

to have found out that restaurant, and he was astonished to hear that Ray was staying in the hotel; he said that was very *chic*. He introduced him to the company generally, as his young friend Mr. Ray, of Midland, who had come on to cast in his literary lot with them in New York; and then he presented him personally to the nearest on either hand. They were young fellows, but their names were known to Ray with the planetary distinctness that the names of young authors have for literary aspirants, though they are all so nebulous to older eyes.

Mr. Kane asked Ray to sit down and take his coffee with them; Ray said he had taken his coffee; they all urged that this was no reason why he should not take some more; he stood out against them, like a fool—as he later called himself with gnashing teeth. He pretended he had an engagement, and he left the pleasant

company he was hungering so to join, and went out and walked the streets, trying to stay himself with the hope that he had made a better impression than if he had remained and enjoyed himself. He was so lonesome when he came back, and caught the sound of their jolly voices on his way up stairs, that he could hardly keep from going in upon them, and asking if they would let him sit with them. In his room he could not work; he wanted to shed tears in his social isolation. He determined to go back to Midland, at any cost to his feelings or fortunes, or even to the little village where his family lived, and where he had been so restless and unhappy till he could get away from it. Now, any place seemed better than this waste of unknown hundreds of thousands of human beings, where he had not a friend, or even an enemy.

[TO BE CONTINUED.]

THE ANCIENT LAKE REGION OF AMERICA.

BY JAMES RICHARDSON.

FOR seven hundred miles the narrow thoroughfare of civilization traverses the desolate plains of Utah and Nevada, and winds among sterile mountain ranges which seem to have been waiting since the dawn of creation for refreshing showers that have never come. Yet it is comparatively but a little while since that thirsty region, covering an area equal to that of our Eastern and Middle States combined, was flooded with sweet water and lush with vegetation; while all around it, in place of the present barren mountains and alkali plains, lay fair expanses of fresh-water seas or fertile savannas, thronged, it may be, with a population denser and more varied than that of any part of the world of to-day.

The story of the transformation is not hard to read. The depth of water in the saline lakes and marshes of the Great Basin is far from constant. Latterly it has been slowly increasing; but the frequent occurrence of salt-pans, or areas thickly covered with salt deposited from evaporated water, is enough to prove that the general level of the waters must have been considerably higher at a period not far distant. Both Fremont, the first to explore the basin, and Stansbury, who followed him, make frequent mention of

such salt-encrusted areas, the latter describing one field in the valley of Great Salt Lake seven miles across and more than ten miles long, the deposit lying so thick that his mule train crossed it as upon a sheet of solid ice. At the northern end of the valley Captain Stansbury counted thirteen successive terraces, each marking a former level of the water, the highest fully two hundred feet above the present surface of the lake. Corresponding terraces around all the minor depressions of the Great Basin show that the ancient lake must have spread over the entire area, converting its mountain ranges into chains of islands; while high above these diminutive banks of later times are benches of uniform elevation, three, six, eight hundred feet above the plain, the shore lines of a majestic inland sea, which at its higher levels must have filled the uplifted cup of the continent almost to the brim. It was a period when water was as abundant in the high lands of the far West as it is now deficient.

To the north of the present deserts of Utah, filling the oval basin traversed but scarcely watered by the deep-flowing Snake River and its tributaries, a broad expanse of fresh water then stretched across Idaho and southeastern Oregon,

filling all the valley between the Rocky and the Blue mountains—a distance of four hundred miles.

Westward, between the Blue Mountains and the Cascade Range, lay several smaller sheets of sweet water, each a giant lake according to modern standards, covering the greater part of central Oregon and Washington.

The trough between the Cascade Range and the newly risen Coast Range was similarly flooded.

Southward, filling the great valley of California, now drained by the Sacramento and the San Joaquin, lay another lake, five hundred miles long by fifty wide, its outlet flowing over the yet unopened Golden Gate.

Eastward, across the Sierras from its southern end, lay the broad lake whose deserted shores, "outliving the memory of a cooler past—a period when the stony mountain chains were green islands among basins of wide watery expanse"—are so graphically sketched by Clarence King from the summit of Mount Tyndall.

South of the arid basin of Owen's Lake, the Gulf of California at that time thrust a broad arm northward several hundred miles beyond its present limit, receiving at its side the independent floods of the Gila and the Colorado as they plunged over their terminal slopes from the elevated plains above.

Watering the surface of its lofty plateau, instead of burrowing a mile beneath it as at present, the Colorado enriched and vivified an immense territory—the garden spot of primeval America, the Egypt of American civilization.

Between the Wasatch border of the great interior sea and the broad belt of the Rocky Mountain ranges, filling the valleys now drained by the Green River and its tributaries, two or more vast sheets of fresh water were slowly depositing those layers of sediment which the geologist of to-day finds so richly stored with the remains of the life forms of that ancient period; while the unbroken walls of the many-looped Rocky Mountains—that "nation of mountain ranges," as Fitz Hugh Ludlow styled them—enclosed hundreds of oval lakes, whose level beds, since emptied through the deeply eroded cañons of their outflowing streams, now form the sheltered parks so attractive to the pioneer herdsman.

Thus the great interior sea was the centre of a lake region for which the earth of to-day can show no counterpart. Its fauna and flora were on a scale of corresponding magnitude and variety.

The best-studied record of the period is that deposited by the waters of a broad fresh-water sea which lay on the eastern flank of the Rocky Mountains, covering an area four or five times that of our boasted Lake Superior. In the successive layers of its marly sediments we may read the history of its rise and decline, as the Assyrian scholar reads the chronicles of ancient empires in the layers of imprinted tiles dug from the long-buried libraries of Babylon or Nineveh.

The record begins in the Middle Tertiary or Miocene period, with a broad marsh, the wallowing-place of gigantic beasts, hog-like in character, elephantine in size. Every year's exploration adds to our list of these strange creatures, still a sufficient number have been made out to enable us to form a tolerable notion of the population of the time.

As the water deepened, multitudes of turtles took possession of the lake, leaving thousands of their shells, from an inch to three feet across, to attest their presence. As time passed on, and the tributary streams increased in number and magnitude, the lake deposits enclosed more numerous representatives of the fauna of that ancient world. The surrounding country appears to have swarmed with animals which have passed away, the most of them leaving no known descendants. Especially numerous were many varieties of deer-like ruminating hogs, which roamed the plains in vast troops, and were frequently driven by their enemies into the watercourses, to be drowned and drifted into the lake.

The marks of carnivorous teeth on the skulls of these antique swine show that the tigers of that early age had as keen an appetite for pork as their descendants of to-day.

During the next or Pliocene period a distinct yet closely allied fauna occupied the shores of our great lake. Semi-aquatic pachyderms, vast in size and countless in number, wallowed in the marshes—one as large as the African hippopotamus. Sharing the same mud beds were five species of rhinoceroses, the largest rivaling the existing unicorn of India.

In most respects the country at this

time resembled the marshy regions of central Africa, as described by Livingstone and other explorers; but it lacked one creature common enough in Africa, for whose sustenance and comfort it would seem to have been admirably adapted—there were no crocodiles. They had swarmed in the earlier Tertiary lakes farther west, but had disappeared. "Where were they," asks Dr. Leidy, "when the shores of the ancient Dakotan and Nebraskan waters teemed with such an abundant provision of savory ruminating hogs?"

To this question no satisfactory answer has been given.

But hogs were not the only occupants of those shores. Great herds of mammoths and elephants, specifically distinct from any elsewhere known, trampled the banks of the watercourses and browsed on the trees which bordered them; while troops of deer, horses, camels, and other herbivorous animals cropped the fresh pasturage of the adjacent plains.

Singularly, though both the horse and the camel were unknown in North America on the first arrival of the European explorers, the continent was no stranger to them. In prehistoric times the continent seems to have been the especial home of horses, something like thirty fossil species having been already discovered.

In that remote age the continents were not divided, as now, nor was the arctic circle an icy barrier to human migration. A bridge of dry land joined America with Europe and Asia, and gave free passage to the plants and animals of the three continents, which had not yet begun to show the marked divergence they have since developed. Alaska and Greenland enjoyed a climate as mild as ours, and were clad with forests whose lineal descendants now flourish in China, in California, and on both shores of the Atlantic. Fan-palms with leaves fifteen feet broad grew as far north as the Yellowstone River, and a tropical or sub-tropical climate prevailed in the region of the great lakes now passed away.

This state of things continued, with little variation, through the Pliocene period, and up to the time when the climate of the northern hemisphere began to chill before the coming reign of snow and ice. Gradually the polar cold crept down to the latitude of New York, and the northern

half of the continent slept under its arctic mantle. The mountains around our once luxuriant lake region were heaped with snow. Glaciers slid through the valleys, carving Yosemite, and strewing the plains with continental débris.

The stages of their gigantic work do not concern us here, nor can we stay to trace the history of the gradual return of milder days, the slow retreat of unbroken winter northward, the repossessing of the land by the plants and animals which had survived the terrible ordeal of glacial cold and forced migration. Millenniums passed, the ice melted from the mountains, the lakes were swollen with accumulated water, and the final transformation of the scenery began.

The last act was the drainage and destruction of the great lakes. By degrees the rocky barrier of the Coast Range had been cut through at the Golden Gate. The ceaseless rush of outflowing water deepened the channel of the discharging stream, steadily sinking the level of the lake which filled the great valley of California, until its fertile plains were ready for human occupation. A similar process was going on in the north, where the lakes of western Oregon and Washington were discharged through the deepening gorge of the Columbia. Meanwhile the Klamath River and the Pitt were cutting their tremendous cañons through the Sierras, for the drainage of the region made memorable by Modoc treachery. Then the second barrier of the Columbia was cloven at the Cascades, and the eventful history of its upper lakes was slowly brought to an end.

The life of these great fresh-water seas had been largely coincident with that of the lakes we have studied farther east. The history of both covers the same geologic ages, and their deposits tell pretty much the same story of animal and vegetable life. Still there are striking differences in the two records. The lakes of California, Oregon, and Idaho witnessed stormier times than those of the eastern slope of the Rocky Mountains, being more severely scourged by volcanic disturbances. From time to time terrific storms of ashes were blown out from numerous volcanic centres, destroying life and covering the lake beds with ash deposits many feet in thickness. Again, floods of lava overflowed the country, burying hundreds of square miles under continu-

ous sheets of molten matter, and paving the lake beds with thick layers of solid basalt.

Then there would come ages of peace and quiet. Forests would repossess the land; troops of animals—mammoths, elephants, camels, horses, bison—would return to the reviving pastures; fish would repeople the waters; and fine sediment, full of organic forms, would gather in thick layers above the sheets of lava. During these alternations of peace and paroxysm nearly every portion of the country, particularly in the great region drained by the Columbia, was deluged by lava torrents. The lakes were filled up, while their outlets wore deeper and deeper into the rocky barriers which kept back their waters.

The ceaseless attrition of flowing water is irresistible. In process of time the hardest rock is cut away, and the best-defended lake is drained to the dregs. So thoroughly have the Columbia and its branches done their allotted task that they have not merely emptied the great lakes through whose ancient beds they flow, but in many cases they have cut their channels two thousand vertical feet into the deposits accumulated beneath the once wide-spreading waters. This unkindly drainage, together with the devastating lava flows, has converted vast expanses of fair water and fertile land into a "monotonous blank desert," as Clarence King describes the Snake Basin, "leaving only here and there near the snowy mountain-tops a bit of cool green to contrast with the sterile uniformity of the plain."

While the desiccation of the northern third of the great interior table-land was going on, the deepening channel of the Colorado was slowly depriving the southern third of its former greenness and fertility. At our first view of this great river—a river without parallel on the globe—we saw it flowing as a majestic stream across its lofty plateau, bathing and fertilizing a region great even in the great West, then plunging down its precipitous slope into the Gulf of California, a hundred miles or more above its present mouth. Gradually its stupendous falls wore backward into the plateau, carving out the marvellous cañons through which it now burrows. For hundreds of miles it has cut its channel from three to six thousand feet deep

through all the orders of sedimentary rocks, from the Tertiary down, and from six to eight hundred feet into the primordial granite below! As the channel sank, age after age, the surrounding country—more and more thoroughly drained of its surface water, and less and less frequently revived by mists and showers drawn from the river's surface—was slowly converted into a region of sterility and desolation, a process evidently hastened by the erosion which began it. The Colorado could not excavate its enormous cañons without discharging somewhere an equal volume of triturated rock. This vast body of mud and sand and gravel necessarily accumulated in the quiet waters of the gulf, steadily raising its bed until a broad sea arm stretching two hundred miles into southern California was cut off from the sea. The scanty rainfall over this heated basin failed to make good the loss by evaporation, and the imprisoned water wasted away, leaving in its place the Colorado Desert, a wide reach of sterile country, more than four thousand square miles of whose area is said to lie below the ocean level.

The transformation of this broad region from an evaporating surface into a thirsty plain must have greatly diminished the rainfall over the Colorado plateau, and hastened the increasing desiccation, which century by century made it less and less able to sustain the populous nations which had developed a semi-civilization on its once fertile plains.

The story of the great central lake of the Utah Basin can be told in few words. It had no outlet, consequently there is no record of erosion and drainage to read, as in the case of the fresh-water seas which encompassed it. It was wasted by sun and wind. As the surrounding regions were drained and dried, thirsty plains and sterile mountains took the place of the former expanses of lake and forest, which had tempered its climate and kept up its supply of moisture. In the mean time the Sierras had thrust higher their snow-compelling summits, depriving the sea-winds of their stores of rain. Age by age the rainfall lessened within the basin, the dwindling streams which drained the inner slopes of the surrounding mountains grew less and less able to make good the increasing loss by evaporation, and the end, as we behold it, was but a question of time.