the moon, floated out across the whole breadth of

the Valley, forming a ceiling that lasted until after sunrise, and the air was filled with the odor of crushed Douglas spruces from a grove that had been mowed down and mashed like weeds."

The day following the earthquake a mass grave was dug and fifteen coffins containing sixteen bodies of "the foreign born," meaning mostly those of Mexican extraction, were buried outside the ruined town of Lone Pine. The Anglos were buried individually in the regular cemetery. Dust obscured the Sierra Nevada for two days following the quake. The town quickly rebuilt.

The mountains rose twenty-three feet within a few moments during the 1872 Lone Pine earthquake. Such violent earth movements are not unusual in California. The San Gabriel Mountains north of Los Angeles were tossed upward six feet during the moderate San Fernando earthquake in 1971, and the earth slipped horizontally twenty feet during the 1906 San Francisco earthquake. Like the seismographs spread throughout the state, the human psyche also registered such jolts.

The California desert is both distant past and near future; it enfolds the California experience. How long humans have been inhabiting the North American continent, and the California desert in particular, is a subject fraught with much emotion, contention, and bitterness. In other words, there is an intense academic debate on the subject. Careers, reputations, and money are at stake.

There are those, including the late Louis S. B. Leaky of African archaeological fame, who believe that human occupation of the California desert extends far back into the past—as far back as 200,000 years or more—and that the oldest remnants of a human presence in the Western Hemisphere can be found at the Calico Early Man Site in the Mojave Desert. Here campsites and workshops were scattered around the shores of an ancient lake, and thousands of stone tools and flakes were found during nineteen years of digging. Calico is the most completely excavated Early Man site in North America. According to reliable scientists, there is evidence of a pre–*Homo sapiens* population.

Nonsense, say the critics. The rocks these scientists have found and dated are not artifacts but just rocks—chipped and flaked by such natural processes as rolling down steep alluvial fans or streambeds. More likely, ancient humans appeared during a window of time when there was

still a land bridge over the Bering Strait, and the ice from the late Pleistocene Epoch was retreating—perhaps some 12,500 years ago. There is a middle ground between the archconservatives and the radicals that falls between 20,000 and 50,000 years ago, when land bridges may have come and gone. Best to extend the time line back slowly, say these moderates.

As the last ice age waned, humans certainly were present in California; they began, at first tentatively and then with boldness and artistry, to leave their marks on the fragile desert pavement from Mono Lake to Baja California. With remarkable prescience, they did not aim their markings at themselves, or at others like them, but rather directly at the vast sky and all that it might hold. No vaulted ceilings came between them and their gods and spirits.

Modern man discovered the symbols from the sky. In the summer of 1932, an ex–U.S. Army pilot flying from Las Vegas to Blythe, just across the Colorado River from Arizona, happened to look down and saw an enormous human figure with sticklike limbs and a representation of an animal etched on the desert below. As George Palmer circled a few miles north of the desert town, more human figures (some exceeding one hundred feet in length) along with abstract shapes of animals and squiggles and circles became visible. The pilot landed at Blythe and returned with his box camera. He took the photographs to the Los Angeles County Museum, and the museum staff was amazed at the discovery of the intaglios.

But, of course, it was no discovery, just a rediscovery. The ancient Indians, and those who immediately followed them, knew of the figures; although contemporary Indians living in the region did not. In 1851, Anglo explorers had come across these scrapings in the desert and reported them. Army Captain Lorenzo Sitgreaves, exploring along the Colorado River, wrote in his report:

> Nov. 7, Camp No. 33—A well worn trail leads down the river, by the side of which in several places were found traced on the ground Indian hieroglyphics, which Mr. Leroux and a Mexican of the party, who had passed many years among the Comanches, interpreted into warnings to us to turn back, and threats against our penetrating farther into the country.

The Comanches knew nothing of these markings; and Antoine Leroux, the guide, had never passed this way before. They interpreted the signs to

suit their purposes, which is not unusual. The expedition was stalked by fear. Leroux had been wounded a few days earlier in one of the many Indian ambushes they encountered. Now the expedition was in the territory of the fierce Mojave Indians, who were taking their toll. The expedition's doctor had just been wounded, and a trooper had been killed. Their food was low. The landscape was bearing down on them. "The most perfect picture of desolation I have ever beheld, as if some sirocco had passed over the land withering and scorching everything to crispness," said Sitgreaves. They fled to the protection of Fort Yuma.

As on the plains of Nazca in Peru, where there are similar figures, modern minds have not been able to comprehend with any degree of certainty how these etchings were created, what they represented, or for whom they were intended. Geometry, hallucinogens, and shaman-induced out-of-body experiences have been suggested as aids in the process of creation. As to what they represent, the quadruped figure near Blythe has been variously described as a horse or a jaguar. Horses, which had become extinct before the Spanish reintroduced them, and jaguars inhabited these lands long before the coming of the Europeans. A serpentlike figure is readily identified as a snake, a common symbol in creation myths.

To some the figures and lines are abstract: messages for the deities, ceremonial pathways, homages to fertility or water. To others they are realistic: landing strips for UFOs, signs for extraterrestrial people, racetracks that may have been used for some ancient sport. The figures, lines, circles, and mazes remain silent, as silent as the artifacts of our civilization will be thousands of years from now.

Space science, the development and testing of weapons, and other military activities are the dominant presences in the contemporary desert. There are nine military bases and testing grounds totaling 3.1 million acres, with huge blocks of reserved airspace. Scientists are preparing for the future—probing the outer reaches of the universe and devising ingenious and horrible means of death for wars yet to come—in close proximity to the markings of the ancients on the rocks and floor of the desert.

Tucked into fifty-two square miles of the 1,000-square-mile Fort Irwin Military Reservation in the Mojave Desert, the Goldstone Deep Space Communications Complex lies adjacent to a dry lake. The gleam-

ing white parabolic antennas that reach out billions of miles into deep space sit amid common creosote bushes, the oldest known living organisms. Some of these desert plants date back ten thousand years to the end of the last ice age.

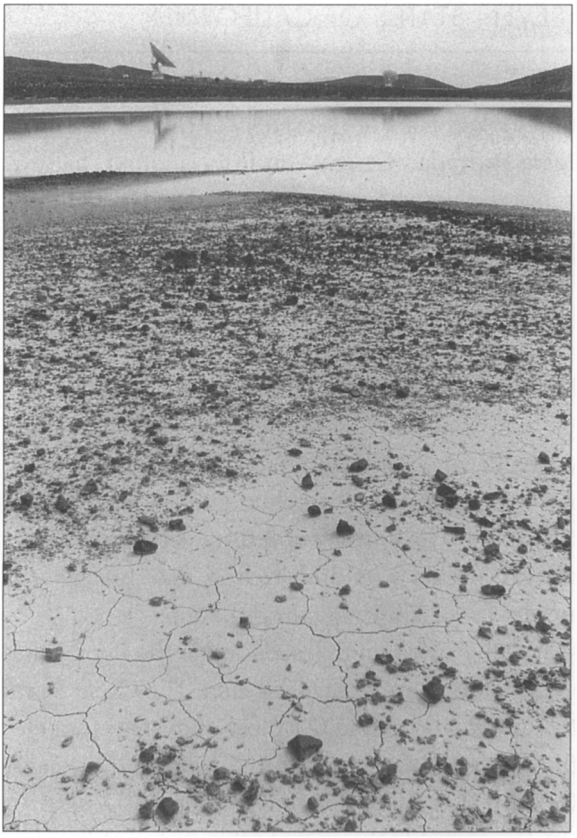
At dusk the softly glowing lights on the space center's gigantic dishes, whose interior parts resemble the probes of insects, add a touch of science fiction to the prehistoric landscape. Not surprisingly, many books and films of this genre, not the least of which were *Dune* and *The Martian Chronicles,* used the stark reality of the Mojave Desert to suggest future worlds.

The white parabolas located around Goldstone Dry Lake are oriented upward, as are the intaglios. They serve a variety of purposes. They are in contact with unmanned spacecraft and satellites transmitting weather data and other observations as they orbit Earth or pass by Mercury, Venus, Mars, Jupiter, Saturn, Uranus, and Neptune. The strength of the detectable signals shrinks to a billionth of a trillionth of a watt as the spacecraft hurtle through the heliosphere and enter interstellar space. The signals will cease entirely when their power supplies fail, and the spacecraft will coast to an end somewhere out among the stars.

Goldstone is also the listening post and transmitting station for the National Aeronautics and Space Administration's search for intelligent life elsewhere. "Are we alone?" is the question. Imagine when the answer comes back, as it eventually must. What better place to receive such news than the desert, which may be the mirror image of that distant planet whose inhabitants will send the message. Many of the photographs of the surfaces of planets transmitted back to Earth by these interplanetary spacecraft closely resemble the floor of the California desert.

The Goldstone site was selected in 1958 for its silence, since any nearby electrical signals would have to be quieter than the weakest signal from space. The bowl-shaped terrain formed by the desert mountains and the sunken playa acts as a shield against interference. There are five antennas. The largest is Mars, whose six-million-pound bulk rotates on a pressurized film of oil the thickness of a single sheet of paper. In order to avoid losses in signal power, the parabolic antenna rotates to point within 0.006 degree of a moving spacecraft.

At nearby China Lake, a scientific community is diligently working on another scenario—the extinction of our species. Deep within the labyrinthine corridors of a laboratory, around an oak conference table that



The antennas and the lake

sits upon a brown carpet in a windowless vault with thick walls and sealed ducts, men and women discuss the design of the next generation of weapons. They are aided by a supercomputer that can make two hundred million computations in the time it takes to tell a second-grader that two plus two equal four.

Thirty years after I made my first crossing of California I drove back into the desert from the opposite direction to begin a counterclockwise tour of the state. I threaded my way down the steep eastern slope of the Sierra Nevada on the narrow road from Monitor Pass. The feeling was one of being suspended over a restless ocean. Coming at me from the east, from the direction of Nevada, were waves upon waves of brown mountain ranges whose frothy white crests, which were about to break against California, bore the remnants of winter snow.

I stopped, got out, and looked back at the stacks of thick clouds that towered above the Sierra Nevada. Caught in fluid motion halfway between the mountains and the desert was a skateboarder. His lightness of being was heightened by the backdrop of dark clouds. With consummate grace and skill he slalomed down the long, black asphalt road. His long blond hair was a small flag of defiance set against gravity and the approaching storm.

Briefly, I wondered if he was an apparition, and then I knew he was another California image that would be indelibly etched on my memory. He typified the fluidity, health, and youthfulness of surfers, skiers, and, more recently, snowboarders whom I had watched and, in some cases, sought to emulate over the years. The journey of rediscovery that I would undertake over the next three years would be rich in new images and older ones recalled from previous California peregrinations.

I got back in my Volkswagen camper and descended to the floor of the desert. Technically, there are three deserts in California. The Great Basin Desert stretches from the Oregon border to the three-thousand-foot elevation mark in the south. The middle desert is the Mojave, and the most southern desert is the Colorado, a subdivision of the Sonoran Desert.

The three deserts, together roughly the size of Ohio, account for one-fourth the total land area of California (one hundred million acres) and are its single largest province. Two percent of the state's population lives in the deserts. They include the rich of Palm Springs, the migrant laborers of the Imperial Valley, scattered desert rats, a few ranchers, a growing number of retirees, military personnel, civilian scientists, and the people to serve all of the above, plus the tourists. Nine out of ten inhabitants were not born in the desert. Most migrated there because of job transfers, military assignments, or for health reasons. Besides the military bases and testing grounds, there are over one hundred communities of varying small sizes.

The deserts are crisscrossed by the arteries that connect California to the rest of the nation and give it life. There are railroads and interstate highways. More than three thousand miles of high-voltage lines carry one-quarter of Southern California's electricity, and twelve thousand miles of oil and natural gas pipelines transport fuel and energy into the state whose economy regularly ranks among the top ten wealthiest nations in the world. No rivers traverse the desert, but water for the nation's number-one agricultural producer (and consumer of water) and for domestic consumption snakes across the desert via irrigation canals and aqueducts.

Nearly six million acres of the deserts have been identified as having wilderness values. There are 2,000 species of plants. As far as anyone knows—and the counts will never be precise—there are 42 species of fish, 64 species of reptiles, 94 species of mammals, and 419 species of birds. A few of these plants and animals have been declared rare, threatened, or endangered by the federal or state government, and sometimes by both.

By the end of the century, perhaps seventy thousand acres in the desert will have been disturbed by mining activities. Grazing is on the decline while off-road vehicle use keeps increasing. Four-wheel-drive vehicles and air-conditioning opened up the desert to visitors and inhabitants after World War II, and solitude and silence are about as rare now as some of those endangered plants and animals. Visibility is poor. A light gray pall from the Los Angeles Basin slithers through the mountain passes and spreads across the desert on most days.

It wasn't always like that. John C. Van Dyke, an art historian who wandered across the Mojave and Sonoran deserts on foot and horse nearly one hundred years ago, thought of the desert in terms of fired colors. The mountains were "roasted to a dark wine-red and the foot-hills burnt to a terra-cotta orange."

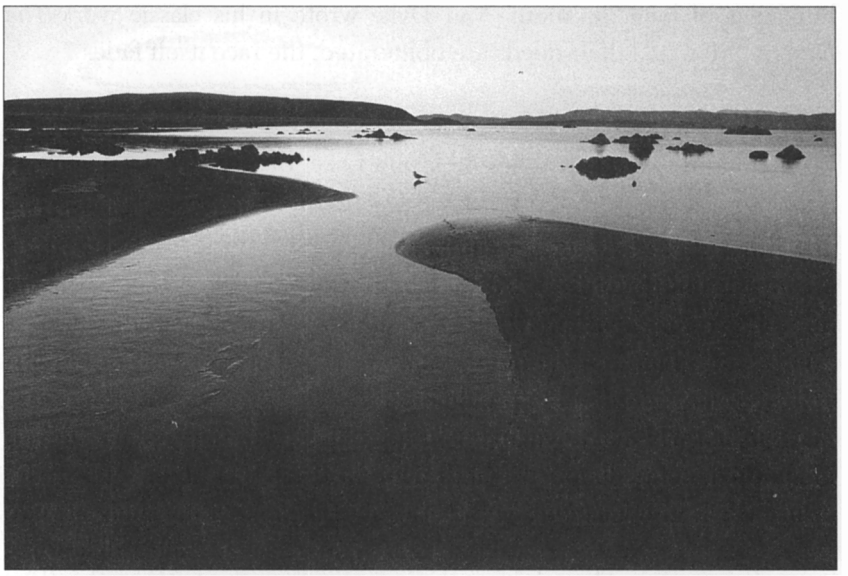
He felt the transience of the human presence in the desert. "Nothing human is of long duration," Van Dyke wrote in his classic work *The Desert*. "Men and their deeds are obliterated, the race itself fades."

I drove south and camped beside Mono Lake, the first stop on my journey down the ancient course of the Owens River that ended in Death Valley, the ultimate sink. Change has distinguished the geologic history of Mono Lake. The lake may have spilled once or several times between 22,000 and 13,000 years ago into Adobe Valley and thence into the Owens River. Each time the river formed, it was for a sufficiently long enough period of time for many generations of human inhabitants to believe they had a permanent source of water at their disposal.

Volcanoes erupted around and within the lake. Nineteen separate layers of volcanic ash have been uncovered in the basin. One consolidated ash layer, known as the Bishop Tuff, lies between 1,300 and 1,600 feet below the surface. The ash from that eruption, far greater than the 1980 eruption of Mount St. Helens, fell over most of western North America

some 700,000 years ago. A "rain of fire" fell on the immediate region. The temperature of the incandescent rock was well over 1,200 degrees Fahrenheit. Life was eradicated. Some 220 years ago hot magma from the bowels of the earth burst forth in the midst of the lake, and Paoha Island was formed almost instantaneously in a massive, boiling cloud of steam and ash.

To this day the region is exceptionally unstable, even by California standards. A U.S. Geological Survey scientist, writing in 1976, noted, "The young age and frequency of eruptions along the Inyo-Mono volcanic chain indicate an active volcanic zone; eruptions of similar kind and magnitude could occur in the future." A bulge in the earth south of Mono Lake was detected and swarms of earthquakes, including six moderate jolts within forty-eight hours, rippled across Mono County during the last decade. Officials readied evacuation plans for the towns. The introduction to the Long Valley Caldera–Mono Crater Contingency Plan, drawn up by the Forest Service, reads, "The increased earthquake activities in the Long Valley Caldera, starting in May 1980, gave significant evidence of a strong possibility that a volcanic eruption could occur. Continued episodes since May 1980, have strengthened the possibility of an eruption."



Mono Lake

Scientists have been attracted to the strange landscape over the years. William H. Brewer, who was Josiah Dwight Whitney's chief assistant in the California State Geological Survey, spent a few days at Mono Lake in July of 1863. It was the weirdest lake he had ever seen. From its surface rose steam and vapors. The water had a nauseating taste, but a silk handkerchief washed in its alkaline waters emerged "with a luster like new." Brewer sampled the brine flies offered by the Indians and commented, "It does not taste bad, and if one were ignorant of its origins, it would make fine soup." He noted the mushroom-shaped tufa formations and then departed to continue his remarkable four-year journey around the state.

Brewer was a full-bearded Victorian gentleman who was an enthusiastic traveler, a careful observer, and a talented writer. Educated at Yale University, he continued his studies in the agricultural sciences, such as chemistry and botany, in Europe. There Brewer undertook a six-hundred-mile walking tour of Switzerland. Returning to this country, he took a teaching position at a Pennsylvania college. His wife and infant son died, and shortly thereafter he was offered the California job. He accepted to escape his despondency, obtain valuable field experience, and advance his career. Historian Francis P. Farquhar termed his journal, which is still in print, "an unabridged, undecorated record of the times." Brewer spent the last forty years of his life at the Sheffield Scientific School at Yale University.

Eighteen years after Brewer departed from Mono Lake, another scientist entered the region. When Israel C. Russell, a geologist with the U.S. Geological Survey, rode into the Mono Lake Basin in 1881, he noted the "stern and wild" and the "silent and lifeless" landscape that had been formed by earthquakes, glaciers, volcanoes, wind, and water. He remarked that "the earth's crust over this entire region is far from being in a state of stable equilibrium."

Of the abrupt conjunction of desert and mountain landscapes, Russell wrote in his subsequent report, "One has the desolation and solitude of the Sahara, the other the rugged grandeur of the Pyrenees." Of the latter, Russell said:

> No prosaic description, however, can portray the grandeur of fifty miles of rugged mountains, rising above a placid lake in which each sharply-cut peak, each shadowy precipice, and each purple gorge is reflected. Nor is it possible to bring to

> these pages the wonderful transparency of the dry atmosphere of California or the gorgeous coloring of the background against which the mountains repose at sunset.

Russell rode on a mule into Mono Basin at a time of transition. When he camped at Warm Spring on the eastern shore of the lake, the only evidence of previous occupation was a trail leading to a spring. When he returned early the next year, there was a railroad crossing the valley and a station where he had previously camped. There were also a few white settlers around the southern and western edges of the lake. Russell noted that livestock had depleted most of the natural pastureland.

Indians still camped around the lake during autumn months. The women gathered fly larvae and separated the soft kernels from the hard cases. "Such scenes are not only novel, but add a bit of life and color to a landscape apt to impress one as somewhat dreary and somber," Russell wrote.

He named the two islands in the lake: *Paoha* was the Paiute name for "hot spring" and also for the ethereal spirits with long, coiling hair who were sometimes sighted in the wisps of vapor that escaped from the fumaroles and vents. *Negit* was understood by Russell to be the Indian word for the blue-winged goose. There were steam vents, noxious vapors, and strange upwellings of water. The surface of the lake was "literally darkened" in the fall and early winter with ducks, geese, swans, gulls, grebes, and other migrating birds. They fed on the brine shrimp and larvae.

Taken altogether, Mono Lake was an unusual place, and Russell attempted to make scientific sense out of it. He noted the terraces 672 feet above the lake level, and deduced that they indicated the highest level of an ancient lake, whose surface he set at 7,060 feet above sea level. Others would later place the maximum height of the lake at 7,200 feet. At that point the ancient lake was seven times deeper and had five times the surface area of the contemporary lake.

When Russell first visited Mono Lake in 1881, a time roughly coinciding with the end of the Little Ice Age, the level of the lake had fallen 820 feet from its greatest height and was 6,380 feet above sea level. A century later the level had fallen eight feet from Russell's time and 56 feet from its historic high of 6,428 feet in 1919. A drier climate and the diversion since 1941 of water south to Los Angeles accounted for the

decrease. Russell spent portions of three years at the lake compiling material for his report. For his efforts the ancient lake, as distinguished from the contemporary one, was named Lake Russell.

While Russell was poking around the shoreline of Mono Lake, another scene was unfolding just outside the basin at the booming mining camps of Bodie and Aurora. To the north of the lake was frontier America par excellence, and, in the case of Bodie, now a state historic park, its fossilized remains are still visible near the Nevada state line.

The desert preserves its past, and the past has been mythologized on the printed page and in television and movies. But, as is often the case, the myths do not fit the realities. For example, take frontier violence, usually depicted as being generalized and random. It was more specialized, aimed more at specific targets than the random type of terrorism exercised today. The young, the old, women (with the exception of prostitutes), children, the weak, and the unwilling were generally not harmed. Gunfighters were poor shots. Swaggering under the influence of alcohol caused more fights than malevolence.

Historian Roger D. McGrath studied frontier and present-day violence. Based on a close reading of the histories of Bodie and Aurora, McGrath concluded:

> The violence and lawlessness that visited the trans-Sierra frontier most frequently and affected it most deeply, then, took special forms: warfare between Indians and whites, stagecoach robbery, vigilantism, and gunfights. These activities bear little or no relation to the violence and lawlessness that pervade American society today. Serious juvenile offenses, crimes against the elderly and weak, rape, robbery, burglary, and theft were either nonexistent or of little significance on the trans-Sierra frontier. If the trans-Sierran frontier was at all representative of frontiers in general, then there seems to be little justification for blaming contemporary violence and lawlessness on a frontier heritage.

Mark Twain lived for a short time in Aurora, and *The WPA Guide to California* noted in 1939:

> The lake has achieved a certain measure of fame in literature and legend. Mark Twain tells in *Roughing It* of a dog that attained a running speed of 250 miles an hour after taking a swim in the lake. A more modern tale is of a long-haired dog that emerged from a swim with nothing more than its bark. But the water that feeds Mono Lake will not go to waste much longer, for, soon purified, it will go into the new Mono Basin Aqueduct and help slake the thirst of metropolitan Los Angeles.

Over the years the causes of contention shifted. Environmentalists from outside the basin and some inhabitants from within took umbrage at the draining of the lake by the Los Angeles Department of Water and Power. In the late 1970s they initiated a water war, using the modern-day tools of publicity, lawsuits, and lobbying in the state legislature and Congress. One of the leaders of the war was David Gaines, who assumed Russell's mantle.

A founding member of the Mono Lake Committee, Gaines was a great admirer of Russell and attempted to follow in his footsteps. "No white man before or since has come to know this dynamic land more intimately," wrote Gaines in the introduction to the reprint of Russell's report published by Gaines in 1984. It wasn't the first time the report had been reprinted. It was first reissued by early Mono Basin residents who wanted to attract tourists. Gaines reprinted it to draw attention to the beauty and uniqueness of the region.

With a great deal of zeal and a deft hand at publicity, the Mono Lake Committee succeeded in thwarting, at least for a time, the diversion of water south to Los Angeles that was partially responsible for drying up the lake. This remote place at the apex of the California desert became nationally known. "Save Mono Lake" became the public rallying cry. Eleven scientists from the National Research Council, aided by a staff of three, pondered the issue and eventually produced a report in 1987 that said the pumping of water south had reduced the lake level by forty feet since 1941, and there was now danger to the birds.

Gaines wrote a guidebook for the lake in which he sketched its human history. The Indians were followed by white miners, ranchers, aqueduct builders, and tourists. At interludes a steamer plied the lake, health addicts sought relief in its waters, and homesteaders attempted to raise goats, rab-

bits, other livestock, and vegetables on Paoha Island. Gaines became part of that history. He died in a winter automobile accident in 1988 and was buried beside the lake.

I awakened before dawn at Black Point, a volcanic extrusion that had been launched upward through the lake some 13,500 years ago. As the sky turned from gray to rose, I climbed through the sagebrush to the five-hundred-foot summit and watched the sun rise. It was like witnessing the dawn of the world.

A sliver of orange rose slowly over a slight depression in the low ridge to the east, its undulating outline punctured by volcanic cones. The surface of the lake glowed like burnished pewter. The dark, serrated shafts of tufa pinnacles pierced the still water. The tufa formations were created by the precipitation of minerals from underwater springs. The fossilized springs resemble stalagmites (to whom they bear a close chemical relationship), concrete cauliflowers, or the fanciful droppings of wet sand.

The air was still enough to hear the gulls crying incessantly on the two islands. Late spring is the time of year when 40,000 to 50,000 California gulls nest at the lake. While on their migration to South America, as many as 100,000 Wilson's phalaropes might stop at Mono Lake to complete their molt and put on fat by eating the plentiful supplies of brine flies and shrimp. The night before, I had heard their nemesis, the yips of coyotes; this morning I saw coyote tracks in the black volcanic soil. Made uncomfortable by my continued presence, a pair of the world's most efficient predators and scavengers—the common raven—rose with a series of *kraaak*s from the summit of Black Point.

The wily raven is *the* bird of the desert. After we are gone, the raven will be here to tell our story, just as many cultures have related the story of the raven. The raven was associated with ancient deluge myths that predated the Bible. From a four-thousand-year-old Arab myth to Jewish folklore and Estonian traditions and on to the myths of the Arctic and sub-Arctic people of Siberia and Alaska, the raven was the bird dispatched from the ark to find land but instead dallied to eat carrion. For this indiscretion, the raven was punished. He was colored black or condemned to eat carrion forevermore, depending on the particular tale. It was the faithful dove that returned with the olive branch from the land.

In North America raven myths flourished among the Indians of the Pacific Northwest, where Raven assumed the role of both creator and trickster. Raven created the earth, the moon, the sun, the stars, and people. Since he was the creator, Raven could do as he pleased. Raven created mosquitoes because people had it too easy. At first Raven made humans out of rocks. When they proved to be too durable, he used dust.

When the Europeans entered the continent, Raven took on another form. Edgar Allan Poe depicted the raven as the bird of ill omen in his famous poem about the death of a beautiful woman. And the same metaphor was used in a recent book titled *The Ravens,* about the pilots who flew in the secret war in Laos. Barry Lopez returned to the trickster image in his book about the desert. He wrote, "The raven is cautious, but he is thorough. He will sense your peaceful intentions. Let him have the first word. Be careful: he will tell you he knows nothing."

The raven has a number of human traits. The black bird with iridescent plumage mimics humans, has a large vocabulary that some researchers claim to understand, sings, plays, uses tools, shows off during courtship, and mates for life. Ravens travel in pairs. They are intelligent. "It is at the top of the most species-rich and rapidly evolving line of birds," wrote Bernd Heinrich, a zoologist who studied ravens in Maine. Their strong, hooked beaks and grasping talons make them efficient predators. They have one known enemy: humans.

The raven population has paralleled the growth of the human population in the California desert. Prior to 1940, ravens were almost unknown. When the curator of the San Bernardino County Museum went looking for a raven to add to the museum's collection in the 1940s, it took him two years to locate one. Then people and their detritus began to occupy the desert in growing numbers. There was a parallel explosion in the number of ravens. Between 1968 and 1988 there was a 1,528 percent increase in the number of ravens in the Mojave Desert, 474 percent in the Colorado Desert, and 168 percent in the Great Basin Desert.

Ravens nest in abandoned shacks, cliffs, railroad trestles, transmission towers, highway billboards, freeway overpasses, caves, tamarisks, and Joshua trees. Flocks of one hundred to four hundred ravens were reported at Harper Dry Lake near Barstow, and at the garbage dumps at Edwards Air Force Base and the Marine Corps Air Ground Combat Center at Twentynine Palms. They feed on animal carcasses and scavenge at Dumpsters outside McDonald's and Taco Bell, at roadside rest

areas, campgrounds, garbage dumps, and sewage treatment plants. Ravens prey on small mammals, insects, birds, bird eggs, reptiles, fish, and the desert tortoise, an endangered species.

The tortoise depredations got them into trouble. The Bureau of Land Management drew up a plan for the "control" of the burgeoning raven population. The bureau's solution: shoot and poison the ravens. A pilot program was instituted in 1989. The poison that was placed in hard-boiled eggs was DRC-1339, known as Starlicide. It was developed by the U.S. Fish and Wildlife Service for use on "pest birds." It is also lethal to doves, crows, game birds, and owls. The bird dies in one to two days from kidney failure or central nervous system depression. In California, the marines have been particularly active in using the poison on birds, not only at their desert base but also at Camp Pendleton on the coast.

The sky grew lighter, and the surrounding countryside came into full view from the summit of Black Point. I was standing at nearly seven thousand feet above sea level, and still the mountains towered above me. A slight breeze flitted across the surface of Mono Lake. In concentric rings that rose above the lake, like the successive tiers of a giant amphitheater, were the various terraces that represented different lake levels. Each level signified an era in one of the oldest lakes on the North American continent.

To the south, extending from Negit Island to Mammoth Mountain, I made out the Mono Craters, the youngest mountain range on the continent. The eruptions that formed this range—actually a chain of domes—date back some 200,000 years to the first uplifting of Mammoth Mountain and forward to some two hundred years ago and the rise of Negit Island above the waters of the lake. Russell found the Mono Craters to be on the scale of Vesuvius and Stromboli, but they have received less attention than the Italian volcanoes because of their remoteness and the fact that they are dwarfed by the adjacent Sierra Nevada range.

This was not the first time I had been here. Years ago I had launched my kayak into the lake. As I approached Negit Island the gulls rose in a white, flapping sheet. Their cries echoed in the thin air. I remembered the red rock that I scrambled across, the stench of gull droppings, and the miniature mountain built by a movie company in the 1950s.

I had skied nearby Mammoth Mountain many times in the late 1960s and early 1970s. Mammoth, the mountain, and Mammoth Lakes, the town, were a California phenomenon—a recreational bonanza in the middle of nowhere into which more than twenty thousand people were stuffed for short periods of time. The condominiums and factory outlet stores now lie cheek by jowl within the bowl of the Long Valley Caldera. I could understand why people continued to invest in real estate at Mammoth. In California there is no such thing as a totally safe environment, but the odds always appear to favor eluding the many different forms of natural disasters.

To the west from where I stood and visible as a notch in the Sierra massif was Tioga Pass, which I had traversed on my first journey into California. Just south of the automobile route into Yosemite National Park was Mono Pass; from it, Bloody Canyon drops down the east side of the Sierra Nevada. The descent is exceedingly steep. Early travelers remarked on the stench of rotting flesh. The name of the pass may have been derived from the many horses that plunged to their death there, or the following incident.

Lt. Tredwell Moore passed eastward over this pass with a company of soldiers in 1852 in hot pursuit of some Miwok Indians from Yosemite Valley who had supposedly killed two or three prospectors. Along with the actual number of those killed, there was some dispute as to the instigators of the crime. One miner, hoping to eliminate competition, may have put the Indians up to it. In any case, Moore caught six Indians and summarily executed them near the pass. Chief Teneiya eluded him and hid with the Paiutes of Mono Lake, who eventually killed him.

The lieutenant and his soldiers were the first white men to see Mono Lake, and, like other invaders, they arrived with hate in their hearts and greed on their minds. The lieutenant returned with samples of gold-bearing ore. There was a gold rush into the region. In 1853, one year after the discovery of gold and eight years before the outbreak of the Civil War, Mono Lake appeared on a published map for the first time.

Mono Lake provides a foretaste of the dark side of California history. Actions against the Chinese followed the near extinction of the Indians. The miners of Bodie, as was their practice elsewhere, went on an anti-Chinese binge. The Chinese laborers who were building the Bodie and Benton Railroad took refuge on Paoha Island until the drunken miners had spent themselves. The Anglo residents of Bodie voted 1,144 to 2

against any further Chinese presence in 1880, and immediately thereafter the Chinese departed. Three Mexicans were shot by gringos. The killings were ruled as self-defense.

To the east over Sagehen Summit was Adobe Valley. The streams that flow into this valley are the northernmost tributaries of the Owens River. It was this route that the ancient river followed. I descended from the summit and drove farther south into the desert.

Below Mono Lake, the river was there, then it wasn't. When it wasn't there—when it was being diverted through tunnels and aqueducts—and even when it was there, it was on its way to Los Angeles, but that was the fate of most rivers in the desert Southwest. At the small town of Independence, in the heart of the Owens Valley, some water was being put back into the river, the idea being to restore it to a semblance of its previous existence. The city, however, never willingly gave water away. Wells dug in the Owens Valley replaced the water released from the aqueduct.

In 1903, Mary Austin foresaw the fate of the valley. She wrote in her first and best-known book, *The Land of Little Rain*: "It is the proper destiny of every considerable stream in the west to become an irrigating ditch." She was thinking of the valley; others were thinking of Los Angeles to the south. Three years later, after Los Angeles began acquiring water rights in the valley, Austin departed to follow her muse. She had written, "Is all this worthwhile in order that Los Angeles should be just so big?"

Austin's fourteen years in that deep desert trough between towering mountain ranges were not happy ones, but they were pivotal. She began them as a wife and mother and ended them as a published writer. Her daughter, whom she wished to be beautiful and intelligent, was born retarded, and Austin blamed "a tainted inheritance." Part of the time she was separated from her husband, a schoolteacher and minor government official. Austin, who had wanted to write since she was seven years old, strapped her screaming daughter in a chair and paced the floor as she composed her stories. The townspeople felt sorry for the child and the husband. Austin befriended Mexicans and Indians, and labored on.

An acquaintance later recalled: "To me she was one of the most colorless humans I have ever known. She was a mark for ridicule and, I believe, had few friends." This woman marveled at what Austin had accomplished.

The Owens Valley

A female physician who treated Austin's daughter and later became Austin's friend described the writer as a "rather short, somewhat dumpy looking woman with a homely, heavy lower face, a sullen mouth, fine eyes, a high forehead and abundant, beautiful gold-brown hair." The doctor at first abhorred Austin's neglect of her child. She then came to sense her sorrow, frustration, and loneliness.

Austin described herself thusly during these years:

> You are to figure to yourself a small, plain, brown woman, with too much hair, always a little sick, and always busy about the fields and mesas in a manner, so they say in the village, as if I should like to see anybody try to stop me.

The essays she wrote of the natural and human life in the valley became her first book. Austin celebrated the landscape of a place where her life was "long dull months of living interspersed between the few fruitful occasions when I actually came into contact with the Land."

It was "a land of lost rivers" that "begins with the creosote" and is inhabited by the raven, "the least objectionable of the inland scavengers." Myths suffused the place: "The palpable sense of mystery in the desert air breeds fables, chiefly of lost treasures." The people were a bit off: "There are many strange sorts of humans bred in a mining country, each

sort despising the queerness of the other." And finally, the theme that Austin emphasized, perhaps as an explanation for her behavior: "The manner of the country makes the usage of life there, and the land will not be lived in except in its own fashion."

Once she departed, Austin never returned to the place that was to give her lasting fame. Nor did she ever visit her daughter, whom she deposited in a private sanatorium. Her husband remained in the valley to fight the unsuccessful water war against Los Angeles. They were eventually divorced. She was now free to write. Austin wrote more books—none as successful as her first one. She consorted with the leading writers of her time in the literary salons of San Francisco, Carmel, Pasadena, New York City, Santa Fe, and London.

Austin's house—"the brown house under the willow-tree at the end of the village street"—still stands on Market Street in Independence. Down the street is Austin's General Store, where liquor, ice, groceries, and bait for fishing in the reconstituted Owens River can be purchased.

When the wind blew from the direction of Owens Lake to the south, Austin noted the "smell of the bitter dust that comes up from the alkali flats." Owens Lake, the second in the chain of playas, is a dry, dusty plain. Not too long before Austin's time, steamships navigated the coffee-colored waters that lay in the shallow depression between the soft tan-and-rust-colored desert mountains to the east and the gray granite of the knifelike Sierra Nevada to the west. The lake covered an area of 240 square miles following the last ice age. It had shrunk to 112 square miles by 1872, when the first steamboat was launched.

With the help of Owens Valley ranchers drawing off extensive amounts of irrigation water around the turn of the century, and the City of Los Angeles diverting the remaining water in 1913, the lake went dry in 1926. Since then, slight amounts of water have periodically appeared in the lake bed when Los Angeles dumps surplus water from its aqueduct or when the spring runoff from the Sierra Nevada is excessive.

Dust and death hover over this dry lake.

On August 3, 1878, Anna Mills, a cripple since childhood, set off for the summit of 14,495-foot Mount Whitney, the highest mountain in the contiguous states. Three local fishermen had made the first recorded climb of Mount Whitney five years earlier. (Very probably Native Amer-

icans had reached the summit sometime before 1873, but there was no record of those ascents.) The indefatigable Mills injured her back, but continued on. She later wrote:

> Climbing over those rocks was no easy task—and how my back did smart and burn! But I didn't mind such trifles when there was so much at stake; my heart was set on something higher, and nothing short of the highest point would satisfy me. I would reach that and die if need be.

The party, which included three other women, successfully navigated the steep, narrow "Devils Ladder" and emerged on the summit ridge, from where it was an easy climb in the cold, thin air to the summit. They were the first women to climb over 14,000 feet in the country, it was thought. Mills, a schoolteacher, gazed back toward Owens Lake and commented:

> This desert, or vast plain of sand, called by some an extinct or dry lake, is locked in on all sides by rock-ribbed mountains whose peaks mount upward among the clouds. One could imagine himself descending into the valley of death and having the gates closed after him.

It truly was the Valley of Death for the Indians. As the white settlers entered the valley, Indians and whites traded atrocities. There were more whites, and they were better armed. The water of Owens Lake was stained red with the blood of the Paiutes. William Brewer wrote of the atrocity that led to the 1863 massacre:

> We camped by the river and took a cooling bath. Our camp was the scene of a fearful tragedy a year ago. The Indians attacked a party of one man, a nigger, two women, and a child. The nigger was on horseback and fought well, killing several. In attempting to cross the river the team of horses was drowned. He gave his horse to the women—both of whom got on it, and they and the white man escaped to Camp Independence. The Indians caught the negro and afterward said that he was tortured for three days.

Charley Tyler, the black, was known as a very effective Indian fighter. He had been in the party that had gunned down a chief and participated in two battles against the Paiutes. After the three days of torture, the Indians bound Tyler with willow thongs and slowly roasted him to death. Tyler was memorialized by the naming of Charley's Butte, near the intake to the Los Angeles Aqueduct.

U.S. Army troops and civilian volunteers who took up the chase of the offending band of Paiutes were ambushed near Owens Lake; the casualties consisted of a clean shot through the hat of one trooper. The whites deployed and forced the Indians slowly down the alluvial fan toward the water. Their marksmanship left something to be desired. They inflicted more casualties on themselves than the Indians did.

Nevertheless, they managed to kill sixteen Indians on land. The remainder jumped into the lake and attempted to swim away. A strong east wind kept forcing them back to shore. As a full moon rose over the desert, the white men lined the shoreline and methodically picked off the Indians. Twenty Indians were killed in the water. One escaped to curse the whites. Tyler's pistol was recovered from one of the bodies.

Two years later the more bloodthirsty local militia was chasing the Indians by itself, the federal troops having departed. A militiaman wrote to an army colonel, "I think things have reached the point, that either the white people must leave this Valley or the Indians killed off, or in some other way got rid of." As the whites were not about to leave, a policy of extermination was commenced.

A white woman and her son were killed and their cabin burned to the ground by the Indians. The family had done much to aid the Indians. The two white men who had been entrusted by the husband to guard the woman and child fled. Rescuers located the cowards and ordered them to leave the country immediately, or be killed. The whites then decided to exterminate the Indians camped on the shoreline of Owens Lake. They attacked at daybreak on January 6, 1865. Three dozen men, women, and children were slaughtered. Six Indians jumped into the icy water of the lake. At least two were shot in the water. Two girls and a boy or two women and two boys, depending on the account, were spared, although fully one-third of the company favored shooting them.

That massacre pretty well broke the back of Indian resistance. Mary Austin wrote, "The Paiutes had made their last stand at the border of the

Bitter Lake; battle driven they died in its waters, and the land filled with cattle-men and adventurers for gold."

The adventurers found gold and silver in the mountains to the east. Discovered by Mexicans, who were either quickly killed or driven from the region, the Cerro Gordo mines soon boomed under the management of an Anglo mining syndicate. By 1872 there were eleven producing mines and the silver ore was being smelted in furnaces at the mountain camp and by the lakeside. The problem was how to get all that bullion south to Los Angeles.

On the sultry Fourth of July morning of 1872, just a few months after the disastrous Lone Pine earthquake had set the valley's economic hopes reeling backward, the steamer *Bessie Brady* was christened on the shoreline of Owens Lake. Twenty wagons decorated with flags and streamers, with a brass band in the lead, trundled down to Ferguson's Landing. At 10:15 A.M. the steamer arrived at the makeshift landing, and the vessel was christened with a bottle of wine by the young daughter of the owner. The poet of the day, W. H. Creighton, rose and intoned the "Ode to the *Bessie Brady,*" which read, in part:

> *A noble work before thee lies,*
> *The opening of a country rich beyond compute,*
> *Removal of the stigma "want of enterprise,"*
> *Which hither to we've born in shame and mute.*

That day the *Bessie Brady* carried one hundred and thirty excursionists on the lake. The local newspaper put the best face on the hostile environment: "The almost intolerable heat of the sun glowered unobstructed upon the deck, and the atmosphere was not made cooler by the added pulsations of heat from the boiler and furnace. But 'the ball went on.' "

The steamer plied the lake from north to south with shipments of bullion, but it was too efficient. The teamsters who hauled the silver south over the muddy roads in winter could not keep up, and, much like the Sorcerer's Apprentice, the little steamer kept arriving at the south end of the lake with more and more ingots that unemployed miners stacked for use as shelters. The smelters were forced to close down, and within a year of its baptism, the *Bessie Brady* was laid up.

Another steamer, somewhat smaller, was constructed on the shoreline in 1877 and christened the *Mollie Stevens,* after the name of the daugh-

ter of the owner. But mining was on the wane. The *Mollie Stevens* was soon dismantled and her engine put in the *Bessie Brady.* The work was nearly completed when the *Bessie Brady* caught fire and was destroyed in 1882. The railroad, which would also disappear in time, entered the north end of the valley that year and the next year there was a stop at Keeler, a lakeside hamlet at the foot of the grade from the Cerro Gordo.

In the early years of this century, Keeler was the richest industrial community in Inyo County, where there were a number of mining operations. Three plants annually processed forty-seven thousand tons of soda ash and bicarbonate, which represented one-half of all the soda products consumed in the United States. Three dwindled to one as the lake became a playa, and then there were none.

Keeler became one more vestige of the past. Its dreams of wealth evaporated and became salt-encrusted dust. The roiling clouds of deadly dust now silently eat away at the health of the seventy inhabitants of Keeler, the self-proclaimed gateway to the defunct Cerro Gordo mines. In addition to the native alkali chlorides, carbonates, and sulfates that are poisonous and carcinogenic, imported toxic wastes were dumped in the dry lake bed in the 1970s. Visibility is sometimes close to zero. Only the readings taken around forest fires exceed the number of particles generated by Owens Lake during a dust storm.

I drove slowly along the rutted streets of Keeler on a day when the dust blew away from the hamlet. A small blond girl who was riding a bike spotted my vehicle from a distance and fell to the ground. She ran like a startled rabbit into a nearby house. I passed the rotting two-story train station. There were no tracks. The concrete side wall of a store advertised Famous ABC Beer, a beer that is now unknown. The store's false front had collapsed.

A Southern Pacific freight car was someone's home. Abandoned vehicles lay about: old dune buggies, ancient Jeeps, painted school buses from the hippie era. Television satellite dishes pulled the world into the small bungalows that were tucked under vegetation grown to ward off the incessant sun. Signs reading NO TRESPASSING and KEEP OUT barred curious outsiders. The desert overflowed into most yards.

The wind blew and the dust rose in vertical columns and horizontal sheets over the dry lake bed. Satellite photos have shown the dust from

Owens Lake blanketing a 54,000-square-mile area. When precipitated out by rain over Orange County to the south, the dust has turned to acid mud that destroyed the finish of vehicles. The dust has halted military operations at nearby China Lake Naval Weapons Center and Edwards Air Force Base. One dust storm from Owens Lake, it is estimated, will produce 80,000 metric tons of suspended matter.

The scientists at China Lake examined the situation. Quoting W. C. Fields ("The game is rigged; but if we don't bet, we can't win"), they advanced a solution similar to a technique used by the Dutch to rid the soil of the Netherlands of sea salt. The cost would probably be excessive.

When the dust in which the bones of Indians are mixed blows through the weed-choked yards of Keeler or over the well-manicured lawns of Southern California, it affects people with lung ailments. The dust from the Valley of Death seeps into houses through tiny cracks. It coats furniture. People cough, sneeze, rub their eyes, or become anxious because it is difficult to breathe. And cats behave strangely, according to one scientific report.

At 3,880 feet above sea level and 328 feet above the level of the present lake bed, Owens Lake began overflowing to the south some 15,000 years ago, eroding the outlet 120 feet. The overflow into Rose Valley and on through Little Lake into China Lake ceased about 10,000 years ago.

The undulating blue waters of Haiwee Reservoir, set against the soft flanks of the Coso Range, follow a portion of that route before being siphoned off by the aqueduct. Farther on down the dry riverbed is Little Lake, a mile-long remnant of past wetness fed by springs that are immune to dry cycles and the public works of humans: they are dependent upon tectonic activity deep within the earth. Because of the vagaries of the fault system, Little Lake is an anomaly. There is more water in the present-day lake than there was five thousand years ago.

Between the reservoir and the lake is Fossil Falls, the best place to sense the ancient river. Fossil Falls is just that, a dry falls where the river once flowed over rocks, polishing them smooth where the rock was hardest or digging potholes where whirlpools found weakness in the basalt. Across smooth shelves and into these holes the river swirled, boiled, and tumbled. There was life and noise and spray where now there is silence and dry, black boulders within the canyon.

Along this moist corridor the Pinto Basin Culture flourished some four thousand years ago. Seven homesites are outlined by postholes, and numerous projectile points, scrapers, manos, and metates have been found in the area that is rich in petroglyphs. Mixed in with these indications of an older Indian culture are more recent signs of the Paiute and Shoshone. The Shoshone Indians called the two-mile-long lava cliff to the east of the lake the Rattlesnake, because of its undulating form and the basaltic rocks that resembled scales.

Who really understands the rattlesnake? Not many people do. Laurence M. Klauber studied them for nearly fifty years and published a two-volume book on the subject. His basement was full of rattlesnakes. Over a twelve-year period he milked 5,171 rattlesnakes as part of a venom project for the San Diego Zoo. Klauber became the international authority on rattlesnakes. The prime message in his monumental work was that the rattlesnake had been the victim of bad press.

The problem, as Klauber saw it, was that the serpent, and the rattlesnake in particular, was the symbol of evil. That biblical concept was imported to America when Captain John Smith warned New England colonists of "the danger of the rattell snake" in 1631. As the population moved west, rattlesnakes were discovered in California (an Eden, some claimed). One species of rattlesnake, the Mojave Desert Sidewinder, was identified and named in 1854.

The sidewinder has a distinctive crawl and leaves tracks that can be mistaken for no other snake's. I have seen those tracks near China Lake. They were parallel slanted lines—one-half of a chevron—laid down when the sidewinder pushed against the sand, threw out its head, pushed against the sand, lay down its head, and so on. The side-flowing or looping motion, using vertical force to anchor itself before the thrust, is a more efficient method of locomotion through sand than the sinuous track of other snakes who use transverse force to push off from more solid footing. Down through the millennia, the sidewinder has adapted to the drier climate.

The other distinguishing characteristic of the sidewinder is the two horns over its eyes, giving it a devilish cast. The horns, or what appear to be horns, fold down over the eyes and protect them from abrasion when the snake buries itself in cool sand, its preferred habitat during the heat of the day.

The sidewinder is a creature of the night. As the desert cools, it bestirs itself and sets off at a gait of some 0.3 miles per hour, searching for lizards and small mammals. In short bursts it can move ten times as fast. It prefers lying in ambush near a burrow. As a pit viper, the sidewinder identifies its prey by an infrared device that functions through two pits, one on each side of its head. Klauber wrote, "Finally, there is the pit, a high-temperature differential-receptor that gives the rattlesnake a knowledge of the direction and distance of objects whose temperature is higher than the rest of the surroundings, a valuable organ to a creature living largely on warm-blooded prey."

While Klauber saw the thermal detectors as offensive devices, more recent research suggests they are also used for defensive purposes. In this scenario, the information is used to determine if the sidewinder should rattle to warn off an enemy or slink away if, for instance, a raven gets too aggressive. The remaining option is to kill. The sidewinder strikes without coiling, and its strike is so fast (averaging 8.12 feet per second) that the eye cannot see it. The strike is actually more of a snap, and the snake's body is yanked off the ground by the force of the movement. It can strike repeatedly.

Because of its nocturnal habits and crooked motion, the sidewinder has acquired a reputation for deadliness far beyond fact. Klauber said it was "an average rattler in disposition, neither especially pugnacious nor tranquil." Within the spectrum of rattlesnakes, the sidewinder is not particularly deadly to humans. Its venom yield is low and not too toxic.

However, an aura of fear hovers about all rattlesnakes. There is this account of a hunting trip into the Sacramento Valley in 1855:

> The dread of rattlesnakes destroyed in great measure the pleasures of our sport, for we lost many a good shot from looking on the ground—which men are apt to do occasionally when once satisfied of the existence of a venomous reptile, the bite of which is by all accounts fatal.

Fear begets extermination. Whole communities organized "rattlesnake bees," a social event for which people armed themselves with clubs, rakes, pistols, shotguns, and rifles and struck out in every direction. The next year, or the year after, they wondered why the populations of rabbits, ground squirrels, and gophers had multiplied and were destroying crops.