JOHN MUIR

THE MOUNTAINS OF CALIFORNIA

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Содержание

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CHAPTER I
THE SIERRA NEVADA

Go where you may within the bounds of California, mountains are ever in sight, charming and glorifying every landscape. Yet so simple and massive is the topography of the State in general views, that the main central portion displays only one valley, and two chains of mountains which seem almost perfectly regular in trend and height: the Coast Range on the west side, the Sierra Nevada on the east. These two ranges coming together in curves on the north and south inclose a magnificent basin, with a level floor more than 400 miles long, and from 35 to 60 miles wide. This is the grand Central Valley of California, the waters of which have only one outlet to the sea through the Golden Gate. But with this general simplicity of features there is great complexity of hidden detail. The Coast Range, rising as a grand green barrier against the ocean, from 2000 to 8000 feet high, is composed of innumerable forest-crowned spurs, ridges, and rolling hill-waves which inclose a multitude of smaller valleys; some looking out through long, forest-lined vistas to the sea;

others, with but few trees, to the Central Valley; while a thousand others yet smaller are embosomed and concealed in mild, round-browed hills, each, with its own climate, soil, and productions.

Making your way through the mazes of the Coast Range to the summit of any of the inner peaks or passes opposite San Francisco, in the clear springtime, the grandest and most telling of all California landscapes is outspread before you. At your feet lies the great Central Valley glowing golden in the sunshine, extending north and south farther than the eye can reach, one smooth, flowery, lake-like bed of fertile soil. Along its eastern margin rises the mighty Sierra, miles in height, reposing like a smooth, cumulous cloud in the sunny sky, and so gloriously colored, and so luminous, it seems to be not clothed with light, but wholly composed of it, like the wall of some celestial city. Along the top, and extending a good way down, you see a pale, pearl-gray belt of snow; and below it a belt of blue and dark purple, marking the extension of the forests; and along the base of the range a broad belt of rose-purple and yellow, where lie the minor's gold-fields and the foot-hill gardens. All these colored belts blending smoothly make a wall of light ineffably fine, and as beautiful as a rainbow, yet firm as adamant.

When I first enjoyed this superb view, one glowing April day, from the summit of the Pacheco Pass, the Central Valley, but little trampled or plowed as yet, was one furred, rich sheet of golden compositae, and the luminous wall of the mountains shone in all its glory. Then it seemed to me the Sierra should

be called not the Nevada, or Snowy Range, but the Range of Light. And after ten years spent in the heart of it, rejoicing and wondering, bathing in its glorious floods of light, seeing the sunbursts of morning among the icy peaks, the noonday radiance on the trees and rocks and snow, the flush of the alpenglow, and a thousand dashing waterfalls with their marvelous abundance of irised spray, it still seems to me above all others the Range of Light, the most divinely beautiful of all the mountain-chains I have ever seen.

The Sierra is about 500 miles long, 70 miles wide, and from 7000 to nearly 15,000 feet high. In general views no mark of man is visible on it, nor anything to suggest the richness of the life it cherishes, or the depth and grandeur of its sculpture. None of its magnificent forest-crowned ridges rises much above the general level to publish its wealth. No great valley or lake is seen, or river, or group of well-marked features of any kind, standing out in distinct pictures. Even the summit-peaks, so clear and high in the sky, seem comparatively smooth and featureless. Nevertheless, glaciers are still at work in the shadows of the peaks, and thousands of lakes and meadows shine and bloom beneath them, and the whole range is furrowed with cañons to a depth of from 2000 to 5000 feet, in which once flowed majestic glaciers, and in which now flow and sing a band of beautiful rivers.

Though of such stupendous depth, these famous cañons are not raw, gloomy, jagged-walled gorges, savage and inaccessible.

With rough passages here and there they still make delightful pathways for the mountaineer, conducting from the fertile lowlands to the highest icy fountains, as a kind of mountain streets full of charming life and light, graded and sculptured by the ancient glaciers, and presenting, throughout all their courses, a rich variety of novel and attractive scenery, the most attractive that has yet been discovered in the mountain-ranges of the world.

In many places, especially in the middle region of the western flank of the range, the main cañons widen into spacious valleys or parks, diversified like artificial landscape-gardens, with charming groves and meadows, and thickets of blooming bushes, while the lofty, retiring walls, infinitely varied in form and sculpture, are fringed with ferns, flowering-plants of many species, oaks, and evergreens, which find anchorage on a thousand narrow steps and benches; while the whole is enlivened and made glorious with rejoicing streams that come dancing and foaming over the sunny brows of the cliffs to join the shining river that flows in tranquil beauty down the middle of each one of them.

The walls of these park valleys of the Yosemite kind are made up of rocks mountains in size, partly separated from each other by narrow gorges and side-cañons; and they are so sheer in front, and so compactly built together on a level floor, that, comprehensively seen, the parks they inclose look like immense halls or temples lighted from above. Every rock seems to glow with life. Some lean back in majestic repose; others, absolutely

sheer, or nearly so, for thousands of feet, advance their brows in thoughtful attitudes beyond their companions, giving welcome to storms and calms alike, seemingly conscious yet heedless of everything going on about them, awful in stern majesty, types of permanence, yet associated with beauty of the frailest and most fleeting forms; their feet set in pine-groves and gay emerald meadows, their brows in the sky; bathed in light, bathed in floods of singing water, while snow-clouds, avalanches, and the winds shine and surge and wreathe about them as the years go by, as if into these mountain mansions Nature had taken pains to gather her choicest treasures to draw her lovers into close and confiding communion with her.

Here, too, in the middle region of deepest cañons are the grandest forest-trees, the Sequoia, king of conifers, the noble Sugar and Yellow Pines, Douglas Spruce, Libocedrus, and the Silver Firs, each a giant of its kind, assembled together in one and the same forest, surpassing all other coniferous forests in the world, both in the number of its species and in the size and beauty of its trees. The winds flow in melody through their colossal spires, and they are vocal everywhere with the songs of birds and running water. Miles of fragrant ceanothus and manzanita bushes bloom beneath them, and lily gardens and meadows, and damp, ferny glens in endless variety of fragrance and color, compelling the admiration of every observer. Sweeping on over ridge and valley, these noble trees extend a continuous belt from end to end of the range, only slightly interrupted by sheer-walled cañons at

intervals of about fifteen and twenty miles. Here the great burly brown bears delight to roam, harmonizing with the brown boles of the trees beneath which they feed. Deer, also, dwell here, and find food and shelter in the ceanothus tangles, with a multitude of smaller people. Above this region of giants, the trees grow smaller until the utmost limit of the timber line is reached on the stormy mountain-slopes at a height of from ten to twelve thousand feet above the sea, where the Dwarf Pine is so lowly and hard beset by storms and heavy snow, it is pressed into flat tangles, over the tops of which we may easily walk. Below the main forest belt the trees likewise diminish in size, frost and burning drought repressing and blasting alike.

The rose-purple zone along the base of the range comprehends nearly all the famous gold region of California. And here it was that miners from every country under the sun assembled in a wild, torrent-like rush to seek their fortunes. On the banks of every river, ravine, and gully they have left their marks. Every gravel- and boulder-bed has been desperately riddled over and over again. But in this region the pick and shovel, once wielded with savage enthusiasm, have been laid away, and only quartz-mining is now being carried on to any considerable extent. The zone in general is made up of low, tawny, waving foot-hills, roughened here and there with brush and trees, and outcropping masses of slate, colored gray and red with lichens. The smaller masses of slate, rising abruptly from the dry, grassy sod in leaning slabs, look like ancient tombstones in a deserted

burying-ground. In early spring, say from February to April, the whole of this foot-hill belt is a paradise of bees and flowers. Refreshing rains then fall freely, birds are busy building their nests, and the sunshine is balmy and delightful. But by the end of May the soil, plants, and sky seem to have been baked in an oven. Most of the plants crumble to dust beneath the foot, and the ground is full of cracks; while the thirsty traveler gazes with eager longing through the burning glare to the snowy summits looming like hazy clouds in the distance.

The trees, mostly *Quercus Douglasii* and *Pinus Sabiniana*, thirty to forty feet high, with thin, pale-green foliage, stand far apart and cast but little shade. Lizards glide about on the rocks enjoying a constitution that no drought can dry, and ants in amazing numbers, whose tiny sparks of life seem to burn the brighter with the increasing heat, ramble industriously in long trains in search of food. Crows, ravens, magpies—friends in distress—gather on the ground beneath the best shade-trees, panting with drooping wings and bills wide open, scarce a note from any of them during the midday hours. Quails, too, seek the shade during the heat of the day about tepid pools in the channels of the larger mid-river streams. Rabbits scurry from thicket to thicket among the ceanothus bushes, and occasionally a long-eared hare is seen cantering gracefully across the wider openings. The nights are calm and dewless during the summer, and a thousand voices proclaim the abundance of life, notwithstanding the desolating effect of dry sunshine on

the plants and larger animals. The hylas make a delightfully pure and tranquil music after sunset; and coyotes, the little, despised dogs of the wilderness, brave, hardy fellows, looking like withered wisps of hay, bark in chorus for hours. Mining-towns, most of them dead, and a few living ones with bright bits of cultivation about them, occur at long intervals along the belt, and cottages covered with climbing roses, in the midst of orange and peach orchards, and sweet-scented hay-fields in fertile flats where water for irrigation may be had. But they are mostly far apart, and make scarce any mark in general views.

Every winter the High Sierra and the middle forest region get snow in glorious abundance, and even the foot-hills are at times whitened. Then all the range looks like a vast beveled wall of purest marble. The rough places are then made smooth, the death and decay of the year is covered gently and kindly, and the ground seems as clean as the sky. And though silent in its flight from the clouds, and when it is taking its place on rock, or tree, or grassy meadow, how soon the gentle snow finds a voice! Slipping from the heights, gathering in avalanches, it booms and roars like thunder, and makes a glorious show as it sweeps down the mountain-side, arrayed in long, silken streamers and wreathing, swirling films of crystal dust.

The north half of the range is mostly covered with floods of lava, and dotted with volcanoes and craters, some of them recent and perfect in form, others in various stages of decay. The south half is composed of granite nearly from base to summit, while

a considerable number of peaks, in the middle of the range, are capped with metamorphic slates, among which are Mounts Dana and Gibbs to the east of Yosemite Valley. Mount Whitney, the culminating point of the range near its southern extremity, lifts its helmet-shaped crest to a height of nearly 14,700 feet. Mount Shasta, a colossal volcanic cone, rises to a height of 14,440 feet at the northern extremity, and forms a noble landmark for all the surrounding region within a radius of a hundred miles. Residual masses of volcanic rocks occur throughout most of the granitic southern portion also, and a considerable number of old volcanoes on the flanks, especially along the eastern base of the range near Mono Lake and southward. But it is only to the northward that the entire range, from base to summit, is covered with lava.

From the summit of Mount Whitney only granite is seen. Innumerable peaks and spires but little lower than its own storm-beaten crags rise in groups like forest-trees, in full view, segregated by cañons of tremendous depth and ruggedness. On Shasta nearly every feature in the vast view speaks of the old volcanic fires. Far to the northward, in Oregon, the icy volcanoes of Mount Pitt and the Three Sisters rise above the dark evergreen woods. Southward innumerable smaller craters and cones are distributed along the axis of the range and on each flank. Of these, Lassen's Butte is the highest, being nearly 11,000 feet above sea-level. Miles of its flanks are reeking and bubbling with hot springs, many of them so boisterous and sulphurous they

seem over ready to become spouting geysers like those of the Yellowstone.

The Cinder Cone near marks the most recent volcanic eruption in the Sierra. It is a symmetrical truncated cone about 700 feet high, covered with gray cinders and ashes, and has a regular unchanged crater on its summit, in which a few small Two-leaved Pines are growing. These show that the age of the cone is not less than eighty years. It stands between two lakes, which a short time ago were one. Before the cone was built, a flood of rough vesicular lava was poured into the lake, cutting it in two, and, overflowing its banks, the fiery flood advanced into the pine-woods, overwhelming the trees in its way, the charred ends of some of which may still be seen projecting from beneath the snout of the lava-stream where it came to rest. Later still there was an eruption of ashes and loose obsidian cinders, probably from the same vent, which, besides forming the Cinder Cone, scattered a heavy shower over the surrounding woods for miles to a depth of from six inches to several feet.

The history of this last Sierra eruption is also preserved in the traditions of the Pitt River Indians. They tell of a fearful time of darkness, when the sky was black with ashes and smoke that threatened every living thing with death, and that when at length the sun appeared once more it was red like blood.

Less recent craters in great numbers roughen the adjacent region; some of them with lakes in their throats, others overgrown with trees and flowers, Nature in these old hearths and

firesides having literally given beauty for ashes. On the northwest side of Mount Shasta there is a subordinate cone about 3000 feet below the summit, which, has been active subsequent to the breaking up of the main ice-cap that once covered the mountain, as is shown by its comparatively unwasted crater and the streams of unglaciated lava radiating from it. The main summit is about a mile and a half in diameter, bounded by small crumbling peaks and ridges, among which we seek in vain for the outlines of the ancient crater.

These ruinous masses, and the deep glacial grooves that flute the sides of the mountain, show that it has been considerably lowered and wasted by ice; how much we have no sure means of knowing. Just below the extreme summit hot sulphurous gases and vapor issue from irregular fissures, mixed with spray derived from melting snow, the last feeble expression of the mighty force that built the mountain. Not in one great convulsion was Shasta given birth. The crags of the summit and the sections exposed by the glaciers down the sides display enough of its internal framework to prove that comparatively long periods of quiescence intervened between many distinct eruptions, during which the cooling lavas ceased to flow, and became permanent additions to the bulk of the growing mountain. With alternate haste and deliberation eruption succeeded eruption till the old volcano surpassed even its present sublime height.

Standing on the icy top of this, the grandest of all the fire-mountains of the Sierra, we can hardly fail to look forward to

its next eruption. Gardens, vineyards, homes have been planted confidingly on the flanks of volcanoes which, after remaining steadfast for ages, have suddenly blazed into violent action, and poured forth overwhelming floods of fire. It is known that more than a thousand years of cool calm have intervened between violent eruptions. Like gigantic geysers spouting molten rock instead of water, volcanoes work and rest, and we have no sure means of knowing whether they are dead when still, or only sleeping.

Along the western base of the range a telling series of sedimentary rocks containing the early history of the Sierra are now being studied. But leaving for the present these first chapters, we see that only a very short geological time ago, just before the coming on of that winter of winters called the glacial period, a vast deluge of molten rocks poured from many a chasm and crater on the flanks and summit of the range, filling lake basins and river channels, and obliterating nearly every existing feature on the northern portion. At length these all-destroying floods ceased to flow. But while the great volcanic cones built up along the axis still burned and smoked, the whole Sierra passed under the domain of ice and snow. Then over the bald, featureless, fire-blackened mountains, glaciers began to crawl, covering them from the summits to the sea with a mantle of ice; and then with infinite deliberation the work went on of sculpturing the range anew. These mighty agents of erosion, halting never through unnumbered centuries, crushed and ground

the flinty lavas and granites beneath their crystal folds, wasting and building until in the fullness of time the Sierra was born again, brought to light nearly as we behold it today, with glaciers and snow-crushed pines at the top of the range, wheat-fields and orange-groves at the foot of it.

This change from icy darkness and death to life and beauty was slow, as we count time, and is still going on, north and south, over all the world wherever glaciers exist, whether in the form of distinct rivers, as in Switzerland, Norway, the mountains of Asia, and the Pacific Coast; or in continuous mantling folds, as in portions of Alaska, Greenland, Franz-Joseph-Land, Nova Zembla, Spitzbergen, and the lands about the South Pole. But in no country, as far as I know, may these majestic changes be studied to better advantage than in the plains and mountains of California.

Toward the close of the glacial period, when the snow-clouds became less fertile and the melting waste of sunshine became greater, the lower folds of the ice-sheet in California, discharging fleets of icebergs into the sea, began to shallow and recede from the lowlands, and then move slowly up the flanks of the Sierra in compliance with the changes of climate. The great white mantle on the mountains broke up into a series of glaciers more or less distinct and river-like, with many tributaries, and these again were melted and divided into still smaller glaciers, until now only a few of the smallest residual topmost branches of the grand system exist on the cool slopes of the summit peaks.

Plants and animals, biding their time, closely followed the retiring ice, bestowing quick and joyous animation on the new-born landscapes. Pine-trees marched up the sun-warmed moraines in long, hopeful files, taking the ground and establishing themselves as soon as it was ready for them; brown-spiked sedges fringed the shores of the newborn lakes; young rivers roared in the abandoned channels of the glaciers; flowers bloomed around the feet of the great burnished domes,—while with quick fertility mellow beds of soil, settling and warming, offered food to multitudes of Nature's waiting children, great and small, animals as well as plants; mice, squirrels, marmots, deer, bears, elephants, etc. The ground burst into bloom with magical rapidity, and the young forests into bird-song: life in every form warming and sweetening and growing richer as the years passed away over the mighty Sierra so lately suggestive of death and consummate desolation only.

It is hard without long and loving study to realize the magnitude of the work done on these mountains during the last glacial period by glaciers, which are only streams of closely compacted snow-crystals. Careful study of the phenomena presented goes to show that the pre-glacial condition of the range was comparatively simple: one vast wave of stone in which a thousand mountains, domes, cañons, ridges, etc., lay concealed. And in the development of these Nature chose for a tool not the earthquake or lightning to rend and split asunder, not the stormy torrent or eroding rain, but the tender snow-flowers

noiselessly falling through unnumbered centuries, the offspring of the sun and sea. Laboring harmoniously in united strength they crushed and ground and wore away the rocks in their march, making vast beds of soil, and at the same time developed and fashioned the landscapes into the delightful variety of hill and dale and lordly mountain that mortals call beauty. Perhaps more than a mile in average depth has the range been thus degraded during the last glacial period,—a quantity of mechanical work almost inconceivably great. And our admiration must be excited again and again as we toil and study and learn that this vast job of rockwork, so far-reaching in its influences, was done by agents so fragile and small as are these flowers of the mountain clouds. Strong only by force of numbers, they carried away entire mountains, particle by particle, block by block, and cast them into the sea; sculptured, fashioned, modeled all the range, and developed its predestined beauty. All these new Sierra landscapes were evidently predestined, for the physical structure of the rocks on which the features of the scenery depend was acquired while they lay at least a mile deep below the pre-glacial surface. And it was while these features were taking form in the depths of the range, the particles of the rocks marching to their appointed places in the dark with reference to the coming beauty, that the particles of icy vapor in the sky marching to the same music assembled to bring them to the light. Then, after their grand task was done, these bands of snow-flowers, these mighty glaciers, were melted and removed as if of no more importance than dew

destined to last but an hour. Few, however, of Nature's agents have left monuments so noble and enduring as they. The great granite domes a mile high, the cañons as deep, the noble peaks, the Yosemite valleys, these, and indeed nearly all other features of the Sierra scenery, are glacier monuments.

Contemplating the works of these flowers of the sky, one may easily fancy them endowed with life: messengers sent down to work in the mountain mines on errands of divine love. Silently flying through the darkened air, swirling, glinting, to their appointed places, they seem to have taken counsel together, saying, "Come, we are feeble; let us help one another. We are many, and together we will be strong. Marching in close, deep ranks, let us roll away the stones from these mountain sepulchers, and set the landscapes free. Let us uncover these clustering domes. Here let us carve a lake basin; there, a Yosemite Valley; here, a channel for a river with fluted steps and brows for the plunge of songful cataracts. Yonder let us spread broad sheets of soil, that man and beast may be fed; and here pile trains of boulders for pines and giant Sequoias. Here make ground for a meadow; there, for a garden and grove, making it smooth and fine for small daisies and violets and beds of heathy bryanthus, spicing it well with crystals, garnet feldspar, and zircon." Thus and so on it has oftentimes seemed to me sang and planned and labored the hearty snow-flower crusaders; and nothing that I can write can possibly exaggerate the grandeur and beauty of their work. Like morning mist they have vanished in sunshine,

all save the few small companies that still linger on the coolest mountainsides, and, as residual glaciers, are still busily at work completing the last of the lake basins, the last beds of soil, and the sculpture of some of the highest peaks.

CHAPTER II
THE GLACIERS

Of the small residual glaciers mentioned in the preceding chapter, I have found sixty-five in that portion of the range lying between latitude 36° 30' and 39°. They occur singly or in small groups on the north sides of the peaks of the High Sierra, sheltered beneath broad frosty shadows, in amphitheaters of their own making, where the snow, shooting down from the surrounding heights in avalanches, is most abundant. Over two thirds of the entire number lie between latitude 37° and 38°, and form the highest fountains of the San Joaquin, Merced, Tuolumne, and Owen's rivers.

The glaciers of Switzerland, like those of the Sierra, are mere wasting remnants of mighty ice-floods that once filled the great valleys and poured into the sea. So, also, are those of Norway, Asia, and South America. Even the grand continuous mantles of ice that still cover Greenland, Spitsbergen, Nova Zembla, Franz-Joseph-Land, parts of Alaska, and the south polar region are shallowing and shrinking. Every glacier in the world is smaller than it once was. All the world is growing warmer, or the crop of snow-flowers is diminishing. But in contemplating the condition of the glaciers of the world, we must bear in mind while trying to account for the changes going on that the same sunshine that

wastes them builds them. Every glacier records the expenditure of an enormous amount of sun-heat in lifting the vapor for the snow of which it is made from the ocean to the mountains, as Tyndall strikingly shows.

The number of glaciers in the Alps, according to the Schlagintweit brothers, is 1100, of which 100 may be regarded as primary, and the total area of ice, snow, and *névé* is estimated at 1177 square miles, or an average for each glacier of little more than one square mile. On the same authority, the average height above sea-level at which they melt is about 7414 feet. The Grindelwald glacier descends below 4000 feet, and one of the Mont Blanc glaciers reaches nearly as low a point. One of the largest of the Himalaya glaciers on the head waters of the Ganges does not, according to Captain Hodgson, descend below 12,914 feet. The largest of the Sierra glaciers on Mount Shasta descends to within 9500 feet of the level of the sea, which, as far as I have observed, is the lowest point reached by any glacier within the bounds of California, the average height of all being not far from 11,000 feet.

The changes that have taken place in the glacial conditions of the Sierra from the time of greatest extension is well illustrated by the series of glaciers of every size and form extending along the mountains of the coast to Alaska. A general exploration of this instructive region shows that to the north of California, through Oregon and Washington, groups of active glaciers still exist on all the high volcanic cones of the Cascade Range,

—Mount Pitt, the Three Sisters, Mounts Jefferson, Hood, St. Helens, Adams, Rainier, Baker, and others,—some of them of considerable size, though none of them approach the sea. Of these mountains Rainier, in Washington, is the highest and iciest. Its dome-like summit, between 14,000 and 15,000 feet high, is capped with ice, and eight glaciers, seven to twelve miles long, radiate from it as a center, and form the sources of the principal streams of the State. The lowest-descending of this fine group flows through beautiful forests to within 3500 feet of the sea-level, and sends forth a river laden with glacier mud and sand. On through British Columbia and southeastern Alaska the broad, sustained mountain-chain, extending along the coast, is generally glacier-bearing. The upper branches of nearly all the main cañons and fiords are occupied by glaciers, which gradually increase in size, and descend lower until the high region between Mount Fairweather and Mount St. Elias is reached, where a considerable number discharge into the waters of the ocean. This is preëminently the ice-land of Alaska and of the entire Pacific Coast.

Northward from here the glaciers gradually diminish in size and thickness, and melt at higher levels. In Prince William Sound and Cook's Inlet many fine glaciers are displayed, pouring from the surrounding mountains; but to the north of latitude 62° few, if any, glaciers remain, the ground being mostly low and the snowfall light. Between latitude 56° and 60° there are probably more than 5000 glaciers, not counting the smallest. Hundreds

of the largest size descend through the forests to the level of the sea, or near it, though as far as my own observations have reached, after a pretty thorough examination of the region, not more than twenty-five discharge icebergs into the sea. All the long high-walled fiords into which these great glaciers of the first class flow are of course crowded with icebergs of every conceivable form, which are detached with thundering noise at intervals of a few minutes from an imposing ice-wall that is thrust forward into deep water. But these Pacific Coast icebergs are small as compared with those of Greenland and the Antarctic region, and only a few of them escape from the intricate system of channels, with which this portion of the coast is fringed, into the open sea. Nearly all of them are swashed and drifted by wind and tide back and forth in the fiords until finally melted by the ocean water, the sunshine, the warm winds, and the copious rains of summer. Only one glacier on the coast, observed by Prof. Russell, discharges its bergs directly into the open sea, at Icy Cape, opposite Mount St. Elias. The southernmost of the glaciers that reach the sea occupies a narrow, picturesque fiord about twenty miles to the northwest of the mouth of the Stikeen River, in latitude 56° 50'. The fiord is called by the natives "Hutli," or Thunder Bay, from the noise made by the discharge of the icebergs. About one degree farther north there are four of these complete glaciers, discharging at the heads of the long arms of Holkam Bay. At the head of the Tahkoo Inlet, still farther north, there is one; and at the head and around the sides of Glacier Bay,

trending in a general northerly direction from Cross Sound in latitude 58° to 59°, there are seven of these complete glaciers pouring bergs into the bay and its branches, and keeping up an eternal thundering. The largest of this group, the Muir, has upward of 200 tributaries, and a width below the confluence of the main tributaries of about twenty-five miles. Between the west side of this icy bay and the ocean all the ground, high and low, excepting the peaks of the Fairweather Range, is covered with a mantle of ice from 1000 to probably 3000 feet thick, which discharges by many distinct mouths.

This fragmentary ice-sheet, and the immense glaciers about Mount St. Elias, together with the multitude of separate river-like glaciers that load the slopes of the coast mountains, evidently once formed part of a continuous ice-sheet that flowed over all the region hereabouts, and only a comparatively short time ago extended as far southward as the mouth of the Strait of Juan de Fuca, probably farther. All the islands of the Alexander Archipelago, as well as the headlands and promontories of the mainland, display telling traces of this great mantle that are still fresh and unmistakable. They all have the forms of the greatest strength with reference to the action of a vast rigid press of oversweeping ice from the north and northwest, and their surfaces have a smooth, rounded, overrubbed appearance, generally free from angles. The intricate labyrinth of canals, channels, straits, passages, sounds, narrows, etc. between the islands, and extending into the mainland, of course manifest

in their forms and trends and general characteristics the same subordination to the grinding action of universal glaciation as to their origin, and differ from the islands and banks of the fiords only in being portions of the pre-glacial margin of the continent more deeply eroded, and therefore covered by the ocean waters which flowed into them as the ice was melted out of them. The formation and extension of fiords in this manner is still going on, and may be witnessed in many places in Glacier Bay, Yakutat Bay, and adjacent regions. That the domain of the sea is being extended over the land by the wearing away of its shores, is well known, but in these icy regions of Alaska, and even as far south as Vancouver Island, the coast rocks have been so short a time exposed to wave-action they are but little wasted as yet. In these regions the extension of the sea effected by its own action in post-glacial time is scarcely appreciable as compared with that effected by ice-action.

Traces of the vanished glaciers made during the period of greater extension abound on the Sierra as far south as latitude 36°. Even the polished rock surfaces, the most evanescent of glacial records, are still found in a wonderfully perfect state of preservation on the upper half of the middle portion of the range, and form the most striking of all the glacial phenomena. They occur in large irregular patches in the summit and middle regions, and though they have been subjected to the action of the weather with its corroding storms for thousands of years, their mechanical excellence is such that they still reflect the

sunbeams like glass, and attract the attention of every observer. The attention of the mountaineer is seldom arrested by moraines, however regular and high they may be, or by cañons, however deep, or by rocks, however noble in form and sculpture; but he stoops and rubs his hands admiringly on the shining surfaces and trios hard to account for their mysterious smoothness. He has seen the snow descending in avalanches, but concludes this cannot be the work of snow, for he finds it where no avalanches occur. Nor can water have done it, for he sees this smoothness glowing on the sides and tops of the highest domes. Only the winds of all the agents he knows seem capable of flowing in the directions indicated by the scoring. Indians, usually so little curious about geological phenomena, have come to me occasionally and asked me, "What makeum the ground so smooth at Lake Tenaya?" Even horses and dogs gaze wonderingly at the strange brightness of the ground, and smell the polished spaces and place their feet cautiously on them when they come to them for the first time, as if afraid of sinking. The most perfect of the polished pavements and walls lie at an elevation of from 7000 to 9000 feet above the sea, where the rock is compact silicious granite. Small dim patches may be found as low as 3000 feet on the driest and most enduring portions of sheer walls with a southern exposure, and on compact swelling bosses partially protected from rain by a covering of large boulders. On the north half of the range the striated and polished surfaces are less common, not only because this part of the chain is lower,

but because the surface rocks are chiefly porous lavas subject to comparatively rapid waste. The ancient moraines also, though well preserved on most of the south half of the range, are nearly obliterated to the northward, but then material is found scattered and disintegrated.

A similar blurred condition of the superficial records of glacial action obtains throughout most of Oregon, Washington, British Columbia, and Alaska, due in great part to the action of excessive moisture. Even in southeastern Alaska, where the most extensive glaciers on the continent are, the more evanescent of the traces of their former greater extension, though comparatively recent, are more obscure than those of the ancient California glaciers whore the climate is drier and the rocks more resisting.

These general views of the glaciers of the Pacific Coast will enable my readers to see something of the changes that have taken place in California, and will throw light on the residual glaciers of the High Sierra.

Prior to the autumn of 1871 the glaciers of the Sierra were unknown. In October of that year I discovered the Black Mountain Glacier in a shadowy amphitheater between Black and Rod Mountains, two of the peaks of the Merced group. This group is the highest portion of a spur that straggles out from the main axis of the range in the direction of Yosemite Valley. At the time of this interesting discovery I was exploring the *névé* amphitheaters of the group, and tracing the courses of the ancient

glaciers that once poured from its ample fountains through the Illilouette Basin and the Yosemite Valley, not expecting to find any active glaciers so far south in the land of sunshine.

Beginning on the northwestern extremity of the group, I explored the chief tributary basins in succession, their moraines, roches moutonnées, and splendid glacier pavements, taking them in regular succession without any reference to the time consumed in their study. The monuments of the tributary that poured its ice from between Red and Black Mountains I found to be the most interesting of them all; and when I saw its magnificent moraines extending in majestic curves from the spacious amphitheater between the mountains, I was exhilarated with the work that lay before me. It was one of the golden days of the Sierra Indian summer, when the rich sunshine glorifies every landscape however rocky and cold, and suggests anything rather than glaciers. The path of the vanished glacier was warm now, and shone in many places as if washed with silver. The tall pines growing on the moraines stood transfigured in the glowing light, the poplar groves on the levels of the basin were masses of orange-yellow, and the late-blooming goldenrods added gold to gold. Pushing on over my rosy glacial highway, I passed lake after lake set in solid basins of granite, and many a thicket and meadow watered by a stream that issues from the amphitheater and links the lakes together; now wading through plushy bogs knee-deep in yellow and purple sphagnum; now passing over bare rock. The main lateral moraines that bounded the view on either hand are

from 100 to nearly 200 feet high, and about as regular as artificial embankments, and covered with a superb growth of Silver Fir and Pine. But this garden and forest luxuriance was speedily left behind. The trees were dwarfed as I ascended; patches of the alpine bryanthus and cassiope began to appear, and arctic willows pressed into flat carpets by the winter snow. The lakelets, which a few miles down the valley were so richly embroidered with flowery meadows, had here, at an elevation of 10,000 feet, only small brown mats of carex, leaving bare rocks around more than half their shores. Yet amid this alpine suppression the Mountain Pine bravely tossed his storm-beaten branches on the ledges and buttresses of Red Mountain, some specimens being over 100 feet high, and 24 feet in circumference, seemingly as fresh and vigorous as the giants of the lower zones.

Evening came on just as I got fairly within the portal of the main amphitheater. It is about a mile wide, and a little less than two miles long. The crumbling spurs and battlements of Red Mountain bound it on the north, the somber, rudely sculptured precipices of Black Mountain on the south, and a hacked, splintery *col*, curving around from mountain to mountain, shuts it in on the east.

I chose a camping-ground on the brink of one of the lakes where a thicket of Hemlock Spruce sheltered me from the night wind. Then, after making a tin-cupful of tea, I sat by my camp-fire reflecting on the grandeur and significance of the glacial records I had seen. As the night advanced the mighty rock walls

of my mountain mansion seemed to come nearer, while the starry sky in glorious brightness stretched across like a ceiling from wall to wall, and fitted closely down into all the spiky irregularities of the summits. Then, after a long fireside rest and a glance at my note-book, I cut a few leafy branches for a bed, and fell into the clear, death-like sleep of the tired mountaineer.

Early next morning I set out to trace the grand old glacier that had done so much for the beauty of the Yosemite region back to its farthest fountains, enjoying the charm that every explorer feels in Nature's untrodden wildernesses. The voices of the mountains were still asleep. The wind scarce stirred the pine-needles. The sun was up, but it was yet too cold for the birds and the few burrowing animals that dwell here. Only the stream, cascading from pool to pool, seemed to be wholly awake. Yet the spirit of the opening day called to action. The sunbeams came streaming gloriously through the jagged openings of the *col*, glancing on the burnished pavements and lighting the silvery lakes, while every sun-touched rock burned white on its edges like melting iron in a furnace. Passing round the north shore of my camp lake I followed the central stream past many cascades from lakelet to lakelet. The scenery became more rigidly arctic, the Dwarf Pines and Hemlocks disappeared, and the stream was bordered with icicles. As the sun rose higher rocks were loosened on shattered portions of the cliffs, and came down in rattling avalanches, echoing wildly from crag to crag.

The main lateral moraines that extend from the jaws of the

amphitheater into the Illilouette Basin are continued in straggling masses along the walls of the amphitheater, while separate boulders, hundreds of tons in weight, are left stranded here and there out in the middle of the channel. Here, also, I observed a series of small terminal moraines ranged along the south wall of the amphitheater, corresponding in size and form with the shadows cast by the highest portions. The meaning of this correspondence between moraines and shadows was afterward made plain. Tracing the stream back to the last of its chain of lakelets, I noticed a deposit of fine gray mud on the bottom except where the force of the entering current had prevented its settling. It looked like the mud worn from a grindstone, and I at once suspected its glacial origin, for the stream that was carrying it came gurgling out of the base of a raw moraine that seemed in process of formation. Not a plant or weather-stain was visible on its rough, unsettled surface. It is from 60 to over 100 feet high, and plunges forward at an angle of 38°. Cautiously picking my way, I gained the top of the moraine and was delighted to see a small but well characterized glacier swooping down from the gloomy precipices of Black Mountain in a finely graduated curve to the moraine on which I stood. The compact ice appeared on all the lower portions of the glacier, though gray with dirt and stones embedded in it. Farther up the ice disappeared beneath coarse granulated snow. The surface of the glacier was further characterized by dirt bands and the outcropping edges of the blue veins, showing the laminated structure of the ice. The uppermost

crevasse, or "bergschrund," where the *névé* was attached to the mountain, was from 12 to 14 feet wide, and was bridged in a few places by the remains of snow avalanches. Creeping along the edge of the schrund, holding on with benumbed fingers, I discovered clear sections where the bedded structure was beautifully revealed. The surface snow, though sprinkled with stones shot down from the cliffs, was in some places almost pure, gradually becoming crystalline and changing to whitish porous ice of different shades of color, and this again changing at a depth of 20 or 30 feet to blue ice, some of the ribbon-like bands of which were nearly pure, and blended with the paler bands in the most gradual and delicate manner imaginable. A series of rugged zigzags enabled me to make my way down into the weird under-world of the crevasse. Its chambered hollows were hung with a multitude of clustered icicles, amid which pale, subdued light pulsed and shimmered with indescribable loveliness. Water dripped and tinkled overhead, and from far below came strange, solemn murmurings from currents that were feeling their way through veins and fissures in the dark. The chambers of a glacier are perfectly enchanting, notwithstanding one feels out of place in their frosty beauty. I was soon cold in my shirt-sleeves, and the leaning wall threatened to engulf me; yet it was hard to leave the delicious music of the water and the lovely light. Coming again to the surface, I noticed boulders of every size on their journeys to the terminal moraine—journeys of more than a hundred years, without a single stop, night or day, winter or summer.

The sun gave birth to a network of sweet-voiced rills that ran gracefully down the glacier, curling and swirling in their shining channels, and cutting clear sections through the porous surface-ice into the solid blue, where the structure of the glacier was beautifully illustrated.

The series of small terminal moraines which I had observed in the morning, along the south wall of the amphitheater, correspond in every way with the moraine of this glacier, and their distribution with reference to shadows was now understood. When the climatic changes came on that caused the melting and retreat of the main glacier that filled the amphitheater, a series of residual glaciers were left in the cliff shadows, under the protection of which they lingered, until they formed the moraines we are studying. Then, as the snow became still less abundant, all of them vanished in succession, except the one just described; and the cause of its longer life is sufficiently apparent in the greater area of snow-basin it drains, and its more perfect protection from wasting sunshine. How much longer this little glacier will last depends, of course, on the amount of snow it receives from year to year, as compared with melting waste.

After this discovery, I made excursions over all the High Sierra, pushing my explorations summer after summer, and discovered that what at first sight in the distance looked like extensive snow-fields, wore in great part glaciers, busily at work completing the sculpture of the summit-peaks so grandly blocked out by their giant predecessors.

On August 21, I set a series of stakes in the Maclure Glacier, near Mount Lyell, and found its rate of motion to be little more than an inch a day in the middle, showing a great contrast to the Muir Glacier in Alaska, which, near the front, flows at a rate of from five to ten feet in twenty-four hours. Mount Shasta has three glaciers, but Mount Whitney, although it is the highest mountain in the range, does not now cherish a single glacier. Small patches of lasting snow and ice occur on its northern slopes, but they are shallow, and present no well marked evidence of glacial motion. Its sides, however, are scored and polished in many places by the action of its ancient glaciers that flowed east and west as tributaries of the great glaciers that once filled the valleys of the Kern and Owen's rivers.

CHAPTER III
THE SNOW

The first snow that whitens the Sierra, usually falls about the end of October or early in November, to a depth of a few inches, after months of the most charming Indian summer weather imaginable. But in a few days, this light covering mostly melts from the slopes exposed to the sun and causes but little apprehension on the part of mountaineers who may be lingering among the high peaks at this time. The first general winter storm that yields snow that is to form a lasting portion of the season's supply, seldom breaks on the mountains before the end of November. Then, warned by the sky, cautions mountaineers, together with the wild sheep, deer, and most of the birds and bears, make haste to the lowlands or foot-hills; and burrowing marmots, mountain beavers, wood-rats, and such people go into winter quarters, some of them not again to see the light of day until the general awakening and resurrection of the spring in June or July. The first heavy fall is usually from about two to four feet in depth. Then, with intervals of splendid sunshine, storm succeeds storm, heaping snow on snow, until thirty to fifty feet has fallen. But on account of its settling and compacting, and the almost constant waste from melting and evaporation, the average depth actually found at any time seldom exceeds ten feet in the

forest region, or fifteen feet along the slopes of the summit peaks.

Even during the coldest weather evaporation never wholly ceases, and the sunshine that abounds between the storms is sufficiently powerful to melt the surface more or less through all the winter months. Waste from melting also goes on to some extent on the bottom from heat stored up in the rocks, and given off slowly to the snow in contact with them, as is shown by the rising of the streams on all the higher regions after the first snowfall, and their steady sustained flow all winter.

The greater portion of the snow deposited around the lofty summits of the range falls in small crisp flakes and broken crystals, or, when accompanied by strong winds and low temperature, the crystals, instead of being locked together in their fall to form tufted flakes, are beaten and broken into meal and fine dust. But down in the forest region the greater portion comes gently to the ground, light and feathery, some of the flakes in mild weather being nearly an inch in diameter, and it is evenly distributed and kept from drifting to any great extent by the shelter afforded by the large trees. Every tree during the progress of gentle storms is loaded with, fairy bloom at the coldest and darkest time of year, bending the branches, and hushing every singing needle. But as soon as the storm is over, and the sun shines, the snow at once begins to shift and settle and fall from the branches in miniature avalanches, and the white forest soon becomes green again. The snow on the ground also settles and thaws every bright day, and freezes at night, until it becomes

coarsely granulated, and loses every trace of its rayed crystalline structure, and then a man may walk firmly over its frozen surface as if on ice. The forest region up to an elevation of 7000 feet is usually in great part free from snow in June, but at this time the higher regions are still heavy-laden, and are not touched by spring weather to any considerable extent before the middle or end of July.

One of the most striking effects of the snow on the mountains is the burial of the rivers and small lakes.

> As the snow fa's in the river
> A moment white, then lost forever,

sang Burns, in illustrating the fleeting character of human pleasure. The first snowflakes that fall into the Sierra rivers vanish thus suddenly; but in great storms, when the temperature is low, the abundance of the snow at length chills the water nearly to the freezing-point, and then, of course, it ceases to melt and consume the snow so suddenly. The falling flakes and crystals form, cloud-like masses of blue sludge, which are swept forward with the current and carried down to warmer climates many miles distant, while some are lodged against logs and rocks and projecting points of the banks, and last for days, piled high above the level of the water, and show white again, instead of being at once "lost forever," while the rivers themselves are at length lost for months during the snowy period. The snow is first

built out from the banks in bossy, over-curling drifts, compacting and cementing until the streams are spanned. They then flow in the dark beneath a continuous covering across the snowy zone, which is about thirty miles wide. All the Sierra rivers and their tributaries in these high regions are thus lost every winter, as if another glacial period had come on. Not a drop of running water is to be seen excepting at a few points where large falls occur, though the rush and rumble of the heavier currents may still be heard. Toward spring, when the weather is warm during the day and frosty at night, repeated thawing and freezing and new layers of snow render the bridging-masses dense and firm, so that one may safely walk across the streams, or even lead a horse across them without danger of falling through. In June the thinnest parts of the winter ceiling, and those most exposed to sunshine, begin to give way, forming dark, rugged-edged, pit-like sinks, at the bottom of which the rushing water may be seen. At the end of June only here and there may the mountaineer find a secure snow-bridge. The most lasting of the winter bridges, thawing from below as well as from above, because of warm currents of air passing through the tunnels, are strikingly arched and sculptured; and by the occasional freezing of the oozing, dripping water of the ceiling they become brightly and picturesquely icy. In some of the reaches, where there is a free margin, we may walk through them. Small skylights appearing here and there, these tunnels are not very dark. The roaring river fills all the arching way with impressively loud reverberating music, which

is sweetened at times by the ouzel, a bird that is not afraid to go wherever a stream may go, and to sing wherever a stream sings.

All the small alpine pools and lakelets are in like manner obliterated from the winter landscapes, either by being first frozen and then covered by snow, or by being filled in by avalanches. The first avalanche of the season shot into a lake basin may perhaps find the surface frozen. Then there is a grand crashing of breaking ice and dashing of waves mingled with the low, deep booming of the avalanche. Detached masses of the invading snow, mixed with fragments of ice, drift about in sludgy, island-like heaps, while the main body of it forms a talus with its base wholly or in part resting on the bottom of the basin, as controlled by its depth and the size of the avalanche. The next avalanche, of course, encroaches still farther, and so on with each in succession until the entire basin may be filled and its water sponged up or displaced. This huge mass of sludge, more or less mixed with sand, stones, and perhaps timber, is frozen to a considerable depth, and much sun-heat is required to thaw it. Some of these unfortunate lakelets are not clear of ice and snow until near the end of summer. Others are never quite free, opening only on the side opposite the entrance of the avalanches. Some show only a narrow crescent of water lying between the shore and sheer bluffs of icy compacted snow, masses of which breaking off float in front like icebergs in a miniature Arctic Ocean, while the avalanche heaps leaning back against the mountains look like small glaciers. The frontal cliffs

are in some instances quite picturesque, and with the berg-dotted waters in front of them lighted with sunshine are exceedingly beautiful. It often happens that while one side of a lake basin is hopelessly snow-buried and frozen, the other, enjoying sunshine, is adorned with beautiful flower-gardens. Some of the smaller lakes are extinguished in an instant by a heavy avalanche either of rocks or snow. The rolling, sliding, ponderous mass entering on one side sweeps across the bottom and up the opposite side, displacing the water and even scraping the basin clean, and shoving the accumulated rocks and sediments up the farther bank and taking full possession. The dislodged water is in part absorbed, but most of it is sent around the front of the avalanche and down the channel of the outlet, roaring and hurrying as if frightened and glad to escape.

SNOW-BANNERS

The most magnificent storm phenomenon I ever saw, surpassing in showy grandeur the most imposing effects of clouds, floods, or avalanches, was the peaks of the High Sierra, back of Yosemite Valley, decorated with snow-banners. Many of the starry snow-flowers, out of which these banners are made, fall before they are ripe, while most of those that do attain perfect development as six-rayed crystals glint and chafe against one another in their fall through the frosty air, and are broken into fragments. This dry fragmentary snow is still further prepared

for the formation of banners by the action of the wind. For, instead of finding rest at once, like the snow which falls into the tranquil depths of the forests, it is rolled over and over, beaten against rock-ridges, and swirled in pits and hollows, like boulders, pebbles, and sand in the pot-holes of a river, until finally the delicate angles of the crystals are worn off, and the whole mass is reduced to dust. And whenever storm-winds find this prepared snow-dust in a loose condition on exposed slopes, where there is a free upward sweep to leeward, it is tossed back into the sky, and borne onward from peak to peak in the form of banners or cloudy drifts, according to the velocity of the wind and the conformation of the slopes up or around which it is driven. While thus flying through the air, a small portion makes good its escape, and remains in the sky as vapor. But far the greater part, after being driven into the sky again and again, is at length locked fast in bossy drifts, or in the wombs of glaciers, some of it to remain silent and rigid for centuries before it is finally melted and sent singing down the mountainsides to the sea.

Yet, notwithstanding the abundance of winter snow-dust in the mountains, and the frequency of high winds, and the length of time the dust remains loose and exposed to their action, the occurrence of well-formed banners is, for causes we shall hereafter note, comparatively rare. I have seen only one display of this kind that seemed in every way perfect. This was in the winter of 1873, when the snow-laden summits were swept by

a wild "norther." I happened at the time to be wintering in Yosemite Valley, that sublime Sierra temple where every day one may see the grandest sights. Yet even here the wild gala-day of the north wind seemed surpassingly glorious. I was awakened in the morning by the rocking of my cabin and the beating of pine-burs on the roof. Detached torrents and avalanches from the main wind-flood overhead were rushing wildly down the narrow side cañons, and over the precipitous walls, with loud resounding roar, rousing the pines to enthusiastic action, and making the whole valley vibrate as though it were an instrument being played.

But afar on the lofty exposed peaks of the range standing so high in the sky, the storm was expressing itself in still grander characters, which I was soon to see in all their glory. I had long been anxious to study some points in the structure of the ice-cone that is formed every winter at the foot of the upper Yosemite fall, but the blinding spray by which it is invested had hitherto prevented me from making a sufficiently near approach. This morning the entire body of the fall was torn into gauzy shreds, and blown horizontally along the face of the cliff, leaving the cone dry; and while making my way to the top of an overlooking ledge to seize so favorable an opportunity to examine the interior of the cone, the peaks of the Merced group came in sight over the shoulder of the South Dome, each waving a resplendent banner against the blue sky, as regular in form, and as firm in texture, as if woven of fine silk. So rare and splendid a phenomenon, of course, overbore all other considerations, and I at once let

the ice-cone go, and began to force my way out of the valley to some dome or ridge sufficiently lofty to command a general view of the main summits, feeling assured that I should find them bannered still more gloriously; nor was I in the least disappointed. Indian Cañon, through which I climbed, was choked with snow that had been shot down in avalanches from the high cliffs on either side, rendering the ascent difficult; but inspired by the roaring storm, the tedious wallowing brought no fatigue, and in four hours I gained the top of a ridge above the valley, 8000 feet high. And there in bold relief, like a clear painting, appeared a most imposing scene. Innumerable peaks, black and sharp, rose grandly into the dark blue sky, their bases set in solid white, their sides streaked and splashed with snow, like ocean rocks with foam; and from every summit, all free and unconfused, was streaming a beautiful silky silvery banner, from half a mile to a mile in length, slender at the point of attachment, then widening gradually as it extended from the peak until it was about 1000 or 1500 feet in breadth, as near as I could estimate. The cluster of peaks called the "Crown of the Sierra," at the head of the Merced and Tuolumne rivers,—Mounts Dana, Gibbs, Conness, Lyell, Maclure, Ritter, with their nameless compeers,—each had its own refulgent banner, waving with a clearly visible motion in the sunglow, and there was not a single cloud in the sky to mar their simple grandeur. Fancy yourself standing on this Yosemite ridge looking eastward. You notice a strange garish glitter in the air. The gale drives wildly overhead with a fierce, tempestuous

roar, but its violence is not felt, for you are looking through a sheltered opening in the woods as through a window. There, in the immediate foreground of your picture, rises a majestic forest of Silver Fir blooming in eternal freshness, the foliage yellow-green, and the snow beneath the trees strewn with their beautiful plumes, plucked off by the wind. Beyond, and extending over all the middle ground, are somber swaths of pine, interrupted by huge swelling ridges and domes; and just beyond the dark forest you see the monarchs of the High Sierra waving their magnificent banners. They are twenty miles away, but you would not wish them nearer, for every feature is distinct, and the whole glorious show is seen in its right proportions. After this general view, mark how sharply the dark snowless ribs and buttresses and summits of the peaks are defined, excepting the portions veiled by the banners, and how delicately their sides are streaked with snow, where it has come to rest in narrow flutings and gorges. Mark, too, how grandly the banners wave as the wind is deflected against their sides, and how trimly each is attached to the very summit of its peak, like a streamer at a masthead; how smooth and silky they are in texture, and how finely their fading fringes are penciled on the azure sky. See how dense and opaque they are at the point of attachment, and how filmy and translucent toward the end, so that the peaks back of them are seen dimly, as though you were looking through ground glass. Yet again observe how some of the longest, belonging to the loftiest summits, stream perfectly free all the way across intervening notches and passes

from peak to peak, while others overlap and partly hide each other. And consider how keenly every particle of this wondrous cloth of snow is flashing out jets of light. These are the main features of the beautiful and terrible picture as seen from the forest window; and it would still be surpassingly glorious were the fore- and middle-grounds obliterated altogether, leaving only the black peaks, the white banners, and the blue sky.

Glancing now in a general way at the formation of snow-banners, we find that the main causes of the wondrous beauty and perfection of those we have been contemplating were the favorable direction and great force of the wind, the abundance of snow-dust, and the peculiar conformation of the slopes of the peaks. It is essential not only that the wind should move with great velocity and steadiness to supply a sufficiently copious and continuous stream of snow-dust, but that it should come from the north. No perfect banner is ever hung on the Sierra peaks by a south wind. Had the gale that day blown from the south, leaving other conditions unchanged, only a dull, confused, fog-like drift would have been produced; for the snow, instead of being spouted up over the tops of the peaks in concentrated currents to be drawn out as streamers, would have been shed off around the sides, and piled down into the glacier wombs. The cause of the concentrated action of the north wind is found in the peculiar form of the north sides of the peaks, where the amphitheaters of the residual glaciers are. In general the south sides are convex and irregular, while the north sides are

concave both in their vertical and horizontal sections; the wind in ascending these curves converges toward the summits, carrying the snow in concentrating currents with it, shooting it almost straight up into the air above the peaks, from which it is then carried away in a horizontal direction.

This difference in form between the north and south sides of the peaks was almost wholly produced by the difference in the kind and quantity of the glaciation to which they have been subjected, the north sides having been hollowed by residual shadow-glaciers of a form that never existed on the sun-beaten sides.

It appears, therefore, that shadows in great part determine not only the forms of lofty icy mountains, but also those of the snow-banners that the wild winds hang on them.

CHAPTER IV
A NEAR VIEW OF THE HIGH SIERRA

Early one bright morning in the middle of Indian summer, while the glacier meadows were still crisp with frost crystals, I set out from the foot of Mount Lyell, on my way down to Yosemite Valley, to replenish my exhausted store of bread and tea. I had spent the past summer, as many preceding ones, exploring the glaciers that lie on the head waters of the San Joaquin, Tuolumne, Merced, and Owen's rivers; measuring and studying their movements, trends, crevasses, moraines, etc., and the part they had played during the period of their greater extension in the creation and development of the landscapes of this alpine wonderland. The time for this kind of work was nearly over for the year, and I began to look forward with delight to the approaching winter with its wondrous storms, when I would be warmly snow-bound in my Yosemite cabin with plenty of bread and books; but a tinge of regret came on when I considered that possibly I might not see this favorite region again until the next summer, excepting distant views from the heights about the Yosemite walls.

To artists, few portions of the High Sierra are, strictly speaking, picturesque. The whole massive uplift of the range

is one great picture, not clearly divisible into smaller ones; differing much in this respect from the older, and what may be called, riper mountains of the Coast Range. All the landscapes of the Sierra, as we have seen, were born again, remodeled from base to summit by the developing ice-floods of the last glacial winter. But all those new landscapes were not brought forth simultaneously; some of the highest, where the ice lingered longest, are tens of centuries younger than those of the warmer regions below them. In general, the younger the mountain-landscapes,—younger, I mean, with reference to the time of their emergence from the ice of the glacial period,—the less separable are they into artistic bits capable of being made into warm, sympathetic, lovable pictures with appreciable humanity in them.

Here, however, on the head waters of the Tuolumne, is a group of wild peaks on which the geologist may say that the sun has but just begun to shine, which is yet in a high degree picturesque, and in its main features so regular and evenly balanced as almost to appear conventional—one somber cluster of snow-laden peaks with gray pine-fringed granite bosses braided around its base, the whole surging free into the sky from the head of a magnificent valley, whose lofty walls are beveled away on both sides so as to embrace it all without admitting anything not strictly belonging to it. The foreground was now aflame with autumn colors, brown and purple and gold, ripe in the mellow sunshine; contrasting brightly with the deep, cobalt blue of the sky, and the black and gray, and pure, spiritual white of the rocks and glaciers. Down

through the midst, the young Tuolumne was seen pouring from its crystal fountains, now resting in glassy pools as if changing back again into ice, now leaping in white cascades as if turning to snow; gliding right and left between granite bosses, then sweeping on through the smooth, meadowy levels of the valley, swaying pensively from side to side with calm, stately gestures past dipping willows and sedges, and around groves of arrowy pine; and throughout its whole eventful course, whether flowing fast or slow, singing loud or low, ever filling the landscape with spiritual animation, and manifesting the grandeur of its sources in every movement and tone.

Pursuing my lonely way down the valley, I turned again and again to gaze on the glorious picture, throwing up my arms to inclose it as in a frame. After long ages of growth in the darkness beneath the glaciers, through sunshine and storms, it seemed now to be ready and waiting for the elected artist, like yellow wheat for the reaper; and I could not help wishing that I might carry colors and brushes with me on my travels, and learn to paint. In the mean time I had to be content with photographs on my mind and sketches in my note-books. At length, after I had rounded a precipitous headland that puts out from the west wall of the valley, every peak vanished from sight, and I pushed rapidly along the frozen meadows, over the divide between the waters of the Merced and Tuolumne, and down through the forests that clothe the slopes of Cloud's Rest, arriving in Yosemite in due time—which, with me, is *any* time. And, strange to say, among

the first people I met here were two artists who, with letters of introduction, were awaiting my return. They inquired whether in the course of my explorations in the adjacent mountains I had ever come upon a landscape suitable for a large painting; whereupon I began a description of the one that had so lately excited my admiration. Then, as I went on further and further into details, their faces began to glow, and I offered to guide them to it, while they declared that they would gladly follow, far or near, whithersoever I could spare the time to lead them.

Since storms might come breaking down through the fine weather at any time, burying the colors in snow, and cutting off the artists' retreat, I advised getting ready at once.

I led them out of the valley by the Vernal and Nevada Falls, thence over the main dividing ridge to the Big Tuolumne Meadows, by the old Mono trail, and thence along the upper Tuolumne River to its head. This was my companions' first excursion into the High Sierra, and as I was almost always alone in my mountaineering, the way that the fresh beauty was reflected in their faces made for me a novel and interesting study. They naturally were affected most of all by the colors—the intense azure of the sky, the purplish grays of the granite, the red and browns of dry meadows, and the translucent purple and crimson of huckleberry bogs; the flaming yellow of aspen groves, the silvery flashing of the streams, and the bright green and blue of the glacier lakes. But the general expression of the scenery—rocky and savage—seemed sadly disappointing; and as

they threaded the forest from ridge to ridge, eagerly scanning the landscapes as they were unfolded, they said: "All this is huge and sublime, but we see nothing as yet at all available for effective pictures. Art is long, and art is limited, you know; and here are foregrounds, middle-grounds, backgrounds, all alike; bare rock-waves, woods, groves, diminutive flecks of meadow, and strips of glittering water." "Never mind," I replied, "only bide a wee, and I will show you something you will like."

At length, toward the end of the second day, the Sierra Crown began to come into view, and when we had fairly rounded the projecting headland before mentioned, the whole picture stood revealed in the flush of the alpenglow. Their enthusiasm was excited beyond bounds, and the more impulsive of the two, a young Scotchman, dashed ahead, shouting and gesticulating and tossing his arms in the air like a madman. Here, at last, was a typical alpine landscape.

After feasting awhile on the view, I proceeded to make camp in a sheltered grove a little way back from the meadow, where pine-boughs could be obtained for beds, and where there was plenty of dry wood for fires, while the artists ran here and there, along the river-bends and up the sides of the cañon, choosing foregrounds for sketches. After dark, when our tea was made and a rousing fire had been built, we began to make our plans. They decided to remain several days, at the least, while I concluded to make an excursion in the mean time to the untouched summit of Ritter.

It was now about the middle of October, the springtime of snow-flowers. The first winter-clouds had already bloomed, and the peaks were strewn with fresh crystals, without, however, affecting the climbing to any dangerous extent. And as the weather was still profoundly calm, and the distance to the foot of the mountain only a little more than a day, I felt that I was running no great risk of being storm-bound.

Mount Ritter is king of the mountains of the middle portion of the High Sierra, as Shasta of the north and Whitney of the south sections. Moreover, as far as I know, it had never been climbed. I had explored the adjacent wilderness summer after summer, but my studies thus far had never drawn me to the top of it. Its height above sea-level is about 13,300 feet, and it is fenced round by steeply inclined glaciers, and cañons of tremendous depth and ruggedness, which render it almost inaccessible. But difficulties of this kind only exhilarate the mountaineer.

Next morning, the artists went heartily to their work and I to mine. Former experiences had given good reason to know that passionate storms, invisible as yet, might be brooding in the calm sun-gold; therefore, before bidding farewell, I warned the artists not to be alarmed should I fail to appear before a week or ten days, and advised them, in case a snow-storm should set in, to keep up big fires and shelter themselves as best they could, and on no account to become frightened and attempt to seek their way back to Yosemite alone through the drifts.

My general plan was simply this: to scale the cañon, wall,

cross over to the eastern flank of the range, and then make my way southward to the northern spurs of Mount Ritter in compliance with the intervening topography; for to push on directly southward from camp through the innumerable peaks and pinnacles that adorn this portion of the axis of the range, however interesting, would take too much time, besides being extremely difficult and dangerous at this time of year.

All my first day was pure pleasure; simply mountaineering indulgence, crossing the dry pathways of the ancient glaciers, tracing happy streams, and learning the habits of the birds and marmots in the groves and rocks. Before I had gone a mile from camp, I came to the foot of a white cascade that beats its way down a rugged gorge in the cañon wall, from a height of about nine hundred feet, and pours its throbbing waters into the Tuolumne. I was acquainted with its fountains, which, fortunately, lay in my course. What a fine traveling companion it proved to be, what songs it sang, and how passionately it told the mountain's own joy! Gladly I climbed along its dashing border, absorbing its divine music, and bathing from time to time in waftings of irised spray. Climbing higher, higher, now beauty came streaming on the sight: painted meadows, late-blooming gardens, peaks of rare architecture, lakes here and there, shining like silver, and glimpses of the forested middle region and the yellow lowlands far in the west. Beyond the range I saw the so-called Mono Desert, lying dreamily silent in thick purple light—a desert of heavy sun-glare beheld from a desert of ice-burnished

granite. Here the waters divide, shouting in glorious enthusiasm, and falling eastward to vanish in the volcanic sands and dry sky of the Great Basin, or westward to the Great Valley of California, and thence through the Bay of San Francisco and the Golden Gate to the sea.

Passing a little way down over the summit until I had reached an elevation of about 10,000 feet, I pushed on southward toward a group of savage peaks that stand guard about Ritter on the north and west, groping my way, and dealing instinctively with every obstacle as it presented itself. Here a huge gorge would be found cutting across my path, along the dizzy edge of which I scrambled until some less precipitous point was discovered where I might safely venture to the bottom and then, selecting some feasible portion of the opposite wall, reascend with the same slow caution. Massive, flat-topped spurs alternate with the gorges, plunging abruptly from the shoulders of the snowy peaks, and planting their feet in the warm desert. These were everywhere marked and adorned with characteristic sculptures of the ancient glaciers that swept over this entire region like one vast ice-wind, and the polished surfaces produced by the ponderous flood are still so perfectly preserved that in many places the sunlight reflected from them is about as trying to the eyes as sheets of snow.

God's glacial-mills grind slowly, but they have been kept in motion long enough in California to grind sufficient soil for a glorious abundance of life, though most of the grist has been

carried to the lowlands, leaving these high regions comparatively lean and bare; while the post-glacial agents of erosion have not yet furnished sufficient available food over the general surface for more than a few tufts of the hardiest plants, chiefly carices and eriogonae. And it is interesting to learn in this connection that the sparseness and repressed character of the vegetation at this height is caused more by want of soil than by harshness of climate; for, here and there, in sheltered hollows (countersunk beneath the general surface) into which a few rods of well-ground moraine chips have been dumped, we find groves of spruce and pine thirty to forty feet high, trimmed around the edges with willow and huckleberry bushes, and oftentimes still further by an outer ring of tall grasses, bright with lupines, larkspurs, and showy columbines, suggesting a climate by no means repressingly severe. All the streams, too, and the pools at this elevation are furnished with little gardens wherever soil can be made to lie, which, though making scarce any show at a distance, constitute charming surprises to the appreciative observer. In these bits of leanness a few birds find grateful homes. Having no acquaintance with man, they fear no ill, and flock curiously about the stranger, almost allowing themselves to be taken in the hand. In so wild and so beautiful a region was spent my first day, every sight and sound inspiring, leading one far out of himself, yet feeding and building up his individuality.

Now came the solemn, silent evening. Long, blue, spiky shadows crept out across the snow-fields, while a rosy glow,

at first scarce discernible, gradually deepened and suffused every mountain-top, flushing the glaciers and the harsh crags above them. This was the alpenglow, to me one of the most impressive of all the terrestrial manifestations of God. At the touch of this divine light, the mountains seemed to kindle to a rapt, religious consciousness, and stood hushed and waiting like devout worshipers. Just before the alpenglow began to fade, two crimson clouds came streaming across the summit like wings of flame, rendering the sublime scene yet more impressive; then came darkness and the stars.

Icy Ritter was still miles away, but I could proceed no farther that night. I found a good campground on the rim of a glacier basin about 11,000 feet above the sea. A small lake nestles in the bottom of it, from which I got water for my tea, and a storm-beaten thicket near by furnished abundance of resiny fire-wood. Somber peaks, hacked and shattered, circled half-way around the horizon, wearing a savage aspect in the gloaming, and a waterfall chanted solemnly across the lake on its way down from the foot of a glacier. The fall and the lake and the glacier were almost equally bare; while the scraggy pines anchored in the rock-fissures were so dwarfed and shorn by storm-winds that you might walk over their tops. In tone and aspect the scene was one of the most desolate I ever beheld. But the darkest scriptures of the mountains are illumined with bright passages of love that never fail to make themselves felt when one is alone.

I made my bed in a nook of the pine-thicket, where the

branches were pressed and crinkled overhead like a roof, and bent down around the sides. These are the best bedchambers the high mountains afford—snug as squirrel-nests, well ventilated, full of spicy odors, and with plenty of wind-played needles to sing one asleep. I little expected company, but, creeping in through a low side-door, I found five or six birds nestling among the tassels. The night-wind began to blow soon after dark; at first only a gentle breathing, but increasing toward midnight to a rough gale that fell upon my leafy roof in ragged surges like a cascade, bearing wild sounds from the crags overhead. The waterfall sang in chorus, filling the old ice-fountain with its solemn roar, and seeming to increase in power as the night advanced—fit voice for such a landscape. I had to creep out many times to the fire during the night, for it was biting cold and I had no blankets. Gladly I welcomed the morning star.

The dawn in the dry, wavering air of the desert was glorious. Everything encouraged my undertaking and betokened success. There was no cloud in the sky, no storm-tone in the wind. Breakfast of bread and tea was soon made. I fastened a hard, durable crust to my belt by way of provision, in case I should be compelled to pass a night on the mountain-top; then, securing the remainder of my little stock against wolves and wood-rats, I set forth free and hopeful.

How glorious a greeting the sun gives the mountains! To behold this alone is worth the pains of any excursion a thousand times over. The highest peaks burned like islands in a sea

of liquid shade. Then the lower peaks and spires caught the glow, and long lances of light, streaming through many a notch and pass, fell thick on the frozen meadows. The majestic form of Ritter was full in sight, and I pushed rapidly on over rounded rock-bosses and pavements, my iron-shod shoes making a clanking sound, suddenly hushed now and then in rugs of bryanthus, and sedgy lake-margins soft as moss. Here, too, in this so-called "land of desolation," I met cassiope, growing in fringes among the battered rocks. Her blossoms had faded long ago, but they were still clinging with happy memories to the evergreen sprays, and still so beautiful as to thrill every fiber of one's being. Winter and summer, you may hear her voice, the low, sweet melody of her purple bells. No evangel among all the mountain plants speaks Nature's love more plainly than cassiope. Where she dwells, the redemption of the coldest solitude is complete. The very rocks and glaciers seem to feel her presence, and become imbued with her own fountain sweetness. All things were warming and awakening. Frozen rills began to flow, the marmots came out of their nests in boulder-piles and climbed sunny rocks to bask, and the dun-headed sparrows were flitting about seeking their breakfasts. The lakes seen from every ridge-top were brilliantly rippled and spangled, shimmering like the thickets of the low Dwarf Pines. The rocks, too, seemed responsive to the vital heat—rock-crystals and snow-crystals thrilling alike. I strode on exhilarated, as if never more to feel fatigue, limbs moving of themselves, every sense unfolding like

the thawing flowers, to take part in the new day harmony.

All along my course thus far, excepting when down in the cañons, the landscapes were mostly open to me, and expansive, at least on one side. On the left were the purple plains of Mono, reposing dreamily and warm; on the right, the near peaks springing keenly into the thin sky with more and more impressive sublimity. But these larger views were at length lost. Rugged spurs, and moraines, and huge, projecting buttresses began to shut me in. Every feature became more rigidly alpine, without, however, producing any chilling effect; for going to the mountains is like going home. We always find that the strangest objects in these fountain wilds are in some degree familiar, and we look upon them with a vague sense of having seen them before.

On the southern shore of a frozen lake, I encountered an extensive field of hard, granular snow, up which I scampered in fine tone, intending to follow it to its head, and cross the rocky spur against which it leans, hoping thus to come direct upon the base of the main Ritter peak. The surface was pitted with oval hollows, made by stones and drifted pine-needles that had melted themselves into the mass by the radiation of absorbed sun-heat. These afforded good footholds, but the surface curved more and more steeply at the head, and the pits became shallower and less abundant, until I found myself in danger of being shed off like avalanching snow. I persisted, however, creeping on all fours, and shuffling up the smoothest places on my back, as I had often

done on burnished granite, until, after slipping several times, I was compelled to retrace my course to the bottom, and make my way around the west end of the lake, and thence up to the summit of the divide between the head waters of Rush Creek and the northernmost tributaries of the San Joaquin.

Arriving on the summit of this dividing crest, one of the most exciting pieces of pure wilderness was disclosed that I ever discovered in all my mountaineering. There, immediately in front, loomed the majestic mass of Mount Ritter, with a glacier swooping down its face nearly to my feet, then curving westward and pouring its frozen flood into a dark blue lake, whose shores were bound with precipices of crystalline snow; while a deep chasm drawn between the divide and the glacier separated the massive picture from everything else. I could see only the one sublime mountain, the one glacier, the one lake; the whole veiled with one blue shadow—rock, ice, and water close together without a single leaf or sign of life. After gazing spellbound, I began instinctively to scrutinize every notch and gorge and weathered buttress of the mountain, with reference to making the ascent. The entire front above the glacier appeared as one tremendous precipice, slightly receding at the top, and bristling with spires and pinnacles set above one another in formidable array. Massive lichen-stained battlements stood forward here and there, hacked at the top with angular notches, and separated by frosty gullies and recesses that have been veiled in shadow ever since their creation; while to right and left, as far as I could see,

were huge, crumbling buttresses, offering no hope to the climber. The head of the glacier sends up a few finger-like branches through narrow *couloirs*; but these seemed too steep and short to be available, especially as I had no ax with which to cut steps, and the numerous narrow-throated gullies down which stones and snow are avalanched seemed hopelessly steep, besides being interrupted by vertical cliffs; while the whole front was rendered still more terribly forbidding by the chill shadow and the gloomy blackness of the rocks.

Descending the divide in a hesitating mood, I picked my way across the yawning chasm at the foot, and climbed out upon the glacier. There were no meadows now to cheer with their brave colors, nor could I hear the dun-headed sparrows, whose cheery notes so often relieve the silence of our highest mountains. The only sounds were the gurgling of small rills down in the veins and crevasses of the glacier, and now and then the rattling report of falling stones, with the echoes they shot out into the crisp air.

I could not distinctly hope to reach the summit from this side, yet I moved on across the glacier as if driven by fate. Contending with myself, the season is too far spent, I said, and even should I be successful, I might be storm-bound on the mountain; and in the cloud-darkness, with the cliffs and crevasses covered with snow, how could I escape? No; I must wait till next summer. I would only approach the mountain now, and inspect it, creep about its flanks, learn what I could of its history, holding myself ready to flee on the approach of the first storm-cloud. But we

little know until tried how much of the uncontrollable there is in us, urging across glaciers and torrents, and up dangerous heights, let the judgment forbid as it may.

I succeeded in gaining the foot of the cliff on the eastern extremity of the glacier, and there discovered the mouth of a narrow avalanche gully, through which I began to climb, intending to follow it as far as possible, and at least obtain some fine wild views for my pains. Its general course is oblique to the plane of the mountain-face, and the metamorphic slates of which the mountain is built are cut by cleavage planes in such a way that they weather off in angular blocks, giving rise to irregular steps that greatly facilitate climbing on the sheer places. I thus made my way into a wilderness of crumbling spires and battlements, built together in bewildering combinations, and glazed in many places with a thin coating of ice, which I had to hammer off with stones. The situation was becoming gradually more perilous; but, having passed several dangerous spots, I dared not think of descending; for, so steep was the entire ascent, one would inevitably fall to the glacier in case a single misstep were made. Knowing, therefore, the tried danger beneath, I became all the more anxious concerning the developments to be made above, and began to be conscious of a vague foreboding of what actually befell; not that I was given to fear, but rather because my instincts, usually so positive and true, seemed vitiated in some way, and were leading me astray. At length, after attaining an elevation of about 12,800 feet, I found myself at the foot of a

sheer drop in the bed of the avalanche channel I was tracing, which seemed absolutely to bar further progress. It was only about forty-five or fifty feet high, and somewhat roughened by fissures and projections; but these seemed so slight and insecure, as footholds, that I tried hard to avoid the precipice altogether, by scaling the wall of the channel on either side. But, though less steep, the walls were smoother than the obstructing rock, and repeated efforts only showed that I must either go right ahead or turn back. The tried dangers beneath seemed even greater than that of the cliff in front; therefore, after scanning its face again and again, I began to scale it, picking my holds with intense caution. After gaining a point about halfway to the top, I was suddenly brought to a dead stop, with arms outspread, clinging close to the face of the rock, unable to move hand or foot either up or down. My doom appeared fixed. I *must* fall. There would be a moment of bewilderment, and then a lifeless rumble down the one general precipice to the glacier below.

When this final danger flashed upon me, I became nerve-shaken for the first time since setting foot on the mountains, and my mind seemed to fill with a stifling smoke. But this terrible eclipse lasted only a moment, when life blazed forth again with preternatural clearness. I seemed suddenly to become possessed of a new sense. The other self, bygone experiences, Instinct, or Guardian Angel,—call it what you will,—came forward and assumed control. Then my trembling muscles became firm again, every rift and flaw in the rock was seen as through a microscope,

and my limbs moved with a positiveness and precision with which I seemed to have nothing at all to do. Had I been borne aloft upon wings, my deliverance could not have been more complete.

Above this memorable spot, the face of the mountain is still more savagely hacked and torn. It is a maze of yawning chasms and gullies, in the angles of which rise beetling crags and piles of detached boulders that seem to have been gotten ready to be launched below. But the strange influx of strength I had received seemed inexhaustible. I found a way without effort, and soon stood upon the topmost crag in the blessed light.

How truly glorious the landscape circled around this noble summit!—giant mountains, valleys innumerable, glaciers and meadows, rivers and lakes, with the wide blue sky bent tenderly over them all. But in my first hour of freedom from that terrible shadow, the sunlight in which I was laving seemed all in all.

Looking southward along the axis of the range, the eye is first caught by a row of exceedingly sharp and slender spires, which rise openly to a height of about a thousand feet, above a series of short, residual glaciers that lean back against their bases; their fantastic sculpture and the unrelieved sharpness with which they spring out of the ice rendering them peculiarly wild and striking. These are "The Minarets." Beyond them you behold a sublime wilderness of mountains, their snowy summits towering together in crowded abundance, peak beyond peak, swelling higher, higher as they sweep on southward, until the culminating

point of the range is reached on Mount Whitney, near the head of the Kern River, at an elevation of nearly 14,700 feet above the level of the sea.

Westward, the general flank of the range is seen flowing sublimely away from the sharp summits, in smooth undulations; a sea of huge gray granite waves dotted with lakes and meadows, and fluted with stupendous cañons that grow steadily deeper as they recede in the distance. Below this gray region lies the dark forest zone, broken here and there by upswelling ridges and domes; and yet beyond lies a yellow, hazy belt, marking the broad plain of the San Joaquin, bounded on its farther side by the blue mountains of the coast.

Turning now to the northward, there in the immediate foreground is the glorious Sierra Crown, with Cathedral Peak, a temple of marvelous architecture, a few degrees to the left of it; the gray, massive form of Mammoth Mountain to the right; while Mounts Ord, Gibbs, Dana, Conness, Tower Peak, Castle Peak, Silver Mountain, and a host of noble companions, as yet nameless, make a sublime show along the axis of the range.

Eastward, the whole region seems a land of desolation covered with beautiful light. The torrid volcanic basin of Mono, with its one bare lake fourteen miles long; Owen's Valley and the broad lava table-land at its head, dotted with craters, and the massive Inyo Range, rivaling even the Sierra in height; these are spread, map-like, beneath you, with countless ranges beyond, passing and overlapping one another and fading on the glowing horizon.

At a distance of less than 3000 feet below the summit of Mount Ritter you may find tributaries of the San Joaquin and Owen's rivers, bursting forth from the ice and snow of the glaciers that load its flanks; while a little to the north of here are found the highest affluents of the Tuolumne and Merced. Thus, the fountains of four of the principal rivers of California are within a radius of four or five miles.

Lakes are seen gleaming in all sorts of places,—round, or oval, or square, like very mirrors; others narrow and sinuous, drawn close around the peaks like silver zones, the highest reflecting only rocks, snow, and the sky. But neither these nor the glaciers, nor the bits of brown meadow and moorland that occur here and there, are large enough to make any marked impression upon the mighty wilderness of mountains. The eye, rejoicing in its freedom, roves about the vast expanse, yet returns again and again to the fountain peaks. Perhaps some one of the multitude excites special attention, some gigantic castle with turret and battlement, or some Gothic cathedral more abundantly spired than Milan's. But, generally, when looking for the first time from an all-embracing standpoint like this, the inexperienced observer is oppressed by the incomprehensible grandeur, variety, and abundance of the mountains rising shoulder to shoulder beyond the reach of vision; and it is only after they have been studied one by one, long and lovingly, that their far-reaching harmonies become manifest. Then, penetrate the wilderness where you may, the main telling features, to which all the surrounding

topography is subordinate, are quickly perceived, and the most complicated clusters of peaks stand revealed harmoniously correlated and fashioned like works of art—eloquent monuments of the ancient ice-rivers that brought them into relief from the general mass of the range. The cañons, too, some of them a mile deep, mazing wildly through the mighty host of mountains, however lawless and ungovernable at first sight they appear, are at length recognized as the necessary effects of causes which followed each other in harmonious sequence—Nature's poems carved on tables of stone—the simplest and most emphatic of her glacial compositions.

Could we have been here to observe during the glacial period, we should have overlooked a wrinkled ocean of ice as continuous as that now covering the landscapes of Greenland; filling every valley and cañon with only the tops of the fountain peaks rising darkly above the rock-encumbered ice-waves like islets in a stormy sea—those islets the only hints of the glorious landscapes now smiling in the sun. Standing here in the deep, brooding silence all the wilderness seems motionless, as if the work of creation were done. But in the midst of this outer steadfastness we know there is incessant motion and change. Ever and anon, avalanches are falling from yonder peaks. These cliff-bound glaciers, seemingly wedged and immovable, are flowing like water and grinding the rocks beneath them. The lakes are lapping their granite shores and wearing them away, and every one of these rills and young rivers is fretting the air into music, and

carrying the mountains to the plains. Here are the roots of all the life of the valleys, and here more simply than elsewhere is the eternal flux of nature manifested. Ice changing to water, lakes to meadows, and mountains to plains. And while we thus contemplate Nature's methods of landscape creation, and, reading the records she has carved on the rocks, reconstruct, however imperfectly, the landscapes of the past, we also learn that as these we now behold have succeeded those of the pre-glacial age, so they in turn are withering and vanishing to be succeeded by others yet unborn.

But in the midst of these fine lessons and landscapes, I had to remember that the sun was wheeling far to the west, while a new way down the mountain had to be discovered to some point on the timber line where I could have a fire; for I had not even burdened myself with a coat. I first scanned the western spurs, hoping some way might appear through which I might reach the northern glacier, and cross its snout; or pass around the lake into which it flows, and thus strike my morning track. This route was soon sufficiently unfolded to show that, if practicable at all, it would require so much time that reaching camp that night would be out of the question. I therefore scrambled back eastward, descending the southern slopes obliquely at the same time. Here the crags seemed less formidable, and the head of a glacier that flows northeast came in sight, which I determined to follow as far as possible, hoping thus to make my way to the foot of the peak on the east side, and thence across the intervening

cañons and ridges to camp.

The inclination of the glacier is quite moderate at the head, and, as the sun had softened the *névé*, I made safe and rapid progress, running and sliding, and keeping up a sharp outlook for crevasses. About half a mile from the head, there is an ice-cascade, where the glacier pours over a sharp declivity and is shattered into massive blocks separated by deep, blue fissures. To thread my way through the slippery mazes of this crevassed portion seemed impossible, and I endeavored to avoid it by climbing off to the shoulder of the mountain. But the slopes rapidly steepened and at length fell away in sheer precipices, compelling a return to the ice. Fortunately, the day had been warm enough to loosen the ice-crystals so as to admit of hollows being dug in the rotten portions of the blocks, thus enabling me to pick my way with far less difficulty than I had anticipated. Continuing down over the snout, and along the left lateral moraine, was only a confident saunter, showing that the ascent of the mountain by way of this glacier is easy, provided one is armed with an ax to cut steps here and there.

The lower end of the glacier was beautifully waved and barred by the outcropping edges of the bedded ice-layers which represent the annual snowfalls, and to some extent the irregularities of structure caused by the weathering of the walls of crevasses, and by separate snowfalls which have been followed by rain, hail, thawing and freezing, etc. Small rills were gliding and swirling over the melting surface with a

smooth, oily appearance, in channels of pure ice—their quick, compliant movements contrasting most impressively with the rigid, invisible flow of the glacier itself, on whose back they all were riding.

Night drew near before I reached the eastern base of the mountain, and my camp lay many a rugged mile to the north; but ultimate success was assured. It was now only a matter of endurance and ordinary mountain-craft. The sunset was, if possible, yet more beautiful than that of the day before. The Mono landscape seemed to be fairly saturated with warm, purple light. The peaks marshaled along the summit were in shadow, but through every notch and pass streamed vivid sun-fire, soothing and irradiating their rough, black angles, while companies of small, luminous clouds hovered above them like very angels of light.

Darkness came on, but I found my way by the trends of the cañons and the peaks projected against the sky. All excitement died with the light, and then I was weary. But the joyful sound of the waterfall across the lake was heard at last, and soon the stars were seen reflected in the lake itself. Taking my bearings from these, I discovered the little pine thicket in which my nest was, and then I had a rest such as only a tired mountaineer may enjoy. After lying loose and lost for awhile, I made a sunrise fire, went down to the lake, dashed water on my head, and dipped a cupful for tea. The revival brought about by bread and tea was as complete as the exhaustion from excessive enjoyment and toil.

Then I crept beneath the pine-tassels to bed. The wind was frosty and the fire burned low, but my sleep was none the less sound, and the evening constellations had swept far to the west before I awoke.

After thawing and resting in the morning sunshine, I sauntered home,—that is, back to the Tuolumne camp,—bearing away toward a cluster of peaks that hold the fountain snows of one of the north tributaries of Rush Creek. Here I discovered a group of beautiful glacier lakes, nestled together in a grand amphitheater. Toward evening, I crossed the divide separating the Mono waters from those of the Tuolumne, and entered the glacier basin that now holds the fountain snows of the stream that forms the upper Tuolumne cascades. This stream I traced down through its many dells and gorges, meadows and bogs, reaching the brink of the main Tuolumne at dusk.

A loud whoop for the artists was answered again and again. Their camp-fire came in sight, and half an hour afterward I was with them. They seemed unreasonably glad to see me. I had been absent only three days; nevertheless, though the weather was fine, they had already been weighing chances as to whether I would ever return, and trying to decide whether they should wait longer or begin to seek their way back to the lowlands. Now their curious troubles were over. They packed their precious sketches, and next morning we set out homeward bound, and in two days entered the Yosemite Valley from the north by way of Indian Cañon.

CHAPTER V
THE PASSES

The sustained grandeur of the High Sierra is strikingly illustrated by the great height of the passes. Between latitude 36° 20' and 38° the lowest pass, gap, gorge, or notch of any kind cutting across the axis of the range, as far as I have discovered, exceeds 9000 feet in height above the level of the sea; while the average height of all that are in use, either by Indians or whites, is perhaps not less than 11,000 feet, and not one of these is a carriage-pass.

Farther north a carriage-road has been constructed through what is known as the Sonora Pass, on the head waters of the Stanislaus and Walker's rivers, the summit of which is about 10,000 feet above the sea. Substantial wagon-roads have also been built through the Carson and Johnson passes, near the head of Lake Tahoe, over which immense quantities of freight were hauled from California to the mining regions of Nevada, before the construction of the Central Pacific Railroad.

Still farther north, a considerable number of comparatively low passes occur, some of which are accessible to wheeled vehicles, and through these rugged defiles during the exciting years of the gold period long emigrant-trains with foot-sore cattle wearily toiled. After the toil-worn adventurers had escaped a

thousand dangers and had crawled thousands of miles across the plains the snowy Sierra at last loomed in sight, the eastern wall of the land of gold. And as with shaded eyes they gazed through the tremulous haze of the desert, with what joy must they have descried the pass through which they were to enter the better land of their hopes and dreams!

Between the Sonora Pass and the southern extremity of the High Sierra, a distance of nearly 160 miles, there are only five passes through which trails conduct from one side of the range to the other. These are barely practicable for animals; a pass in these regions meaning simply any notch or cañon through which one may, by the exercise of unlimited patience, make out to lead a mule, or a sure-footed mustang; animals that can slide or jump as well as walk. Only three of the five passes may be said to be in use, viz.: the Kearsarge, Mono, and Virginia Creek; the tracks leading through the others being only obscure Indian trails, not graded in the least, and scarcely traceable by white men; for much of the way is over solid rock and earthquake avalanche taluses, where the unshod ponies of the Indians leave no appreciable sign. Only skilled mountaineers are able to detect the marks that serve to guide the Indians, such as slight abrasions of the looser rocks, the displacement of stones here and there, and bent bushes and weeds. A general knowledge of the topography is, then, the main guide, enabling one to determine where the trail ought to go—*must* go. One of these Indian trails crosses the range by a nameless pass between the head waters of the south and middle

forks of the San Joaquin, the other between the north and middle forks of the same river, just to the south of "The Minarets"; this last being about 9000 feet high, is the lowest of the five. The Kearsarge is the highest, crossing the summit near the head of the south fork of King's River, about eight miles to the north of Mount Tyndall, through the midst of the most stupendous rock-scenery. The summit of this pass is over 12,000 feet above sea-level; nevertheless, it is one of the safest of the five, and is used every summer, from July to October or November, by hunters, prospectors, and stock-owners, and to some extent by enterprising pleasure-seekers also. For, besides the surpassing grandeur of the scenery about the summit, the trail, in ascending the western flank of the range, conducts through a grove of the giant Sequoias, and through the magnificent Yosemite Valley of the south fork of King's River. This is, perhaps, the highest traveled pass on the North American continent.

The Mono Pass lies to the east of Yosemite Valley, at the head of one of the tributaries of the south fork of the Tuolumne. This is the best known and most extensively traveled of all that exist in the High Sierra. A trail was made through it about the time of the Mono gold excitement, in the year 1858, by adventurous miners and prospectors—men who would build a trail down the throat of darkest Erebus on the way to gold. Though more than a thousand feet lower than the Kearsarge, it is scarcely less sublime in rock-scenery, while in snowy, falling water it far surpasses it. Being so favorably situated for the stream of Yosemite travel, the more

adventurous tourists cross over through this glorious gateway to the volcanic region around Mono Lake. It has therefore gained a name and fame above every other pass in the range. According to the few barometrical observations made upon it, its highest point is 10,765 feet above the sea. The other pass of the five we have been considering is somewhat lower, and crosses the axis of the range a few miles to the north of the Mono Pass, at the head of the southernmost tributary of Walker's River. It is used chiefly by roaming bands of the Pah Ute Indians and "sheepmen."

But, leaving wheels and animals out of the question, the free mountaineer with a sack of bread on his shoulders and an ax to cut steps in ice and frozen snow can make his way across the range almost everywhere, and at any time of year when the weather is calm. To him nearly every notch between the peaks is a pass, though much patient step-cutting is at times required up and down steeply inclined glaciers, with cautious climbing over precipices that at first sight would seem hopelessly inaccessible.

In pursuing my studies, I have crossed from side to side of the range at intervals of a few miles all along the highest portion of the chain, with far less real danger than one would naturally count on. And what fine wildness was thus revealed—storms and avalanches, lakes and waterfalls, gardens and meadows, and interesting animals—only those will ever know who give the freest and most buoyant portion of their lives to climbing and seeing for themselves.

To the timid traveler, fresh from the sedimentary levels of the

lowlands, these highways, however picturesque and grand, seem terribly forbidding—cold, dead, gloomy gashes in the bones of the mountains, and of all Nature's ways the ones to be most cautiously avoided. Yet they are full of the finest and most telling examples of Nature's love; and though hard to travel, none are safer. For they lead through regions that lie far above the ordinary haunts of the devil, and of the pestilence that walks in darkness. True, there are innumerable places where the careless step will be the last step; and a rock falling from the cliffs may crush without warning like lightning from the sky; but what then! Accidents in the mountains are less common than in the lowlands, and these mountain mansions are decent, delightful, even divine, places to die in, compared with the doleful chambers of civilization. Few places in this world are more dangerous than home. Fear not, therefore, to try the mountain-passes. They will kill care, save you from deadly apathy, set you free, and call forth every faculty into vigorous, enthusiastic action. Even the sick should try these so-called dangerous passes, because for every unfortunate they kill, they cure a thousand.

All the passes make their steepest ascents on the eastern flank. On this side the average rise is not far from a thousand feet to the mile, while on the west it is about two hundred feet. Another marked difference between the eastern and western portions of the passes is that the former begin at the very foot of the range, while the latter can hardly be said to begin lower than an elevation of from seven to ten thousand feet. Approaching the

range from the gray levels of Mono and Owen's Valley on the east, the traveler sees before him the steep, short passes in full view, fenced in by rugged spurs that come plunging down from the shoulders of the peaks on either side, the courses of the more direct being disclosed from top to bottom without interruption. But from the west one sees nothing of the way he may be seeking until near the summit, after days have been spent in threading the forests growing on the main dividing ridges between the river cañons.

It is interesting to observe how surely the alp-crossing animals of every kind fall into the same trails. The more rugged and inaccessible the general character of the topography of any particular region, the more surely will the trails of white men, Indians, bears, wild sheep, etc., be found converging into the best passes. The Indians of the western slope venture cautiously over the passes in settled weather to attend dances, and obtain loads of pine-nuts and the larvae of a small fly that breeds in Mono and Owen's lakes, which, when dried, forms an important article of food; while the Pah Utes cross over from the east to hunt the deer and obtain supplies of acorns; and it is truly astonishing to see what immense loads the haggard old squaws make out to carry bare-footed through these rough passes, oftentimes for a distance of sixty or seventy miles. They are always accompanied by the men, who stride on, unburdened and erect, a little in advance, kindly stooping at difficult places to pile stepping-stones for their patient, pack-animal wives, just as they would prepare the way

for their ponies.

Bears evince great sagacity as mountaineers, but although they are tireless and enterprising travelers they seldom cross the range. I have several times tracked them through the Mono Pass, but only in late years, after cattle and sheep had passed that way, when they doubtless were following to feed on the stragglers and on those that had been killed by falling over the rocks. Even the wild sheep, the best mountaineers of all, choose regular passes in making journeys across the summits. Deer seldom cross the range in either direction. I have never yet observed a single specimen of the mule-deer of the Great Basin west of the summit, and rarely one of the black-tailed species on the eastern slope, notwithstanding many of the latter ascend the range nearly to the summit every summer, to feed in the wild gardens and bring forth their young.

The glaciers are the pass-makers, and it is by them that the courses of all mountaineers are predestined. Without exception every pass in the Sierra was created by them without the slightest aid or predetermining guidance from any of the cataclysmic agents. I have seen elaborate statements of the amount of drilling and blasting accomplished in the construction of the railroad across the Sierra, above Donner Lake; but for every pound of rock moved in this way, the glaciers which descended east and west through this same pass, crushed and carried away more than a hundred tons.

The so-called practicable road-passes are simply those

portions of the range more degraded by glacial action than the adjacent portions, and degraded in such a way as to leave the summits rounded, instead of sharp; while the peaks, from the superior strength and hardness of their rocks, or from more favorable position, having suffered less degradation, are left towering above the passes as if they had been heaved into the sky by some force acting from beneath.

The scenery of all the passes, especially at the head, is of the wildest and grandest description,—lofty peaks massed together and laden around their bases with ice and snow; chains of glacier lakes; cascading streams in endless variety, with glorious views, westward over a sea of rocks and woods, and eastward over strange ashy plains, volcanoes, and the dry, dead-looking ranges of the Great Basin. Every pass, however, possesses treasures of beauty all its own.

Having thus in a general way indicated the height, leading features, and distribution of the principal passes, I will now endeavor to describe the Mono Pass in particular, which may, I think, be regarded as a fair example of the higher alpine passes in general.

The main portion of the Mono Pass is formed by Bloody Cañon, which begins at the summit of the range, and runs in a general east-northeasterly direction to the edge of the Mono Plain.

The first white men who forced a way through its somber depths were, as we have seen, eager gold-seekers. But the cañon

was known and traveled as a pass by the Indians and mountain animals long before its discovery by white men, as is shown by the numerous tributary trails which come into it from every direction. Its name accords well with the character of the "early times" in California, and may perhaps have been suggested by the predominant color of the metamorphic slates in which it is in great part eroded; or more probably by blood-stains made by the unfortunate animals which were compelled to slip and shuffle awkwardly over its rough, cutting rocks. I have never known an animal, either mule or horse, to make its way through the cañon, either in going up or down, without losing more or less blood from wounds on the legs. Occasionally one is killed outright —falling headlong and rolling over precipices like a boulder. But such accidents are rarer than from the terrible appearance of the trail one would be led to expect; the more experienced when driven loose find their way over the dangerous places with a caution and sagacity that is truly wonderful. During the gold excitement it was at times a matter of considerable pecuniary importance to force a way through the cañon with pack-trains early in the spring while it was yet heavily blocked with snow; and then the mules with their loads had sometimes to be let down over the steepest drifts and avalanche beds by means of ropes.

A good bridle-path leads from Yosemite through many a grove and meadow up to the head of the cañon, a distance of about thirty miles. Here the scenery undergoes a sudden and startling condensation. Mountains, red, gray, and black, rise close at hand

on the right, whitened around their bases with banks of enduring snow; on the left swells the huge red mass of Mount Gibbs, while in front the eye wanders down the shadowy cañon, and out on the warm plain of Mono, where the lake is seen gleaming like a burnished metallic disk, with clusters of lofty volcanic cones to the south of it.

When at length we enter the mountain gateway, the somber rocks seem aware of our presence, and seem to come thronging closer about us. Happily the ouzel and the old familiar robin are here to sing us welcome, and azure daisies beam with trustfulness and sympathy, enabling us to feel something of Nature's love even here, beneath the gaze of her coldest rocks.

The effect of this expressive outspokenness on the part of the cañon-rocks is greatly enhanced by the quiet aspect of the alpine meadows through which we pass just before entering the narrow gateway. The forests in which they lie, and the mountain-tops rising beyond them, seem quiet and tranquil. We catch their restful spirit, yield to the soothing influences of the sunshine, and saunter dreamily on through flowers and bees, scarce touched by a definite thought; then suddenly we find ourselves in the shadowy cañon, closeted with Nature in one of her wildest strongholds.

After the first bewildering impression begins to wear off, we perceive that it is not altogether terrible; for besides the reassuring birds and flowers we discover a chain of shining lakelets hanging down from the very summit of the pass, and

linked together by a silvery stream. The highest are set in bleak, rough bowls, scantily fringed with brown and yellow sedges. Winter storms blow snow through the cañon in blinding drifts, and avalanches shoot from the heights. Then are these sparkling tarns filled and buried, leaving not a hint of their existence. In June and July they begin to blink and thaw out like sleepy eyes, the carices thrust up their short brown spikes, the daisies bloom in turn, and the most profoundly buried of them all is at length warmed and summered as if winter were only a dream.

Red Lake is the lowest of the chain, and also the largest. It seems rather dull and forbidding at first sight, lying motionless in its deep, dark bed. The cañon wall rises sheer from the water's edge on the south, but on the opposite side there is sufficient space and sunshine for a sedgy daisy garden, the center of which is brilliantly lighted with lilies, castilleias, larkspurs, and columbines, sheltered from the wind by leafy willows, and forming a most joyful outburst of plant-life keenly emphasized by the chill baldness of the onlooking cliffs.

After indulging here in a dozing, shimmering lake-rest, the happy stream sets forth again, warbling and trilling like an ouzel, ever delightfully confiding, no matter how dark the way; leaping, gliding, hither, thither, clear or foaming: manifesting the beauty of its wildness in every sound and gesture.

One of its most beautiful developments is the Diamond Cascade, situated a short distance below Red Lake. Here the tense, crystalline water is first dashed into coarse, granular spray

mixed with dusty foam, and then divided into a diamond pattern by following the diagonal cleavage-joints that intersect the face of the precipice over which it pours. Viewed in front, it resembles a strip of embroidery of definite pattern, varying through the seasons with the temperature and the volume of water. Scarce a flower may be seen along its snowy border. A few bent pines look on from a distance, and small fringes of cassiope and rock-ferns are growing in fissures near the head, but these are so lowly and undemonstrative that only the attentive observer will be likely to notice them.

On the north wall of the cañon, a little below the Diamond Cascade, a glittering side stream makes its appearance, seeming to leap directly out of the sky. It first resembles a crinkled ribbon of silver hanging loosely down the wall, but grows wider as it descends, and dashes the dull rock with foam. A long rough talus curves up against this part of the cliff, overgrown with snow-pressed willows, in which the fall disappears with many an eager surge and swirl and plashing leap, finally beating its way down to its confluence with the main cañon stream.

Below this point the climate is no longer arctic. Butterflies become larger and more abundant, grasses with imposing spread of panicle wave above your shoulders, and the summery drone of the bumblebee thickens the air. The Dwarf Pine, the tree-mountaineer that climbs highest and braves the coldest blasts, is found scattered in storm-beaten clumps from the summit of the pass about half-way down the cañon. Here it is succeeded by the

hardy Two-leaved Pine, which is speedily joined by the taller Yellow and Mountain Pines. These, with the burly juniper, and shimmering aspen, rapidly grow larger as the sunshine becomes richer, forming groves that block the view; or they stand more apart here and there in picturesque groups, that make beautiful and obvious harmony with the rocks and with one another. Blooming underbrush becomes abundant,—azalea, spiraea, and the brier-rose weaving fringes for the streams, and shaggy rugs to relieve the stern, unflinching rock-bosses.

Through this delightful wilderness, Cañon Creek roves without any constraining channel, throbbing and wavering; now in sunshine, now in thoughtful shade; falling, swirling, flashing from side to side in weariless exuberance of energy. A glorious milky way of cascades is thus developed, of which Bower Cascade, though one of the smallest, is perhaps the most beautiful of them all. It is situated in the lower region of the pass, just where the sunshine begins to mellow between the cold and warm climates. Here the glad creek, grown strong with tribute gathered from many a snowy fountain on the heights, sings richer strains, and becomes more human and lovable at every step. Now you may by its side find the rose and homely yarrow, and small meadows full of bees and clover. At the head of a low-browed rock, luxuriant dogwood bushes and willows arch over from bank to bank, embowering the stream with their leafy branches; and drooping plumes, kept in motion by the current, fringe the brow of the cascade in front. From this leafy covert the stream leaps

out into the light in a fluted curve thick sown with sparkling crystals, and falls into a pool filled with brown boulders, out of which it creeps gray with foam-bells and disappears in a tangle of verdure like that from which it came.

Конец ознакомительного фрагмента.