less. By careful measurement he ascertained that the greatest advance was two hundred and sixty-nine feet; the least, one hundred and twenty-five.

8. But it is to James David Forbes, formerly professor of natural philosophy in the University of Edinburgh, that we are mainly indebted for the varied and accurate knowledge we now possess regarding the motion of glaciers. He was the first to show, in 1842, that by means of a theŏd'olīte, the motion of a glacier may be made sensible to the eye from day to day, and even from hour to hour. The scene which he chose for his labors, and which still continues a fāvorīte spot for the study of glacier phenomena, was the well-known Mer de Glace, so called from its resemblance to a frozen sea. This is an enormous glacier which descends from a noble amphitheatre of mountains belonging to the group of Mont Blanc, and, after a course of many miles, forces its way through a narrow gorge, close to the beautiful village of Chamouni.[1] Here the professor remained for several weeks, and by accurate mĕasurement determined the exact rate of advance of every part of the glacier, thus placing the question of glacier motion, for the first time, on a sound basis of facts.

9. A theodolite, as I dare say you know, is practically a telescope mounted on a stand; and for the purpose of exact observation the eye-piece of the telescope is provided with two fine spider threads, which crŏss one another at right angles. Planting the instrument on the mountain side, and looking through the telescope, straight acrŏss the glacier, it is not difficult to get some well-defined peak of ice to cōincīde' with the intersection of these two cross-threads. This done, the instrument may be left fixed in its position for three or four hours. On looking through the telescope at the end of that time, it will be seen that the peak of ice no longer coincides with the intersection of the threads, but has advanced sensibly across the field of view. From careful observations made in this way, and ŏften repeated, it has been shown that the maximum[2] motion of the Mer de Glace, in passing through the gorge, is about three feet a day in summer, and about hälf that distance in winter.

[1] **Chamouni** (shä'mo nē').

[2] **Măx'i mum**, the greatest.

III.

86. THE GLACIERS OF THE ALPS.

PART THIRD.

THOUGH the glăç'iërs of the Alps take their origin from snowfields of dazzling whiteness, they do not lŏng preserve unsullied this spotless purity of color. The fōrces of nature are unceasingly at work on the mountains that flank them at ēither side. Mighty rocks are rent asunder by the frŏst; lŏfty cliffs are shattered by the lightning; loose shingle[1] and mud are washed down by the tŏrrent; and all this ruin is heaped up, from day to day and from year to year, on the surface of the glacier. The lighter materials are scattered about in all directions by the wind, and envelop the glacier in a vesture of dingy brown. But the larger masses of rock remain, for the most part, near the foot of the mountains, and form, at each side of the glacier, a long and lofty pile, which is bōrne slowly down tōward the plain below. These ramparts of rock are called Lateral Morāines'; and I know hardly any object of more striking interest in the natural history of our globe.

2. Standing in the lonely recess'es of a glacier, the traveler hears, at intervals, the rattle of the loose shingle down the mountain side, and he sees the fragments, sometimes one by one, sometimes in a cluster, like a shower of rockets, leap out upon the ice, to begin their long and tēd'iŏŭs, but inevitable journey to the valley below. Now and then a massive rock is let loose which, leaping from crag to crag, comes down at length with a crash to take its place among its fellows on the moraine; or perhaps it is caught on a projecting ledge, and its journey delayed for years. Now, we must realize to our minds that this prŏcess, which we may witness for hälf an hour, once and again, is going on, not for hours only, nor for days, but for years and for centuries; and thus we shall come to form a picture of what Nature is really about in the wild solitudes of the glaciers, unseen and unnoticed, except at rare intervals, by human eye. She is hewing her mountains to pieces, and carrying away the ruins by a machinery of her own, strange and

[1] **Shĭn'gle**, loose gravel and pebbles, worn by the action of water.

wonderful, to distant sites, where she is minded, no doubt, to use them for other purposes, which may be to us an object of speculation and wonder, but which we can hardly hope fully to comprehend.

3. When two glaciers meet they unite like the tributaries of a river, and move on together down the valley. In such a case it is evident that the two adjacent lateral moraines of the two glaciers will come together at the point of junction, and thĕncefōrth form one united ridge of rock and rubbish. This ridge is called the Medial, or Middle Moraine. When there are three tributary glaciers there will be, of course, two medial moraines—one formed at the junction of the first and second glaciers, the other at the junction of the second and third. And so, in evèry case, each new tributary involves the production of a new medial moraine. These medial moraines, which may be readily distinguished when we look up the valley from below, constitute a very characteristic feature of glacier phenŏmenâ. They appear as long barriers of rock, roughly parallel to the sides of the valley, and marking out definitely the several tributaries of which a great trunk glacier is composed.

4. Every glacier wastes away at its lower end by the melting of the ice; and as it wastes away it deposits on the floor of the valley the mâss of rock and shingle and mud which it has bōrne down from the higher mountains. The waste, however, is, for the most part, made good by the advânce of the ice from behind; and thus the actual position of the end of the glacier may remain unchanged for many years together. Meanwhile, the pōrtion that disappears each year adds a fresh contribution to the pile of rock and ruins, which thus grows up into a great barrier stretching across the valley. This barrier is called the Terminal Moraine of the glacier.

5. Sometimes, however, the yearly waste of the glacier is greater than the compensation made by its onward march; and then the glacier diminishes in size and shrinks backward up the valley, leaving its terminal moraine behind. Many such terminal moraines may be seen at the present day in Switzerland, covered with vegetation, and separated sometimes by pasture fields, and even by villages, from the glaciers by which they were deposited. On the other hand, when the snowfall for a

number of years has been unusually great, and the summers unusually cold, then the compensation exceeds the waste; the glacier moves farther down the valley, carrying before it human dwellings, tearing up fŏrest trees, and even pushing along, with gentle but resistless force, the mountain-like pile of its own terminal moraine.

6. Another in'teresting feature of the glacier consists in those deep clefts or fissures by which it is intersected in all dĭrĕctions, and which are generally known by the French name of crevasses. The crevasse first appears as a minute crack in the surface of a glacier, into which you could with difficulty introduce the blade of a penknife. In a few days this crack is, perhaps, an inch wide; later on, it is a foot across; and so it continues to increase, until it becomes at length a yawning chasm of unknown depth, several feet in width, and, it may be, a hundred yards or more in length.

7. Chasms of this kind constitute one of the difficulties and dangers of glacier excursions. In summer, below the snow-line, the surface of the glacier is usually free from snow, and you can see the chasm as you approach. It is then little more than an obstacle in your way, and involves no real danger. If it is narrow, you can step across; if too wide for leaping, you will ŏften find a colossal mass of rock caught in the jaws of the crevasse, which affords a convenient bridge over which you may pass in safety. At the worst, you can follow the edge of the chasm, which must come to an end somewhere, and thus get round it at the loss of a little time and trouble. But in the higher regions, where the glacier is covered with snow, the crevasse is a great source of danger, and has proved the grave of many a bold, perhaps I should say reckless, mountaineer. The whŏle surface is here an unbroken field of snow; and the treacherous chasm is concealed from the traveler's eye until he steps into it and is lost.

8. Nevertheless, a remedy has been found for this danger, and we are assured by the most experienced guides that nŏne need suffer except from their own neglect. A single traveler has, indeed, no security. But a party of four or five, with a rope passing from one to the other, firmly secured to each, leaving an interval of ten or twelve feet between, are held to be

perfectly safe. One of the party may step into a hidden crevasse, and disappear for a moment, but his companions, who have firm footing on the solid glacier, are at hand to pull him out. No doubt there are many who might not like even this temporary acquaintance with the interior of a crevasse; and I suppose the best security for them is to keep carefully, in their excursions, below the limits of perpetual snow.

9. You will, perhaps, be interested to hear an authentic stŏry of Al′pĭne adventure, which at once illustrates the danger of crevasses and brings hŏme to the mind, in a practical way, the reality of glacier motion. In the month of August, 1820, Dr. Hamel, a Russian traveler, with two English companions and a party of seven guides, attempted the ascent of Mont Blanc. They had reached in safety that magnificent expanse of snow known as the Grand Plateau, not far from the highest summit of the mountain, when they were caught in an ăv′a-lănçhe′, which swept three of the guides into a yawning crevasse. Forty years passed away, and no tidings were ever hĕard of them; but on the fifteenth of August, 1861, far away in the valley, many miles from the scene of the catăs′trophe, their remains were given up, by the melting of the ice, at the end of the Glacier des Bossons. Arms, legs, and skulls were successively brought fŏrth to the light of day, the flesh being still quite white and adhering firmly to the bones. Near them were found fragments of clothes, the straw hat of one of the guides, the gauze veil of Dr. Hamel, a broken alpenstock,[1] and, perhaps most curious of all, a roast leg of mutton still in a good state of preservation. These and many other similar records of the sad catastrophe, having been gathered together, were carried to the ŏffice of the mayor of Chămo̤unĭ′, and became the subject of judicial investigation.

10. The chief witness was Marie Couttet, one of the guides who had escaped, and who was now seventy-two years of age. The old man identified, without difficulty, all the various fragments spread out before him, and was deeply affected as each, in turn, brought vividly to his mind some incident of the perilous expedition. "This is the hat," he said, "of Auguste

[1] **Al′pen stock**, a long staff, pointed with iron, used in traveling among the Alps.

Tairraz; it was he who carried the pigeons which we were to let fly from the summit; and see, here is the wing of one of them. This stick, shod with iron, is the remnant of my alpenstock; I made it myself for my excursions on the glaciers. And it saved my life; for when my companions were swallōwed up I was suppōrted on my staff, and remained suspended over the crevasse. It broke at last; but I was able to free myself from the snow, and I was saved. What joy to see it again! This is the hand of Balmat; I know it well." And kissing it tenderly, he added: "I could not have believed that before leaving the world it would have been granted me to press once again the hand of my brave cŏmrāde, my good friend Balmat." Another surviving guide of the expedition, Julien Devouassoux, was also present at this strange scene. But he was upward of eighty years of age; memory and intelligence were gone; and he looked on at the sad spectacle without emotion or appâr′ent interest.

11. But it is time to return to the history of the glacier, and follow it out to the end. We have seen that the glacier is fed from the snowfields, and the snowfields are the product of the clouds that sweep across the Alps; and the clouds are ōnly the vapor of the atmosphere, first condensed into water, and then crystallized into snow; and the vapor of the atmosphere has been drawn ŏff from the ocean by the action of the sun's heat: and now it remains for me only to tell you how the glacier itself returns to its pârent ocean, and thus completes the cycle[1] of its history. The lower end of every glacier is the source of a river, which rushes out from beneath a massive vault of ice. This river is fed partly by the melting of the ice at the end of the glacier, partly by the melting that goes on over its surface the whōle summer through. Evèry traveler knows that a glacier is traversed in summer with numerous rills, which make for themselves little fŭrrōws in the ice, often uniting so as to form considerable streams, and flowing down over the surface until they come to the edge of a crevasse, into which they plunge and disappear. All these rills and streams find their

[1] **Cȳ′cle**, an interval of time in which a certain succession of events or phenomena is completed, and then returns again, uniformly and continually in the same order.

way through the ice to the floor of the valley, and then continuing their course underneath the glacier, issue at length from the vaulted arch at the end.

12. The river thus brought into existence is, thĕrefore, nŏthing less than the glacier itself, under a new form, and entering on a new career. It is saturated with fine mud, produced by the grinding action of the glacier against its valley-bed; and when first we see the turbid, muddy stream into which the exquisite blue ice of the glacier has been converted, we can hardly suppress a feeling of disappointment and regret. But the beauty of the glacier has not been wholly effaced; it has only been veiled for a time. If we follow the stream in its course, we shall find that it throws down its muddy garb in the first great lake through which it flows; and we shall recognize once again the beautiful tints of the glacier ice in the blue waters of Geneva, Constance, Lucerne, Garda, and Como.

13. After a brief interval of repose in these great basins, the glacier streams set out once more on their long journey, and under the familiar names of the Rhine, the Rhone, the Po, the Ad'ĭge, the Inn, stretch away in all directions, for hundreds of miles, across the continent of Europe, never halting on the way till they pour back the melted snowfields of the Alps into the Northern Ocean, the Black Sea, and the Mediterranean. Thus we learn that the glaciers of the Alps represent but one particular stage in a long series of changes, which go on unceasingly from age to age. The glaciers of to-day are the clouds of yesterday and the rivers of to-morrow. They spring from the ocean, and to the ocean they return.

14. I have sought ōnly, in this hŭrried sketch, to put before you the leading features of a great natural phenomenon, and to give you some idea of the harmony and beauty of those laws that are concerned in its history. Of the majestic aspect which the glaciers of the Alps present to the eye, and of the glorious scenery that surrounds them, I have attempted no description. But I venture to hope that in sketching out the laws to which these stupendous works of Nature owe their existence, their action, and their decay, I have suggested to you some new thoughts, and furnished, perhaps, a new source of enjoyment. For I believe that scenery the most beautiful and sublime

receives a new charm when we are able not merely to contemplate the face of Nature, but to reach the intelligence behind; not merely to discern in her works that external beauty which strikes the eye and kindles the imagination, but to trace out the evidence of wisdom, forethought, power, which leads the mind from the admiration of the material world to the knowledge and worship of Him who is the great Invisible Creator and Ruler of the universe.

Abridged from Rev. Gerald Molloy, D.D.

IV.

87. *HYMN IN THE VALE OF CHAMOUNI.*

HAST thou a charm to stay the morning star
In his steep cōurse? So lŏng he seems to pause
On thy bald, awful head, oh, sŏvereĭgn Blanc!
The Arvè and Arveiron at thy base
Rave ceaselessly; but *thou*, most awful form,
Risest from fŏrth thy silent sea of pines
How silently! Around thee and above
Deep is the air, and dark, substantial, black,
An ĕbon mäss! Methinks thou piercest it
As with a wedge! But when I look again,
It is thine own cälm hōme, thy crystal shrine,
Thy habitation from eternity.
Oh, dread and silent Mount! I gazed on thee
Till thou, still present to the bodily sense,
Didst vanish from my thought: entrânced in prâyer,
I worshipped the Invisible alone.

2. Yet like some sweet beguiling melody,
So sweet we know not we are lis*t*ening to it,
Thou, the meanwhile wast blending with my thought,
Yea, with my life, and life's own secret joy.
Awake, my soul! Not ōnly passive praise
Thou ōwèst! Not alone these swelling tears,
Mute thanks and secret ecstasy! Awake,
Voice of sweet sŏng! Awake, my heart, awake!
Green vales and icy cliffs, all join my hymn!

3. Thou first and chief, sole sŏvereĭgn of the vale!
Oh, struggling with the darkness all the night,
And visited all night by troops of stars—
Or when they climb the sky, or when they sink—
Companion of the morning star at dawn,
Thyself ĕarth's rosy star, and of the dawn
Co-herald! wake, oh, wake! and utter praise!
Who sank thy sunless pillars in the earth?
Who filled thy countenance with rosy light?
Who made thee father of perpetual streams?

4. And you, ye five wild tŏrrents, fiercely glad,
Who called you fōrth from night and utter death?
From dark and icy caverns called you fōrth,
Down those preçĭp′itous, black, jaggèd rocks,
Forever shattered, and the same forever?
Who gave you your invul′nerable life,
Your strength, your speed, your fury, and your joy,
Unceasing thunder and eternal foam?
And who commanded—and the silence came—
"Here shall the billows stiffen and have rest?"

5. Ye ice-falls! ye that from the mountaĭn's brow
Adown enormous răv′ines slope amain—
Torrents, methinks, that hĕard a mighty voice,
And stopped at once amidst their maddest plunge!
Motionless torrents! silent cataracts!
Who made you glorious as the gates of heaven,
Beneath the keen full moon? Who bade the sun
Clothe you with rainbows? Who with lovely flowers
Of living blue spread garlands at your feet?
Gŏd! let the torrents like a shout of nations
Answer! and let the ice-plains echo God!
God! sing ye meadōw streams with gladsome voice,
And pine-groves with your sŏft and soul-like sounds!
And they too have a voice, yon piles of snow,
And in their perilous fall shall thunder, God!
Ye living flowers, that skirt the etĕrnal frŏst!
Ye wild goats sporting round the eagle's nest!
Ye eagles, playmates of the mountain storm!

Ye lightnings, the dread ărrōws of the clouds!
Ye signs and wonders of the elements!
Utter fōrth God! and fill the hills with praise!

6. Thou too, hōar Mount! with thy sky-pointing peaks,
Oft from whose feet the avalançhe, unhĕard,
Shoots downward, glittering through the pure serene
Into the depth of clouds that veil thy breast—
Thou too again, stupendous Mountain! thou
That as I raise my head, awhile bowed low
In adoration, upward from thy base
Slow traveling with dim eyes suffused with tears,
Solemnly seemest, like a vapory cloud,
To rise before me. Rise, oh, ever rise,
Rise like a cloud of incense from the earth!
Thou kingly spirit throned among the hills,
Thou dread ambassador from earth to heaven,
Great hierärch,[1] tell thou the silent sky,
And tell the stars, and tell yon rising sun,
Earth, with her thousand voices, praises God!

COLERIDGE.

SAMUEL TAYLOR COLERIDGE, one of the most imaginative and original of poets, was born at St. Mary Ottery, Devonshire, England, in October, 1772, and died at Highgate in July, 1834. He was the author of "Christabel," the "Rhyme of the Ancient Mariner," and other poems which have an enduring reputation, and of various prose works which exhibit a profound and subtle but not a thoroughly well-balanced intellect.

SECTION XXI.

I.

88. *FALSE JUDGMENTS OF THE UNJUST*

[*A Selection from the Inspired Book of Wisdom.*]

LOVE justice, you that are the judges of the earth. Think of the Lord in goodness, and seek Him in simplicity of heart: for He is found by them that tempt Him not; and He showeth Himself to them that have faith in Him.

2. For perverse thoughts separate from God; and His power,

[1] **Hi′ e rarch**, a leader or ruler, especially one who has authority in sacred things.